CORNING AGWAY
WORK PLAN
CORNING AGWAY FACILITY
SOUTH CORNING, NEW YORK

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by

H&A of New York
Rochester, New York

for

John Eberenz, Inc.

File No. 70158-40

April 1990

H&A of New York

Consulting
Geotechnical Engineers,
Geologists and
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1 May 1990
File No. 70158-40

Sayles, Evans, Brayton, Palmer & Tifft
One West Church Street
Elmira, New York 14901

Attention: Ms. Cynthia Hutchinson, Esq.

Subject: Bell's Farm and Home Center
Interim Remedial Measures Program

Ladies and Gentlemen:

H&A of New York is pleased to submit herewith a final Work Plan to comply with NYSDEC's requirements to conduct a hydrogeologic investigation at the former location of Bell's Farm and Home Center in South Corning, New York. This Work Plan discusses the objectives and procedures necessary to conduct investigations to determine whether the 3 September 1989 fire suppression activities resulted in contamination of soil, surface water or groundwater at the site. In addition, the Work Plan proposes clean up criteria and the rationale for developing interim remedial measures.

The interpretations made herein are based on currently available off-site and on-site data and may require re-evaluation during subsequent phases of the investigation. We have forwarded the appropriate number of copies of the Work Plan to the State agencies listed below via overnight express mail.

Sincerely yours,
H&A OF NEW YORK

Joseph S. Campisi

Joseph S. Campisi
Senior Env. Geologist

Lawrence P. Smith
Assistant Manager

JSC/LPS/jsc

xc: NYSDEC - Region 8 - Albert Butkas (1 copy)
NYSDEC - Albany - Robert Hall (5 copies)
NYSDOH - Rochester - David Napier (1 copy)

Affiliate of
Haley & Aldrich, Inc.
Cambridge, Massachusetts

Offices
Glastonbury, Connecticut
Portland, Maine
Bedford, New Hampshire

QUALITY ASSURANCE STATEMENT

Date 1 May 1990

The attached document has been reviewed, and comments and suggestions have been submitted to the Project Manager prior to submission of the attached document to the New York State Department of Environmental Conservation.

David J. Hagen

David J. Hagen
Quality Assurance Officer
Staff Hydrogeologist

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I. INTRODUCTION

1.1 Background

This document shall serve as the work plan for the Corning Agway site located in South Corning, New York (see Project Locus-Figure 1). The intent of the work plan is to outline the work tasks and quality assurance procedures necessary to perform the proposed investigation and implement interim remedial measures, if necessary, on the John Eberenz Inc. property. The purpose of the investigation is to characterize the nature and extent of potential contamination in soil, surface water and groundwater at the site due to the 3 September 1989 fire at the Corning Agway site. Based on the results of the investigation program it may be necessary to implement interim remedial measures (IRM) at the site. This investigation is being carried out by John Eberenz Inc. at the direction of the New York State Department of Environmental Conservation (NYSDEC).

A fire at the Bell's Farm and Home Center occurred on 3 September, 1989 and resulted in the potential release of chemicals during suppression activities by local fire companies. As a precautionary measure the Village of South Corning turned off its water supply well adjacent to the site on 3 September, 1989. Soil, surface water, and groundwater have been sampled by the New York State Department of Health and Groundwater Technology Incorporated between 5 September 1989 and 14 December 1989 to determine if chemicals allegedly released during fire suppression efforts have affected the environment. A summary of the sampling parameters and analytical results are found in Tables 2-1 and 2-2.

1.2 Work Plan Organization

This document describes the rationale for the investigations to be performed on-site and detailed procedures for conducting the various field investigations and laboratory analyses. The work plan also describes proposed clean up levels for contaminants in on-site soils and groundwater, and tasks necessary to identify and screen possible remedial alternatives in the event contaminants resulting from the fire are found at levels above the proposed cleanup levels.

Section 2 describes the scope of work and technical approach for the site investigation program. Section 3 describes the project organization and the personnel that will implement the project. Section 4 describes the schedule and reporting requirements for the site investigation program. Cleanup criteria proposed for the site, and the basis for the cleanup levels selected for the IRMs are described in Section 5. Section 6 describes the interim remedial measures that may be implemented at the Agway site, and Section 7 describes the health and safety plan for the site investigations.

1.3 Background Hydrogeologic Conditions

The site is located in the northern glaciated section of the Allegheny Plateau. The underlying bedrock consists of nearly horizontal bedded shale and siltstone of the Gardeau Formation. During the glacial period ice advanced over the area, scouring the existing topography, widening valleys and steepening hillslopes. Till deposits were formed as the ice pushed sediment ahead and to the side. As the glaciers receded, the valleys were partially filled with thick layers of outwash deposited by the melting water. Periodically small lakes would form on the surface of the outwash and deposit interbedded layers of silt and clay.

The stratigraphy resulting from these processes, shown in Figure 2, consists of thick layers of sand and gravel with lenses of silt and clay in the river valleys. Glacial till has been deposited along the valley walls. The saturated sand and gravel deposits in the river valley provide a high yielding aquifer relied on by municipalities for water supply.

A potentiometric surface map for the area (Figure 3) indicates the groundwater flow beneath the site is to the southeast in the deep valley fill aquifer.

1.4 Previous Chemical Testing

An existing chemical database has been developed by GTEL Environmental Laboratories and the New York State Department of Health. The database has been used by NYSDEC to identify several compounds of concern on the site. The compounds previously detected are summarized in Table 1-2. Laboratory QA/QC problems with some of the analyses render a portion of the data questionable, as indicated in the Table. The following are the specific concerns:

GTEL Data

1. The Matrix Spike Recovery (MSR) is a test to determine if the chemistry of the sample (the matrix) is interfering with the laboratory's ability to accurately quantify a

particular compound. The MSR for 2,4-D should fall between 20 and 160%, while the MSR data for this compound for GTEL's analysis of soils was 1,530%. This indicates that the 2,4-D concentrations cited for soils in the GTI report may be elevated from actual concentrations.

2. MSR data for several trace metals show similar problems to that specified for 2,4-D. Acceptability Limit = 75 to 125%; Copper MSR = 55.7%, Lead MSR = 0%, Zinc MSR = 0%. The MSR values for these trace metals indicates that the actual metals analyses may be elevated.

3. Sample Duplicate Precision (SDP) is a measure of the laboratory's ability to repeat the analysis of a sample for a particular compound and obtain similar results. The repeated analyses should not differ from the original analysis by more than 20%. The duplicate analyses for several trace metals in soil yielded high SDP values; chromium (70%), copper (25%), lead (70%), and zinc (34%). These SDP values indicate a high relative difference between the original sample analysis and the duplicate analysis. These SDP values indicate that the trace metal concentrations may not be repeatable.

New York State Department of Health Data

1. The laboratory method blank analyzed by the NYSDOH for the ash sample indicated the presence of tetrachlorodibenzofurans and pentachlorodibenzofurans at concentrations of 69 pg/kg and 63 pg/kg, respectively. These results indicate that the laboratory analyses of the method blank showed erroneous positives, or could indicate that the laboratory method blank was contaminated with these compounds.

2. The laboratory method blank analyzed by the NYSDOH for water indicated the presence of octachlorodibenzodioxin at a concentration of 97 pg/l.

Although the above chemical testing data was not subjected to a rigorous data validation, the concerns expressed indicate a need for supplemental chemical analyses to corroborate earlier results.

II. SCOPE OF WORK FOR SITE INVESTIGATIONS

2.1 IRM Investigation Program Objectives

The purpose of the IRM is to remediate the potential sources of contamination which may exist on the site, i.e. pond, dry well sediments, surface soils. Before potential sources of contamination can be remediated, it must be determined which if any on site media (surface water, groundwater, soil, sediments) is a source of contamination. The proposed investigation has been designed to obtain samples of these various media to evaluate whether contaminants resulting from the fire exist in elevated concentrations that may present a health or environmental threat to the residents of the Village of South Corning. The results of this investigation will be utilized to determine what level of interim remedial measures will be necessary and provide an evaluation of remedial action alternatives. Figure 4 provides a Flow Chart reviewing the various phases of the investigation and methodology for implementing interim remedial measures and continued monitoring.

2.2 Well Cluster Installation

A well cluster consisting of one shallow and one deep overburden well has been installed southeast of the site immediately adjacent to the southeast section of perimeter fence line (see Figure 5. This cluster is approximately 130 feet upgradient from the Village of South Corning water supply well. The deep boring was advanced to approximately 85 feet with continuous sampling. A clay layer was confirmed at approximately 21 to 32 feet below ground surface at B101D.

It is anticipated that the deep well will be completed with a screened interval extending from 73 to 83 feet, which is roughly equivalent to the screened interval of the Village well. The shallow well will be screened over a 5 ft. interval above the clay layer. The well cluster will yield information on subsurface hydrogeologic conditions including the extent to which the clay layer is acting as an aquitard to separate the shallow aquifer from the deeper aquifer. Figure 6 shows the well construction diagrams for both wells.

2.3 Soil and Water Sampling

The purpose of the sampling program to be conducted at the Agway Site is to obtain sufficient data to determine whether contamination has resulted from the fire, and if confirmed, the extent and nature of the contaminants. The sampling program has been developed to address requirements discussed during a

21 March 1990 meeting with representatives of DEC and a 23 March 1990 letter from the DEC specifying the contents of the work plan and the sampling program to be utilized to evaluate whether interim remedial measures will be necessary.

The details of the sampling program are included in Table 2-1 which is a matrix depicting the proposed sampling locations and chemical analyses that will be conducted, and Table 2-2 which shows the holding times and preservation requirements for sampling parameters. The locations of proposed on-site, off-site, and background sampling points are depicted on Figures 5 and 6. The schedule for all major field activities and submittals is included on Table 2-3. The following discussion provides an overview of the major components of the sampling program.

2.3.1 Soil Sampling

Soil samples will be collected from a number of on-site locations, from the pond sediments, from the south side of Flower Avenue and from off-site background locations. The locations for the proposed soil sampling are shown in Figure 5 and 5. The number of soil samples to be collected from each area and the chemical constituents to be analyzed for are shown in Table 2-1. A duplicate sample will be collected from each sampling location for possible future analysis. No samples will be analyzed for organochlorine pesticides because organochlorine pesticides were not detected in any of the previously analyzed soil or groundwater samples.

On-site and off-site surficial soil samples, as well as one of the pond sediment samples will be composited. This sampling technique will provide for samples which are more representative of the actual on and off-site soil chemical condition. Soil properties, including chemical concentration, are extremely variable even over short distances. For this reason it is probable that a composite of 4 to 8 samples from a well defined, discrete, physically homogeneous area will yield an accurate chemical profile for that area. In contrast, a single soil sample from a physically homogeneous area could yield chemical results that are high, representative, or low compared to the actual average concentration for that area. An example of a physically homogeneous area is the depression on the northern site of the site.

Surficial soil samples (0-6 inches depth) collected for organic analysis will be composited from 4 to 8 locations, collected with a decontaminated stainless steel trowel, mixed in a decontaminated stainless steel bowl or bucket, and inserted into appropriate sample containers. Surficial soil samples collected for metals analysis will be collected and composited in a similar manner, except that plastic sampling and compositing equipment will be used. A separate trowel/bowl set will be used for each sampling location. All samples will be appropriately preserved, and shipped to an analytical laboratory within 12 hours of the time of collection.

If contaminants are detected above the proposed clean up criteria (see Section 5.2) in on-site or off-site surficial soil samples, a second round of soil sampling will be proposed to obtain discrete samples from below the top 6 inches of the soil profile to confirm the vertical profile of the soil contamination. Prior to the second round of sampling H&A will propose changes to the analyte list if necessary. The proposed changes will be submitted to the NYSDEC for approval.

- Background Soil Sampling

  Two background soil samples and a background drywell sediment sample will be collected and analyzed for nitrogen and phosphorus pesticides, herbicides, total metals, and dioxins and furans. The soil sampling locations are located in an area with soil type and slope that are similar to that of the site. The results of their analysis will be used to determine what levels of these chemicals constituents are representative for the area, and not related to the 3 September 1989 fire.

  The background soil samples will be obtained to provide chemical testing data which can be considered representative for soil in the local area. More specifically, one soil sample will be collected from the Little League Ball Park located along Vine Street, and a second soil sample will be located behind the Foodmart, located approximately 300 feet west of the site. The third background sample will be obtained from a dry well which is located in front of the Foodmart along Park Avenue (see Figure 6). These locations were reviewed with DEC-Albany's field representative for the project, Gardner Cross.

- Site Surficial Soil Sampling

  Four composite soil samples and one grab sample will be collected from the site (see Figure 5). This will allow for wide coverage of the potentially contaminated site areas. Compositing will provide for more representative samples. Each composite will be assembled from a discreet confirmed area of the site. On-site soil samples will be analyzed for nitrogen and phosphorus pesticides, herbicides, total metals, dioxins and furans.

Locations for the on-site soil composite samples are: low lying areas along Flower Avenue, low lying area on the north side of the site, and the central part of the site. Two composites will be collected along Flower Avenue.

- <u>Flower Avenue Soil Sampling</u>

  A composite sample will be collected from the northern edge of the private lots on the south side of Flower Avenue. It is reported that standing water along Flower Avenue covered parts of these lots after the fire. This sample will be analyzed for nitrogen and phosphorus pesticides, herbicides, dioxins and furans, and total metals. The results of these analyses will be used to determine if soils in the area contain concentrations of contaminants resulting from the fire that are higher than normal background levels.

- <u>Flower Avenue Drywell</u>

  A sediment sample will be collected from the drywell located along Flower Avenue. This sediment sample will be analyzed for dioxins and furans, the Target Compound List (TCL), and total metals. The results of these analysis will be used to determine if sediments washed into the dry well during fire suppression activities carried contaminants into the drywell.

- <u>Pond Sediment Sampling</u>

  A composite sample of the upper layer of the pond sediment will be submitted for laboratory analyses to evaluate whether runoff from the fire suppression activities resulted in contaminants concentrating in the pond sediments. The sediment sample will be analyzed for dioxins, furans, and the TCL list. Because the pond allows infiltration of water to subsurface soils the results from pond sediment sampling will be compared to background dry well sediment quality. A grab sample will also be collected from the vicinity of the western edge of the pond.

2.3.2 Water Sampling

Water samples have been collected from the two new monitoring wells, and the on-site pond water will also be sampled. The locations of the new wells and the pond are shown on Figure 5. The chemical constituents to be analyzed for are shown in Table 2-1. The NYSDEC or NYSDOH will be allowed to collect duplicate or split samples during water sampling events if they so desire. All samples will be appropriately preserved and containerized, and will be shipped to an analytical laboratory within 24 hours of sample collection.

- Groundwater Sampling

  Monitoring wells B101S-OW and B101D-OW will be sampled to evaluate whether groundwater quality has been impacted as a result of fire suppression activities. In addition, this well cluster, which is downgradient from the Agway site, will allow for an assessment of the potential for the Village of South Corning's municipal well to have been affected. Water samples from each well will be analyzed for the entire (TCL) list; dioxins, furans, herbicides, nitrogen and phosphate pesticides and inorganic indicator parameters. Water samples will be analyzed for both total and dissolved metals using unfiltered and filtered samples, respectively. A separate decontaminated bailer and chord will be used for each location. Monitoring well B101D-OW is a deep well screened at approximately the same elevation as the municipal well, and B101S-OW is a shallow well screened above a clay layer which may serve as an aquitard. Following the first sampling round at this well cluster, H&A will evaluate the groundwater quality to determine whether changes to the analyte list for subsequent monthly sampling are necessary. H&A will submit any proposed changes to the NYSDEC for approval.

  B101S-OW is approximately 85 feet from MW-4. H&A is planning not to include MW-4 in the subsequent monthly sampling because the two wells monitor the same zone of the aquifer, and therefore are apt to have similar chemical results. In the event that results of analyses indicate that B101S-OW is uncontaminated, MW-4 will be included in subsequent monthly sampling to confirm the presence of 2,4-D.

  The NYSDOH has agreed to sample the water supply well adjacent to the Foodmart for volatiles, semi-volatiles, herbicides, pesticides and dioxin and furans. H&A is proposing to use these results as indicative of background groundwater quality.

- **Pond Water Sampling**

  The on-site pond will be sampled to evaluate the water quality. The water quality analyses will assist in establishing the appropriate disposal alternative for the pond water. One water sample will be collected from the on-site retention pond and will be analyzed for BOD, COD, pH, and total and dissolved metals. Pond water has previously been collected by the NYSDOH and sampled for volatile and semi-volatile organics herbicides, dioxin and furans, and pesticides. The proposed chemical testing will supplement the previous NYSDOH analysis, which when taken together with the proposed analyses constitute a full TCL Analysis.

2.4 In-situ Hydraulic Conductivity Testing

H&A will conduct falling or rising head tests at the four Groundwater Technology Inc. monitoring wells and at the proposed monitoring well cluster to evaluate in-situ hydraulic conductivities. The results from the in-situ hydraulic conductivity tests will provide estimates of aquifer permeability and allow for calculation of groundwater flow velocities. Measured values will be used to calculate flow velocities under non-pumping conditions. Estimated groundwater gradients will be used to calculate groundwater velocities under pumping conditions.

2.5 Water Level Measurements

H&A will collect water level measurements from the two new wells, the four existing GTI wells, the deep well adjacent to the Foodmart store, and the Village of South Corning water supply well, if possible. These measurements will be used to estimate the groundwater velocity in the two aquifers, and to determine to what extent the two aquifers are interconnected.

2.6 Interim Remedial Measures

Based on the on-site and off-site investigations, H&A will interpret the sampling results based on relevant State and Federal standards and propose cleanup criteria to evaluate whether it will be necessary to implement interim remedial measures. If required, H&A will examine the feasibility of various remedial alternatives and develop a reasonable remediation strategy for the contaminated media. The evaluation of remedial alternatives will consider feasibility, schedule for implementation, environmental and health criteria, and costs.

2.7 Quality Assurance/Quality Control

Appendices A through G provide the detailed procedures for the field investigations, sampling and laboratory analysis;

Appendix A: Procedures for Drilling and Monitoring Well Installation
Appendix B: Drilling Equipment Decontamination
Appendix C: Waste Containerization
Appendix D: Procedures for Soil Sampling for Chemical Analysis
Appendix E: Procedures for Groundwater Sampling
Appendix F: ENSECO - Laboratory Analytical Procedures (Quality Assurance Program Plan)
Appendix G: Procedures for Rising/Falling Head Tests

Quality Control Sampling

During the field sampling program, H&A will provide for quality control sampling, which will consist of the following sample types:

1. Rinsate blank - The field equipment utilized for soil or water sampling will be decontaminated following the sample collection. The decontaminated equipment will then be rinsed with distilled water and the rinsate will be collected in the appropriate sample bottles for laboratory submission see Tables 2-1 and 2-2. The purpose of the rinsate blank is to ensure that decontamination procedures are sufficient to preclude cross contamination or introduction of contaminants into a sample. A rinsate blank will be obtained for each media sampled during the remedial investigation program.

2. Duplicate sample - During sampling of soil and water, H&A will obtain duplicate samples which consists of separating the sample into equivalent portions to be placed in the appropriate sample bottles. The duplicate sample will be retained for laboratory analysis as part of the quality control program or will be saved and refrigerated for potential future analysis. The duplicate samples provide information on the uniformity of sampling methodology and the inherent variability in soil and water samples. A minimum of ten percent duplicate samples will be submitted by H&A for laboratory analysis.

3. Trip Blank - A trip blank consists of laboratory prepared deionized water that is carried throughout the sampling round in a cooler with the other sampling containers, and is subsequently submitted for laboratory analysis. The purpose of the trip blank is to ensure that site related contaminants do not impact sample container integrity. One trip blank will be prepared and carried during each individual sampling round.

As stated previously, H&A will obtain duplicate samples for all soil and water samples collected. This will allow for confirmational analysis by NYSDEC and NYSDOH. Approximately 10 percent of the samples submitted for laboratory analysis will consist of quality control samples as defined above. The field sampling quality control program will provide additional assurance that the sampling methodologies have been followed and that the results can be further scrutinized to confirm the integrity of the database.

Data validation will be conducted by Mr. Rock Vitale of Environmental Standards, Inc. and will be conducted in accordance with NYSDEC's scope of work for Data Validation - RI/FS Program. Mr. Vitale's resume is included in Appendix H.

III. PROJECT ORGANIZATION

H&A of New York will use a project team of hydrogeologists, geologists and engineers experienced with hazardous waste site characterization. The team will consist of a Program Director, Project Manager, Task Leaders, a Health and Safety Officer, and additional staff as necessary. The resumes of key H&A personnel are contained in Appendix H.

3.1 Program Director

The Program Director, Lawrence P. Smith, will have authority and responsibility for H&A of New York's environmental investigation. He will provide overall supervision of the project to ensure that schedule and budget commitments are met and that the technical work is directed towards meeting the project's objectives. He will be involved in directing the project team, reviewing the results of the study and keeping John Eberenz Inc. and NYSDEC informed on the progress of the investigation. Mr. Smith's duties will include:

- Meeting project objectives within established budgets and schedules.
- Administer all contractual agreements.
- Assure that staffing levels and technical expertise are provided.
- Interact with the Project Manager on issues requiring additional management or technical support.
- Provide quality assurance review for all field and office activities.
- Review deliverables prior to issue.
- Interface with representatives of NYSDEC and other state and local involved agencies.
- Community relations, typically through state and federal liaison officials.

3.2 Project Manager

The Project Manager, Joseph S. Campisi, will be responsible for the successful completion of work assignments within budget and schedule. The Project Manager is responsible for the following:

- Preparing and organizing project work.

- Selecting team personnel and briefing them in specific assignments.
- Coordinating with the task leaders to complete the work plan.
- Completing final reports.
- Establishing safety and equipment requirements that are to be met, and monitoring compliance with those requirements.
- Coordinating with regulatory agencies.

3.3 Health and Safety Representative

Mr. Robert Mahoney will serve as the Health and Safety Representative for this project. Mr. Mahoney and all H&A personnel who will work on the site have received at least the minimum required OSHA safety training for work on hazardous waste sites required by OSHA 29CFR 1910.120.

The Health and Safety Representative will be responsible for safety procedures and operations at the site, including the following:

- Determining the level of personal protection required.
- Updating equipment or procedures based on new information gathered during the site inspection.
- Changing the levels of protection based on site observations.
- Monitoring compliance with the safety requirements.
- Stopping work as required to protect personal worker safety or where noncompliance with safety requirements is found.
- Determining and posting emergency telephone numbers (including poison control centers) and routes to capable medical facilities; arranging for emergency transportation to medical facilities.

- Notifying local public emergency officers (i.e., police and fire department) of the nature of the team's operations and coordinating the team's contingency plan with that of the local authorities.

- Informing personnel (other than team members) who want access to work areas of the potential hazards of the site.

- Determining that each team member has been given the proper medical clearance by a qualified medical consultant; monitoring team members to determine compliance with the applicable physical requirements as stipulated in the health and safety program.

3.4 Quality Assurance Officer

The Quality Assurance Officer (QAO) for the project is David Hagen, whose resume is included in Appendix H. Mr. Hagen will be responsible for development of the sampling program and review of all field investigation and sampling efforts. The QAO will be responsible for interfacing with H&A field sampling personnel and the analytical laboratory to make requests and resolve problems. In addition, the QAO officer will interface with the data validator and develop a project specific data useability report. The QAO will attend all site specific meetings between H&A and NYSDEC, and sign off on the work plan.

3.5 Task Leaders

The Project Manager will direct the efforts of several other members of the technical team that are responsible for the tasks outlined herein. These task leaders are:

- Joshua Goldowitz -- Well installation, soil and water sampling.

- Joshua Goldowitz -- Hydrogeologic Testing.

- James Little -- Chemical results review and interpretation.

The site task leaders are responsible for the following:

- Execution of the site work plan.

- Safety procedure compliance through coordination with the site safety officer.

- Field operations management including coordination with laboratories and subcontractors.
- Site control.
- Compliance of field documentation and sampling methods.

3.6 Project Schedule

The anticipated schedule for the implementation and execution of the Work Plan is presented in Table 2-3, Project Work Schedule.

IV. PROJECT SCHEDULE AND REPORTING REQUIREMENTS

Table 2-3 provides a schedule for the proposed investigations and submission of documents to DEC. The goals for these studies are to expeditiously determine the extent of site contamination, determine the potential for the Village of South Corning's municipal well to have been impacted by the fire suppression activities, and proceed with cleanup to enable timely reconstruction of the Agway facilities. The IRM investigation will be completed by late July with a final report scheduled for submission to DEC in late August.

H&A will inform DEC of field activities allowing five days notice prior to start of work. It is our understanding that DEC and NYSDOH personnel may be present during well installation and sampling activities to inspect H&A's work and obtain duplicate soil or water samples. H&A staff will review field sampling procedures and sampling requirements with DEC/DOH personnel to determine that sampling protocols are consistent.

The first sampling effort included collection of groundwater samples from the downgradient well cluster B101S-OW and B101D-OW. The groundwater samples will be submitted to ENSECO laboratory located in Cambridge, Massachusetts. We anticipate that a partial report summarizing the chemical test results will be available from ENSECO by mid-June. Assuming DEC approves the work plan in the first half of May, H&A plans to conduct the balance of the sampling program in the last two weeks of May. The results from this sampling effort will become available in July. H&A will send the final lab reports to DEC in a timely manner to keep DEC staff current on project developments.

As previously discussed in Section 2.3, H&A will conduct monthly sampling at the downgradient well cluster to evaluate any changes in groundwater quality over time. We recommend that this well cluster be monitored for a 6 month period to determine whether there are any adverse impacts from the fire suppression activities. The sampling parameters for the second and subsequent sampling rounds will depend on the chemical testing results from the late April sampling. Given the proximity of this well cluster to the Village of South Corning's municipal well, H&A will provide final lab reports for groundwater sampling to DEC in an expeditious manner.

V. CLEANUP CRITERIA

The primary objective of the remedial investigation program is to determine whether the fire suppression activities at the Agway site resulted in soil or water contamination. Should H&A's investigations confirm the presence of site related contamination, the chemical testing results will be compared to known State and Federal drinking water quality standards and soil guidelines to evaluate the significance of the reported concentrations. In addition, the results from the background soils chemical testing and groundwater quality from the Foodmart well near the site will be used to establish background conditions. The background soil and groundwater quality data will be utilized to evaluate whether the fire suppression activities at the Agway Site resulted in an impact to on-site soil or groundwater quality.

The cleanup criteria for confirmed site related contamination will be established using the appropriate regulatory standards and guidelines. The cleanup criteria proposed will also account for the background levels of chemical constituents identified during the remedial investigation program. Should the background level of a constituent exceed the proposed cleanup criteria for that constituent, the cleanup criteria would be adjusted to the background concentration of the constituent. This method of accounting for background concentrations will ensure that site remediation cleanup goals are based on a technically defensible methodology.

This approach may be particularly important for assessing the impact of the fire suppression activities on site groundwater quality. The quarterly monitoring at City of Corning municipal wells located upgradient of the Agway site show exceedances of drinking water standards for volatile organic compounds and several trace metals. Given the highly transmissive nature of the unconsolidated aquifer it is possible that the contaminants identified at the City of Corning municipal well(s) may have impacted groundwater quality at the Agway site. In discussions with representatives of NYSDOH, H&A was informed that the testing of the Village of South Corning's municipal wells have not included volatile organics to date. Consequently, it is not possible to ascertain existing water quality at the Village's municipal well with the available data.

5.1 Groundwater

During fire suppression activities on 3 September 1989 it is estimated that in excess of 1 million gallons of water were used to control the fire. The fire suppression water runoff to Flower Avenue may have entered the groundwater via a storm runoff drywell and runoff to the pond may have infiltrated the groundwater regime. The purpose of this section is to propose groundwater cleanup standards to be used in the event that groundwater quality is found to have been affected by runoff from the 3 September 1989 fire.

Groundwater cleanup criteria are based on the NYSDEC memorandum distributed on 21 July 1989 by Mr. Paul R. Countermen, Director, Bureau of Hazardous Waste Facility Permitting on the subject, "Groundwater Protection Concentrations and EPA Health Based Soil Investigation Criteria." According to that memo, "quality standards for Class GA groundwater shall be the most stringent of Part 703.5 standards, Part 5 MCLs, Part 170 Standards, or EPA MCLs promulgated under the State Drinking Water Act." The memorandum also states that state T.O.G.S. values can be employed when a constituent does not have a Part 703 Class GA standard, and that Environmental Protection Agency Health Based Criteria Value can be employed when a constituent has neither a Part 703 Class GA standard nor a State T.O.G.S. value. Cleanup standards for groundwater at the Corning Agway site are included in Table 5-1.

The 6NYCRR Part 703.5 Class GA standard for 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) is 0.000035 ug/L. Although no 2,3,7,8-TCDD has been detected on site, other, less toxic cogenitors have potentially been found by NYSDOH analyses. According to "USEPA Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans" the concentration of a dioxin or furan cogenitor can be converted to an equivalent 2,3,7,8-TCDD concentration by multiplying the cogenitor concentration by its toxic equivalency factor. The 2,3,7,8-TCDD cleanup level will be applied to the sum of the products of the cogenitor concentrations multiplied by their toxic equivalency factors. The cogenitors and their toxic equivalency factors are found in Table 5-2. Table 5-3 provides a summary of the toxic equivalent for the maximum concentrations of the cogenitors detected at the Agway site.

As stated in the introduction to this section, the cleanup criteria for groundwater will be based on existing standards, although the presence of background concentrations of these constituents may indicate an upgradient off-site source of these contaminants. In this instance, the cleanup goals established for groundwater will be based on confirmation of a site related source and will not be more restrictive than the background concentration of these constituents.

5.2 Soils

Cleanup goals for soils pertain to the on-site soils and pond sediments and off-site surface soils on the south side of Flower Avenue. Contamination of soils may have taken place as runoff from the fire suppression measures infiltrated into the ground, or as particles entrained in the runoff settled on the soil surface. The following cleanup goals shall be used in the event that soil quality is found to have been affected by the fire of 3 September 1989, with respect to the contaminants listed.

The above referenced memorandum (NYSDEC, 21 July 1989) states that, "The EPA Health Based Soil Injestion Criteria shall be used when implementing "clean-closure." The Health Based Soil Injestion Criteria for carcinogens and systemic toxicants that have been found on-site are listed in Table 5-1.

