DES MOINES
SOUTH AREA SOURCE CONTROL OPERABLE UNIT
SAMPLING AND ANALYSIS PLAN

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DES MOINES
SOUTH AREA SOURCE CONTROL OPERABLE UNIT
SAMPLING AND ANALYSIS PLAN

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DISTRIBUTION

The following persons shall receive an official copy of this Sampling and Analysis Plan:

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1.0 INTRODUCTION

The information contained within this Sampling and Analysis Plan (SAP) incorporates two distinct plans developed for the South Area Source Control (SASC) project: the Quality Assurance Project Plan (QAPP), and the Field Sampling Plan (FSP). In accordance with the EPA document Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, the SAP is composed of the QAPP and FSP under one cover.

This SAP is a supplementary document to the Remedial Investigation (RI)/Feasibility Study (FS) Work Plan, dated July, 1989 and prepared by ECKENFELDER INC. for the SASC project. The table of contents from the RI/FS Work Plan has been included as Appendix A for reference. Another document referenced in this SAP is entitled A Compendium of Superfund Field Operations Methods, herein referred to as the Compendium.

The Health and Safety Plan for the RI/FS has been developed concurrently with the SAP and will be available prior to the inception of any field activities. The table of contents from the Health and Safety Plan has been included as Appendix B for reference.

2.0 QUALITY ASSURANCE PROJECT PLAN (QAPP)

2.1 PROJECT DESCRIPTION

2.1.1 Introduction

A comprehensive project description is included in the RI/FS Work Plan (see Table of Contents, Appendix A, for specific sections).

The SASC project consists of two separate processes: a Remedial Investigation (RI) and an engineering Feasibility Study (FS). However, as shown on Figure 2-1, these two programs will be conducted in parallel, or interactively, to enhance the timely productivity of each. The RI portion of this investigation consists of the following seven initial data-gathering tasks:

- Property survey
- Underground utilities inventory
- Geophysical survey
- Shallow auger borings
- Deep soil borings
- Surface water/sediment sampling
- Groundwater sampling

2.1.2 Project Objectives

The primary objective of this SAP is to assure data obtained from the field investigation satisfies the data quality objectives (DQOs) established for the RI/FS. DQOs are informational objectives and associated specific data needs required to develop, support, and evaluate the portions of the RI/FS process. The process includes the following principal steps:

- Site characterization
- Risk assessment
- Health and safety planning
- Development and evaluation of alternatives

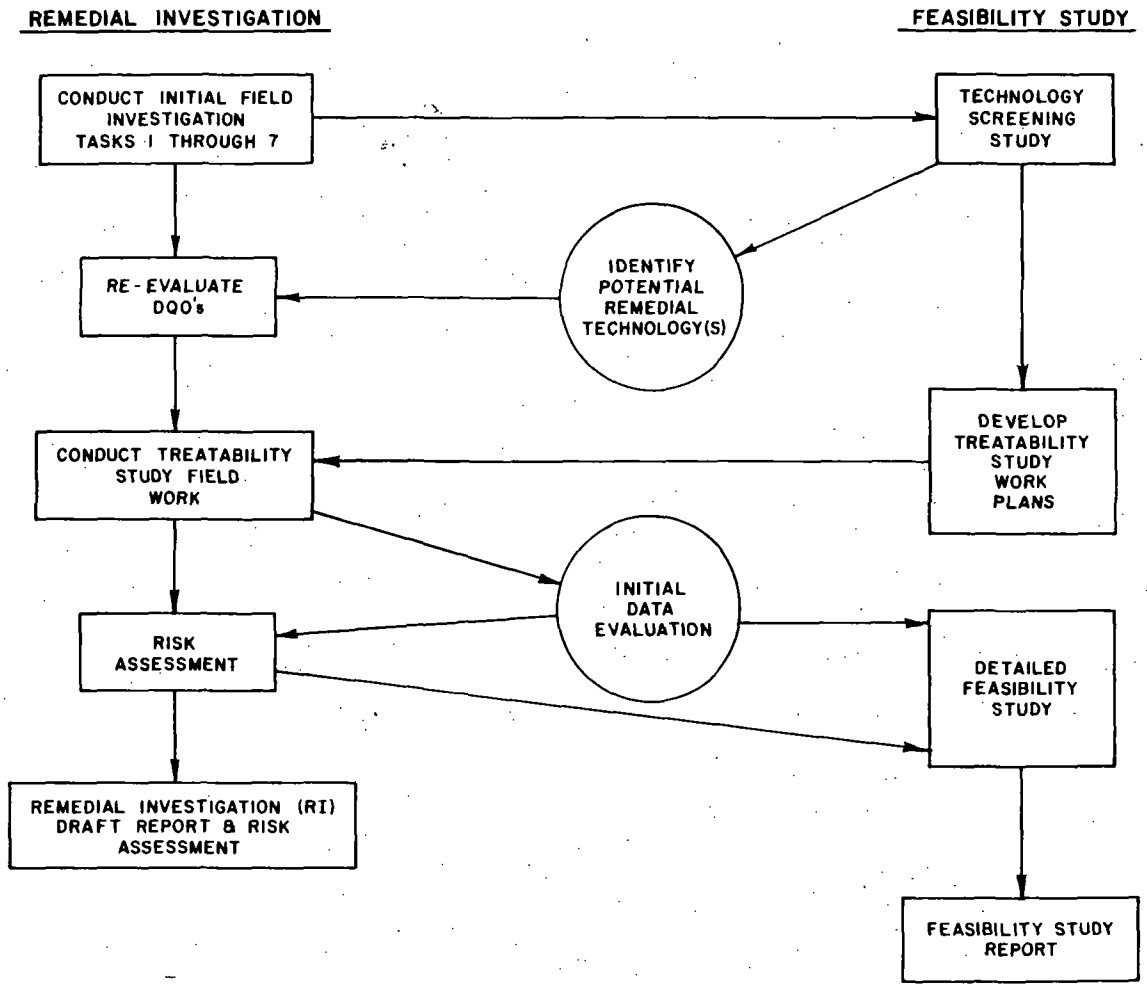


FIGURE 2-1

PROJECT FLOW CHART

DES MOINES SOUTH AREA SOURCE CONTROL PROJECT

ECKENFELDER INC. Nashville, Tennessee Midvale, New Jersey

- Treatability studies
- Monitoring during implementation of remedial alternative.

The overall objectives and scope of the RI/FS are presented in Sections 4.1 and 4.2 of the RI/FS Work Plan, including a list of all potential DQOs. A focused list of DQOs for the RI is presented in Table 2-1.

2.1.3 Site Description

To delineate the area to be examined in this investigation in contrast to that covered by previous studies and reports, the following nomenclature has been adopted. Previous work, including the groundwater Operable Unit Feasibility Study (OUFS), was focused within a relatively large area known a the Des Moines TCE Site. This area included the Des Moines Water Works property, the industrial area north of the Raccoon River (Meredith Corporation, Des Moines Tech/Central Campus, etc.), the Tuttle Street landfill to the east and the Frank De Puydt Woods to the south. In all, this area encompassed approximately 200 acres and in fact is still expanding to the north as USEPA continues to investigate the source(s) of the northern plume.

Within the Des Moines TCE Site is a much smaller area currently owned by DICO, Inc. The DICO property and a portion of the Frank De Puydt Woods will be addressed by this second Operable Unit RI/FS. Because the area specifically does not include other potential sources of contamination to the north, this more limited area has been given the name South Area Source Control project or "SASC". The boundaries of the DICO property and the entire SASC project have been illustrated on Figure 2-2.

2.1.4 Site History

DICO, Inc., currently a subsidiary of the Dyneer Corporation, has evolved through a series of owners and business interests since the inception of operations at its current location in the mid 1940s. Prior to this time, the property was the site of a grey iron foundry. A predecessor of DICO first began operations on the property in 1944. In 1946, DICO began the manufacture of steel wheels, a product line which continues today. In 1967, the company

Table 2-1
Focused List of Data Quality Objectives for the RI

Data Quality Objectives	Specific Data Needs
-Define site characteristics topography, and drainage.	-Property boundary survey. -Detailed base map. -Locate Ingersol ditch. -Collect climatic data. -Collect data on local ecosystem\critical habitat.
-Identify buried structures (potential contaminant sources).	-Buried utilities survey. -Buried tank inventory. -Aerial survey for buried drums. -Geophysical Survey
-Define physical soil characteristics.	-Stratigraphy. -Grain size distribution.
-Define horizontal and vertical limits of soil contamination	-Biased and unbiased soil borings. -Continuous soil sampling to water table. -OVA field screening. -Samples for laboratory analysis.
-Identify soil chemistry\contamination.	-VOC analysis on all samples. -Focused herbicide\metals analysis. -Confirmatory total HSL analysis.
-Evaluate impacts to GW quality. -Evaluate impacts to surface water\sediment quality.	-Focused herbicide\metals analysis. -Focused total HSL analysis. -Focused sampling locations\analysis.

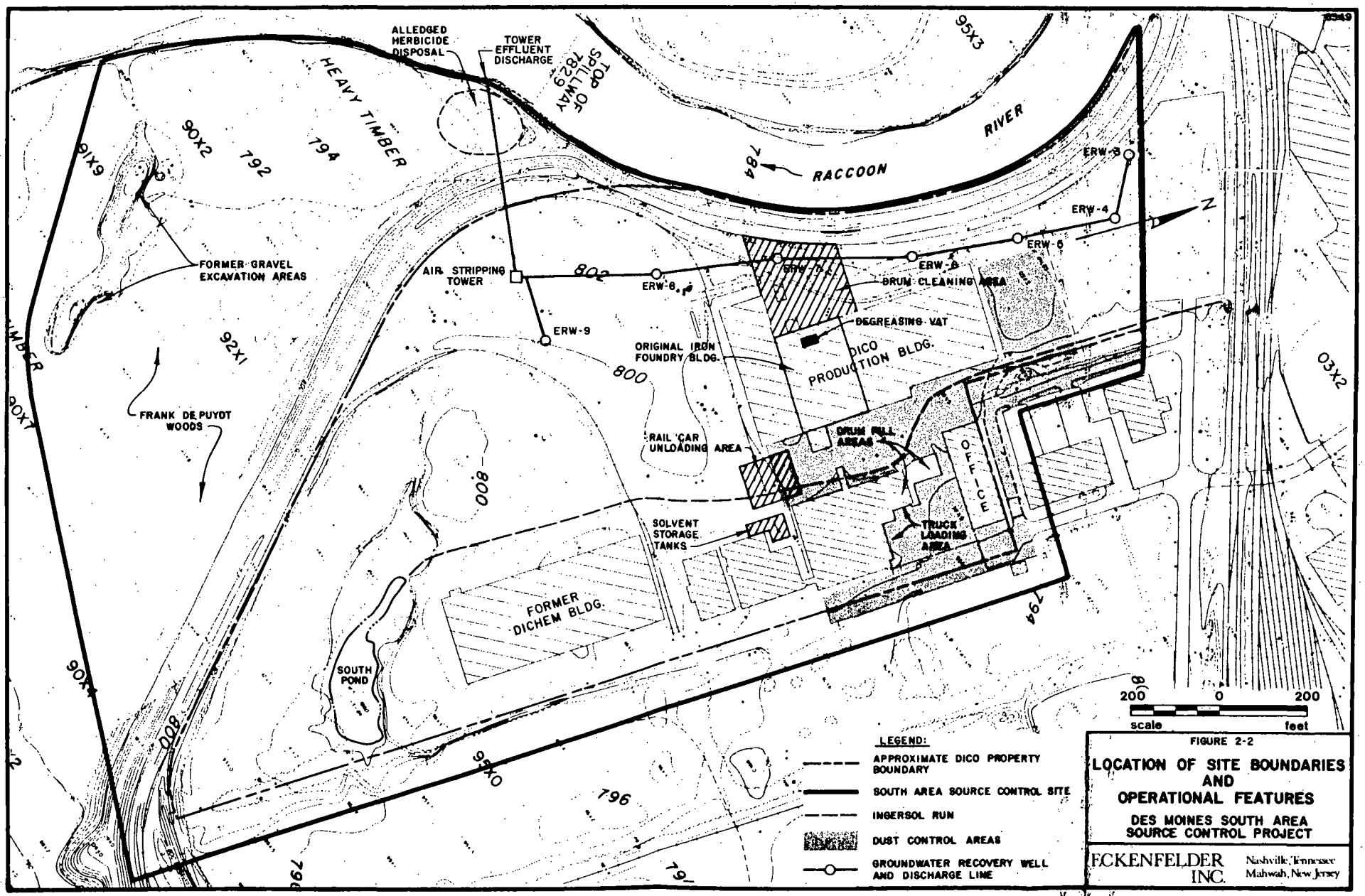


FIGURE 2-2

LOCATION OF SITE BOUNDARIES AND OPERATIONAL FEATURES

DES MOINES SOUTH AREA SOURCE CONTROL PROJECT

ECKENFELDER INC. Nashville, Tennessee; Mahwah, New Jersey

was sold to the Greater Iowa Corporation, later renamed the DICO Corporation. In 1978, the DICO Corporation was sold to the ASPRO Corporation, later called Dyneer. In 1979, the DICO Company, Inc. was formed and the DICO Corporation was liquidated. DICO, Inc. is a corporate successor to DICO Company, Inc.

A detailed discussion of the operational history of the site is included in the RI/FS Work Plan. Some of the former operations at the site, and how they relate to the RI/FS sampling strategy, are described in Section 2.4.

2.1.5 Previous Investigations

Since the first identification of volatile organics at the Des Moines TCE site in 1985 there have been four major field investigative efforts, including the installation of the present groundwater recovery system. The investigations can be summarized as follows.

Date	Investigators	Major Field Activity
April 1978	USEPA/DMWW	6 sand points
August 1982	USEPA (FIT)	11 monitoring wells (EW-series)
November 1984	USEPA (CH2M-Hill)	20 monitoring wells (NW-1 thru NW-20)
		9 piezometers (P-1 thru P-9)
August 1986 - December 1987	DICO (ECKENFELDER INC.)	9 Monitoring Wells (NW-21 thru NW-29)
		9 Piezometers (P-10 thru P-18)
		7 recovery wells (ERW-3 thru ERW-9)

Each of these investigations is further described in terms of its contribution to the data requirements of the SASC OU investigation. A summary of soil quality data obtained from these investigations is presented on Figure 2-3.

1978 USEPA/DMWW Investigation

Six sand points were installed east of the Raccoon River and were used for groundwater sampling. The points only intersected the upper 3 to 5 feet of

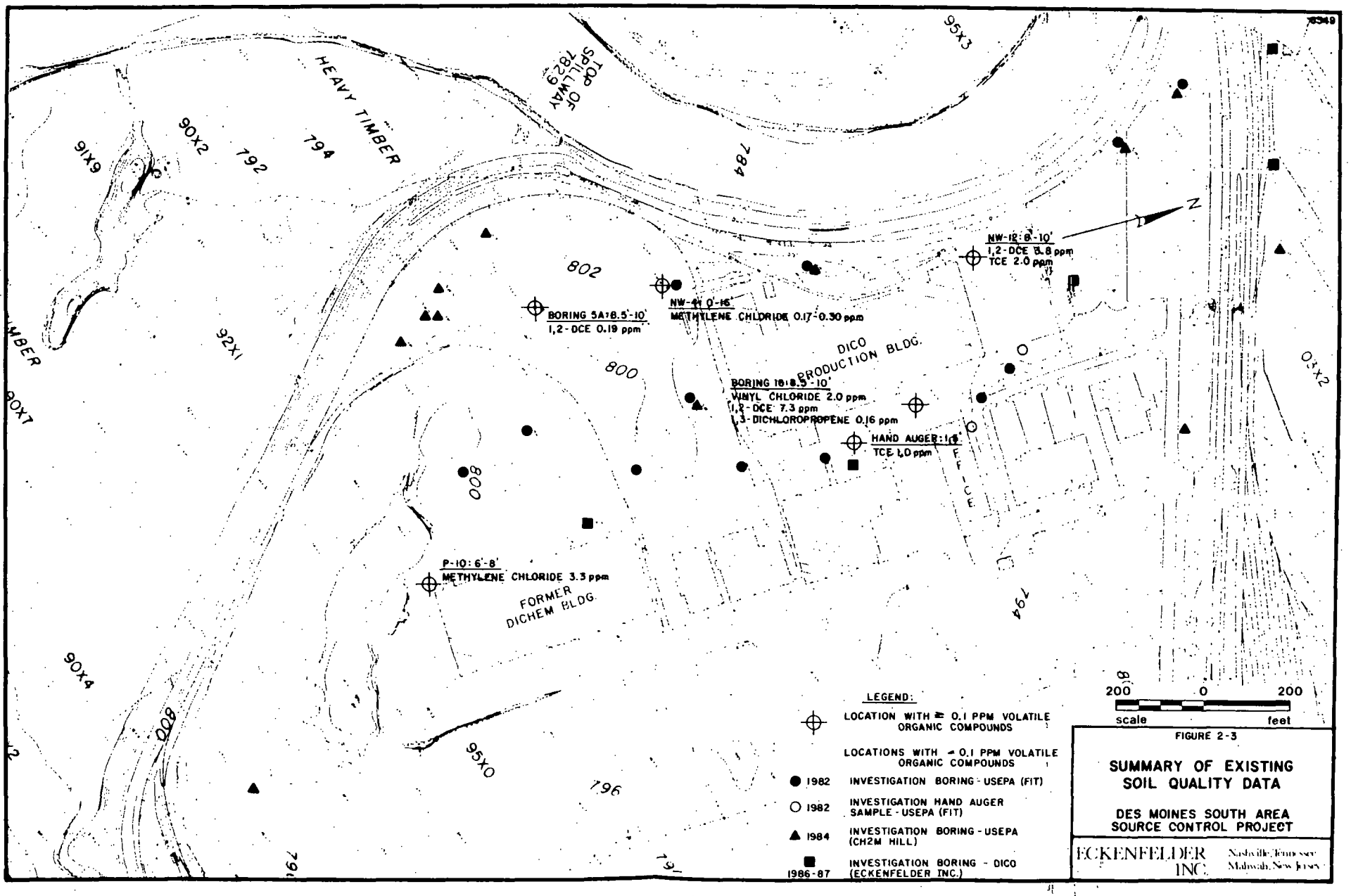


FIGURE 2-3

SUMMARY OF EXISTING SOIL QUALITY DATA

DES MOINES SOUTH AREA SOURCE CONTROL PROJECT

ECKENFELDER INC. Nashville, Tennessee Midlands, New Jersey

the aquifer and no soil samples were analyzed. Data from this investigation was not useful in evaluating site conditions for the SASC work plan.

1982 USEPA (FIT) Investigation

During August of 1982, the 11 "EW-" series wells were installed. During installation, soil samples were collected at five-foot depth intervals using split-spoon samplers. Twenty-six (26) soil samples were collected at depths ranging from 0.7 to 25 feet below grade and submitted for volatile organic analysis.

1984 USEPA Remedial Investigation (RI)

During the installation of the first 20 "NW-" series monitoring wells and 9 piezometers, a total of 102 soil samples were collected for analysis. Each sample was analyzed for volatile organic compounds and metals. Of these, 41 were also analyzed for semi-volatile organics and pesticides. A soil gas survey was also conducted during the RI in which 27 locations were monitored.

1986-1987 ECKENFELDER INC. Investigation

During the supplemental investigation by ECKENFELDER INC., nine monitoring wells and nine piezometers were installed to evaluate the effectiveness of the groundwater recovery system. In order to take advantage of the mobilized drilling equipment, soil samples were collected for chemical analysis from a selected number of these locations. A total of 32 soil samples were collected from six boring locations within and outside of the SASC project. The majority of the samples were analyzed for volatile organics, base-neutral extractable organics and metals.

2.1.6 Ongoing Remedial Activities

Based on the results of the investigations described in Section 2.1.4, two plumes of groundwater contamination were identified beneath portions of the Des Moines TCE site. The northern plume consists primarily of 1,2-Dichloroethylene (1,2-DCE) with lesser amounts of TCE, and stems from

sources north of the DICO property which have not yet been identified. The southern plume is comprised primarily of TCE with lesser concentrations of 1,2-DCE.

Based on the results of the USEPA's Feasibility Study (FS) and subsequent optimization by ECKENFELDER INC., a groundwater recovery and treatment system was designed. The original design consisted of 9 recovery wells located east of the Raccoon River, each piping to a common air stripping tower for treatment. However, due to the lack of timely access to the property of Meredith Corporation, only 7 of the 9 wells were actually installed. The modified system became operational on December 17, 1987.

During the first year of groundwater recovery and treatment, approximately 790 gallons of TCE has been recovered from both the south and north plumes. Furthermore, the hydraulic capture zone which has been established encompasses the entire area of investigation within the Des Moines TCE site, that is, groundwater within the perimeter of all existing wells and piezometers indicates flow toward the recovery system. This hydraulic capture is maintained even though the DMWW withdrew 10 to 15 mgd from their galley system during 1988.

2.1.7 Action Levels

Review of previous investigations conducted at the site has revealed three compounds which have been persistently detected in the groundwater and within numerous soil samples collected from the site. These compounds are trichloroethylene (TCE), 1,2-Dichloroethylene (1,2-DCE), and vinyl chloride. These three compounds are the primary contaminants of concern for this investigation.

Specific action levels for these and other compounds will be established as analytical data become available during this investigation and a site-specific scenario is developed with regards to the actual nature and extent of the contamination present.

The CLP-required detection limits for TCE, 1,2-DCE and vinyl chloride are 5 ppb, 5 ppb and 10 ppb, respectively, for low concentration soils (wet weight basis). In the laboratory analytical procedure, these detection limits, as well as the detection limits for other volatile organic compounds, are based on filling/analyzing a purge vessel (5-gram capacity) with a representative aliquot of the investigative soil sample. In order to achieve lower detection limits than those specified in the CLP, a purge vessel with greater sample capacity (e.g., 10-gram capacity) must be used. However, there presently is no EPA methodology for incorporating a purge vessel of greater capacity into the analytical procedure. Therefore, the CLP-required detection limits for the HSL volatile organic compounds, including TCE, 1,2-DCE and vinyl chloride are as low as possible under current EPA-approved methodology and will likely be several orders of magnitude lower than any action levels established during this investigation.

Contaminants in the groundwater are presently being addressed through the Administrative Order issued in July, 1986, therefore, no new action levels for the water matrixes will be established.

2.2 PROJECT ORGANIZATION AND RESPONSIBILITIES

A detailed description of the project coordination is presented in Section 1.1 of the RI/FS Work Plan. A flow chart illustrating the interactive approach to be taken within the RI and FS investigations is included as Figure 2-1. ECKENFELDER INC.'s project organizational structure is depicted as Figure 2-4.

The following individuals have been identified for participation in the SASC project:

Responsibility	Affiliation	Name	Phone No.
Project Manager	USEPA Region VII	Glenn Curtis	(913) 236-2856
Plant Contact	DICO	John Strouf	(515) 244-7286
Attorney Representing DICO	Cleary, Gottlieb, Steen & Hamilton	Charles Lettow	(202) 728-2748
Project Director	ECKENFELDER INC.	Robert D. Mutch, Jr.	(201) 529-0800

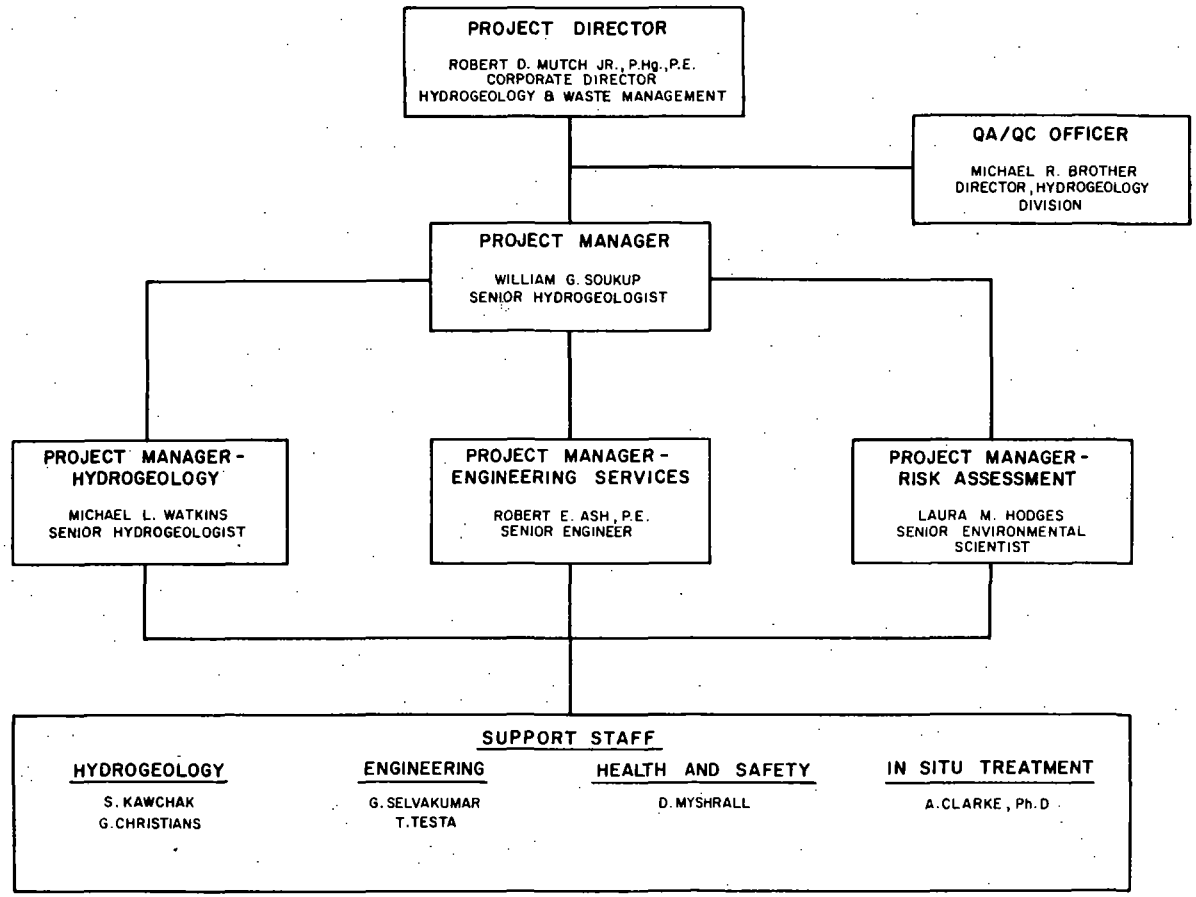


FIGURE 2-4

PROJECT ORGANIZATION

DES MOINES SOUTH AREA
SOURCE CONTROL PROJECT

ECKENFELDER INC. Nashville, Tennessee Matawan, New Jersey

Responsibility	Affiliation	Name	Phone No.
Project Manager	ECKENFELDER INC.	William G. Soukup	(201) 529-0800
QA/QC Officer	ECKENFELDER INC.	Michael R. Brother	(201) 529-0800
Project Manager (Hydrogeology)	ECKENFELDER INC.	Michael L. Watkins	(201) 529-0800
Project Manager (Engineering Services)	ECKENFELDER INC.	Robert E. Ash	(201) 529-0800
Project Manager (Risk Assessment)	ECKENFELDER INC.	Laura M. Hodges	(615) 255-2288
Analytical Lab Contact	University Hygienic Laboratories	Dr. Michael Wichman	(319) 335-4500
Drilling Services Contact	Layne-Western	Mary Goodwin	(515) 232-3563
Surveying Services Contact	Shive-Hattery Engineers and Architects, Inc.	John Vande Steeg	(515) 223-8104

2.3 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT

2.3.1 Introduction

To assure that the data generated during the RI fulfills the needs of the data quality objectives, quality assurance practices will be maintained both in the field and in the laboratory. Field procedures will be performed in accordance with this SAP. Laboratory procedures will adhere to Contract Laboratory Program (CLP) protocol and University Hygienic Laboratory's (UHL) Standard Operating Procedures (SOPs), many of which directly reference or incorporate CLP protocol. All data generation, review, and reporting by UHL will be accomplished in accordance with the appropriate CLP Statement of Work (SOW) as referenced in UHL's SOPs. UHL's SOPs are included as Appendix C.

2.3.2 Field Methodologies

It is essential to any investigation that samples collected in the field destined for laboratory analyses be representative of the conditions present within the specific sampled matrix (e.g., soil, sediment, groundwater, and

surface water) at the time of sampling. To assure sample representativeness and completeness, all sampling procedures will be in accordance with the FSP (Section 3.0).

For field-generated data such as head space analyses, geophysical survey, and water temperature, specific conductivity and pH measurements, the accuracy, precision, and comparability of the data will be within the limits of the field instrument when calibrated, used, and maintained according to the instrument manufacturer's directions and those procedures described in this SAP.

2.3.3 Laboratory Methodologies

Parameters to be tested for during the RI are all on the Hazardous Substance List (HSL), as established by the USEPA. The HSL has been divided into four sublists of organic and inorganic parameters for this investigation, as presented in Table 2-2. Samples of all matrixes (soil, sediment, groundwater, and surface water) will be tested for any one, or combination, of these sublists.

In addition to the parameters discussed above, a National Bureau of Standards (NBS) library search will be performed on those samples destined for volatile organic or semivolatile organic laboratory analyses. The library search will tentatively identify those unknown compounds not on the HSL with the greatest apparent concentrations.

The HSL is referred to under new terminology in many CLP documents and in UHL's SOPs. This terminology separates the HSL into two distinct lists: the Target Compound List (TCL) consisting of all the organic parameters, and the Target Analyte List (TAL) consisting of the inorganic parameters. Although TCL and TAL are generally more widely accepted today, HSL is used throughout the text of this SAP to maintain consistency with the RI/FS Work Plan and other previously submitted documents associated with the SASC project.

All the parameters of the HSL are presented in Appendix C, along with the required CLP detection limit for each. The required CLP detection limits for

TABLE 2-2

SUBDIVISIONS OF THE HAZARDOUS SUBSTANCE LIST

VOLATILE ORGANICS

1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethane
1,2-Dichloroethene (total)
1,2-Dichloropropane
2-Butanone
2-Hexanone
4-Methyl-2-pentanone
Acetone
Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon Disulfide
Carbon Tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
cis-1,3-Dichloropropene
Dibromochloromethane
Ethyl Benzene
Methylene Chloride
Styrene
Tetrachloroethene
Toluene
trans-1,3-Dichloropropene
Trichloroethene
Vinyl Acetate
Vinyl Chloride
Xylenes (total)

SEMIVOLATILE ORGANICS

1,2,4-Trichlorobenzene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
2-Chloronaphthalene
2-Chlorophenol
2-Methylnaphthalene
2-Methylphenol
2-Nitroaniline
2-Nitrophenol
3,3'-Dichlorobenzidine
3-Nitroaniline
4,6-Dinitro-2-methylphenol
4-Bromophenyl-phenylether
4-Chloro-3-methylphenol (para-chloro-meta-cresol)
4-Chloroaniline
4-Chlorophenyl-phenyl ether
4-Methylphenol
4-Nitroaniline
4-Nitrophenol
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Benzoic acid
Benzyl alcohol
bis(2-Chloroethoxy) methane
bis(2-Chloroethyl) ether
bis(2-Ethylhexyl)phthalate
bis-(2-Chloroisopropyl) ether
Butylbenzylphthalate
Chrysene
Di-n-butylphthalate
Di-n-octylphthalate
Dibenz(a,h)anthracene
Dibenzofuran
Diethylphthalate
Dimethylphthalate
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(1,2,3-cd)pyrene
Isophorone
N-Nitroso-di-n-dipropylamine
N-nitrosodiphenylamine
Naphthalene

TABLE 2-2 (Continued)

SUBDIVISIONS OF THE HAZARDOUS SUBSTANCE LIST

SEMIVOLATILE ORGANICS
(Continued)

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)Fluoranthene
Nitrobenzene
Pentachlorophenol
Phenanthrene
Phenol
Pyrene

PESTICIDES/PCBs

4,4'-DDD
4,4'-DDE
4,4'-DDT
Aldrin
alpha-BHC
alpha-Chlordane
Aroclor-1016
Aroclor-1221
Aroclor-1232
Aroclor-1242
Aroclor-1248
Aroclor-1254
Aroclor-1260
beta-BHC
delta-BHC
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin ketone
gamma-BHC (Lindane)
gamma-Chlordane
Heptachlor
Heptachlor epoxide
Methoxychlor
Toxaphene

METALS/INORGANICS

Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Cyanide
Iron
Lead
Magnesium
Manganese
Mercury
Nickel
Potassium
Selenium
Silver
Sodium
Thallium
Vanadium
Zinc

trichloroethylene, vinyl chloride, and 1,2-dichloroethene (total) are 5 µg/l, 10 µg/l, and 5 µg/l, respectively. However, a lower water matrix detection limit of 1.0 µg/l will be established for these three parameters during this investigation to maintain consistency with previous investigations which tested for those parameters. The soil/sediment matrix detection limits for these three parameters will remain unchanged.

Another minor modification to CLP protocol involves the analytical process for samples requiring analysis for TCL pesticides. UHL will replace the dibutylchlorendate surrogate with two surrogates, tetrachlorometaxylene and nonachlorobiphenyl). Dibutylchlorendate is susceptible to pH effects which can cause low surrogate recoveries.

Accuracy and Precision

In the laboratory, accuracy is defined as how close a measured value is to the true value, whereas precision refers to how close two or more measurements of the same quantity come to one another. Accuracy and precision limits will be established for each measurement parameter in accordance with the appropriate CLP SOW, as referenced in UHL's SOPs (Appendix C). Procedures detailed in the SOWs for accepting or rejecting data will be followed, accompanied by the appropriate required documentation.

Comparability

All data will be generated using methodologies included in the applicable CLP SOW, as referenced in UHL's SOPs (Appendix C). Included in the SOWs are specific instructions for sample receiving, sample storage, sample preparation, internal chain-of-custody, sample tracking, analytical methodology, document control and reporting. Adherence to these instructions assure that data generated during this investigation may be compared to, or used in conjunction with, former and/or future data generated that follows similar data quality protocol.

2.4 SAMPLING PROCEDURES

Sampling procedures are described in detail in Section 3.0. Where applicable, procedures directly reference the Compendium.

2.4.1 Sample Location Rationale

Rationale for determining sample locations was based on the site operational history, summarized below.

Iron Foundry

A grey-iron foundry was established on the property in approximately 1910. The original building (built in 1910) was remodeled in 1917 and is still in existence today (Figure 2-2). The major products were grey iron castings such as street lamp posts. This operation was discontinued prior to World War II. Dairy Industries acquired the property in approximately 1941 or 1942.

Solvent Use

Various manufacturing operations conducted on the DICO property previously involved the use of solvent degreasers. The primary constituent of these degreasers was trichloroethylene (TCE). Wheels manufactured by DICO were punched from sheet metal and pressed into shape. Prior to painting, the wheels were degreased in a vat-type vapor process. Metal parts were suspended above a vat of TCE solvent (Triclene) located below the floor of the main DICO production building (Figure 2-2). Vapors from the bath effected the degreasing and were then condensed on coils above the vat and recovered. Between 1966 and 1978, sludge from the solvent bath was applied to road and parking surfaces as a means of dust control. The areas in which the degreaser sludge was applied are illustrated on Figure 2-2.

After 1979, DICO began recycling the used solvent through a distillation process. This was done to reduce the quantities of waste solvent sludge. An average of 5 gallons of waste sludge a month was generated from the recycling process. The sludge was transported periodically to the Metro East Sanitary

Landfill under permits issued by IDNR. Currently, no solvent degreasers are used in DICO's operations.

For a time, DICO conducted operations on a portion of the property as an area wholesaler of the cleaning solvents Triclene and Perclene, which contained trichloroethylene (TCE) and perchloroethylene (PCE), respectively. As part of this operation, TCE was stored on site in aboveground tanks. Spills and leaks may have taken place during the filling and draining of these tanks into drums for subsequent sale. The location of these potential spill areas is identified on Figure 2-2.

Occasionally, drums would be returned from area buyers with small amounts of TCE left in the bottoms. The drums would arrive at the loading dock on the west side of the production building (Figure 2-2). For a period of time, the drums were cleaned at this location prior to refilling.

A final investigative target associated with solvents at the DICO plant is a fill area south of the plant. As a flood control measure prior to the construction of the levee and the improvements in the Ingersol Run drainage basin, fill material was brought to the area by local contractors. A significant volume consisted of demolition debris from various public work projects. This construction-type material is evident in the area and has been encountered consistently during boring and trenching activities at the site. In addition to the demolition debris, it is possible that some plant refuse was also placed in this fill area. Although it is not expected that solvents were included in this refuse, it is possible that residual contamination from refuse is present.

Herbicide Repackaging

During its existence, the DICO Corporation owned a separate corporation, DiChem, Inc. (DiChem), which conducted operations at the location identified as the DiChem building on Figure 2-2. DiChem was involved in herbicide repackaging beginning in the mid- to late-1950s and continuing through 1970, when it was liquidated. The plant dealt primarily with the herbicide Randox and some of the 2,4-D-based products. Randox repackaging took place under a

contract with the Randox manufacturers, Monsanto Company. Materials were primarily received in bulk form in both drums and tank cars on a rail spur which also served DICO. Although there is no history of spills of these products, empty Randox herbicide packaging material was found in fill material excavated during construction of footing and pipeline trenches at the location of the air stripping tower.

Miscellaneous Operations and Site Features

Solar Aircraft Company, formerly located in a building which now serves as the Des Moines Tech/Central Campus, used stainless steel and Inconel in the production of jet engines. During the excavation of soil for construction of recovery well ERW-3 and associated piping, a drum was uncovered containing nickel steel shavings. This area, although within the SASC project, was reportedly used by Solar Aircraft for disposal of some shop trash. At the time of Solar Aircraft's operations (prior to levee construction), the area was an unimproved lot at the same general elevation as the basement of the Solar building.

During the 1960s, DICO obtained gravel from an area within the Frank De Puydt Woods. The remnant excavations of this operation are evident from the ground surface topography illustrated on Figure 2-2.

Figure 2-2 also shows an area southeast of the spillway which was alleged to have received herbicide material. However, a review of historical site operations does not indicate any such activity in this area. Furthermore, the discharge pipe and outfall from the groundwater recovery system was constructed through this area. A large trench was excavated for this purpose and no evidence of contamination or fill was observed.

The last feature of significance is the surface water drainageway known as Ingersol Run. It previously drained an area northwest of the Meredith Corporation and then ran south through the Meredith and DICO properties. From 42nd Street, about 1.7 miles northwest of the Meredith Corporation, to the Meredith Corporation, Ingersol Run was enclosed in a box culvert and served as a storm sewer. South of the Meredith property, the system was an open ditch

that flowed through the middle of the DICO property. This runoff now discharges into the Raccoon River immediately east of the Fleur Drive bridge and is no longer a significant contributor of surface water to the area south of the DiChem building. Through the years the ditch was progressively enclosed in a culvert. Prior to levee reconstruction, overflow from the South Pond ran southeast discharging into the Raccoon River.

After review of the site operational history and previous investigations, sample locations were chosen. Sample locations are discussed in detail in the FSP and are illustrated on Figures 3-1, 3-2, 3-3, and 3-4. Specific laboratory analyses corresponding to each sample location are presented in the FSP as Table 3-1 and are also based on the site operational history and suspected contaminants.

Shallow Auger Borings

The locations of the shallow auger borings (see Figure 3-1) are focused in the areas where solvent bath sludge was formerly applied for dust control. One soil sample from each of these borings will be analyzed for the HSL volatile organic compounds.

Deep Soil Borings

The locations of the deep soil borings (see Figure 3-2) have been designed to provide soil quality data for the SASC area in general, with emphasis on the following:

- Aboveground triclene and perclene storage tank area
- Drum fill areas
- Truck-loading area
- Rail car unloading area
- Drum cleaning area
- Fill area south of the DICO production building
- Former DiChem building
- Alleged herbicide disposal area (one boring for confirmation)

An additional deep soil boring will be installed which is considered to represent background conditions. The location of this soil boring will be field determined, based on preliminary data obtained while drilling the other borings. This "background" boring will be the last boring installed, and its location must be approved by DICO and the EPA. Since true background soil conditions are difficult to ascertain, the representativeness of the designated soil boring of actual background conditions will be assessed after the laboratory analytical results have been revised.

The laboratory analyses corresponding to each deep soil boring location is presented in Table 3-1. Sample depths are discussed in Section 3.5.5.

Surface Water and Sediment Sampling

The surface water and sediment sample locations (see Figure 3-3) are in or adjacent to South Pond, Ingersol Run, and the former gravel excavation areas. All of these samples will be analyzed for the HSL volatile organic compounds, pesticides and metals. If other appropriate sample locations are field determined, both DICO and the EPA will be contacted to evaluate the relevancy of sampling those locations.