Contaminants found in on-site soils for which Health Based Injestion Criteria do not exist are Mirex, Methoxychlor, Arsenic, Cadmium, Copper, Lead, and Zinc. Of the trace metals only Cadmium and Lead are outside of the naturally occurring range found in soils (see Table 5-4) and both compounds were outside of acceptable QA/QC limits in the GTEL analyses. For these metals a cleanup goal will be adopted based on New Jersey Dept. of Environmental Protection Remediation Goals. Mirex and Methoxychlor were detected at near detection limit concentrations in soil, and these concentrations do not warrant the need for soil remediation. This decision may be revised once the results of soil analysis are reviewed.

In summary, soils showing evidence of contamination will be remediated if the concentration exceeds the proposed cleanup goal and the concentrations of the background samples.

VI. INTERIM REMEDIAL MEASURES

6.1 Objectives

The primary objective of interim remedial measures is to remediate soil or water contamination resulting from the 3 September 1989 fire that poses a threat to human health or the environment. As previously stated, the purpose of the investigation program is to determine whether the fire suppression activities of 3 September 1989 resulted in contamination of surficial soils, pond water, pond sediments, dry well sediments, or groundwater. The cleanup criteria discussed in Section 5.0 have been developed so that the interim remedial measures are protective of human health. If the remedial investigation indicates that site related contamination exceeds the proposed cleanup criteria, interim remedial measures will be proposed and implemented. The following sections identify possible remedial alternatives if contamination is found and is a threat to human health and the environment. A more in-depth study of remedial alternatives will be developed if site conditions warrant.

6.2 On-Site Pond

H&A has contacted Mr. Ray Helmer of Steuben County concerning acceptance of the pond water at the Bath pretreatment facility which was designed and built to treat landfill leachate with various hazardous constituents. H&A also contacted Mr. Sathi of Larsen Engineers who designed the facility relative to the ability of the plant to treat the pond water. Based on these preliminary discussions it appears likely the pond water could be accepted for treatment pending completion of analytical testing. The sampling program has been designed to obtain additional inorganic chemistry data necessary to assess compatibility with treatment at the Bath facility. If the constituent chemistry indicates low level contamination, disposal at the city of Corning treatment plant via a nearby sanitary sewer would also be investigated. Final disposal would be in accordance with NYSDEC guidance.

6.3 Surficial Soils

As discussed previously, it is possible that the fire suppression activities may have dispersed inorganic and organic constituents in the runoff. Site generated contaminants may have been deposited in the surficial soils across the eastern part of the site, in the upper layer of the pond sediments, in soils on either side of Flower Avenue, and in the sediments in the dry well located along the northern side of Flower Avenue. The sampling program will obtain additional information on the nature and extent of these constituents in the above mentioned areas. Should concentrations of soils or sediment exceed cleanup criteria and require remediation the available options

VII. HEALTH AND SAFETY PLAN

7.1 Introduction

The Bell's Farm and Home Center is located in the village of South Corning, New York at the corner of Garden Street and Flower Avenue. The "site" as described herein comprises the former location of the Farm and Home Center and the land adjacent, as outlined in Figure 4.

In investigating the potential for groundwater and soil contamination at the site, and implementing remedial measures, there is a need to protect the health and safety of personnel involved in site activities. Detailed health and safety procedures will help to prevent injury, illness and accidents by avoiding unnecessary risks while maintaining an efficient work environment.

This Health and Safety Plan was developed for Bell's Farm and Home Center and is intended for use during field investigations, water and soil sampling and construction activities exclusively associated with the remediation of groundwater and soil contamination at the site. The requirements of the plan shall apply to all H&A personnel implementing the work activities associated with the site investigation. All contractors working on the site are required to adopt their own Health and Safety Plans which must, as a minimum, contain the requirements of this plan. As discussed this site-specific health and safety plan is intended for site investigation activities only. Prior to commencing with interim remedial measures, the site specific health and safety plan will be revised based on the results from H&A's soil and water sampling program.

7.2 Objectives

The objectives of the Health and Safety Plan are:

- To establish levels of personnel protection and equipment requirements to all scheduled activities and to develop contingency plans.
- To assign on-site health and safety responsibilities.
- To outline mandatory operating procedures.

The provisions of this plan are mandatory for all personnel assigned to the activities described in the respective work plans. The Health and Safety Procedures contained in this plan have been developed for the specific activities intended for the investigation.

7.3 Site Description

The site consists of approximately 2 acres of land located in a residential area on which Bell's Farm and Home Center operated. The store, which stocked pesticides, herbicides, fertilizers and oil, burned to the ground on September 3, 1989. The land adjacent to the former buildings consist of grassy areas, construction debris and ash. Also present on site are two small storage/repair buildings and a retention pond.

7.4 Potential Hazards

The potential hazards at the site consist of the possible presence of metals, herbicides, pesticides, dioxins or furans in the water and/or soil and work activities involving field investigation and implementation of remedial measures. The irregular ground surface and debris may make site access difficult.

The potential routes of exposure for the chemicals mentioned above include inhalation, skin absorption, ingestion and skin/eye contact. The potential for exposure through any one of these routes will depend on the activity conducted. Most likely routes of exposure for the activities to be conducted at the site include:

Activity	Potential Routes of Exposure
Drilling and Soil Sampling	INH, ABS, CON
Hydrogeologic Testing	INH, ABS, CON
Excavation of Contaminated Soil	INH, ABS, CON
Construction	INH, ABS, CON
Water Quality Sampling	INH, ABS, CON

Note:

INH = Inhalation
ABS = Skin Absorption
CON = Skin/Eye Contact

The greatest risk to workers will occur if the work directly exposes personnel to high concentrations in contaminated soil or groundwater. The activities most likely to expose workers to these conditions would include the sampling of contaminated surficial soils, drilling operations, pond sampling, groundwater sampling, water level monitoring, and in-situ hydraulic conductivity testing.

for IRM are somewhat limited due to the RCRA land ban. Consequently one option for contaminated soils would be to excavate and transport them to a central area on-site for isolation. More specifically, the contaminated soils could be disposed of under a new building or parking lot for the rebuilt Agway store. The method of design for the disposal would be based on the type and concentrations of compounds detected and may include a soil or membrane around the contaminated fill. H&A will investigate other possible alternatives for on-site and off-site disposal and/or treatment of the wastes. Following removal of contaminated soils from an area confirmational sampling will be conducted to provide data indicating that the remaining soil has acceptable chemical quality.

6.4 Pond Sediment

Two sediment samples will be obtained from the pond to evaluate whether the fire suppression activities resulted in contamination of pond sediments. One pond sediment sample will be collected as a grab sample near the western edge of the pond to evaluate the potential for the contaminates to be concentrated in this area. The second pond sediment sample will be collected as a composite to represent the average sediment chemical characteristics. The purpose of the pond sediment sampling will be to evaluate the appropriate interim remedial measures. The pond sediment will be handled in the same manner as contaminated surficial soils, unless the sampling results indicate greater concentration of contaminants. The proposed method for treatment or disposal of contaminated pond sediments will be selected in accordance with NYSDEC guidance. Following removal of contaminated sediments from an area, confirmational sampling will be conducted to provide data demonstrating that the remaining sediments have acceptable chemical quality.

6.5 Groundwater

If groundwater has been impacted by the fire suppression activities at the Agway site it may be necessary to conduct a more intensive groundwater investigation to define the potential for off-site migration of contaminants. As discussed in section 2 the two new monitoring wells will be sampled as part of the remedial investigation program. Additionally, these monitoring wells will be sampled monthly for at least a 6 month period to evaluate the potential downgradient impacts on the aquifer and the village's municipal water supply. The development of a remediation program for groundwater contamination will depend on the nature of contaminants identified, their source(s) and the potential for the village of South Corning's water supply to be impacted.

7.5 General Health and Safety

Protective clothing and respiratory protection help prevent workers from coming in contact with potential hazards. Personnel protective equipment must be appropriate to protect against the anticipated hazards for each of the activities outlined above.

o Personnel Protective Equipment

The minimum level of personnel protection to be implemented at the site will be Level D. The required equipment includes:

- Work boots (steel toe and shank recommended)
- Rubber boots or latex boot covers
- Hard hat
- Safety glasses
- Inner gloves
- Chemical resistant gloves

For the drilling, groundwater sampling, pond sampling and soil sampling, hydraulic testing, or other activities which may potentially expose workers to contaminated soil, the Level D program will be modified to include, in addition to the items listed above, the following:

- Chemical resistant clothing (tyvex suit)
- Respirator availability

o Respiratory Protection

The decision to don respirators during a particular activity will be based on the results of the continuous air monitoring performed during the site activity. Detection of organic vapors in excess of 3 parts per million (ppm) above background concentrations monitored in the breathing zone during the site activity will necessitate donning of respirators or immediate evacuation of the work area as defined in Section 7.7. If respirators are required, work activities will continue unless organic vapor concentrations are detected in excess of 200 ppm above background levels in the breathing zone. If this level of organic vapors is reached during the site activities, immediate evacuation of the work area will be required. The field monitoring personnel will notify the Health and Safety Representative and the Project Manager if concentrations of organic vapors in the breathing zone and the work area exceed 200 ppm.

o Contingency Plan

If concentrations in excess of 3 ppm above background are detected at the perimeter of the site all work will be ceased and appropriate action will be taken. Appropriate actions will include watering to control fugitive dust and covering the work area with tarps to minimize volatilization.

If total concentrations of organic vapors above 200 ppm are detected in the breathing zone, the Health and Safety Plan will be modified to provide the level of protection necessary to protect the health and safety of the workers prior to the resumption of site activities. It is currently anticipated such conditions would necessitate a modification to Level B health and safety requirements, which would include the use of positive pressure self-contained breathing apparatus.

7.6 Assignment of Responsibilities

To coordinate the health and safety aspects of the project, the following individuals are necessary:

o Project Manager

The Project Manager is responsible for project management, communicating site requirements to all personnel, general supervision of all activities, contacting the appropriate medical, fire and emergency personnel, and coordinating the work of contractors.

o Field Monitoring Personnel

Field Monitoring personnel will be responsible for the day-to-day implementation of the Health and Safety Plan during the various field activities. The responsibilities of field monitoring personnel will include:

- Utilize the appropriate personnel protective equipment and monitoring equipment.

- Monitor site conditions during all field activities.
- Bring any observed work practices or conditions that may result in injury or exposure to hazardous substances to the attention of workers, the Project Manager, and (if applicable) the contractor's project manager. This does not relieve contractors of their responsibility for health and safety of contractor's personnel.

The personnel needed to perform the activities outlined above will be briefed on the anticipated hazards and trained on available respirator equipment, safety practices, emergency procedures and communication pathways. Training will be accomplished in a health and safety briefing and attendance will be required for all personnel.

7.7 Work Areas

Work areas for the above outlined activities shall include a minimum 50 ft. radius around drilling and sampling operations. All workers and personnel within the 50 ft. work area radius shall be required to comply with site health and safety procedures. The work areas associated with the water quality sampling and hydrogeologic testing activities shall include a minimum 25 ft. radius of the site activity.

Access to all work areas within the site shall be controlled by the field monitoring personnel. When respirator use is required in a work area, access shall be restricted by means of barricades or fencing. Persons not directly involved in work activities will be kept from the work area to protect them from possible exposure to contaminants.

o Air Monitoring

Continuous air monitoring will be performed during the activities for which inhalation has been identified as a potential exposure route, namely, during drilling, and soil and water sampling. Air monitoring will be conducted in the breathing zone and at the ground surface in the work area. If during site activities it is necessary to upgrade to Level C protection, H&A will also monitor for volatile organics around the perimeter of the site in the down wind direction.

A flame ionization detector (FID) will be used to monitor for vapors from volatile organic compounds. Due to the trace concentrations of the pesticides, herbicides, dioxins and furans and their low volatility it will not be possible to detect these compounds with the FID. The primary concern for these compounds is inhalation, ingestion and contact which will be minimized by controlling on-site fugitive dust by watering, if needed, and by wearing the appropriate protective clothing.

7.8 Personnel Decontamination

Personnel decontamination activities will be conducted during all site activities to reduce the potential for contamination of personnel and/or transmission of contaminants off-site.

Disposable personnel protective clothing such as tyvex suits or outer gloves shall be disposed of at the close of each day's activities.

If respirators are required during site activities, the organic vapor cartridges shall be replaced after each day's operations. The cartridges shall be disposed of in the decontamination container. The container will be manifested and disposed as a Hazardous waste.

7.9 Equipment Decontamination Procedures

All drilling equipment which will come in contact with contaminated soil or ground water shall be steam cleaned prior to arriving and prior to leaving the site. The steam cleaning shall be conducted in the designated decontamination area adjacent to the western side of the on-site pond.

All well drilling and soil sampling equipment which will penetrate the ground shall be decontaminated between each exploration location by the following sequence of cleaning solutions: clear water rinse, detergent wash, clear water rinse. In addition, all soil sampling equipment shall be decontaminated between each soil sample with the same sequence of cleaning solutions.

7.10 Medical Emergency Plan

During site activities, unpredictable events such as physical injury, chemical exposure, fire or explorations may occur. The emergency plan is described in order to provide prompt responses to emergency situations. The routes for ambulance response and contacts for medical and fire emergencies shall be provided to all field monitoring personnel.

o Personnel Injury

In case of personnel injury at the site the following procedures shall be followed:

- Field team members trained in first aid should administer care to the injured worker.

- Dial 936-4177 for emergency ambulance assistance.

- Injured personnel should be transported to the nearest medical center (Corning Hospital).

o Chemical Exposure

If a member of the field crew is exposed to chemicals, the procedure outlined below should be followed:

- Another team member should remove the individual from the immediate area of contamination.

- Precautions should be taken to avoid exposure of other workers to the chemical.

- If the chemical is on the individual's clothing, the clothing should be removed if it is safe to do so.

- If the chemical has contacted the skin, the skin should be washed with copious amounts of water, preferably under a shower.

- In case of eye contact, emergency eye wash should be used. Eyes should be washed for at least 15 minutes.

- If necessary, the victim should be transported to the nearest hospital. If necessary, an ambulance should be called to transport the victim.

o Weather Related Conditions

Since the site activity will be conducted during the spring and summer months, precautions should be taken by the workers to prevent frostbite and heatstroke.

Frostbite

Frostbite can be categorized into:

- Frostnip or incipient frostbite characterized by sudden blanching or whitening of the skin.

- Superficial frostbite-skin has a waxy or white appearance, is firm to the touch but tissue beneath is resilient.

- Deep frostbite - tissues are cold and hard indicating an extremely serious injury.

First aid for frostbite will include bringing the victim indoors and rewarming affected areas quickly with warm (not hot) water according to first aid procedures. Medical help should be called immediately.

Frostbite can be prevented by the use of insulated gloves, socks and other protective clothing. All protective clothing should be chosen so that it is compatible with the chemical resistant clothing required for certain site activities.

Heatstroke

Heatstroke is characterized by:

- Reduction in perspiration and clammy skin

- Disoriented and/or incoherent

Heat stroke can be treated by removing the affected individual to a shaded area and removing protective clothing. For extreme heat stroke, the individual's body temperature should be lowered artificially with ice packs and/or cold water applied in accordance with standard first aid practices.

7.11 First Aid and Decontamination

There is a possibility the decontamination procedures may interfere with medical treatment or cause more serious health effects in an emergency situation. If prompt lifesaving first aid and medical treatment is required, decontamination procedures should be omitted. If site evacuation is required for health and safety reasons, decontamination of personnel, protective clothing and equipment should be delayed until it is safe to do so.

7.12 Health and Safety Training

All field monitoring personnel have received their 40 hour OSHA training for work on hazardous waste sites.

All personnel involved in site activities shall be trained in accordance with the health and safety procedures outlined above. In addition, all field personnel shall participate in a Medical Monitoring Program including, at a minimum:

- Medical and Occupation History Form
- Physical Examination
- Blood Analysis

- Urine Analysis
- Chest X-ray
- Pulmonary Function Test
- Audiogram

In addition to the Health and Safety Training and Medical Monitoring Programs, at least one individual on site during a site activity shall have completed and be current in Multimedia first Aid and Cardiopulmonary Resuscitation.

VIII. ANALYTICAL PROCEDURES

The analytical procedures required for this project must be capable of providing a low method detection limit for the dissolved groundwater constituents which are present in the low ppb range and as well as quantification of very high concentrations in the ppm range which are associated with the source areas. In order to achieve these low detection limits, EPA methods and procedures contained within the 3rd Edition of SW-846, USEPA Test Methods for Evaluating Solid Wastes, Laboratory Manual, Physical/Chemical Methods, November 1986 will be used.

Appendix F contains the analytical methods to be utilized to evaluate samples for the following: pH, specific conductance, cyanide, sulfide, metals, mercury, halogenated volatile organics, semivolatile organics, nonhalogenated volatile organics, organochlorane pesticides, herbicides and organophosphorous pesticides.

lps23026

LIST OF REFERENCES

1. Counterman, P.R., 1989, "Groundwater Protection Concentrations and EPA Health Based Soil Ingestion Criteria", Memorandum, NYSDEC, July 21, 1989.

2. Groundwater Technology, Inc., 1989. Hydrogeologic Report, South Corning Site.

3. Miller, T.S., Belli, J.L.; Allen, R.V., 1982, "Geohydrology of the Valley Fill Aquifer in the Corning Area, Steuben County, New York", USGS.

4. Miller, T.S., 1982, "Corning Area" in Atlas of Eleven Selected Aquifers in New York, by R.M. Waller and A.S. Finch, p. 173-194.

5. New Jersey Department of Environmental Protection, "Soil Cleanup Objectives".

6. USEPA, 1989" USEPA Interim Procedures for Estimating Risks Associated with Exposure to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans", EPA/625/3-89/016, March 1989.

7. USEPA, 1983, "Hazardous Waste Land Treatment", SW-874, USEPA Office of Solid Waste and Emergency Response.

8. USGS, 1984, "Element Concentrations in Soils and other Surficial Materials of the Conterminous United States", USGS Professional Paper No. 1270.

TABLE 1-1
BELL'S FARM AND HOME CENTER
SOUTH CORNING, NEW YORK
REMEDIAL INVESTIGATION PROGRAM

SUMMARY OF PREVIOUS SAMPLING PROGRAM

	Soil Sampling				Groundwater Sampling					Surface Water	
	SS-1 (GTI)	SS-2 (GTI)	SS-3 (GTI)	West of Pond (DOH)	MW-1 (GTI)	MW-2 (GTI)	MW-3 (GTI)	MW-4 (GTI)	Car Wash Well (DOH)	Dry Well (DOH)	Pond Water (DOH)
Organochlorine Pesticides	X	X	X	X	X	X	X	X	X	X	X
Organophosphate Pesticides	X	X	X	X		X		X	X	X	X
Chlorinated Herbicides	X	X	X	X	X	X	X	X	X	X	X
Volatile Organic Compounds								X			X
Priority Pollutant Metals	X	X	X			X		X			
Nitrate					X	X	X	X			
Total Phosphate					X	X	X	X			
Dioxins				X					X	X	X
Furans				X					X	X	X

TABLE 1-2
PREVIOUS CHEMICAL TESTING RESULTS

GROUNDWATER
(ug/L)

PARAMETER	MW-1 (GTI)	MW-2 (GTI)	MW-3 (GTI)	MW-4 (GTI)	Drywell (DOH)	Offsite Well (DOH)	Blank (DOH)
Acetone				12.0			
Dichloropropane		ND		0.77			
Atrazine					40	<1	
2,4-D	ND	BDL	ND	6.9	1800	<0.5	
Arsenic		ND		49			
Chromium		ND		690			
Copper (3)		ND		760			
Lead (3)		12		209			
Nickel (3)		ND		820			
Silver		ND		56			
Thallium		ND		1200			
Zinc (3)		21		2200			
Nitrate	4000	3200	2400	890			
Total Phosphate	130	200	110	110			
Total Dioxin (4)					0.001687	0.000600	0.000097
Total Furan (4)					0.001475	<0.000262	<0.000203

SOIL & SEDIMENT
(ug/kg)

PARAMETER	SS-1 (GTI)	SS-2 (GTI)	SS-3 (GTI)	W. of Pond (DOH)	Blank (DOH)
2,4-D (3)	1300	ND	BDL		
2,4,5-T	BDL	ND	ND		
4,4-DDD				0.002	
4,4-DDE				0.001	
MIREX				0.001	
Arsenic	7900	20000	5100		
Cadmium	ND	4500	14000		
Chromium	14000	45000	93000		
Copper (3)	27000	140000	200000		
Lead (3)	42000	370000	230000		
Nickel (3)	17000	19000	62000		
Zinc (3)	220000	1400000	1100000		
Total Dioxin (4)				0.001990	<0.000308
Total Furan (4)				0.000330	0.000132

POND WATER
(mg/L)

PARAMETER	POND (DOH)
Butylate	1
Chlorpyrifos	1
2,4-D	78
Diazinon	20
Endosulfan II	0.001
Lindane	0.49
Malathion	20
Methoxychlor	0.02
1,1,1-TCA	1000
Trifluralin	3
Total Dioxin	0.000377
Total Furan	0.00258

NOTES

1. (GTI) Refers to data from Groundwater Technology Inc, February 1990report (see Appendix I)
2. (DOH) Refers to data from New York State Dept. of Health (see Appendix J)
3. See discussion under section 1.4 regarding Matrix Spike recovery and sample duplicate precision results which indicate laboratory inaccuracies.
4. See discussion under section 1.4 regarding lab method blank contamination with dioxin and furans.
5. This table reflects all parameters detected above method detection limits.

TABLE 2-1
BELL'S FARM AND HOME CENTER
SOUTH CORNING, NEW YORK
REMEDIAL INVESTIGATION PROGRAM

SAMPLING PROGRAM MATRIX

MEDIA AND LOCATION	TOTAL METALS	DISS METALS	pH	TEMP	COND	BOD COD	HERB	N&P PEST.	DIOXIN FURANS	TCL & TAL	VOLATILE COMPOUNDS
SOIL-ONSITE											
SD	X						X	X			
SW									X	X	
SF1	X						X	X	X		
SF2	X						X	X			
SCC	X						X	X	X		
SPC									X	X	
SPG									X	X	
SOIL-OFFSITE											
FLOWER AVE COMPOSITE	X						X	X	X		
SOIL-BACKGROUND											
DRY WELL	X						X	X	X		
SOIL #1	X						X	X	X		
SOIL #2	X						X	X	X		
GROUNDWATER											
B101D-OW	X	X	X	X	X		X	X	X	X	
B101S-OW	X	X	X	X	X		X	X	X	X	
POND WATER	X	X	X	X	X	X					
QUALITY CONTROL											
Duplicate-Water							X				X
Duplicate-Soil								X	X		
Field Rinsate-Soil											X
Field Rinsate-Water									X		
Trip Blanks (2)											X

Total Metals = Target Analyte List Metals measured on soil or unfiltered water samples
Diss Metals = Dissolved Metals, Target Analyte List Metals measured on filtered water samples
pH = pH measured on water samples in the field
Temp = Temperature in degrees Farenheit measured in the field
Cond = Conductivity measured in micromhos/cm in the field
BOD & COD = Biological and Chemical Oxygen Demand measured in mg/L oxygen
Herb = Herbicides by EPA Method 8150
N&P Pest = Nitrogen and Phosphorous Pesticides by EPA Method 8140
Dioxin & Furans = Chlorinated Dioxin and Furan by EPA Methods 8280 and 613
TCL & TAL = NYSDEC Target Compound List and Target Analyte List
Volatile Compounds = Volatile Compounds by EPA Methods 8240 and 624

TABLE 2-2
BELL'S FARM AND HOME CENTER
SOUTH CORNING, NEW YORK
REMEDIAL INVESTIGATION PROGRAM

SAMPLING SUMMARY

PARAMETER	EPA METHOD	MATRIX	CONTAINER	MINIMUM SAMPLE SIZE	HOLDING TIME
Dioxins/Furans	8280	Water Soil	glass glass	1000 ml 50 g	30 days 30 days
ICP Metals	200.7/6010	Water Soil	polyethylene glass	100 ml 10 g	180 days 180 days
Arsenic	206.2/7060	Water Soil	polyethylene glass	100 ml 10 g	180 days 180 days
Mercury	245.1/7470	Water Soil	polyethylene glass	100 ml 10 g	26 days 26 days
Selenium	270.2/7740	Water Soil	polyethylene glass	100 ml 10 g	180 days 180 days
Thallium	279.2/7941	Water Soil	polyethylene glass	100 ml 10 g	180 days 180 days
Lead	239.2/7421	Water Soil	polyethylene glass	100 ml 10 g	180 days 180 days
Chromium	220.7/218.4/ 312B/7197	Water Soil	polyethylene glass	100 ml 10 g	24 hours 24 hours
Biological Oxygen Demand	405.1	Water	polyethylene	200 ml	48 hours
Volatile Organic Compounds	8240	Water Soil	VOA vial glass	40 ml 10 g	7 days 7 days
Semi-Volatile Compounds	8270	Water Soil	glass glass	1000 ml 50 g	5 d. extr. 40 d. anal.
Organo-chlorine Pesticides	8080	Water Soil	glass glass	1000 ml 50 g	7 days 7 days
Organo-phosphate Pesticides	8140	Water Soil	glass glass	1000 ml 50 g	7 days 7 days
Herbicides	8150	Water Soil	glass glass	1000 ml 50 g	7 days 7 days

TABLE 2-3
BELL'S FARM AND HOME CENTER
SOUTH CORNING, NEW YORK
REMEDIAL INVESTIGATION PROGRAM

SCHEDULE OF ACTIVITIES

TASK	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
Install and Develop Monitoring Well Cluster	■						
Sample Well Cluster	■						
Obtain Chemical Test Results from Groundwater Sampling			■				
Develop Draft Work Plan for NYSDEC (submit to DEC on April 12)	■						
Receive NYSDEC Comments on Work Plan (April 24)	X						
Submit Final Work Plan to NYSDEC (April 30)	X						
Execute Consent Order (May 4)		X					
Conduct Sampling and Testing		■					
Obtain chemical Results from Soil/Sediment and Pond Water			■	■			
Data Reduction and IRM Evaluation			■	■	■		
Dispose of Pond Water			■	■			
Submit Summary Report and Propose Recommended IRM's					■		
Monthly Sampling at Well Cluster			■	■	■	■	■

TABLE 5-1
BELL'S FARM AND HOME CENTER
SOUTH CORNING, NEW YORK
REMEDIAL INVESTIGATION PROGRAM

COMPARISON OF APPLICABLE CLEAN-UP STANDARDS WITH MAXIMUM CONTAMINANT CONCENTRATIONS

CONSTITUENT	WATER STANDARD (mg/l)	SOIL CLEAN-UP GOAL (mg/kg)	MAXIMUM CONCENTRATIONS WATER (mg/l)	SOIL (mg/kg)
ORGANICS				
Acetone	4.0 [1]	N	0.012	ND
Atrazine	0.0075 [1]	N	0.040	ND
2,4-D	0.0044 [1]	0.8 [6]	1.800	1.3
4,4-DDD	N	2.9 [5]	ND	0.000002
4,4-DDE	N	2.1 [5]	ND	0.000001
Dichloropropane	0.005 [1]	N	0.00077	ND
Lindane	0.004	0.33 [6]	0.00049	0.00001
METALS				
Arsenic	0.025 [1]	20 [6]	0.049	20
Cadmium	N	3 [6]	ND	14
Chromium	0.050 [2]	100 [6]	0.690	93
Copper	1.0 [1]	170 [6]	0.760	200
Lead	0.025 [1]	500 [6]	0.209	230
Nickel	0.700 [4]	100 [6]	0.820	62
Silver	0.050 [1]	5.0 [6]	0.056	ND
Thallium	0.004 [3]	5.0 [6]	1.200	ND
Zinc	3.0 [1]	350 [6]	2.200	110
DIOXINS AND FURANS				
	(pg/L)	(pg/Kg)	(pg/L)	(pg/Kg)
1,2,3,4,6,7,8-Heptachlorodibenzodioxi	7,000 [7]	3,120 [7]	210	230
Octachlorodibenzodioxin	7,000 [7]	3,120 [7]	1,200	1,600
1,2,3,4,7,8-Hexachlorodibenzofuran	350 [7]	156 [7]	90	ND
1,2,3,4,6,7,8-Heptachlorodibenzofuran	7,000 [7]	3,120 [7]	500	98
Octachlorodibenzofuran	7,000 [7]	3,120 [7]	1,900	180

TABLE 5-1 (Continued)
BELL'S FARM AND HOME CENTER
SOUTH CORNING, NEW YORK
REMEDIAL INVESTIGATION PROGRAM

NDARDS AND CLEAN-UP GOALS FOR TRACE CONSTITUENTS FOUND IN POND WATER

CONSTITUENT	WATER STANDARD (ug/L)	SOIL CLEAN-UP GOAL (mg/Kg)
Diazinon	0.07[1]	0.007 *
Endosulfan II	50[2]	4.0[3]
lindane	4.0[2]	20[3]
Malathion	7.0[1]	0.7 *
Methoxychlor	35[1]	3.5 *
Mirex	5.0[2]	0.5 *
Trifluralin	35[1]	3.5 *
1,1,1-Trichloroethane	5.0[2]	7,000[3]

* There are no USEPA or NYSDEC standards for this constituent in soil. The proposed standard for this site is 100 times the applicable water standard on a weight/weight basis.

Table 5-1
(Continued)

1. NYSDEC, 1986. Water Quality Regulations; Surface Water and Groundwater Classifications and Standards. New York State Codes, Rules and Regulations Title 6 Chapter 10 Parts 700-705.
2. See Note 1, Appendix 31
3. USEPA, 1989. Interim Final RCRA Facility Investigation Guidance, Table 8-7.
4. Barolo, Daniel M., 1987. Ambient Water Quality Standards and Guidance Values. NYSDEC Memorandum to Bureau Directors, Regional Water Engineers and Section Chiefs.
5. See Note 3, Table 8-6.
6. Hall, Robert, April 1990. Letter to H&A of New York Re: IRM Work Plan/Bell Farm Site, No. 851015, Steuben County, Table 3.
7. See Note 6, Tables 1 and 2.

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TABLE 5-2
BELL'S FARM AND HOME CENTER
SOUTH CORNING, NEW YORK
REMEDIAL INVESTIGATION PROGRAM

TOXIC EQUIVALENCY FACTORS FOR SELECTED DIOXIN AND FURAN COGENITORS

COGENITOR	TOXIC EQUIVALENCY FACTOR
2,3,7,8-Tetrachlorodibenzodioxin	1.0
1,2,3,4,7,8-Hexachlorodibenzodioxin	0.05
1,2,3,4,6,7,8-Heptachlorodibenzodioxin	0.005
Octachlorodibenzodioxin	0.005
2,3,7,8-Tetrachlorodibenzofuran	0.1
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.005
Octachlorodibenzofuran	0.005

Data source: NYSDEC 1989 Standards, communicated to H&A of New York via letter from Mr. R. Hall, P.E., NYSDEC, dated 24 April 1990.