The collection of a sample at each location will be contingent upon the presence of an adequate volume of sediment or surface water to obtain a sample. If insufficient volume is present at any location, the location may be moved or abandoned, however, not without prior approval from DICO and the EPA.

Since there is no evidence of any waste material ever having been deposited in the former gravel excavation areas, those samples (SS-6, SS-7, SS-8 and SW-3) are to confirm the absence of contamination. Due to the proximity of South Pond to the former DiChem building and fill area, and since Ingersol Run passes beneath a portion of the DICO facility and then drains into South Pond, these samples (SS-1, SS-2, SS-3, SS-4, SS-5 and SW-1 and SW-2) will determine the water/sediment quality in and adjacent to the pond.

Groundwater Sampling

Twelve existing monitoring wells (see Figure 3-4) will be sampled and analyzed for the total HSL to establish current groundwater quality at the site. Wells were chosen that best represent the site and would detect any groundwater contamination resulting from past/present site operations. Well NW-17 is considered to represent background conditions.

2.5 SAMPLE CUSTODY

The goal of implementing chain-of-custody procedures is to ensure that the sample is traceable from the time it is collected until it, or its derived data, are used. Samples will be considered "in custody" under the following conditions:

1. it is in personal possession
2. it is in personal view after being in personal possession
3. it was in personal possession when it was properly secured
4. it is in a designated secure area

When transferring and/or shipping from the field, samples will be accompanied by the chain-of-custody record (see Appendix G). The form includes the signatures of the relinquishers and the receiver as well as the date and time of the exchange and any pertinent remarks. Since all samples will be immediately placed in coolers, shipment will also be made using these coolers. The sampler will package the sample containers within the cooler(s), complete the appropriate portion of the chain-of-custody form, and ship the cooler(s) to UHL via Federal Express Priority 1 service. The receiving party at the laboratory will complete the remainder of the chain-of-custody form. A copy of the form will be retained by the sampler and kept with the field data sheets for that round of sampling. A copy of the final chain-of-custody form will be included with the final analytical results submitted by UHL.

2.6 CALIBRATION PROCEDURES

Throughout soil sampling activities, ambient air will be monitored using an HNU systems photoionization analyzer (Model PI-101). A Century Systems'

Organic Vapor Analyzer (OVA) will be used on a daily basis to perform the head space analyses in the field for the soil samples. Other field instruments to be used in the field consist of the following:

- combustible gas/oxygen indicator
- Y.S.I Model 33 S-C-T (for measuring water temperature and specific conductivity)
- Orion Research Model 211 pH Meter.

These instruments will be calibrated in accordance with the manufacturer's instructions at the start of each day's use or otherwise specified. Calibration procedures, frequency, and results will be recorded daily in the field notebook kept by the geologist.

Laboratory calibration procedures to be used by UHL are specified in their SOPs (Appendix C) and will follow CLP protocol.

2.7 ANALYTICAL PROCEDURES

All laboratory analytical procedures will be performed in strict accordance to CLP protocol as referenced in UHL's SOPs (Appendix C).

2.8 DATA REDUCTION, VALIDATION, AND REPORTING

Data will be collected and recorded in a variety of ways during the project. These include the following:

- standard forms such as field data sheets (Appendix D), soil boring log forms (Appendix D), and chain-of-custody forms (Appendix G)
- the field notebook, maintained by ECKENFELDER INC. personnel
- customized forms such as those used to record the geophysical survey data and head space analysis results (Appendix D)

- standard analytical laboratory report forms (CLP specified).

Examples of properly completed forms for those to be prepared by field personnel are also included in Appendices D and G, respectively, and may be used as a guide when filling out the actual form.

A water-resistant field notebook will be maintained by the ECKENFELDER INC. field geologist during the field investigation. Pencil or waterproof ink will be used to record all field data in the notebook. This information will include but not be limited to the following:

- day and date of entries
- weather conditions
- description of sampling location
- time and designation of any samples taken
- special observations
- time spent on each activity
- name, position and affiliation of any visitors.

At the end of each week, that week's entries into the notebook will be photocopied and kept in a separate file.

Photographs will also be taken during field activities. Photographs will be taken of various sampling procedures, sample locations, and any other significant field activity associated with the RI. A log will be kept by the field geologist and will include the following information for each photograph taken:

- date and time of photograph
- roll and frame number
- description of photographs subject matter
- photographer's name.

The originals of these methods of documentation will be kept in a file maintained by ECKENFELDER INC. throughout the active portion of the project. Data which lends itself to computerization, such as geophysical survey data

and analytical results will be placed in a computerized data storage system by ECKENFELDER INC. The system will be capable of basic data reduction, manipulation and reporting functions.

Prior to the issuance of each laboratory analytical report, a systematic data validation procedure will be implemented to include random checks of laboratory QA/QC back-up documents, spiked samples and spiked duplicate runs, interpretation of chromatographs, and transmittal errors. Errors detected in the process will be identified and evaluated in light of the overall required accuracy of the method and the objectives of the study. Data validation will be conducted by UHL in accordance with CLP protocol and UHL's SOPs (Appendix C).

Field generated data such as geophysical data and soil classifications will also be checked for validity. These checks will be conducted by Mr. Soukup or Mr. Brother of ECKENFELDER INC. as the data is received from the field. The checks will include comparisons with data from other portions of the SASC area, data from other investigations in the SASC area, and the literature as appropriate.

Upon validating the data generated from the field and in the laboratory, they will be incorporated in the final RI report through descriptive and graphical presentation of all relevant data, including the following:

- soil profiles/cross sections
- potentiometric surface maps
- isoconcentration maps of selected chemical parameters for each sampled media.

All completed field and laboratory forms will be included as appendices in the final RI report.

2.9 INTERNAL QUALITY CONTROL

Internal QC within UHL will be in accordance with CLP protocol referenced in Appendix C. Specific UHL QC procedures are also presented in Appendix C. Other internal QC procedures are discussed in Sections 2.8 and 2.10.

2.10 PERFORMANCE AND SYSTEMS AUDITS

The field procedures used to obtain environmental samples for laboratory analyses and generate data to be incorporated into this project will be audited by ECKENFELDER INC. as information is made available from the field through bi-weekly telephone conversations, facsimile messages, document transmittals, and UHL laboratory results. Mr. Brother will be responsible for evaluating the data, and methods used to obtain the data. In the evaluation of the data, the following criteria will be utilized:

- adherence to the SAP
  - data representativeness, comparability and completeness
  - accuracy and precision of field-generated data
  - field instruments used according to manufacturer's directions
- interpretation of laboratory data
  - QA/QC sample results
    - trip blanks
    - rinsate blanks
    - field duplicates
    - distilled water blank
    - water tank blank

After reviewing all of the available data, if any inconsistencies exist, Mr. Brother will delineate the cause of the inconsistency and initiate the proper corrective action in accordance to Section 2.13. At least once during the field investigation, either Mr. Brother or Mr. Soukup will visit the site and inspect the field operations to assure they are being conducted according to protocol established in this SAP. The results of these audits and inspections will be presented in the quarterly progress reports.

UHL participates in several proficiency series, including the USEPA CLP. UHL was most recently audited by the USEPA Region VII, EMSL/LESC, and NEIC/CEAT in September, 1989 for their organic CLP contract No. 68-01-7369 and by the United States Army Environmental Hygiene Agency (USAEHA) in association with RFP solicitation number DAAD 05-89-R-5416 for total metals in June, 1989. Audit checklists for the organic and inorganic programs are included as

Attachment A to UHL's SOPs (Appendix C). Other proficiency programs UHL currently participate in include the following:

AIHA (formerly NIOSH) PAT Rounds. All analytes (metals, silica, asbestos, and solvents) are analyzed, and UHL has been accredited by AIHA since 1973.

USEPA Contract Laboratory Program quarterly blinds. UHL has been in the CLP for multi-media, multi-concentration organic analyses for the Superfund Program since 1985.

USEPA Water Supply (WS) Series. UHL is the principal state laboratory under the Safe Drinking Water Act for the State of Iowa and is certified for all parameters currently covered under SDWA, including the new volatile organics.

USEPA Water Pollution (WP) Series. All metals, organics, and wet chemical procedures are performed.

USEPA Solid Waste interlaboratory comparison series. All metals, organics, and wet chemical procedures are performed.

USEPA NEIC (National Enforcement Investigation Center, Denver). Pesticide residue and formulation quarterly proficiency samples.

UHL also participates in various CDC, AOAC and other interlaboratory method validation studies, and has performed method checks for NIOSH 3rd edition methods.

To provide an external check of the quality of UHL's analytical procedures, as well as sampling procedures in the field, a number of trip blanks, rinsate blanks, and field duplicates will be submitted to the laboratory along with the investigative samples. Trip blanks will be analyzed to check for contamination due to shipping and handling procedures. Rinsate blanks will be analyzed to check for the adequacy of the field decontamination procedures. Field duplicates will be analyzed to check for sampling and analytical error. A distilled water blank and water tank blank, submitted to UHL from the first container of distilled water used to decontaminate sampling equipment and from

the first tank of water used to steam clean the drilling equipment, will be analyzed to insure against impure decontamination water. If these blanks indicate any target analyte concentration greater than the detection limit, the cause of the anomaly will be investigated by Mr. Brother or Mr. Soukup through communication with Dr. Wichman and the field sampling team. Once the cause has been isolated, the appropriate corrective action will be emplaced in accordance with Section 2.1.3.

As an additional external audit of UHL, the EPA will prepare and submit performance evaluation samples to UHL. These samples will include one submitted early in the investigation to be analyzed along with the investigative groundwater samples for the total HSL list, followed by one submittal per week for HSL volatile organic analysis through the duration of the field sampling. The results of these EPA-submitted sample analyses will be assessed by the EPA and the appropriate action implemented in accordance with CLP protocol, EPA's procedures, and this SAP.

In addition to external QA/QC controls, UHL will exercise internal quality assurance procedures in the laboratory. These include the preparation of matrix spike and matrix spike duplicate samples for organic analyses, matrix spike and duplicate samples for inorganic analyses, method blanks and surrogate compound spikes. All of these internal QA/QC samples will be prepared, analyzed and reported in accordance with CLP protocol.

2.11 PREVENTATIVE MAINTENANCE

Routine maintenance of laboratory instruments will be performed in accordance with UHL's SOPs (Appendix C) and the manufacturers' instructions associated with each instrument.

Routine maintenance of instruments used in the field (e.g., HNU, OVA, pH meter, specific conductivity/temperature meter and combustible gas/oxygen indicator) will also follow the instrument manufacturer's instructions kept on site. In the event any of these field instruments become inoperable and cannot be readily repaired in the field, ECKENFELDER INC.'s equipment manager will be contacted at (615) 255-2288 and another instrument of the same nature

will be sent to the site via overnight delivery. Due to the intricate construction of these instruments, no spare parts will be available on site and no attempt will be made to field repair these instruments other than those procedures described in the manufacturer's instructions. Routine preventative maintenance, such a instrument calibration and battery charging, will be performed on a daily or as-needed basis.

The drill rig will have been recently serviced prior to mobilization to the site. Preventative maintenance to the drill rig will be in accordance with that schedule developed by the Layne-Western Company. The driller will have a variety of tools and spare parts (e.g., nuts, bolts, screws and belts) on site to facilitate possible field repair of the rig, if necessary. However, if field repair is not possible, a Layne-Western Company mechanic will be available in Ames, Iowa (located approximately 30 miles north of Des Moines), and may be contacted at (515) 232-3563.

A record of all preventative maintenance procedures performed during this investigation will be maintained by UHL and ECKENFELDER INC.

2.12 DATA ASSESSMENT PROCEDURES

In the laboratory, UHL will follow their SOPs (Appendix C) and CLP protocol to assess the precision, accuracy, and completeness of the data. If this assessment determines any data to be invalid, the appropriate corrective action will be initiated and documented as described in Section 2.13.

In the field, the precision, accuracy, and completeness of the data will be assessed through those procedures discussed in Sections 2.8 and 2.10.

2.13 CORRECTIVE ACTIONS

In the laboratory, precision limits are defined by a percent coefficient of variation which, when exceeded, indicate unacceptable analytical performance. Accuracy limits are expressed in percent recovery of spiked material. A recovery outside of the acceptable range established by the CLP and presented in the specific SOW, as referenced in UHL's SOPs (Appendix C), indicates a need for corrective action.

The following presents a number of corrective actions which may be employed, depending upon the particular situations. Other corrective actions may be initiated, according to CLP protocol.

- Calculations are rechecked.
- Sample handling, i.e., digestion, concentration, and/or extraction logs are checked for discrepancies in sample handling.
- Analyte concentration is reviewed to determine if it has severely influenced the reliability of the precision or recovery calculations.
- Instrument and method performance is verified by inspecting data on standard reference materials processed in the same data set.
- Quality control data on the other samples in the data set, including surrogate recovery, internal standards, etc., are reviewed to determine if the problem is method related or sample related.
- If original sample is available, the sample is assessed for homogeneity.
- If sample is unavailable and no explanation for poor quality control results can be determined, DICO and the USEPA are notified and additional sample is obtained. If additional sample is unavailable, the results are issued with a qualification as to their accuracy.

Dr. Wichman of UHL is responsible for determining when corrective measures are necessary with respect to laboratory procedures and analytical results, and for initiating the appropriate corrective action. Dr. Wichman's decision-making policies will be in accordance with CLP protocol and UHL's SOPs (Appendix C).

In the field, corrective action may be needed for any of the field investigation procedures if the data being generated does not meet the data usage requirements discussed in Section 4.2 of the RI/FS Work Plan. The first

task is to identify a defect or inconsistency in the data as discussed in Section 2.8. The error is then evaluated in light of its significance and traced to its source. The source may be a specific field procedure, piece of equipment, or in the overall approach itself. Once identified, a plan will be developed to correct the defect and maintain documentation of the results of the correction throughout the remainder of the task or project. Mr. Soukup of ECKENFELDER INC. is responsible for determining when corrective action is necessary and what form of corrective action is to be employed with respect to the field investigation.

The final RI report will include documentation of all corrective actions initiated during the investigation, the reason for their usage, and the result of applying the corrective action.

2.14 QUALITY ASSURANCE REPORTS

Throughout the course of the field investigation and subsequent receipt of analytical results, ECKENFELDER INC. will prepare quarterly progress reports, submitted in accordance with the Administrative Order of Consent. Each report will summarize the work completed during that time period and focus on assuring the QA is being maintained throughout the investigation. These reports will include results of performance and system audits and an explanation of any confirmed or potential QA problems along with recommended solutions. Any corrective action taken will be described as well as its result. Deviations from the RI/FS Work Plan will be noted, along with reasons which constituted each deviation.

The final RI report will include a QA section which summarizes the data quality and the extent to which these data satisfy the data quality objectives presented in Section 4.2 of the RI/FS Work Plan.

3.0 FIELD SAMPLING PLAN (FSP)

3.1 SITE BACKGROUND

A detailed presentation of background information compiled for the SASC project is included in the RI/FS Work Plan. This presentation includes the following elements:

- Site location
- Operational history
- Previous investigations
- Ongoing remedial activities.

The reader is referred to the RI/FS Work Plan for additional information regarding site background.

3.2 SAMPLING OBJECTIVES

Specific sampling objectives are defined in Section 4.0 of the RI/FS Work Plan. In general, sampling objectives include the following

- Define site characteristics, topography, and drainage
- Identify buried structures (potential contaminant sources)
- Define physical soil characteristics
- Define horizontal and vertical limits of soil contamination
- Identify soil chemistry/contamination
- Evaluate impacts to groundwater quality
- Evaluate impacts to surface water/sediment quality.

3.3 SAMPLE DESIGNATION

During the field investigation, samples collected will be assigned a prefix followed by the number of the sample location or soil boring. The prefixes will be as follows:

SW - surface water sample

SS - sediment sample

SB - shallow auger boring sample

DB - deep soil boring sample

EW, NW, or P - groundwater sample from existing monitoring well

The prefix will be followed by the appropriate number of the sample location, soil boring or monitoring well from which the sample was obtained. Surface water samples will be numbered from 1 to 3 (e.g., SW-2), sediment samples numbered from 1 to 8 (e.g., SS-5), shallow soil borings numbered from 1 to 27 (e.g., SB-15) and deep soil borings numbered from 1 to 58 (e.g., DB-32). Upon collection, the appropriate number will be assigned to the sample and cross-referenced with Figures 3-1, 3-2, and 3-3 to assure each sample is designated properly. Included in the sample designation for the sediment and soil boring samples will be the depth from which each sample was obtained (e.g., DB-11 2'-4'). The groundwater sample prefixes will be accompanied by the appropriate number of the monitoring well from which the sample was collected (e.g., NW-22) in accordance with those wells delineated on Figure 3-4.

Additional information to be included as part of each sample designation consists of the following:

- project name
- ECKENFELDER INC. project number
- date of sample
- time of sample
- sample matrix (e.g., sediment, surface water, groundwater, soil)
- analyses to be performed, if applicable.

Additional samples submitted for QA/QC will also be designated by the above general information. The specific type of QA/QC sample will be identified by the following abbreviations:

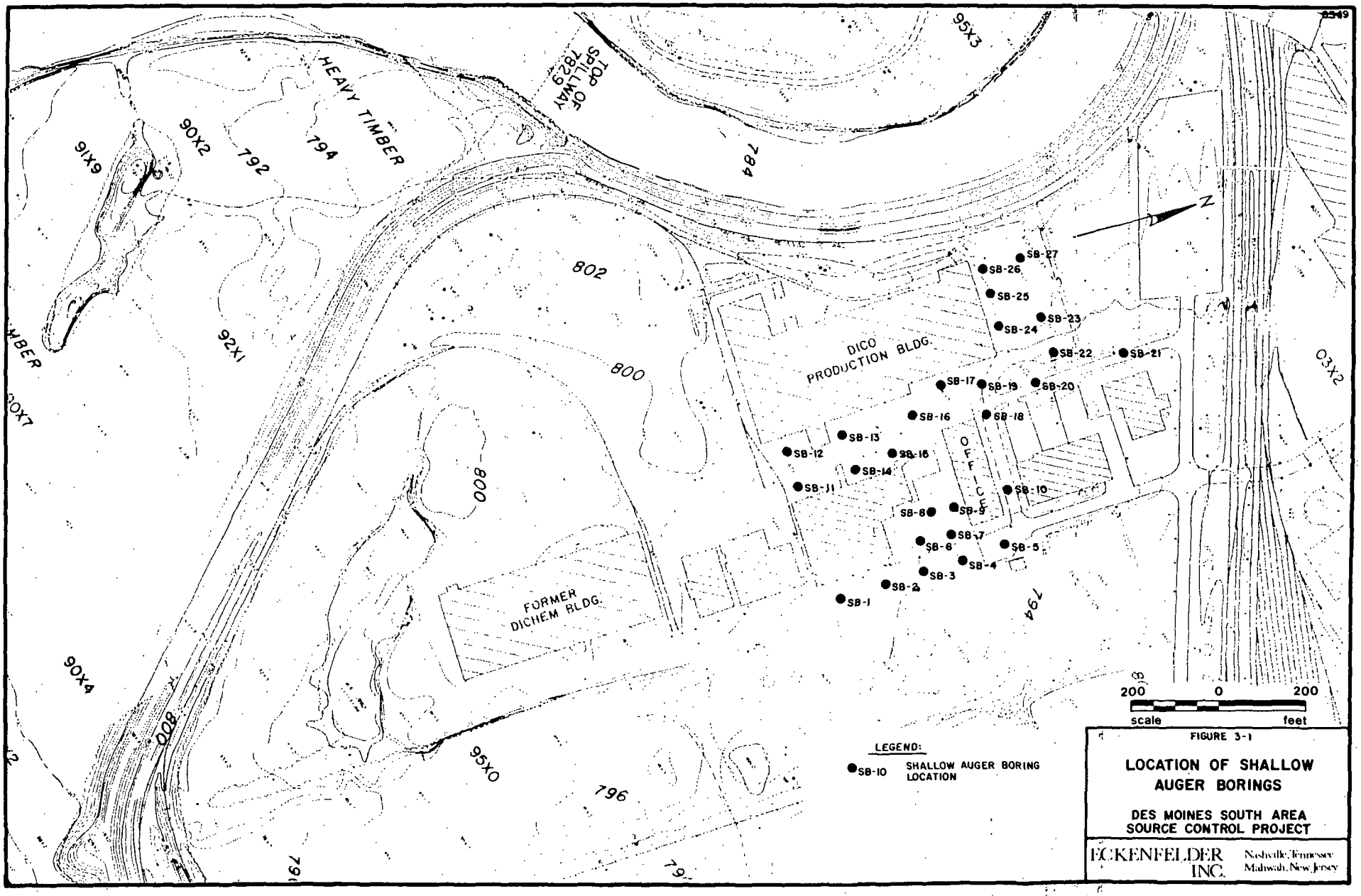
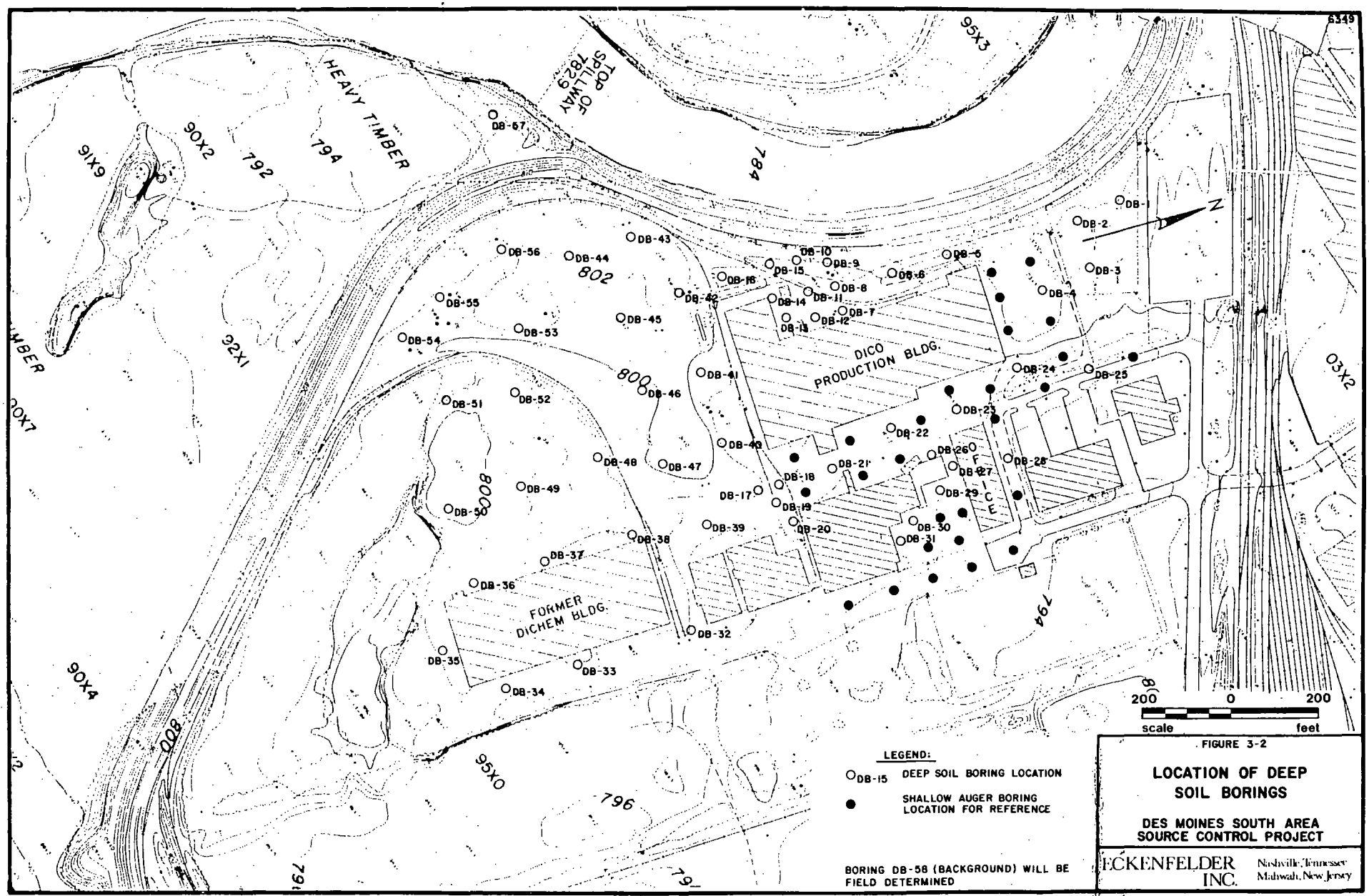


FIGURE 3-1

LOCATION OF SHALLOW AUGER BORINGS

DES MOINES SOUTH AREA SOURCE CONTROL PROJECT

ECKENFELDER INC. Nashville, Tennessee Mahwah, New Jersey


6349
HEAVY TIMBER
TOP OF SPILLWAY 782.9
DB-67
DB-1
DB-2
DB-3
DB-4
DB-5
DB-6
DB-7
DB-8
DB-9
DB-10
DB-11
DB-12
DB-13
DB-14
DB-15
DB-16
DB-17
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DB-40
DB-41
DB-42
DB-43
DB-44
DB-45
DB-46
DB-47
DB-48
DB-49
DB-50
DB-51
DB-52
DB-53
DB-54
DB-55
DB-56
DICO PRODUCTION BLDG.
FORMER DICHEM BLDG.
FENCE
N
200 0 200
scale feet
LEGEND:
DB-15 DEEP SOIL BORING LOCATION
SHALLOW AUGER BORING LOCATION FOR REFERENCE
BORING DB-58 (BACKGROUND) WILL BE FIELD DETERMINED
FIGURE 3-2
LOCATION OF DEEP SOIL BORINGS
DES MOINES SOUTH AREA SOURCE CONTROL PROJECT
ECKENFELDER INC.
Nashville, Tennessee
Mahwah, New Jersey

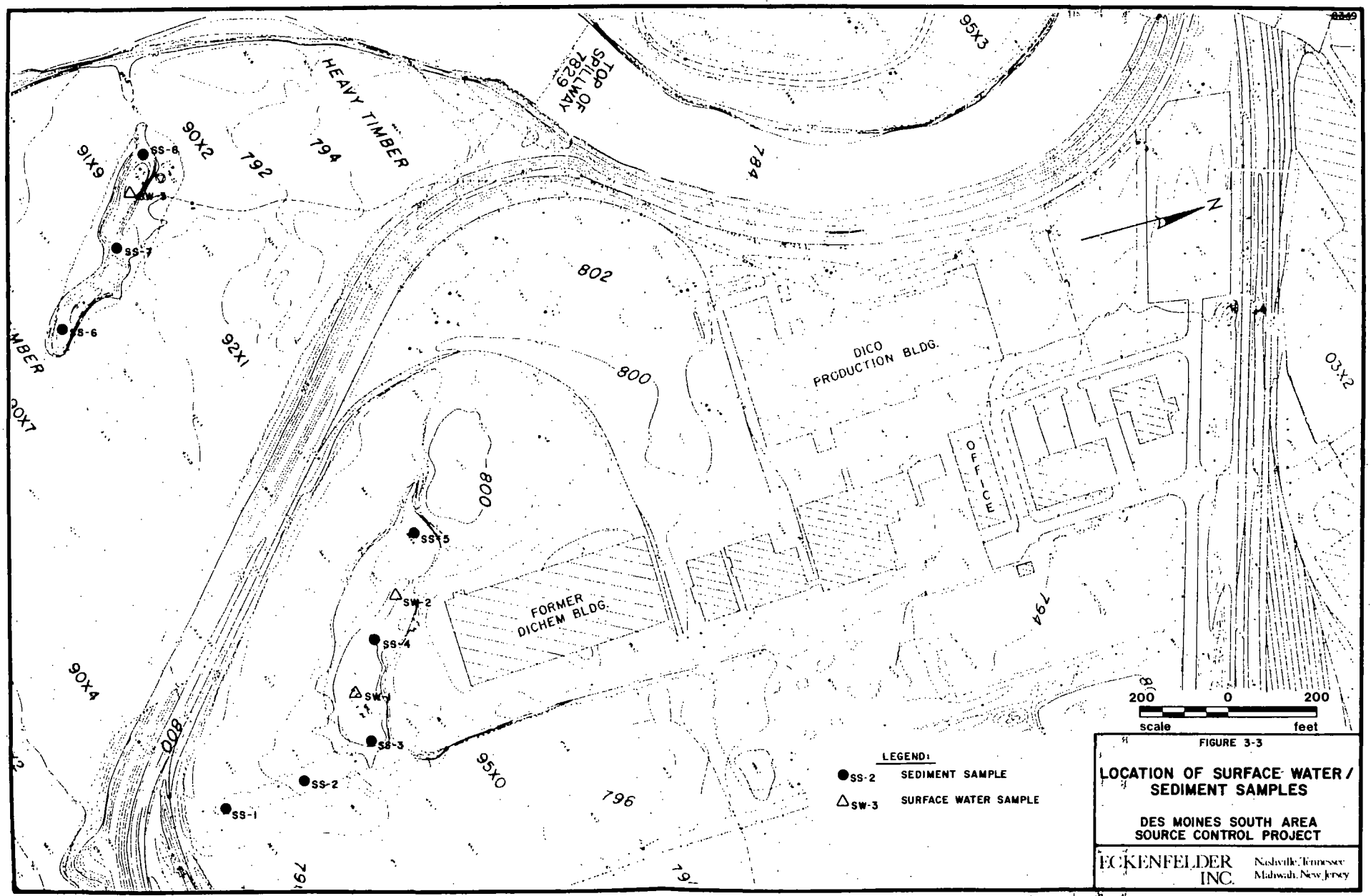

FIGURE 3-3

LOCATION OF SURFACE WATER / SEDIMENT SAMPLES

DES MOINES SOUTH AREA SOURCE CONTROL PROJECT

ECKENFELDER INC. Nashville, Tennessee Mahwah, New Jersey

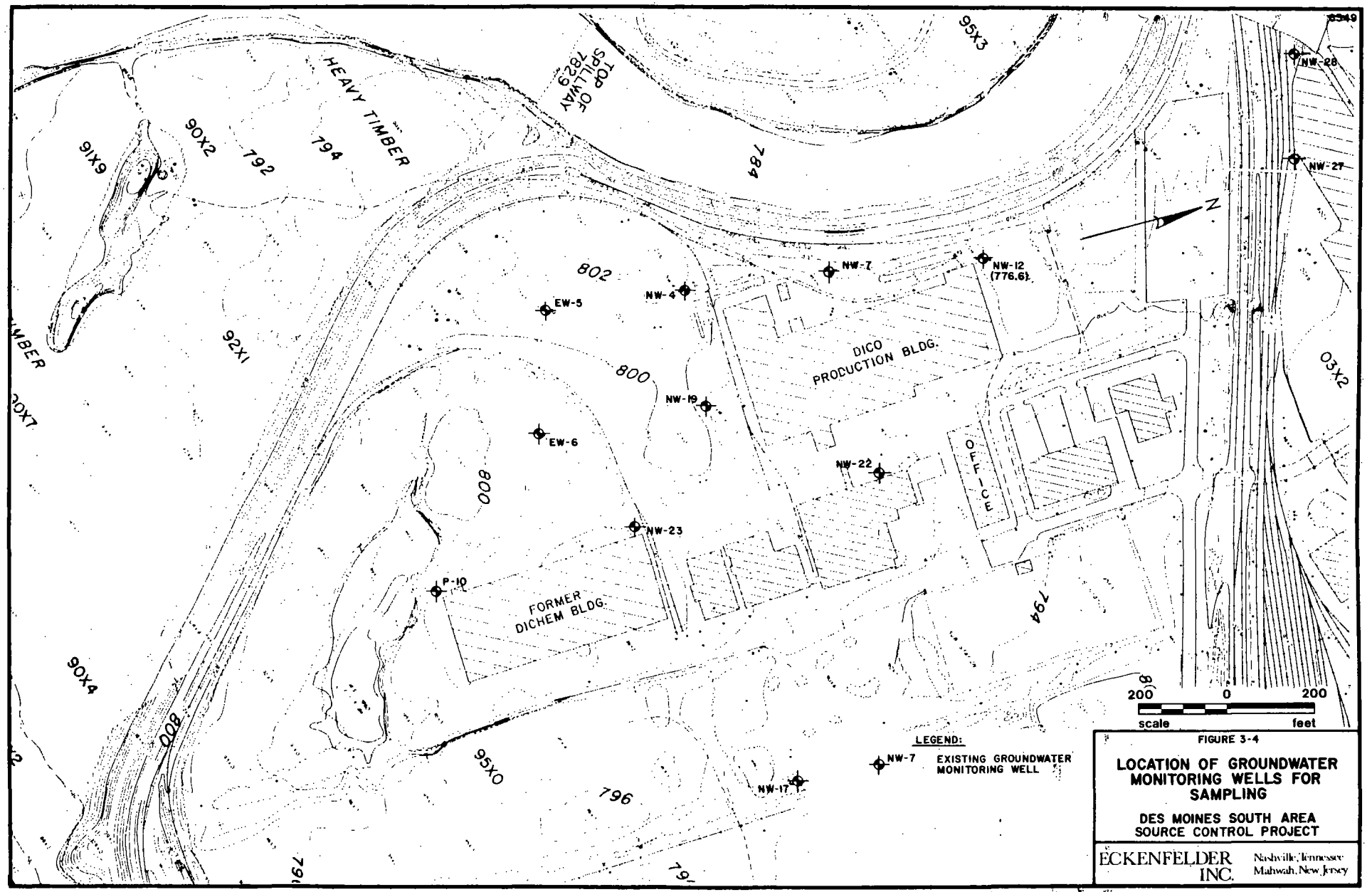

FIGURE 3-4

LOCATION OF GROUNDWATER MONITORING WELLS FOR SAMPLING

DES MOINES SOUTH AREA SOURCE CONTROL PROJECT

ECKENFELDER INC. Nashville, Tennessee Mahwah, New Jersey

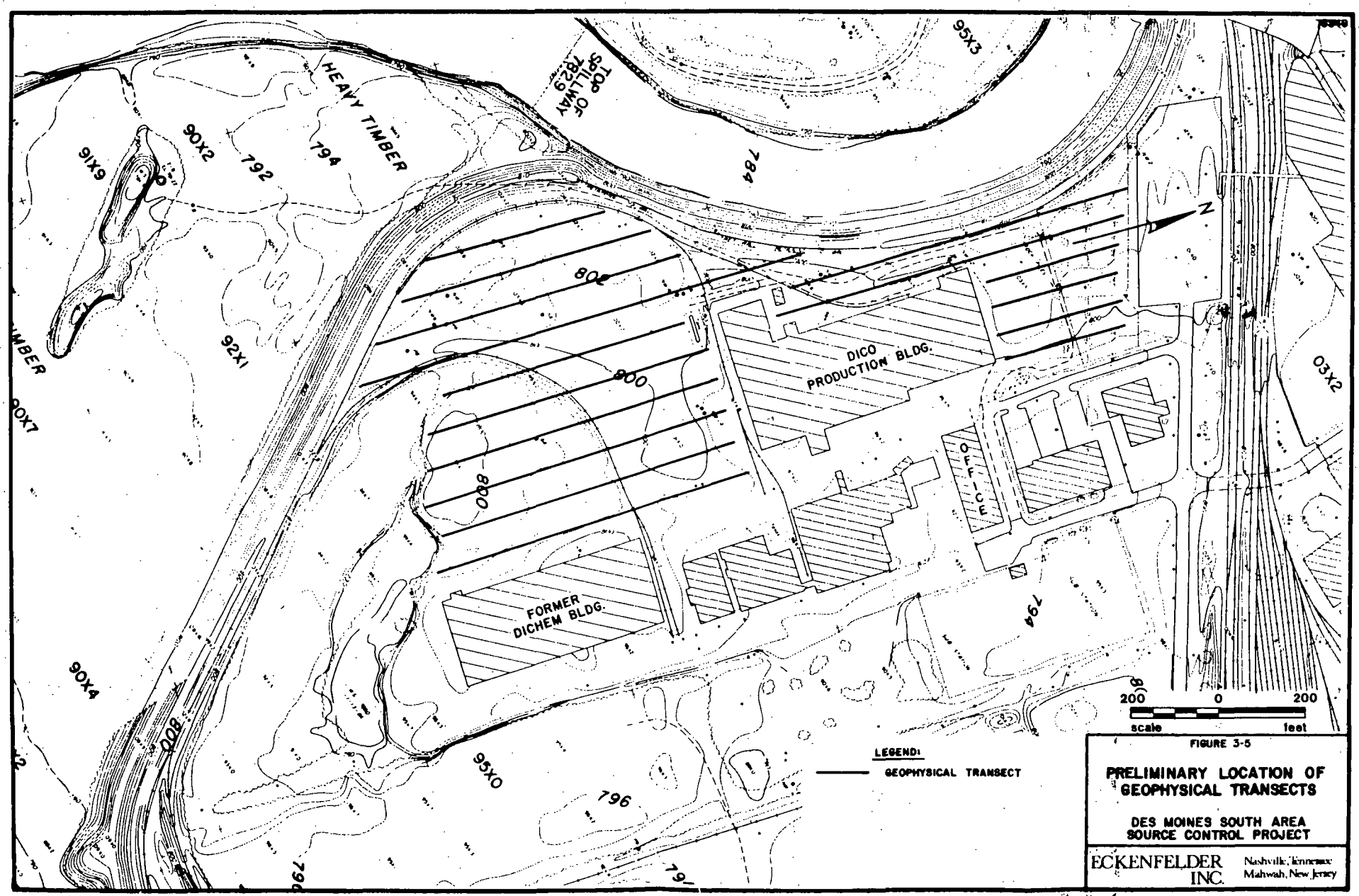

FIGURE 3-5

PRELIMINARY LOCATION OF GEOPHYSICAL TRANSECTS

DES MOINES SOUTH AREA SOURCE CONTROL PROJECT

ECKENFELDER INC. Nashville, Tennessee Mahwah, New Jersey

on a base map, along with the conductivity value corresponding to each point (separate maps will be generated for the horizontal and vertical dipole values). These values will be contoured and anomalous areas identified. A contour interval will be used consistent with the level of detail necessary to delineate the anomalies.

Once these contour maps are complete, each transect will be scanned using a metal detector in an "analog" mode to better define any anomalies identified by the survey. A Technical Memorandum will be submitted to DICO and the USEPA presenting the geophysical survey results, then the need for any modifications or additions to the present scope of work will be assessed to address the delineated anomalous areas (if any are located).

3.5.4 Shallow Auger Borings/Sampling

Approximately 27 shallow auger borings will be drilled at locations illustrated on Figure 3-1. These shallow borings will be drilled using a four-inch diameter, stainless steel hand auger. The borings will be advanced to a depth of approximately 1.5 feet below the ground surface. A soil sample will be collected from the interval of 1.5 to 2.0 feet using an approximate 2-inch diameter stainless steel drive sampler or bucket auger and placed in the appropriate sample container (as specified in Section 3.6) for head space screening (discussed in Section 3.5.5) and laboratory analysis for the HSL volatile organic compounds. The sample will be collected directly from the drive sampler or auger using stainless steel spoons and trimming knives. Once the sample destined for laboratory analysis has been jarred, it will be labeled and handled in accordance with those procedures described in Sections 3.3 and 3.6, respectively. Each boring will be backfilled with its auger cuttings. If additional backfill material is needed, cement grout will be used.

For those borings conducted through an asphalt surface, a power-cutting tool will be used to remove the asphalt plug. Upon completion of the boring, the asphalt will be patched to grade using "cold patch".

All sampling equipment will be decontaminated between boring locations by those procedures described in Section 3.5.9.

3.5.5 Deep Soil Borings/Sampling

Approximately 58 deep soil borings will be conducted at locations illustrated on Figure 3-2 using a truck-mounted hollow-stem-auger drill rig. Augers with sufficient inside diameter to easily accommodate standard two-inch diameter split-spoons will be used. Soil samples will be continuously collected at two-foot intervals during the advancement of each boring in accordance with ASTM D-1586-87 protocol. Split-spoon samples will be collected from the ground surface to a depth two feet below the groundwater table. For those borings to be conducted through asphalt or concrete at the surface, a special cutting bit may be used to make the surface penetration.

If auger refusal is encountered while conducting any of the deep soil borings, and may be contributable to buried fill material (e.g., scrap metal and concrete), the boring will either be relocated within ten feet of the original location or abandoned. This decision will be based on the depth of refusal and the location of that particular soil boring. However, a soil boring location will not be abandoned without the EPA's approval.

Field Screening for Volatile Organics

A representative portion (a composite of at least three separate sections from throughout the entire sample length) of the contents of each split-spoon interval will be collected for field screening and will undergo the following handling procedures:

- The sample will be immediately placed in the sample jar upon opening of the split-spoon sampler.
- The jar opening will be immediately covered with aluminum foil, capped with a screw-on lid, and shaken for 30 seconds.
- The sample will be taken to a controlled temperature environment, such as an office, and allowed to equilibrate to room temperature (approximately 20°C) for at least one hour.

- The lid will be removed, exposing the inner aluminum foil cap.

- The aluminum foil will be pierced with a clean probe from a Century Systems' Portable Organic Vapor Analyzer (OVA) Model OVA-128 in order to measure the organic vapor concentration (in ppm) in the head space above the sample. The OVA will be used in the "survey" mode and will be calibrated according to the manufacturer's specifications.

- The observed organic vapor concentration will be recorded for future reference on the appropriate form (see Appendix D).

- The lid will be replaced without the foil and the jar labeled (as per Section 3.4) and stored in similarly labeled cartons at a designated location at DICO. These samples will be retained for at least the duration of the project and will not be used for any further chemical analyses.

Along with the samples from each boring location, an empty jar will be included, following the procedures listed above. This jar will be a field blank and used to establish background concentrations for the head space analyses.

Physical Description

For each two-foot interval, the soil will be visually examined and described in general accordance with the Burmister Soils Classification system (Appendix F). This information, along with a record of the length of the recovered portion of the interval and any other distinguishing characteristics of the soil (e.g., odor), will be entered into the geologist's field notebook. The stored samples from the field screening will be available for future reference and classification verification.

Soil Samples for Laboratory Analyses

Representative soil samples will be collected from each split-spoon interval using stainless steel spoons and trimming knives, and placed in the

appropriate sample containers (as specified in Section 3.6) for laboratory analyses. From each boring, one sample collected from the fill/overbank deposits interface will be analyzed for volatile organic compounds. A second sample from each boring, corresponding to the highest head space value determined from field scanning, will also be analyzed for volatile organic compounds. If all sample intervals within a borehole indicate head space values below background, or if all values are within 2 ppm of one another, the second laboratory sample will be arbitrarily selected from within the fill material. Since the head space values will not be known until after each boring has been completed, sufficient sample from each sample interval must be kept in a cooler at approximately 4°C until the head space screening can be performed. Furthermore, as discussed in Section 3.4, an additional sample will be analyzed for the entire HSL parameters from 12 (or approximately 20 percent) of the borings, based on the head space analyses results. To obtain a sufficient volume of sample and meet holding time requirements for the total HSL analysis, it may be necessary to drill a separate boring, within three feet of the original, down to the desired sampling interval.

A surface soil sample (0-0.5' depth) will be collected from one deep soil boring from each of the boring groups presented in Table 3-2 and from the background boring (DB-58), providing sufficient surface soils are present at each location. The borings chosen for these samples are intended to be representative of the site, both spatially and with respect to the potential source areas. The actual borings to be sampled will be field determined. These samples will be analyzed for the HSL metals and pesticides. If the head space analysis indicates a concentration greater than 100 ppm for this sample interval from any of the designated borings, that particular sample will also be tested for the HSL volatile organic compounds. To facilitate collection of these surface samples, a hand auger may be used to obtain the samples rather than the drill rig. If a hand auger is used, sampling will follow procedures discussed in Section 3.5.4.

A complete listing of the proposed laboratory analyses to be run on samples from each boring, and a description of the QA/QC samples to be included is presented in Section 3.4. Once each sample destined for laboratory analysis has been jarred, it will be labeled and handled in accordance with those procedures presented in Sections 3.3 and 3.6, respectively.

Decontamination of the drilling and sampling equipment will be in accordance with those procedures described in Section 3.5.9.

Soil Boring Completion

Upon completion of each soil boring, it will be backfilled to grade with a bentonite/cement grout using the "tremie" method. Drill cuttings will be spread around on the ground surface when possible, otherwise they will be stockpiled at an on-site location designated by DICO. For those borings conducted through asphalt, the surface will be repaired with "cold patch".

3.5.6 Surface Water Sampling

Three surface water samples will be collected from those locations illustrated on Figure 3-3. Water will be collected in a Teflon® bailer and transferred to the appropriate sample container as listed in Section 3.6. These samples will be analyzed for the HSL volatile organic compounds, metals and pesticides. Each container will be labeled and handled in accordance with those procedures described in Sections 3.3 and 3.6, respectively.

When collecting samples destined for HSL volatile organics analysis, agitation of the sampled water will be minimized when filling the 40 ml septum vials to prevent volatilization of any volatile organic compounds present. Once each septum vial has been filled to the top, and the lid replaced, it will be inverted and gently tapped to check for entrained air bubbles. If an air bubble is discovered, the vial will be refilled and checked until no air bubbles are present.

At each surface water sampling location, water temperature, specific conductivity and pH measurements will be taken. Temperature and specific conductivity values will be measured using a Y.S.I. Model 33 S-C-I (or comparable) meter and the pH will be measured using an Orion Research Model 211 (or comparable) pH meter. The operation directions, included with each instrument, shall be followed in obtaining the measurements. At each location, approximately 1 liter of water will be collected using a Teflon® bailer and poured into a wide-mouth plastic container. The water temperature, specific conductivity and pH measurements will be taken immediately, directly

from the water in the container and recorded in the field notebook. The water will then be discarded.

Decontamination of the surface water sampling equipment will be in accordance with the procedures described in Section 3.5.9.

3.5.7 Sediment Sampling

Eight sediment samples will be collected from those locations illustrated on Figure 3-3. These samples will be obtained from the uppermost six inches of sediment at each location using either stainless steel spoons or a stainless steel hand auger, depending on the depth of the water at the time of sampling and the composition of the sediment bed. Each sample will be placed in the appropriate container, labeled, and handled in accordance with those procedures described in Sections 3.3 and 3.6. Laboratory analyses will be for the HSL volatile organic compounds, metals and pesticides.

Decontamination of the sediment sampling equipment will follow those procedures described in Section 3.5.9.

3.5.8 Groundwater Sampling

Twelve groundwater samples will be collected from those wells illustrated on Figure 3-4 and analyzed for the entire HSL parameters. Prior to sampling, the volume of water within each well will be calculated using the following equation:

$$V = 7.48\ \pi r^2 h$$

Where: V = volume of water within well (gallons)
π = 3.14
r = radius of well (feet)
h = height of water column in the well (feet)

The static water level will be measured in the well using either an electronic water level meter or a weighted fiberglass measuring tape. The depth to

groundwater and total depth of the well will be measured from a marked reference point on the innermost well casing. These measurements will be recorded in the geologist's field notebook.

The well will be purged using a PVC bailer. After purging a well volume, the water temperature, specific conductivity and pH will be measured using that methodology described in Section 3.5.6. The values will be recorded on the appropriate groundwater sampling data sheet (Appendix D). Purging will continue until the temperature, specific conductivity and pH values have stabilized and at least three well volumes have been purged from the well, or until the well has been bailed dry. Once the water level has recovered to the static level, or a maximum of three hours have elapsed since bailing, water samples will be taken. A PVC bailer will be used to sample each well, and upon retrieval of the full bailer, the water will be poured directly into the appropriate sample container (as described in Section 3.6). All 40 ml septum vials will be filled in the manner described in Section 3.5.6. If insufficient water exists in the well to fill all of the sample containers at one time, they will be filled as adequate water volume becomes available. The order in which the containers for specific analyses will be filled is as follows: (1) volatile organic compounds, (2) semi-volatile organic compounds, (3) pesticides/PCBs, (4) cyanide, and (5) metals. Each container will be labeled and handled in accordance with those procedures described in Sections 3.3 and 3.6, respectively. The appropriate groundwater sampling data sheet (Appendix D) will be completed. The bailers will either be dedicated to each well or decontaminated following the procedures described in Section 3.5.9.

For those samples to be tested for the HSL metals, both a nonfiltered and filtered sample will be collected and shipped to UHL. However, only the nonfiltered sample will be analyzed initially. The filtered sample shall be preserved in accordance with CLP protocol for possible future analysis. The water will be filtered at the time of sampling by passing the water through a pre-cleaned NALGENE® filtration system equipped with a 0.45 um filter.

3.5.9 Equipment Decontamination

All equipment coming in contact with the subsurface materials, including drilling rods, augers, pipe, and tools will be decontaminated prior to site

entry, between each soil boring location, and prior to leaving the site. An area designated by DICO and agreed upon by ECKENFELDER INC. will be used for drilling equipment decontamination. Decontamination of this equipment will be accomplished by placing the equipment on pallets, using a brush to remove any large solid particles, and steam cleaning the equipment with clean water.

The drill rig will be steam cleaned prior to site entry and prior to leaving the site. The rig may also be steam cleaned during the investigation if ECKENFELDER INC.'s field geologist observes any of the following:

- accumulation of excessive soil or dust on the rig
- evidence of unauthorized persons contacting the rig
- leaks, spills, or smearing of substances onto the rig (e.g., oil, gasoline, or grease).

Equipment in actual contact with a laboratory sample will be decontaminated prior to and between each use. This equipment includes: split-spoon samplers, stainless steel spoons and trimming knives, hand auger, and sampling bailers. Decontamination procedures will consist of the following steps:

- scrub with brush in an alconox/distilled water solution
- distilled water rinse
- hexane rinse
- distilled water rinse
- air dry.

3.6 SAMPLE HANDLING AND LABORATORY ANALYSIS

Upon acquisition of each sample, it will be placed in the appropriate sample container according to Table 3-4. All sample containers will have been cleaned by UHL in the laboratory prior to shipment to the site. Table 3-5 shows the preservation method required for each type of sample and the maximum holding times. The holding times are per CLP protocol (see Appendix C). A label will be completed and affixed to each container (see Appendix C). Each

TABLE 3-4

SAMPLE CONTAINERS

Type of Analysis	40 ml Glass Septum Vials	1 Pint Glass	1 Quart Glass	500 ml Polyethylene
Soil/Sediment Matrix				
Volatile Organics	3			
Semivolatile Organics/ Pesticides/Metals (any combination)		2		
Groundwater/Surface Water Matrix				
Volatile Organics	3			
Semivolatile Organics			1*	
Pesticides			1*	
Metals				1
Cyanide			1	

*Amber glass container will be used.

TABLE 3-5

SAMPLE PRESERVATION AND HOLDING TIMES

Type of Analysis	Preservation			Holding Times (days from receipt)	
	1:1 HNO_3	NaOH	4°C	Extraction	Analysis
Soil/Sediment Matrix					
Volatile Organics			x		10
Semivolatile Organics			x	10	40
Pesticides			x	10	40
Metals			x		180
Cyanide			x		12
Mercury			x		26
Groundwater/Surface Water Matrix					
Volatile Organics			x		10
Semivolatile Organics			x	5	40
Pesticides			x	5	40
Metals	x		x		180
Cyanide		x	x		12
Mercury			x		26

Note: The required aliquot of laboratory grade HNO_3 or NaOH will be placed in the appropriate sample containers by UHL prior to collection of the samples.

Note: This table is based on a maximum "lag" time (including shipping) of two days from time of sampling to laboratory receipt of the sample(s).

sample will be placed within its own zip-lock clear plastic bag, a signed and dated custody seal (Appendix G) affixed across the seam, and placed in a hard plastic or metal cooler. The contents of the cooler will be maintained at approximately 4°C with ice or cold packs. The collected samples will be shipped to UHL three times per week (Monday, Wednesday, and Friday). Prior to shipping, the samples will be securely packed in the cooler(s) using vermiculite or other similar materials. The appropriate chain-of-custody and sampling information forms (containing the information described in Section 3.3) (Appendix G) will be completed and the sampler's copies retained. The remaining copies will be placed inside a zip-lock bag and taped to the inside of the respective cooler lid. Sufficient ice/cold packs will be added to the cooler to assure 4°C is maintained during shipment. The lid will then be closed and securely taped using duct tape. Two signed and dated custody seals will be affixed across the seam of the cooler/lid (one on the front of the cooler and the other on the back). The shipping air bill (Appendix G) will be completed and the cooler(s) shipped via Federal Express Priority 1 next day service to UHL. The laboratory will be contacted the next day to assure receipt of the complete shipment.

Soil samples destined for head space analyses may be designated by printing the pertinent information described in Section 3.3 directly onto the top of the jar lid using a weatherproof marker.

APPENDIX A

RI/FS WORK PLAN TABLE OF CONTENTS

DES MOINES
SOUTH AREA SOURCE CONTROL OPERABLE UNIT
RI/FS WORK PLAN

Prepared for:

DICO, Inc.
200 Southwest 16th Street
Des Moines, Iowa 50305

Prepared By:

ECKENFELDER INC.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430

July 1989

6349

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UNIVERSITY HYGIENIC LABORATORY SOPs

MLLW

The University of Iowa

Iowa City, Iowa 52242

Hygienic Laboratory

319/335-4500
Telefax: 319/335-4555
Telex: 4909945095 PHN UI

1847

August 2, 1989

Mr. Mike Watkins
Eckenfelder, Inc.
1200 MacArthur Blvd
Mahwah, New Jersey 07430

Dear Mike:

Enclosed is a copy of the University Hygienic Laboratory (UHL) Work/Quality Assurance Project Plan for the U.S. EPA Contract Laboratory Program. Please note that this Work/QA Plan must be updated to account for changes in staff, etc. An updated version of the Work/QA Plan will be forwarded on to you as soon as the plan is modified.

Also included are our Standard Operating Procedures for Organics and Inorganics. We will be following the USEPA Contract Laboratory Program, Statement of Work (SOW) for Organic Analysis, Multi-Media, Multi-Concentration, 10/86, Rev: 1/87, 2/87, 7/87 for methods, reporting, etc. for all organic target compound determinations. We will be following USEPA Contract Laboratory Program, Statement of Work (SOW) for Inorganic Analysis, Multi-Media, Multi-Concentration, SOW No. 788 for all inorganic analyte determinations. QA/QC measures are explicitly detailed in each SOW.

A copy of Exhibit C: Inorganic Target Analyte List (TAL) including Contract Required Detection Limits (CRDL) is included from the Inorganic 788 SOW. Also included is a copy of Exhibit C: Organic Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) from the Organic 7/87 SOW. I have included page D-4 (Inorganic Exhibit C) which indicates proper containers, preservatives, and sample holding times for inorganic analytes. Page A-2 is also included (Organic Exhibit C) which lists sample holding times for organic parameter determinations. To aid our efforts in meeting sample holding times, it would be best if the sampling was performed in an even manner over a period of approximately six weeks. Two sample shipments per week would probably be best from our standpoint.

For organics, a matrix spike and matrix spike duplicate sample must be prepared and analyzed for each sample matrix (water, soil/sediment) and concentration level (low, medium). For inorganics, a duplicate and matrix spike sample must be prepared and analyzed for each sample matrix and concentration level. For both organics and inorganics, the frequency for these QA/QC samples is at least 5%. Since we do not know the concentration levels at this time, we cannot exactly predict how many QA/QC samples will be required.

The bottles that we send to you should already have appropriate sample preservative within the containers. For example: samples for metals should be placed into 500 mL plastic bottles containing 5 mL of 1:1 nitric acid preservative.

I am working on determining the number containers that we should send to you presently. I have estimated that you will need approximately 500 glass 40-mL vials for volatile organics, 120 pint glass jars total for soil samples. The soil samples in the pint containers are to be analyzed for metals, cyanide, pesticides, and semivolatile organics or combination thereof. For water samples, I have estimated that you will require approximately 20 quart glass containers for pesticides, 15 quart glass containers for semivolatile organics, 15 500 mL plastic containers for metals, and 15 quart glass containers for cyanide. Please let me know if you think that you will require more containers. As I mentioned previously, we cannot accurately determine exactly the number of QA/QC samples that will be required until we know the concentration levels of organics and inorganics in the samples.

Please call if you have any questions or require any further information.

Sincerely yours,

Michael D. Wichman, Ph.D.
Quality Assurance Coordinator,
Organic Analysis

cc: Dr. Keith Cherryholmes
Mr. Ivan Schwabbauer
Dr. George Breuer
Mr. Lee Friell

Enclosures

WORK/QUALITY ASSURANCE PROJECT PLAN

CONTRACT LABORATORY PROGRAM
U.S. EPA

Project Officer — G.M. Breuer, Ph.D., CIH

Quality Assurance Officer — Carol Seger, B.S.

Prepared as per OWRS/QA-1

1. Project Name: Contract Laboratory Program

2. Project Requested By: U.S. Environmental Protection Agency (USEPA)

3. Date of Request: 5/84, Rev. 9/84, Rev. 10/84, Rev. 3/87, Rev. 8/88

4. Date of Project Initiation: 11/1/87

5. Project Officer: G.M. Breuer, Ph.D.

6. Quality Assurance Officer: Carol Seger B.S.

7. Project Description

   A. Objective and Scope Statement

      The objective of this project is to provide analytical support to aid in identification of hazardous materials.

   B. Data Usage

      Analytical results produced under this contract will be used to identify and specify hazardous waste substances, and to monitor their removal or detoxification.

   C. Monitoring Network Design and Rationale

      The sampling and monitoring will be conducted by the USEPA or their designees.

   D. Monitoring Parameters and their Frequency of Collection

      The types of analyses and their frequency will be determined by the USEPA. The parameters include those organic chemicals on the hazardous substances list as detailed in Exhibit C of the Contract Laboratory Program Statement of Work.

   E. Parameter Table

      The sample matrices may be soil and/or water. The samples will be analyzed by methods detailed in Exhibit D of the Contract Laboratory Program Statement of Work. This document also details sample preservation and holding times. All procedures performed will adhere to these specifications.

8. Fiscal Information - Not Applicable

9. Task Schedule - as Defined by the Contract Laboratory Program Protocol

10. Project Organization and Responsibility

The following is a list of key project personnel and their corresponding responsibilities:

USEPA - sampling operations

USEPA - sampling QC

Terry Cain - laboratory analysis + GC/MS

Lauren Johnson - laboratory analysis - Pesticides

William Berger - data processing activities

William Berger - data processing QC

George Breuer/Carol Seger - data quality review

UHL/USEPA - performance auditing

UHL/USEPA - systems auditing

George Breuer/Carol Seger - overall QA

George Breuer - overall project coordination

An organizational chart for this project (Attachment A) and the Agency (Attachment B) are appended.

11. Data Quality Requirements and Assessments

The USEPA has determined specifications and criteria concerning analytical accuracy and precision, and the detection and quantitation limits necessary in the Contract Laboratory Program. These criteria and specifications are detailed in Exhibits C, D and E of the Statement of Work (Attachment C).

Date Representativeness

The representativeness of the sample to the environment from which it was collected is the responsibility of the USEPA or their designees. Samples received will be prepared for analysis in a manner to assure that portions of the whole sample have an equal opportunity to be analyzed. This will be accomplished by mixing and/or sampling from various sections of the matrix.

Data Completeness

The determination of adequate sampling frequency and volume to calculate completeness is the responsibility of the USEPA. For this program completeness will be calculated as the percentage of samples received that are appropriately analyzed. The goal of the University Hygienic Laboratory is to complete testing on 100% of the samples received in this program.

12. Sampling Procedures

The environmental sampling procedures are the responsibility of the EPA or their designee. The sampling devices and sampling containers are predetermined and specified. Preservation techniques, sample holding times and identification forms are specified in Exhibit D of the Statement of Work.

13. Sample Custody Procedures

Integrity and security of the received samples must assure that the results of analysis meet the criteria for legal admissibility. The specifications for sample security and "chain-of-custody" procedures are detailed in Exhibit F. Samples that are delivered of questionable quality or integrity will not be accepted for testing without Sample Management Office approval. In the case of broken or leaking sample containers the section supervisor will be contacted as detailed in the Central Services Standard Operating Procedure Manual. Upon receipt of the samples they will be stored in a secure location or be in the immediate possession of an authorized individual, as detailed in the Standard Operating Procedure of the Organic Analysis Section.

14. Calibration Procedures and Preventive Maintenance

The Contract Laboratory Program Statement of Work (Exhibit E) details the specific calibration procedures to be used for parameters on the hazardous substances list. Equipment logs are maintained as specified in the Organic Analysis Standard Operating Procedure Manual, Book I.

15. Documentation, Data Reduction and Reporting

A. Documentation

The Contract Laboratory Program Statement of Work (Exhibit F) contains detailed requirements for chain-of-custody and laboratory document control. The Laboratory has designated a document control officer to assure that all paperwork for a specified case will be accounted for when the project is completed. All results not recorded on preprinted data sheets will be entered into permanent laboratory logbook, in ink, and included in the final documentation package. All documents relevant to each case will be accumulated by the data generators and verified by the document control officer prior to shipment.

B. Data Reduction and Reporting

Data produced and calculated by an analyst will be reviewed for correctness and consistency by the section supervisor prior to insertion into the document package. These data will include QC information as appropriate and specified in the Organic Analysis Standard Operating Procedure Manual.

16. Data Validation

The validation process will assure that data generated are reliable and consistent. The process includes review of blind check/QC samples, calibration results, interlaboratory performance samples and other quality assurance/quality control measurements designed to indicate whether the analytical/sample tracking mechanisms are operating properly.

17. Performance and Systems Audits

Performance samples tested under the water supply and water pollution series administered by USEPA provide a periodic check of the internal quality assurance system. These independent data are an indication that all control measures are in place. Since errors observed in this process may not define existing problems, systems audits will determine whether an analytical error is due to system changes or deviations or a random, nonreproducible event. These overall systems (QA) audits will be actuated at least biannually or more frequently if deemed necessary by the Project Officer.

18. Corrective Action

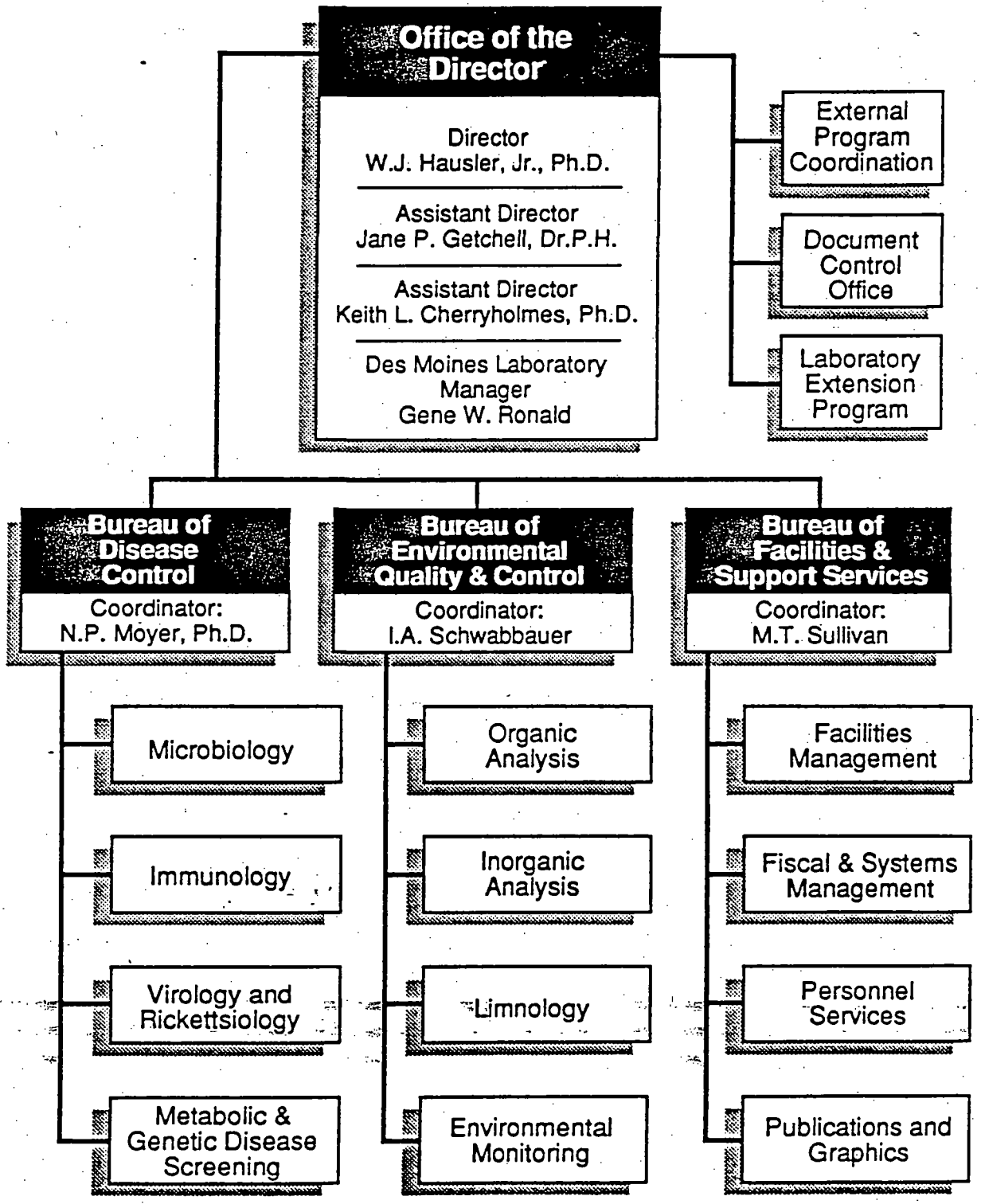
Corrective action will be instituted upon an observed error in the system. Analytical errors will be the responsibility of the section supervisor as detailed in the agency QA Program Plan, and non-analytical errors will be handled by the Project Officer with the assistance of the Quality Assurance Officer.

19. Reports

The present quality assurance reports to the Agency Director provide a periodic review of system functioning, problems observed and corrective action instituted. These reports are issued on a biannual basis by the Quality Assurance Unit. The reporting of results is in concurrence with the requirements of the Contract Laboratory Program.

University Hygienic Laboratory

Organizational Structure

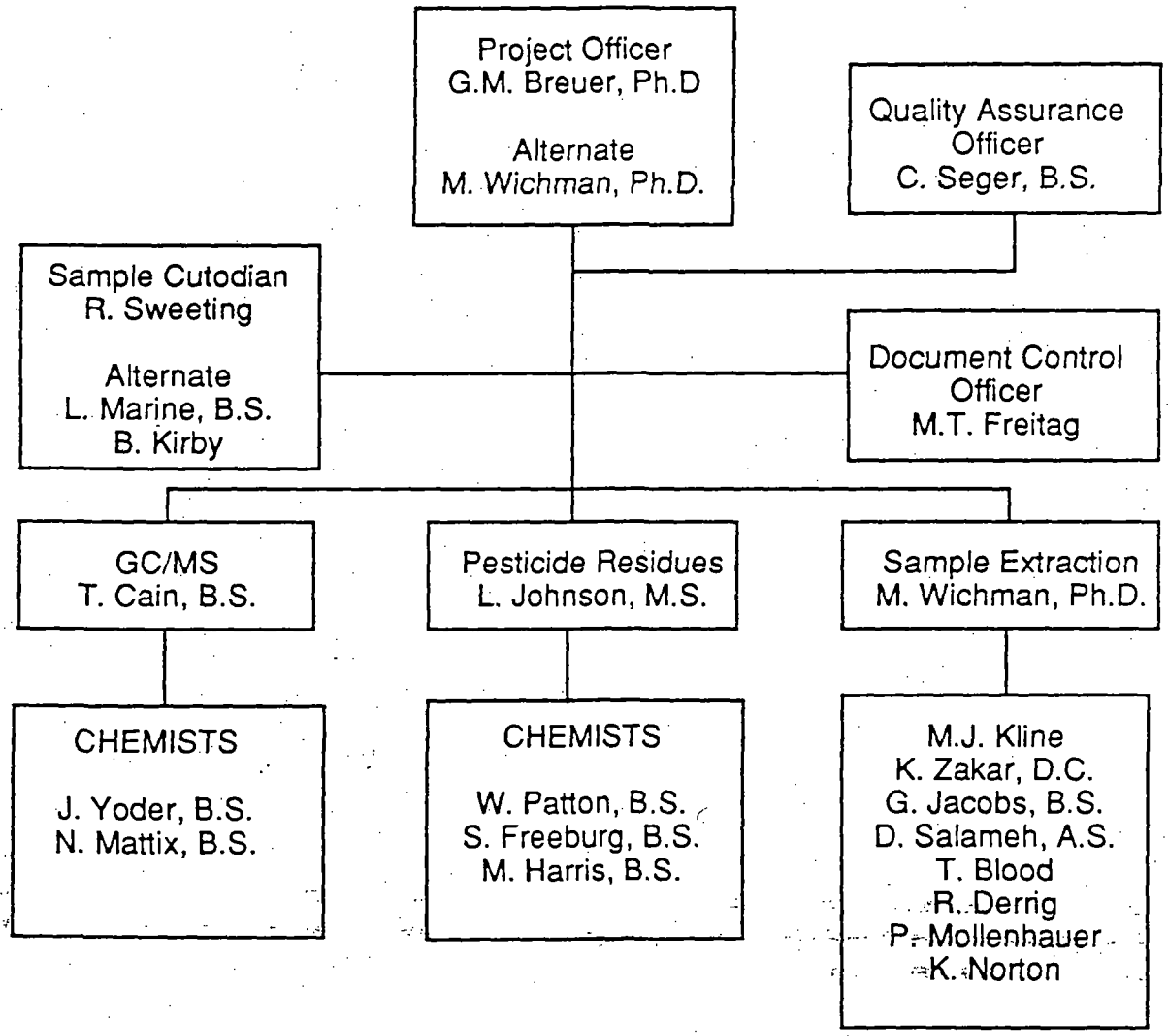


7/1/88

University Hygienic Laboratory

USEPA CLP

Project Organizational Chart



8/89

1. The Contractor shall have a written QA/QC standard operating procedures (SOP) which describes the in-house procedures that he employs to guarantee, to the extent possible, the quality of all analysis activities. It should describe the quality assurance and the quality control procedures used during the analysis. Each Contractor should prepare his own SOPs to suit the needs of his organization as he has best determined. The QA/QC SOP should contain the essential elements described in this section.

2. Elements of a QA/QC SOP

2.1 All routine laboratory tasks should have written QA/QC Standard Operating Procedures. Standard Operating Procedures should be detailed documents describing who does what, when, where, how, and why. They shall be sufficiently complete and detailed to ensure that:

2.1.1 Data of known quality and integrity are generated.

2.1.2 The loss of data due to out-of-control conditions is minimized.

2.2 Standard Operating Procedures shall be:

2.2.1 Adequate to establish the traceability of standards, instrumentation, samples, and environmental data.

2.2.2 Simple, so a user with basic education, experience and/or training can properly use them.

2.2.3 Complete enough so the user can follow the directions in a stepwise manner.

2.2.4 Consistent with sound scientific principles.

2.2.5 Consistent with current EPA regulations, guidelines, and contract requirements.

2.2.6 Consistent with the instrument manufacturer's specific instruction manuals.

2.3 Standard Operating Procedures shall also provide for documentation sufficiently complete to:

2.3.1 Record the performance of all tasks and their results.

2.3.2 Explain the cause of missing data.

2.3.3 Demonstrate the validation of data each time they are recorded, calculated, or transcribed.

2.4 To accomplish these objectives, Standard Operating Procedures should address the major elements upon which the final quality of the Contractor's work depends. In the following descriptions these six major areas have been divided into sub-elements, where applicable. These elements include but are not limited to:

3.5 Procedures for making revisions to technical procedures or documents must be clearly defined, with the lines of authority indicated. Procedural revisions should be written and distributed to all affected individuals, thus ensuring implementation of changes.

4. Facilities and Equipment

4.1 Procurement and Inventory Procedures - Purchasing guidelines for all equipment and reagents having an effect on data quality should be well-defined and documented. Similarly, performance specifications should be documented for all items of equipment having an effect on data quality. Once any item which is critical to the analysis such as an in situ instrument, or reagent is received and accepted by the organization, documentation should be retained of the type, age, and acceptance status of the item. Reagents should be dated upon receipt in order to establish their order of use and to minimize the possibility of exceeding their useful shelf life.

4.2 Preventive Maintenance - Preventive maintenance procedures should be clearly defined and written for each measurement system and required support equipment. When maintenance activity is necessary, it should be documented on standard forms maintained in logbooks. A history of the maintenance record of each system serves as an indication of the adequacy of maintenance schedules and parts inventory.

5. Analytical Methodology

5.1 Calibration and Operating Procedures - Calibration is the process of establishing the relationship of a measurement system output to a known stimulus. In essence, calibration is a reproducible reference point to which all sample measurements can be correlated. A sound calibration SOP should include provisions for documentation of frequency, conditions, standards, and records reflecting the calibration history of a measurement system.

5.1.1 The accuracy of the calibration standards is an important point to consider since all data will be in reference to the standards used. An SOP for verifying the accuracy of all working standards against primary grade standards should be routinely followed.

5.2 Feedback and corrective action - The SOP should specify the corrective action that is to be taken when an analytical or sampling error is discovered or the analytical system is determined to be out of control. The SOP should require documentation of the corrective action and notification of the analyst of the error and correct procedures.

6. Sample Custody

6.1 Sample custody is a part of any good laboratory or field operation. Where samples may be needed for legal purposes, "chain-of-custody" procedures, as defined in Exhibit F must be used. However, at a minimum, the following sample custody procedures should be addressed in the QA/QC SOP.

8. Data Handling

8.1 Data Handling, Reporting, and Recordkeeping - Data handling, reporting, and recordkeeping procedures should be described. Data handling and reporting includes all procedures used to record data on standard forms, and in laboratory notebooks. The reporting format for different types of bench data should be described and the forms provided. The contents of notebooks should be specified.

8.1.1 Recordkeeping of this type serves at least two useful functions: (1) it makes possible the reanalysis of a set of data at a future time, and (2) it may be used in support of the experimental conclusions if various aspects of the analysis are called into question.

8.2 Data Validation - Data validation procedures, defined ideally as a set of computerized and manual checks applied at various appropriate levels of the measurement process, should be in written form and clearly defined for all measurement systems.

8.2.1 Criteria for data validation must be documented and include limits on:

8.2.1.1 Operational parameters such as GC conditions;

8.2.1.2 Calibration data;

8.2.1.3 Special checks unique to each measurement, e.g., successive values/averages;

8.2.1.4 Statistical tests, e.g., outliers; and

8.2.1.5 Manual checks such as hand calculations.

8.2.2 The limits defined in the contract ensure a high probability of detecting invalid data for either all or the majority of the measurement systems. The required data validation activities (GC operating conditions, analytical precision, etc.) should be recorded on standard forms in a logbook.

MLW

The University of Iowa
Iowa City, Iowa 52242

Hygienic Laboratory

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1847

August 9, 1989

Mr. Mike Watkins
Eckenfelder, Inc.
1200 MacArthur Blvd
Mahwah, New Jersey 07430

Dear Mike:

In answer to your questions concerning performance of system audits, we have most recently been audited by the American Industrial Hygiene Association (AIHA) for reaccreditation, the United States Army Environmental Hygiene Agency (USAEHA) in association with RFP solicitation number DAAD05-89-R-5416 for total metals, and USEPA Region VII, EMSL/LESC, and NEIC/CEAT for our organic CLP contract #68-01-7369. The AIHA audit was conducted in July, 1989. The USAEHA audit was conducted in June, 1989, and the organic CLP audit by USEPA Region VII, EMSL/LESC, and NEIC/CEAT was conducted in September, 1988. UHL was awarded the total metals contract with USAEHA.

In my initial letter to you, I indicated that we would be following the 7/87 SOW for organic analytes. We have the 2/88 update and have incorporated those updates into our analytical process. We wish to incorporate another minor modification into the analytical process for samples requiring analysis for TCL pesticides. We wish to replace the dibutylchlorendate surrogate with two surrogates, tetrachlorometaxylene and nonachlorobiphenyl. Dibutylchlorendate is susceptible to pH effects which can cause low surrogate recoveries.

Dr. George Breuer, Chief, Organic Analysis, has prepared an overview of the quality assurance measures and programs that are currently in place at UHL. I am including a copy of that document with this letter. In addition to the programs outlined in that document, the organic CLP and the USAEHA contracts include further QA measures in the form of blind audit samples. Audit samples are included with all sample cases associated with the USAEHA contract. In addition to quarterly performance evaluation samples, blind audit samples are included occasionally with cases associated with the organic CLP contract.

Please call if you have any questions or require any further information.

Sincerely yours,

M. D. Wichman

Michael D. Wichman, Ph.D.
Quality Assurance Coordinator,
Organic Analysis

cc: Dr. Keith Cherryholmes
Mr. Ivan Schwabbauer
Dr. George Breuer
Mr. Lee Friell

Enclosures

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1847

QUALITY CONTROL--OVERVIEW

Quality control (QC) within the Laboratory is the responsibility of each analyst and is emphasized for all analytical work. QC is regarded as an integral part of laboratory work, not an "add-on", and appropriate quality control is included within Standard Operating Procedures available to the analyst rather than in a separate document. Quality assurance (QA) is overseen by the Quality Assurance Group, chaired by the Laboratory's Quality Assurance Officer, Ms. Carol Seger. The Quality Assurance Group also has as members representatives of various analytical areas to assure direct contact with the bench analysts; however, the group reports directly to the Office of the Director. The Quality Assurance Group is part of the Laboratory Extension Program which has the responsibility of on-site audits of hospital laboratories within the state as well as the Laboratory's in-house QA program administration. The Quality Assurance Officer reports to the Director of the Laboratory. Specific points of common interest concerning the program at UHL are enumerated below.

1. Overall guidance for Quality Assurance/Quality Control within the University Hygienic Laboratory is provided by the Quality Assurance Program Plan; a copy of the current version can be provided to those using UHL's services on request. The Laboratory's quality assurance statement is found in the front of each procedure manual. Individual analyses or projects are covered by Work/Quality Assurance Project Plans prepared in accordance with USEPA QA-1, other required guidance, or (for infrequent individual analyses) by that required by the method.

2. For guidance in field collection of samples, the Laboratory provides instructional sheets or references appropriate and generally available manuals such as SW-846. The Laboratory also publishes a booklet describing the analytical methods used and a synopsis of appropriate sampling information for field personnel using its industrial hygiene services. Further information and assistance with interpretation of results is provided by telephone. The Laboratory has a small staff of field personnel, and some air sampling pumps and other equipment is available for loan from the Laboratory.

3. UHL uses methodology, as published, from USEPA Contract Laboratory Program (2/88 Statement of Work for organics; 788 Statement of Work for inorganics), other USEPA methods (such as SW-846, 3rd Edition), the "NIOSH Manual of Analytical Methods" (2nd Edition volumes 1-7 and 3rd Edition volumes 1-3), OSHA's Manual of Analytical Methods and various APHA (Standard Methods for the Examination of Water), APCA and ASTM methods and publications as the primary analytical references.

4. A master file of procedure manuals are maintained in the Director's Office area. Working copies of those manuals appropriate for the procedures being run in each analytical area are also maintained in that analytical area for ready access to the analyst.

5. Non-routine analyses can be performed if a method is available from standard sources or the literature or can be easily adapted from such sources. Standards covering an appropriate range are run to verify analytical performance, as are blanks, spiked media and an external quality control check sample where available.

6. New procedures are generally validated and reduced to practice in a manner similar to that for non-routine procedures (see item 5 above). The Procedure Manual for each area is reviewed approximately annually, and new methods would be added at that time if being used routinely. The immediate supervisor of the analytical area performs this task in conjunction with the analyst(s); the revised manual is also reviewed and approved by the Quality Assurance Committee, the Bureau Coordinator, and the Director.

7. Accuracy is generally determined by spike recoveries from a well-characterized appropriate matrix. Precision is determined from duplicate spike analyses, duplicate analyses, or long-term spike recovery data from control charts.

8. Blanks are run by the analyst to verify method and instrument cleanliness on a daily basis or more frequently if required by high samples or other circumstances. Standards are run initially and may also be interspersed throughout the analytical run if more than just a few samples are being analyzed. A well-characterized appropriate matrix is spiked with appropriate representative compounds and/or surrogates and is run with each set of samples. Where available, external check samples are run on a routine basis. Matrix spikes of client samples are performed as required by the client's work/QA plan if sufficient additional sample is provided; these checks for matrix effects in the client's samples are done at the client's request and expense. The analyst prepares and runs these samples with the exception of blind spikes, if used, which are prepared by the immediate supervisor or by the QA Committee representative. Raw data, calculations and reports are reviewed by the immediate supervisor.

9. Quality control charts, tables, worksheets, and/or reports are maintained for routine analyses, as appropriate.

10. The Laboratory participates in several proficiency series as appropriate, available, and generally accepted for the analyses performed. These currently are:

    AIHA (formerly NIOSH) PAT Rounds. All analytes (metals, silica, asbestos, and solvents) are analyzed, and the Laboratory has been accredited by AIHA since 1973.

    USEPA Contract Laboratory Program quarterly blinds. The Laboratory has been in the Contract Laboratory Program for multi-media, multi-concentration organic analyses for the Superfund Program since 1985.