TABLE 5-3
BELL'S FARM AND HOME CENTER
SOUTH CORNING, NEW YORK
REMEDIAL INVESTIGATION PROGRAM

TOXIC EQUIVALENT OF DIOXINS AND FURANS DETECTED ON-SITE

GROUNDWATER (DRYWELL)	TEF	CONC.	TOXIC EQUIVALENT
2,3,7,8-Tetrachlorodibenzodioxin	1.0	ND	0.0
1,2,3,4,6,7,8-Heptachlorodibenzodioxin	0.005	210 pg/L	1.1 pg/L
Octachlorodibenzodioxin	0.005	1,200 pg/L	6.0 pg/L
2,3,7,8-Tetrachlorodibenzofuran	0.1	ND	0.0
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1	67 pg/L	6.7 pg/L
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.005	280 pg/L	1.4 pg/L
Octachlorodibenzofuran	0.005	1,000 pg/L	5.0 pg/L

Total Toxic Equivalent = 20.2 pg/L

SURFACE WATER (POND)	TEF	CONC.	TOXIC EQUIVALENT
2,3,7,8-Tetrachlorodibenzodioxin	1.0	ND	0.0
1,2,3,4,6,7,8-Heptachlorodibenzodioxin	0.005	62 pg/L	0.3 pg/L
Octachlorodibenzodioxin	0.005	280 pg/L	1.4 pg/L
2,3,7,8-Tetrachlorodibenzofuran	0.1	ND	0.0
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1	90 pg/L	9.0 pg/L
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.005	500 pg/L	2.5 pg/L
Octachlorodibenzofuran	0.005	1,900 pg/L	9.5 pg/L

Total Toxic Equivalent = 22.7 pg/L

SOIL	TEF	CONC.	TOXIC EQUIVALENT
2,3,7,8-Tetrachlorodibenzodioxin	1.0	ND	0.0
1,2,3,4,6,7,8-Heptachlorodibenzodioxin	0.005	230 pg/L	1.2 pg/L
Octachlorodibenzodioxin	0.005	1,600 pg/L	8.0 pg/L
2,3,7,8-Tetrachlorodibenzofuran	0.1	ND	0.0
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1	ND	0.0
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.005	48 pg/L	0.3 pg/L
Octachlorodibenzofuran	0.005	180 pg/L	0.9 pg/L

Total Toxic Equivalent = 10.4 pg/L

TABLE 5-4
BELL'S FARM AND HOME CENTER
SOUTH CORNING, NEW YORK
REMEDIAL INVESTIGATION PROGRAM

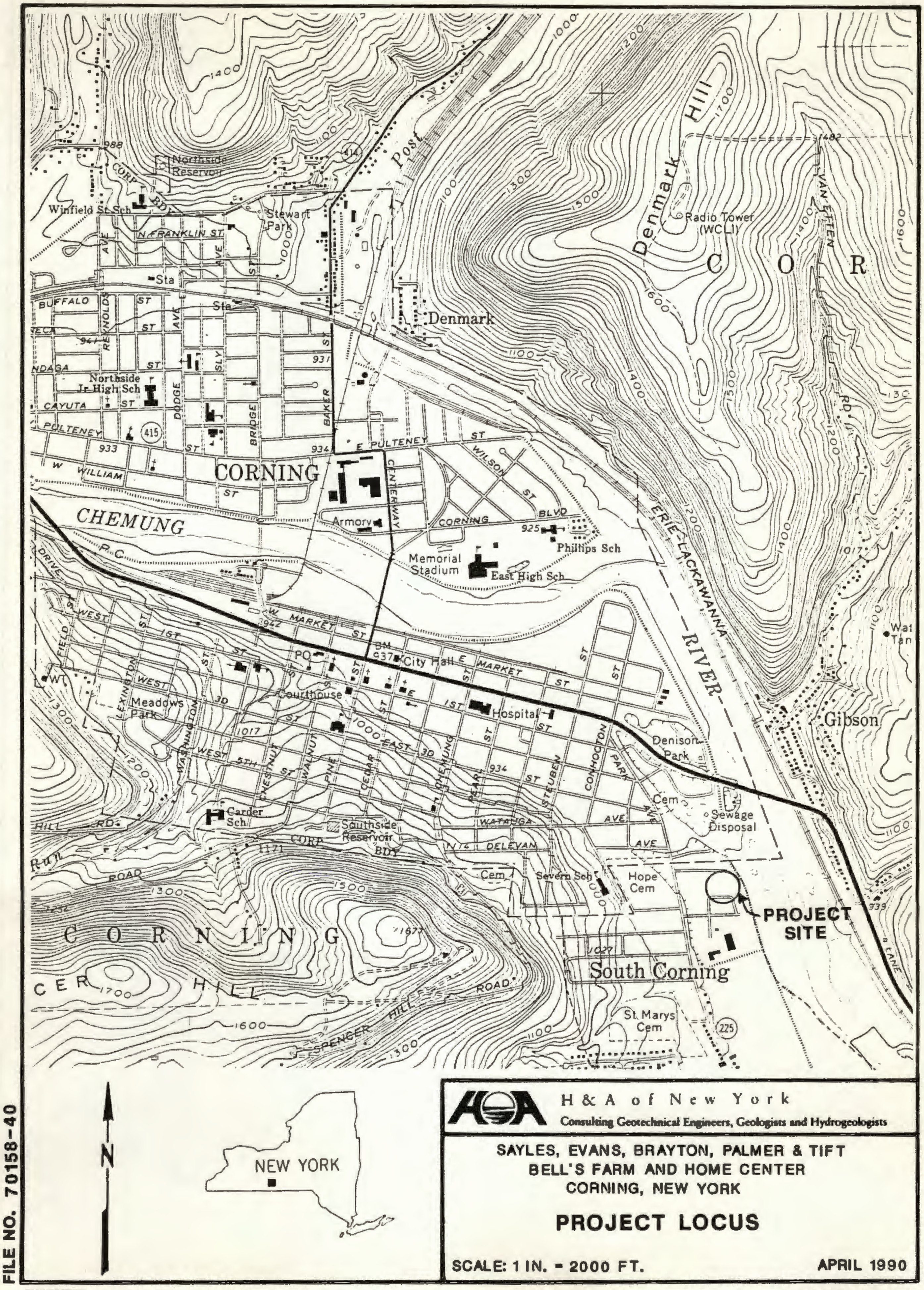
NATURAL RANGE OF TRACE METALS IN SOIL

	USGS mg/kg (1)		EPA SW-874 mg/kg (2)	
	RANGE	MEAN	RANGE	MEAN
Arsenic	<0.1 to 73	7.4	1 to 50	5
Cadmium	NA	NA	0.01 to 0.7	0.06
Chromium	1 to 1000	52	1 to 1000	100
Copper	<1 to 700	22	2 to 100	30
Lead	<10 to 300	17	2 200	10
Nickel	<5 to 700	18	5 to 500	40
Zinc	<5 to 2,900	52	10 to 300	50

REFERENCES

1. USGS, 1984, "Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States", USGS Professional Paper 1270. (Trace metal concentrations are from Table 2, Eastern United States).

2. USEPA, 1983, "Hazardous Waste Land Treatment", SW-874, USEPA Office of Waste and Emergency Response (page 273, table 6.46).



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CORNING, NEW YORK

PROJECT LOCUS

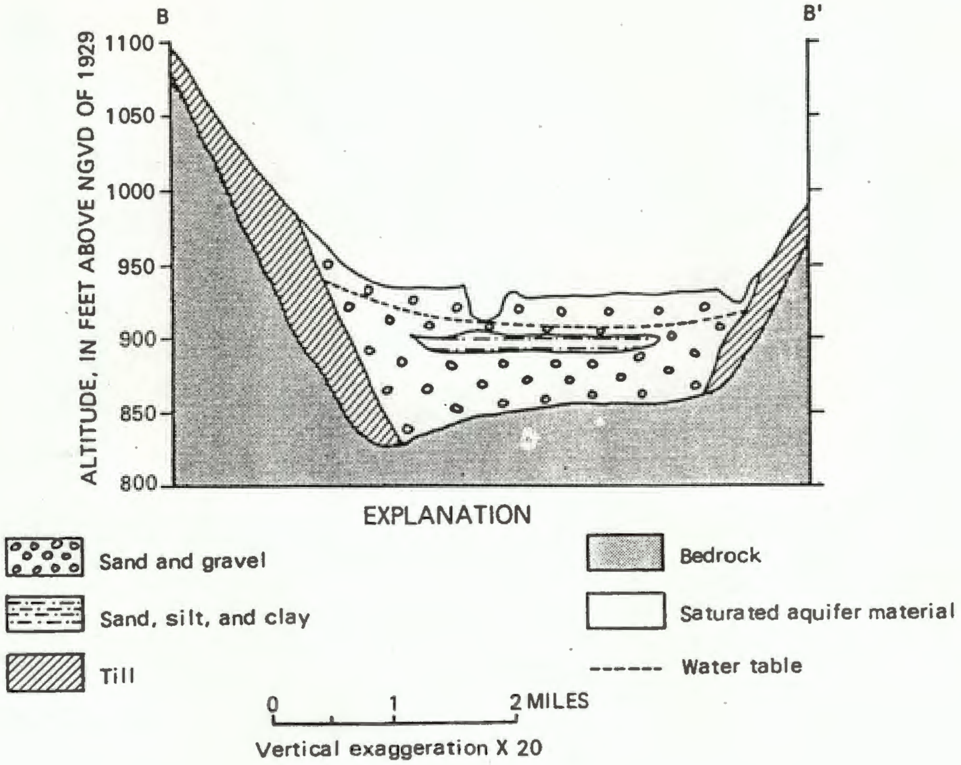
SCALE: 1 IN. = 2000 FT.

APRIL 1990

FILE NO. 70158-40

CHARRETTE

FIGURE 1



NOTES:

1. SEE FIGURE 2 FOR LOCATION OF CROSS SECTION.
2. REFERENCE: DRAWING COPIED FROM MILLER, T.S., 1982, "CORNING AREA" IN ATLAS OF ELEVEN SELECTED AQUIFERS IN NEW YORK, BY R.M. WALLER AND A.J. FINCH, p. 173-194.

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CORNING, NEW YORK

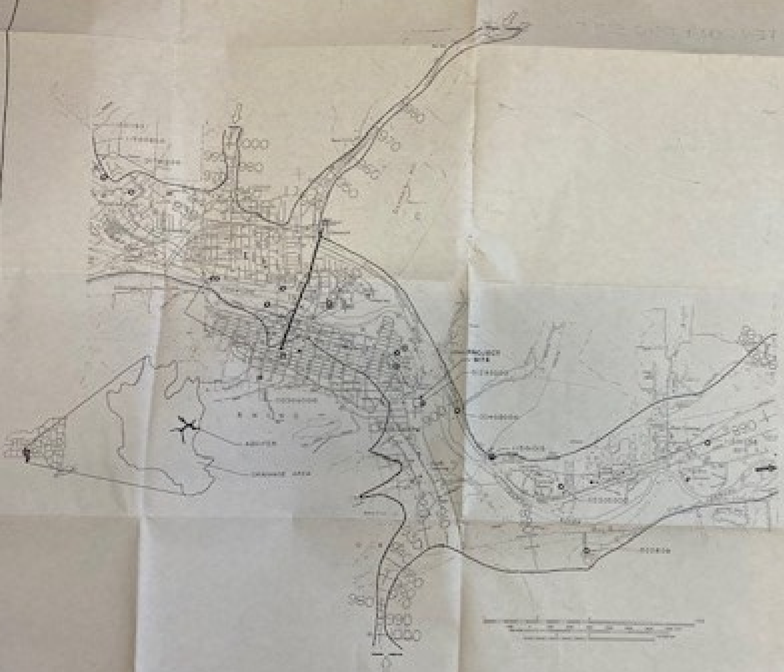
GEOLOGIC CROSS-SECTION
CHEMUNG RIVER VALLEY

APRIL 1990

FILE NO. 70158-40

CHARRETTE

FIGURE 2



POTENTIOMETRIC SURFACE

By

Todd S. Miller and Ronald V. Allen

H&A of New York

Consulting Geotechnical Engineers, Geologists and Hydrogeologists

SAYLES, EVANS, BRAYTON, PALMER AND TIFFT

[illegible]

[illegible]

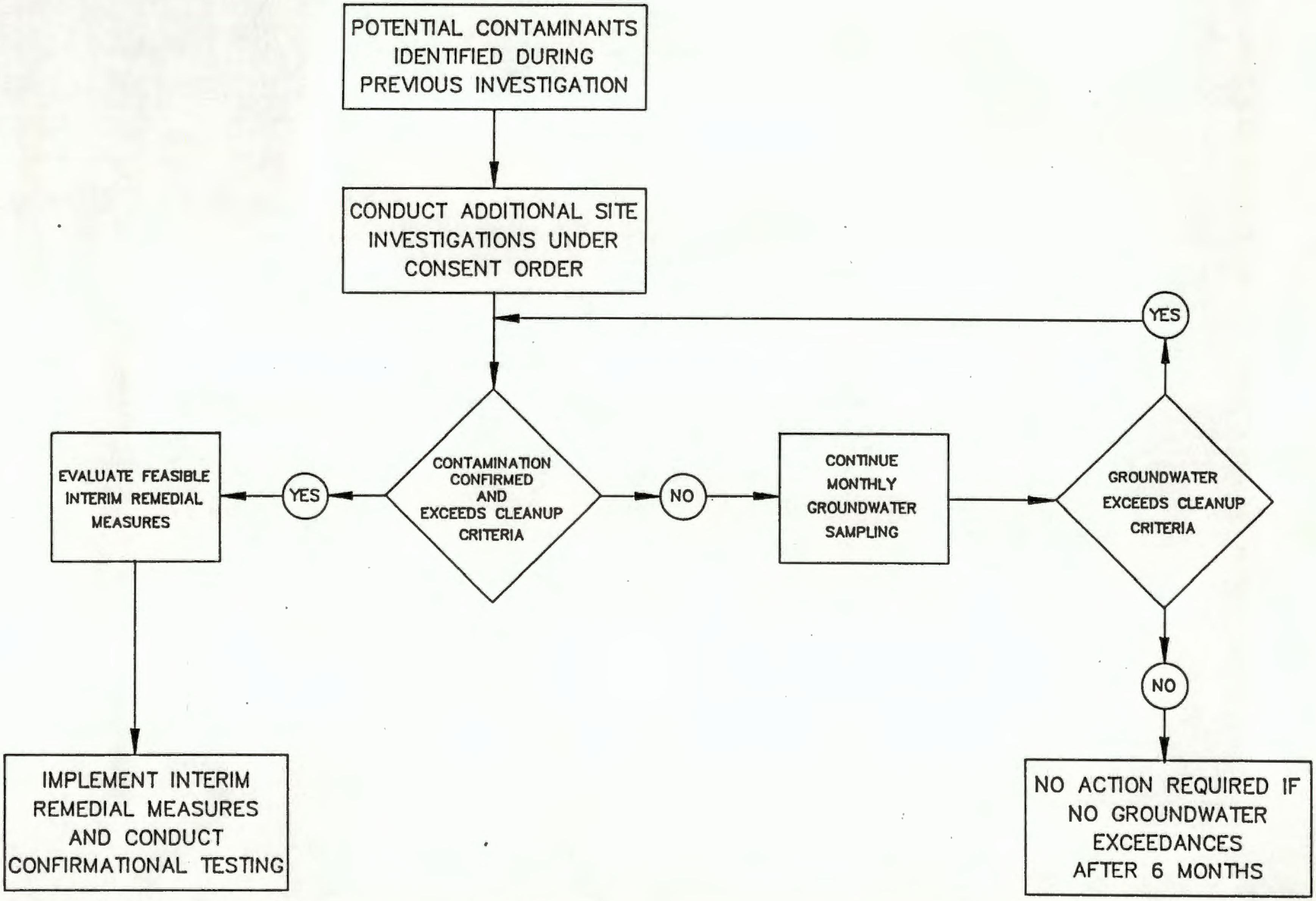
POTENTIOMETRIC SURFACE

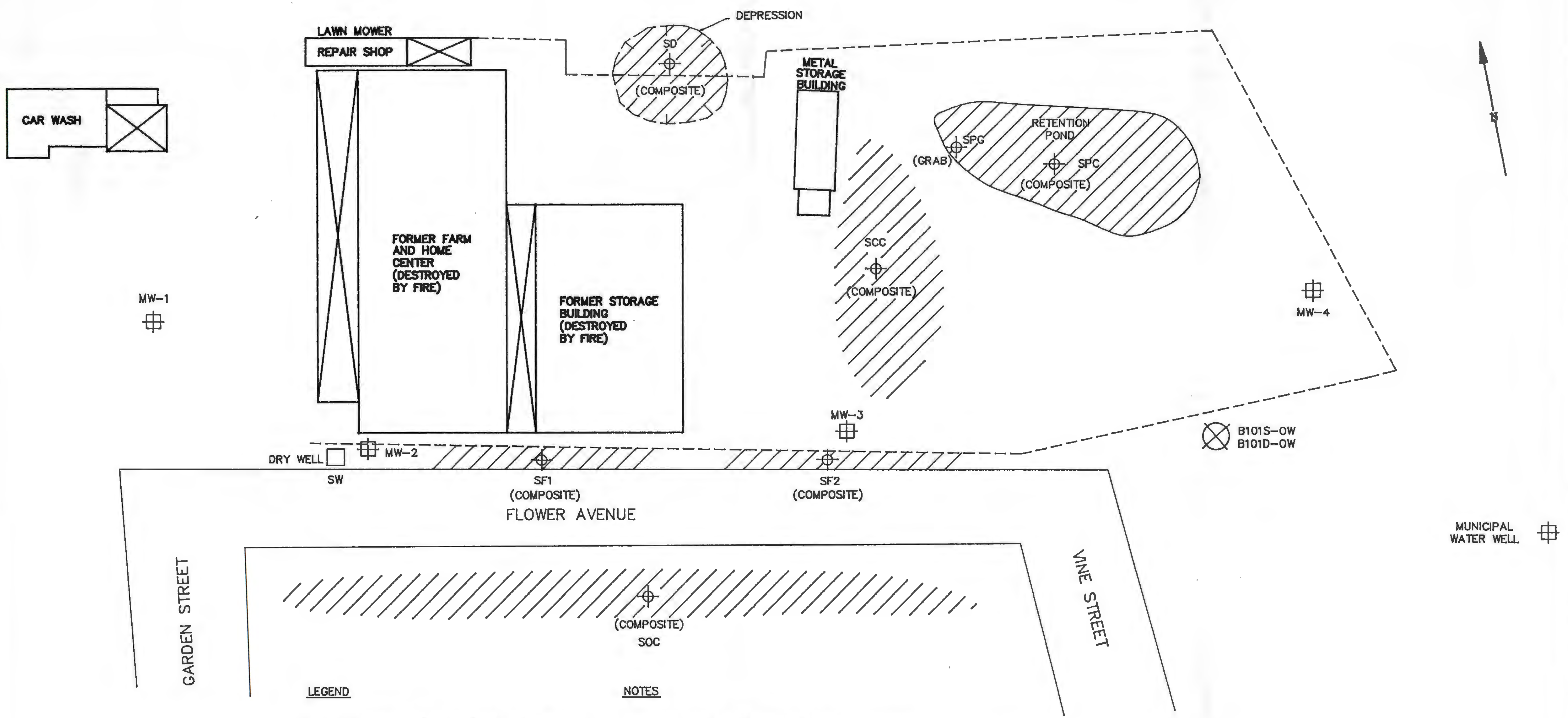
APRIL [illegible]

FIGURE

FILE NO. 70118-43

FIGURE 4
IRM FLOW CHART





LEGEND

⊞ EXISTING MONITORING WELLS – INSTALLED BY GROUNDWATER TECHNOLOGY INC. IN DECEMBER 1989

⊕ PROPOSED SOIL/SEDIMENT SAMPLE LOCATIONS (SHADED AREA REFLECTS LOCATION OF SAMPLING FOR COMPOSITE SAMPLES)

⊗ MONITORING WELL CLUSTER B101S-OW AND B101D-OW

– – FENCE

NOTES

1. LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. SAMPLE LOCATIONS MAY VARY AS SURFACE CONDITIONS DICTATE.

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MONITORING WELL AND SAMPLING LOCATION PLAN

SCALE: 1 IN. = 50 FT.
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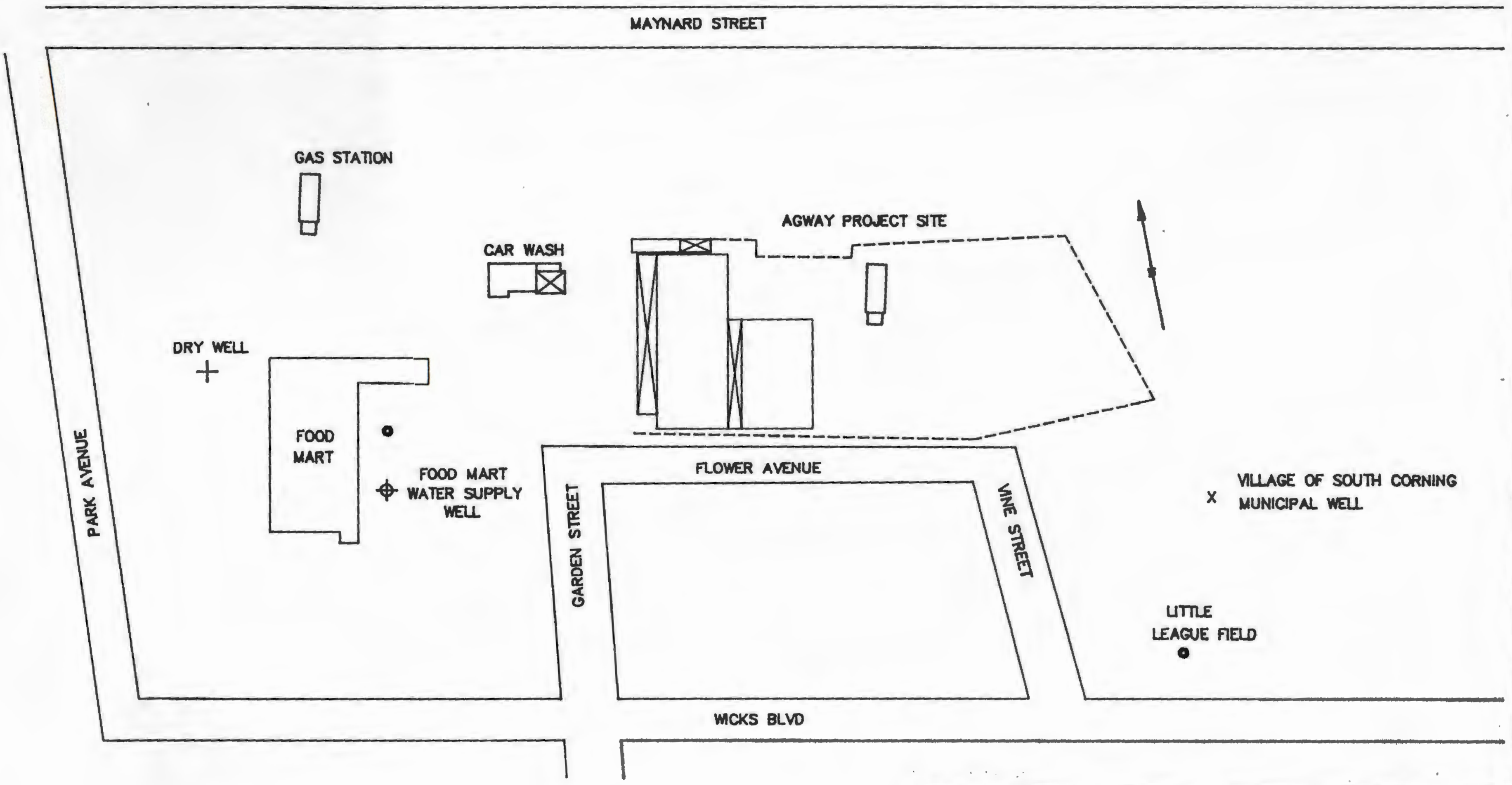
FIGURE 5

FILE NO. 70158-40

CHARRETTE

FILE NO. 70158-40



LEGEND

● BACKGROUND AND SURFACE SOIL SAMPLE

+ BACKGROUND SEDIMENT SAMPLE FROM DRY WELL

⌖ BACKGROUND GROUNDWATER SAMPLING LOCATION

NOTES

1. PLAN IS DRAWN SCHEMATICALLY NOT TO SCALE.
2. SURFACE SOIL AND SEDIMENT SAMPLING LOCATIONS ARE APPROXIMATE.

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LOCATION OF BACKGROUND SOIL AND SEDIMENT SAMPLES

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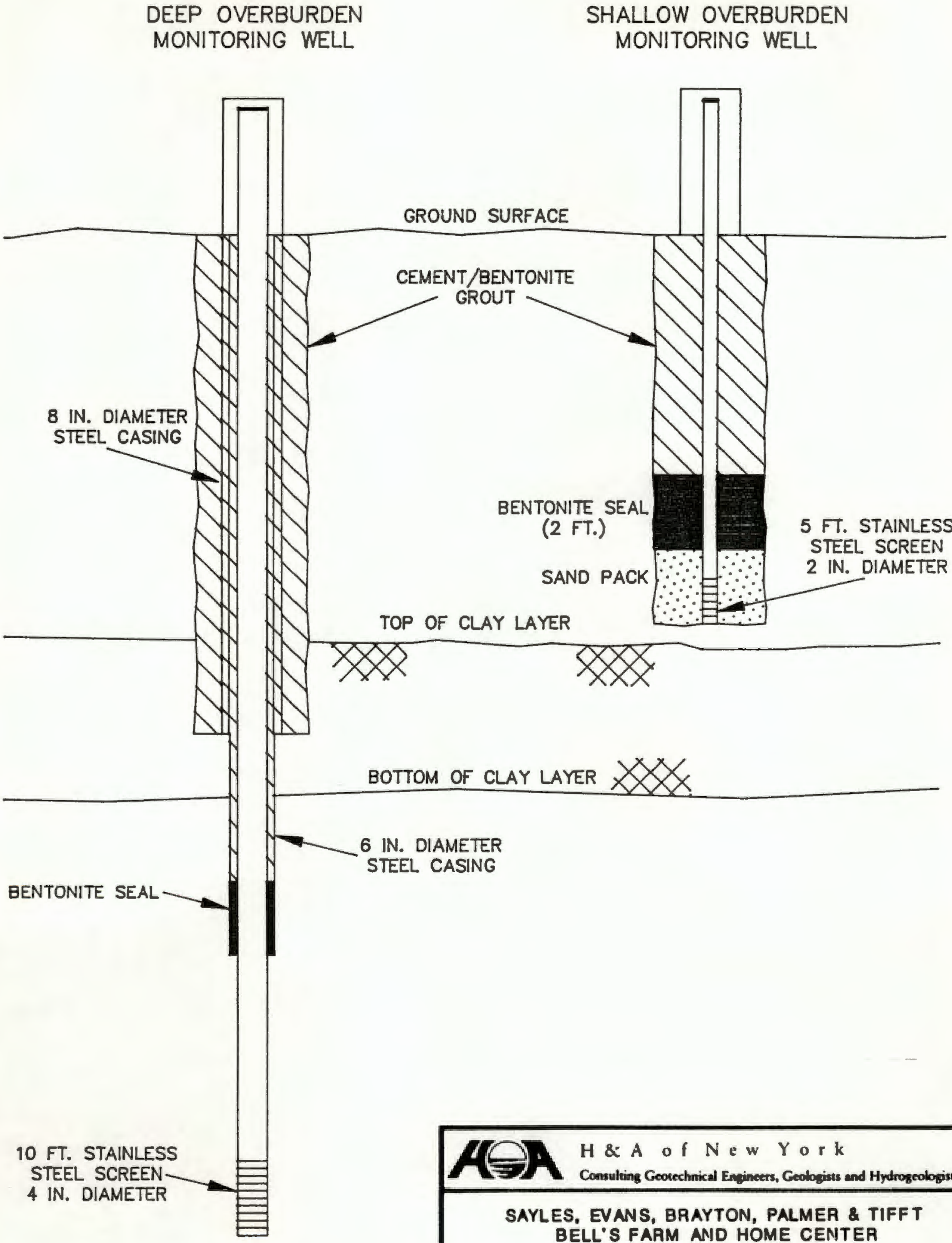
FIGURE 6



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CORNING, NEW YORK

MONITORING WELL CONSTRUCTION

NOT TO SCALE
APRIL 1990

FILE NO. 70158-40

FIGURE 7

APPENDIX A

DRILLING PROCEDURES FOR TEST BORING/MONITORING WELL INSTALLATION

APPENDIX A

DRILLING PROCEDURES FOR TEST BORING/MONITORING WELL INSTALLATION

1.0 Introduction

Test Boring and monitoring well installation will be performed under the observation of a trained geologist. The geologist will direct the drilling and monitoring well installation, prepare geologic logs and prepare well completion reports.

2.0 Procedures

2.1 Pre-Drilling Activities

Upon arrival on-site, the drilling rig and all related equipment will be cleaned in the designated site decontamination areas. The cleaning procedure for drilling equipment is contained in Appendix B.

The drilling rig and related equipment will be set up at each designated drilling location in a manner allowing the control of acces to the work area. The size and nature of operations these zones is site specific dependent on local conditions as discussed in Section 7.0, Health and Safety Plan.

The drilling crew will assemble the necessary barrels for containerization of drill cuttings prior to the initiation of drilling activities. Water generated during drilling will be pumped to the on-site pond.

4.0 Drilling and Monitoring Well Installation

Two types of wells will be installed at Bell's Farm and Home Center:

- o Shallow overburden
- o Deep overburden

A test boring will be installed to characterize hydrogeologic conditions in the overburden.

4.1 Deep Overburden Well

A test boring using 6-1/4 in. hollow stem augers shall be advanced approximately 5 feet into the clay layer, as identified and confirmed by an on-site geologist. An 8 in. permanent casing will be set to the total depth of the drilled hole. The permanent casing will be grouted in place and allowed to set for 12 hours prior to the resumption of drilling activities.

A 6 in. casing will be advanced approximately 85 feet, using a pound and wash technique. Continuous split spoon samples will be collected to the bottom of the clay layer, and standard split spoon sampling at 5 ft. intervals will be utilized below this point.