    USEPA Water Supply (WS) Series. The Laboratory is the principle state laboratory under the Safe Drinking Water Act for the State of Iowa and is certified for all parameters currently covered under SDWA including the new volatile organics.

    USEPA Air Monitoring Proficiency Series. The Laboratory is responsible for maintenance and calibration of the statewide air monitoring network and participates in this proficiency series for lead in air, carbon monoxide, sulfur dioxide, and high volume particulate sampling.

    USEPA Water Pollution (WP) Series. All metals, organics, and wet chemical procedures are performed.

    USEPA Solid Waste interlaboratory comparison series. All metals, organics, and wet chemical procedures are performed.

USEPA Radiochemical proficiency series for water, soil, air and vegetation. Radiochemical proficiency samples are analyzed for gross alpha activity, gross beta activity, tritium, radium 226 and 228, cesium 137, cobalt 60, potassium 40, strontium 89 and 90, uranium and gamma emitters.

USEPA NEIC (National Enforcement Investigation Center, Denver) pesticide residue and formulation quarterly proficiency samples.

NIST NVLAP (formerly USEPA) Bulk Asbestos Identification proficiency series.

Wisconsin (formerly CDC) Blood Lead Proficiency Series.

CDC CLIA. The Laboratory's license number is 14-1035.

CDC Neonatal Metabolic Screening proficiency series.

Additional in-house and commercial quality assurance samples are run as appropriate. The Laboratory also participates in various CDC, AOAC and other interlaboratory method validation studies, and has performed method checks for NIOSH 3rd Edition methods.

STANDARD OPERATING PROCEDURES

for

ORGANICS

EPA WA87K236

STANDARD OPERATING PROCEDURES

1. SAMPLE RECEIPT AND LOGGING.
2. SAMPLE STORAGE.
3. PREVENTING SAMPLE CONTAMINATION.
4. SECURITY FOR LABORATORY AND SAMPLES.
5. TRACEABILITY OF STANDARDS.
6. MAINTAINING INSTRUMENT RECORDS AND LOGBOOKS.
7. SAMPLE ANALYSIS AND DATA CONTROL SYSTEMS.
8. GLASSWARE CLEANING.
9. TECHNICAL AND MANAGERIAL REVIEW OF LABORATORY OPERATION AND DATA PACKAGE PREPARATION.
10. SAMPLE ANALYSIS, DATA HANDLING AND REPORTING.
11. CHAIN-OF-CUSTODY AND DOCUMENT CONTROL, INCLUDING CASE FILE PREPARATION.

Introduction

As an established environmental and public health laboratory, the University Hygienic Laboratory has standard operating procedures which cover the full spectrum of the work done at the Laboratory. Because of the variety of UHL's standard workload, a large number of manuals, occupying some eight to ten feet of shelf space are maintained and regularly updated. It is impractical to send all of this material, most of it irrelevant to solicitation WA87K236. For the convenience of the reviewer, the essentials of the relevent procedures are summarized here in the same order as given in the solicitation under "Evaluation of Bidder-Supplied Documentation." A separate Quality Assurance Project Plan is developed for major projects such as requested by this solicitation, and this will be established to meet EPA's requirements after award of the contract.

1. SAMPLE RECEIPT AND LOGGING

SAMPLE RECEIVING

Sample Custodian (listed first) and Alternates
Richard Sweeting
Leonard Marine
Bernie Kirby

Samples received from the carrier are to be delivered unopened (or ortherwise tampered with) to the Organic Anaysis receiving area, room N10 on the ground floor of the north wing of Oakdale Hall. If necessary, carriers or other personnel can consult the receptionist at the south entrance of the Laboratory during business hours or call the duty officer via campus security (319-335-5022) during non business hours.

The sample custodian receiving the samples is to use extreme care in sample receipt. Opening of coolers should be done in the hood, especialy if there is any indication of breakage, leakage, etc. Any abnormality in paperwork is to be brought to the attention of the document ocntrol officer and the project manager as quickly as possible.

The condition of samples and seals and any discrepancy between samples, chain of custody and traffic report are to be noted on the chain of custody traffic report and a positive statement of sample condition made on the UHL receiving form.

Once the above checks have been made, custody is to be maintained and documented on the chain of custody form received with the samples (see SOP for external chain of custody and example form following). The UHL Sample Number is assigned, attached to all sample containers in the set, stamped appropriately and legibly on paperwork received, and is cross-referenced to the EPA sample numbers by completely filling in the UHL Sample Identification Form (see example form following). To verify consistency of information received the UHL Sample Log-In Sheet is filled in (example following) and signed by the Sample Custodian. Finally, this information is entered into the UHL LIMS 2000 System for sample tracking.

Photocopies of all paperwork received or originated with the samples are made. The original Organic Traffic Report, completed external Chain of Custody form, Sample Tags, and one copy of all paperwork are sent to the Document Control Office. One copy of all paperwork is placed in a manila file folder for each fraction to be analyzed. This folder and the volatiles sample containers are taken to the GC/MS volatiles area where samples are placed in the volatile sample storage refrigerator and the paperwork is transferred to the analyst or section chief. Samples and folders for semivolatiles (BNA) fraction and pesticides/PCB's fraction are taken to the east wing where the samples are placed in the locked cage in the first floor walk-in cooler and the folder(s) are given to the extraction area supervisor or the shift supervisor. Sample storage areas are in restricted access areas open only to laboratory personnel (see sample storage SOP).

In case transfer to another laboratory is requested by SMO, the Sample Transfer Memo is to be used (example following).

University Hygienic Laboratory

The University of Iowa
Oakdale Hall
Iowa City, IA 52242
319-335-4500 (FAX 335-4555)

H.A. Wallace Building
900 East Grand
Des Moines, IA 50319
515-281-5371 (FAX 243-1349)

CHAIN OF CUSTODY RECORD

Sampler:	Project:
Address:	Comments:

Location	Sample ID	Date	Time	No./Type Container

Relinquished by (signature)	Date	Time	Received by (signature)
Relinquished by (signature)	Date	Time	Received by (signature)
Relinquished by (signature)	Date	Time	Received by (signature)
Relinquished by (signature)	Date	Time	Received for Lab by:

Custody seals intact? ☐ Yes ☐ No

Sample containers intact? ☐ Yes ☐ No

Remarks:

UHL SAMPLE IDENTIFICATION FORM

CASE # _____

ATE RECEIVED _____

DATE DUE IN DCO _____

DATE DUE IN SMO _____

REGION NO. _____

CONTRACT NO. 68-W8-0011

FRACTIONS ☐ VOA
☐ BNA
☐ PESTICIDE

SAMPLE TYPE	CONC. LEVEL	EPA SAMPLE NO.	UHL SAMPLE NO.
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		

[illegible] Hygienic Laboratory

Sample Log-in Sheet

Date _____

Sample Custodian Signature: _____

Circle the Appropriate Response

1. a. Custody Seal on Container — present/absent
   b. Custody Seal on Bottle — intact/not intact
2. Chain-of-Custody — present/absent
3. Sample Tags — present/absent
   Sample Tag Numbers — listed/not listed on chain-of-custody
4. SMO Forms — present/not present
5. Resolution of Discrepencies

Document Control # _____

Case Number _____

Airbill Number _____

BNA samples placed in storage

By _____ On _____

Pesticide samples placed in storage

By _____ On _____

VOA samples placed in storage

By _____ On _____

Date Rec'd	Time Rec'd	Chain-of-Custody Record Number	SMO Sample Numbers	CORRESPONDING		Does Information on Custody Records, Traffic Reports, and Sample Tags Agree?	Remarks: Condition of Sample Shipment, etc.
				Sample Tag Numbers	Assigned Lab Numbers		

The University of Iowa

HYGIENIC LABORATORY

SAMPLE TRANSFER MEMO

_____ Laboratories is transferring _____ samples from Case _____ as listed below to your custody.

(sample list)

These samples were received at our facility via _____ on _____ by _____. The contents were checked for completeness and have been repackaged (or have been unopened). The following documents accompany the shipment:

(document list)

These samples were shipped via _____ on _____ by _____. The samples were received and have been maintained in custody while at our laboratory. A custody seal has been placed on the shipping container.

Organic Analysis Division

Procedure for Logging-in Samples

1. Examine shipping containers and contents to determine integrity of package and note in sample folder or on forms submitted as appropriate. If sample is damaged see item 2. Number and type of samples is ascertained and checked against information submitted; if chain of custody is submitted, verify sample tags against custody record, note condition of seals, and maintain custody. If there are any discrepancies see item 2. Sign on custody forms or on other sample information and date.

2. If the package or its contents are damaged or if there is a discrepancy in information or seals, the nature and extent of the damage or discrepancy are noted and filed with the sample file, and supervisory personnel and the submittor are notified as appropriate. Personal protective equipment and spill control materials are used as needed to prevent laboratory contamination and personal injury.

3. Assign a laboratory number and the date received for each sample for logging and accounting purposes. If multiple samples are received from the same source, each container (or set) or individually specified sample is given a unique number in sequence. A computer is used to record receipt and analysis of samples. The following information is entered for each sample: laboratory number; source of samples; sample type; date of receipt; date due; and assignment to analytical area.

4. All other information as well as the "Sample Information Sheet" are placed in a file folder which is labeled with the sample number and filed sequentially.

5. Samples are then placed sequentially in the walk-in cooler or the sample freezer as appropriate. Sample storage areas are in restricted access areas open only to lab personnel.

January 6, 1987

University Hygienic Laboratory
Perkin-Elmer LIMS 2000
Sample Management System

The University of Iowa's Hygienic Laboratory uses a Perkin-Elmer 3230 Minicomputer and Perkin-Elmers' LIMS 2000 software for tracking of all of its environmental samples that are received at either of its two laboratories.

The computer system is located in the Iowa City Laboratory with the Des Moines's Laboratory linked into the computer via 2 high speed dedicated communication lines. Each of these lines are capable of handling upto 8 devices.

Each sample gets logged into the computer and is given a unique sample number by the operator which is verified by the computer. Several of the fields, such as who submitted the sample, are compared against previously stored items. After completing information concerning the sample the operator then assigns which tests are to be performed. Groups of commonly repeated tests can be placed into project codes to make the task of assigning tests easier for the operator.

Every test that is performed by the Hygienic Laboratory is assigned a service group, which is the area of the laboratory which performs that test. This enables each area to select out all of the tests that have been assigned to any samples that have logged into the system and that have not been completed. Many areas have these reports generated each night so that their list of samples to work on is waiting for them in the morning.

When the analysis is for one of the tests is complete, the analyst goes to one of the terminals on the system, and is stepped through a series of specific questions pertaining to the results of that test.

Management, at any point in time, is able to see the level of work load in each or specific areas, so that samples can be completed within a reasonable time frame.

An audit log is maintained, which records all activity regarding samples, tests assigned, or any results entered. Also, a transaction log is maintained on a separated disk drive, in the event of a hardware failure, with backups performed on the entire system on a weekly basis.

2. SAMPLE STORAGE

Sample Storage

Samples received under the Contract Laboratory Program are to be stored in the cooler on the first floor of the east wing of Oakdale Hall. This is a secure area. The walk-in cooler is divided into two portions. The rear portion of this cooler is additionally locked (the sample custodian and the CLP project manager or designee have keys to this lock) and this area is to be used for storage of CLP samples. VOA samples or portions of samples are not to be stored with the BNA/pesticide samples in the walk-in cooler; they must be stored in the refrigerator in the GC/MS volatiles sample storage area in room C105. At least one VOA holding blank is to be stored and analyzed with each case.

Temperatures of coolers, freezers, and refrigerators are to be maintained at SOW specified temperatures. A chart of temperature is to be maintained in the area of the cooler and the temperature recorded every working day. Each such refrigerated storage unit must have instructions posted (see next page) of procedure to be followed in case of malfunction.

Sample extracts are to be transferred to the appropriate analytical area (see internal chain of custody SOP) and stored in the extract storage refrigerator in that area (refrigerator in C105 in GC/MS area or M8A in pesticide area).

Month: **Year:**

Temperature °C

-10																															
-11																															
-12																															
-13																															
-14																															
-15																															
-16																															
-17																															
-18																															
-19																															
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Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Initial																															

Month: **Year:**

Temperature °C

-10																															
-11																															
-12																															
-13																															
-14																															
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Initial																															

Month: **Year:**

Temperature °C

-10																															
-11																															
-12																															
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Initial																															

Freezer Malfunction Instructions

If the daily temperature reading of a freezer is greater than -10°C, read the temperature again in one hour. If it is still out of range, notify (in order of availability): **1. The section supervisor; 2. Mr. Condon; 3. Dr. Breuer.** If the freezer will be off longer than the shift on which the malfunction is discovered, move the contents to an alternate unit.

On weekends call **Campus Security (335-5022)** and have them notify the UHL Duty Officer.

Signatures

Temperature Monitor

First Alternate

Second Alternate

Month: **Year:**

Temperature °C	+																															
	10																															
	9																															
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	7																															
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Initial																																

Month: **Year:**

Temperature °C	+																															
	10																															
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Initial																																

Month: **Year:**

Temperature °C	+																															
	10																															
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Date		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Initial																																

Refrigerator Malfunction Instructions

If the daily temperature reading of a refrigerator varies from 4±2°C, read the temperature again in one hour. If it is still out of range, notify (in order of availability): **1. The section supervisor; 2. Mr. Condon; 3. Dr. Breuer.** If the refrigerator will be off longer than the shift on which the malfunction is discovered, move the contents to an alternate unit.

On weekends call **Campus Security** (335-5022) and have them notify the UHL Duty Officer.

Correction Factor

Fisher #15-0418: ________

Signatures

____
Temperature Monitor

____
First Alternate

____
Second Alternate

PART A - SAMPLE STORAGE

1. Procedures for Sample Storage

1.1 The samples must be protected from light and refrigerated at 4°C from the time of receipt until extraction.

1.2 Water samples must be extracted within 5 days of receipt and completely analyzed within 40 days of extraction. VOA analysis of water samples must be performed within 7 days of sample receipt. Soil samples must be extracted within 10 days of sample receipt and completely analyzed within 40 days of extraction. VOA analysis of soil samples must be performed within 10 days of sample receipt.

NOTE: This does not preclude the contract requirement of 30-day turn-around of analytical data.

3. PREVENTING SAMPLE CONTAMINATION

PREVENTION OF SAMPLE CONTAMINATION

Contamination of samples is prevented by the use of good laboratory practice and facility design. Some of the aspects that are particularly applicable to the samples handled under this program are discussed specifically below. This is not a comprehensive discussion.

Volatile samples are stored in a refrigerator with temperature regulated at 4°C and monitored. No standards, semivolatile samples, or any other potential source of contamination have been or are stored in this refrigerator. Storage blanks are kept in the refrigerator for possible analysis to define problems in cases of suspected contamination. Semivolatile and pesticide samples are stored in a walk-in cooler regulated at 4°C and monitored. No standards or known high level samples are stored in this cooler. Extracts of semivolatile and pesticide samples are stored under refrigeration separate from standards.

Cleanliness of the analytical systems is checked by running blanks at the beginning of each day or autosampler run and at intervals as needed during the analytical process. The instruments are maintained routinely, by the chemists and/or by the laboratory's electronics technician; the GC/MS units are all under maintenance contracts as well, which include preventive maintenance visits by factory service representatives several times per year.

4. SECURITY FOR LABORATORY AND SAMPLES

LABORATORY AND SAMPLE SECURITY

The sample receiving area in Room N10 is open during working hours and is locked at all other times. Samples received under the contract laboratory program are in the immediate possession of the sample custodian at all times from time of opening and verification of seals until the sample containers are placed in storage for extraction and analysis.

Samples for BNA/pesticide analysis are kept in the first floor walk-in cooler in the east wing. Extraction of samples is performed in the extraction laboratories on the second floor of the east wing where the extracts are also stored in a locked metal box in a freezer. Both of these floors of the east wing are locked at all times: only authorized personnel in the employment of the laboratory have access to this area.

Volatiles samples are kept in the refrigerator in the volatiles GC/MS area in room C105 South where analysis takes place. Extracts are analyzed in the semivolatiles GC/MS area in C105 Middle. Access to the wing containing these rooms is available only through the receptionist area, which is manned at all times during business hours, or past management offices and the chromatography laboratory area. The wing is open only to authorized personnel in the employment of the laboratory during business hours and is locked at all other times.

5. TRACEABILITY OF STANDARDS

STANDARDS PREPARATION AND TRACEABILITY

Standards used for CLP work at UHL must be traceable to the U.S. EPA's standards as provided for that purpose by the Quality Assurance Materials Bank. The attached SOP describes the procedures to be taken to establish and document that traceability.

University Hygienic Laboratory

Standard Operating Procedure for Standards Preparation and Traceability. Revised 3/28/89.

Preparation of all standards will be recorded in the appropriate standards data book. Each data book will be uniquely identified by an identifier consisting of the area and/or program for which the book contains information, followed by the number of the book (e.g. MV2, referring to the second book for the GC/MS volatiles analysis). Each standard prepared will be labelled with an identifier consisting of the book identifier, the page number on which the entry referring to that standard begins, and if necessary the number of the entry on that page.

The entry for each standard will be made at the time the standard is prepared. The information recorded will be the following:

name of the standard (e.g. HSL volatiles)
identifier
name of the preparer
date of preparation
solvent used (supplier and lot number in parentheses)
volume
a listing of each chemical in the standard along with the supplier and lot number, the initial and final weights or volume added as appropriate, and the final calculated concentration

Following this entry room is left to refer to information on the traceability of the standard to NBS or EPA standards. All comparative data (sequential runs, etc.) which establishes such traceability will be filed separately for each stock standard and a reference to the file and its location will be noted immediately beneath the standard preparation data, including the method of verification, the date of verification, and the person doing the work. If reverification of traceability is performed, this data is entered in the same way following the initial verification.

Standards traceability must be performed 1) at least once per year, 2) whenever new lots of prepared standards (other than EPA) are received and used, or 3) when new lots of pure standards are received and used, whichever is more frequent for each fraction, and is to be performed by analyses according to the current SOW using comparable dilutions of the stock standard and of standards obtained from the EPA Repository. Retention times (and for GC/MS, mass spectra) must match within standard criteria in the current SOW; for Toxaphene and Aroclors at least 50% of individual peaks must meet criteria. Any responses not within 20% must be repeated and correction or discrepancy documented.

6. MAINTAINING INSTRUMENT RECORDS AND LOGBOOKS

Instrument Maintenance

On-going instrument maintenance is performed as needed for the various instruments, and a log book for each instrument is maintained. Photocopies of some pages from these manuals are included here along with copies of some of the recent logs of samples prepped and run in each area. UHL policy on instrument maintenance is included in the Organic Analysis Division Procedure Manual.

Department GC/MS Semivolatiles

Subject HP 1000 Intrument Log

Name

Address

43-649

National

Laboratory Research Notebook

Dennison National Company, Holyoke, MA 01041

11-7-86 Bill Pires service call 11-6 - 11-7.

Sensitivity dropping, but repeller o.k. Switched to filament 2 & sensitivity back. Filament 1 may be bad or in focus element maybe not making good contact on side plates. Can replace filament and/or tighten in focus contacts when source is removed next. Appears that running power cords from printer & terminals through the Topsy helped stopped repeller drop. (common ground for all power line now)

Bill Pires recommend backing up software occassionally. Have no acquisition running & all again turned off. Insert tape with arrow pointing away from safe (to allow taping). Wait 4-5 min. (busy light on) Move save switch to right once for 2 sec. Release & push again for 2 sec. When tape 1 is full after about 45 min. there will be chattering noise. I install other tape. When #2 is done after about 45 min. the busy light will finish & not start flashing. Remove tape 2. Done. Can use these tapes as back up for methods, ID files, etc in case of hard crash etc.

Push Button SAVE 4 10-41 in manual

(arrow away) (don't push save again) Before light & sound cycling 30- & light flashing If not busy then push again one off completely

11-25-86 Installed new column.

12-08-86 Cleaned Source and replaced filaments.

12-11-86 Problem: 502 mass on PFTBA Tune had 0 abundance and no peak could be distinguished. Abundances on 69 and 219 were also low but peak shape was good.
Solution: Galileo multiplier is "too good". Doesn't distinguish high mass. HP screens these multipliers and sells them for twice the price. Increased multiplier from 1750 V to 2100 V to bring back 502. Can increase multiplier to 3000 V if needed.

12-24-86 Broke off 10 inches from front of column & cleaned ~~nut~~ flakes from nut. Let internal std areas increased ~ 10X. TC

1-7-87 Cleaned ~~nut~~ nut at front of column TC

Client

Hickok

IPP

Sample Ledger

Date 1-6-87

>HIK22 8690037 (1/100) vol=12ml +5ml, IC/Bkt
2-1 of 10-1+5-1

>HIK23 8610037 (1/10) vol=19.2ml
2-1 of .1ml+5-1

>DFP88 DFTB Tune
1 vl of B1246 DFTPP

>SND40 Daily Standard
2-1 of B1450 Daily Std.

>IPP06 8610455 (1/10) vol=1800
2-1 of 50-1+50-1+5-1

>IPP07 8610455 vol=1800
2-1 of .5ml+.5ml+5-1

>IPP08 8610455 (1/100) vol=1800
2-1 of 5-1+5-1+5-1

>IPP09 8610456 (1/100) vol=1920
2-1 of 5-1+5-1+5-1

> IPP10 8610957 (1/10) vol=1740ml
2ml of 50ml+50ml+5ml IS+900ml CH_2Cl_2

> IPP11 8610458 (1/100) vol=1520ml
2ml of 5ml+5ml+5ml IS+1000ml CH_2Cl_2

> IPP12 8610591 vol=1500ml
2ml of .5ml+.5ml+5ml IS

> IPP13 8610592 vol=1840ml
2ml of .5ml+.5ml+5ml IS

> IPP14 8610593 vol=1880ml
2ml of .5ml+.5ml+5ml IS

> IPP15 8610596 vol=1620ml
2ml of .5ml+.5ml+5ml IS

> IPP16 8610602 vol=1890ml
2ml of .5ml+.5ml+5ml IS

> IPP17 8610603 vol=1790ml
2ml of .5ml+.5ml+5ml IS

> IPP18 8610606 vol=1570ml
2ml of .5ml+.5ml+5ml IS

> IPP19 8610607 vol=1710ml
2ml of .5ml+5ml+5ml IS

> IPP20 8610608 vol=1910ml
2ml of 5ml+5ml+5ml IS

> IPP21 8610609 vol=1510ml

FERMILAB 1023

LOG

INSTRUMENT [illegible]

[illegible] MODEL [illegible]

DATE	PROBLEM REPORTED	SYSTEM "DOWN" DURATION, COMMENTS, ETC
6-13-86		Replace filament - CCB
10-15-86		EM voltage would not remain at a fixed value The EM voltage switch was sprayed with cleaner and lubricant. Still the voltage would not remain constant.
10-16-86		EM Voltage Switch was replaced by John Stroppel. Still the EM voltage did not stay at a fixed value.
11-3-86		Received and installed a new EM voltage source. Still the EM Voltage did not stay at a fixed value
11-6-86		Service call by Tom Staley of Finnigan The Digital Voltmeter was replaced. This stabilized the EM Voltage indication. CCB
11/21/86	MANIFOLD OVERHEATING	MANIFOLD TEMPERATURE UP TO 200+ DEGREES, WOULD NOT RESPOND TO LOWERING MANIFOLD POTENTIOMETER JOHN STROPPEL REPLACED TRIAC IN HEATER POWER SUPPLY PCB 40012-61010, JJY
11/24/86	GRINDING NOISE IN DISK DRIVE	REPLACED DISK DRIVE AIR FAN BEARING BECAUSE IT WAS NOISY. JJY
11/26/86	IONIZER HEATER WON'T SHUT OFF, ALSO, POOR	CLEANED ION SOURCE AND REPLACED FILAMENT. IONIZER HEATER DOES NOT SHUT OFF. JJY
12/3/86 JJY	SENSITIVITY AND	REPLACED HEATER POWER SUPPLY BOARD 40012-61010.
12/4/86	CANNOT TUNE TO [illegible] (BFB)	IONIZER HEATER STILL DID NOT SHUT OFF. JJY SERVICE CALL BY PETE NIKLAS OF FINNIGAN [illegible] REPLACED TEMP CONTROLLER BOARD [illegible] CLEANED SEPARATOR. JJY
12 [illegible]	[illegible]	CLEANED [illegible] SOURCE RODS JJY

Department GC/MS

Subject 4000 ENVIRONMENT LOG

Name

Address DENOTED A-1

43-649

National

Laboratory Research Notebook

Cannon National Company, Holyoke, MA 01041

Date	Filename	Client	Run#		Comments	
12/22/86	GD360MS	EPA CLP	4890	✓	5ml GD360 + 10µl SSIS V-290A + 10µl 1/10 MS V-290E	
12/22/86	GD360MSD	EPA CLP	4891	✓	5ml GD360 + 10µl SSIS V-290A + 10µl 1/10 MS V-290E	
12/22/86	610209	MONR	4892	✓	5ml 610209 + 10µl SSIS V-290A	JEF
12/22/86	610210		4893	✓	5ml 610210 + 10µl SSIS V-290A	JEF
12/22/86	610211		4894	✓	5ml 610211 + 10µl SSIS V-290A	JEF
12/22/86	610212		4895	✓	5ml 610212 + 10µl SSIS V-290A	JEF
12/23/86	BFB23		4896	✓	2 ml BFB TUNE	JJY
12/23/86	STD23		4897	✓	5 ml V-290F + 10 ml SSIS V-290A	JJY
12/23/86	OFW23		4898	✓	5 ml OFW + 10 ml SSIS V-290A	JJY
12/23/86	610213	MONR	4899	✓	5 ml 610213 + 10 ml SSIS V-290A	JJY
12/23/86	610214		4900	✓	5 ml 610214 + 10 ml SSIS V-290A	JJY
12/23/86	610215		4901	✓	5 ml 610215 + 10 ml SSIS V-290A	JJY
12/23/86	610889		4902	✓	5 ml 610889 + 10 ml SSIS V-290A	JJY
12/23/86	610890		4903	✓	5 ml 610890 + 10 ml SSIS V-290A	JJY
12/23/86	610891		4904	✓	5 ml 610891 + 10 ml SSIS V-290A	JJY
12/23/86	610892		4905	✓	5ml 610892 + 10µl SSIS V-290A	JEF
12/23/86	610988	NONL	4906	✓	5ml 610988 + 10µl SSIS V-290A	JEF
12/23/86	610989		4907	✓	5ml 610989 + 10µl SSIS V-290A	JEF
12/23/86	610990		4908	✓	5ml 610990 + 10µl SSIS V-290A	JEF
12/23/86	610991		4909	✓	5ml 610991 + 10µl SSIS V-290A	JEF
12/23/86	610992		4910	✓	5ml 610992 + 10µl SSIS V-290A	JEF
12/23/86	610993		4911	✓	5ml 610993 + 10µl SSIS V-290A	JEF
12/24/86	BFB24		4912	✓	~~5 ml~~ 2 ml BFB TUNE	JJY
12/24/86	STD24		4913	✓	5 ml V-290G + 10 ml SSIS V-290A	JJY
~~12/24/86~~	~~610994 JJY~~	~~NONL~~	~~4914~~		~~5 ml 610994 + 10 ml SSIS V-290A~~	~~JJY~~
12/24/86	OFW24		4914	✓	5 ml OFW + 10 ml SSIS V-290A	JJY
12/24/86	610994	NONL	4915	✓	5 ml 610994 + 10 ml SSIS V-290A	JJY
12/24/86	610995		4916	✓	5 ml 610995 + 10 ml SSIS V-290A	JJY
12/24/86	610996		4917	✓	5 ml 610996 + 10 ml SSIS V-290A	JJY
12/24/86	610997		4918	✓	5 ml 610997 + 10 ml SSIS V-290A	JJY
12/24/86	610998		4919	✓	5 ml 610998 + 10 ml SSIS V-290A	JJY
12/24/86	610999		4920	✓	5 ml 610999 + 10 ml SSIS V-290A	JJY
12/26/86	BFB26		4921		2 ml BFB TUNE	JJY
12/26/86	ACETONITRILE		4922		5 ml V-290H + 10 ml SSIS V-290A	JJY
12/29/86	BFB29		4923	✓	2 ml BFB TUNE	JJY
12/29/86	STD29		4924	✓	5ml V-290B + 10µl SSIS V-290B	JEF
12/29/86	OFW29		4925	✓	5 ml OFW + 10 ml SSIS V-290B	JJY
12/29/86	610993	MONR	4926	✓	5 ml 610993 + 10 ml SSIS V-290B	JJY
12/29/86	610994		4927	✓	5 ml 610994 + 10 ml SSIS V-290B	JJY

Name Tracor 560 GC

Project Maintenance Record

AMERICAN PAD & PAPER CO./HOLYOKE, MASS. 01040

Efficiency.
DATA NOTEBOOK

50 SHEETS 11 x 8½ 22-221
DATA RULED/10 COLUMNS

11/21/86 auto sampler to #1 (unused packed)
columns on N2: Meth
packed two new columns 3% OV-1 6 foot 2mm I.D. not detected
A: designated for Serum PCB method study, installed on #2 side to condition
B: designated for PCB analysis from Peace Response, not installed yet
CLP calibration run (final conditions; no more attempts to linearize)
Mixed packed, #1 side, temp 182, flow 10, 220° inj, 330° det

11/24/86 Installed new OV-1 column (A) to side #2. moved autosampler to #2
Oven temp 205°, 220° inj, 330° det (to match speed for serum PCB task)

12/1/86 auto sampler to #1
columns on N2
column #1 Mixed pack (preparing for CLP run) set atn = 1.0
Temp 180°, injector 220, detector 330°, flow 7 (RDT = 12.46)
conditions produce linear response on CLP
conditions set for primary CLP runs

12/2/86 autosampler to #2
PCB in serum method develop 3% OV-1 11/21/A.
Temp 208°, injector 220, detect 330°, flow 26 (= 36 ml/min)
conditions good for PCB in serum

12/3/86 auto sampler to #1
CLP conditions

12/15/86 autosampler to #2 PCB in serum conditions

12/16/86 autosampler on #2 CLP 3% OV-1 column installed
conditions Temp = 180°, inj. 220, detect 330°, flow 26

12/19/86 PCB in serum column installed in #2, conditions set
Blank column installed #1 detector, detector temp to 350 9:30 - [illegible]

9/25/86 install mixed column #2

9/25 re-install detector #1 after reconditioning at factory

9/26 install # OV-1 column # 2, mixed column #1
#1 shows bad linearity still (#2 continuing to show bad linearity)

10/13 install ~~mixed column #2~~, septa
dual column

10/15 install mixed column #2, #1 shows bad sensitivity

10/16 install OV-1 column #2

10/17 install mixed column #2, septa

10/22 OV-1 in #2

10/28 auto sampler to #1, install new OV-1 column in #1
still bad linearity and sensitivity

10/30 old OV-1 to #1, new OV-1 to #2 (septa problem)

10/31 auto sampler to #2 (good sensitivity #2 but still bad linearity)

11/3 auto sampler to #1 still with N_2
flow dial 10 temp 180° detector 330 injector 220

11/18 auto sampler to #2 (OV-1)
flow dial 26 temp 205° detector 330 injector 250 (FID in same program)

DAILY PESTICIDE TO DO LIST PRODUCED ON 01/04/87 AT 06 40 PAG

SAMPLE #	TEST #	DATE DUE	SUBMITTE	DESCRIPT
8610727 00	MRWM	01/07/87	CEDAR RAPIDS WP	RIVER WATER
8610728 00	MRWM	01/09/87	IOWA CITY WD	WATER
8610825 00	MRWM	01/13/87	OSKALOOSA MUNI WD	WATER
8610826 00	MRWM	01/13/87	COUNCIL BLUFFS WW	WATER
8610827 00	MRWM	01/13/87	DUBUQUE WW	WATER
8610887 00	MRWM	01/14/87	CHEROKEE WS	WATER
8610888 00	MRWM	01/14/87	KEOKUK WW	WATER
8610910 00	MSCPW	01/14/87	MET LABS	WATER
8610911 00	MRWM	01/14/87	DES MOINES WW	WATER
8610940 00	IGSPR	01/01/87	IGS	WATER
8610941 00	IGSPR	01/01/87	IGS	WATER
8610942 00	IGSPR	01/01/87	IGS	WATER
8610943 00	IGSPR	01/01/87	IGS	WATER
8610944 00	IGSPR	01/01/87	IGS	WATER
8610945 00	IGSPR	01/01/87	IGS	WATER
8610946 00	IGSPR	01/01/87	IGS	WATER
8610947 00	IGSPR	01/01/87	IGS	WATER
8610948 00	IGSPR	01/01/87	IGS	WATER
8610949 00	IGSPR	01/01/87	IGS	WATER
8610950 00	IGSPR	01/01/87	IGS	WATER
8610951 00	IGSPR	01/01/87	IGS	WATER
8610952 00	IGSPR	01/01/87	IGS	WATER
8610953 00	IGSPR	01/01/87	IGS	WATER
8611021 00	MSCPW	01/19/87	WILLIAMS STEVEN	WATER
8611023 00	APPPR	01/19/87	PEORIA DISPOSAL CO	WATER
8611024 00	APPPR	01/19/87	PEORIA DISPOSAL CO	WATER
8611025 00	MSCPS	01/19/87	UNIV OF NORTHERN IA	SOIL
8611026 00	MSCPS	01/19/87	UNIV OF NORTHERN IA	SOIL
8611027 00	MSCPS	01/19/87	UNIV OF NORTHERN IA	SOIL
8611028 00	MSCPS	01/19/87	UNIV OF NORTHERN IA	SOIL
8611029 00	MSCPS	01/19/87	UNIV OF NORTHERN IA	SOIL
8611030 00	MSCPS	01/19/87	UNIV OF NORTHERN IA	SOIL
8611033 00	MRWM	01/20/86	HAMBURG WS	RIVER WATER
8611037 00	FCBPO	01/20/87	IOWA POWER & LIGHT CO DM	OIL
8611038 00	FCBPO	01/20/87	IOWA POWER & LIGHT CO DM	OIL
8611039 00	FCBPO	01/20/87	IOWA POWER & LIGHT CO DM	OIL
8611053 00	MODAG	01/20/87	MISSOURI DEPT AG BPC	WATER
8611054 00	MODAG	01/20/87	MISSOURI DEPT AG BPC	WATER
8611055 00	MODAG	01/20/87	MISSOURI DEPT AG BPC	SWAB
8611056 00	MODAG	01/20/87	MISSOURI DEPT AG BPC	SWAB
8611074 00	MSCPW	01/27/87	EPD C	WATER
8611075 00	MSCPS	01/27/87	EPD S	SOIL
8611076 00	MSCPS	01/21/87	EPD S	SOIL
8611079 00	IGSPR	01/01/87	IGS	WATER
8611135 00	MDWS	01/20/87	LE GRAND	WATER
8611136 00	MDWS	01/20/87	TINTINNATI	WATER
8611137 00	MDWS	01/20/87	DRAKESVILLE WS	WATER
8611138 00	MDWS	01/20/87	WEBSTER WS	WATER
8611139 00	MDWS	01/20/87	WHITTEMORE MUNI WS	WATER
8611140 00	MDWS	01/20/87	RYAN WS	WATER

SAMPLE #	TEST #	DATE DUE	SUBMITTE	DESCRIPT
8611091	00 MDWS	01/20/87	PRAIRIEBURG	WATER
8611092	00 MDWS	01/20/87	BURT	WATER
8611093	00 MDWS	01/20/87	FARLEY WS	WATER
8611094	00 MDWS	01/20/87	ONSLOW WS	WATER
8611095	00 MDWS	01/20/87	COLO	WATER
8611096	00 MDWS	01/20/87	CLUTIER WS	WATER
8611097	00 MDWS	01/20/87	WILLIAMS WS	WATER
8611098	00 MDWS	01/20/87	CLEARFIELD RWA	WATER
8611117	00 MDWS	01/20/87	SERGEANT BLUFF WS	WATER
8611120	00 MDWS	01/21/87	CORNING MUNI WD	WATER
8611121	00 MDWS	01/21/87	DENMARK WS	WATER
8611122	00 MDWS	01/21/87	BAGLEY WD	WATER
8611123	00 MDWS	01/21/87	OLIN WS	WATER
8611124	00 MDWS	01/21/87	COIN	WATER
8611125	00 MDWS	01/21/87	COUITER	WATER
X8661603	00 HREFW	10/15/86	POLK CO HEALTH DEPT	WATER
X8661677	00 PCB	10/16/86	EPA	WATER
X8663085-00	RCRA	11/21/86	INTERNATIONAL PAPER (J)	SOIL
X8663086	00 RCRA	11/21/86	INTERNATIONAL PAPER (J)	SOIL
8663763	00 FRFPW	12/15/86	DES MOINES WDS	WATER
8664359	00 MSCPS	12/26/86	UNIV OF NORTHERN IA	SOIL
8664360	00 MSCPS	12/26/86	UNIV OF NORTHERN IA	SOIL
8664361	00 MSCPS	12/26/86	UNIV OF NORTHERN IA	SOIL
8664362	00 MSCPS	12/26/86	UNIV OF NORTHERN IA	SOIL
8664363	00 MSCPS	12/26/86	UNIV OF NORTHERN IA	SOIL
8664364	00 MSCPS	12/26/86	UNIV OF NORTHERN IA	SOIL
8664365	00 MSCPS	12/26/86	UNIV OF NORTHERN IA	SOIL

377 SELECTIONS QUALIFIED

7. SAMPLE ANALYSIS AND DATA CONTROL SYSTEMS

SAMPLE ANALYSIS AND DATA CONTROL SYSTEMS

Sample analysis procedures and data collection and package assembly procedures are under the supervision of individuals in charge of the various areas: Mr. Richard Sweeting is sample custodian and supervisor of the sample extraction area. Mr. Dennis Seeger is in charge of the volatiles and semivolatiles GC/MS analytical areas, Mr. Lauren Johnson is in charge of the pesticides analytical area, and Ms. Mary Frietag is document control officer and supervisor of the document assembly area. Dr. George Breuer is CLP project manager. SMO contact personnel are Ms. Frietag for sample scheduling or routine questions and Dr. Breuer for all other questions.

Each analytical or documentation area has a procedure manual which is followed. These are assembled into the Organic Analysis Procedure Manual for the Contract Laboratory Program. Relevant portions of this manual are cited throughout this submission to show how analytical, document control and sampling tracking procedures are put into practice.

GC/ECD ANALYSIS OF PESTICIDES/PCBs

Pesticide/PCB analysis of CLP samples is performed in room M7 of the basement floor of the west wing of Oakdale Hall. This is a secure area and is locked at all times. The Laboratory's Tracor model 560 GC with dual electron capture detectors is used for these analyses according to the latest statement of work applicable to this Laboratory. Data analysis is performed on the Perkin-Elmer LIMS computer system in the Laboratory.

Internal chain of custody must be used in obtaining extracts for analysis of CLP samples.

Mr. Lauren Johnson is chief of this analytical area.

GC/MS ANALYSIS OF EXTRACTABLE ORGANICS

Extractable organic compound analysis of CLP samples is done in room C105 Middle or South. The Laboratory's Finnigan 1020 GC/MS instrument with data system or the Hewlett-Packard 5890/5970 GC/MS with Hewlett-Packard 1000 data system is to be used for this analysis according to the latest statement of work applicable to this Laboratory. The nine-track tape drive connected to the Finnigan 1020 or the Hewlett-Packard 1000 is used for long term data storage.

Internal chain of custody is to be used for obtaining samples from the sample custodian for analysis.

Mr. Dennis Seeger is chief of this analytical area.

GC/MS ANALYSIS OF PURGEABLE ORGANICS

Purgeable organic compound analysis of CLP samples is done in room C105 South. The Laboratory's Finnigan 4023 GC/MS instrument with Incos data system and Tekmar LSC-2 purge and trap is to be used for this analysis according to the latest statement of work applicable to this Laboratory. The nine-track tape drive connected to the Finnigan 1020 is used for long term data storage.

Internal chain of custody is to be used for obtaining samples from the sample custodian for analysis.

Mr. Dennis Seeger is chief of this analytical area.

8. GLASSWARE CLEANING

STANDARD OPERATING PROCEDURES

for

GLASSWARE CLEANING

AFTER USE, GLASSWARE IS RINSED WITH TAP WATER TO PRERINSE ANY RESIDUAL SAMPLE MATERIAL FROM THE GLASSWARE.

GLASSWARE IS THEN PLACED IN SOAPY WATER FOR A SOAKING PERIOD; MICRO "LABORATORY CLEANING SOLUTION" BRAND IS USED AS SOAP.

THEN SCRUBBED WITH APPROPRIATE BRUSHES AND/OR PADS TO INSURE VIGOROUS SUDSING ACTION IN THE SOAPY WATER; RINSED THREE TIMES WITH HOT TAP WATER, AND THEN THREE TIMES WITH DISTILLED WATER.