A 10 ft. section of 4 in. stainless steel screen threaded to a sufficient length of 4 in. stainless steel riser pipe will be installed. The screen and riser will be set to a depth of approximately 85 ft. within the temporary casing. The temporary casing will be pulled up to 2 ft. above the top of screen. The contractor will use a "spaghetti rod" string to determine if the formation has collapsed around the well screen. If necessary, sand pack will be installed to fill the borehole annulus to a level approximately 30 feet above the well screen. A bentonite seal will be installed to prevent vertical migration of groundwater contaminants. The remaining annular space will be grouted to surface with a cement/bentonite grout tremied into the hole as the temporary casing is removed.

4.2 Shallow Overburden Well

A shallow well will be completed adjacent to the deep boring. A boring will be completed to approximately 25 ft. using a 4-1/4 in. hollow stem auger. A 5 ft. length of 2 in. stainless steel screen, threaded to a sufficient length of stainless steel riser pipe will be installed. The annular space will be packed with sand to 2 ft. above the top of screen. A 3 ft. seal of bentonite pellets will be installed above the sand pack. The remaining annular space will be grouted to surface with a cement/bentonite grout.

4.3 Well Development

The wells will be developed by either pumping or bailing in combination with surging until the discharge is relatively sediment free. H&A will evaluate the success of well development by recording the turbidity using a nephelometer. The NYSDEC maximum acceptable turbidity value is 50 NTU. Records of water lost during drilling will be maintained and well development will continue until 1.5 times the volume of fluid lost while drilling the respective monitoring interval are retrieved.

5.0 Well Completion Report

The well construction details, as well as a summary of subsurface conditions, will be summarized on a Well Completion Report. Examples of typical well completion report forms are shown in Figure 4.

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APPENDIX B

DRILLING EQUIPMENT DECONTAMINATION

APPENDIX B

FIELD OPERATING PROCEDURE
DRILLING EQUIPMENT DECONTAMINATION

1.1 Hollow Stem Augers and Related Equipment

The following procedures will be used to decontaminate hollow stem augers and related equipment:

1. Water wash equipment used during well drilling.
2. Wire brush equipment to remove visible soils adhering to the equipment.
3. Rinse equipment with clean water.
4. Clean equipment with pressurized low-volume water or steam.

1.2 Cleaning of Liquid Recirculation Drilling Equipment

The cleaning procedure for liquid recirculation drilling equipment (drilling pumps and hoses) will be as follows:

1. All exposed surfaces and equipment will be steam cleaned.
2. The pumping system and hoses will be flushed with potable water for 15 minutes.

1.3 Cleaning of Packers, Sampling and Examination Tools

The cleaning procedures for the packer assembly, grouting equipment, split spoon samplers, spatula, knives and other tools will be as follows:

1. Alconox detergent wash.
2. Tap water rinse.
3. Distilled/deionized water rinse.
4. Air dry.

The distilled/deionized water will not be recycled during the cleaning operation.

1.4 Cleaning of Well Construction Materials

All well casing and screens will be decontaminated prior to placement in the borehole. The casing and screens will be steam cleaned in the decontamination area and transported to the drilling area on clean plastic. The well materials shall not come into contact with the ground surface. All casing and screens will be stored at the drilling site on the clean plastic tarp until their use.

Gravel/sand pack used in monitoring well construction will be decontaminated prior to arrival on-site by the manufacturer. The sand pack will be composed of inert material such as silica sand.

lps23027

APPENDIX C

PROCEDURES FOR CONTAINING DRILLING RELATED WASTES

APPENDIX C

PROCEDURES FOR CONTAINING DRILLING RELATED WASTES

This document contains the procedures to be used for containerizing drilling related wastes at the Bell's Farm and Home Center.

1.0 Drilling Wastes

1.1 Drilling Fluids and Drilling Equipment Decontamination Wastes

The drilling recirculating fluid, drilling equipment decontamination wastes and the effluent from well development will be disposed of in the retention pond on site.

1.2 Soil and Rock Cuttings

The soil and rock cuttings from the drilling procedure will be containerized in closed drums. The drums will be stored on site.

APPENDIX D

PROCEDURES FOR SURFICIAL SOIL AND SEDIMENT SAMPLING

APPENDIX D

PROCEDURES FOR SURFICIAL SOIL AND SEDIMENT SAMPLING

1.0 Introduction

Surficial soil and sediment samples will be collected for laboratory chemical analysis. The work plan specifies the data objective, location, and analytical parameters for each soil sample. The purpose of this field operation procedure is to describe the methods to be used during each procedure.

2.0 Sample Collection

Surficial Soil Samples

The surficial soil samples (0 to 6 inches in depth) will be obtained using a stainless steel trowel from discrete areas as depicted on Figures 4 and 5. Each composite sample will consist of 4 to 8 individual surficial soil samples that will be combined in a stainless steel mixing bowl and mixed together thoroughly. Once the sample is relatively homogenized a sufficient quantity of soil will be obtained with a stainless spoon or spatula and placed in the appropriate sample containers.

Dry Well Sediment

Sediment from on-site and off-site dry wells will be obtained using a stainless steel trowel. The sediment sample will be obtained from the top 6 inches of sediment contained in the dry well. The sediment sample will then be placed in appropriate containers using a stainless steel spoon or spatula. If a dry well is found have standing water, a clam shell grab sampler will be used to obtain the sediment samples.

Pond Settlement

A clam shell grab sampler will be used to obtain pond sediment samples. 6 to 8 pond sediment samples will be obtained from the pond to obtain sufficient number of samples for compositing. The spring loaded clam-shell grab sampler is designed to close once it reaches several inches into the pond sediment. The clam shell grab sampler will be attached to the end of a long stainless steel pole and directed to the desired location in the pond. The 6 to 8 samples will be combined in a stainless steel mixing bowl and mixed together thoroughly using a stainless steel spoon or spatula.

The soil samples will be placed in the appropriate sample container as described in Appendix F and placed in a cooler. The containers will be labeled with the following information:

- Date
- Soil Sample Location Number
- Sample Number
- Job Number

3.0 Sample Handling

All samples sent to the laboratory for chemical analysis will remain in a condition as close as possible to in situ conditions, particularly in the case of volatile organic compounds. The first consideration is the proper selection of containers, preservation and holding times. Other considerations include proper field notes, proper chain-of-custody procedures, and proper labeling of samples.

3.1 Containers

The type and size of containers used for soil sample collection will be specified in Section 2, Sampling Analysis Plan.

3.2 Preservation

The general purpose of preservation is to maintain the original characteristics (and thus validity) of the sample during the time required for shipping of the sample to the laboratory. For soil, the only preservation technique is cooling the sample to approximately 4°C. This will be done in the field using ice or cold packs in coolers. To the extent possible, samples which are visually (highly) contaminated or from areas known to be contaminated will be kept separate from those which are not during transportation.

3.3 Sample Custody Procedures

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 would 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. 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 samplers will complete the appropriate portion of the chain-of-custody form and hand deliver the cooler to an overnight shipping company office. The receiving party will complete the remainder of the form and a copy will be retained by the sampler and kept with the field data sheets for that round of sampling. Each cooler will also be sealed using chain-of-custody tape.

3.4 Labels

The sample to be sent to the laboratory for chemical analysis will be identified with the following information:

- Date and time of collection
- Boring number
- Sample number
- Analysis to be performed
- Samplers name and affiliation

3.5 Equipment Cleaning Methods

Equipment in actual contact with a laboratory sample will be cleaned prior to and between each use. The equipment will then be temporarily placed on clean racks, off the ground until it is used. Equipment such as soil samplers and soil knives will be cleaned with the following materials:

- Alconox detergent wash
- Tap water rinse
- Deionized water rinse
- Air dry.

APPENDIX E

GROUNDWATER SAMPLING

APPENDIX E

GROUNDWATER SAMPLING

1.0 INTRODUCTION

The sampling and analysis protocol utilized at Bell's Farm and Home Center in Corning, New York is designed to accommodate the collection of reliable hydrogeologic data and representative groundwater samples suitable for analysis of the Target Compound List (TCL). The sampling and analysis protocol follows a strict quality assurance and quality control program in order to provide reliable analytical measures and document the accuracy of data for regulatory compliance.

The investigation is currently in its initial stages. It is contemplated that the monitoring system to be installed during the investigation will include a well installed to monitor the shallow overburden zone and a well to monitor the deep overburden zone.

Groundwater sampling events will be conducted at monthly intervals, and samples will be subsequently analyzed by an approved Laboratory in conformance with this document.

2.0 PRE-SAMPLING ACTIVITIES

Prior to sampling, the following tasks are performed:

- well maintenance check
- static water level measurement
- depth to bottom measurement

All wells will be purged. Wells that recover rapidly will be sampled immediately after purging. Wells with recovery rates too slow to yield sufficient sample volume immediately after purging, will be sampled within 2 hours. If a well does not recover sufficiently in 2 hours, the well will be sampled within 24 hours. Also during purging and sampling, wells that do not provide adequate sample volume due to the need for redevelopment will be identified.

2.1 Well Maintenance Check

Prior to every sampling event, a routine inspection of the condition of the protective casing and surface seal is performed. The protective casing will be inspected for the integrity of the locking cap and the surface seal and any deficiencies will be noted and corrected. In addition, wells are checked for other signs of damage or inadvertent entry. Wells should have identical padlocks with one key opening all wells. Observations of any irregularities are noted in the Field Log Book as well as the well number, date and time.

2.2 Static Water Level Measurements

At each scheduled sampling event, the depth to groundwater will be measured with an electronic depth indicator. At present, a Slope-M, (Model No. 51453) meters are used for this task. The probe will be lowered into the well until the meter indicates water is reached (by a buzzing sound). The probe will be lowered a few inches into the water and then pulled back until the buzzing stops. The probe will be slowly lowered again until the buzzing sound is heard again. The cable will be held against the side of the outer protective well casing and a depth reading taken. This procedure will be followed three times or until a consistent value is obtained. The value will be recorded to the nearest tenth of a foot in the Field Log Book. The probe will then be raised to the surface, and together with the lower 3 to 4 feet of cable be decontaminated according to the procedures described in Section 5.0. Before leaving the well location, the volume of water in the well and the volume of water required to purge three well volumes will be calculated and entered into the Field Log Book.

The calibrated cable on the depth indicator will be checked against a surveyors steel tape annually. A new cable will be installed if the cable has changed by more than 0.01% (0.01 ft. for a 100 ft. cable). Calibration data will be kept in a Field Equipment Calibration Log Book. This log will be updated quarterly on all field equipment employed.

2.3 Depth to Well Bottom Measurement

Each time that a well is sampled, the depth to bottom of the well will be measured. The measurement will be performed following the static water level measurement using a weighted surveyor's stainless steel tape. The weighted tape will be lowered to the bottom of the well, and after the bottom of the well is reached, the tape will be held against the side of the outer protective well casing and a depth reading taken. The well will be sounded three times or until a consistent value is obtained. The value will be recorded to the nearest 0.1 feet in the Field Log Book. The tape will then be raised to the surface and that portion that was wetted will be decontaminated according to the procedures described in Section 5.0.

3.0 WELL EVACUATION

Wells will be purged of three standing well volumes or until the well is brought to dryness. The calculation of three standing well volumes will be taken from the Field Log Book, and is based upon the depth to groundwater measurements, and well depth logs. All evacuated water will be containerized in 5 gallon plastic carboys at the well. The actual volume purged will be noted from the level in the carboy(s) and recorded in the Field Log Book along with the date and time of purging.

3.1 Pumping

Wells greater than 60 feet deep will be evacuated using a submersible piston pump (Bennett sample pump). The following procedures will be employed:

1. A polypropylene air exhaust tube, air supply tube and water discharge tube will be connected to a Bennett submersible piston pump (the specifications of which are attached). The pump will be inserted into the well and lowered to within 1 foot of the bottom.

2. An external air supply from an oil-less air compressor will be attached to the control box. The air compressor will be located at least 10 feet down wind of the well head. A discharge line from the water discharge tube on the control box will be routed to a calibrated 5-gallon bucket.

3. The air compressor will be turned on, thus activating the pump. The flow rate will be adjusted using the air pressure regulator on the control box. The discharge will be measured in the calibrated bucket and adjusted to approximately 2 gallons per minute. The air compressor will be turned off, the discharge line redirected to a 55-gallon drum or other appropriate container and then pumping will be resumed.

4. The well will be purged for a time sufficient to evacuate 3 well volumes from the well. Observations of the flow rate, rate of recovery and other pertinent information will be recorded in the field logbook.

3.2 Bailing

Wells with depth less than about 60 feet will be evacuated using either a 1.5 or 3 inch diameter thin-walled stainless steel bottom filling bailers about 3 feet in length. The bailers will be lowered using a dedicated (one use only) polypropylene rope attached to a 5 feet length of teflon coated stainless steel monofilament cable attached to the top of the bailer with a stainless steel clip. The cable and bailer will be decontaminated between wells according to the procedures outlined in Section 5.0.

3.3 Disposal

Purge water will be collected and disposed of on site.

During transfer operations, appropriate health and safety procedures outlined in Section 8.0 of the work plan will be followed to provide workers with a safe level of personal protection.

4.0 SAMPLING ACTIVITIES

After purging, those wells with a demonstrated slow recovery rate will be sampled within 24 hours, all other wells will be sampled within 2 hours. Dedicated pre-labeled bottom filling teflon bailers, 1.66 inch outer diameter and 1 to 3 feet in length are used to obtain the samples. The dedicated bailers are all precleaned, and brought to the site wrapped in aluminum foil. After sampling, the bailers are placed in plastic bags for transport to the laboratory where they are decontaminated according to procedures described in Section 5.0.

Samples are placed into the appropriate pre-labeled containers for the respective analytes as described in Table 1. and collected in duplicate. Containers required for sample collection are cleaned and labelled at the laboratory. If preservation of a sample is required, a third portion of sample water of equal volume is collected and the number of drops of preservative required is determined by stepwise addition. All containers are labeled with the following information:

- client name
- site name
- job number and sample I.D.
- analysis required
- preservative

Clear packing tape is placed over the label in the laboratory. This prevents filling in any additional information on the label in the field, and guarantees that the labels remain undamaged and attached to their container. Pre-labeled identification numbers are correlated with well locations in the field. The well locations versus identification number is noted in both the Field Log and the Chain of Custody. Procedures for completing chain of custody forms are discussed in Section 6.

The sampling procedure will be performed in the following manner. A set of containers for the required analyses and one 125 ml plastic bottle will be procured from, and placed on top of a cooler. At this point, vial identification labels are verified as to well locations and recorded in the Field Log. The bailer will then be slowly lowered into the well to minimize the disturbance of water, and taking care to not have any portion touch the ground. When the bailer reaches the water surface, it will be lowered an additional two to three feet and allowed to remain there until filled (as indicated by cessation of the bubbling sound in the well). The bailer will then be retrieved.

After the bailer is retrieved, the bailer load will be slowly and carefully poured into the containers held at an angle to minimize any agitation and degassing of volatiles. At this point if any preservation is required, the amount will be determined on the third container as described above. As the container is near full, it will be held vertically so a meniscus can be formed at the surface. The containers will then be capped, inverted and tapped, and checked to see if any bubbles are present. If any bubbles appear, the filling procedure will be repeated.

After the containers are filled, the remaining water in the bailer will be placed in the 125 ml plastic bottle and field tested for the primary parameters temperature, specific conductance, and pH in that order. After the 125 ml plastic bottle is filled the vials will be placed in the cooler. No change in water quality would be expected as a result of the sampling, given the very small volume of water removed from the well (approximately 230 ml) relative to the volume in storage. A glass stem partial-immersion thermometer, marked in increments of 0.1 degree centigrade, will be rinsed with analyte-free deionized water and immersed in the bottle. The temperature will be measured and recorded in the Field Log. The thermometer will then be rinsed with deionized water and stored in a plastic carrying case.

Currently, a Chemtrix Model No. 700 Conductivity meter calibrated against a 0.01 Normal Potassium Iodide standard (1413 umho/cm) is used to measure specific conductance. The reading will be corrected for temperature as taken in the previous step. The meter calibration will be checked hourly and noted in the Field Log Book. If the meter calibration is off by more than 5%, a spare meter will be used. The probe will be rinsed with analyte-free deionized water and placed in the 125 ml. bottle. After a reading is taken and recorded, the probe will be re-rinsed and the meter placed in its case. Equipment specifications on the Chemtrix Model No. 700 and calibration and operational procedures are contained in Appendix   of this Attachment.

The pH will be measured last on the water in the 125 ml bottle. The pH meter will be calibrated hourly with pH buffers of 4.0, 7.0 and 10.0 standard units. The buffers will be freshly prepared and provided by the laboratory. The pH probe will be rinsed with analyte-free deionized water before inserting in the sample bottle and to take a reading. As with all other measurements taken at the well head, the reading will be immediately entered into the Field Log Book. The bottle used for the field tests will then be capped, stored in another chest and the contents later disposed of with the purged water.

The last task at the well site is to recheck if all readings have been recorded in the Field Log Book and if all equipment has been properly cleaned and placed back in its proper place. Finally, the well cap is closed and locked.

5.0 DECONTAMINATION

The decontamination procedure for all non-dedicated equipment will be done in the following manner:

- wash and scrub with low phosphate detergent
- tap water rinse
- deionized rinse, analyte-free
- air dry

When any non-dedicated equipment is being prepared for transport to the site that has been used previously at a different site, or is being stored for future use at the site, the decontamination procedure sequence will proceed in the following manner:

- wash and scrub with low phosphate detergent
- tap water rinse
- deionized rinse, analyte-free
- air dry
- wrap in aluminum foil, shiny side out for transport

6.0 SAMPLE HANDLING, PRESERVATION, AND CHAIN OF CUSTODY

Ice chests will be used to store sample sets collected at the wells. Approximately two half full chests are kept iced and the temperature within the chests as determined by a max/min thermometer will be recorded hourly.

Chain of Custody forms are initiated with vial sets when they are prelabeled in the laboratory. The name and signature of bottle preparer, number and type of containers (aliquots), ID numbers assigned to bottle sets, parameters needed on each aliquot, sample preservation, filtering requirements and ice chest number are identified. At the end of the sampling operation, a check is made that the well locations are matched with the proper sample identification number on the bottle. This and other pertinent information, such as date and times of sampling, ice chest temperatures, crew members names and signature of a crew member are then recorded on the Chain of Custody form. The Chain of Custody forms will be placed in a large moisture proof plastic bag and placed in a pocket taped to the underside of the chest cover. The ice chest will then be sealed with packing tape and placed in the crew van for direct transport to the laboratory. Any future modifications to the form must include at a minimum the pertinent information discussed above.

Field logs are checked before leaving the site. Bound Field Log include the following:

- Identification of each well
- Well dimensions and depths
- Static water level
- Calculated purge volume
- Actual volume purged
- Method of purging
- Dates and times of all tasks
- Field equipment calibration information
- Field observations
- Crew names
- Weather conditions
- Internal temperatures (hourly of ice chest)

At the laboratory (within one half hour of the well site) the samples will be received by a sample custodian. The transfer of possession will be noted by signing the chains and the conditions of samples (integrity and temperature) also noted in the laboratory sample receipt log book.

7.0 FIELD QUALITY CONTROL

7.1 Trip Blanks

Trip blanks and equipment blanks will be included with each purging and sampling event. The frequency of trip blanks will be one trip blank with each shipment. The trip blank is a 40 ml glass vial, with teflon septum, filled with analyte-free deionized water at the laboratory. The vial is taken from the same batch of clean vials used for the collection of the samples. The trip blank(s) is the first container placed in the cooler to hold samples, and is transported to the sampling site but is never opened. The trip blank(s) is returned to the laboratory in a manner identical to the handling procedure used for the samples. The trip blank(s) is analyzed for volatile organics. If the trip blank(s) shows significant concentrations of any volatile organics, the sample handling procedures will be reviewed and steps taken to eliminate the sources of contamination. The project manager will conduct this review and prepare a report of corrective actions to be implemented prior to the next sampling event.

7.2 Field Rinsate Blanks

Field rinsate blanks will be performed for each sampling round on all equipment that undergoes decontamination to verify purging and sampling operations have not affected the quality of the samples, and no cross contamination of wells has resulted from these operations. Two possible sources of cross contamination are avoided with the use of dedicated purge tubing and dedicated sampling bailers. Non-dedicated equipment contacting the groundwater include: 1) the lower three to four feet of the teflon coated stainless steel monofilament cable for the sampling or purging bailer and, 2) any bailers used for well purging. To verify that this equipment is decontaminated properly, rinse blanks will be prepared by capturing the rinse water into vials. This is done each day during the course of activities. One such blank is prepared daily for each type of equipment (i.e., bailers used for purging, and the bailer cable). The equipment rinse blanks are subjected to the same analyses as the groundwater samples. If contaminants are found in the blanks, the procedure will be reviewed and corrective action taken.

7.3 Duplicates

Field duplicates are also taken of the groundwaters. One duplicate for every ten samples (ten percent) will be taken in duplicate. Duplicate samples will be obtained by first slowly and carefully filling the appropriate container held at an angle in order to minimize any agitation and degassing of volatiles. As the container is near full, it will be held vertically so a meniscus can be formed at the surface. The container will then be capped, inverted and tapped, and checked to see if any bubbles are present. If any bubbles appear, the filing procedures will be repeated. After the first set of containers is checked, the sample duplicate will be obtained by taking a second bailer volume and using the same filling procedure, with no purging between bailers. For each bailer volume, remaining water will be placed in two 125-ml plastic bottles and field tested for the primary parameters according to the procedures outlined in Section 4.0. This method of obtaining duplicates minimizes sample agitation and exposure to the atmosphere.

7.4 Calibration

Field equipment including pH, temperature and conductivity meters are calibrated prior to field use and calibration checked in the field. This is performed on an hourly basis and has proven to be adequate for this survey. The wells are so near one another, and the time between samplings so minimal (five to ten minutes), that the meters are actually in near continuous use.

7.5 Acceptance Criteria

Any analyte found in an equipment or trip blank above 5 times the MDL or greater than 1/10 the lowest sample value, whichever is higher, will implement an immediate investigation on the part of the Project Manager. A determination of the source of contamination will be made and corrective action taken prior to the next sampling event. Each will be documented to the respective regulatory agencies.

8.0 ANALYTICAL PROCEDURES

The analytical procedures required for this project must be capable of providing a low method detection limit for the dissolved groundwater constituents which are present in the low ppb range and as well as quantification of very high concentrations in the ppm range which are associated with the source areas. In order to achieve these low detection limits, EPA methods and procedures contained within the 3rd Edition of SW-846, USEPA Test Methods for Evaluating Solid Wastes, Laboratory Manual, Physical/Chemical Methods, November 1986 will be used.

Appendix F contains the analytical methods to be utilized to evaluate samples for the following: pH, specific conductance, cyanide, sulfide, metals, mercury, halogenated volatile organics, semivolatile organics, nonhalogenated volatile organics, organochlorane pesticides, herbicides and organophosphorous pesticides. The method detection limit for each compound is also provided in Appendix F.

9.0 LABORATORY QA/QC PROGRAM

Enseco is the laboratory that will be utilized for the majority of the investigative site sampling episodes, and their Quality Assurance Plan is presented in Appendix F and includes a description of the analytical acceptance criteria. Because of the large number of samples from the site, matrix spikes and matrix spikes duplicates are analyzed specific to the site on a 5% basis or less. Precision and accuracy data, generated from these analyses, is compared to internal limits as part of the data evaluation procedure.

Along with the analytical results, a Quality Control Summary is provided and includes all Method Blank, Check Sample, MS/MSD and Surrogate Recovery data. All QC data is reported along with current acceptance limits. QC data exceeding these limits are flagged, along with an explanation of how the analytical data is affected. Please refer to ENSECO's QAPP for further details on data validation and acceptance data.

Enseco is certified by the New York State Department of Health ELAP program for all common potable water, wastewater, air, and solids analysis. In addition, Enseco Testing carries the necessary NYDEC Technically Acceptable Laboratory Status for analyzing groundwater.

10.0 WELL MAINTENANCE AND DEVELOPMENT PLAN

The Well Maintenance and Development Plan is designed to insure that the monitoring wells are properly operated and maintained in order to insure a long service life throughout the duration of the project.

10.1 Well Maintenance Check

Prior to each sampling event, a routine inspection of the condition of the protective casing and surface seal is performed. The protective casing will be inspected for the integrity of the locking cap and the surface seal and any deficiencies will be corrected. In addition, each well is checked for any other signs of damage or inadvertent entry and that it is clearly labelled. Each well should have a metal locking cap and a number clearly painted on the well casing. Wells should have identical padlocks with one key opening all wells. Observations of any irregularities are noted in the Field Log Book as well as the well number, date and time. This information will also be recorded in the individual well record file.

Each time a well is sampled, the well will be sounded using a weighted surveyor's tape according to the procedures described in Section 2.4. This data is recorded into the Field Log Book and is maintained in the Well Record File. If the measured well depth differs by more than 10% of the constructed well depth the well will be redeveloped. After redevelopment, the depth to bottom will be measured again, and that measured depth shall become the new base total well depth from which all future measurements will be compared against for additional well development.

10.2 Well Record File

A Well Record File for each individual well will be maintained and updated quarterly. This file will contain the following information:

- well construction and boring log
- measured depth to bottom of the well
- visual condition of well standpipe and surface seal
- repair work completed on the well
- dewatering effects of interim measures
- recovery time from purging
- observed turbidity of sample
- plumbness
- HNU readings
- presence of NAPL

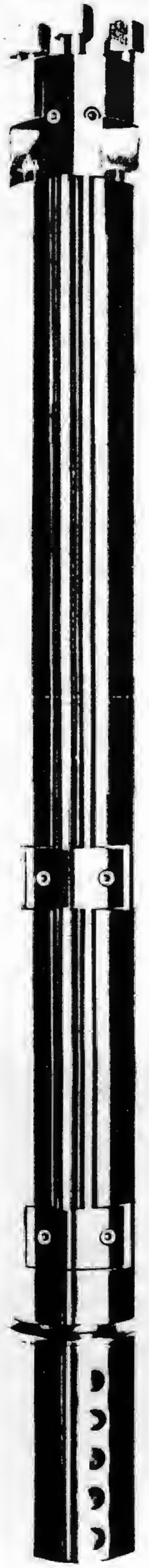
This information will be compared to the historical record of the well, and any redevelopment or repair shall be determined by this comparison and will be conducted before the next sampling event for that well. Any repairs will be documented in the next appropriate progress report.

lps23017

ATTACHMENT A

BENNETT PUMP SPECIFICATIONS

BENNETT SAMPLE PUMPS



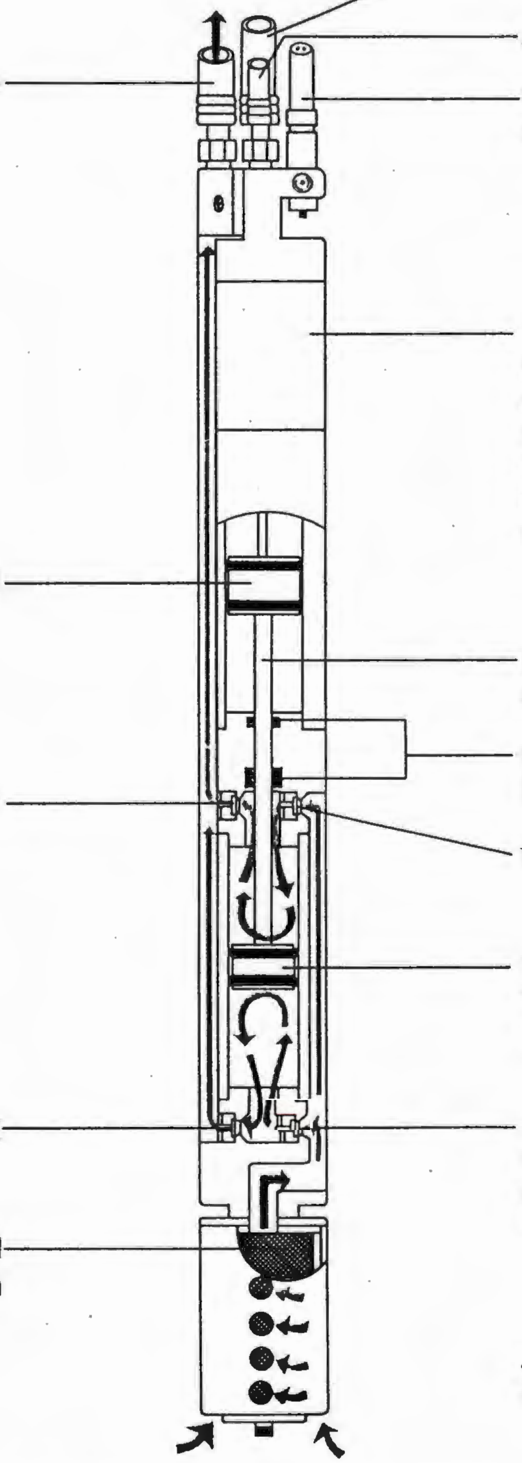
U.S. Patent No. 4295801 • Canadian Patent Nos. 1166075 & 1187331

Submersible Piston Pump

- For Small Diameter Boreholes
- For Lifts Up To 1000 Feet
- Compressed Air Operated
- Constructed of Stainless Steel
- Models Available for 1.5 and 2.0 Inch Boreholes

Manufactured & Distributed by:
Bennett Sample Pumps, Inc. • Amarillo, Texas • (806) 352-0264

Bennett Sample Pumps have automatic reciprocating piston motors, operated by compressed air, that generate power for operating a double acting, piston fluid pump. Models for lifts up to 500 feet have one motor piston; Models for lifts up to 1000 feet have two motor pistons, providing increased power for operating the pump. All models have a differential ratio between the motor pistons and the pump to accomplish lifts using low pressure air from small compressors.



AIR EXHAUST TUBE — releases exhaust air at surface.

AIR SUPPLY TUBE

WATER DISCHARGE TUBE

WATER LEVEL INDICATOR — contact probe.

VALVE BODY — patented valving mechanism provides rapid switching of air to motor pistons, resulting in continuous pumping and efficient use of air power. Cycle rate is easily controlled by adjusting air pressure supplied to the motor.

MOTOR PISTON

PISTON ROD — stainless steel — connects motor piston to pump piston.

ROD SEALS — prevent air in motor from entering fluid pump.

FLUID DISCHARGE VALVE

FLUID INLET VALVE

PUMP PISTON — Lip type seals provide cylinder wall cleaning action that reduces damage when pumping fluids containing solids.

FLUID DISCHARGE VALVE

FLUID INLET VALVE (ACETYL PLASTIC — Self-flushing, poppet valves with guides and springs for positive seating.)

INLET SCREEN
stainless steel - 100 mesh

ARROWS SHOW FLUID FLOW THROUGH PUMP

Bennett Pumps may be operated in any position from horizontal to vertical. These pumps will operate submerged to great depths or above water with a drop tube attached to the fluid inlet.

Bennett Sample Pumps may be used as portable units, capable of sampling multiple boreholes, or used in dedicated well systems. They are constructed to permit easy dis-assembly in the field for cleaning and replacement of pump seals and valves, using ordinary tools. Repair kits containing all parts for re-conditioning the pump are available. Pump body, piston and piston rod are made of stainless steel.

BENNETT SAMPLE PUMPS

U.S. Patent No. 4295801 * Canadian Patent Nos. 1166075 & 1187331

Models 180 & 1800
(for 2" & larger wells)

SPECIFICATIONS

Pump Model No.	Diameter	Length	Weight	Motor Cylinders	Piston Stroke	Piston Cycles per minute
180	1.8"	19.625"	10.5 lbs.	1	3"	Variable from 0 to 90 CPM maximum
1800	1.8"	23.625"	13 lbs	2	3"	

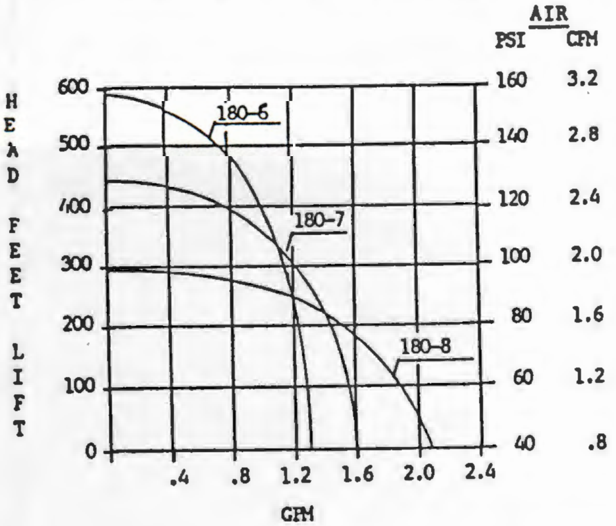
Materials of Construction: 303 and 304 Stainless Steel

Model 180 and 1800 pumps are equipped with a 1" diameter pump piston for maximum flow rates at low pumping lifts. Intermediate lifts require a 7/8" diameter pump piston that reduces the flow rate. High lift applications require a 3/4" diameter pump piston with further reductions in pump flow rate.

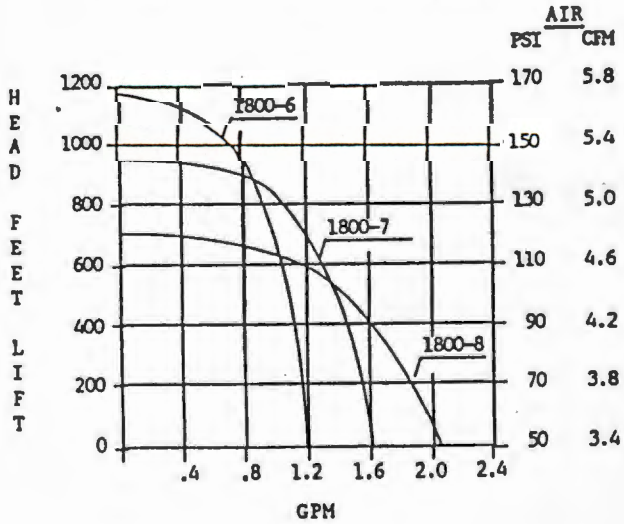
PUMP PERFORMANCE CURVES

COMPRESSED AIR REQUIREMENTS

Model 180-6 - 3/4" pump piston
Model 180-7 - 7/8" pump piston
—> Model 180-8 - 1.0" pump piston



Model 1800-6 - 3/4" pump piston
Model 1800-7 - 7/8" pump piston
Model 1800-8 - 1.0" pump piston



The performance curves show maximum flow rates at given lifts. Lower flow rates are obtained, at any lift, by reducing the air pressure to the pump motor.

FEATURES OF BENNETT SAMPLE PUMPS

1. Pumping lifts to 500 feet are accomplished using the single piston air motor. Lifts to 1000 feet are accomplished using the two piston air motor.

2. All pump models have a differential ratio between the air motor piston and the pump piston. This feature permits using low pressure air to the motor piston, resulting in development of high fluid pressure with the pump piston. Smaller diameter pump pistons are used to provide pumps with high lift capabilities and larger diameter pump pistons provide higher flow rates at lower lifts.

3. Efficient use of compressed air by the air motor permits using small, commercially available air compressors for the air supply source.

4. Rod seals used at the end of the air motor prevent any air to water contact. Rod seals used at the upper end of the pump cylinder prevent water from entering the air motor.

5. The fluid pump piston travels to one end of the cylinder and back to complete a full cycle. One hundred percent of the fluid volume taken in on the intake stroke will be expelled on the discharge stroke.

6. Variable pumping rates are obtained by controlling the cycle rate of the pump piston. This is accomplished by changing the air pressure that operates the air motor.

BENNETT SAMPLE PUMPS have two basic components, a double acting piston pump and a motor to operate the pump.

PUMP MOTOR

1. Piston type motor - operated with compressed air or gas.
2. Double acting air motor - generates equal power for the up and down stroke of the piston cycle.
3. Automatic cycling - a patented air valving mechanism, connected to the motor cylinder, alternately directs air pressure to the upper and lower faces of the motor piston.
4. Motor sealing - totally sealed for submersible operation

Figure 1 shows the single piston air motor used in pumps for lower lifts. Figure 2 shows the two piston motor used in pumps for high lifts.

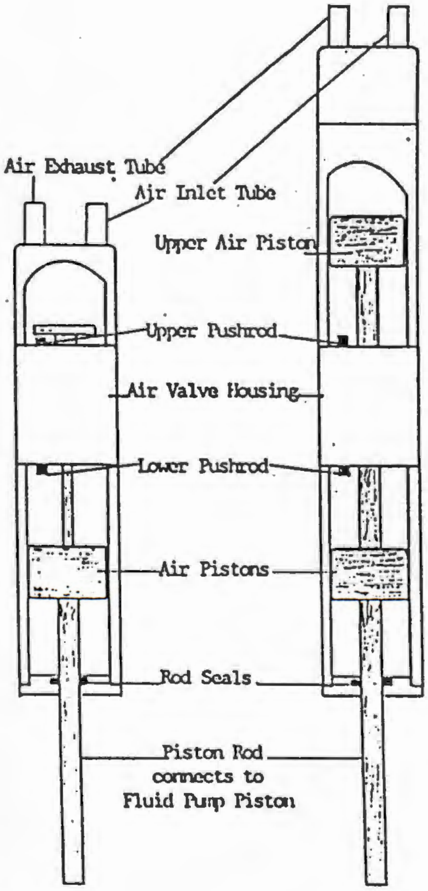


Figure 1
Single Cylinder
Pump Motor

Figure 2
Two Cylinder
Pump Motor

AIR MOTOR OPERATION

1. Pressurized air or gas is supplied to the motor through the inlet tube. The air supply tube is continously pressurized when the motor is operating.

2. Pressurized air drives the motor piston to the end of the cylinder. The piston contacts a pushrod that shifts the air valving to the alternate position. Pressurized air is directed to the other side of the motor piston, driving it in the opposite direction from the original stroke. Continous, automatic cycling is achieved by air valve shifting each time the motor piston reaches either end of the cylinder.

The air motor in Bennett Sample Pumps provides several advantages for operating a pump in borehole pumping applications.

1. Low Air Consumption - When the motor piston completes a stroke (up or down), only that volume of air is vented to the exhaust air tube.

2. Continous Cycling - Air valve shifting is instantaneous and automatic as determined by the action of the motor piston on the pushrod for shifting the air valving.

3. Variable Cycle Rate - Use of an adjustible air pressure regulator, the only surface control device, will provide an infinately variable motor cycle rate.

4. Positive Displacement - The motor piston and piston rods have bi-directional pressure seals for positive sealing to prevent air pressure escaping to the exhaust side of the piston or to the outside of the motor.

FLUID PUMP OPERATION

Figure 3

Double Acting Fluid Pump

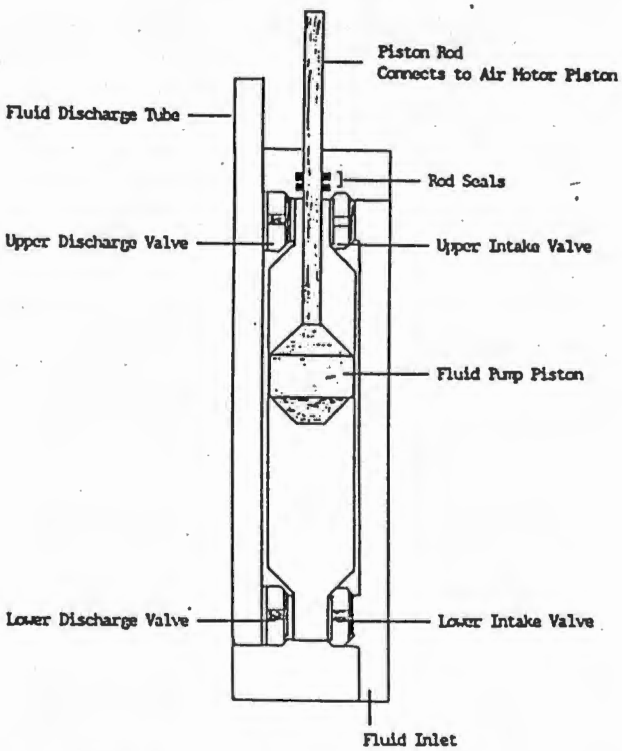


Figure 3 shows the double acting piston pump.

The fluid pump piston is mechanically operated by the piston rod connected to the air motor pistons. Reciprocal motion and cycle rate are directly controlled by the air motor.

The pump piston has bi-directional seals necessary for double action. One inlet valve and one discharge valve are located at each end of the pump cylinder. When the pump piston is traveling downward, the lower inlet valve is closed and the lower discharge valve is open, as fluid is pushed from the lower cylinder into the discharge tube. At the same time, the upper discharge valve is closed and the upper inlet valve is open, as fluid is drawn into the upper cylinder. When the pump piston reaches the end of the down stroke, air pressure switching occurs in the motor, and the pump piston begins its upward stroke. At this time, fluid in the upper cylinder is pushed into the discharge tube and fluid is drawn into the lower cylinder.

Design Features of the Fluid Pump

1. Pump Piston - The pump piston has two faces that are shaped to mate with the ends of the pump cylinder to minimize residual fluid at the end of each stroke.

2. Pump Valves - The pump valves have large diameter passageways to insure minimum restriction to fluid flow as it enters and leaves the pump cylinder. Valves operate in a horizontal position to promote better flushing action when pumping fluids containing small solid particles. Pump valves are guided and very lightly spring loaded to insure proper seating, with minimum restriction to fluid flow.

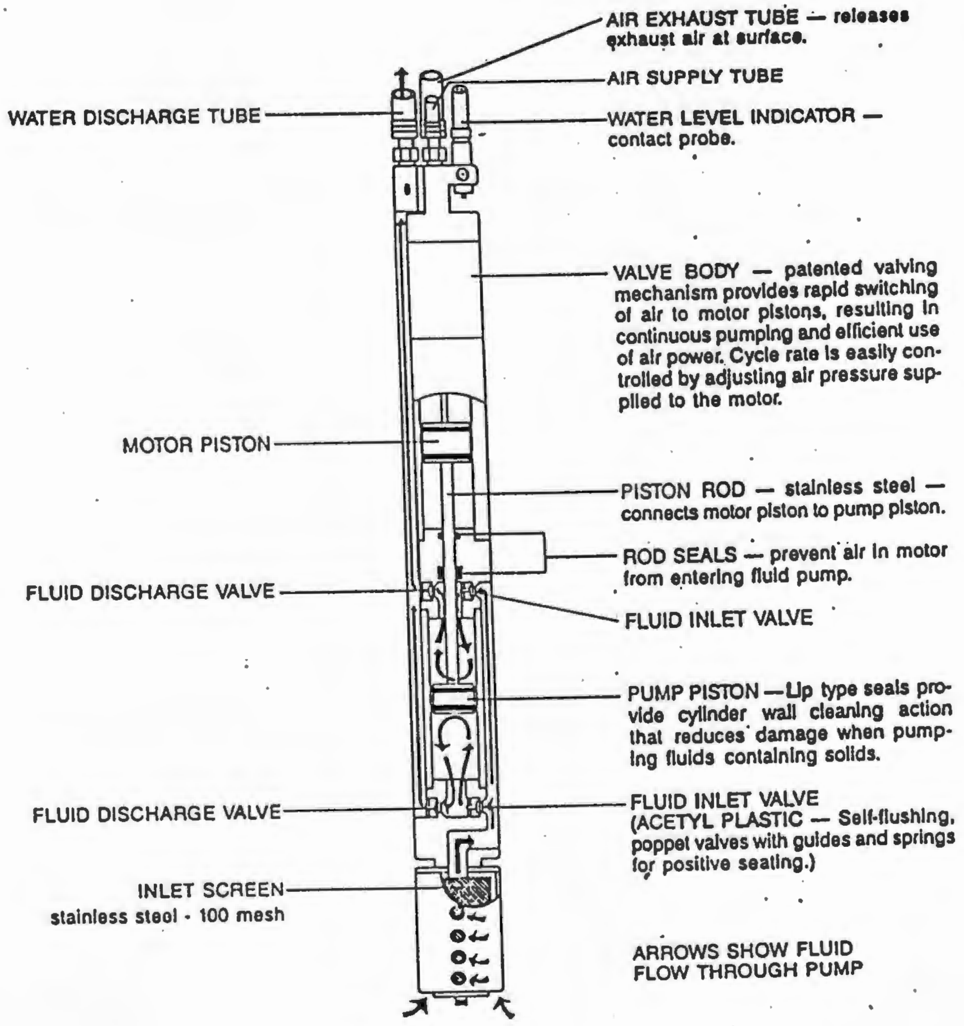


Figure 4
BENNETT SAMPLE PUMP

Figure 4 shows the BENNETT SAMPLE PUMP. This is the combination of the air motor and the piston fluid pump.

APPENDIX F

Enseco QAPP

Enseco Incorporated

Enseco

ENSECO INCORPORATED
QUALITY ASSURANCE
PROGRAM PLAN
FOR
ENVIRONMENTAL CHEMICAL MONITORING

Prepared by:

Enseco Incorporated
2200 Cottontail Lane
Somerset, NJ 08873

Revision 3.3
May, 1989

Approval:

Kathleen Carlberg

Kathleen Carlberg
Vice President
Quality Assurance

4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Fax: 303/431-7171

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Table Page

1. INTRODUCTION

Enseco Incorporated (Enseco) is the largest and most experienced environmental testing laboratory in the United States. The environmental component of Enseco consists of the combined resources of:

- Enseco-Erco Laboratory in Cambridge, Massachusetts,
- Enseco-Marblehead in Marblehead, Massachusetts,
- Enseco-East in Somerset, New Jersey,
- Enseco-Rocky Mountain Analytical Laboratory in Denver, Colorado,
- Enseco-Houston in Houston, Texas,
- Enseco-California Analytical Laboratory in Sacramento, California,
- Enseco-CRL in Garden Grove, California,
- Enseco-El Monte in El Monte, California,
- Enseco-Santa Maria in Santa Maria, California,
- Enseco-Ventura in Ventura, California, and
- Enseco-Mobile Laboratories headquartered in Garden Grove, California.

Addresses and telephone numbers for these Enseco laboratories are listed in Table 1-1.

This document describes the Enseco Quality Assurance policies and procedures related to chemical monitoring for environmental pollutants.

TABLE 1-1

ENSECO LABORATORY LOCATIONS

Enseco-California Analytical Laboratory
2544 Industrial Boulevard
West Sacramento, CA 95691
(916) 372-1393
Facsimile (916) 372-1059

Enseco-CRL
7440 Lincoln Way
Garden Grove, CA 92641
(714) 898-6370
Facsimile (714) 891-5917

Enseco-East
2200 Cottontail Lane
Somerset, NJ 08873
(201) 469-5800
Facsimile (201) 469-7516

Enseco-El Monte
9537 Telstar Avenue #118
El Monte, CA 91731
(818) 442-8400
Facsimile (818) 442-3758

Enseco-Erco Laboratory
205 Alewife Brook Parkway
Cambridge, MA 02138
(617) 661-3111
Facsimile (617) 354-5258

Enseco-Houston
1420 East North Belt Suite 120
Houston, TX 77032
(713) 987-9767
Facsimile (713) 987-9769

Enseco-Marblehead
Doaks Lane at Little Harbor
Marblehead, Massachusetts 01945
(617) 639-2695
Facsimile (617) 639-2637

Enseco-Mobile Laboratories
7440 Lincoln Way
Garden Grove, CA 92641
(714) 898-6370
Facsimile (714) 891-5917

Enseco-Rocky Mountain Analytical Laboratory
4955 Yarrow Street
Arvada, CO 80002
(303) 421-6611
Facsimile (303) 431-7171

Enseco-Santa Maria
2325 Skyway Drive, Suite K
Santa Maria, CA 93455
(805) 922-2776
Facsimile (805) 922-5897

Enseco-Ventura
2810 Bunsen Avenue, Unit A
Ventura, CA 93003
(805) 650-0546
Facsimile (805) 650-0756

Enseco, Inc. (Corporate Office)
2200 Cottontail Lane
Somerset, NJ 08873
(201) 469-5800
Facsimile (201) 469-7516

2. QUALITY ASSURANCE POLICY

Enseco is committed to providing quality environmental analytical services to both the public and private sectors. To ensure the production of scientifically sound, legally defensible data of known and documentable quality, an extensive Quality Assurance (QA) program has been implemented within Enseco. This program relies on clearly defined objectives, well-documented procedures, a comprehensive audit system, and management support, both Corporate and Divisional, for its effectiveness.

3. PURPOSE AND SCOPE OF DOCUMENT

Purpose

This QA Program Plan presents an overview of the essential elements of the Enseco QA program. Enseco has modeled this plan along EPA guidelines as outlined in "Interim Guidelines and Specifications for Preparing Quality Assurance Program Plans," QAMS-004/80, December 29, 1980 and "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," QAMS-005/80, February, 1983. Both of these documents have been issued by the Office of Monitoring Systems and Quality Assurance, Office of Research and Development, U.S. Environmental Protection Agency (U.S. EPA). Elements above and beyond those specified in these two documents have been included in this QA Program Plan in order to completely describe the Enseco QA/QC system.

Scope

The Enseco QA program is designed to control and monitor the quality of data generated in Enseco laboratories. The program has four key elements.

- Demonstrating laboratory capability by providing information which documents the overall qualifications of the laboratory to perform environmental analyses;
- Controlling laboratory operations by establishing procedures which measure the laboratory's performance on a daily basis;
- Measuring matrix effects to determine the effect of a specific matrix on method performance, and
- Reporting appropriate QC information with the analytical results to enable the end-user to assess the quality of the data.

The specific procedures involved in implementing each aspect of the Enseco program are described in this document. An overview of these QC procedures, along with the section number in which each is discussed, is given in Table 3-1.

The QA/QC policies and procedures described herein are designed to eliminate systematic errors and minimize the occurrence of other errors. However, no QA program, regardless of how elaborate, can eliminate all errors which may occur during an analysis. The QA program forms the framework for minimizing errors and identifying and correcting those errors which do occasionally occur. These QA/QC policies and procedures must be coupled with the professional judgement of the technical staff in interpreting the events surrounding the generation of the final result to ensure that quality data is consistently produced.

Table 3-1

ELEMENTS OF QA PROGRAM PLAN

Evaluation Criteria	Operational Elements	Section of QA Plan
LABORATORY QUALIFICATIONS	Facilities/equipment/staff	*
	Written SOPs for all laboratory procedures, including:	15
	Sample custody	5
	Calibration procedures	6
	Analytical procedures	7
	Data validation	8
	Documented QA program	1-15
	Laboratory certifications	10
LABORATORY PERFORMANCE	Check samples	9
	Method blanks	9
	Calibration data	6
	Method detection limits (determined on method blank)	12
MATRIX EFFECTS	Matrix spike/matrix duplicate/ matrix spike duplicate analyses	9
	Sample surrogate recoveries	9
	Standard additions	9
	Field blanks	9
	Method detection limits (determined with specific sample matrix)	12
DATA REPORTING	Data reduction and validation	10
	Data reporting	10
	Reporting Limits	12

* Described in a separate document available from Enseco.

4. DEFINITION OF TERMS

Quality Assurance (QA): the total integrated program for assuring the reliability of data generated in the laboratory.

Quality Control (QC): the routine application of specific, well-documented procedures to ensure the generation of data of known and accepted quality, thus fulfilling the objectives of the QA program.

Quality Assurance Program Plan (QAPP): an assemblage of management policies, objectives, principles, and general procedures outlining the techniques by which the laboratory produces data of known and accepted quality.

Standard Operating Procedure (SOP): a detailed, written description of a procedure designed to systematize and standardize the performance of the procedure.

Quality Assurance Project Plan (QAPjP): an assemblage of detailed procedures describing how the laboratory will generate data that meet the Data Quality Objective (DQOs) of a specific project.

Holding Time: the period of time during which a sample can be stored after collection and preservation without significantly affecting the accuracy of the analysis.

Sample Delivery Acceptance: the point in time at which Enseco determines that it can proceed with the analytical work. Sample delivery acceptance follows receipt and inspection of the samples and complete definition of analyses required.

Initiate Preparation: the point in time at which the separation of organic extractable compounds or metals from the sample matrix by solvent extraction or acid digestion is begun.

Initiate Analysis: the point in time at which the sample, extract or digestate is introduced into an instrument or process which complies with the SOP for analysis of the parameter of interest.

5. RESPONSIBILITIES AND AUTHORITIES

Executing an effective QA program in a large and complex multi-laboratory system demands the commitment and attention of both management and staff. The QA effort at Enseco is directed by the Vice President of Quality Assurance who manages the Corporate Quality Assurance Office. The VP of QA reports directly to the Chief Executive Officer (CEO) and has the responsibility for overseeing and regulating all laboratory functions (see Figure 5-1). The QA Office operates independently of all areas generating analytical data to ensure complete objectivity in the evaluation of laboratory operations.

The implementation of the QA program within each individual Enseco laboratory is the responsibility of the Division QA Director. The QA Director reports to both the VP of QA and to the Division Director, who manages the laboratory. In addition, all scientists within the organization play a vital role in assuring the quality of their work. We believe that the success of Enseco is dependent upon the continued commitment of all within the organization to a strong and viable QA Program. The responsibilities and levels of authority within the organization are described below.

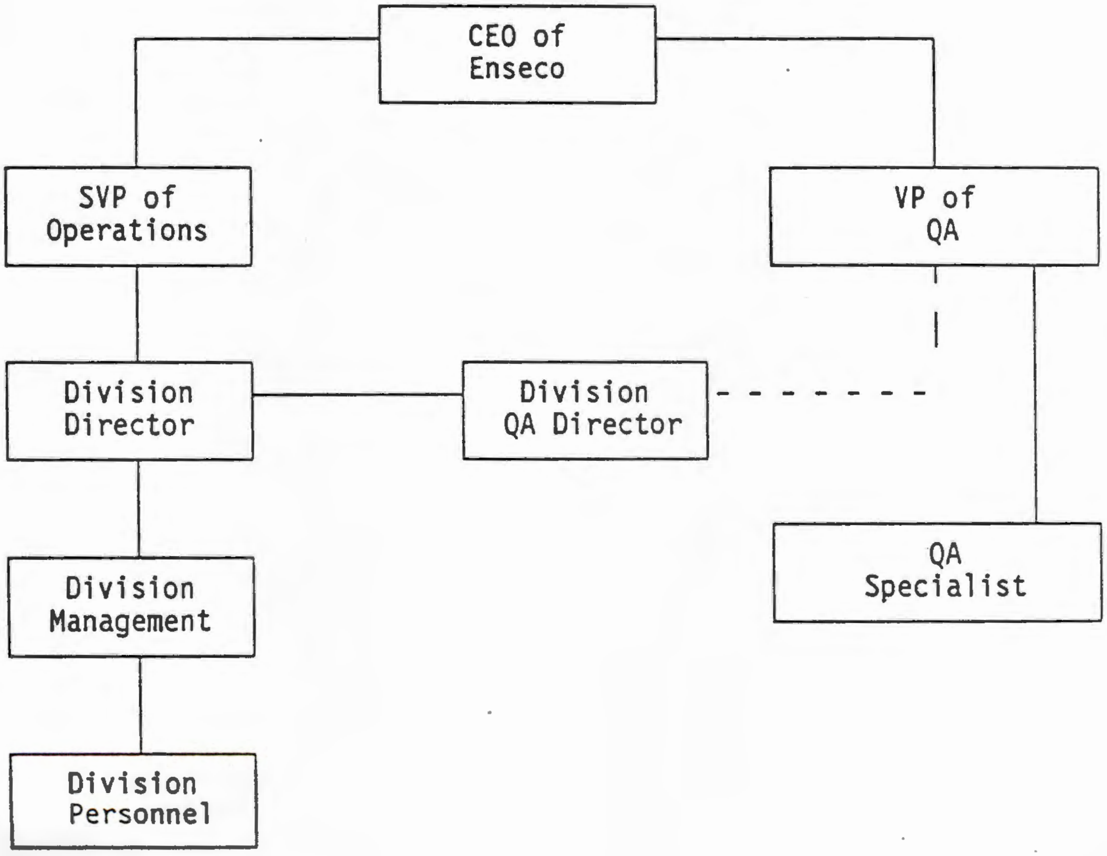
Corporate Quality Assurance Office

Members

The QA effort within Enseco is directed by the VP of QA who reports directly to the CEO of Enseco. The Corporate QA Office also includes a QA specialist who assists the VP in carrying out the responsibilities of the department.

Figure 5-1

ENSECO QA ORGANIZATIONAL CHART



Responsibilities

The VP of QA is responsible for:

- Developing and implementing a Corporate QA program that ensures that all data generated in Enseco laboratories are scientifically sound, legally defensible, and of known precision and accuracy;
- Monitoring the QA Plan to ensure compliance with QA objectives in all Enseco laboratories;
- Developing and implementing new QA procedures within the corporation to improve data quality;
- Conducting audits and inspections of all Enseco laboratories on a regular basis, reporting the results of those audits to management, and applying corrective actions as needed to ensure compliance with the Enseco QA Plan;
- Coordinating the distribution of Performance Evaluation (PE) samples to all Enseco laboratories on a routine basis, evaluating the results of those samples, reporting to management, and applying corrective actions as needed to ensure that all Enseco laboratories are able to generate data that meet the data quality objectives defined in the QA Plan;
- Establishing databases that accurately reflect the performance of each of the Enseco laboratories;
- Directing Division QA Directors in the implementation of the Enseco QA Plan within individual facilities;
- Chairing the Enseco QA Committee, a working committee which includes all of the Division QA Directors and QA Specialists and deals with QA issues on an ongoing basis;
- Coordinating certification programs within Enseco;
- Conducting seminars on QA issues for both clients and laboratory staff; and
- Promoting sound QA practices within the environmental regulatory and analytical communities.

Authority

The VP of QA is the final authority on all issues dealing with data quality and has the authority to require that procedures be amended or discontinued, or analyses suspended or repeated. Also, the VP of QA has the authority to suspend or terminate employees on the grounds of dishonesty, incompetence, or repeated non-compliance with QA procedures. In addition, the VP of QA has the authority to overrule decisions and actions of the Division QA Directors and must approve the termination or transfer of any Division QA Director. The authority of the VP of QA comes directly from the CEO of Enseco.

Divisional Quality Assurance Departments

Members

Each Divisional QA Department is managed by a QA Director. The QA Director reports directly to the Division Director and indirectly to the Corporate VP of QA. The QA Director is supported by a QA staff within the laboratory.

Responsibilities

The Division QA Director is responsible for:

- Implementing Enseco QA policies;
- Monitoring the implementation of the QA Plan within the laboratory to ensure complete compliance with QA objectives;
- Conducting in-house audits to identify potential problems and ensure compliance with written SOPs;
- Performing statistical analyses of QC data and establishing databases that accurately reflect the performance of the laboratory;

- Prescribing and monitoring corrective actions;
- Serving as the in-house client representative on all project inquiries involving data quality issues;
- Monitoring the preparation and verification of analytical standards;
- Assisting chemists in the writing of SOPs;
- Reporting the status of the laboratory QA program to the Corporate VP of QA with formal and informal communications;
- Maintaining records and archives of all QC data, PE results, audit comments, and customer inquiries concerning data quality;
- Assuring that the laboratory staff has access to current SOPs;
- Monitoring laboratory performance in the areas of holding times, turn-around times, and meeting contractual obligations;
- Conducting seminars on QA issues for clients and laboratory staff;
- Preparing QA Project Plans when needed;
- Assisting the Corporate QA office in the writing of QA policies and procedures;
- Serving as a member of the Enseco QA Committee; and
- Auditing subcontractors.

Authority

The Division QA Director is the final authority within each laboratory on all issues dealing with data quality. He/she has the authority to require that procedures be amended or discontinued or analyses suspended or repeated. He/she can make recommendations to the Division Director and the Corporate VP of QA regarding suspension or termination of employees for incompetence or non-compliance with QA procedures. The authority of the Division QA Director comes directly from the Corporate VP of QA.

Divisional Management

Members

The managers and supervisors who direct the analytical work at each laboratory are directly responsible for ensuring that all employees reporting to them are complying with the Enseco QA Plan.

Responsibilities

Laboratory management is responsible for:

- Actively supporting the implementation of the Enseco QA Plan within the laboratory;
- Maintaining accurate SOPs and enforcing their use in the laboratory;
- Maintaining a work environment that emphasizes the importance of data quality; and
- Providing management support to the Corporate and Divisional QA departments.

Authority

The managers and supervisors of the laboratory have the authority to accept or reject databased on compliance with well-defined QC criteria. In addition, managers and supervisors, with the approval of the QA department, can accept or reject data that fall outside of established QC guidelines if, in their judgment, there are technical reasons which warrant the acceptance or rejection of the data. These circumstances must be well documented and any need for corrective action identified by the incident must be defined and initiated. The authority of the laboratory management comes directly from the Corporate VP of Operations and the Division Director.

Divisional Personnel

Members

All laboratory personnel involved in the generation and reporting of data have a responsibility to understand and follow the Enseco QA Plan.

Responsibilities

Laboratory personnel are responsible for:

- Having a working knowledge of the Enseco QA Plan;
- Ensuring that all work is generated in compliance with the Enseco QA Plan;
- Performing all work according to written SOPs;
- Ensuring that all documentation related to their work is complete and accurate; and
- Providing management with immediate notification of quality problems.