GLASSWARE IS THEN ALLOWED TO DRAIN OFF EXCESS WATER, AND PLACED IN A DRYING OVEN FOR A PERIOD OF TIME; USUALLY OVERNIGHT (12 to 14 HOURS), DRYING OVEN IS MAINTAINED AT 200°C

AFTER DRYING, THE GLASSWARE IS REMOVED FROM THE DRYING OVEN AND PLACED IN STOCK.

9. TECHNICAL AND MANAGERIAL REVIEW OF LABORATORY OPERATION AND DATA PACKAGE PREPARATION

TECHNICAL AND MANAGERIAL REVIEW OF LABORATORY OPERATIONS AND DATA PACKAGE PREPARATION

Sample analysis procedures and data collection and document assembly operations are under the supervision of individuals in charge of the various areas: Mr. Richard Sweeting is ample custodian and supervisor of the sample extraction area, Mr. Dennis Seeger is in charge of the volatiles and semivolatiles GC/MS analytical areas, Mr. Lauren Johnson is in charge of the pesticides analytical area, and Ms. Mary Freitag is document control officer and supervisor of the document assembly area. Dr. George Breuer is CLP project manager. SMO contact personnel are Ms. Frietag for sample scheduling or routine questions and Dr. Breuer for all other questions. Each of these people is involved in review of the operations under their supervision in cooperation with the sample custodian, document control officer and project manager especially.

Data packages are prepared from the analytical data and completed summary forms filled out by the analysts in each analytical area and initially reviewed by the area supervisor. The Document Control Office then reviews and assembles the data, noting and correcting any apparent deficiencies, numbers the pages, and copies the data package. This is then reviewed in its entirety by the project manager and signed. The data packages are then sent by express mail or overnight courier service to SMO, the appropriate region, and EMSL Las Vegas.

10. SAMPLE ANALYSIS, DATA HANDLING AND REPORTING

Sample Analysis

Standard analytical procedures are written for all analyses the Laboratory performs. Separate manuals are sometimes maintained for major projects (e.g., Safe Drinking Water Act sample analyses), in addition to the standard 3 volume manual for organic analysis (which includes EPA methods 608, 624 and 625, the core of the hazardous substance analyses). For review, the introductory portions of the Organic Analysis Division Procedure Manual are photocopied here, giving in detail the general laboratory procedures as well as listing in the table of contents the methods included in the three volumes. Methods 608, 624 and 625 are included completely as published by EPA. All procedure manuals are available for inspection at UHL at any time.

Data Production and Verification

Standard procedures are established for production, reduction, transcription, verification and distribution of laboratory data. Examples are given here of various formats that have been developed in the laboratory for reporting results. A complete file containing all paperwork, calculations, etc., is maintained for each sample. After verification, review and reporting, completed files are ordinarily stored in file cabinets under major project headings or by sample number (for individual cases); complete file purging to the sponsoring agency can be easily accomplished.

University Hygienic Laboratory
Analytical Report

Client:
Client Address:

Client Sample Identification:
Date Sample Collected:
Date Sample Received:

ANALYTICAL RESULTS

Lab I.D.		Concentration ( )	Precision	Accuracy (%Recovery)	Quantitation Limit
			±		
			±		
			±		
			±		

Analytical Method:

Analyst:
Verified:
Date Reported:

D2/form2

SDWA MAXIMUM TOTAL THM POTENTIAL ANALYSIS

PWS I.D.

REPORT TO

BILL TO

NAME OF SAMPLE COLLECTOR (Last Name First)

Sample Collection Date: Mo. Day Yr.

All results in mg/L.

	1	2 3
LAB NO.		
SAMPLE TYPE		M
SAMPLE COLLECTION LOCATION	BLANK	
TIME		
CHLOROFORM $CHCl_3$	9003	9003 SIGN RESULT
BROMO-DICHLORO-METHANE $CHCl_2Br_2$	9004	9004 SIGN RESULT
CHLORO-DIBROMO-METHANE $CHClBr_2$	9005	9005 SIGN RESULT
BROMOFORM $CHBr_3$	9006	9006 SIGN RESULT
TOTAL TRIHALO-METHANES	2950	2950 SIGN RESULT

ANALYZED BY: _____

W.J. Hausler, Jr., Ph.D

11. CHAIN-OF-CUSTODY AND DOCUMENT CONTROL, INCLUDING CASE FILE PREPARATION

RECORDS, FORMS AND LOGBOOKS TO AID SAMPLE TRACKING

Various records, forms and logbooks are used in the Laboratory to assist recordkeeping and provide a means for sample tracking at various stages in the analytical process. A brief description of the form or other record used in each area is provided along with a general listing of the type of information included.

SAMPLE RECEIVING AREA -- Upon receipt of a case, the air bill, organic traffic report, detachable sample tags, signed chain of custody, and other paperwork received with the case are sent to the DCO for return to SMO or inclusion in the purge file, as appropriate. A "Sample Log-In Sheet" is prepared to note the presence/absence of the for-going information and document agreement between them as well as date/time and condition of receipt. For correlation of EPA and UHL sample numbers, a "UHL Sample Identification Form" is used listing sample type, expected concentration level, EPA sample number and UHL sample number.

INTERNAL CHAIN OF CUSTODY -- When samples are delivered to sample preparation areas by the Sample Custodian or an extract is prepared from a sample, an internal chain of custody is initiated by the person who receives the samples or prepares the extract. This preprinted form includes boxes where the applicable fraction (original sample, BN/A extract, pesticide extract, or VOA vial) is marked and removal or return of samples or extracts to their storage locations is documented. After completion of all work, any remaining sample is returned to the first floor walk-in cooler (E113) for storage of at least 60 days following data submission, extracts are returned to the appropriate extract storage refrigerator for storage of at least 365 days following data submission (unless requested by EPA), and the internal chain of custody records are sent to the DCO for inclusion in the case purge file.

SAMPLE PREPARATION AREA -- The "Sample Extraction Record" is used to record necessary information on the samples extracted and methods used, as well as other comments as appropriate, on pre-numbered sheets. The information contained includes client, sample numbers, dates, matrix, weight or volume, pH, method and solvents, with information on the bottom on person doing the work and transfer of the completed extract. Five columns for samples, blanks and spikes are given per numbered page. Only the first column is usually filled out if the information is the same for all columns. If gel permeation chromatography is used for sample clean-up, a GPC clean-up log is also used to document case, date, sample numbers, and analyst initials.

GC/MS -- A logbook is used to record appropriate

information and sequence for GC/MS analysis, either volatiles or semivolatiles. Client, sample, date and analyst information is given. Sample information usually consists of amounts of sample (or base/neutral followed by acid extract) and any internal or surrogate standards or matrix spike solution, sample numbers, and data system file numbers. A standards preparation log is also used with analytes, amounts, and sources. For the semivolatiles analysis, a "BNA worksheet" is used to record appropriate information for the final extract volume; sample numbers, dates, fractions, total amounts of extract (for analysis, clean-up, screening, etc.), and dilution volumes are recorded along with analyst initials.

PESTICIDES -- A "CLP Injection Log Book" pre-numbered form is used for the injection sequence. Date, sample or standard identification, description, time and analyst initials are recorded. A "CLP Sample Clean-up" pre-numbered form is also used for samples where clean-up is necessary. Solvents, clean-up materials, and sample identification are recorded.

The above forms and other records, when completed for a case, are sent to the DCO with the analytical file and are included in the purge file for the case.

The University Hygienic Laboratory

Sample Log-In Sheet

Date _____

Sample Custodian Signature: _____

Circle the Appropriate Response

1. a. Custody Seal on Container — present/absent
   b. Custody Seal on Bottle — intact/not intact
2. Chain-of-Custody — present/absent
3. Sample Tags — present/absent
   Sample Tag Numbers — listed/not listed on chain-of-custody
4. SMO Forms — present/not present
5. Resolution of Discrepencies

Document Control # _____

Case Number _____

Airbill Number _____

BNA samples placed in storage

By _____ On _____

Pesticide samples placed in storage

By _____ On _____

VOA samples placed in storage

By _____ On _____

Date Rec'd	Time Rec'd	Chain-of-Custody Record Number	SMO Sample Numbers	CORRESPONDING		Does Information on Custody Records, Traffic Reports, and Sample Tags Agree?	Remarks: Condition of Sample Shipment, etc.
				Sample Tag Numbers	Assigned Lab Numbers		

UHL SAMPLE IDENTIFICATION FORM

CASE # _____

TE RECEIVED _____
DATE DUE IN DCO _____
DATE DUE IN SMO _____
REGION NO. _____
CONTRACT NO. 68-W8-0011

FRACTIONS ☐ VOA
☐ BNA
☐ PESTICIDE

SAMPLE TYPE	CONC. LEVEL	EPA SAMPLE NO.	UHL SAMPLE NO.
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		

The University Hygienic Laboratory

Sample Control Record

☐ Sample ☐ BN and A Extract ☐ Pesticide/PCB Extract ☐ VOA Vial

Laboratory Sample No.	Removed By	Date and Time Removed	Reason	Date and Time Returned

University Hygienic Laboratory

Sample Extraction Record

CLP Contract 68-W8-0011

Client

Lab Sample No.					
Date Received					
Date Extracted					
Sample Matrix					
EPA Sample No.					
Source					
Tare Wt.					
Tare & Sample Wt. (Wet)					
Tare & Sample Wt. (Dry)					
Sample Wt. (Wet)					
Sample Wt. (Dry)					
Wt. Loss					
% Moisture or Oil					
Emulsion					
Sample Volume					
Sample pH					
Method					
Analytes					
Solvent(s)					
(Lot #)					

Comments

Extracted By

Transferred To

Extract Location

Transfer Date

7-28-88

GPC Cleanup Log

UU1

DATE	UHL Sample	CASE	SDG	Initials
	calibration std.			
7/21/89	PBLK	12380	EFPBLK	SF
	8906771		EFF00	
	8906771MS		EFF00MS	
	8906771MSD		EFF00MSD	
	8906772		EFF01	
	8906773		EFF02	
	8906774		EFF03	
	8906775		EFF04	
	8906776		EFF05	
	8906777		EFF06	

GC/MS Injection Log (Logbook) — SV + VOA

030

Client	Sample Info	Date	Analyst
CLP	>III12 8901331 vol=2000ul	3/21/89	TC/Auto
case 11398	2ul of .25ml+.25ml+2.5ul IS FJ708		
SDG FJ619	>III13 8901332 vol=2000ul		
	2ul of .25ml+.25ml+2.5ul IS FJ715		
	>III14 8901333 vol=2000ul		
	2ul of .25ml+.25ml+2.5ul IS FJ716		
	>III15 8901221MS vol=2000ul		
	2ul of .25ml+.25ml+2.5 ul IS FJ703MS		
	>III16 8901221MSD vol=2000ul		
	2ul of .25ml+.25ml+2.5ul IS FJ703MSD		
	>DFTT86 DFTPP Tune	3/22/89	TC/Auto
	2ul of B187B		
	>STD83 CatCali SSTD050		
	2ul of B188A		
	>STD84 CatCali SSTD050		
	2ul of B188A		
SS out	>III17 8901218 vol=2000ul		
	2ul of .25ml+.25ml+2.5ul IS FJ700		
SS out	>III18 8901215 vol=2000ul		
	2ul of .25ml+.25ml+2.5ul IS FJ619		
SS in	>III19 SBLK22 I vol=2000ul diln.=MET02		
	2ul of .25ml+.25ml+2.5ul IS FJ700 3/22/89		
	>III20 8901215RE vol=2000ul		
	2ul of .25ml+.25ml+2.5ul IS FJ700RE		
SS out	>III21 ~~8901215~~ TC 3/22/89 SBLK22 II vol=2000ul		
SS in	2ul of .25ml+.25ml+2.5ul IS		
SS out	>III22 SBLK22 I vol=20ul		
	2ul of .25ml+.25ml+2.5ul IS		

Reviewed By TC
Date 3/24/89

11398

GC/MS Standard Prep Log

B183A 12/23/88 — 1/10 Surrogate Working Std — Nathan Mattix

20 ml B167A

in 200 ml MeOH btj GC² lot # AT133

B183B 2/3/88 — 1/40 DFTPP Working Soln — Terry Cain

25ul of EPA DFTPP 1010-02-01 QAMB

975ul of DCM B+J

= 25ng/ul DFTPP (50ng/2ul)

B182C 1/9/89 — Spt. Cali Surrogate Stock — Terry Cain

2-Fluorophenol	80ul	EPA	193-84-02	5000ug/ml
Phenol-d5			31-06-01	
2,4,6-Tribromophenol			875-01-03	
Nitrobenzene-d5			166-03-01	
2-Fluorobiphenyl			194-02-01	
p-Terphenyl-d14			909-02-01	

= 833 ug/ml SS's

Spt Initial Cali Stock (TCL's) — Terry Cain

B183D 1/9/89

HC1	300ul	Chem Service	21-16G	2000ng/ml
HC2			25-14B	
HC3			21-7C	
HC4			25-48C	
HC6			25-55E	
HC7			10-141G	
HC9			21-8V	
DCM	900ul	B&J	AU119	

= 200ug/ml TCL's

Reviewed By TC Date 3/23/89

B183E 1/9/89 — Spt Initial Cali Working Stds — Terry Cain

STD	ul B183D	ul B183C	CS-25-79E ul HCs	B+J AU119 ul DCM
20	50	12	5	933
50	125	30	5	840
80	200	48	5	747
120	300	72	5	623
160	400	96	5	499

The University of Iowa
Hygienic Laboratory
BNA Worksheet
Final Extract Volume Adjustment (µl)

Lab Code: IOWA ____________

Case: ____________

SDG: ____________

EPA Sample No.	Lab Sample No.	Date Extracted	Date Adjusted	Fraction	Volume 1	Volume 2	Volume 3	Subtotal	Amount Added	Total	Analyst

CLP Injection Log Book

№ 160

Case# ____________ Inst# _____ Autosampler __Y __N

Purpose ____

Date	Sample/Std	Description	Time	Init

Analyst ______________________________ Date ______________

Verified by __________________________ Date ______________

CLP Sample Clean-up

№ 240

Case # _____ Date _____

Solvent and Reagent Source and Lot Number:

Hexane _____ _____

Acetone _____ _____

Ether _____ _____

Iso-propanol _____ _____

Water _____ _____

TBM _____ _____ When checked?

Alumina _____ _____ _____

EPA Sample #	UHL Number	Sulfur Removed Y/N	Sulfur Removed

Analyst _____ Date _____

Verified by _____ Date _____

NOTE

The Contractor shall not deviate from the procedures described herein without the prior written approval of the Contracting officer: Provided, that the Contracting Officer may ratify in writing such deviation and such ratification shall constitute the approval required herein.

5/

Specifications for Chain-of-Custody and Document Control Procedures

The contractor must have written standard operating procedures (SOP's) for receipt of samples, maintenance of custody, tracking the analysis of samples and assembly of completed data. These procedures are necessary to ensure that analytical data collected under this contract are acceptable for use in EPA enforcement case preparations and litigation. The contractor's SOP's shall provide mechanisms and documentation to meet each of the following specifications and shall be used by EPA as the basis for laboratory evidence audits.

1. The contractor shall have a designated sample custodian responsible for receipt of samples.

2. The contractor shall have written SOPs for receiving and logging in of the samples. The procedures shall include documentation of the sample condition, maintenance of custody and sample security and documentation of verification of sample tag information against custody records.

3. The contractor shall have written SOPs for maintenance of the security of the samples after log in and shall demonstrate security of the sample storage and laboratory areas.

4. The contractor shall have written SOPs for tracking the work performed on any particular sample. The tracking system shall include standard data logging formats, logbook entry procedures and a means of controlling logbook pages, computer printouts, chromatograph tracings and other written or printed documents relevant to the samples. Logbooks, printed forms or other written documentation must be available to describe the work performed in each of the following stages of analysis:

   Sample receipt
   Sample extraction/preparation
   Sample analysis
   Data reduction
   Data reporting

5. The contractor shall have written SOPs for organization and assembly of all documents relating to each EPA case. Documents shall be filed on a case specific basis. The procedures must ensure that all documents including logbook pages, sample tracking records, measurement readout records, computer printouts, raw data summaries, correspondence and any other written documents having reference to the case are compiled in one location for submission to EPA. The system must include a document numbering and inventory procedure.

6. Document control and chain-of-custody records include but are not limited to: sample tags, custody records, sample tracking records, analysis logbook pages, bench sheets, measurement readout records, extraction and analysis chronicles, computer printouts, raw data summaries, instrument logbook pages, correspondence, and the document inventory.

Upon receipt of samples in custody, inspect the package and note any damage to the sealing tape or custody seals. Note on the custody record or other logbook that the seals or locks were intact upon receipt if no tampering or damage appears to have occurred. Open the package and verify that each item listed on the sheet is present and correctly identified. If all data and samples are correct, sign and date the "received by Laboratory by" box. In the event errors are noted, record the discrepancies in the remarks column (initial and date each comment) then sign the chain-of-custody record. Report discrepancies to the Sample Management Office for remedies.

Laboratory Document Control

The goal of the Document Control Program is to assure that all documents for a specified case (group of samples) will be accounted for when the project is completed. The program includes a document numbering and inventory procedu for preparation of the specified documentation packages for each case.

Logbooks

All observations and results recorded by the laboratory but not on pre-printed data sheets are entered into permanent laboratory logbooks. Data recorded are referenced with the case number date and analyst's signature at the top of the page. Data from only one case are recorded per page. When all the data from a case are compiled copies of all logbook entries must be included in the documentation package.

Instrument logs shall be maintained by the laboratory and copies of logbo pages for each case must be included in the final documentation package.

Corrections to Documentation

All documentation in logbooks and other documents shall be in ink. If an error is made in a logbook assigned to one individual, that person should make corrections simply by crossing a line through the error and entering the correct information. Changes made subsequently are dated and initialed. Corrections made to other data records or non-personal logbooks are made by crossing a single line through the error, entering the correct information and initialing and dating the correction.

Consistency of Documentation

Before releasing analytical results, the laboratory assembles and cross checks the information on sample tags, custody records, lab bench sheets, personal and instrument logs and other relevant data to ensure that data pertaining to each particular sample or case is consistent throughout the record.

Document Numbering and Inventory Procedure

In order to provide document accountability of the completed analysis records, each item in a case is inventoried and assigned a serialized number and an identifier associating it to the case and region.

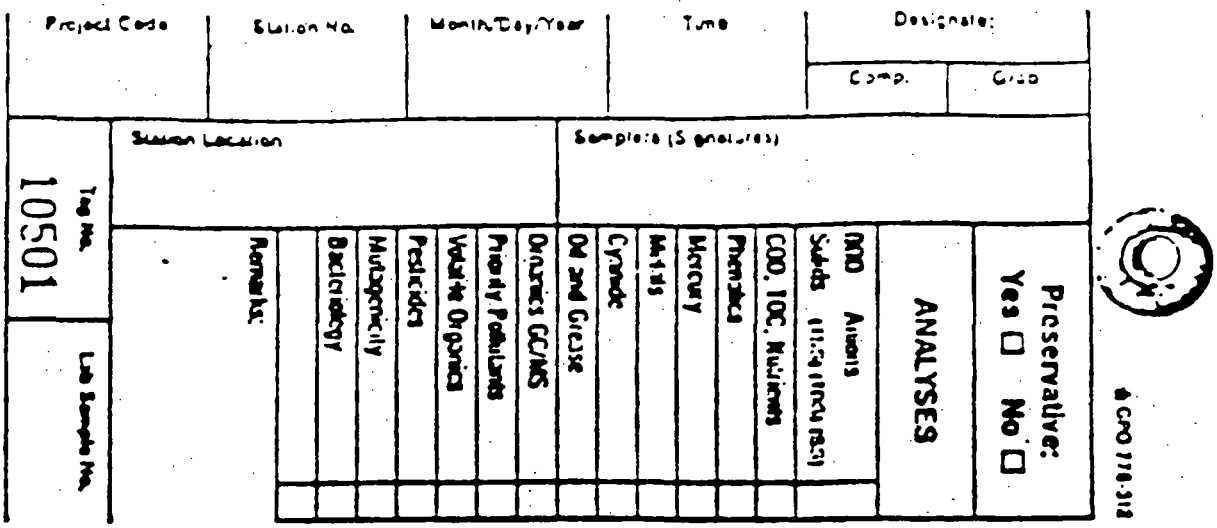


Figure 1. Example sample tag.

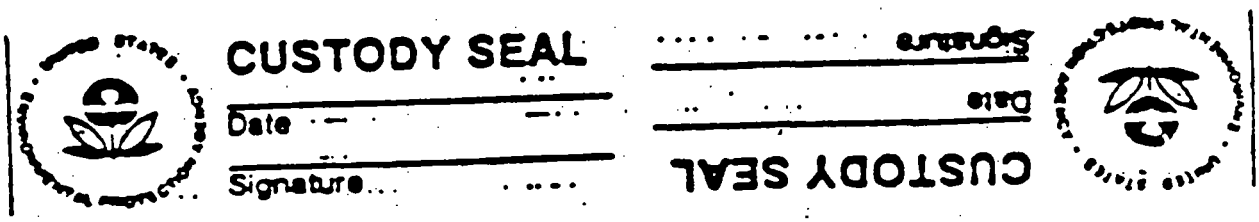


Figure 3. Example custody seal made of perforated paper stock.

Figure 4. Example Document Inventory Form for Each Case

1. Study plans or project plans.
2. Sample traffic records, weekly reports.
3. Custody records, sample tags, sample loop.
4. Laboratory logbooks, personal logbooks, instrument logbooks.
5. Laboratory data (sorted by sample), calibration and quality control results.
6. Data summaries and reports.
7. All other documents, forms or records referencing the samples.

Instructions for Sample Custody Record Form

This form is to be used for the logging of samples and/or extracts into and out of secure storage and for internal custody transfers. Forms will be originated by sample custodian with page 1 remaining there with subsequent pages being initiated as sample fractions are distributed. Custody transfers from sample custodian will be logged on both page 1 as well as the appropriate subsequent sheet.

Contract # 68-01-7101

Case # _____ - This should be filled in with the number on the upper left hand side labeled Case Number on the Organics Traffic Report.

Fraction # _____ - This should be filled in with BN/A, Pesticides or VOA.

Page ____ of ____ to be filled in by person who logs samples in as sheets are originated for individual departments.

NOTE: If for example page 1 becomes filled and page 2 has been already distributed, a page 1.1 etc may be generated to continue the transfer of custody record for the referenced sample/fraction(s) noted on page 1.

Items Transferred - Samples or extracts referenced by the UHL lab number and/or EPA sample number from the Organics Traffic Report. This may be an individual number or if a series of numbers the first and last number of the series.

Taken From and/or Relinquished By - This is used for two purposes: 1) whenever items are removed from secure storage area or 2) whenever custody of items are transferred from one person to another. This should be noted as signatures or initials and/or secure storage area.

Date and Time - Date and time when you have taken from or relinquished the referenced items transferred.

Received By - Signature or initials of person removing samples from secure storage or person receiving samples or extracts in the case of custody transfer.

E35/instruct1

Internal Dept. Transfer - Used when custody is changed within a department without returning the sample/fraction(s) to storage.

EXAMPLE - Person A logs samples out of cooler then a shift change occurs with Person B assuming the responsibilities of Person A. Since Person A will not be present to log the sample/fraction(s) back into the storage facility a custody transfer must be noted to justify Person B logging it back in.

From - Person who had current custody of sample/fraction(s).

To - Person assuming custody. .

Time - Time in which transaction occurred.

Reason for Transfer - Reason for either taken from and/or relinquised by and also the reason for the internal department transfer should be noted here.

EXAMPLE - analysis
shift change

Returned to Storage

At - Secure storage location

By - The person who is returning the referenced items to storage. This must also be the person logged as last person having custody of the sample.

Date-Time - Date and time in which this transaction occurred.

Comments - Used to explain any discrepancies in the custody record or any other comments needed to interpret information contained on the form.

ONTRACT # _____

UNIVERSITY HYGI[redacted] LABORATORY

PAGE ____ ____

ASE # _____

" _____

SAMPLE CUSTODY RECORD

ITEMS RANSFERRED	TAKEN FROM AND/OR RELINQUISHED BY	DATE	TIME	RECEIVED BY	INTERNAL DEPT. TRANSFER			REASON FOR TRANSFER	RETURNED TO STORAGE			
					FROM	TO	TIME		AT	BY	DATE	TIM

MMENTS:

DELIVERABLES INDEX

I. Case Narrative

The Case narrative must contain: Case number, Contract number, summary of any QC, sample, shipment and analytical problems, and documentation of all internal decision tree processes used. Outline problems encountered and final solutions. Be as specific and detailed as necessary.

II. QC Summary

A. Surrogate Percent Recovery Summary (Form II)

B. Matrix Spike/Matrix Spike Duplicate Summary (Form III)

C. Method Blank Summary (Form IV)
(If more than a single form is necessary, it must be arranged in chronological order.)

D. GC/MS Tuning and Calibration Standard (Form V)

1. DFTPP in chronological order; by instrument.
2. BFB in chronological order; by instrument.

III. Sample Data

A. Samples should be arranged in packets with the Traffic Report, the Organic Analysis Data Sheet (Form I), followed by the raw data for volatile, semi-volatile and pesticide sample fractions. These sample packets should then be placed in increasing SMO sample number order.

1. Copy of Sample Traffic Report

2. HSL Results - Organic Analysis Data Sheet (Form I)

3. Tentatively Identified Compounds (Form I, Part B) - Must be included even if no compounds are found; if so, indicate on form: "no volatile compounds found" and/or "no semi-volatile compounds found."

4. Raw data - in order: VOA, BNA, Pesticide

a. Reconstructed ion chromatogram(s) (GC/MS), chromatogram(s)((

b. Data System Printout

- Quantitation report or legible facsimile (GC/MS)
- Integration report or data system printout (GC)
- Calibration plots (area vs. concentration) for 4,4'-DDT 4,4'-DDD, 4,4'-DDE or toxaphene (where appropriate)

SECTION II DELIVERABLES INDEX AND REPORTING SCHEDULE

This section provides the Contractor Laboratory with the specific order of deliverables. Arrange each section in the order specified, separate with rubber bands, paper clips or other means as needed. Refer to Figure 2.1, for the specific reporting schedule and Figure 2.2, for report distribution addressees.

The contract reporting schedule, including report distribution requirements, appears following the deliverables index, on pages B-23 and B-24.

DELIVERABLES INDEX

Sample Data Summary Package

As specified in the Delivery Schedule, one Sample Data Summary Package is delivered to SMO concurrent with delivery of other required sample data. The Sample Data Summary Package shall be ordered as follows and must be submitted separately (i.e., separated by rubber bands, clips or other means) preceding Deliverables Index items I - V (pages B-19 - B-22).

Case Narrative

MSL Results - Organic Analysis Data Sheet (Form 1)*

Tentatively Identified Compounds (Form 1, Part B)*

Surrogate Percent Recovery Summary (Form II)

Matrix Spike/Matrix Spike Duplicate Summary (Form III)

Blank Data - Tabulated Results (Form 1) and Tentatively Identified Compounds (Form I, Part B)

* In increasing SMO sample number order.

c. Raw HSL mass spectra and the background subtracted HSL mass spectra with lab generated HSL standard spectra (Dual Display)

- **data systems incapable of dual display shall provide spectra in order:**

- raw HSL compound spectra

- enhanced or background subtracted spectra

- laboratory generated HSL standard spectra

d. GC/MS library search spectra for Tentatively Identified Compound(s) (TIC)

e. Quantitation/Calculation of tentative ID concentration(s)

f. Manual work sheets

g. GPC Chromatograms (if appropriate)

IV. Standards Data

A. Current list of laboratory calculated instrument detection limits for all HSL compounds.

B. Initial Calibration Data (Form VI) - in order: VOA, BNA; by instrument if more than one instrument used.

1. When more than one initial calibration is performed, the data must be put in chronological order. All initial calibration data must be included even for a specific Case.

C. Continuing Calibration (Form VII) - in order: VOA, BNA; by instrument if more than one instrument used.

1. When more than one Continuing Calibration is performed, forms must be in chronological order.

D. Pesticide forms in the following order:

1. Form VIII - Pesticide Evaluation Standards Summary (all GC colum

2. Form IX - Pesticide/PCB Standards Summary (all GC columns)

3. Form X - Pesticide/PCB Identification (only required for positive results)

E. VOA standard(s) reconstructed ion chromatograms and quantitation reports (or legible facsimile) for both the initial (five point) and all continuing (12 hour) calibrations. Spectra are not required.

F. BNA standard(s) reconstructed ion chromatograms and quantitation reports (or legible facsimile) for the both initial (five point) and all continuing (12 hour) calibrations. Spectra are not required.

G. All pesticide Evaluation Standard(s) (A, B, and C) chromatograms and data system printouts in chronological order by GC column type.

H. All pesticide Individual Standard Mix (A or B) chromatograms and data system printouts in chronological order by GC column type.

1. Pesticide Quantitation standard(s) chromatograms and data system printouts.

V. Raw QC Data

A. DFTPP (For each 12-hour period, for each GC/MS system utilized)

1. Bar graph spectrum

2. Mass listing

B. BFB (For each 12-hour period, for each GC/MS system utilized)

1. Bar graph spectrum

2. Mass listing

C. Blank Data

1. Tabulated results (Form I)

2. Tentatively Identified Compounds (TIC) (Form I, Part B) even if none found.

3. Raw Data - in order: VOA, BNA, Pesticide

a. Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS)

b. Chromatogram(s) and data system printout(s) (GC)

c. HSL spectra with lab generated standard (dual display)

- data systems which are incapable of dual display shall provide spectra in order:

  - raw HSL compound spectra
  - enhanced or background subtracted spectra
  - laboratory generated HSL standard spectra

d. GC/MS library search spectra for Tentatively Identified Compounds (TIC)

e. Quantitation/Calculation of Tentatively Identified Compound(s) (TIC) concentrations

D. Matrix Spike Data

1. Tabulated results (Form I) of non-spiked HSL compounds

- Form 1, Part B not required

2. Raw Data - in order: VOA, BNA, Pesticide

a. Reconstructed ion chromatogram(s) and quantitation report(or legible facsimile (GC/MS)

- spectra <u>not</u> required

b. Chromatogram(s) and data system printout(s) (GC)

1. Both primary and confirmation column data is required.

E. Matrix Spike Duplicate Data

1. Tabulated results (Form I) of non-spiked HSL compounds

- Form 1, Part B not required

2. Raw Data - in order: VOA, BNA, Pesticide

a. Reconstructed ion chromatogram(s) and quantitation report(or legible facsimile (GC/MS)

- spectra <u>not</u> required

b. Chromatogram(s) and data system printout(s) (GC)

1. Both primary and confirmation column data is required.

CONTRACT REPORTING SCHEDULE

Report	No. Copies	Delivery Schedule	Report Distribution SMO (1)	EMSL-LV (2)	Region-Client(3)	NEIC (4)
A. Weekly Progress Report	2	Weekly	X			
*B. Sample Traffic Report	1	7 days from receipt of samples	X			
**C. Sample Data Package	3	30 days from receipt of samples	X	X	X	
**D. Raw QC Data Package	3	30 days from receipt of samples	X	X	X	
**E. Sample Data Summary Package	1	30 days from receipt of samples	X			
**F. Standards Data Package	3	30 days from receipt of samples	X	X	X	
G. GC/MS Tapes	Lot	Within 180 days after data submission Contractor requests PO for authorization to dispose of extracts or provide extracts within seven (7) days after receipt of written request by PO or SMO.				
H. Extracts	Lot	Within 180 days after data submission Contractor requests PO for authorization to dispose of extracts or provide extracts within seven (7) days after receipt of written request by PO or SMO.				
I. Complete Case File Purge	1 Pkg	180 days from date of data submission or within seven (7) days after receipt of written request by PO or SMO.				

* Also to be included as Item 1 in the sample data package (see Exhibit B, Page B-19).
** Concurrent delivery required.

Figure 2.1. Contract reporting schedule.

(1) USEPA Contract Lab Program
Sample Management Office (SMO)
P. O. Box 818
Alexandria, VA 22313

For overnight delivery service, use street address:

300 N. Lee Street
Alexandria, VA 22314

(2) USEPA Environmental Monitoring
Systems Laboratory (EMSL-LV)
P. O. Box 15027
Las Vegas, NV 89114
ATTN: Data Audit Staff

For overnight delivery service, use street address:

944 E. Harmon, Executive Center
Las Vegas, NV 89109
ATTN: Data Audit Staff

(3) USEPA REGIONS:

The CLP Sample Management Office will provide the Contractor with the list of addressees for the ten EPA Regions. SMO will provide the Contractor with updated Regional address/name lists as necessary throughout the period of the contract.

(4) NEIC, Contractor Evidence Audit Team
12600 West Colfax, Suite 310
Lakewood, Colorado 80215

Figure 2.2. Report distribution addressees.

SECTION III - FORM INSTRUCTION GUIDE

This section includes specific instructions for the completion of all required forms. These include instructions on header information as well as specific details to the bodies of individual forms. Instructions are arranged in the following order:

A. Organic Analysis Data Sheet (Form I)

B. Surrogate Percent Recovery Summary (Form II)

C. Matrix Spike/Matrix Spike Duplicate Summary (Form III)

D. Method Blank Summary (Form IV)

E. GC/MS Tuning and Calibration Standard (Form V)

F. Initial Calibration Data (Form VI)

G. Continuing Calibration Data (Form VII)

H. Pesticide/PCB Evaluation Standards Summary (Form VIII)

I. Pesticide/PCB Standards Summary (Form IX)

J. Pesticide/PCB Identification (Form X)

Document Control

The Document Control Officer is in charge of overseeing several other aspects of the Contract Lab Program. A few of these are listed below with a brief description of how to handle problems and information on how to deal with forms and reporting procedures.

When we receive a case, it is logged in by Sample Receiving. They also make the appropriate notations to the Organics Traffic Report. Sample Receiving also notifies the DCO if there are any discrepancies in the samples we received and what was scheduled. Discrepancies should be brought to SMO's attention as soon as possible.

The official paperwork (sample tags, airbills, organic traffic report, Region Chain of Custody), is then delivered to the DCO where it is filed in a holding file until the case is completed and reported. Also filed with the original paperwork are any telephone log sheets, correspondence memos and other information that should make up the purge file (discussed further in this section). The SMO's organic traffic report copy is returned to them at this time (as you will note this is to be returned to them within 7 days). It is also important that the party responsible for checking in the samples sign and date box 11 and report condition of samples received.

In-house chain-of-custody forms are filled out by sample receiving personnel and kept with the person in custody of the sample. They are enclosed in the case purge file after completion of sample analysis.

The DCO then keeps up with how extraction and analysis of the samples is going. (See Attachment J). The DCO serves as a central location for problem solving and implementation of correspondence concerning a specific case or the Contract Lab Program as a whole.

The Deliverables Index, which appears in our Contract Lab Programs Statement of Work contains a list of deliverables, reporting schedule and information on how to fill out forms. This information should be followed for preparing and reporting Contract Lab cases.

STANDARD OPERATING PROCEDURES
for
INORGANICS

Revised 2/1/89

1. SAMPLE RECEIPT AND LOGGING

SAMPLE RECEIVING

Sample Custodian (listed first) and Alternates
Robin White
James Leege

Samples received from the carrier are delivered unopened (or otherwise untampered with) to the Central Services receiving area, room 1110 on the 1st floor of the Wallace Building. If necessary, carriers or other personnel can consult the sample custodian at the west entrance of the Laboratory during business hours or call the duty officer via capital security (515-281-5608) during non-business hours.

The sample custodian receiving the samples uses extreme care in sample receipt. Opening of coolers should be done in the hood, especially if there is any indication of breakage, leakage, etc. Any abnormality in paperwork is to be brought to the attention of the document control officer and the project manager as quickly as possible.

The condition of samples and seals and any discrepancy between samples, chain of custody and/or traffic report are noted on the chain of custody and traffic report and a positive statement of sample condition made on the UHL receiving form.

Laboratory benches where samples are opened have inert tops.

Sample Custodian Signature: _____

Sample Log-In Sheet

Date _____

Check the Appropriate Response

1. a. Custody Seal on Container ❑ Present ❑ Absent
   b. Custody Seal on Bottle ❑ Intact ❑ Not Intact
2. Chain-of-Custody ❑ Present ❑ Absent
3. Sample Tags ❑ Present ❑ Absent
   Sample Tag Numbers ❑ Listed ❑ Not Listed on Chain-of-Custody
4. SMO Forms ❑ Present ❑ Absent
5. Resolution of Discrepancies:

Document Control No. _____

Case No. _____

Metals samples placed in storage

By _____ On _____

Cyanide samples placed in storage

By _____ On _____

Date Rec'd	Time Rec'd	Chain-of-Custody Record Number	SMO Sample Numbers	Corresponding		Does Information on Custody Records, Traffic Reports, and Sample Tags Agree?	Remarks: Condition of Sample Shipment, etc.
				Sample Tag Numbers	Assigned Lab Numbers		

INORGANIC ANALYSIS DIVISION

Procedure for Logging-in Samples

1. Examine shipping containers and contents to determine integrity of package and note their condition in sample folder or on forms submitted as appropriate. If sample is damaged see item 2. Number and type of samples is ascertained and checked against information submitted; if chain-of-custody is submitted, verify sample tags against custody record (If there are any discrepancies see item 2), note condition of seals, and sign custody forms to maintain custody.

2. If the package or its contents are damaged or if there is a discrepancy in information or seals, the nature and extent of the damage or discrepancy are noted and filed with the sample file, and the supervisory personnel and the submitter are notified as appropriate. Personal protective equipment and spill control materials are used as needed to prevent laboratory contamination and personal injury.

3. Assign a laboratory number and the date received for each sample, for logging-in and accounting purposes. If multiple samples are received from the same submitter, each container (or set) or individually specified sample is given a unique number in sequence. A computer is used to record the date received and the required analysis for each sample. The following information is entered for each sample: laboratory number, source of samples, sample type, date of receipt, date due, and assignment to analytical area.

4. All sample information as well as the "sample Information Sheet" are placed in a file folder which is stamped with its respective sample number. All sample folders are then filed sequentially according to their sample numbers.

5. The samples are placed sequentially in the secured walk-in cooler area storage room (Room 179). The sample storage area is located in a restricted access area open only to lab personnel.

2. SAMPLE STORAGE

SAMPLE STORAGE

All samples received under the Contract Laboratory Program are to be stored in the walk-in cooler (Room 179) of the Wallace Building. This is a secure area.

Temperature of the walk-in cooler is to be monitored and maintained at approximately 4 C. A chart of temperature is to be maintained near the area of the cooler and the cooler temperature recorded every working day.

Sample preparations/digestions etc. are stored in a secured area in laboratory when not in use.

3. PREVENTING SAMPLE CONTAMINATION

PREVENTION OF SAMPLE CONTAMINATION

Contamination of samples is prevented by the use of good laboratory practice and facility design. Some of the aspects that are particularly applicable to the samples handled under this program are discussed specifically below. This is not a comprehensive discussion.

All samples are stored in the walk-in cooler with temperature regulated at 4°C and monitored. No standards, or any other potential source of contamination have been or are stored in this cooler.

Cleanliness of the analytical systems is checked by running blanks at the beginning of each day or autosampler run and at intervals as needed during the analytical process. The instruments are maintained routinely, by the chemists and/or by the Laboratory's electronics technician; the AA and ICP units are under maintenance contracts as well, which include preventive maintenance visits by factory service representatives several times per year.

Sample preparation areas are separated from the instrument locations. The instrumental areas are maintained in a high degree of cleanliness. Sample preparation areas, glassware, and reagents are monitored routinely through preparation blanks. Distilled and deonized water are routinely monitored for conductivity and contamination.

Good laboratory practices are followed for all determinations to avoid and minimize sample contamination.

4. SECURITY FOR LABORATORY AND SAMPLES

LABORATORY AND SAMPLE SECURITY

Samples received under chain of custody are in the immediate possession of the sample custodian at all times from time of opening and verification of seals until the sample containers are placed in storage for extraction and analysis.

All samples are kept in the secured walk-in cooler (Room 179). Sample preparation is performed in Rooms 182 and 199. These rooms are only accessible to authorized personnel in the employment of the laboratory.

Access to the secured walk-in cooler is available only during business hours and is locked at all other times.

5. TRACEABILITY OF STANDARDS

STANDARDS PREPARATION AND TRACEABILITY

Standards used for Contract Laboratory Program at UHL must be traceable to U.S. EPA's standards provided for that purpose by the Quality Assurance Materials Bank.

Preparation of all standards are recorded in the appropriate standards data book. Each data book is uniquely identified by an identifier consisting of the area and/or program for which the book contains information, followed by the number of the book.