Authority

Laboratory personnel have the authority to accept or reject databased on compliance with well-defined QC criteria. The acceptance or rejection of data that fall outside of established QC guidelines must be approved by laboratory management and the QA department. The authority of the laboratory personnel flows from the Division Director.

6. SAMPLING PROCEDURES

The generation of quality data begins with the collection of the sample, and therefore the integrity of the sample collection process is of concern to the laboratory. Samples must be collected in such a way that no foreign material is introduced into the sample and no material of interest escapes from the sample prior to analysis. To ensure sample integrity, the following must be considered:

- Samples must be collected in appropriate containers. In general, glass containers are used for organic parameters and polyethylene containers for inorganic/metal parameters (see Appendix I);
- The sample containers must be properly cleaned to ensure that the sample is not contaminated during the collection process;
- Samples must be preserved appropriately to minimize the loss of materials of interest due to adsorption, chemical or biological degradation, or volatilization (see Appendix I);
- Appropriate volumes of sample must be collected to ensure that the required detection limits can be met and quality control samples can be analyzed (see Appendix I); and
- Samples must be properly shipped to the laboratory, in the appropriate time frame, to ensure that holding times for the analyses can be met (see Appendix I).

Sample Containers and Preservatives

Enseco can assist in the sample collection process by providing consultation and assistance to clients designing sampling programs. Also Enseco can make available to the client the Enseco "Sample Safe^{TM}," a set of sample containers that are properly cleaned and preserved for use in sample collection. Appropriate containers and preservatives, and minimum sample volumes required for analyzing routine organic, metal, and conventional parameters are listed in Appendix I.

Holding Times

EPA has established holding time requirements for some analyses. These holding time requirements are listed in Appendix I, along with container and preservative requirements. As indicated in Appendix I, holding time requirements differ depending on the regulatory program. Enseco follows the holding times given in SW-846, Update I unless otherwise instructed by the client. CLP holding times are followed when CLP protocols are requested by the client. Other holding times can be honored if special arrangements are made with the laboratory.

Enseco is obligated to initiate preparation and/or analysis of the sample within holding times if sample delivery acceptance occurs within 72 hours of sampling or before one-half of the holding time period has expired, whichever is less. (See Section 4 for definition of above terms.)

On occasion, a sample must be reanalyzed to comply with this QA Program Plan. If this reanalysis is conducted outside of the holding time, the laboratory will be considered to have fulfilled its obligation to meet holding times if the first preparation and/or analysis was initiated within the prescribed holding time.

7. SAMPLE CUSTODY

Upon receipt by Enseco, samples proceed through an orderly processing sequence specifically designed to ensure continuous integrity of both the sample and its documentation.

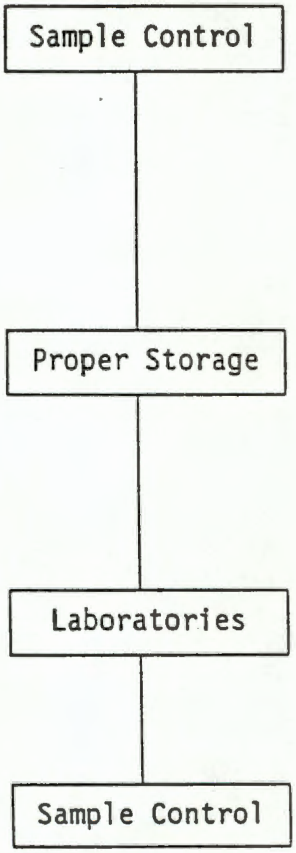
All samples are received by Enseco's Sample Control Group and are carefully checked for label identification, and completed, accurate chain-of-custody records. Photographs document the condition of samples and each sample is then assigned a unique laboratory identification number through a computerized Laboratory Information Management System (LIMS) that stores all identifications and essential information. The LIMS system tracks the sample from storage through the laboratory system until the analytical process is completed and the sample is returned to the custody of the Sample Control Group for disposal. This process is summarized in Figure 7-1. Access to all Enseco laboratories is restricted to prevent any unauthorized contact with samples, extracts, or documentation.

An example of the Enseco Chain-Of-Custody Record used to transmit samples from the client to the laboratory is given in Figure 7-2. The Chain-Of-Custody Record (Interlaboratory Analysis Form) used to transmit samples between laboratories within Enseco is given in Figure 7-3.

Sample bottles provided to the client by Enseco are transmitted under custody using the Enseco "Sample Safe^{TM}".

Figure 7-1

ENSECO SAMPLE PROCESSING FLOW CHART



* Check and document physical condition of sample
* Verify documentation and parameter assignment
* Log into LIMS
* Send acknowledgement letter to client

* Store sample according to preservation guidelines
* Transfer sample to lab with proper documentation

* Document analytical work
* Return unused samples to Sample Control

* Return sample to client or arrange for sample disposal

Enseco - Rocky Mountain Analytical

4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Facsimile: 303/431-7171

CHAIN OF CUSTODY

No. 5068

Attn: ______________________

Enseco Client ______________________

Project ______________________

Sampling Co. ______________________

Sampling Site ______________________

Team Leader ______________________

SAMPLE SAFE™ CONDITIONS

1. Packed by: ______________________ Seal # ____________
2. Seal Intact Upon Receipt by Sampling Co.: Yes No
3. Condition of Contents: ______________________
4. Sealed for Shipping by: ______________________
5. Initial Contents Temp.: ____________ °C Seal # ____________
6. Sampling Status: Done Continuing Until ____________
7. Seal Intact Upon Receipt by Laboratory: Yes No
8. Contents Temperature Upon Receipt by Lab: ____________ °C
9. Condition of Contents: ______________________

Date	Time	Sample ID/Description	Sample Type	No. Containers	Analysis Parameters	Remarks

FIGURE 7-2

CUSTODY TRANSFERS PRIOR TO SHIPPING

Relinquished by (signed)	Received by (signed)	Date	Time
1			
2			
3			

SHIPPING DETAILS

Delivered to Shipper by: ______________________

Method of Shipment ____________ Airbill # ____________

Received for Lab ____________ Signed ____________ Date/Time ____________

Enseco Project No ______________________

FIGURE 7-3

Page ________ of ________
File Index ______________

Enseco

INTERLABORATORY ANALYSIS

SHIP TO: *(circle one)*

CAL ERCO CLE GAS MAR HOU

Attention:

SEND RESULTS TO:

Rocky Mountain Analytical Laboratory
4955 Yarrow Street
Arvada, CO 80002
(303) 421-6611 FAC: (303) 431-7171

Attention:

CLIENT NAME

PROJECT NO.

Relinquished by: *(Signature)* Received by: *(Signature)* Date Time

Relinquished by: *(Signature)* Received by: *(Signature)* Date Time

Import Lab ID	Enseco ID	Client ID	Matrix (a, s, w)	Date Sampled	Date Rec'd	Date Auth.	Analysis Requested/ P.L. Item #	Sample Condition Upon Receipt

a. Written results required by (date): ________________ Verbal results required by (date): ______________

b. QC: ☐ Standard Enseco ☐ CLP Protocol ☐ Project-Specific ______________________________

c. Sample Disposal: ☐ Enseco ☐ Return to Client ☐ Phone RMAL

d. Raw Data Copies Needed: ☐ Yes ☐ No

e. Detection Limits: ☐ Standard Product ☐ Other*

f. Holding Times: ☐ Enseco ☐ EPA-CLP ☐ Other*

g. *Special Instructions: ____

**h. Intercompany Rebate: *(circle one)* 0% 5% 10%

i. P.O. Number ______________________

8. CALIBRATION PROCEDURES AND FREQUENCY

Standard/Reagent Preparation

A critical element in the generation of quality data is the purity/quality and traceability of the standard solutions and reagents used in the analytical operations. Enseco continually monitors the quality of reagents and standard solutions through a series of well-documented procedures.

To ensure the highest purity possible, all primary reference standards and standard solutions used by Enseco are obtained from the National Institue of Standards and Technology, the EPA Repository or other reliable commercial sources. All standards and standard solutions are logged into a database that identifies the supplier, lot number, purity/concentration, receipt/preparation date, preparer's name, method of preparation, expiration date, and all other pertinent information.

Standard solutions are validated prior to use. Validation procedures can range from a check for chromatographic purity to verification of the concentration of the standard using a standard prepared at a different time or obtained from a different source. Stock and working standards are checked regularly for signs of deterioration, such as discoloration, formation of precipitates, or change in concentration. Care is exercised in the proper storage and handling of standard solutions, and all containers are labeled as to compound, concentration, solvent, expiration date, and preparation data (initials of preparer/date of preparation).

Reagents are examined for purity by subjecting an aliquot or subsample to the analytical method in which it will be used; for example, every lot of dichloromethane (for organic extractables) is analyzed for undesirable contaminants prior to use in the laboratory.

A database is used to store essential information on specific standards or reagents. The system is designed to serve various functions (e.g., the system issues warnings on expiration dates and allows chemists to obtain a list of all working standard solutions prepared from the same stock solution). The program also facilitates the management and auditing of reagents and standards.

Instrument Calibration and Tuning

Calibration of instrumentation is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established reporting limits. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. The frequency of calibration and the concentration of calibration standards is determined by the manufacturer's guidelines, the analytical method, or the requirements of special contracts.

Gas Chromatography/Mass Spectrometry (GC/MS)

Each day prior to analysis of samples, the instrument is tuned with bromofluorobenzene (BFB) for volatile compounds and decafluorotriphenylphosphine (DFTPP) for semivolatile compounds (according to the tuning criteria specified in the U.S. EPA Contract Laboratory Program (CLP)). No samples are analyzed until the instrument has met tuning criteria.

The instrument is then calibrated for all target compounds. An initial calibration curve is produced and certain key compounds referred to as System Performance Calibration Compounds (SPCC) and Continuing Calibration Compounds (CCC) are evaluated on a daily basis to ensure that the system is within calibration. If the daily standard does not meet the established criteria, the system is recalibrated.

Chromatography

The field of chromatography involves a variety of instrumentation and detection systems. While calibration standards and acceptance criteria vary depending on the type of system and analytical methodology required for a specific analysis, the general principles of calibration apply uniformly. Each chromatographic system is calibrated prior to performance of analyses. Initial calibration consists of determining the linear range, establishing limits of detection, and establishing retention time windows. The calibration is checked on a daily basis to ensure that the system remains within specifications. If the daily calibration check does not meet established criteria, the system is recalibrated and samples analyzed since the last acceptable calibration check are reanalyzed.

Metals

Metals analysis basically involves two types of analytical instrumentation: inductively coupled argon plasma emission spectroscopy (ICP), and atomic absorption spectroscopy (AA).

Each ICP is calibrated prior to any analyses being performed using criteria prescribed in the CLP protocol. The calibration is then verified using standards from an independent source. The linear range of the instrument is established once every quarter using a linear range verification check standard. No values are reported above this upper concentration value without dilution.

A calibration curve is established daily by analyzing a minimum of two standards, one of which is a calibration blank. The calibration is monitored throughout the day by analyzing a Continuing Calibration Blank (CCB) and a Continuing Calibration Verification standard (CCV). The standard must meet established criteria or the system is recalibrated and all samples analyzed since the last acceptable calibration check are reanalyzed.

An interelement check standard is analyzed at the beginning and end of each analytical run, and on a continuing basis, to verify that interelement and background correction factors have remained constant. Results outside of the established criteria trigger reanalysis of samples.

Each AA unit is calibrated prior to any analyses being conducted. A calibration curve is prepared with a minimum of a calibration blank and three standards and then verified with a standard that has been prepared from an independent source at a concentration near the middle of the calibration range. The calibration is then verified on an ongoing basis with a midpoint calibration standard. If the ongoing calibration standard does not meet established acceptance criteria, the system is recalibrated and all samples analyzed since the last acceptable calibration check are reanalyzed. All samples are spiked to verify the absence of matrix effects or interferences. The method of standard additions is used when matrix interferences are present.

Conventional Analyses

The field of conventional, non-metals analysis involves a variety of instrumental and wet chemical techniques. While calibration and standardization procedures vary depending on the type of system and analytical methodology required for a specific analysis, the general principles of calibration apply universally. Each system is calibrated prior to analyses being conducted. Calibration consists of defining the linear range by use of a series of standard solutions, establishing limits of detection, and identifying potential interferences. The calibration is checked on an ongoing basis to ensure that the system remains within specifications. If the ongoing calibration check does not meet established criteria, the system is recalibrated and all samples analyzed since the last acceptable calibration check are reanalyzed.

9. ANALYTICAL PROCEDURES

Most analyses performed by Enseco are driven by regulatory concerns. Therefore, methods used at Enseco predominantly originate from regulatory agencies. Generally the methods used are those specified by the U.S. EPA and other federal agencies, state agencies, and professional organizations, as provided in the following references:

- Current EPA (CLP) protocols for the analysis of organic and inorganic hazardous substances including chlorinated dioxins and furans.
- "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act," 40 CFR, Part 136.
- "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020 (revised March, 1983).
- "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater," EPA-600/4-82-057 (July, 1982).
- "Test Methods for Evaluating Solid Waste" (SW-846), 2nd Edition (revised), Update I (1984), Update II (1985), 3rd Edition (1986), Update I (1989), Office of Solid Waste and Emergency Response, U.S. EPA.
- "Standard Methods for the Examination of Water and Wastewater," 16th Edition, American Public Health Association, American Water Works Association, Water Pollution Control Federation, Washington, DC (1985).
- "Official Methods of Analysis," 14th Edition, Association of Official Analytical Chemists, Arlington, VA (1984).
- "Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water," U.S. EPA, Environmental Monitoring and Support Laboratory - Cincinnati (September, 1986).
- "Annual Book of ASTM Standards," Volumes 11.01 and 11.02, American Society for Testing and Materials (ASTM), Philadelphia, PA (1987).
- "Techniques of Water Resources Investigations of the United States Geological Survey (USGS), Book 5, Laboratory Analysis," USGS, Washington, DC (1979).

The choice of method is dependent on the objectives of the study in terms of qualitative certainty, quantitative sensitivity, precision and accuracy, and the type of matrix to be analyzed. Each method used routinely is documented in the form of an SOP. The SOP contains detailed instructions concerning both the use and the expected performance of the method. Any deviations from published methodology are documented and explained in the SOP. A complete description of the contents of laboratory SOPs is given in Section 17.

Before any methods are routinely used to generate analytical data, the method is validated. Validation criteria consist of:

- Method selection by a senior staff member;
- Documentation of the method in an SOP. This includes a summary of the method, detailed description of the analytical procedure, calculations, reporting formats, safety concerns, and special remarks;
- Testing of the method to verify detection limits and linear range, establish reporting limits and precision and accuracy criteria; and
- Establishment of data acceptance criteria that must be approved by a senior staff member and the Divisional QA Director.

10. DATA REDUCTION, VALIDATION, AND REPORTING

Data Reduction and Validation

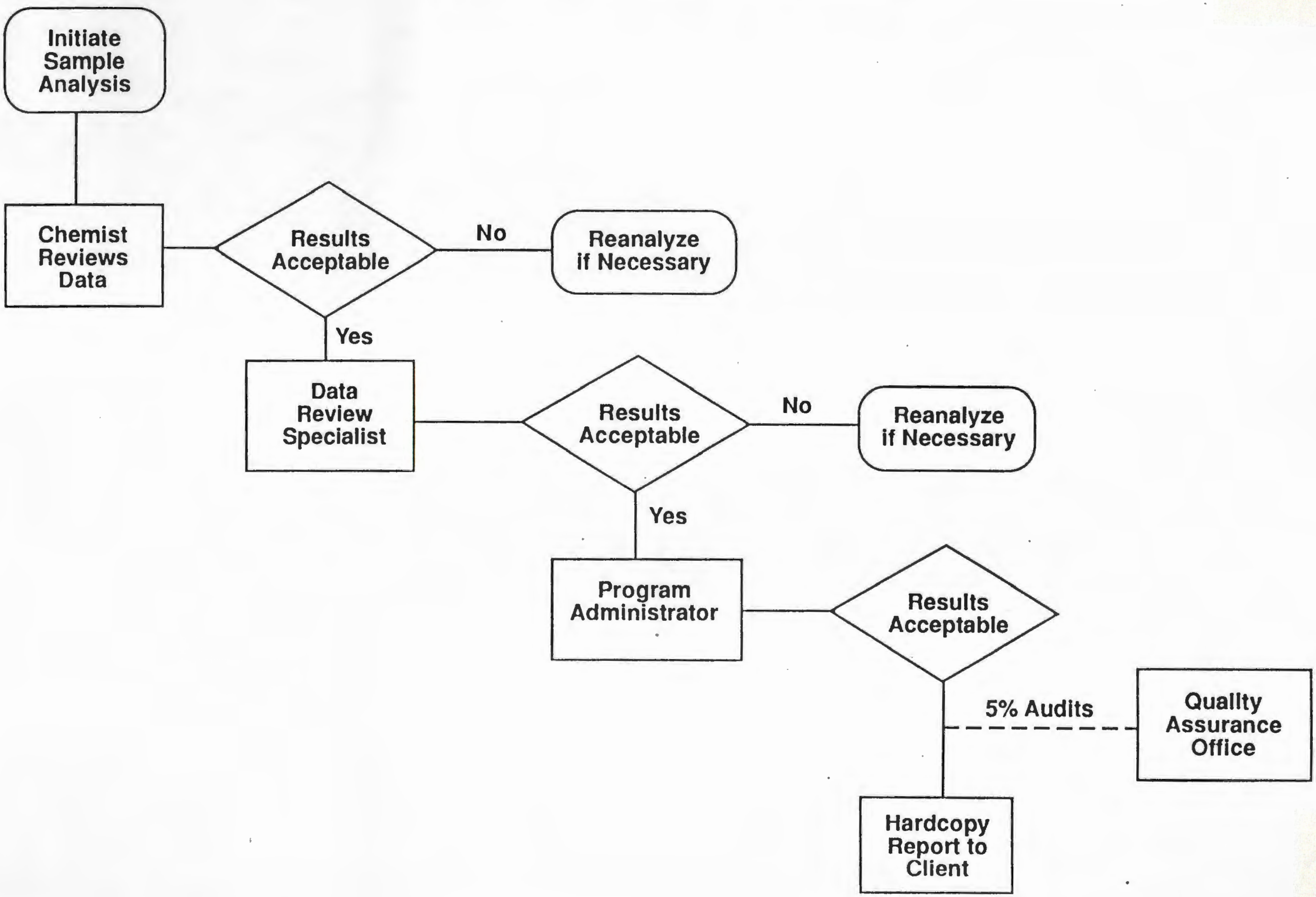
All analytical data generated within Enseco laboratories are extensively checked for accuracy and completeness. The data validation process consists of data generation, reduction, and three levels of review, as described below (also see Figure 10-1).

The analyst who generates the analytical data has the prime responsibility for the correctness and completeness of the data. All data are generated and reduced following protocols specified in laboratory SOPs. Each analyst reviews the quality of his or her work based on an established set of guidelines. The analyst reviews the data package to ensure that:

- Sample preparation information is correct and complete;
- Analysis information is correct and complete;
- The appropriate SOPs have been followed;
- Analytical results are correct and complete;
- QC samples are within established control limits;
- Blanks are within appropriate QC limits;
- Special sample preparation and analytical requirements have been met; and
- Documentation is complete (e.g., all anomalies in the preparation and analysis have been documented, Out-of-Control forms [if required] are complete; holding times are documented, etc.).

Figure 10-1

Data Validation Scheme



The data reduction and validation steps are documented, signed and dated by the analyst. This initial review step, performed by the analyst, is designated Level 1 review. The analyst then passes the data package to an independent reviewer, who performs a Level 2 review.

Level 2 review is performed by a supervisor or data review specialist whose function is to provide an independent review of the data package. This review is also conducted according to an established set of guidelines and is structured to ensure that:

- Calibration data are scientifically sound, appropriate to the method, and completely documented;
- QC samples are within established guidelines;
- Qualitative identification of sample components is correct;
- Quantitative results are correct;
- Documentation is complete and correct (e.g., anomalies in the preparation and analysis have been documented; Out-of-Control forms [if required] are complete; holding times are documented, etc.);
- The data are ready for incorporation into the final report; and
- The data package is complete and ready for data archive.

Level 2 review is structured so that all calibration data and QC sample results are reviewed and all of the analytical results from 10% of the samples are checked back to the bench sheet. If no problems are found with the data package, the review is complete. If any problems are found with the data package, an additional 10% of the samples are checked to the bench sheet. The process continues until no errors are found or until the data package has been reviewed in its entirety.

An important element of Level 2 review is the documentation of any errors that have been identified and corrected during the review process. Enseco believes that the data package submitted by the analyst for Level 2 review should be free of errors. Errors that are found are documented and transmitted to the appropriate supervisor. The cause of the errors is then addressed with additional training or clarification of procedures to ensure that quality data will be generated at the bench.

Level 2 data review is also documented and the signature of the reviewer and the date of review recorded. The reviewed data are then approved for release and a final report is prepared.

Before the report is released to the client, the Program Administrator who is responsible for interfacing directly with the client reviews the report to ensure that the data meet the overall objectives of the client, as understood by the Program Administrator. This review is labeled Level 3 review.

Each step of this review process involves evaluation of data quality based on both the results of the QC data and the professional judgement of those conducting the review. This application of technical knowledge and experience to the evaluation of the data is essential in ensuring that data of high quality are generated consistently.

In addition to the three levels of review discussed above, the Divisional QA department randomly audits 5% of all projects reported. The QA audit includes verifying that holding times have been met, calibration checks are adequate, qualitative and quantitative results are correct, documentation is complete, and QC results are complete and accurate. During the review, the QA department checks the data from 20% of the samples back to the bench sheet. If no problems are found with the data package, the review is complete. If any problems are found with the data package, an additional 10% of the samples are checked to the bench sheet. The process continues until no errors are found or until the data package has been reviewed in its entirety.

Data Reporting

A variety of reporting formats, from computerized data tables, to complex reports discussing regulatory issues, to a CLP-deliverables package, are available. In general, Enseco reports contain:

General Discussion: Description of samples types, tests performed, any problems encountered and general comments are given.

Analytical Data: Data are reported by sample or by test. Pertinent information including dates sampled, received, prepared, and extracted are included on each results page. The Enseco reporting limit for each analyte is also given.

QC Information: The results (Percent Recovery and Relative Percent Difference) of the Laboratory Control Samples analyzed with the project are listed, together with the control limits. Also, the analytical results for method blanks generated during analysis of organic and metals parameters are given.

Results of any matrix spikes, duplicates, matrix spike duplicates or other project-specific QC are also reported.

Methodology: Reference for analytical methodology used is cited.

Custom Services: Special services including data interpretation, special consultation, and raw data packages (when requested) are included.

11. INTERNAL QC CHECKS

The Enseco QA/QC program monitors data quality with internal QC checks. Internal QC checks are used to answer two questions:

1) Are laboratory operations "in control," (i.e., operating within acceptable QC guidelines), during data generation?

2) What effect does the sample matrix have on the data being generated?

The first question is answered by Laboratory Performance QC. Laboratory performance QC is based on the use of a standard, control matrix to generate precision and accuracy data that are compared, on a daily basis, to control limits. This information, in conjunction with method blank data, is used to assess daily laboratory performance.

The second question is addressed with Matrix-Specific QC. Matrix-Specific QC is based on the use of an actual environmental sample for precision and accuracy determinations and commonly relies on the analysis of matrix spikes, matrix duplicates, and matrix spike duplicates. This information, supplemented with field blank results, is used to assess the effect of the matrix and field conditions on analytical data.

Laboratory Performance QC is provided as a standard part of every routine Enseco analysis. Matrix-Specific QC is available as an option to the client and should be specified based on the types of matrices to be analyzed and the Data Quality Objectives (DQOs) and regulatory requirements of the project.

A complete discussion of the Enseco Internal QC Check program follows.

Laboratory Performance QC Program

Laboratory Performance QC is provided as a standard part of every routine Enseco analysis. The main elements of Laboratory Performance QC are:

- The analysis of Laboratory Control Samples, which include Duplicate Control Samples (DCS), Single Control Samples (SCS), and method blanks, and
- The generation of daily calibration data.

The Laboratory Control Sample program is discussed below. Please refer to Section 8 of this manual for a discussion of calibration procedures.

Laboratory Control Samples (LCS)

Laboratory Control Samples (LCS) are well-characterized, laboratory generated samples used to monitor the laboratory's day-to-day performance of routine analytical methods. Certain LCS are used to monitor the precision and accuracy of the analytical process, independent of matrix effects. Other LCS are used to identify any background interference or contamination of the analytical system which may lead to the reporting of elevated concentration levels or false positive data.

The results of the LCS are compared to well-defined laboratory acceptance criteria to determine whether the laboratory system is "in control." Controlling lab operations with LCS (as opposed to matrix spike/matrix spike duplicate samples), offers the advantage of being able to differentiate low recoveries due to procedural errors from those due to matrix effects. As a result, procedural errors can be identified and corrected by the analyst at the bench, without waiting for extensive senior level review or costly and time-consuming reanalysis of the sample.

Three types of LCS are routinely analyzed: Duplicate Control Samples (DCS), Single Control Samples (SCS), and Method Blanks. Each of these LCS are described below.

Duplicate Control Samples (DCS)

Duplicate Control Samples (DCS) are used to monitor the precision and accuracy of the analytical system on an on-going basis. Each DCS consists of a standard, control matrix that is spiked with a group of target compounds representative of the method analytes. A DCS pair is analyzed for every 20 samples processed by the method. DCS are analyzed with environmental samples to provide evidence that the laboratory is performing the method within accepted QC guidelines for accuracy and precision.

Accuracy (average recovery of each analyte in the DCS pair) and precision (Relative Percent Difference [RPD] between each analyte in the DCS pair) data are compared to control limits that have been established for each of the analytes contained in the DCS. Initially, control limits for analytes spiked into the DCS are taken directly from the CLP program. If CLP limits are not available, Enseco historical data are used to set the control limits. As sufficient laboratory data become available, the control limits are redefined based upon the most recent nine months of DCS data. Control limits for accuracy for each analyte are based on the historical average recovery (mean of the average recoveries of the DCS pairs) plus or minus three standard deviation units. Control limits for precision for each analyte are based on the historical RPD and range from zero (no difference between DCS results) to the average RPD plus three standard deviation units. Calculated control limits tend to be tighter than CLP limits because of the use of a control matrix. However, if the calculated limits are broader than the CLP limits, the CLP limits are used to control the laboratory.

Analytical data that are generated with a DCS pair which falls within the established control limits are judged to be in control. Data generated with a DCS pair which falls outside of the control limits are considered suspect and are repeated or reported with qualifiers. The procedure used to evaluate data from control samples is given in Figure 11-1. The protocols include examination of instrument performance and preparation and analysis information, consultation with the supervisor, and finally a decision path for determining whether reanalysis is warranted.

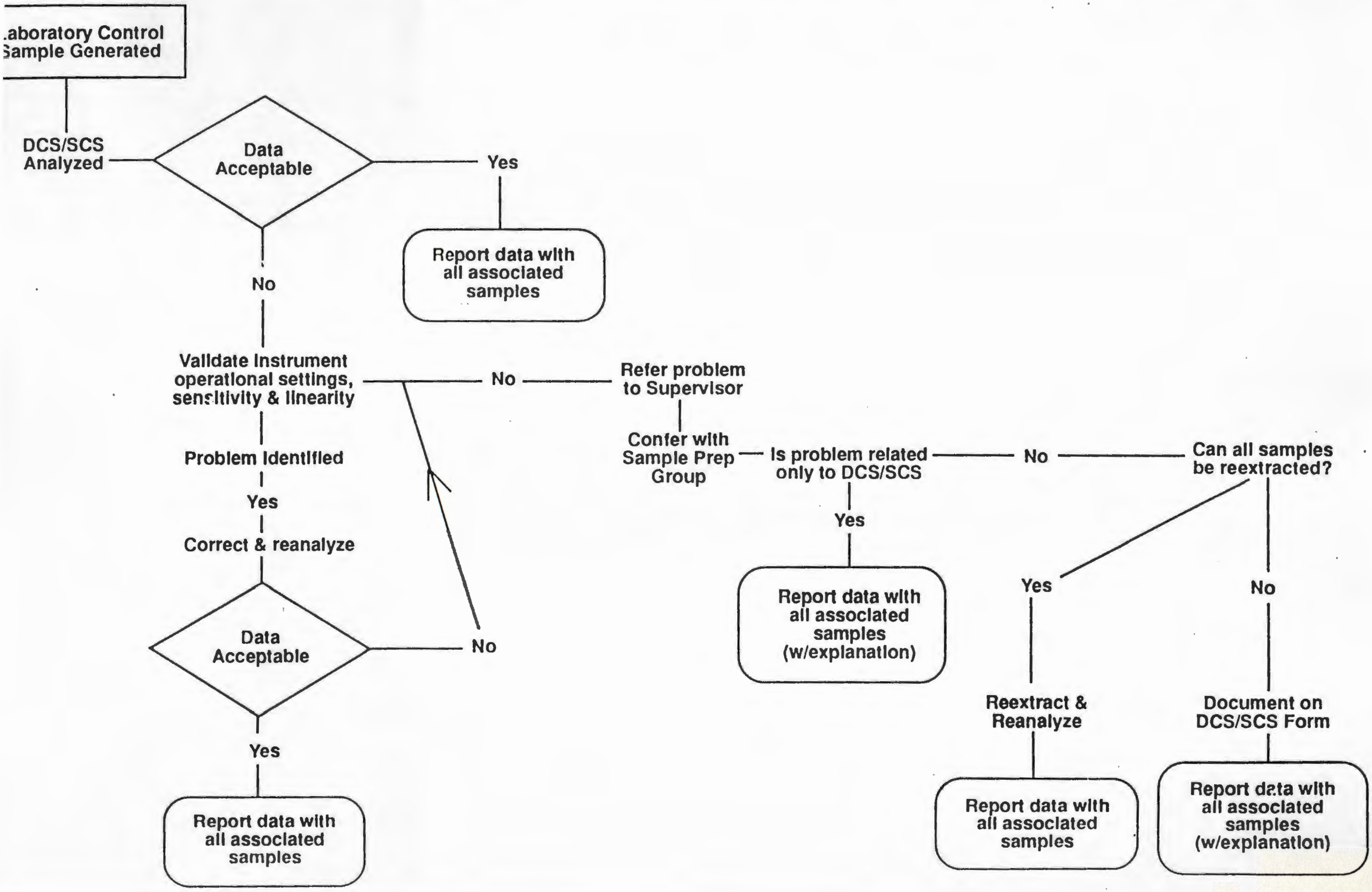
DCS have been established for each routine analytical method. Reagent water is used as the control matrix for the analysis of aqueous samples. The DCS compounds are spiked into reagent water and carried through the appropriate steps of the analysis. The control matrix for solids samples is standard Ottawa sand, an ASTM approved material for use in highway construction, due to its fine degree of homogeneity. The DCS compounds are spiked into the Ottawa sand and carried through the appropriate steps of the analysis.