University Hygienic Laboratory

Standard Operating Procedure for Standards Preparation and Traceablity.

Preparation of all standards are recorded in the appropriate standards data book. Each data book is uniquely identified by an identifier consisting of the area and/or program for which the book contains information, followed by the number of the book (e.g. ICP-2, referring to the second book for the ICP Metals analysis). Each standard prepared will be labeled with an identifier consisting of the book identifier, the page number on which the entry referring to that standard begins, and if necessary the number of the entry on that page.

The entry for each standard will be made at the time the standard is prepared. The information recorded will be the following:

name of the standard (e.g. ICP-2, HGA-1)

identifier

name of the preparer

date of preparation

matrix used (supplier and lot number in parentheses)

volume

a listing of each chemical in the standard along with the supplier and lot number, the volumes added, and the final calculated concentration.

Following this entry, room is left to refer to information on the traceability of the standard to NBS or EPA standards. All comparative data (sequential runs, etc.) which establishes such traceability will be filed separately for each stock standard and a reference to the file and its location will be noted immediately beneath the standard preparation data, including the method of verification, the date of verification, and the person doing the work. If reverification of traceability is performed, this data is entered in the same way following the initial verification.

6. MAINTAINING INSTRUMENT RECORDS AND LOGBOOKS

INSTRUMENT MAINTENANCE

On going instrument maintenance is performed as needed for the various instruments, and a log book for each instrument is maintained. Photocopies of some pages from these manuals are included here along with copies of some of the recent logs of samples run in each area. UHL policy on instrument maintenance is included in the UHL Quality Assurance Program Plan Supplement #1 DML (page 3).

Proper care and maintenance is performed on each instrument in use. Logs are kept to document in-house maintenance, service visits and component part replacements. Problems with equipment, failure to properly respond, etc., are documented. During periods of questionable operation the instrument is not used in data generation. Supervisors document that instrument is operable after corrective measures have been taken before operations can resume.

Routine maintenance checks are performed at scheduled intervals. Performance of these checks is documented. Records of service contract maintenance visits are maintained in the Laboratory Manager's files.

7. SAMPLE ANALYSIS AND DATA CONTROL SYSTEMS

SAMPLE ANALYSIS AND DATA CONTROL SYSTEMS

Sample analysis procedures , data collection, and document assembly procedures are specified in the University Hygienic Laboratory Inorganic Chemical Services Procedure Manual or the USEPA Contract Laboratory Program Statement of Work for Inorganics Analysis - SOW No. 788. The various responsibilities are distributed as follows: Ms. Robin White is the Sample Custodian, Mr. James Leege is the Alternate Sample Custodian, Mr. Lee Friell is the Inorganics Laboratory Supervisor, Mr. Sean Ryan is the ICP Operator and Spectroscopist, Ms. Theresa Liarakos is the Atomic Absorption Operator, Ms. Melinda Leseney is the back-up Atomic Absorption Operator, Ms. Donna Cole is the Inorganic Sample Preparation Specialist, Ms. Elena Aguilar is the Classical Techniques Analyst, Dr. Shamsher Brar serves as the Technical back-up, Ms. Carol Seger is Quality Assurance Officer and Dr. Shamsher Brar is the Inorganic Quality Assurance Coordinator, Mr. Mary Freitag is the Document Control Officer, Dr. Michael Wichman is the Inorganic CLP Analysis Project Manager, and Dr. George Breuer is the CLP Coordinator for Inorganic and Organic Analysis.

8. GLASSWARE CLEANING

STANDARD OPERATING PROCEDURES FOR GLASSWARE CLEANING

After use, glassware is rinsed with tap water to prerinse any residual sample material from the glassware.

Glassware is machine washed with "Liquinox" laboratory detergent and rinsed with tap water followed by a final distilled water rinse.

Glassware is rinsed with dilute (1:4) nitric acid.

Glassware is machine rinsed with distilled, deionized water.

Glassware is air dried.

Note: Glassware that is not clean after following above procedure is cleaned with "Multiterge" chromic acid replacement, tap water rinsed, rinsed with dilute (1:4) hydrochloric acid, distilled water rinsed, rinsed with dilute (1:4) nitric acid, distilled water rinsed, finally rinsed with distilled, deionized water, and allowed to air dry.

9. TECHNICAL AND MANAGERIAL REVIEW OF LABORATORY OPERATION AND DATA PACKAGE PREPARATION

TECHNICAL AND MANAGERIAL REVIEW OF LABORATORY OPERATIONS AND DATA PACKAGE PREPARATION

All sample analysis procedures and data generation is initially reviewed by the individual analysts. All data packages are prepared from the initial raw analytical data. Data forms are filled out by analysts in each analytical area. The data is reviewed by Mr. Lee Friell and Dr. Shamsher Brar in the Des Moines Laboratory.

The raw analytical data and all forms are sent to the Document Control Office in Iowa City. The data and forms are reviewed by Ms. Mary Freitag and Dr. Michael Wichman. The data is assembled at this point and any apparent deficiencies are noted and resolved. The final data package is assembled, pages numbered, and copies of the entire data package are prepared. The data package is reviewed in its entirety by the Inorganic Analysis Project Manager and the CLP Project Coordinator and signed. The data packages are sent via express mail or overnight courier service to SMO, the appropriate region, and EMSL Las Vegas.

10. Internal Review of Contractally-Required Quality Assurance and Quality Control Data for each Individual Data Package

INTERNAL REVIEW OF CONTRACTUALLY-REQUIRED QUALITY ASSURANCE AND QUALITY CONTROL FOR EACH INDIVIDUAL DATA PACKAGE

Initial review of all contractually required quality assurance will be performed by the analyst. Further review of quality assurance data will be performed by the Inorganic Laboratory Manager and the Inorganic Analysis Quality Assurance Coordinator. Final review of contractually required quality assurance will be performed by the Document Control Officer, the Inorganic CLP Project Manager, and the CLP Coordinator.

11. Sample Analysis, Data Handling and Reporting

SAMPLE ANALYSIS AND DATA CONTROL SYSTEMS

Sample analysis procedures and data collection and document assembly prodedures are under the supervision of individuals in charge of the various areas: Mr. Lee Friell is the technical manager of the Des Moines Laboratory, Mr. Michael Wichman will be the Project Director for this contract, Dr. George Breuer is the overall manager of all work dealing with the U.S. Contract Laboratory Program.

Each analytical or documentation area has a procedure manual which is followed.

12. Chain-of-Custody

INTERNAL CHAIN OF CUSTODY AND SAMPLE TRACKING

Chain of custody of samples and digestions/preparation must be maintained within the Laboratory as well as the external chain of custody received with the samples. The attached protocol and forms are to be used by sample personnel in obtaining samples for digestion and by chemists in obtaining samples or extracts for analysis.

Sample tracking is accomplished by means of the UHL Sample Identification Form (attached), the BEQC LIMS computer entry, and the internal chain of custody record as noted above. For tracking through the analytical processes, the extraction notebooks and instrument logbooks can be consulted. Individuals signing out samples or extracts are to be consulted to determine status at any time of items checked out from the sample custodian.

University Hygienic Laboratory

Sample Identification Form

Case No. _____

Date Rec'd _____
Date Due in DCO _____
Date Due in SMO _____
Region No. _____
Contract No. _____

Determinations	
Metals	☐
Cyanide	☐

Sample Type	Conc. Level	EPA Sample No.	UHL Sample No.
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		

University Hygienic Laboratory

Sample Control Record

Metals Sample ☐

Cyanide Sample ☐

Laboratory Sample No.	Removed By	Date and Time Removed	Reason	Date and Time Returned

1. Sample Chain-of-Custody

A sample is physical evidence collected from a facility or from the environment. An essential part of hazardous waste investigations is that samples and data may be used as evidence in EPA enforcement proceedings. To satisfy enforcement uses of the data, the following chain-of-custody procedures have been established.

1.1 Sample Identification

To ensure traceability of samples while in possession of the laboratory, a method for sample identification shall be developed and documented in laboratory Standard Operating Procedures (SOPs) (see Section 3). Each sample or sample preparation container shall be labeled with a unique number identifier (or the EPA Sample Number). This identifier shall be cross-referenced to the sample tag EPA Sample Number and the SMO number. There shall be a written description of the method of assigning this identifier and attaching it to the sample container included in the laboratory SOPs.

1.2.1 A sample is under custody if:

1.2.1.1 It is in your actual possession,

1.2.1.2 It is in your view after being in your physical possession,

1.2.1.3 It was in your possession and then you locked or sealed it up to prevent tampering, or

1.2.1.4 It is in a secure area.

1.2.2 Upon receipt of the samples in custody, the Contractor shall inspect the shipping container and sample bottles and shall document receiving information as specified in section 3.2. The sample custodian or a designated representative shall sign and date all appropriate receiving documents at the time of receipt (i.e., EPA chain-of-custody forms, Traffic Reports, airbills, etc.). The Contractor shall contact SMO if documents are absent, if information on receiving documents does not agree, if custody seals are not intact, or if the sample is not in good condition. The Contractor shall document resolution of any discrepancies, and this documentation shall become a part of the permanent Case file.

1.2.3 Once samples have been accepted by the laboratory, checked, and logged in, they must be maintained in accordance with custody and security requirements specified in 3.3.

University Hygienic Laboratory

Sample Control Record

Metals Sample ☐

Cyanide Sample ☐

Laboratory Sample No.	Removed By	Date and Time Removed	Reason	Date and Time Returned

University Hygienic Laboratory

Sample Identification Form

Case No. ____________________

Date Rec'd ____________________
Date Due in DCO ____________________
Date Due in SMO ____________________
Region No. ____________________
Contract No. ____________________

Determinations
Metals ☐
Cyanide ☐

Sample Type	Conc. Level	EPA Sample No.	UHL Sample No.
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		
☐ S ☐ W	☐ L ☐ M		

13. Document Control, including Case File Preparation

Document Control

The Document Control Officer is in charge of overseeing several other aspects of the Contract Lab Program. A few of these are listed below with a brief description of how to handle problems and information on how to deal with forms and reporting procedures.

When we receive a case, it is logged in by Sample Receiving. They also make the appropriate notations to the Organics Traffic Report. Sample Receiving also notifies the DCO if there are any discrepancies in the samples we received and what was scheduled. Discrepancies should be brought to SMO's attention as soon as possible.

The official paperwork (sample tags, airbills, organic traffic report, Region Chain of Custody), is then delivered to the DCO where it is filed in a holding file until the case is completed and reported. Also filed with the original paperwork are any telephone log sheets, correspondence memos and other information that should make up the purge file (discussed further in this section). The SMO's organic traffic report copy is returned to them at this time (as you will note this is to be returned to them within 7 days). It is also important that the party responsible for checking in the samples sign and date box 11 and report condition of samples received.

In-house chain-of-custody forms are filled out by sample receiving personnel and kept with the person in custody of the sample. They are enclosed in the case purge file after completion of sample analysis.

The DCO then keeps up with how extraction and analysis of the samples is going. (See Attachment J). The DCO serves as a central location for problem solving and implementation of correspondence concerning a specific case or the Contract Lab Program as a whole.

The Deliverables Index, which appears in our Contract Lab Programs Statement of Work contains a list of deliverables, reporting schedule and information on how to fill out forms. This information should be followed for preparing and reporting Contract Lab cases.

2. Document Control Procedures

The goal of the laboratory document control program is to ensure that all documents for a specified Case will be accounted for when the project is completed. Accountable documents used by Contractor laboratories shall include, but not be limited to, logbooks, chain-of-custody records, sample work sheets, bench sheets, and other documents relating to the sample or sample analyses. The following document control procedures have been established to ensure that all laboratory records are assembled and stored for delivery to EPA or are available upon request from EPA prior to the delivery schedule.

2.1 Preprinted Data Sheets and Logbooks

Preprinted data sheets shall contain the name of the laboratory and be dated and signed by the analyst or individual performing the work. All documents produced by the laboratory which are directly related to the preparation and analysis of EPA samples shall become the property of the EPA and shall be placed in the Case file. For that reason, all observations and results recorded by the laboratory but not on preprinted data sheets shall be entered into permanent laboratory logbooks. The person responsible for the work shall sign and date each entry and/or page in the logbook. When all data from a case is compiled, copies of all EPA Case-related logbook entries shall be included in the documentation package. Analysts' logbook entries must be in chronological order and shall include only one Case per page. Instrument run logs shall be maintained so as to enable a reconstruction of the run sequences of individual instruments.

Because the laboratory must provide copies of the instrument run logs to EPA, the laboratory may exercise the option of using only laboratory or EPA sample identification numbers in the logs for sample ID rather than government agency or commercial client names.

Using laboratory or EPA Sample Number IDs only in the run sequences will assist the laboratory in preserving the confidentiality of commercial clients.

2.2 Error Correction Procedure

All documentation in logbooks and other documents shall be in ink. If an error is made, corrections shall be made by crossing a line through the error and entering the correct information. Changes shall be dated and initialed. No information shall be obliterated or rendered unreadable.

2.3 Consistency of Documentation

Before releasing analytical results, the laboratory shall assemble and cross-check the information on sample tags, custody records, lab bench sheets, personal and instrument logs, and other relevant data to ensure that data pertaining to each particular sample or Case is consistent throughout the Case file.

2.4 Document Numbering and Inventory Procedure

In order to provide document accountability of the completed analysis records, each item in a Case shall be inventoried and assigned a serialized number and identifier associating it to the Case and Region.

Case # - Region - Serialized number (For example: 75-2-0240)

The number of pages of each item must be accounted for if each page is not individually numbered. All documents relevant to each Case, including logbook pages, bench sheets, mass spectra, chromatograms, custody records, library search results, etc., shall be inventoried. The laboratory shall be responsible for ensuring that all documents generated are placed in the file for inventory and are delivered to EPA in the Case File Purge package (Exhibit B, Paragraph F). Figure 1 is an example of a document inventory.

2.5 Shipping Data Packages and Case Files

The Contractor shall have written procedures to document shipment of deliverables packages to the recipients. These shipments require custody seals on the containers placed such that it cannot be opened without damaging or breaking the seal. The Contractor shall also document what was sent, to whom, the date, and the method (carrier) used.

C. Sample Traffic Reports

Original Sample Traffic Report page marked "Lab Copy for Return to SMO" with lab receipt information and signed in original Contractor signature, shall be submitted for each sample in the Sample Delivery Group.

Traffic Reports (TRs) shall be submitted in Sample Delivery Group (SDG) sets (i.e., TRs for all samples in an SDG shall be clipped together), with an SDG Cover Sheet attached.

The SDG Cover Sheet shall contain the following items:

- o Lab name
- o Contract number
- o Sample Analysis Price - full sample price from contract.
- o Case Number
- o List of EPA sample numbers of all samples in the SDG, identifying the first and last samples received, and their dates of receipt.

NOTE: When more than one sample is received in the first or last SDG shipment, the "first" sample received would be the lowest sample number (considering both alpha and numeric designations); the "last" sample received would be the highest sample number (considering both alpha and numeric designations).

In addition, each Traffic Report must be clearly marked with the SDG Number, the sample number of the first sample in the SDG (as described in the following paragraph). This information should be entered below the Lab Receipt Date on the TR.

The EPA sample number of the first sample received in the SDG is the SDG number. When several samples are received together in the first SDG shipment, the SDG number shall be the lowest sample number (considering both alpha and numeric designations) in the first group of samples received under the SDG. (The SDG number is also reported on all data reporting forms. See Section III, Form Instruction Guide.)

If samples are received at the laboratory with multi-sample Traffic Reports (TRs), all the samples on one multi-sample TR may not necessarily be in the same SDG. In this instance, the laboratory must make the appropriate number of photocopies of the TR, and submit one copy with each SDG cover sheet.

D. Sample Data Package

The sample data package shall include data for analysis of all samples in one Sample Delivery Group (SDG), including analytical (field) samples, reanalyses, blanks, spikes, duplicates, and laboratory control samples.

The sample data package must be complete before submission, must be consecutively paginated (starting with page number one and ending with the number of all pages in the package), and shall include the following:

1. Cover Page for the Inorganic Analyses Data Package, (COVER PAGE -- Inorganic Analyses Data Package), including: laboratory name; laboratory code; contract number; Case No.; Sample Delivery Group (SDG) No.; Statement of Work (SOW) number (appears on cover page of SOW); EPA sample numbers in alphanumeric order, showing EPA sample numbers cross-referenced with lab ID numbers; comments, describing in detail any problems encountered in processing the samples in the data package; and, completion of the statement on use of ICP background and interelement corrections for the samples.

   The Cover Page shall contain the following statement, verbatim: "I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature." This statement shall be directly followed by the signature of the Laboratory Manager or his designee with a typed line below it containing the signers name and title, and the date of signature.

   In addition, on a separate piece of paper, the Contractor must also include any problems encountered; both technical and administrative, the corrective action taken and resolution.

2. Sample Data

   Sample data shall be submitted with the Inorganic Analysis Data Reporting Forms for all samples in the SDG, arranged in increasing alphanumeric EPA sample number order, followed by the QC analyses data, Quarterly Verification of Instrument Parameters forms, raw data, and copies of the digestion and distillation logs.

   a. Results -- Inorganic Analysis Data Sheet [FORM I - IN]

      Tabulated analytical results (identification and quantitation) of the specified analytes (Exhibit C). The validation and release of these results is authorized by a specific, signed statement on the Cover Page. If the Laboratory Manager cannot validate all data reported for each sample, he/she must provide a detailed description of the problems associated with the sample(s) on the Cover Page.

      Appropriate concentration units must be specified and entered on Form I. The quantitative values shall be reported in units of micrograms per liter (ug/L) for aqueous samples and milligrams per kilogram (mg/kg) for solid samples. No other units are acceptable. Results for solid samples must be reported on a dry weight basis. Analytical results must be reported to two significant figures if the result value is less than 10; to three significant figures if the value is greater than or equal to 10. Results for percent solids must be reported to one decimal place. The preceding discussion concerning significant numbers applies to Form I only. For

other Forms, follow the instructions specific to those forms as contained in this exhibit.

b. Quality Control Data

1) Initial and Continuing Calibration Verification [FORM II (PART 1) - IN]

2) CRDL Standard for AA and Linear Range Analysis for ICP [FORM II (PART 2) - IN]

3) Blanks [FORM III - IN]

4) ICP Interference Check Sample [FORM IV - IN]

5) Spike Sample Recovery [FORM V (PART 1) - IN]

6) Post Digest Spike Sample Recovery [FORM V (PART 2) - IN]

7) Duplicates [FORM VI - IN]

8) Laboratory Control Sample [FORM VII - IN]

9) Standard Addition Results [FORM VIII - IN]

10) ICP Serial Dilutions [FORM IX - IN]

11) Preparation Log [Form XIII - IN]

12) Analysis Run Log [Form XIV - IN]

c. Quarterly Verification of Instrument Parameters

1) Instrument Detection Limits (Quarterly) [FORM X - IN]

2) ICP Interelement Correction Factors (Annually) [FORM XI (PART 1) - IN]

3) ICP Interelement Correction Factors (Annually) [FORM XI (PART 2) - IN]

4) ICP Linear Ranges (Quarterly) [FORM XII - IN]

(Note that copies of Quarterly Verification of Instrument Parameters forms for the current quarter must be submitted with each data package.)

d. Raw Data

For each reported value, the Contractor shall include in the data package all raw data used to obtain that value. This applies to all required QA/QC measurements, instrument standardization, as well as all sample analysis results. This statement does not apply to the Quarterly Verification of Instrument Parameters submitted as a part of each data package.

Raw data must contain all instrument readouts used for the sample results. Each exposure or instrumental reading must be provided, including those readouts that may fall below the IDL. All AA and ICP instruments must provide a legible hard copy of the direct real-time instrument readout (i.e., stripcharts, printer tapes, etc.). A photocopy of the instruments direct sequential readout must be included. A hardcopy of the instrument's direct instrument readout for cyanide must be included if the instrumentation has the capability.

The order of raw data in the data package shall be: ICP, Flame AA, Furnace AA, Mercury, and Cyanide. All raw data shall include concentration units for ICP and absorbances with concentration units for flame AA, furnace AA, Mercury and Cyanide. All flame and furnace AA data shall be grouped by element.

Raw data must be labeled with EPA sample number and appropriate codes, shown in Table 1 following, to unequivocally identify:

1) Calibration standards, including source and prep date.

2) Initial and continuing calibration blanks and preparation blanks.

3) Initial and continuing calibration verification standards, interference check samples, ICP serial dilution samples, CRDL Standard for ICP and AA, Laboratory Control Sample and Post Digestion Spike.

4) Diluted and undiluted samples (by EPA sample number) and all weights, dilutions and volumes used to obtain the reported values. (If the volumes, weights and dilutions are consistent for all samples in a given SDG, a general statement outlining these parameters is sufficient).

5) Duplicates.

6) Spikes (indicating standard solutions used, final spike concentrations, volumes involved). If spike information (source, concentration, volume) is consistent for a given SDG, a general statement outlining these parameters is sufficient.

7) Instrument used, any instrument adjustments, data corrections or other apparent anomalies on the measurement record, including all data voided or data not used to obtain reported values and a brief written explanation.

8) All information for furnace analysis clearly and sequentially identified on the raw data, including EPA sample number, sample and analytical spike data, percent recovery, coefficient of variation, full MSA data, MSA correlation coefficient, slope and intercepts of linear fit, final sample concentration (standard addition

concentration), and type of background correction used: BS for Smith-Heiftje, BD for Deuterium Arc, or BZ for Zeeman.

9) Time and date of each analysis. Instrument run logs can be submitted if they contain this information. If the instrument does not automatically provide times of analysis, these must be manually entered on all raw data for initial and continuing calibration verification and blanks, as well as interference check samples and CRDL standard for ICP.

10) Integration times for AA analyses.

e. Digestion and Distillation Logs

Logs shall be submitted in the following order: digestion logs for ICP, flame AA, furnace AA and mercury preparations, followed by a copy of the distillation log for cyanide. These logs must include: (1) date, (2) sample weights and volumes, (3) sufficient information to unequivocally identify which QC samples (i.e., laboratory control sample, preparation blank) correspond to each batch digested, (4) comments describing any significant sample changes or reactions which occur during preparation, and (5) indication of pH <2 or >12, as applicable.

3. A legible copy of the Sample Traffic Reports submitted in Item A for all of the samples in the SDG. The Traffic Reports shall be arranged in increasing EPA Sample Number order, considering both alpha and numeric designations. A legible photocopy of the SDG cover sheet must also be submitted.

E. Data in Computer Readable Form

The Contractor shall provide a computer-readable copy of the data on data reporting Forms I-XIV for all samples in the Sample Delivery Group, as specified in the Contract Performance/Delivery Schedule. Computer-readable data deliverables shall be submitted on an IBM or IBM-compatible, 5.25 inch floppy double-sided, double density 360 K-byte or a high density 1.2 M-byte diskette or on an IBM or IBM-compatible, 3.5 inch double-sided, double density 720 K-byte or a high density 1.44 M-byte diskette. The data shall be recorded in ASCII, text file format, and shall adhere to the file, record and field specifications listed in Exhibit H, Data Dictionary and Format for Data Deliverables in Computer-Readable Format.

When submitted, floppy diskettes shall be packaged and shipped in such a manner that the diskette(s) cannot be bent or folded, and will not be exposed to extreme heat or cold or any type of electromagnetic radiation. The diskette(s) must be included in the same shipment as the hardcopy data and shall, at a minimum, be enclosed in a diskette mailer.

Table 1

Codes for Labelling Raw Data

Sample		XXXXXX
Duplicate		XXXXXXD
Matrix Spike		XXXXXXS
Serial Dilution		XXXXXXL
Analytical Spike		XXXXXXA
Post Digestion/Distillation Spike		XXXXXXA
MSA:		
Zero Addition		XXXXXX0
First Addition		XXXXXX1
Second Addition		XXXXXX2
Third Addition		XXXXXX3
Instrument Calibration Standards:		
ICP	S or S0 for blank standard	
Atomic Absorption and Cyanide	S0, S10,...etc.	
Initial Calibration Verification		ICV
Initial Calibration Blank		ICB
Continuing Calibration Verification		CCV
Continuing Calibration Blank		CCB
Interference Check Samples:		
Solution A		ICSA
Solution AB		ICSAB
CRDL Standard for AA		CRA
CRDL Standard for ICP		CRI
Laboratory Control Samples:		
Aqueous (Water)		LCSW
Solid (Soil/Sediment)		LCSS
Preparation Blank (Water)		PBW
Preparation Blank (Soil)		PBS
Linear Range Analysis Standard		LRS

Notes:

1. When an analytical spike or MSA is performed on samples other than field samples, the "A", "0", "1", "2" or "3" suffixes must be the last to be added to the EPA Sample Number. For instance, an analytical spike of a duplicate must be formatted "XXXXXXDA."

2. The numeric suffix that follows the "S" suffix for the standards indicates the true value of the concentration of the standard in ug/L.

3. ICP calibration standards usually consist of several analytes at different concentrations. Therefore, no numeric suffix can follow the ICP calibration standards unless all the analytes in the standard are prepared at the same concentrations. For instance, the blank for ICP must be formatted "S0."

4. The CRDL standard for AA is considered to be a calibration standard if it was a part of the calibration curve, thus it must be formatted like any other standard. The "CRA" format must be used if the CRDL standard for AA is not used to establish the calibration curve.

F. Results of Intercomparison/Performance Evaluation(PE) Sample Analyses

Tabulation of analytical results for Intercomparison/PE Sample analyses include all requirements specified in items D. and E., above.

G. Compilation of Complete Case File Purge

Within 7 days after data submission, the Contractor shall have compiled the Complete Case File Purge package described in item H., following.

H. Complete Case File Purge

The Complete Case File Purge package includes all laboratory records received or generated for a specific Case that have not been previously submitted to EPA as a deliverable. These items shall be submitted along with their Case File Document Inventory (see Exhibit F, paragraph 2.4 for description of document numbering and inventory procedure). These items include, but are not limited to: sample tags, custody records, sample tracking records, analysts logbook pages, bench sheets, instrument readout records, computer printouts, raw data summaries, instrument logbook pages (including instrument conditions), correspondence, and the document inventory.

Shipment of the Complete Case File Purge package by first class mail, overnight carrier, priority mail or equivalent is acceptable. Custody seals, which are provided by EPA, must be placed on shipping containers and a document inventory and transmittal letter included. The Contractor is not required to maintain any documents for a sample Case after submission of the Complete Case File Purge package; however, the Contractor should maintain a copy of the document inventory and transmittal letter.

I. Quarterly Verification of Instrument Parameters

The Contractor shall perform and report quarterly verification of instrument detection limits and linear range by methods specified in Exhibit E for each instrument used under this contract. For the ICP instrumentation and methods, the Contractor shall also report quarterly interelement correction factors (including method of determination), wavelengths used, and integration times. Quarterly Verification of Instrument Parameters forms for the current quarter shall be submitted in each Sample Delivery Group data package, using Forms X, XI and XII. Submission of Quarterly Verification of Instrument Parameters shall include the raw data used to determine those values reported.

FUNCTIONAL DESCRIPTIONS OF KEY PERSONNEL

GEORGE M. BREUER, Ph.D., CIH. Industrial Hygienist and Chief, Organic Analysis Division. Dr. Breuer has a B.S. in chemistry from the University of Missouri at Rolla and a Ph.D. in chemistry from the University of California, Irvine. After two years of postdoctoral work in England and the United states, Dr. Breuer worked for 3 years at the Statewide Air Pollution Research Center in Riverside, California, investigating the atmospheric chemistry of chlorofluorocarbons and the affect of solar ultraviolet variations on air pollution. Dr. Breuer then spent more than 6 years at the National Institute for Occupational Safety and Health working on analytical methods and instrumentation for toxic materials in the work place, including sample collection and HPLC analysis of polycyclic aromatic hydrocarbons in diesel exhaust and coal dust in underground mines. He has overall responsibility for the Contract Laboratory Program.

MICHAEL D. WICHMAN, Ph.D. Dr. Wichman received his Ph.D. in analytical chemistry from Kansas State University. His Ph.D. research included Atomic Emission Spectroscopy involving ICP, DCP, and flames. He is the Assistant to the Chief of Organic Analysis and Quality Assurance Coordinator. In this role Dr. Wichman directs the staff responsible for the extraction of samples from a variety of environmental matrices. He is also responsible for overseeing applied research for method development. Prior to joining the UHL staff he was a research chemist with The Shepherd Color Company where he was responsible for setting up their research and development laboratory and developing methods.

GENE W. RONALD, M.S. Manager of the Des Moines Branch of the Hygienic Laboratory. Mr. Ronald received a M.S. in microbiology/minor, chemistry from South Dakota State University. As manager of the Branch Laboratory, Mr. Ronald supervises the personnel and daily activities as well as consults with various clientele and agencies. Mr. Ronald also provides technical backup where needed.

LEE A. FRIELL, M.S. Mr. Friell is the Technical Manager of the Des Moines Branch of the Hygienic Laboratory. He received a M.S. in analytical chemistry from the University of Iowa. Mr. friell has been with the Hygienic Laboratory for over 18 years and has extensive experience with sample preparation and mineral and metals analyses using Inductively Coupled Plasma Spectrophotometer and Atomic Absorption methods. In addition, he provides analytical backup as required.

SHAMSHER S. BRAR, Ph.D. Dr. Brar holds a Ph.D. in soil biochemistry and microbiology from the University of Georgia. As a chemist Dr. Brar provides scientific expertise during special laboratory projects, nonroutine analyses and methods development for the Des Moines Laboratory. He has been with the Hygienic Laboratory since 1981 and has vast experience in the minerals and metals section of the Laboratory in such things as sample preparation and Atomic Absorption and Inductively Coupled Plasma Spectrophotometer procedures.

SEAN RYAN, M.S. Chemist for the Des Moines Branch of the Hygienic Laboratory. Mr. Ryan received his M.S. in inorganic chemistry from the University of Iowa. He has been with the Laboratory since 1984 and performs analyses of water/wastewater samples for the presence of minerals and metals using Atomic Absorption and Inductively Coupled Plasma Spectrophotometer methods.

ELENA S. AGUILAR, B.S. Ms. Aguilar has been with the Laboratory since 1974 and is a chemist with the Des Moines Branch Laboratory. She has a B.S. from Havana University. She operates both flame and flameless AA and she performs cyanide analysis and sulfide RCRA tests (reactivity, corrosivity, ignitability and toxicity). Ms. Aguiler operates an ICP and she also does biological testing for metals.

TERESA M. LIARAKOS, B.S. Chemist in Industrial Hygiene Section. Ms. Liarakos has a B.S. in chemistry from Rosary Hill College. She analyzes inorganic industrial hygiene samples; specifically she prepares and analyzes air and bulk samples for metals by atomic absorption. Ms. Liarakos also performs analyses by Inductively Coupled Plasma Spectrophotometer methods. She has over five years experience performing these procedures.

DONNA J. COLE, B.S. Laboratory Technician for the Des Moines Branch of the Hygienic Laboratory. Ms. Cole received her B.S. in general science from the University of Iowa. She supervises the daily activities of the metals and minerals analyses section. Ms. Cole is involved in sample preparation and analytical testing of environmental samples to determine their inorganic chemical content by Atomic Absorption. She has over ten years experience in the minerals and metals section of the Laboratory.

MELINDA H. LESENEY. Ms. Leseney is a Laboratory Technician who performs atomic absorption analyses and sample preparation for the minerals and metals section, for the metabolic screening program and for blood lead tests. She also does analyses and sample preparation for the effluent quality analysis program. Ms. Leseney has over ten years experience performing these procedures.

SHARON G. MILLER. Ms. Miller is a Laboratory Technician who has been with the Laboratory since 1980. She prepares samples for minerals and metals analyses, and performs atomic absorption analyses for the mineral and metals section of the Des Moines Branch Laboratory. She also performs extraction procedures on plant materials and feeds, along with butterfat extractions of milk samples for pesticide residues.

WALTER J. MALEY, B.A. Mr. Maley has a B.A. in chemistry from Grinnell College. He prepares samples for analysis by Atomic Absorption and also performs Atomic Absorption/Emission analysis of soils and waters for metals and minerals.

VINCENT R. DWYER, B.S. Mr. Dwyer has a B.S. in chemistry from Northwest Missouri State University. He performs environmental analyses through the use of ion chromatograph, Atomic Absorption, and Colormetric procedures. He also has extensive experience with the Technicon Autoanalyzer.

ROBIN WHITE. Sample Custodian for the Des Moines Laboratory. Ms. White logs-in samples on the computer as they are received in the Laboratory. She checks to make sure there are no abnormalities or discrepancies between the samples and their paperwork, then distributes the samples and paperwork to their respective sections for analysis. She is also involved in sample kit preparation and inventory control.

L. JIM LEEGE. Mr. Leege is the back up sample Custodian for the Des Moines Laboratory. He assists in logging-in samples on the computer. He also assists with the preparing and shipping of sample kits and keeping inventory of the supplies at the Des Moines Laboratory.

CAROL L. SEGER, B.S. Ms. Seger has a B.S. in biology from the University of Wisconsin at LaCrosse. She is the Hygienic Laboratory's Quality Assurance Officer. In this capacity Ms. Seger organizes and conducts monthly meetings with the QA group to review external audits and proficiency tests in accordance with the QA Program Plan. She also monitors reports and external correspondence for quality, accuracy, and clarity and generates semi-annual summary reports for the Office of the Director.

MARY T. FREITAG. Document Control Officer. Her duties include preparing and reporting information required by the U.S. EPA, and the filing of Contract Laboratory Program cases within the document control office. She is also responsible for compiling and reporting of analytical results for the Bureau of Environmental Quality Control of the Laboratory.

WILLIAM A. BERGER, B.A. Systems Analyst. Mr. Berger received a B.A. in computer science and business administration from Luther College. Mr. Berger oversees the activities and personnel of the computer services section of the Hygienic Laboratory.

MICHAEL T. SULLIVAN, B.S. Business Manager. Mr. Sullivan holds a B.S. in business administration from Arizona State University. Prior to joining the Hygienic Laboratory, he worked as an accountant at the University of Iowa Business Office for eight years. He is responsible for facilities and support services at the Hygienic Laboratory.

FACILITIES AND ANALYTICAL INSTRUMENTS

FACILITIES AND EQUIPMENT

A. The UHL operates laboratories in Iowa City and Des Moines, Iowa. In Iowa City the Laboratory occupies more than 36,893 square feet (gross) on the Oakdale Campus of the University of Iowa. Sections of the Laboratory housed in Iowa City include: Organic Analysis, Airborne Contaminants and Radiological Health, Microbiology, Viral and Rickettsial Diseases, Data Processing, Administrative Services and the Laboratory Extension Division.

The Des Moines Branch Laboratory (DMBL) occupies approximately 10,000 square feet (gross) in the new Henry A. Wallace State Office Building. The DMBL houses the following analytical sections: Inorganic Analysis, *Limnology and Metabolic Disease Screening.*

Analytical laboratories available for this work are modern and fully equipped to provide for worker safety as well as efficient organization of work areas and staff time.

DES MOINES LABORATORY

INSTRUMENT	DESCRIPTION	MAKE	MODEL
Atomic Absorption 1980	With HGA 500 graphite furnace. Microprocessor controlled automatic sampler.	Perkin-Elmer	5000
Atomic Absorption 1978	with HGA 2100 graphite furnace. W/AS-1 Automatic sampler. Dedicated to graphite furnace work.	Perkin-Elmer	306
Atomic Absorption 1976	Flame Analysis	Perkin-Elmer	306
Atomic Absorption 1988	With Zeeman HGA and AS-60 autosampler-dedicated to furnace anlysis-personal computer controlled.	Perkin-Elmer	5100PC/ HGA-600
Carbon Analyser 1985	UV oxidation or furnace combustion, IN/IR detection.	Dohrman	DC-80

DES MOINES LABORATORY

INSTRUMENT	DESCRIPTION	MAKE	MODEL
Gaseous Hydride Atomic Absorption Accessory 1978	For use with atomic absorption unit for gaseous hydride technique.	Varian	VGA-65
ICP 1985	Computer controlled sequential, inductively coupled plasma w/ AS-50 autosampler.	Perkin-Elmer	6000
Ion Chromatograph 1988	Gradient system with ionic supression, conductivity detection.	Dionex	4000
Mercury Analyser 1978	Uses cold vapor techniques, dedicated to mercury.	Coleman/ Perkin-Elmer	MAS-50
TRAACS 1987	Four channel autosampler, personal computer controlled.	Technicon	800

DATA PROCESSING EQUIPMENT

A description of the computer systems in-house or within the University of Iowa Computer Center is outlined below:

HARDWARE

a. In-house -- Perkin-Elmer 3230 mini-computer

b. University of Iowa Computer Center
   1. IBM 3083
   2. Prime 850

c. 20 IBM-PCs and compatibles

d. 11 IBM-ATs compatibles

e. NCR Tower XP

f. 3 HP Vectra/386

SOFTWARE

a. In-house -- LIMS/CLAS

b. University of Iowa Computer Center - full range of programming languages including statistics, graphics, and data base management (dbms)

c. In-house word processing, spread sheet, dbms, and communication software.

COMMUNICATIONS

a. In-house -- Perkin Elmer
   1. sytek
   2. modems

b. University of Iowa Computing Center
   1. IBM 370 as nodes in JES network
   2. Prime 850 as part of Telenet network with other Primes
   3. sytek campus wide network

c. ISD (Information Systems Division), Des Moines, (DNR)

d. Research Triangle Park -- EPA

e. AMA/NET - Dialcom

EXHIBIT C

TARGET COMPOUND LIST (TCL) AND

CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)

Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*

Volatiles	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment[a] ug/Kg
1. Chloromethane	74-87-3	10	10
2. Bromomethane	74-83-9	10	10
3. Vinyl Chloride	75-01-4	10	10
4. Chloroethane	75-00-3	10	10
5. Methylene Chloride	75-09-2	5	5
6. Acetone	67-64-1	10	10
7. Carbon Disulfide	75-15-0	5	5
8. 1,1-Dichloroethene	75-35-4	5	5
9. 1,1-Dichloroethane	75-34-3	5	5
10. 1,2-Dichloroethene (total)	540-59-0	5	5
11. Chloroform	67-66-3	5	5
12. 1,2-Dichloroethane	107-06-2	5	5
13. 2-Butanone	78-93-3	10	10
14. 1,1,1-Trichloroethane	71-55-6	5	5
15. Carbon Tetrachloride	56-23-5	5	5
16. Vinyl Acetate	108-05-4	10	10
17. Bromodichloromethane	75-27-4	5	5
18. 1,2-Dichloropropane	78-87-5	5	5
19. cis-1,3-Dichloropropene	10061-01-5	5	5
20. Trichloroethene	79-01-6	5	5
21. Dibromochloromethane	124-48-1	5	5
22. 1,1,2-Trichloroethane	79-00-5	5	5
23. Benzene	71-43-2	5	5
24. trans-1,3-Dichloropropene	10061-02-6	5	5
25. Bromoform	75-25-2	5	5
26. 4-Methyl-2-pentanone	108-10-1	10	10
27. 2-Hexanone	591-78-6	10	10
28. Tetrachloroethene	127-18-4	5	5
29. Toluene	108-88-3	5	5
30. 1,1,2,2-Tetrachloroethane	79-34-5	5	5

(continued)

Volatiles	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment[a] ug/Kg
31. Chlorobenzene	108-90-7	5	5
32. Ethyl Benzene	100-41-4	5	5
33. Styrene	100-42-5	5	5
34. Xylenes (Total)	1330-20-7	5	5

[a]Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Volatile TCL Compounds are 125 times the individual Low Soil/Sediment CRQL.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**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 contract, will be higher.

Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*

Semivolatiles	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment[D] ug/Kg
35. Phenol	108-95-2	10	330
36. bis(2-Chloroethyl) ether	111-44-4	10	330
37. 2-Chlorophenol	95-57-8	10	330
38. 1,3-Dichlorobenzene	541-73-1	10	330
39. 1,4-Dichlorobenzene	106-46-7	10	330
40. Benzyl alcohol	100-51-6	10	330
41. 1,2-Dichlorobenzene	95-50-1	10	330
42. 2-Methylphenol	95-48-7	10	330
43. bis(2-Chloroisopropyl) ether	108-60-1	10	330
44. 4-Methylphenol	106-44-5	10	330
45. N-Nitroso-di-n-dipropylamine	621-64-7	10	330
46. Hexachloroethane	67-72-1	10	330
47. Nitrobenzene	98-95-3	10	330
48. Isophorone	78-59-1	10	330
49. 2-Nitrophenol	88-75-5	10	330
50. 2,4-Dimethylphenol	105-67-9	10	330
51. Benzoic acid	65-85-0	50	1600
52. bis(2-Chloroethoxy) methane	111-91-1	10	330
53 2,4-Dichlorophenol	120-83-2	10	330
54. 1,2,4-Trichlorobenzene	120-82-1	10	330
55. Naphthalene	91-20-3	10	330
56. 4-Chloroaniline	106-47-8	10	330
57. Hexachlorobutadiene	87-68-3	10	330
58. 4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
59. 2-Methylnaphthalene	91-57-6	10	330
60. Hexachlorocyclopentadiene	77-47-4	10	330
61. 2,4,6-Trichlorophenol	88-06-2	10	330
62. 2,4,5-Trichlorophenol	95-95-4	50	1600
63. 2-Chloronaphthalene	91-58-7	10	330
64. 2-Nitroaniline	88-74-4	50	1600

(continued)

Semivolatiles	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment[b] ug/Kg
65. Dimethylphthalate	131-11-3	10	330
66. Acenaphthylene	208-96-8	10	330
67. 2,6-Dinitrotoluene	606-20-2	10	330
68. 3-Nitroaniline	99-09-2	50	1600
69. Acenaphthene	83-32-9	10	330
70. 2,4-Dinitrophenol	51-28-5	50	1600
71. 4-Nitrophenol	100-02-7	50	1600
72. Dibenzofuran	132-64-9	10	330
73. 2,4-Dinitrotoluene	121-14-2	10	330
74. Diethylphthalate	84-66-2	10	330
75. 4-Chlorophenyl-phenyl ether	7005-72-3	10	330
76. Fluorene	86-73-7	10	330
77. 4-Nitroaniline	100-01-6	50	1600
78. 4,6-Dinitro-2-methylphenol	534-52-1	50	1600
79. N-nitrosodiphenylamine	86-30-6	10	330
80. 4-Bromophenyl-phenylether	101-55-3	10	330
81. Hexachlorobenzene	118-74-1	10	330
82. Pentachlorophenol	87-86-5	50	1600
83. Phenanthrene	85-01-8	10	330
84. Anthracene	120-12-7	10	330
85. Di-n-butylphthalate	84-74-2	10	330
86. Fluoranthene	206-44-0	10	330
87. Pyrene	129-00-0	10	330
88. Butylbenzylphthalate	85-68-7	10	330
89. 3,3'-Dichlorobenzidine	91-94-1	20	660
90. Benzo(a)anthracene	56-55-3	10	330
91. Chrysene	218-01-9	10	330
92. bis(2-Ethylhexyl)phthalate	117-81-7	10	330
93. Di-n-octylphthalate	117-84-0	10	330
94. Benzo(b)fluoranthene	205-99-2	10	330

(continued)

Semivolatiles	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment[b] ug/Kg
95. Benzo(k)fluoranthene	207-08-9	10	330
96. Benzo(a)pyrene	50-32-8	10	330
97. Indeno(1,2,3-cd)pyrene	193-39-5	10	330
98. Dibenz(a,h)anthracene	53-70-3	10	330
99. Benzo(g,h,i)perylene	191-24-2	10	330

[b]Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Semi-Volatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**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 contract, will be higher.

Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*

Pesticides/PCBs	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment[C] ug/Kg
100. alpha-BHC	319-84-6	0.05	8.0
101. beta-BHC	319-85-7	0.05	8.0
102. delta-BHC	319-86-8	0.05	8.0
103. gamma-BHC (Lindane)	58-89-9	0.05	8.0
104. Heptachlor	76-44-8	0.05	8.0
105. Aldrin	309-00-2	0.05	8.0
106. Heptachlor epoxide	1024-57-3	0.05	8.0
107. Endosulfan I	959-98-8	0.05	8.0
108. Dieldrin	60-57-1	0.10	16.0
109. 4,4'-DDE	72-55-9	0.10	16.0
110. Endrin	72-20-8	0.10	16.0
111. Endosulfan II	33213-65-9	0.10	16.0
112. 4,4'-DDD	72-54-8	0.10	16.0
113. Endosulfan sulfate	1031-07-8	0.10	16.0
114. 4,4'-DDT	50-29-3	0.10	16.0
115. Methoxychlor	72-43-5	0.5	80.0
116. Endrin ketone	53494-70-5	0.10	16.0
117. alpha-Chlordane	5103-71-9	0.5	80.0
118. gamma-Chlordane	5103-74-2	0.5	80.0
119. Toxaphene	8001-35-2	1.0	160.0
120. Aroclor-1016	12674-11-2	0.5	80.0
121. Aroclor-1221	11104-28-2	0.5	80.0
122. Aroclor-1232	11141-16-5	0.5	80.0
123. Aroclor-1242	53469-21-9	0.5	80.0
124. Aroclor-1248	12672-29-6	0.5	80.0
125. Aroclor-1254	11097-69-1	1.0	160.0
126. Aroclor-1260	11096-82-5	1.0	160.0

[C]Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Pesticide/PCB TCL compounds are 15 times the individual Low Soil/Sediment CRQL.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**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 contract, will be higher.

SECTION II

SPECIFIC REQUIREMENTS

A. For each sample, the Contractor shall perform the following tasks:

Task I: Receive and Prepare Hazardous Waste Samples.

1. Receive and handle samples under the chain-of-custody procedures described in Exhibit F.

2. Prepare samples as described in Exhibit D. VOA analysis of water or soil samples must be completed within 10 days of VTSR (Validated Time of Sample Receipt). If separatory funnel or sonication procedures are employed for extractions for semivolatile and pesticide analyses, extraction of water samples shall be completed within 5 days of VTSR, and extraction of soil samples shall be completed within 10 days of VTSR. If continuous liquid-liquid extraction procedures are employed, extraction of water samples shall be started within 5 days of VTSR.

   Extracts of either water or soil samples must be analyzed within 40 days of VTSR.

Task II: Extraction and Analysis for Identity of Specific Organic Compounds.

1. Extracts and aliquots prepared in Task I shall be analyzed by GC and GC/MS techniques given in Exhibit D for the target compounds listed in Exhibit C.

2. The target compounds listed in Exhibit C shall be identified as described in the methodologies given in Exhibit D. Automated computer programs may be used to facilitate the identification.

Task III: Qualitative Verification of the Compounds Identified in Task II.

1. The compounds analyzed by GC/MS techniques and initially identified in Task II shall be verified by an analyst competent in the interpretation of mass spectra by comparison of the suspect mass spectrum to the mass spectrum of a standard of the suspected compound. Two criteria must be satisfied to verify the identifications:

   a. Elution of the sample component at the same GC relative retention time as the standard component, and

   b. Correspondence of the sample component and standard component mass spectra. This procedure requires the use of multiple internal standards.

2. For establishing correspondence of the GC relative retention time (RRT), the sample component RRT must compare within ±0.06 RRT units of the RRT of the standard component. For reference, the calibration standard must be run on the same 12-hour time period as the sample.

EXHIBIT C

INORGANIC TARGET ANALYTE LIST

INORGANIC TARGET ANALYTE LIST (TAL)

Analyte	Contract Required Detection Limit (1,2) (ug/L)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

(1) Subject to the restrictions specified in the first page of Part G, Section IV of Exhibit D (Alternate Methods - Catastrophic Failure) any analytical method specified in SOW Exhibit D may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Limit (CRDL) requirements. Higher detection limits may only be used in the following circumstance:

If the sample concentration exceeds five times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the Contract Required Detection Limit. This is illustrated in the example below:

For lead:

Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample concentration = 220
Contract Required Detection Limit (CRDL) = 3

SECTION II

SAMPLE PRESERVATION AND HOLDING TIMES

A. Sample Preservation

1. Water Sample Preservation

Measurement Parameter	Container(1)	Preservative(2)
Metals(3)	P,G	HNO_3 to pH <2
Cyanide, total and amenable to chlorination	P,G	0.6g ascorbic acid(4) NaOH to pH >12 Cool, maintain at 4°C(±2°C) until analysis

FOOTNOTES:

(1) Polyethylene (P) or glass (G).
(2) Sample preservation is performed by the sampler immediately upon sample collection.
(3) Samples are filtered immediately on-site by the sampler before adding preservative for dissolved metals.
(4) Only used in the presence of residual chlorine.

2. Soil/Sediment Sample Preservation

The preservation required for soil/sediment samples is maintenance at 4°C (± 2°) until analysis.

B. Holding Times for Water and Soil/Sediment Samples

Following are the maximum sample holding times allowable under this contract. To be compliant with this contract, the Contractor must analyze samples within these times even if these times are less than the maximum data submission times allowed in this contract.

Analyte	No. of Days Following Sample Receipt by Contractor
Mercury	26 days
Metals (other than mercury)	180 days
Cyanide	12 days

ATTACHMENT A

USEPA CLP AUDIT CHECKLISTS

ORGANICS

EVENT SEQUENCE FOR PRE-AWARD SITE EVALUATION

A. Meeting with Laboratory Manager and Project Manager

General discussion of purpose of site visit, purpose of analysis and current contract award status.

B. Verification of Personnel

Review qualifications of bidder personnel in place and committed to project.

C. Verification of Instrumentation

Review equipment in place and committed to project. The bidder must demonstrate adequate equipment redundancy, as defined in Appendix C, to ensure capability to perform the required analyses in the required time.

D. Quality Control Procedures

Walk through laboratory to review conformance to written SOP's (as described on Page 3 of Preaward Bid Confirmations) for the following:

1. Sample receipt and logging.
2. Sample storage.
3. Preventing sample contamination.
4. Security for laboratory and samples.
5. Traceability of standards.
6. Instrument records and logbooks.
7. Sample analysis and data control systems.
8. Glassware cleaning.
9. Technical and managerial review of laboratory operation and data package preparation.
10. Sample analysis, data handling and reporting.
11. Chain-of-custody and document control, including Case file preparation.

E. Review of Standard Operating Procedures (SOPs)

Review SOPs with Project Manager to ensure that the laboratory understands the scope and requirements of the program and adaption of SOP's to meet the requirements of the contract.

F. Identification of Needed Corrective Actions

Discuss with Project Manager the actions needed to correct weaknesses identified during site inspection, PE sample analysis or production of reports (hard copy floppy diskette and magnetic tapes) and documentation. Determine how and when corrective actions will be documented, how and when improvements will be demonstrated, and the bidder employee responsible for corrective actions.

APPENDIX D

LABORATORY EVALUATION CHECKSHEET EXAMPLE*

Laboratory: _____

Date: _____

Type of Evaluation: _____

Contract Number: N/A

Contract Title: _____

Personnel Contacted:

Name	Title

Laboratory Evaluation Team:

Name	Title

*Some items may not be applicable for preaward lab evaluation.

I. ORGANIZATION AND PERSONNEL

ITEM	YES	NO	COMMENT
Laboratory or Project Manager (individual responsible for overall technical effort): Name: _____			
GC/MS Laboratory Supervisor Name: _____ Experience: 3 years minimum requirement			
GC Laboratory Supervisor Name: _____ Experience: 3 years minimum requirement			
Sample Preparation Laboratory Supervisor Name: _____ Experience: 3 years minimum requirement			
GC/MS Operator Name: _____ Experience: 1 year minimum requirement (3 years if no degree in physical science)			
GC/MS Spectral Interpretation Expert Name: _____ Experience: 2 years minimum requirement			
Extraction/Concentration Expert Name: _____ Experience: 1 year minimum requirement			
Pesticide Residue Analysis Expert Name: _____ Experience: 2 years minimum requirement			

I. ORGANIZATION AND PERSONNEL (Continued)

ITEM	YES	NO	COMMENT
Do personnel assigned to this project have the appropriate educational background to successfully accomplish the objectives of the program?			
Is the organization adequately staffed to meet project commitments in a timely manner?			
Was the Quality Assurance officer available during the evaluation? Name: _____			
Does the Laboratory Quality Assurance Officer report to senior management levels?			
Was the Project Manager available during the evaluation?			

Additional Comments

II. SAMPLE RECEIPT AND STORAGE AREA

ITEM	YES	NO	COMMENT
Is a sample custodian designated? If yes, name of sample custodian. Name: _____			
Are written Standard Operating Procedures (SOPs) developed for receipt and storage of samples?			
Is the appropriate portion of the SOP available to the analyst at the sample receipt/storage area?			
Are the sample shipping containers opened in a manner which prevents possible laboratory contamination?			
Are samples that require preservation stored in such a way as to maintain their preservation?			
Are volatile samples stored separately from semivolatile samples?			
Are adequate facilities provided for storage of samples, including cold storage?			
Is the temperature of the cold storage recorded daily in a logbook?			
Are temperature excursions noted and are appropriate actions taken when required?			

II. SAMPLE RECEIPT AND STORAGE AREA (Continued)

ITEM	YES	NO	COMMENT
Are the sample receipt/storage and temperature logbooks maintained in a manner consistent with GLP?			
Has the supervisor of the individual maintaining the notebook/bench sheet personally examined and reviewed the notebook/bench sheet periodically, and signed his/her name therein, together with the date and appropriate comments as to whether or not the notebook/bench sheet is being maintained in an appropriate manner?			

Additional Comments

III. SAMPLE PREPARATION AREA

When touring the facilities, give special attention to: (a) the overall appearance of organization and neatness, (b) the proper maintenance of facilities and instrumentation, (c) the general adequacy of the facilities to accomplish the required work.

ITEM	YES	NO	COMMENT
Is the laboratory maintained in a clean and organized manner?			
Does the laboratory appear to have adequate workspace (120 sq. feet, 6 linear feet of unencumbered bench space per analyst)?			
Are the toxic chemical handling areas either a stainless steel bench or an impervious material covered with absorbent material?			
Are contamination-free areas provided for trace level analytical work?			
Are contamination-free work areas provided for the handling of toxic material (e.g., glove box)?			
Are exhaust hoods provided to allow contamination-free work with volatile materials?			
Is the air flow of the hoods periodically checked and recorded (i.e., once per quarter?)			
Are chemical waste disposal policies/procedures well-defined and followed by the laboratory?			

III. SAMPLE PREPARATION AREA (Continued)

ITEM	YES	NO	COMMENT
Can the laboratory supervisor document that trace-free water is available for preparation of standards and blanks?			
Is the analytical balance located away from drafts and areas subject to rapid temperature changes?			
Has the balance been calibrated and checked within one year by a certified technician?			
Is the balance routinely checked with the appropriate range of class S weights before each use and are the results recorded in a logbook?			
Are the solvent storage cabinets properly vented as appropriate for the prevention of possible laboratory contamination?			
Are reagent grade or higher purity chemicals used to prepare standards?			
Are analytical reagents dated upon receipt?			
Are reagent inventories maintained on a first-in, first-out basis?			
Are analytical reagents checked out before use?			
Are fresh analytical standards prepared at a frequency consistent with the IFB requirement?			
Are reference materials properly labeled with concentrations, date of preparation, and the identity of the person preparing the sample?			

III. SAMPLE PREPARATION AREA (Continued)

ITEM	YES	NO	COMMENT
Is a spiking/calibration standards preparation and tracking logbook(s) maintained?			
Are the primary standards traceable to EPA standards?			
Do the analysts record bench data in a neat and accurate manner.			
Are the sample receipt/storage and temperature logbooks maintained in a manner consistent with GLP?			
Has the supervisor of the individual maintaining the notebook/bench sheet personally examined and reviewed the notebook/bench sheet periodically, and signed his/her name therein, together with the date and appropriate comments as to whether or not the notebook/bench sheet is being maintained in an appropriate manner?			
Are standards stored separately from sample extracts?			
Are volatile and semivolatile solutions properly segregated?			
Is the appropriate portion of the SOP available to the analyst at the sample preparation area?			
Is the SOP for glassware washing posted at the cleaning station?			
Is the temperature of the refrigerator/freezers recorded daily?			
Are temperature excursions noted and appropriate actions taken when required?			

III. SAMPLE PREPARATION AREA (Continued)

Additional Comments

IV. SAMPLE ANALYSIS INSTRUMENTATION

A. GC/MS/DS Instrumentation

	Manufacturer	Model / Revision		Installation Date
GC/MS ID #				
GC/MS ID #				
GC/MS ID #				
Data System ID #				
EPA/NIH Mass Spectral Library				
Data System ID #				
EPA/NIH Mass Spectral Library				
Purge and Trap ID #				
Purge and Trap ID #				

A. GC/MS/DS Instrumentation (Continued)

ITEM	YES	NO	COMMENT
Are manufacturer's operating manuals readily available to the operator?			
Is service maintenance by contract?			
Are extensive in-house replacement parts available?			
Is preventative maintenance applied?			
Is a permanent service record maintained in a logbook?			
Has the instrument been modified in any way?			
Is the instrument properly vented or are appropriate traps in place?			
Is a glass jet separator in place and operational?			
Is raw data being archived and documented properly (i.e., magnetic tape)?			
Are in-house quality control charts maintained and available for on-site inspection?			
Is a split/splitless capillary injector in place?			

A. GC/MS/DS Instrumentation (Continued)

Additional Comments

B. GC Instrumentation

	Manufacturer	Model	Installation Date	Column(s)
GC ID #				
GC ID #				
GC ID #				
GC ID #				
Data System ID #				
Data System ID #				
Data System ID #				
Data System ID #				

ITEM	YES	NO	COMMENT
Are manufacturer's operating manuals readily available to the operator?			
Is service maintenance by contract?			
Are in-house replacement parts available?			
Is preventative maintenance applied?			

B. GC Instrumentation (Continued)

ITEM	YES	NO	COMMENT
Is a permanent service record maintained in a logbook?			
Has the instrument been modified in any way?			
Is the instrument properly vented or are appropriate traps in place?			
Are Aroclor 1221 and 1232 standards run at the proper frequency and the data maintained for on-site inspection?			

Additional Comments

V. DATA HANDLING AND REVIEW

ITEM	YES	NO	COMMENT
Are data calculations spot-checked by a second person?			
Do records indicate that appropriate corrective action has been taken when analytical results fail to meet QC criteria?			
Are computer programs validated before use?			
Do supervisory personnel review the data and QC results?			

Additional Comments

VI. QUALITY CONTROL MANUAL CHECKLIST

ITEM	YES	NO	COMMENT
Does the laboratory maintain a project specific Quality Control Manual?			
Does the manual address the important elements of a QC program, including the following:			
Personnel?			
Facilities and equipment?			
Operation of instruments?			
Documentation of procedures?			
Preventive maintenance?			
Reliability of data?			
Data validation?			
Feedback and corrective action?			

Additional Comments

VII. SUMMARY CHECKSHEET

ITEM	YES	NO	COMMENT
Do responses to the evaluation indicate that project and supervisory personnel are aware of QA/QC and its application to the project?			
Do project and supervisory personnel place positive emphasis on QA/QC?			
Have responses with respect to QA/QC aspects of the project been open and direct?			
Has a cooperative attitude been displayed by all project and supervisory personnel?			
Does the organization place the proper emphasis on quality assurance?			
Have any QA/QC deficiencies been discussed before leaving?			
Is the overall quality assurance adequate to accomplish the objectives of the project?			
Has corrective action(s), recommended during previous evaluations, been implemented? If not, provide details in Section VII.B.			

VII. SUMMARY CHECKSHEET (Continued)

Additional Comments

INORGANICS

LABORATORY EVALUATION CHECKSHEET EXAMPLE*

Laboratory: _____

Date: _____

Type of Evaluation: _____

Personnel Contacted:

Name	Title

Laboratory Evaluation Team:

Name	Title

* Some items may not be applicable for preaward laboratory evaluation.

Attachment 1
Laboratory Evaluation Checklist

I. ORGANIZATION AND PERSONNEL

ITEM	YES	NO	COMMENT
Inorganics Laboratory Supervisor (individual responsible for overall technical effort): Name: _____ Experience: 3 years minimum requirement			
ICP Spectroscopist Name: _____ Experience: 2 year minimum requirement			
ICP Operator: Name: _____ Experience: 1 year minimum requirement			
AA Operator: Name: _____ Experience: 1 year minimum requirement			
Inorganic Sample Preperation Specialist: Name: _____ Experience: 6 months minimum requirement			
Classical Techniques (Cyanide) Analyst: Name: _____ Experience: 6 months minimum requirement			
Do personnel assigned to this project have the appropriate educational background to successfully accomplish the objectives of the program?			

I. ORGANIZATION AND PERSONNEL (Continued)

ITEM	YES	NO	COMMENT
Quality Assurance Supervisor Name: _____			
Glassware Preparation Technician Name: _____			
Is the organization adequately staffed to meet project commitments in a timely manner?			
Were all personnel involved with the CLP analysis available during the evaluation? (List those not present.)			

Additional Comments

II. SAMPLE RECEIPT AND STORAGE AREA

ITEM	YES	NO	COMMENT
Are written Standard Operating Procedures (SOPs) developed for receipt and storage of samples?			
Is the appropriate portion of the SOP available to the sample custodian at the sample receipt/ storage area?			
Are the sample shipping containers opened in a manner which prevents possible laboratory contamination?			
Are soil and cyanide samples that require refrigeration at 4°C stored in such a way as to maintain their preservation? (Exhibit D)			
Are adequate facilities provided for storage of samples, including cold storage?			
Is the temperature of the cold storage recorded daily in a permanent record?			
Are temperature excursions (plus/minus 4°C) noted and are appropriate actions taken when required.			
Are the sample receipt/storage and temperature records maintained in a manner consistent with GLP?			
Are standards stored separately from sample digestates?			

II. SAMPLE RECEIPT AND STORAGE AREA (Continued)

ITEM	YES	NO	COMMENT
Do the digested cases examined contain LCS's, duplicates, and matrix spikes? Cases _____ (Exhibit E)			
Has the supervisor of the individual maintaining the notebook/bench sheet personally examined and reviewed the notebook/bench sheet periodically, and signed his/her name therein, together with the date and appropriate comments as to whether or not the notebook/bench sheet is being maintained in an appropriate manner?			

Additional Comments

III. SAMPLE PREPARATION AREA

When touring the facilities, give special attention to: (a) the overall appearance of organization and neatness, (b) the proper maintenance of facilities and instrumentation, (c) the general adequacy of the facilities to accomplish the required work.

ITEM	YES	NO	COMMENT
Is the laboratory maintained in a clean and organized manner?			
Does the laboratory appear to have adequate workspace (120 sq. feet, 6 linear feet of unencumbered bench space per analyst)?			
Are contamination-free areas provided for trace level analytical work?			
Are the hoods in good condition and functional?			
Are chemical waste disposal policies/procedures well defined and followed by the laboratory?			
Does the laboratory have a source of distilled/ demineralized water?			
Is the conductivity of distilled/demineralized water routinely checked and recorded?			
Is the analytical balance located away from draft and areas subject to rapid temperature changes?			
Has the balance been calibrated within one year by a certified technician?			

III. SAMPLE PREPARATION AREA (Continued)

ITEM	YES	NO	COMMENT
Is the balance routinely checked with the appropriate range of class S weights daily before use and are the results recorded in a logbook?			
Is the sample preparation portion of the SOP available to the analyst at the sample preparation area?			
Are unexpired standards used to prepare instrument calibration standards?			
Are fresh analytical standards prepared at a frequency consistent with the IFB requirement?			
Are chemicals and standards dated upon receipt?			
Are reagent inventories maintained on a first-in, first-out basis?			
Are reference materials properly labeled with concentrations, date of preparation, and the identity of the person preparing the sample?			
Is a spiking/calibration standards preparation and tracking logbook(s) maintained?			
Are the primary standards traceable to EPA standards where possible?			
Do the analysts record bench data in a neat and accurate manner? (Exhibit G)			

III. SAMPLE PREPARATION AREA (Continued)

ITEM	YES	NO	COMMENT
Is the SOP for glassware washing posted at the cleaning station?			
Is a UV-Visible spectrophotometer operational and properly maintained?			
Is the mercury analyzer operational and well maintained (i.e., properly vented)?			
Are sufficient cyanide distillation apparatus available to routinely analyze all samples within the required holding period?			
Is the pH of the samples recorded and available for data review? (Exhibit D)			
Are digestion logbooks/bench sheets maintained in a neat and organized manner? (Exhibit G)			
Is an adequate drying oven available with a temperature measurement device?			
Has the supervisor of the individual maintaining the notebook/bench sheet personally examined and reviewed the notebook/bench sheet periodically, and signed his/her name therein, together with the date and appropriate comments as to whether or not the notebook/bench sheet is being maintained in an appropriate manner?			

Additional Comments

IV. SAMPLE ANALYSIS INSTRUMENTATION

A. ICP/DS Instrumentation

Installation	Manufacturer	Model	Type: Sequential or Simultaneous	Date
ICP ID #				
Data System				
ICP ID #				
Data System				

ITEM	YES	NO	COMMENT
Are calibration intensity and gains kept in a permanent record so that instrument performance can be measured over time?			
Is a permanent service record maintained in a logbook?			
Has the instrument been modified in any way?			
Is the instrument properly vented?			
Is a mass flow controller used?			
Is an auto-sampler used?			
Is the interference correction automatically performed?			

ITEM	YES	NO	COMMENT
Are interelement correction factors updated every six months or more frequently?			
Is service maintenance by contract?			
Is preventative maintenance applied?			

Additional Comments

IV. SAMPLE ANALYSIS INSTRUMENTATION (Continued)

B. Atomic Absorption (AA) Spectrometer

	Manufacturer	Model / Revision		Installation Date
AA ID #				
Data System				
AA ID #				
Data System				
AA ID #				
Data System				
AA ID #				
Data System				

IV. SAMPLE ANALYSIS INSTRUMENTATION (Continued)

ITEM	YES	NO	COMMENT
Is there a methods manual available to the operator?			
Are element specific SOP's listing instrument conditions, background correction, instrument conditions, and required instrument sensitivity available to the analyst?			
Are calibration results (i.e., sensitivity) kept in a permanent record so that instrument performance can be measured over time?			
Is a permanent service record maintained in a logbook?			
Has the instrument been modified in any way?			
Is the instrument properly vented?			
Is the unit equipped with flameless accessory?			
Are L'vov platforms used?			
Is an auto-sampler used?			
Are EPA or instrument manufacturer matrix modifiers used?			
Is the unit equipped with electrodeless discharge lamps?			
Is service maintenance by contract?			
Is preventative maintenance applied?			

IV. SAMPLE ANALYSIS INSTRUMENTATION (Continued)

Additional Comments

V. DATA HANDLING AND REVIEW

ITEM	YES	NO	COMMENT
Are manual data calculations spot-checked by a second person?			
Do records indicate that appropriate corrective action has been taken when analytical results fail to meet QC criteria?			
Is a Laboratory Information Management System (LIMS) used? Manufacturer/Model:			
Is the operation of the LIMS validated with a test set of data and is the data maintained for on-site inspection?			

Additional Comments

VI. QUALITY CONTROL MANUAL AND SOP'S

ITEM	YES	NO	COMMENT
Does the laboratory maintain a project specific Quality Control Manual?			
Does the manual address the important elements of a QC program, including the following:			
Personnel?			
Facilities and equipment?			
Operation of instruments?			
Documentation of procedures?			
Preventive maintenance?			
Reliability of data?			
Data validation?			
Feedback and corrective action?			
Are files of outdated SOP's stored for reference?			

Additional Comments:

VII. SUMMARY CHECKSHEET

ITEM	YES	NO	COMMENT
Do responses to the evaluation indicate that project and supervisory personnel are aware of QA/QC and its application to the project?			
Do project and supervisory personnel place positive emphasis on QA/QC?			
Have responses with respect to QA/QC aspects of the project been open and direct?			
Has a cooperative attitude been displayed by all project and supervisory personnel?			
Does the organization place the proper emphasis on quality assurance?			
Have any QA/QC deficiencies been discussed before leaving?			
Is the overall quality assurance adequate to accomplish the objectives of the project?			
Has corrective action(s), recommended during previous evaluations, been implemented? If not, provide details in Section VII. B.			

Additional Comments

APPENDIX D

ECKENFELDER INC. FORMS

ECKENFELDER INC.
HEAD SPACE ANALYSES DATA SHEET

Page________of________
Analyst______________________
Date______________Time________
Project____________NO.________
Client______________________

Boring Number	Sample Number	Sample Depth	OVA Reading (ppm)	Background Reading	Remarks (Weather Conditions,etc.)

EXAMPLE

ECKENFELDER INC.
HEAD SPACE ANALYSES DATA SHEET

Page 1 of 1
Analyst M. Watkins
Date 11/10/89 Time 2:00-2:30 p.
Project SASC NO. 6595A
Client DICO

Boring Number	Sample Number	Sample Depth	OVA Reading (ppm)	Background Reading	Remarks (Weather Conditions, etc.)
DB-15	Blank	—	0.2		68° F, inside office
"	S-1	0-2	1.4	0.2	"
"	S-2	2-4	2.6	"	"
"	S-3	4-6	4.2	"	"
"	S-4	6-8	1.8	"	"
"	S-5	8-10	0.4	"	"
"	S-6	10-12	0.2	"	"
"	S-7	12-14	0.2	"	"

Page______ of ______
Technicians____________
Project____________ NO.______
Client____________
Date____________
Time____________

ECKENFELDER INC.
GEOPHYSICAL SURVEY DATA SHEET

Traverse Point No.	Date	Location Coordinates	Horizontal Dipole Mode Value	Vertical Dipole Mode Value	Remarks (Weather, Obstructions, etc.)

ECKENFELDER INC.
GEOPHYSICAL SURVEY DATA SHEET

Page 1 of 10
Technicians M. Watkins, S. Kawchal
Project SASC NO. 6595A
Client DICO
Date 11/5/89
Time 10:00 am - 2:00 pm

Traverse Point No.	Date	Location Coordinates (feet)	Horizontal Dipole Mode Value	Vertical Dipole Mode Value	Remarks (Weather, Obstructions, etc.)
1	11/5	N 8100.00 E 10700.00	6.8	7.0	72° F, cloudy, No rain
2		N 8067.19 E 10700.00	7.0	7.4	
3		N 8034.38 E 10700.00	6.7	7.0	
4		N 8001.57 E 10700.00	6.8	7.7	
5		N 7968.76 E 10700.00	7.3	7.6	
6		N 7935.95 E 10700.00	6.4	7.0	
7		N 7903.14 E 10700.00	6.8	6.0	
8		N 7870.33 E 10700.00	7.4	6.5	
9		N 7837.52 E 10700.00	6.6	7.3	
10		N 7804.71 E 10700.00	6.6	7.0	

ECKENFELDER INC

GROUNDWATER SAMPLING FIELD DATA SHEET

LOCATION No. _____

SAMPLE No. _____

PROJECT: _____ DATE: _____ TIME: _____

CLIENT: _____ WEATHER CONDITIONS: _____

JOB No: _____ AIR TEMPERATURE: _____

PERSONNEL: _____

WELL DATA:

CASING, DIAMETER: _____ ☐ STAINLESS STEEL ☐ STEEL ☐ PVC ☐ TEFLON ☐ OTHER: _____

INTAKE, DIAMETER: _____ ☐ STAINLESS STEEL ☐ GALV. STEEL ☐ PVC ☐ TEFLON ☐ OPEN ROCK

STATIC WATER LEVEL: _____ BOTTOM DEPTH: _____

DATUM: ☐ TOP OF PROT. CASING ☐ TOP OF WELL CASING ☐ OTHER: _____

WELL CLEAN TO BOTTOM? ☐ YES ☐ NO WELL IN GOOD CONDITION ☐ YES ☐ NO

VOLUME OF WATER IN WELL: _____

PURGING DATA:

METHOD: ☐ BLADDER PUMP ☐ PERISTALTIC PUMP ☐ BAILER ☐ SUB. PUMP ☐ OTHER: _____

MATERIALS: PUMP/BAILER: ☐ TEFLON ☐ STAINLESS STEEL ☐ PVC ☐ OTHER: _____ TUBING/ROPE: ☐ TEFLON ☐ POLYPROPYLENE ☐ NYLON ☐ OTHER: _____

PUMPING RATE: _____ ELAPSED TIME: _____ VOLUME PUMPED: _____

WAS WELL EVACUATED? ☐ YES ☐ NO NUMBER OF WELL VOLUMES PURGED: _____

TIME SERIES DATA:

WELL VOLUMES						
TEMP						
pH						
SPEC COND.						

PURGING EQUIPMENT: ☐ DEDICATED ☐ PREPARED OFF-SITE ☐ FIELD CLEANED

SAMPLING DATA:

METHOD: ☐ BLADDER PUMP ☐ PERISTALTIC PUMP ☐ BAILER ☐ OTHER: _____

MATERIALS: PUMP/BAILER: ☐ TEFLON ☐ STAINLESS STEEL ☐ PVC ☐ OTHER: _____ TUBING/ROPE: ☐ TEFLON ☐ POLYPROPYLENE ☐ NYLON ☐ OTHER: _____

SAMPLING EQUIPMENT: ☐ DEDICATED ☐ PREPARED OFF-SITE ☐ FIELD CLEANED

METALS SAMPLE FIELD FILTERED? ☐ YES ☐ NO METHOD: _____

PHYSICAL & CHEMICAL DATA:

APPEARANCE: ☐ CLEAR ☐ TURBID ☐ COLOR: _____

☐ CONTAINS IMMISCIBLE LIQUID ☐ OTHER: _____

FIELD DETERMINATIONS: TEMP: _____ pH: _____ SPEC. COND: _____

I CERTIFY THAT THIS SAMPLE WAS COLLECTED AND HANDLED IN ACCORDANCE WITH APPLICABLE REGULATORY AND CORPORATE PROTOCOLS

_____ SIGNATURE

_____ DATE

(11/87)

EXAMPLE

ECKENFELDER INC. Nashville, Tennessee; Mahwah, New Jersey

GROUNDWATER SAMPLING FIELD DATA SHEET

LOCATION No. NW-19

SAMPLE No: NW-19

PROJECT: SASC

CLIENT: DICO

JOB No: 6595 A

PERSONNEL: M. Watkins / S. Kawchak

DATE: 11/10/89 TIME: 10:30 A.M.

WEATHER CONDITIONS: cloudy, humid

AIR TEMPERATURE: 80-85°F

WELL DATA:

CASING, DIAMETER: 2" ☐ STAINLESS STEEL ☐ STEEL ☒ PVC ☐ TEFLON ☐ OTHER:

INTAKE, DIAMETER: 2" ☐ STAINLESS STEEL ☐ GALV. STEEL ☒ PVC ☐ TEFLON ☐ OPEN ROCK

STATIC WATER LEVEL: 8.60 BOTTOM DEPTH: 14.80

DATUM: ☐ TOP OF PROT. CASING ☒ TOP OF WELL CASING ☐ OTHER:

WELL CLEAN TO BOTTOM? ☒ YES ☐ NO WELL IN GOOD CONDITION ☒ YES ☐ NO

VOLUME OF WATER IN WELL: 1.01

PURGING DATA:

METHOD: ☐ BLADDER PUMP ☐ PERISTALTIC PUMP ☒ BAILER ☐ SUB. PUMP ☐ OTHER:

MATERIALS: PUMP/BAILER: ☐ TEFLON ☐ STAINLESS STEEL ☒ PVC ☐ OTHER: TUBING/ROPE: ☐ TEFLON ☐ POLYPROPYLENE ☒ NYLON ☐ OTHER:

PUMPING RATE: 0.2 gpm ELAPSED TIME: 20 min VOLUME PUMPED: 4 gal

WAS WELL EVACUATED? ☐ YES ☒ NO NUMBER OF WELL VOLUMES PURGED: 4

TIME SERIES DATA:

WELL VOLUMES	1	2	3	4		
TEMP (F)	57°	54°	52°	52°		
pH	7.0	7.2	7.2	7.2		
SPEC. COND. (um/cm)	780	765	758	759		

PURGING EQUIPMENT: ☒ DEDICATED ☐ PREPARED OFF-SITE ☐ FIELD CLEANED

SAMPLING DATA:

METHOD: ☐ BLADDER PUMP ☐ PERISTALTIC PUMP ☒ BAILER ☐ OTHER:

MATERIALS: PUMP/BAILER: ☐ TEFLON ☐ STAINLESS STEEL ☒ PVC ☐ OTHER: TUBING/ROPE: ☐ TEFLON ☐ POLYPROPYLENE ☒ NYLON ☐ OTHER:

SAMPLING EQUIPMENT: ☒ DEDICATED ☐ PREPARED OFF-SITE ☐ FIELD CLEANED

METALS SAMPLE FIELD FILTERED? ☒ YES ☒ NO (Bark) METHOD: NALGENE (0.45um)

PHYSICAL & CHEMICAL DATA:

APPEARANCE: ☒ CLEAR ☐ TURBID ☐ COLOR:

☐ CONTAINS IMMISCIBLE LIQUID ☐ OTHER:

FIELD DETERMINATIONS: TEMP: 52° F pH: 7.2 SPEC. COND: 758 um/cm

I CERTIFY THAT THIS SAMPLE WAS COLLECTED AND HANDLED IN ACCORDANCE WITH APPLICABLE REGULATORY AND CORPORATE PROTOCOLS

Michael Watkins
SIGNATURE

11/10/89
DATE

(11/87)

ECKENFELDER INC.

TEST BORING LOG

NO.

PROJECT:

CLIENT:

SHEET NO. 1 of

PROJECT NO.

DRILLING DATA	
CONTRACTOR:	
DRILLER:	
EQUIPMENT:	
METHOD:	

SAMPLING METHODS			
	SAMPLER	TUBE	CORE
TYPE			
DIAMETER			
OTHER			

WELL CONSTRUCTION		
	RISER	INTAKE
MATERIAL		
DIAMETER		
COUPLING		

WELL DEVELOPMENT				
METHOD:		GROUND	WELL	PROT CSG
DURATION:	ELEV			
YIELD:	DATE STARTED:			
OTHER:	DATE COMPLETED:			
	INSPECTOR:			

WELL CONSTRUCTION	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6 INCHES	CLASSIFICATION (AFTER BURMISTER, 1959)	REMARKS
	0					
	5					
	10					
	15					
	20					
	25					
	30					
	35					
	40					

EXAMPLE

ECKENFELDER INC.

TEST BORING LOG

NO. DB-5

PROJECT: SASC
CLIENT: DICO

SHEET NO. 1 of 1
PROJECT NO. 6595A

DRILLING DATA	
CONTRACTOR:	Layne Western Co.
DRILLER:	John Doe
EQUIPMENT:	Mobile B-61
METHOD:	Hollow Stem Auger

SAMPLING METHODS			
	SAMPLER	TUBE	CORE
TYPE	Split Spoon		
DIAMETER	2" SS		
OTHER			

WELL CONSTRUCTION		
	RISER	INTAKE
MATERIAL		
DIAMETER		
COUPLING		

WELL DEVELOPMENT	
METHOD:	
DURATION:	
YIELD:	
OTHER:	

	GROUND	WELL	PROT CSG
ELEV	356.24		

DATE STARTED: 11/7/89
DATE COMPLETED: 11/7/89
INSPECTOR: M. Watkins

WELL CONSTRUCTION	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6 INCHES	CLASSIFICATION (AFTER BURMISTER, 1959)	REMARKS
	0	S-1	SS	27-29-24-10	Fill misc. fill with reddish-black topsoil, brick frags., trace white powder	
		S-2	SS	2-8-6-4-	Overbank Deposits Dense black silty CLAY, some f-m sand, trace f gravel	
	5	S-3	SS	4-6-8-4-		
		S-4	SS	5-6-6-5		
		S-5	SS	3-2-6-4-		
	10	S-6	SS	10-4-5-6		▼ ground water encountered at 12'
		S-7	SS	6-7-6-9	Dark gray-black CLAY, little f-m sand, very dense, high plasticity	
	15				Bottom of Boring	
	20					
	25					
	30					
	35					
	40					

APPENDIX E

EM 34-3 OPERATING INSTRUCTIONS

GEONICS LIMITED
1745 Meyerside Dr. Unit 8 Mississauga, Ontario Canada L5T 1C5

Tel. (416) 676-9580
Telex 06-968688
Cables: Geonics

EM34-3 OPERATING INSTRUCTIONS

February 1987.

NOTE TO EM34-3 USERS

One of the most common problems with the instrument is the contamination of the connector and battery contacts. To clean connector contacts on the cables, receiver and transmitter use contact cleaning aerosol (like WD40), which is available in most of the electronic components stores. To clean battery contacts use fine sand paper (#400 or higher) and wipe several times over the contacts. Ensure that the spring action of the battery holders is maintained. Bend holder slightly if necessary. Kip protective cup over connectors when cables not in use.

February 1988

GEONICS LIMITED
1745 Meyerside Dr. Unit 8 Mississauga, Ontario Canada L5T 1C5
Tel. (416) 676-9580
Telex 06-968688
Cables: Geonics

EM34-3 OPERATING INSTRUCTIONS

The following is the set-up and operating procedure for the EM34-3 Terrain Conductivity Meter.

1. INITIAL SET-UP At the beginning of the survey select an area free of "cultural interference" and man-made conductors such as buried pipes, buildings, power lines and steel reinforced concrete, etc.