As stated previously, DCS are analyzed at a frequency of no less than one DCS pair per 20 samples. The DCS program is supplemented with the SCS program to ensure that Laboratory Performance QC is available with each batch of samples processed (see following subsection).

DCS precision and accuracy data are archived in the LIMS. In addition, the associated DCS data are reported with each set of sample results to enable the client to make a quality assessment of the data.

Figure 11-1

Laboratory Performance QC Control Sample Evaluation



Single Control Samples (SCS)

As stated above, a DCS pair is analyzed with every 20 samples to measure the precision and accuracy of an analysis on an ongoing basis. However, samples are often analyzed in lots of less than 20, due to holding time or turn-around time requirements. Since it is necessary to have a measure of laboratory performance with each batch of samples processed, Enseco has instituted the SCS program.

An SCS consists of a control matrix that is spiked with surrogate compounds appropriate to the method being used. In cases where no surrogate is available, (e.g., metals or conventional analyses) a single DCS serves as the control sample. An SCS is prepared for each sample lot for which the DCS pair are not analyzed. Recovery data generated from the SCS are compared to control limits that have been established for each of the compounds being monitored. Initially, CLP control limits or Enseco historical data are used to set the control limits. When sufficient SCS data are available, control limits are redefined based on the most recent nine months of data. Control limits for SCS components are based on the historical average recovery in the SCS plus or minus three standard deviation units.

Analytical data that are generated with an SCS which falls within the control limits are judged to be in control. Data that are generated with an SCS which falls outside of acceptance criteria are considered suspect and are reanalyzed or reported with qualifiers. The protocols for evaluating SCS are identical to those established for DCS (see Figure 11-1).

SCS recovery (accuracy) data are archived in the LIMS. In addition, the associated SCS data are reported with each set of sample results to enable the client to make a quality assessment of the data.

Method Blank

Method blanks, also known as reagent, analytical, or preparation blanks, are analyzed to assess the level of background interference or contamination which exists in the analytical system and which might lead to the reporting of elevated concentration levels or false positive data.

As part of the standard Enseco QC program, a method blank is analyzed with every batch of samples processed. A method blank consists of reagents specific to the method which are carried through every aspect of the procedure, including preparation, clean-up, and analysis. The results of the method blank analysis are evaluated, in conjunction with other QC information, to determine the acceptability of the data generated for that batch of samples.

Ideally, the concentration of target analytes in the blank should be below the Reporting Limit for that analyte. In practice, however, some common laboratory solvents and metals are difficult to eliminate to the parts-per-billion levels commonly reported in environmental analyses. Therefore, criteria for determining blank acceptability must be based on consideration of the analytical techniques used, analytes reported, and Reporting Limits required.

For organic analyses, the concentration of target analytes in the blank must be below the Reporting Limit for that analyte in order for the blank to be considered acceptable. An exception is made for common laboratory contaminants [methylene chloride, acetone, 2-butanone, toluene, and bis(2-ethylhexyl)phthalate] which may be present in the blank at up to 5 times the Reporting Limit and still be considered acceptable. This policy is consistent with the CLP policy and has been established in recognition of the fact that these compounds are frequently found at low levels in method blanks due to the materials used in the collection, preparation, and analysis of samples for organic parameters.

For metals analysis, where the Reporting Limits are typically near the Instrument Detection Limit (IDL) and background levels for certain metals are difficult to completely eliminate, the policy is that the concentration of the target analytes in the blank must be below two times the Reporting Limit. If the blank value for a target analyte lies below the Reporting Limit, the Reporting Limit for that analyte in the associated samples is unaffected. If the blank value lies between the Reporting Limit and two times the Reporting Limit, the Reporting Limit for that analyte in the associated samples is raised to the level found in the blank. A blank containing an analyte(s) above two times the Reporting Limit is considered unacceptable unless the lowest concentration of the analyte in the associated samples is at least ten times the blank concentration (as per CLP protocol).

For conventional inorganic tests, the method SOP directs how the blank is treated. Generally, a reagent blank is used both to zero the equipment and as one of the calibration standards. If a preparation step is required for the analysis, then a prep blank is also analyzed to determine the extent of contamination or background interference. In most cases, the concentration found in the prep blank is subtracted from the concentration found in any associated sample prior to calculating the final result. Blanks have no application or significance for some conventional inorganic parameters (e.g. pH).

If the blank does not meet acceptance criteria, the source of contamination must be investigated and appropriate corrective action must be taken and documented. Investigation includes an evaluation of the data to determine the extent and effect of the contamination on the sample results. Corrective actions may include reanalysis of the blank, and/or repreparation and reanalysis of the blank and all associated samples.

For organic and metals analyses, and selected conventional inorganic tests, method blank results are reported with each set of sample results.

Sample results are not corrected for blank contamination. Occasionally, due to limited sample volume or other constraints, the laboratory reports data associated with an unacceptable blank. In these cases, the Reporting Limit for the each analyte contained in the blank is raised to the level found in the blank.

Matrix-Specific QC

Matrix-Specific QC is used to assess the effects of a sample matrix or field conditions on the analytical data. The main elements of Matrix-Specific QC are:

- The analysis of matrix spikes, matrix duplicates, and matrix spike duplicates;
- Monitoring the recovery of surrogate compounds from environmental samples;
- Monitoring the results of standard additions in environmental samples;
- The analysis of field blanks; and
- The determination of method detection limits in a specific matrix.

Different regulatory programs have different requirements in terms of Matrix-Specific QC. In order to ensure that the data generated meet all Data Quality Objectives, Enseco encourages its clients to include Matrix-Specific QC that fulfills the Data Quality Objectives and regulatory requirements of the project. A discussion of the different elements of Matrix-Specific QC follows.

Matrix Spikes, Matrix Duplicates, and Matrix Spike Duplicates

A Matrix Spike (MS) is an environmental sample to which known concentrations of analytes have been added. The MS is taken through the entire analytical procedure and the recovery of the analytes is calculated. Results are expressed as percent recovery. The MS is used to evaluate the effect of the sample matrix on the accuracy of the analysis.

A Matrix Duplicate (MD) is an environmental sample that is divided into two separate aliquots. The aliquots are processed separately and the results compared to determine the effects of the matrix on the precision of the analysis. Results are expressed as RPD.

A Matrix Spike Duplicate (MSD) is an environmental sample that is divided into two separate aliquots, each of which is spiked with known concentrations of analytes. The two spiked aliquots are processed separately and the results compared to determine the effects of the matrix on the precision and accuracy of the analysis. Results are expressed as RPD and percent recovery.

Surrogate Recoveries and Standard Additions

Surrogates are organic compounds which are similar to the analytes of interest in chemical behavior, but which are not normally found in environmental samples. Surrogates are added to samples to monitor the effect of the matrix on the accuracy of the analysis. Results are reported in terms of percent recovery.

Enseco routinely adds surrogates to samples requiring GC/MS analysis and reports these surrogate recoveries to the client. The laboratory does not control its operations based on surrogate recoveries in environmental samples. As discussed earlier in this section, Enseco controls its operations based on the results of Laboratory Control Samples. The surrogate recoveries are primarily used by the laboratory to assess matrix effects. However, obvious problems with sample preparation and analysis (e.g. evaporation to dryness, leaking septum, etc.) which can lead to poor surrogate spike recoveries must be ruled out prior to attributing low surrogate recoveries to matrix effects.

Standard Additions (SA) is the practice of adding a series of known amounts of an analyte to an environmental sample. The fortified samples are then analyzed and the recovery of the analytes calculated. The practice of SA's is generally used with metal and conventional analyses to determine the effect of the sample matrix on the accuracy of the analyses.

Field Blanks

Field blanks are check samples that monitor contamination originating from the collection, transport or storage of environmental samples. One example of a field blank is an equipment blank. An equipment blank is blank water that is poured through the sample collection device to check the adequacy of the cleaning procedures for the sampling equipment. Another type of field blank is a trip blank. A trip blank is a laboratory control matrix (typically water) which is sent to the field in an appropriate sample container, remains unopened in the field, and then is sent back to the laboratory. The purpose of the trip blank is to assess the impact of field and shipping conditions on the samples. The results from field blanks are reported to the client as samples in the same concentration units as the samples. No correction of the analytical data is done in the laboratory based on the analysis of field blanks.

Matrix-Specific Detection Limits

Method Detection Limits (MDL's) determined on a specific sample matrix are called Matrix-Specific Detection Limits. See Section 14 for a discussion of detection and reporting limits.

12. PERFORMANCE AND SYSTEM AUDITS

Enseco laboratories participate in a variety of federal and state certification programs, (including the U.S. EPA CLP), that subject each of the laboratories to stringent system and performance audits on a regular basis. A system audit is a review of laboratory operations conducted to verify that the laboratory has the necessary facilities, equipment, staff and procedures in place to generate acceptable data. A performance audit verifies the ability of the laboratory to correctly identify and quantitate compounds in blind check samples submitted by the auditing agency. The purpose of these audits is to identify those laboratories that are capable of generating scientifically sound data. Enseco is certified to perform environmental analyses under programs administered by the U.S. EPA, U.S. Army, U.S. Navy, and over 15 states. The most current list of Enseco certifications is available upon request.

In addition to external audits conducted by certifying agencies or clients, Enseco regularly conducts the following internal audits:

- Quarterly systems audits conducted by the Divisional QA Director.
- Periodic (at least yearly) audits conducted by the Corporate QA Office.
- Special audits by the Divisional QA Director or Corporate QA Office when a problem is suspected.

Enseco laboratories also routinely analyze check samples as described below:

- Laboratory Control Samples (DCS, SCS, and method blanks) are analyzed at a frequency equal to at least 10% of the total number of samples analyzed (see Section 11).
- All Enseco laboratories participate in the analyses of EPA check samples provided under the Water Supply (WS) and Water Pollution (WP) Performance Evaluation Studies. The results of these PE samples are tabulated by the Corporate QA Office to identify performance trends within the Enseco laboratories.

- The majority of the Enseco laboratories are CLP labs and thus analyze organic and/or inorganic CLP PE samples on a quarterly basis. The results of these analyses are also tabulated and evaluated by the Corporate QA Office.
- The laboratories participate in multiple state certification programs (including New York, New Jersey and California) which require that PE samples be analyzed periodically.
- Blind check samples from an independent commercial firm are sent to the laboratories periodically by the Corporate QA Office. The frequency and type of samples sent is based on problem areas identified by evaluation of tabulated PE results.

The results of these check samples are used to identify areas where additional training is needed or clarification of procedures is required.

13. PREVENTIVE MAINTENANCE

To minimize downtime and interruption of analytical work, preventive maintenance is routinely performed on each analytical instrument. Designated laboratory personnel are trained in routine maintenance procedures for all major instrumentation. When repairs are necessary, they are performed by either trained staff or trained service engineers employed by the instrument manufacturer.

Each laboratory has detailed SOPs on file that describe preventive maintenance procedures and schedules. The laboratories also maintain detailed logbooks documenting the preventive maintenance and repairs performed on each analytical instrument.

14. SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA QUALITY AND DETERMINE REPORTING LIMITS

Data Quality Assessment

The effectiveness of a QA program is measured by the quality of data generated by the laboratory. Data quality is judged in terms of its precision, accuracy, representativeness, completeness and comparability. These terms are described as follows:

Precision is the degree to which the measurement is reproducible. Precision can be assessed by replicate measurements of DCS, reference materials, or environmental samples. Enseco routinely monitors precision by comparing the RPD between DCS measurements with control limits established at plus three standard deviations from the mean RPD of historical DCS data.

Precision is frequently determined by comparison of replicates. The standard deviation of "n" measurements of "x" is commonly used to estimate precision.

Standard deviation (S) is calculated as follows:

$$S = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (X_1 - \bar{X})^2}$$

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

The relative standard deviation (or sample coefficient of variation, CV), which expresses standard deviation as a percentage of the mean, is generally useful in the comparison of three or more replicates (although it may be applied in the case of n = 2).

$$RSD = 100\ (s/\bar{X})$$

or

$$CV = 100\ (s/\bar{X})$$

where: RSD = relative standard deviation

CV = coefficient of variation

s = standard deviation

$\bar{X}$ = mean

In the case of duplicates, the RPD between the two samples may be used to estimate precision.

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

where: RPD = relative percent difference

D_1 = first sample value

D_2 = second sample value (duplicate)

Accuracy is a determination of how close the measurement is to the true value. Accuracy can be assessed using LCS, standard reference materials, or spiked environmental samples. Unless specified otherwise in special contracts, Enseco monitors accuracy by comparing LCS results with control limits established at plus or minus three standard deviation units from the mean of historical LCS results.

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

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

where: X = the observed value of measurement

T = "true" value

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Analytical data should represent the sample analyzed regardless of the heterogeneity of the original sample matrix. Enseco strives to accommodate all sample matrices. Some samples may require analysis of multiple phases to obtain representative results.

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions.

To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. In addition, all data are reviewed in terms of stated goals in order to determine if the database is sufficient.

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

$$\text{Completeness} = \frac{\text{valid data obtained}}{\text{total data planned}} \times 100\%$$

Comparability expresses the confidence with which one data set can be compared to another data set measuring the same property. Comparability is ensured through the use of established and approved analytical methods, consistency in the basis of analysis (wet weight, volume, etc.), consistency in reporting units (ppm, ppb, etc.), and analysis of standard reference materials.

Reporting Limits

Assuring the validity of quantitative measurements at low concentrations is an extremely difficult technical problem. With regulatory action levels being pushed lower and lower, the validity of any given measurement becomes even more important. The consequences of false positive or false negative data can be significant.

A number of terms have been used, by the EPA and other technical groups, to express the lowest concentration of an analyte which can be measured. Some of these terms, their definitions, and sources are listed in Table 14-1. A graphical representation of these terms is given in Figure 14-1.

Enseco takes very seriously its responsibility to report technically defensible data. Therefore, we have established a Reporting Limit (RL) for each analyte in each method. The RL represents the value above which we believe reliable data can be routinely obtained.

These Reporting Limits were established by collecting Method Detection Limit (MDL) data for organic analyses and Instrument Detection Limit (IDL) data for metals analyses from each Enseco laboratory. The MDL data were collected using the procedures described in 40CFR136 Appendix B. IDL data were calculated using the procedures outlined in the EPA Contract Laboratory Program (CLP) Statement of Work dated 12/87. The MDL/IDL data were then compared to various limits published in EPA methods and in the regulations. For example for Volatile Organics, the MDL data generated in Enseco laboratories were compared to the Practical Quantitation Limits (PQLs) published in SW-846 method 8240; the PQLs contained in the July 9, 1987, Federal Register Final Rulemaking on Appendix IX; the Contract Required Detection Limits (CRDLs) in the CLP Method for Volatile Organics; and the MDLs in Method 624. Then a Reporting Limit for each analyte was established which considered all of this information. The RL was set at a level above which we were confident that our laboratories could detect and quantify the analyte consistently. Using this procedure, the Reporting Limits established are generally between 2 to 5 times the laboratory MDL/IDL. This range is consistent with the American Chemical Society definition for the Limit of Quantitation (LOQ). (See Table 14-1)

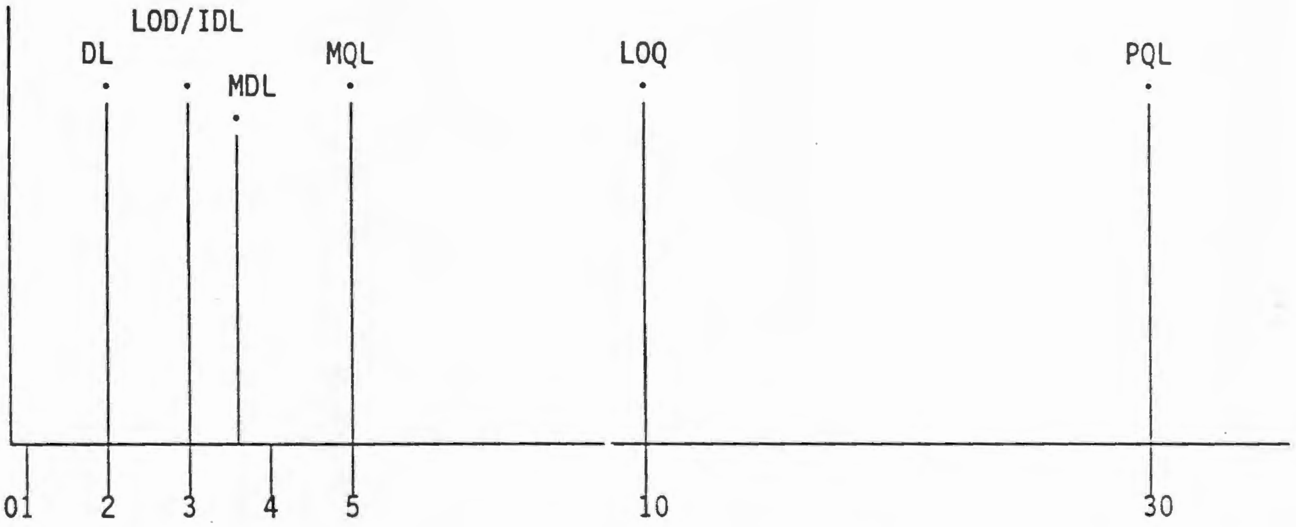
TABLE 14-1

DEFINITION OF DETECTION LIMIT TERMS

	DEFINITION	DETERMINATION	CALCULATION	SOURCE
tection Limit (DL)	The concentration which is distinctly detectable above, but close to a blank.	Analysis of replicate standards	Two times the standard deviation	Methods for Chemical Analysis of Water and Wastes
mit of Detection (LOD)	The lowest concentration that can be determined to be statistically different from a blank	Analysis of replicate samples	Three times the standard deviation	ACS Definition
ethod Detection Limit MDL)	The minimum concentration of a substance that can be identified, measured and reported with 99% confidence that the analyte concentration is greater than zero.	Analysis of a minimum of seven replicates spiked at 1 to 5 times the expected detection limit.	The standard deviation times the Student t-value at the desired confidence level. (For seven replicates, the value is 3.14)	40 CFR 136 Definition for EPA Water Programs
nstrument Detection imit (IDL)	The smallest signal above background noise that an instrument can detect reliably.	Analysis of three replicate standards at concentrations of 3-5 times the detection limit.	Three times the standard deviation	Contract Laboratory Program
ethod Quantitation Limit MQL)	The minimum concentration of a substance that can be measured and reported	Analysis of replicate samples	Five times the standard deviation	SW-846
imit of Quantitation LOQ)	The level above which quantitative results may be obtained witha specified degree of confidence	Analysis of replicate samples	Ten times the standard deviation	ACS Definition
ractical Quantitation imit (PQL)	The lowest level that can be reliably determined within specified limits of precision and accuracy during routine laboratory operating conditions	Interlaboratory analysis of check samples	1) Ten times the MDL 2) Value where 80% of laboratories are within 20% of the true value	RCRA SDWA Programs
ontract Required etection Limit (CRDL)	Reporting limit specified for laboratories under contract to the EPA for	Unknown	Unknown	Contract Laboratory Program

FIGURE 14-1

Graphical Representation of Detection Limit Terms
(See Table 14-1 for Definitions)



MULTIPLIER OF STANDARD DEVIATION OF REPLICATES

NOTE: The values along the horizontal "Standard Deviation (SD)" axis are approximate values and are meant to show the relative, not absolute, relationship between the terms.

15. CORRECTIVE ACTION

When errors, deficiencies, or out-of-control situations exist, the QA program provides systematic procedures, called "corrective actions," to resolve problems and restore proper functioning to the analytical system.

Laboratory personnel are alerted that corrective actions may be necessary if:

- QC data are outside the acceptable windows for precision and accuracy;
- Blanks, DCS or SCS contain contaminants above acceptable levels;
- Undesirable trends are detected in spike recoveries or RPD between duplicates;
- There are unusual changes in detection limits;
- Deficiencies are detected by the QA department during internal or external audits or from the results of performance evaluation samples; or
- Inquiries concerning data quality are received from clients.

Corrective action procedures are often handled at the bench level by the analyst, who reviews the preparation or extraction procedure for possible errors, checks the instrument calibration, spike and calibration mixes, instrument sensitivity, and so on. If the problem persists or cannot be identified, the matter is referred to the laboratory supervisor, manager and/or QA department for further investigation. Once resolved, full documentation of the corrective action procedure is filed with the QA department. Corrective action documentation is routinely reviewed by the VP of QA.

16. QA REPORTS TO MANAGEMENT

The reporting system is a valuable tool for measuring the overall effectiveness of the QA program. It serves as an instrument for evaluating the program design, identifying problems and trends, and planning for future needs. Divisional QA Directors submit extensive monthly reports to the VP of QA and the Divisional Director. These reports include:

- The results of internal systems audits including any corrective actions taken;
- Performance evaluation scores and commentaries;
- Results of site visits and audits by regulatory agencies and clients;
- Performance on major contracts, (including CLP);
- Problems encountered and corrective actions taken;
- Holding time violations;
- Comments and recommendations; and
- A summary of the 5% QA data audits conducted.

The VP of QA submits weekly reports to the CEO and regularly reports on the status of the QA Program to the Enseco Management Committee and each Divisional Director. These reports summarize the information gathered through the laboratory reporting system and contain a thorough review and evaluation of laboratory operations throughout Enseco.

17. LABORATORY DOCUMENTATION

Complete and accurate documentation of analytical and procedural information is an important part of the QA program. The following describes different types of documentation used in the Enseco laboratories.

SOPs

Details of analytical and QC protocols are contained in SOPs. SOPs are documents that contain detailed information on the requirements for the correct performance of a laboratory procedure. Enseco has four categories of laboratory SOPs:

- SOPs for Performance of an Analytical Method;
- SOPs for Preparation of Standards and Reagents;
- SOPs for Equipment Operation, Calibration, and Maintenance; and
- SOPs for General Laboratory Procedures.

The formats for these SOP'S are given in Appendix II.

All SOP'S are approved by the QA Department before being implemented. The distribution of current SOP'S and archiving of outdated ones is controlled through the QA Department.

LIMS

Enseco laboratories rely on a customized Laboratory Information Management System (LIMS) as the primary database. Client information, sample results, and QC results are all stored in the LIMS. Reports are generated directly from the database to eliminate transcription errors. A tiered security system is in place to control the ability of lab personnel to change results, and the system is designed with an audit trail that identifies when information has been changed and who changed it. The most recent two to three months of analytical data are kept on-line. All other data are archived on magnetic tape or optical disk.

Laboratory Bench Sheets

Laboratory bench sheets are used to document information from routine laboratory operations, including sample preparation and analysis. Bench sheets are used to ensure that the information is recorded in a complete and organized manner and that the analysis can be reconstructed, if necessary. Portions of information from the bench sheet are also stored in the LIMS.

Laboratory Notebooks

Laboratory notebooks are used to document information that cannot easily be recorded in the LIMS. Information typically recorded in laboratory notebooks includes unusual observations or occurrences in the analysis of samples, or methods development information. Each page in a laboratory notebook is initialed and dated as information is entered.

Control Charts

Enseco laboratories use control charts, generated directly from the LIMS, to visually track the LCS precision and accuracy data. These control charts are used to identify trends in the analyses which may indicate a problem with the analytical procedure. When an adverse trend is detected, as specified in the SOP for generating and interpreting control charts, analysis is stopped and corrective action undertaken.

Anomaly Forms

Any situation which is outside of the normal scope of operations, as described in the laboratory SOPs, is documented on an Anomaly Form.

Examples of anomalous situation include: formation of a precipitate in an extract; formation of an emulsion during an extraction step; or missed holding times. These situations are thoroughly documented to enable a thorough review of the data to occur.

Out-of-Control situations are also documented on Anomaly Forms. An Out-of-Control situation occurs when QC data fall outside of established control limits. The documentation associated with and Out-of-Control situation is reviewed by the supervisor and the QA Department. Out-of-Control situations trigger Corrective Action. Corrective Actions taken are also documented on the Anomaly Form.

Project Files

A project file is created for each project handled within the laboratory. The project file contains all documents associated with the project. This includes correspondence from the client, chain-of-custody records, raw data, copies of laboratory notebook entries pertaining to the project, and a copy of the final report. When a project is complete, all records are passed to the Document Custodian who inventories the file, checks for completeness, and puts the file into document archive.

APPENDIX I

MAXIMUM HOLDING TIMES AND SAMPLE COLLECTION/PRESERVATION INFORMATION

Sources: Tables A-E:
Federal Register, October 26, 1984
SW-846, 3rd Edition, Update I
State of California Leaking Underground Fuel Tank Field Manual, May 1988

Table F:
Contract Laboratory Program Statement of Work for Organic Analysis dated 10/86
Contract Laboratory Program Statement of Work for Inorganic Analysis dated 12/87

A. VOLATILE ORGANICS

Matrix	Container	Minimum Sample Size	Preservative	Holding Time (From Date Sampled)
Water Samples				
No Residual Chlorine Present	3 40 mL vials with Teflon lined septum caps	40 mL	4 drops conc. HCl, 4°C	14 days
Residual Chlorine Present	3 40 mL vials with Teflon lined septum caps	40 mL	4 drops of 10% sodium thiosulfate, 4 drops conc. HCl, 4°C	14 days
Acrolein and Acrylonitrile	3 40 mL vials with Teflon lined septum caps	40 mL	Adjust to pH 4-5, 4°C	14 days
Soil/Sediments and Sludges	Glass jar with Teflon liner or core tube	10 g	4°C	14 days
Concentrated Waste Samples	Glass jar with Teflon liner or core tube	10 g	None	14 days

The above information applies to the following parameters and methods:

Parameter	Method
Volatile Halocarbons	601/8010 (GC)
Volatile Aromatics	602/8020 (GC)
Volatile Organics	624/8240/8260 (GC/MS)
Acrolein/Acrylonitrile	603/8030 (GC)

B. SEMIVOLATILE ORGANICS

Matrix	Container	Minimum Sample Size	Preservative	Holding Time (From Date Sampled)
Water Samples				
No Residual Chlorine Present	1 liter glass with Teflon liner	1 liter	4°C	Samples must be extracted within 7 days and analyzed within 40 days of extraction.
Residual Chlorine Present	1 liter glass with Teflon liner	1 liter	Add 3 mL 10% sodium thiosulfate per gallon, 4°C	Samples must be extracted within 7 days and analyzed within 40 days of extraction.
Soil/Sediments and Sludges	Glass jar with Teflon liner or core tube	50 g	4°C	Samples must be extracted within 14 days and analyzed within 40 days of extraction.
Concentrated Waste Samples	Glass jar with Teflon liner or core tube	50 g	None	Samples must be extracted within 14 days and analyzed within 40 days of extraction.

The above information applies to the following parameters and methods:

Parameter	Method
Phenols	604/8040 (GC)
Phthalate Esters	606/8060 (GC)
Organochlorine Pesticides/PCBs	608/8080 (GC)
Polyaromaltic Hydrocarbons	610/8310 (HPLC)
Organophosphate Pesticides	614/8140 (GC)
Phenoxy acid Herbicides	615/8150 (GC)
Semivolatile Organics	625/8270 (GC/MS)
Carbamate & Urea Pesticides	632 (HPLC)

C. OTHER ORGANICS

Parameter	Method No.	Matrix	Holding Time[a] (from Date Sampled)	Container	Preservative	Min. Sample Size
Dioxins/Furans	8280	Water	30 days extn. 45 days anal.[b]	One liter glass	4°C	1000 ml
		Soil/Waste	30 days extn. 45 days anal.[b]	core tube or glass jar	4°C	50 g
Petroleum Hydrocarbons as Gasoline	TPH-Gasoline Purge & Trap (LUFT manual)	Water	14 days	3 40 mL vials with Teflon liners	4°C, HCl to pH < 2	40 mL
		Soil/Waste	14 days	Core tube or glass jar	4°C	50 g
Petroleum Hydrocarbons as Gasoline	TPH-Gasoline Extractable (LUFT manual)	Water	14 days extn. 40 days anal.	One liter glass	4°C, HCl to pH < 2	500 mL
		Soil/Waste	14 days extn. 40 days anal.	Core tube or glass jar	4°C	50 g
Petroleum Hydrocarbons as Diesel	TPH-Diesel Extractable (LUFT manual)	Water	14 days extn. 40 days anal.	One liter glass	4°C	500 mL
		Soil/Waste	14 days extn. 40 days anal.	Core tube or glass jar	4°C	50 g
Petroleum Hydrocarbons (TPH)	TPH-IR (418.1)	Water	28 days	One liter glass	4°C, H_2SO_4 to pH < 2	1000 mL

(a) extn: extraction anal: analysis
(b) from date of collection

D. METALS

Parameter	Method No.	Matrix	Holding Time (from Date Sampled)	Container	Preservative[(a)]	Min. Sample Size
Metals (ICP)	200.7/6010	Water	6 months	Poly	HNO_3 to pH < 2.0	100 ml
		Soil/Waste	6 months	core tube/glass jar	4°C	10 g
Arsenic (GF-AA)	206.2/7060	Water	6 months	Poly	HNO_3 to pH < 2.0	100 ml
		Soil/Waste	6 months	core tube/glass jar	4°C	10 g
Mercury (CV-AA)	245.1/7470	Water	28 days	Poly	HNO_3 to pH < 2.0	100 ml
		Soil/Waste	28 days	core tube/glass jar	4°C	10 g
Selenium (GF-AA)	270.2/7740	Water	6 months	Poly	HNO_3 to pH < 2.0	100 ml
		Soil/Waste	6 months	core tube/glass jar	4°C	10 g
Thallium (GF-AA)	279.2/7841	Water	6 months	Poly	HNO_3 to pH < 2.0	100 ml
		Soil/Waste	6 months	core tube/glass jar	4°C	10 g
Lead (GF-AA)	239.2/7421	Water	6 months	Poly	HNO_3 to pH < 2.0	100 ml
		Soil/Waste	6 months	core tube/glass jar	4°C	10 g
Chromium (III/VI)	220.7/218.4/ 312B/7197	Water	24 hours	Poly	4°C	100 ml
		Soil/Waste	24 hours extn. (b)	core tube/glass jar	4°C	10 g
Silica	200.7/6010	Water	28 days	Poly	4°C	100 ml
		Soil/Waste	28 days	core tube/glass jar	4°C	10 g

(a) Listed preservative is for total metals. Dissolved or suspended metals require filtration prior to pH adjustment.