1.1 Having determined the coil separation to be used for the survey, lay the instrument out on the ground accordingly. Connect the reference cable (10, 20 or 40 meters) - one end to the 8-pin connector on the transmitter (Tx) coil and the other end to the "REFERENCE" connector on the receiver console. See attached sketch for proper use of thimbles and snaps on the cable.

1.2 Connect the transmitter console to the transmitter coil using the appropriate short cable.

1.3 Put the "LEVEL" switch on the transmitter console to the "NORMAL" position. (See Section 6.)

1.4 Set the receiver and transmitter coils to the selected coil separation with red circles on the coils both facing in the same direction.

1.5 Set transmitter "SEPARATION" switch to selected value and turn on trasmitter ("POWER/OFF" switch to "POWER" position).

1.6 Check to see that Battery Monitor Meter indicator is in the black area of the scale. If not, batteries are low or are not making proper contact to the battery clips.

1.7 Check condition of receiver battery by rotating receiver "SEPARATION" switch to "BATT" position with "POWER/OFF" switch in "OFF" position (see Section 5.2).

1.8 Set receiver "SEPARATION" switch to selected value.

2. ELECTRONIC NULLING To remove any offsets in the output (DC) circuitry.

Prior to turning receiver on, insure that meters read zero by adjusting mechanical meter zero control.

2.2 Turn on receiver ("POWER/OFF" switch to "POWER" position).

2.3 With receiver coil disconnected depress "NULL MODE" push button switch. Both meter needles should go to zero.

2.4 If either needle is not at zero reading, release the lock on the appropriate "NULL" control potentiometer. With "NULL MODE" switch still depressed adjust the "NULL" control to zero the meter.

2.5 Lock the "NULL" control.

2.6 Connect the receiver coil to the receiver console "COIL" connector via the appropriate short cable.

3. RECEIVER COMPENSATION AND GAIN CHECK

3.1 Maintaining the receiver and transmitter coils in the same plane adjust the coil separation to obtain zero reading (centre of green area) on the "COIL SEPARATION" meter. (Insure that red circles on coils face in the same direction.) The coil separation should now measure the selected value and allow from 2-4 meters of slack reference cable between the thimbles which attach to the console leather cases.

3.2 With the "SENSITIVITY RANGE" switch set to the 300 millimho/meter position move the receiver coil toward the transmitter until the "COIL SEPARATION" meter deflects to full scale mark.

3.3 Measure the distance that the receiver coil has moved. This distance should be 10.4% of intercoil spacing.

4. TAKING A READING

The instrument is now operational, reading apparent terrain conductivity directly in millimhos/meter in either the horizontal or vertical dipole mode.

4.1 At each measurement station the transmitter operator positions himself and remains stationary. The receiver operator should position the receiver coil such that the "COIL SEPARATION" meter is in the green area.

4.2 The "SENSITIVITY RANGE" switch should be set to the position which positions the "CONDUCTIVITY" reading in the upper 70% of the scale. The meter reading should then be recorded in millimhos/meter. (The "SENSITIVITY RANGE" switch setting indicates full scale meter reading.)

NOTE: In order to minimize reading errors particularly on the most sensitive settings it is necessary to keep the receiver and transmitter consoles separated from their respective coils by 0.7 - 1.0 meter.

5. PERIODIC DAILY CHECKS

5.1 Nulling: To make sure that any possible drift is kept under control, we suggest that you repeat the electronic nulling procedure (steps 2.1 to 2.6) at least once per day during the survey.

5.2 Receiver Battery Check: The receiver battery test is done simply by switching the "SEPARATION" switch to "BATT" position and power switch to "OFF" position. The meters will indicate the condition of the two sets of receiver batteries. If the indicator is below the markings replace the batteries, or see that the battery contacts are clean.

With new batteries, meter reading could be on the upper limit of the scale.

5.3 Transmitter Batteries: With the Tx coil connected and the "LEVEL" switch in the "HIGH" position, needle of the Battery Monitor Meter should be in the black area of the scale. Keeping the transmitter batteries warm in cold weather will improve battery lifetime.

6. TRANSMITTER OUTPUT POWER

As earlier mentioned transmitter output power should be kept at the "NORMAL" level for increased battery life. Under very noisy conditions (power line or spherics) the transmitter power should be increased by switching the "LEVEL" switch to "HIGH" position.

7. INSTRUMENT CALIBRATION

Prior to leaving the factory, the instrument is calibrated to read correctly, but due to its high sensitivity, fine adjustment of the instrument in the field may be helpful, particularly in regions of low conductivity and where the conductivity values are known to a good degree of confidence.

NOTE: As a precautionary measure the readings and exact location should be recorded prior to making any adjustments so that if the correction is found to be unsatisfactory the original settings can be recovered without returning the instrument to the factory.

7.1 Having decided what the new reading should be, the instrument "zero" can be adjusted by controls inside the receiver console. To gain access to these controls remove the receiver chassis from its metal cover by undoing the two side screws and battery lid.

7.2 The "zero" adjustment potentiometers are located on printed circuit board No.5 - one potentiometer for each coil separation.

10 meters - R15
20 meters - R14
40 meters - R13

7.3 The appropriate potentiometer should then be adjusted to give the desired meter reading.

NOTE: Each control should be adjusted only with the corresponding coil separation.

7.4 After adjusting any of the "zero" controls check the Electronic Null (Section 2). Re-Null is necessary and repeat "zero" adjustment.

7.5 The switch with positions "N" (normal) and "R" (reversed), which is not shown on the accompanying illustration, is used to reverse the meter deflection. This switch is operated when the meter deflects negatively as may occur when traversing vertical dikes.

EM34-3 INSTRUMENT SPECIFICATIONS

Measured Quantity	Apparent conductivity of the ground, in mS/meter (divided into 1000 gives ohm meters)
Range of Conductivity	0-3, 10, 30, 100, 300 mS/meter
Instrument Noise Level	Less than 0.2 mS/meter
Measurement Accuracy	±5% at 20 mS/meter
Measurement Precision	±2% of full scale deflection
Primary Field Source	Self-contained dipole transmitter
Sensor	Self-contained dipole receiver
Intercoil Spacing	Interchangeable 10 meters, 20 meters or 40 meters
Operating Frequency	6.4 kHz at 10 meter spacing 1.6 kHz at 20 meter spacing 0.4 kHz at 40 meter spacing
Operating Temperature Range	Operation to specifications within temperature range -40°C to +50°C
Power Supply	Transmitter: 8 disposable "D" cells Life: 20 hrs continuous duty-"NORMAL" Life: 7 hrs continuous duty-"HIGH" Receiver: 8 disposable "C" cells Life: 20 hrs continuous
Reference Cable	Lightweight 2 wire shielded cable

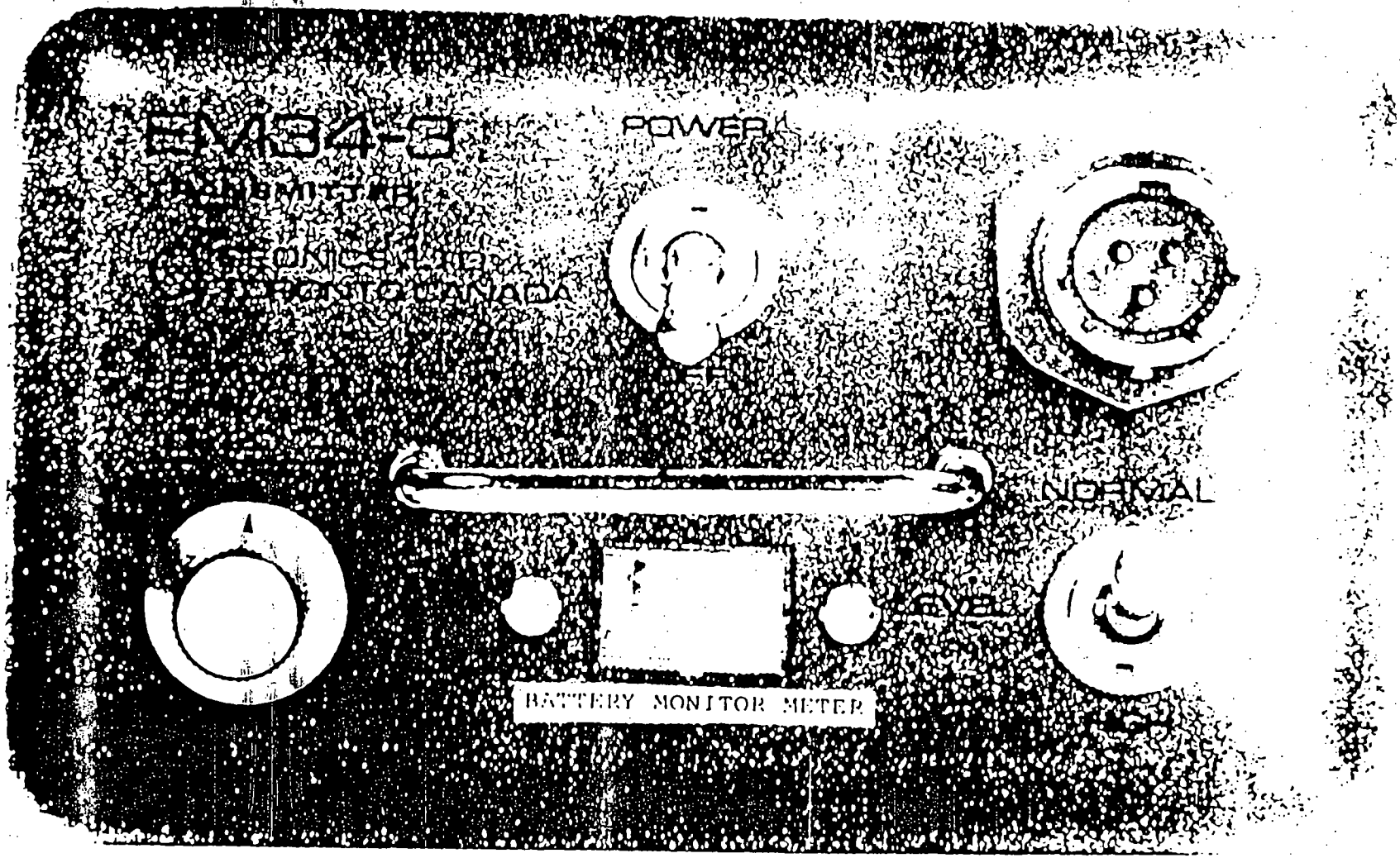
Dimensions:

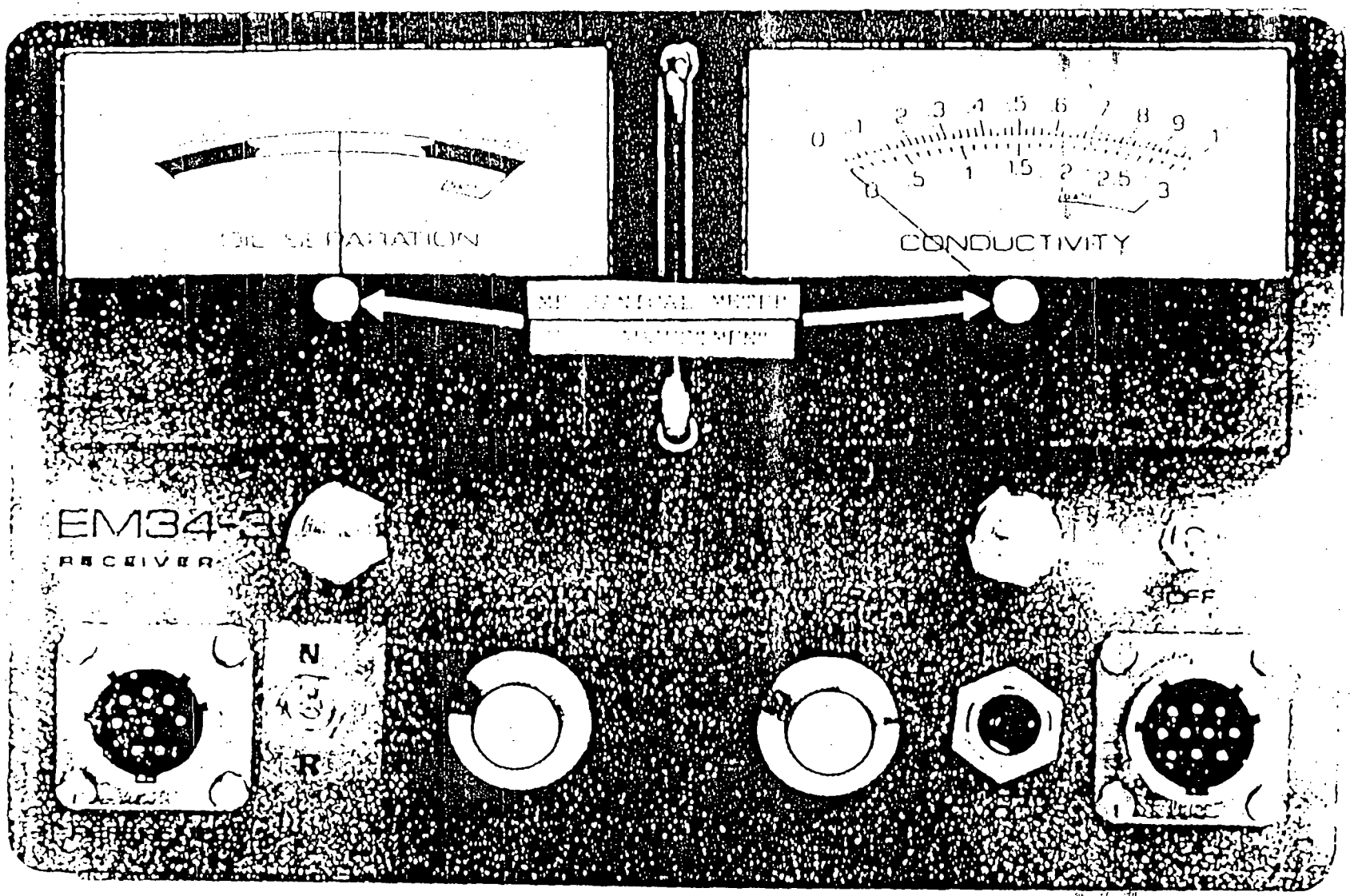
Receiver Console	19.5 x 13.5 x 26 cm
Receiver Coil	63 cm
Transmitter Console	15 x 8 x 26 cm
Transmitter Coil	63 cm

Weights:

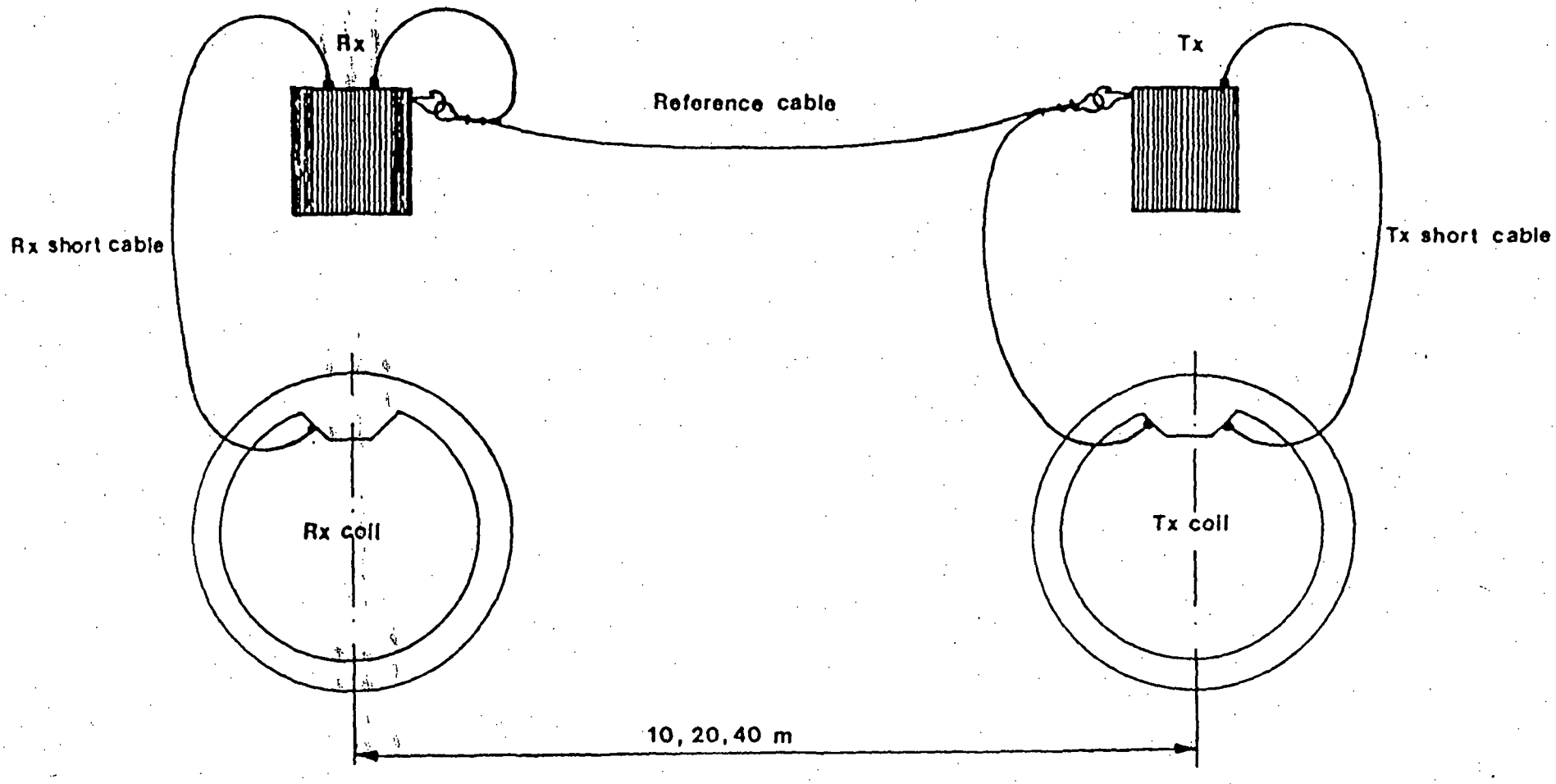
Receiver Console	3.1 kg
Receiver Coil	5.6 kg
Transmitter Console	3.0 kg
Transmitter Coil	8.8 kg
Shipping Weight	50 kg

Sept. 1986./FBS


EMB4-3
POWER
NORMAL
BATTERY MONITOR METER


CONDUCTIVITY
EM34-3
RECEIVER
N
R
OFF

EM 34-3 CABLE CONNECTION



APPENDIX F

BURMISTER SOIL CLASSIFICATION SYSTEM

THE BURMISTER SOILS CLASSIFICATION SYSTEM

The Burmister system, also referred to as the American Society for Engineering Education (ASEE) system, provides a definitive shorthand nomenclature. Percentage ranges in weight for various granular components are given as: AND, >50%; and, 35-50%; some, 20-35%; little, 10-20%; trace, 1-10%. The percentages are estimated from experience, or by the use of the "ball moisutre test" [see Burmister (1949) and Table 5.36].

Silts and clays can be identified by the smallest diameter thread that can be rolled with a saturated specimen as given on Table 5.35.

An example sample description is "Coarse to fine SAND, some fine gravel, little silt," or in shorthand nomenclature: "c-f S, s.f G, l. S."

Field Determinations

A guide to determining the various soil components on the basis of characteristics and diagnostic procedures is given on Table 5.36, and a guide to the identification of the fine-grained fractions is given on Table 5.37.

Field Descriptions

The elements of field descriptions, including the significance of color, and nomenclature for structure and fabric are given on Table 5.38. The importance of complete field descriptions cannot be overstressed, since they provide the basic information for evaluations.

REFERENCES

Burmister, D.M., 1949, "Principles and Techniques of Soil Identification," Proc. 29th Annual Mtg., Highway Research Board, Washington, D.C.

TABLE 5.34
ASEE SYSTEM OF DEFINITION FOR VISUAL IDENTIFICATION OF SOILS*

DEFINITION OF SOIL COMPONENTS AND FRACTIONS

Granular material	Symbol	Fraction	Sieve size and definition
Boulders	Bldr		9 in +
Cobbles	Cbl		3 to 9 in
Gravel	G	Coarse (c) Medium (m) Fine (f)	1 to 3 in ¾ to 1 in No. 10 to ¾ in
Sand	S	Coarse (c) Medium (m) Fine (f)	No. 30 to no. 10 No. 60 to no. 30 No. 200 to no. 60
Silt	S		Passing no. (0.074 mm). (Material nonplastic and exhibits little or no strength when air-dried.)
Organic silt	OS		Material passing no. 200, exhibiting: (1) plastic properties within a certain range of moisture content and (2) fine granular and organic characteristics.
Clay	See below		Material passing no. 200 which can be made to exhibit plasticity and clay qualities within a certain range of moisture content, and which exhibits considerable strength when air-dried.

Clay material	Symbol	Plasticity	Plasticity index
Clayey SILT	CyS	Slight (SL)	1 to 5
SILT and CLAY	S&C	Low (L)	5 to 10
CLAY and SILT	C&S	Medium (M)	10 to 20
Silty CLAY	SyC	High (H)	20 to 40
CLAY	C	Very high (VH)	40+

DEFINITION OF COMPONENT PROPORTIONS

Component	Written	Portions	Symbol	Percentage range by weight†
Principal	CAPITALS			50 or more
Minor	Lower case	And	a	35 to 50
		some	s	20 to 35
		little	l	10 to 20
		trace	t	1 to 10

*After Burmister (1948).[31]

†Minus sign (−) signifies lower limit, plus sign (+) upper limit, no sign middle range.

TABLE 5.35
IDENTIFICATION OF COMPOSITE CLAY SOILS ON AN OVERALL PLASTICITY BASIS*

Degree of overall plasticity	PI	Identification (Burmister system)	Smallest diameter of rolled threads, mm
Nonplastic	0	SILT	None
Slight	1-5	Clayey Silt	6
Low	5-10	SILT and CLAY	3
Medium	10-20	CLAY and SILT	1.5
High	20-40	Silty CLAY	0.8
Very high	>40	CLAY	0.4

*After Burmister (1951c).[33] Reprinted with permission from the *Annual Book of ASTM Standards*, Part 19, copyright, American Society for Testing and Materials.

TABLE 5.36
FIELD DETERMINATION OF SOIL COMPONENTS*

Component	Characteristic	Determination
Gravel	Dia. 5-76 mm	Measurable.
Sand		
Coarse	Dia. 2-5 mm	Visible to eye, measurable.
Medium	Dia. 0.4-2.0 mm	Visible to eye.
Fine	Dia. 0.074-0.4 mm	Barely discernible to unaided eye.
Silt: coarse	Dia. 0.02-0.074 mm	Distinguishable with hand lens.
Sand-silt mixtures	Apparent cohesion	Measured by ball test [Burmister (1949)[32]].
		Form ball in hand by compacting moist soil to diameter 1½ in (37 mm).
		Medium to fine sand forms weak ball with difficulty; cannot be picked up between thumb and forefinger without crushing.
		Ball can be picked up with difficulty: 20% silt
		Ball readily picked up: 35 to 50% silt.
Silt vs. clay	Dia. <0.074 mm	See also Table 5.37.
Silt	Strength	Low when air-dried, crumbles easily.
	Dilatancy test	Mixed with water to thick paste consistency. Appears wet and shiny when shaken in palm of hand, but when palm is cupped and sample squeezed, surface immediately dulls and dries.
	Dispersion test	Mixed with water in container; particles settle out in ¼ to 1 hour [L = >10 cm].
	Thread test	Rolls into thin threads in wet state but threads break when picked up by one end.
Clay	Strength	High when air-dried, breaks with difficulty.
	Plasticity	When mixed with water to form paste and squeezed in hand, specimen merely deforms and surface does not change in appearance.
	Dispersion test	Remains in suspension from several hours to several days in container.
	Thread test	Can be rolled into fine threads that remain intact. Fineness depends on clay content and mineralogy.
		Thread diameter when saturated vs. PI and identification given on Table 5.35.
	Adhesion	Sticky and greasy feel when smeared between fingers.
Organic Soils	Strength	Relatively high when air-dried.
	Odor	Decayed organic matter; gases.
	Organic matter	Root fibers, etc.
	Shrinkage	Very high.

TABLE 5.37
IDENTIFICATION OF FINE-GRAINED SOIL FRACTIONS FROM MANUAL TESTS*

Material	Dry strength	Dilatency reaction	Toughness of plastic thread	Plasticity description
Sandy silt	None-very low	Rapid	Weak, soft	None-low
Silt	Very low-low	Rapid	Weak, soft	None-low
Clayey silt	Low-medium	Rapid-slow	Medium stiff	Slight-medium
Sandy clay	Low-high	Slow-none	Medium stiff	Slight-medium
Silty clay	Medium-high	Slow-none	Medium stiff	Slight-medium
Clay	High-very high	None	Very stiff	High
Organic silt	Low-medium	Slow	Weak, soft	Slight
Organic clay	Medium-very high	None	Medium stiff	Medium-high

*From ASTM D2488. Reprinted with permission of the American Society for Testing and Materials.

TABLE 5.38
SOIL IDENTIFICATION: ELEMENTS OF FIELD DESCRIPTIONS

Elements	Importance	Description
Gradation	Components	See Table 5.36.
Grain shape	Strength	Rounded, subrounded, subangular, angular.
Mineral constituents	Strength	From Table 5.5.
Color	Provides information on soil minerals and environment	Tone: Function of soil moisture; the wetter the deeper the color. Red, yellow, brown: Good drainage and aeration. Deep reds: Indicate iron oxides. Pale yellow, yellow browns: Hydrated iron oxides. Bluish gray: Reduced bivalent iron compound, poor drainage and aerobic conditions. Light grays: Due to leaching. Mottled colors: Restricted permeability, or poor drainage and aeration. Black, dark brown, or gray: Organic soils; or caused by dark minerals (manganese, titanium, magnetite). Green: Glauconite (hydrous silicate, K and Fe). White: Silica, lime, gypsum, kaolin clay.
Compactness in situ	Compressibility of granular soils	From SPT (see *Table* 3.28) or visual estimate.
Consistency in situ	Strength of clay soils	From hand test or SPT (see *Table* 3.29).
Field moisture	Estimate GWL depth	From sample appearance: Dry, moist, wet (saturated).
Homogeneity	Permeability estimates (k_h vs. k_v)	Fabric or structure: Terms not universally defined. Homogeneous: Without stratification; uniform fabric. Stratified: Partings—very fine, barely visible, form weakness planes Lenses—from very fine to 5 mm Seams—5 mm to 2 cm Layers—>2 cm Varves—interbedded seams Pockets: Foreign irregularly shaped mass in matrix. Heterogeneous: very irregular, without definite form.
Cementation	Strength	Reaction with dilute HCl: None, weak, strong.

NOTE: Example: "Medium compact, tan, silty coarse to fine sand (subrounded, quartz, with some shell fragments) with lenses and seams of dark gray silt; moist."

APPENDIX G

SAMPLE DOCUMENTATION AND SHIPPING FORMS

University Hygienic Laboratory

The University of Iowa
Oakdale Hall
Iowa City, IA 52242
319-335-4500 (FAX 335-4555)

H.A. Wallace Building
900 East Grand
Des Moines, IA 50319
515-281-5371 (FAX 243-1349)

CHAIN OF CUSTODY RECORD

Sampler:	Project:
Address:	Comments:

Location	Sample ID	Date	Time	No./Type Container

Relinquished by (signature)	Date	Time	Received by (signature)
Relinquished by (signature)	Date	Time	Received by (signature)
Relinquished by (signature)	Date	Time	Received by (signature)
Relinquished by (signature)	Date	Time	Received for Lab by:

Custody seals intact? ☐ Yes ☐ No

Sample containers intact? ☐ Yes ☐ No

Remarks:

EXAMPLE

University Hygienic Laboratory

The University of Iowa
Oakdale Hall
Iowa City, IA 52242
319-335-4500 (FAX 335-4555)

H.A. Wallace Building
900 East Grand
Des Moines, IA 50319
515-281-5371 (FAX 243-1349)

CHAIN OF CUSTODY RECORD

Sampler: Michael Watkins
ECKENFELDER INC.

Project: SASC - DICO
#6595 A

Address: 1200 MacArthur Blvd.
Mahwah, NJ
07430

Comments: 1 of 1

Location	Sample ID	Date	Time	No./Type Container
DB-46	DB-46 4'-6'	11/20/89	9:30 A	3-40ml 2-glass pint
DB-46	DB-46 10'-12'	11/20/89	9:50 A	3-40ml 2-glass pint
DB-47	DB-47 6'-8'	11/20/89	1:45 P	3-40ml
DB-47	DB-47 10'-12'	11/20/89	2:05 P	3-40ml
Rinsate Blank DB-47	RB-7	11/20/89	2:10 P	3-40ml 1-glass Quart
Trip Blank	TB-18	11/20/89	8:00 A	1-40ml

Relinquished by (signature)	Date	Time	Received by (signature)
Michael Watkins	11/20/89	3:30 pm	
Relinquished by (signature)	Date	Time	Received by (signature)
Relinquished by (signature)	Date	Time	Received by (signature)
Relinquished by (signature)	Date	Time	Received for Lab by:

Custody seals intact? ☐ Yes ☐ No

Sample containers intact? ☐ Yes ☐ No

Remarks:

HYGIENIC LABORATORY • The University of Iowa

University Hygienic Laboratory
Oakdale Campus
Iowa City, Iowa 52242

Henry A. Wallace Building
900 E. Grand Avenue
Des Moines, Iowa 50319

Sampling Information

Report to: _____

_____

_____

_____

Telephone: _____

Bill to: P.O. No._____

_____

_____

_____

_____

Telephone: _____

Complete the following information. Attach photocopies of analyte lists, methods, detection limits, etc., required by QA/work plan, permit or other regulations. Use the back of form to supply diagrams, possible interferences, or additional information.

Type of sample: ☐-water ☐-soil ☐-_____ Project name: _____

Reason for sampling: _____

Sample location (or PWSID #): _____

Sampling date: _____ Time(s): _____

MUST BE COMPLETED: (include list of analytes)

Analysis desired: _____

If specific method is required, list here: _____

Check here if RUSH analysis at extra cost is required: ☐ RUSH

Shipping date: _____ Via: _____

Collector's signature: _____

Collector's name (print): _____

FOR LABORATORY USE ONLY

Received by: _____ Via: _____

Date: _____ Time: _____ Log No: _____

Sample intact? ☐ Yes ☐ No End log: _____

Comments: _____

_____

EXAMPLE

HYGIENIC LABORATORY • The University of Iowa

[redacted]versity Hygienic Laboratory
[redacted]kdale Campus
Iowa City, Iowa 52242

Henry A. Wallace Building
900 E. Grand Avenue
Des Moines, Iowa 50319

Sampling Information

Report to:
William G. Saukup
ECKENFELDER INC.
1200 MacArthur Blvd.
Mahwah, NJ 07430
Telephone: (201) 529-0800

Bill to: P.O. No.
DICO, Inc.
200 SW 16th Street
Des Moines, IA 50305
Telephone: (515) 244 7286

Complete the following information. Attach photocopies of analyte lists, methods, detection limits, etc., required by QA/work plan, permit or other regulations. Use the back of form to supply diagrams, possible interferences, or additional information.

Type of sample: ☐-water ☒-soil ☐-_____ Project name: SASC

[redacted]son for sampling: RI

Sample location (or PWSID #): DB-20 8'-10'

Sampling date: 11/8/89 Time(s): 10:00 am

MUST BE COMPLETED: (include list of analytes)

Analysis desired: HSL (V)

If specific method is required, list here: per CLP

Check here if RUSH analysis at extra cost is required: ☐ RUSH

Shipping date: 11/9/89 Via: Federal Express Priority 1

Collector's signature: Michael Watkins

Collector's name (print): Michael Watkins

FOR LABORATORY USE ONLY

Received by: _____ Via: _____

[redacted]Date: _____ Time: _____ Log No: _____

Sample intact? ☐ Yes ☐ No End log: _____

Comments: _____

Sample Label

UNIVERSITY HYGIENIC LABORATORY
Oakdale Campus, Iowa City, IA 52242
(319) 335-4500

Container Code # _____

Project # or Facilty/Location _____

_____

Well # or Specimen I.D. _____

Date _____ Time _____ ☐ AM ☐ PM

Collector _____

CUSTODY SEAL

DATE _____

SIGNATURE _____

CHEM I

23787-F Eichler St.
Hayward, CA 94545
(415) 782-3905
(800) 443-1689

Specialty Cleaned Containers

EXAMPLE

Sample Label

UNIVERSITY HYGIENIC LABORATORY
Oakdale Campus, Iowa City, IA 52242
(319) 335-4500

Container Code # _____

Project # or Facilty/Location 6595 A

DICO

Well # or Specimen I.D. DB-12 8'-10'

Date 11-7-89 Time 2:15 ☐ AM ☒ PM

Collector Michael Watkins

CUSTODY SEAL

11-7-89
DATE

Michael Watkins
SIGNATURE

CHEM

23787-F Eichler St.
Hayward, CA 94545
(415) 782-3905
(800) 443-1689

Specialty Cleaned Containers

CUSTOMER:
PLEASE REMOVE ONE OF THESE LABELS AND
PLACE IT ABOVE THE AIRBILL POUCH.

9h2E03E03E2h

9h2E03E03E2h

FEDERAL EXPRESS

AIRBILL

USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

PACKAGE TRACKING NUMBER 3245303246

3245303246

3 2 4 5 3 0 3 2 4 6

Sender's Federal Express Account Number	Date

From (Your Name) Please Print	Your Phone Number (Very Important)
1	( )
Company	Department/Floor No.
Street Address	
City State	ZIP Required

To (Recipient's Name) Please Print	Recipient's Phone Number (Very Important)
2	( )
Company	Department/Floor No.
Exact Street Address *(We Cannot Deliver to P.O. Boxes or P.O. E. Zip Codes.)*	
City State	ZIP Required

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.)

PAYMENT ☐ Bill Sender ☐ Bill Recipient's FedEx Acct. No. Fill in Account Number below ☐ Bill 3rd Party FedEx Acct No Fill in Account Number below ☐ Bill Credit Card Fill in Credit Card Number below ☐ Cash

Expiration Date ____ /

H IF HOLD FOR PICK-UP, Print FEDEX Address Here

Street Address

City State ZIP Required

4 SERVICES

1 ☐ PRIORITY 1 Overnight Delivery
2 ☐ COURIER-PAK OVERNIGHT ENVELOPE*
3 ☐ OVERNIGHT BOX
4 ☐ OVERNIGHT TUBE
5 ☐ STANDARD AIR Delivery not later than second business day
6 ☐ OVERNIGHT LETTER*
7 ☐
8 ☐
9 ☐
10 ☐

*Declared Value Limit $100.

DELIVERY AND SPECIAL HANDLING

1 ☐ HOLD FOR PICK-UP (Fill in Box H)
2 ☐ DELIVER WEEKDAY
3 DELIVER SATURDAY (Extra charge) ☐
4 ☐ DANGEROUS GOODS (Extra charge)
5 ☐ CONSTANT SURVEILLANCE SERVICE (CSS) (Extra charge) (Release Signature Not Applicable)
6 ☐ DRY ICE ____ Lbs
7 ☐ OTHER SPECIAL SERVICE ____
8 ☐
9 ☐ SATURDAY PICK-UP
10 ☐
11 ☐
12 ☐ HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT IN POUNDS ONLY	YOUR DECLARED VALUE (See right)	PICK-UP $
Total	Total	Total	

Received at
U.S. Postal Stop
F.E. Center
Driver
Station
FEDEX Corp Employee No.
Date/Time FEDEX Use

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

Use of this airbill constitutes your agreement to the service conditions in our current Service Guide which is available upon request. See back of sender's copy of this airbill for further information.

We will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay or non-delivery, unless you specify a higher amount in the space to the left pay 40¢ per additional $100 specified and document your actual loss in the event of a claim. Maximum amount limitations found in the current Federal Express Service Guide apply. Your rights to recover from Federal Express for loss of the intrinsic value of the package as well as for loss of sales, income, interest, profit, attorneys fees, costs and any other form of damage whether direct, incidental, consequential or special is limited to the greater of $100 or the declared value specified to the left. In no event shall your recovery exceed your actual loss.

In the event of untimely delivery, Federal Express will at your request and with some limitations refund all transportation charges paid. See Service Guide for further information.

5 Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature: ____

Federal Express Use
Base Charge
Multiple Box Discount
Other 1
Other 2
Total Charge

PART #2041738900
REVISION DATE 10/88
PRINTED IN U.S.A. WCSEL
009
© 1988 F.E.C.
3/89

EXAMPLE

CUSTOMER: PLEASE REMOVE ONE OF THESE LABELS AND PLACE IT ABOVE THE AIRBILL POUCH.

9h2E03E5h2E

9h2E03E5h2E

FEDERAL EXPRESS

AIRBILL

USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

PACKAGE TRACKING NUMBER 3245303246

3245303246

Sender's Federal Express Account Number: 1234-56-7891

Date: 11/7/89

From (Your Name) Please Print: Michael Watkins

Your Phone Number (Very Important): (201) 529-0800

Company: ECKENFELDER INC.

Department/Floor No.:

Street Address: 1200 MacArthur Blvd

City: Mahwah State: NJ ZIP Required: 07430

To (Recipient's Name) Please Print: Dr. Michael Wichman

Recipient's Phone Number (Very Important): (319) 335-4500

Company: University Hygienic Laboratory

Department/Floor No.:

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): Oakdale Campus

City: Iowa City State: IA ZIP Required: 52242

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.): 6595 A

H IF HOLD FOR PICK-UP, Print FEDEX Address Here

Street Address:

City State ZIP Required

PAYMENT ☒ Bill Sender ☐ Bill Recipient's FedEx Acct No. Fill in Account Number below ☐ Bill 3rd Party FedEx Acct No. Fill in Account Number below ☐ Bill Credit Card Fill in Credit Card Number below

☐ Cash Expiration Date ___/___

4 SERVICES

1 ☒ **PRIORITY 1** Overnight Delivery
2 ☐ **COURIER-PAK OVERNIGHT ENVELOPE***
3 ☐ **OVERNIGHT BOX**
4 ☐ **OVERNIGHT TUBE**
5 ☐ **STANDARD AIR** Delivery not later than second business day
6 ☐ **OVERNIGHT LETTER***
7 ☐
8 ☐
9 ☐
10 ☐

* Declared Value Limit $100

DELIVERY AND SPECIAL HANDLING

1 ☐ **HOLD FOR PICK-UP** (If in Box H)
2 ☒ **DELIVER WEEKDAY**
3 **DELIVER SATURDAY** (Extra charge) ☐
4 ☐ **DANGEROUS GOODS** (Extra charge)
5 ☐ **CONSTANT SURVEILLANCE SERVICE (CSS)** (Extra charge) (Release Signature Not Applicable)
6 ☐ **DRY ICE** ___ Lbs
7 ☐ **OTHER SPECIAL SERVICE** ___
8 ☐
9 ☐ **SATURDAY PICK-UP** (Extra charge)
10 ☐
11 ☐
12 ☐ **HOLIDAY DELIVERY** (If offered) (Extra charge)

PACKAGES	WEIGHT IN POUNDS ONLY	YOUR DECLARED VALUE (See right)	CASH/COD
1	25		
Total 1	Total 25	Total	

Received at
1 ☐ Regular Stop
2 ☐ Courier Pick-up
Drop Box | Station | Route | Driver No. | Time

FEDEX Corp. Employee No.

Date/Time by FEDEX Use

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

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In the event of untimely delivery Federal Express will at your request and with some limitations refund all transportation charges paid. See Service Guide for further information.

5 Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature: ___

FedEx Employee Use
Extra Charges
Extended Liability Charge
Other 1
Other 2
Total Charges

PART #204173#900
REVISION DATE 10/88
PRINTED IN U.S.A. WCSEL

009

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3'89

ECKENFELDER INC.

October 24, 1989 6349

Mr. Glenn Curtis
Waste Management Division
USEPA Region 7
726 Minnesota Avenue
Kansas City, Kansas 66101

RE: Des Moines South Area Source Control Project
Sampling and Analysis Plan

Dear Mr. Curtis:

ECKENFELDER INC. is pleased to submit the enclosed Sampling and Analysis Plan (SAP). The SAP includes a detailed description of both the field procedures (Field Sampling Plan) and laboratory procedures (Quality Assurance Project Plan) associated with the SASC project.

Should you have any questions, please do not hesitate to contact us.

Very truly yours,

ECKENFELDER INC.

Michael L Watkins

Michael L. Watkins
Senior Hydrogeologist

William G. Soukup /cas

William G. Soukup
Senior Hydrogeologist

MLW/cas

Enclosure

1200 MacArthur Boulevard
Mahwah, New Jersey 07430
201.529.0800
FAX 201.529.0818