(b) extn: extraction

E. CONVENTIONALS

Parameter	Method No.	Matrix	Holding Time(a) (from Date Sampled)	Container	Preservative	Min. Sample Size
Color	110.2	Water	48 hours	Poly	4°C	100 ml
Oil and Grease	413.1/ 413.2	Water	28 days	Glass	4°C, H_2SO_4 to pH < 2	1000 ml
Specific Conductance	120.1	Water	28 days	Poly	4°C	50 ml
Acidity	305.1	Water	14 days	Poly	4°C	50 ml
pH	150.1	Water	ASAP	Poly	4°C	50 ml
Alkalinity	310.1	Water	14 days	Poly	4°C	50 ml
Hardness	200.7/ 314A/314B	Water	6 months	Poly	HNO_3 to pH < 2	50 ml
Biochemical Oxygen Demand	405.1	Water	48 hours	Poly	4°C	200 ml
Chemical Oxygen Demand	410.4	Water	28 days	Glass	4°C, H_2SO_4 to pH < 2	100 ml
Organic Carbon (TOC)	415.1	Water	28 days	Glass	4°C, H_2SO_4 to pH < 2	100 ml

C. CONVENTIONALS (Cont.)

Parameter	Method No.	Matrix	Holding Time[a] (from Date Sampled)	Container	Preservative	Min. Sample Size
Orthophosphate	365.3	Water	48 hours	Poly	4°C	100 ml
Total Phosphorus	365.3	Water	28 days	Glass	H_2SO_4 to pH < 2	100 ml
Total Kjeldahl Nitrogen	351.2	Water	28 days	Glass	4°C, H_2SO_4 to pH < 2	100 ml
Ammonia	350.1	Water	28 days	Glass	4°C, H_2SO_4 to pH < 2	50 ml
Nitrite	354.1	Water	48 hours	Poly	4°C	50 ml
Nitrate	353.2/300.0	Water	48 hours	Poly	4°C	50 ml
Nitrite plus Nitrate	353.2	Water	28 days	Glass	4°C, H_2SO_4 to pH < 2	50 ml
Total Solids	160.3	Water	7 days	Poly	4°C	100 ml
Total Suspended Solids	160.2	Water	7 days	Poly	4°C	100 ml
Total Dissolved Solids	160.1	Water	7 days	Poly	4°C	100 ml

C. CONVENTIONALS (Cont.)

Parameter	Method No.	Matrix	Holding Time[a] (from Date Sampled)	Container	Preservative	Min. Sample Size
Total Volatile Solids	160.4	Water	7 days	Poly	4°C	100 ml
Turbidity	180.1	Water	48 hours	Poly	4°C	50 ml
Sulfate	300.0	Water	28 days	Poly	4°C	50 ml
Sulfite	377.1	Water	ASAP	Poly	4°C	100 ml
Sulfide	376.2	Water	7 days	Poly	4°C, NaOH to pH > 9 $Zn(C_2H_3O_3)2$	100 ml
Cyanide	335.1/ 335.2/335.3	Water	14 days	Poly	4°C, NaOH to pH > 12	250 ml
Coliform, Total & Fecal	909A/ 909C	Water	6 hours	Sterile poly	4°C, $Na_2S_2O_3$	100 ml
Bromide	Dionex	Water	28 days	Poly	4°C	50 ml
Chloride	300.0	Water	28 days	Poly	4°C	50 ml
Chlorine, residual	330.1	Water	ASAP	Poly	4°C	100 ml

C. CONVENTIONALS (Cont.)

Parameter	Method No.	Matrix	Holding Time(a) (from Date Sampled)	Container	Preservative	Min. Sample Size
Fluoride	340.2	Water	28 days	Poly	4°C	50 ml
Iodide	Dionex	Water	28 days	Poly	4°C	50 ml
Organic Halogen (TOX)	9020	Water	28 days	Glass	4°C, H_2SO_4 to pH < 2	200 ml
Phenolics	420.1/ 420.2	Water	28 days	Glass	4°C, H_2SO_4 to ph < 2	100 ml
Surfactants (MBAS)	425.1	Water	48 hours	Poly	4°C	100 ml
Gross Alpha, Beta and Radium	9310/ 9315	Water	6 months	Poly	HNO_3 to ph < 2	2000 ml
Odor	140.1	Water	ASAP	Glass	4°C	1000 mL

a) Parameters with holding times of 24 hours or less are analyzed on the day of receipt in the laboratory. Parameters with holding times between 24 and 48 hours are analyzed within one day of receipt in the laboratory.

F. CLP HOLDING TIMES

Parameter	Matrix	Holding Time(a) (from Date Received)	Container	Preservative	Min. Sample Size
Volatile Organics	Water	10 days	2 40 mL vials with Teflon lined caps	4°C	40 mL
	Soil	10 days	Glass jar with Teflon liner or core tube	4°C	10 g
Extractable Organics	Water	5 days extn. 40 days anal.	1 liter glass with Teflon liner	4°C	1000 mL
	Soil	10 days extn. 40 days anal.	Glass jar with Teflon liner or core tube	4°C	50 g
Metals (other than Mercury)	Water	180 days	P,G (b)	HNO_3 to pH < 2	100 mL
	Soil	180 days	P,G	4°C	10 g
Mercury	Water	26 days	P,G	HNO_3 to pH < 2	100 mL
	Soil	26 days	P,G	4°C	10 g
Cyanide	Water	14 days	P,G	0.6 g ascorbic acid,(c) NaOH to pH >12, 4°C	100 mL
	Soil	14 days	P,G	4°C	10 g

(a) Holding times calculated from date of receipt in laboratory
(b) Polyethylene (P) or glass (G)
(c) Only used in the presence of residual chlorine

APPENDIX II

FORMATS FOR STANDARD OPERATING PROCEDURES (SOP)

FORMAT FOR SOP - LABORATORY, ANALYTICAL METHOD

Title (includes method number)

1. Scope and Application
    - 1.1 Analytes
    - 1.2 Detection limit (instrument and method)
    - 1.3 Applicable matrices
    - 1.4 Dynamic range
    - 1.5 Approximate analytical time (i.e., 5 minutes, 2 days)
2. Summary of Method
    - 2.1 Generic description of method and chemistry behind it (i.e., extract with solvent, convert to methyl ester, analyze by electron-capture gas chromatography)
3. Comments
    - 3.1 Interferences
    - 3.2 Helpful hints
4. Safety Issues (specific to the method)
5. Sample Collection, Preservation, Containers, and Holding Times
6. Apparatus
7. Reagents and Standards
8. Procedure (detailed step-by-step)
    - 8.1 Sample preparation
    - 8.2 Calibration
    - 8.3 Analysis

FORMAT FOR SOP - LABORATORY, ANALYTICAL METHOD
(cont.)

9. QA/QC Requirements
    - 9.1 QC samples
    - 9.2 Acceptance criteria (precision and accuracy, % of multi-component QC analytes which must be within windows)
    - 9.3 Corrective action required (reference current QC manual)

10. Calculations

11. Reporting
    - 11.1 Reporting units
    - 11.2 Reporting limits
    - 11.3 Significant figures and reporting values below detection limit
    - 11.4 LIMS data entry

12. References
    - 12.1 Method source
    - 12.2 Deviations from source method and rationale

FORMAT FOR SOP - LABORATORY, STANDARDS AND REAGENTS

Title

1. Reagent/Standard Name

2. Type (reagent, calibration standard, DCS, SCS, stock solution, etc.)

3. Constituents/concentration

4. Solvent

5. Safety Issues (specific to the reagent or standard)

6. Shelf Life

7. Procedure

    7.1 Preparation
    7.2 Documentation (purchase date, open date, labeling, etc.)
    7.3 Verification

FORMAT FOR SOP - LABORATORY, EQUIPMENT OPERATION, CALIBRATION, AND MAINTENANCE

Title

1. Purpose

2. Safety Issues (applicable to the specific equipment)

3. Procedure

   3.1 Initial start-up
   3.2 Calibration and performance documentation
   3.3 Example output
   3.4 Shut-down
   3.5 Maintenance and maintenance records

4. Responsibilities

5. Comments

6. Definitions

FORMAT FOR SOP - LABORATORY, PROCEDURAL

Title

1. Purpose
2. Policies
3. Safety Issues
4. Procedure
5. Responsibilities
6. Comments
7. Definitions

APPENDIX G

PROCEDURES FOR RISING/FALLING HEAD TESTS

APPENDIX G

Procedures for Rising/Falling Head Tests

In order to determine the in-place hydraulic conductivity of the unconsolidated and consolidated geologic material, single-well, rising/falling head tests will be performed. These tests involve raising or lowering the water level in the well and measuring the change in head with respect to time as the well is allowed to recover. In wells which are slow to recover the water levels will be taken manually. Wells which recover too quickly for this step will be tested by means of a pressure transducer connected to an electronic data logger system.

The recovery tests for fast recovery wells are conducted as follows:

- The static water level in the well to be tested is measured and recorded.
- The pressure transducer is placed in the well to a minimum depth of three feet below the static water level.
- Readings are made using the data logger until three consecutive readings are the same (equilibrium conditions).
- The data logger is then calibrated to read 0.00 feet at static conditions. Following the installation and calibration of the pressure transducer, a pre-cleaned bailer is lowered into the well and placed just below the water surface.
- Water level measurements will again be made until the water level returns to static conditions following introduction of the bailer. If static conditions are not reached within 15 minutes following introduction of the bailer the well will be tested using the procedures described below for slow recovery wells.
- Once static conditions are re-established, the bailer will be rapidly removed from the water column, thus creating a virtually instantaneous decline of the water level in the well. Coincident with the withdrawal of the bailer, automatic logging of the water levels will be initiated using the data logger. It is a primary goal in a recovery test to "instantaneously" remove a volume of water that will result in a

measurable head decline, the recovery of which (to static conditions) can be monitored over time. Such an instantaneous withdrawal results in recovery due to contributions of flow from the surrounding formation controlled by its hydraulic conductivity and not other factors (e.g., a long-term drawdown that would result in aquifer dewatering and thus inflow which would be affected by a portion going into storage). Thus, storage effects need not be considered in a slug test.

- o Alternatively if the falling head method is utilized a sufficient slug (typically 2 to 3 gallons) of deionized water will be introduced to the well bore to effect an increase in head and the well response during the recovery period will be monitored as previously described.

- o The water level measurements will continue until water levels recover to within a minimum of 10 percent of the original static level (90 percent recovery), or an elapsed time of one hour. If after one hour the well has not recovered to the above criteria at the discretion of the hydrogeologist, the transducer will be removed and the well will be tested at a later date using the procedures described below for slow recovery wells.

- o Data stored in the data loggers will be "dumped" either to a hard copy printout using a field printer or to a magnetic disk using a portable computer. If field printouts are used, each will be dated and signed by the hydrogeologist.

A laboratory cleaned bailer for each well will be used in the rising head testing. All equipment entering the well, such as the transducer and transducer cable, will be cleaned prior to reuse with clean water, a hexane wipe, and deionized water rinse. All well water and rinse water generated by the slug tests will be collected in appropriate containers and disposed of in the on-site retention pond.

For slow recovery wells the following procedure is used:

- o The static water level is measured and recorded

- o The well is bailed by hand until the depth to water appears to stabilize based on the depth of travel of the bailer rope (this measurement needs only to be approximated and is not critical to the test), or to the top of the open or screened interval

- The bailer is then removed and water level measurements are collected by hand (measuring tape or electronic water level indicator) at a frequency which will provide approximately 15 to 20 data points during recovery (to within 10 percent of the total drawdown), if feasible.

- Alternatively if the falling head method is utilized a sufficient slug (typically 2 to 3 gallons) of deionized water will be introduced to the well bore to effect an increase in head and the well response during the recovery period will be monitored as previously described.

Data will be entered onto the Rising/Falling Head Test Form.

The data is then plotted and evaluated as described below:

The following equation is used to calculate the in situ hydraulic conductivity of the formation opposite the interval of the piezometer (Lambe and Whitman, 1961).

$$Kh = \frac{d^2 \ln \frac{(2mL)}{D}}{8\ L\ (t2 - t1)} \ln\frac{h1}{h2}$$

where
D = diameter of corehole, cm
d = diameter of riser, cm
L = Length of corehole, cm
h_1 = head ration at time t_1, dimensionless
h_2 = head ratio at time t_2, dimensionless
kh = horizontal permeability, cm/sec.
kv = vertical permeability, cm/sec.
$\frac{kh}{kv}$ = 10 for bedrock (assumed)
3 for soils (assumed)

$$m = \frac{kh}{kv}$$

The above method of calculating hydraulic conductivity was developed by Hvorslev (1951) for the U.S. Army Corps of Engineers as a result of a comprehensive study of methods of in situ hydraulic conductivity estimation. The method is founded on the precept that whenever a hydrodynamic system is disturbed (e.g., piezometer installation, artificial withdrawal of water) water will flow from (or to, in the case of a surcharge) the system until equilibrium is again achieved. A time lag will exist between the disturbance and re-establishment of equilibrium. The magnitude of this time lag is inversely proportional to the hydraulic conductivity of the formation and varies with the size and type of well.

Hvorslev's research resulted in the definition of a series of shape factors for a variety of well construction details. The preceding equation for calculating hydraulic conductivity corresponds to a shape factor for a well with casing extending to an open hole in which the slug test is performed and where L/R is greater than eight. This shape factor was selected to match the piezometer/well construction in the study area.

In using this equation for calculating hydraulic conductivity, all of the input variables are clearly defined except for the h and t intervals. When doing recovery test data analysis, the head ratio and time are plotted on semi-logarithmic paper and an expotential relationship, or straight-line data plot, should result. Hvorslev's research, however, indicated that field influences could affect the data for the region of head ratios representative of in-situ hydraulic conductivity. Hvorslev suggested that data for the region of head ratios between 0.37 and 0.1 will be most representative, and thus the straight line portion of the data plot within these limits, will be used in the calculation of hydraulic conductivity. In those cases where the data plot between these limits is found to be inconsistent or erratic, those points providing a best fit straight line will be used for the calculations.

Reference:

Lambe, T.W. and R.W. Whitman, Soil
Mechanics, John Wiley and Sons, Inc.
1961.

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APPENDIX H

RESUMES OF PROJECT STAFF

Lawrence P. Smith

Assistant Manager
H&A of New York
Associate
Haley & Aldrich, Inc.

Experience

October 1985 - Present

H&A of New York
Manager of Hydrogeological Services

Manager of Hydrogeological Services and Project Manager for groundwater contamination and groundwater development investigations, oil and hazardous material site evaluations, remedial investigations and feasibility studies under RCRA and CERCLA, development and implementation of remedial measures, landfill siting, closure and remedial studies, and geologic investigations. Responsible for site evaluations, well and well field design, hydrologic testing, groundwater monitoring systems, investigation and mitigation of groundwater pollution, geophysical investigations, groundwater modeling, engineering geology and expert witness testimony.

Recent project experience includes:

- Project Manager and Project Hydrogeologist for a 5 MGD groundwater supply development investigation at Ft. Drum, New York. The investigation assessed the hydrogeologic conditions in an approximate 30 square mile area near Watertown, New York. A wellfield was developed in a karst limestone and fractured sandstone aquifer in close proximity to an existing sanitary landfill. The potential for leachate contamination of the groundwater system was evaluated by identification of hydrogeologic conditions in the landfill vicinity and simulation of future groundwater flow conditions utilizing a three-dimensional groundwater flow model.

- Project Manager for the characterization and remediation of groundwater contamination in fractured rock aquifer in a residential neighborhood. The investigation is designed to define the structural features controlling groundwater flow and contaminant transport and is being conducted under consent order with the NYSDEC.

- Project Manager and Project Hydrogeologist for several hazardous waste investigations and recovery studies for a major industrial firm. The studies have included the definition of hydrogeologic and hydrochemical conditions, the installation of monitoring and recovery wells, development and implementation of remedial action plans and negotiations with the USEPA and the NYSDEC.

- Project Manager for the remediation of soil groundwater contamination resulting from a sanitary landfill. Project work has included hydrogeologic assessment, monitoring well installation, development of liner and cover design criteria, development and implementation of remedial measures, and negotiations with the New York State DEC.

- Project Manager and Project Hydrogeologist for a remedial groundwater investigation involving the definition and remediation of approximately 500 acres of chlorinated solvent contaminated groundwater at a fractured rock aquifer site. Project includes the development and implementation of an innovative technology for remediation of contamination in fractured rock and pilot testing of innovative treatment technologies. The project is under an EPA Corrective Action Order under 3008(h) of RCRA.

Sept. 1987 - Present	Dept. of Geological Sciences University of Rochester Rochester, New York Lecturer

Mr. Smith instructs a course in advanced hydrogeology as a part-time faculty member of the University. The course applies groundwater flow and contaminant transport theory to the solution of water supply and hazardous waste remediation problems.

1982 - 1985	J. W. Patterson & Assoc., Inc. Office Manager & Associate Reno, Nevada 1983 -1985 Senior Hydrogeologist Denver, Colorado 1982

Project manager for a wide range of geologic and hydrogeologic investigations. Project experience included groundwater supply development for oil shale facilities in western Colorado, precious metal mines in Colorado and Nevada and for several commercial, municipal and industrial clients in the western

United States; mine dewatering investigations in Colorado and Nevada; evaluation of the impact of water supply development on existing water rights; evaluation of cyanide seepage from a mine tailings facility, evaluation of potential impacts of groundwater supply development on regional water resources and water quality; environmental impact assessments; water quality investigations for industrial and municipal clients and investigations for the detection and mitigation of groundwater pollution.

Specific experience included water well design and installation, water quality investigations, installation of monitoring well systems, aquifer testing, well rehabilitation, surface and borehole geophysical investigations, delineation of groundwater flow systems using induced tracers, design of contaminant recovery systems, preparation of well field operation and maintenance plans, establishment of water quality monitoring programs, groundwater modeling and slope stability investigations. Other duties included offering testimony in courts and before regulatory agencies in groundwater hydrology water quality and water rights matters.

1980 - 1981	College of Earth Sciences, University of Arizona, Tucson, Arizona Research Staff

Conducted an evaluation of ground and surface water supplies in the western United States for a National Science Foundation project entitled "Projected Effects of Climatic Variation on Water Availability in the Western United States."

1978	H & A of New York Geologist

Performed field reconnaissance, geologic mapping, soil investigations, slope stability studies, monitoring of drilling and testing, laboratory analyses, and construction monitoring for geotechnical engineering projects.

Education

State University College at Geneseo, New York, B.A., Geology, Magna Cum Laude, 1977
University of Arizona, Tucson, Arizona, M.S., Geology, 1981

Short Courses

Corrective Action for Containing and Controlling Groundwater Contamination, Association of Groundwater Scientists and Engineers, 1987.
Institute for Professional Practice, ASFE, 1989

Professional Registration

Professional Engineer - Nevada, Pending in New York
Professional Geologist - Arizona, California

Professional Societies

American Institute of Professional Geologists
  (Certified Professional Geologist)
American Water Works Association
Association of Groundwater Scientists and Engineers

Joseph S. Campisi

H&A of New York
Senior Environmental Geologist

Experience

August 1987 - Present

H & A of New York/
Haley & Aldrich, Inc.

As a Senior Environmental Geologist, Mr. Campisi is responsible for management of a wide variety of the firm's environmental projects. His responsibilities include all phases of project planning and execution, including implementation of subsurface exploration programs, development of site-specific sampling programs, evaluation of geologic, hydrogeologic and chemical data to characterize local hydrogeologic conditions, report preparation, public meeting presentation, and environmental regulatory interaction.

Recent project experience

- Responsible for managing geologic/hydrogeologic studies for a municipal landfill permitting project in upstate New York. This project included preparation of pertinent DEIS Chapters describing the geology and hydrogeology. H&A implemented a comprehensive hydrogeologic investigation program to gather information required under the new NYSDEC Part 360 regulations for submission of a detailed hydrogeologic report to NYSDEC. This project has required development and management of field exploration programs, presentations at public meetings, and coordination with consultant and agency staff.

- Responsible for preparing geologic and hydrogeologic sections of a Part 360 Permit Renewal for an industrial solid waste landfill operated by an industrial client in upstate New York. Developed a work plan submitted to NYSDEC for upgrading the existing groundwater monitoring network at the landfill.

- Managed hydrogeologic studies at a former coal-gas manufacturing facility located in Rochester, New York. The primary objective at the site has been to evaluate the extent of coal tar contamination in subsurface soils, and to determine the potential for off-site groundwater contamination.

- Coordination of hydrogeologic studies and environmental review process on a 90 acre industrial site in Beverly, MA. The major environmental concern at this site is soil contaminated with petroleum hydrocarbons, solvents, and PAHs.

- Managed site assessment and remedial activities at a Marina in Beverly, MA. This project required development of a remediation strategy including underground fuel storage tank removal and excavation of petroleum contaminated soils.

June 1980 - August 1987	New York State Electric and Gas Corporation (NYSEG) Binghamton, New York

Staff Environmental Specialist responsible for the management of environmental projects. Projects experience includes:

- Development of groundwater monitoring systems, and coordination and preparation of detailed hydrogeologic assessments for five NYSEG generating stations.

- Management of hydrogeologic investigations at four NYSEG fly ash disposal facilities, which entailed upgrading existing monitoring well networks, assessing the potential for off-site contaminant transport, and recommending appropriate remedial measures.

- Design and implementation of a field research study to examine how different groundwater sampling devices would effect the geochemical integrity of groundwater samples. Project results were utilized to justify installation of dedicated gas drive groundwater sampling devices.

- Preparation of a detailed hydrogeologic assessment to evaluate how the excavation of a major rock cut impacted the groundwater regime in the vicinity of two adjacent state superfund landfills.

Education

The Pennsylvania State University	B.S. Earth Science (Geology) 1980
SUNY-Binghamton, New York	M.A. Geological Sciences 1989

Professional Societies

National Water Well Association
Buffalo Association of Professional Geologists

Publications and Papers

1988, Evaluation of Hydrogeology and Geochemistry at Two Different Fly Ash Landfills; Unpublished MA Thesis, 114p.

Robert J. Mahoney

Staff Geologist
H&A of New York

Experience

1980 - Present H&A of New York/Haley & Aldrich, Inc.

Staff Geologist for a wide range of geologic, hydrogeologic and engineering projects including groundwater investigation and remediation, environmental site assessments, landfills, rock and soil tunnels, high and low rise buildings, highways, dams, wastewater treatment facilities and utilities.

As current Manager of Exploration Services, Mr. Mahoney oversees a staff of personnel responsible for services for both geologic and engineering projects including site reconnaissance, subsurface explorations, aerial photography interpretation, geologic mapping, laboratory testing of rock and soil samples and construction monitoring. Responsibilities include planning and implementing exploration programs, engaging subcontractors, maintaining quality control during exploration and testing phases, and preparation of final reports.

As Health and Safety Coordinator for H&A's Rochester office, responsibilities include implementing the company's Health and Safety program, reviewing health and safety plans for all pertinent projects, and overseeing use and maintenance of monitoring instrumentation. Additional duties include in-house training of personnel in accordance with OSHA regulations as defined by CFR 1910.120.

Recent Project Experience

o On-site coordinator for a groundwater investigation performed in an urban residential neighborhood adjacent to a major industrial facility currently listed by the New York State Department of Environmental Conservation as an active hazardous waste site. The study was performed to determine the extent, if any, to which volatile organic contamination in the soil and bedrock groundwater had migrated offsite, thereby posing a potential health threat to residents and students of a nearby elementary school.

  Responsibilities included implementing a program of subsurface explorations that included wells and angled test borings in both overburden and bedrock, and overseeing all drilling operations and subsequent well development, permeability testing and sampling performed in accordance with New York State DEC requirements. The work was performed over a period of several months, and required up to five drilling rigs and 12 field geologists and hydrogeologists.

Additional duties included performing initial Health and Safety training (as required by OSHA) for all project personnel, and overseeing implementation of Health and Safety requirements throughout the duration of the project, including work performed in Level C and B personnel protection; overseeing additional well development and permeability testing of approximately 45 existing monitoring wells located on the industrial facility using a variety of well pumping techniques; geologic mapping of bedrock outcrops in the vicinity of the project.

o Project geologist for a terrain analysis and river crossing study for a proposed natural gas pipeline through New York State and Connecticut. Responsibilities included aerial photographic interpretation and preparation of geologic maps for over 300 miles of proposed, and alternative routes, and implementing land and water-based subsurface explorations for several of the proposed river crossings.

o Performance of environmental site assessments for several clients in New York State, Pennsylvania and Illinois, for the purpose of evaluating the impacts of prior or proposed use of oil or hazardous materials on site soil and water quality, primarily as related to real estate transactions and proposed site development. Responsibilities include site walkover, aerial photography review, site historical research, soil and water sampling program development and report writing.

o Project geologist for major facilities expansion by the U.S. Army at Fort Drum, New York, involving construction of 40 miles of roads, several miles of buried utilities, and several structures. Responsibilities included planning and implementing a program of explorations involving over 300 test borings, 200 test pits and geologic mapping.

Education

Monroe Community College, Rochester, NY A.S. 1977
State University College at Geneseo, Geneseo, NY B.A., Geology 1980
University of Rochester, Rochester, NY, Continuing Education, Advanced Hydrogeology courses, 1987 and 1990

Professional Societies

Association of Groundwater Scientists and Engineers
New York State Geological Association
Buffalo Association of Professional Geologists

Honors and Activities

Graduated with Distinction, Monroe Community College, 1977

Geology Tutor - Educational Opportunity Program - S.U.C. at Geneseo, 1980

Received Harl P. Aldrich Excellence Award for contribution to quality of service to clients, 1989

Certification

Trained in accordance with 29 CFR 1910.120 for hazardous waste operations and supervisor of such operations..

Certified for nuclear density gauge operation by Troxler Electronic Laboratories, Inc.

Joshua Goldowitz

Staff Hydrogeologist
H&A of New York

Experience

1989 - Present H&A of New York/Haley & Aldrich, Inc.

Staff Hydrogeologist for environmental and hydrogeological projects.

As a Staff Hydrogeologist Mr. Goldowitz is responsible for executing hydrogeologic exploration programs, data evaluation, hydrogeologic characterization, interpretation of geochemical information, and report preparation. Recent project experience includes:

- o Project hydrogeologist for a landfill siting study in upstate New York. Responsibilities included determining hydrogeologic parameters, interpretation of chemical data, assessing the potential effects of a leachate release from the proposed landfill, and final report preparation.
- o Project hydrogeologist for an investigation to determine the source of organic pollutants in a municipal water supply well.
- o Project hydrogeologist for a contamination transport study investigating the possible migration of solvents and metals from waste stream impoundments at a manufacturing facility.
- o Project hydrogeologist for a groundwater re-injection system trial to determine the effect of injecting clean water on contaminant plume recovery at manufacturing facility.

1987-1989

Staff Scientist
Geraghty & Miller, Inc.
Tucson, Arizona

Mr. Goldowitz was involved in the management, scheduling, and execution of a wide range of hydrologic projects including water supply development, contaminant migration studies, environmental assessments, and leaking underground storage tank remediation.

Project experience includes:

- o Project manager for a hydrogeologic and geophysical determination of an assured 100-year water supply for a resort/retirement community near Phoenix, Arizona.

- Design and execution of a groundwater tracer study at a Nevada gold mine. Mr. Goldowitz was involved in the design of this study with a team including leading researchers in the field of groundwater tracers.

- Management of a study to determine the effect of a landfill on offsite water supply wells.

1986

Hydrologist
Pima County DOT and
Flood Control District
Tucson, Arizona

Responsible for hydrogeologic evaluations for groundwater supply availability and surface water flood control for the Pima County Department of Transportation.

Education

University of Arizona, M.S., Hydrology & Water Resources, 1989
State University of New York at Binghamton, B.S., Geology, 1981

Professional Societies

Association of Groundwater Scientists and Engineers
Arizona Hydrologic Society

Honors and Awards

College of Engineering and Mines 1986 Award for Meritorious Performance as a Teaching Assistant.

James W. Little

Assistant Environmental Geologist
H&A of New York

Experience

June 1989 - Present   H&A of New York/Haley & Aldrich, Inc.

Since joining H&A of New York, Mr. Little has been an Assistant Environmental Geologist providing technical support for groundwater contamination investigations, groundwater supply studies, and environmental site assessments. He has been responsible for monitoring of groundwater well installations and testing of aquifer characteristics.

He is experienced in the application of computers for graphical analysis, computer aided design and data management.

Recent Project Experience

- Assisted in environmental site assessments in Virginia to evaluate the potential for contamination from hazardous materials; as related to real estate transactions.
- Environmental geologist responsible for managing and reducing hydrogeologic and water quality data from groundwater contamination studies.
- Rising head hydraulic conductivity testing using a computer-driven data logger and pressure sensitive transducer.
- Environmental geologist assisting in groundwater modeling for the purpose of water supply management.

Previous Experience

1986-1989

Instructor
Engineering Science
Department
Broome Community College
Binghamton, New York

Mr. Little taught courses and developed laboratory exercises in Geology, Physics, Meteorology, Physical Science and Computer Science. He served as coordinator of the Environmental Science curriculum.

1984-1989

Research and Teaching Asst.
Department of Geological
and Environmental Sciences
State University of N.Y.
at Binghamton, New York

- Supervised lab, lecture and discussion sections for classes in Environmental Science, Physical Geology and Applied Geomorphology.
- Collected and interpreted groundwater data in an area surrounding a proposed landfill site.
- Obtained research funding from Sigmi Xi scientific society for thesis research in which a model was developed to predict discharge in rivers.

Education

Alfred University	B.A. Geology 1984
State University of New York at Binghamton	M.A. Geology (pending) 1990

Professional Societies

Sigma Xi Scientific Society

David J. Hagen
H&A of New York
Staff Hydrogeologist

Experience

1986-Present
Staff Hydrogeologist
H&A of New York

Staff Hydrogeolgist participating in a variety of hydrogeologic investigations involving the delineation and remediation of groundwater contamination. Project experience and responsibilities includes design and implementaion of groundwater monitoring programs, implementation of remedial measures, landfill siting, site and hydrogeologic investigations. Responsible for monitoring and recovery well design, site evaluations, permeability and aquifer testing, installation of groundwater monitoring systems and groundwater modeling.

Recent project experience includes serving as an in-house Project Hydrogeologist for a large industrial facility where groundwater was contaminated with organic solvents. Responsibilities included project management of an investigation which defined hydrogeologic and geochemical conditons in a fractured bedrock aquifer contaminated by dense non-aqueous phase liquids. The site investigation included the installation of monitoring wells, implementation of interim remedial measures and soil vapor surveying. Additional project experience included preliminary site evaluation a proposed flyash landfill and evaluation of the effectiveness of remedial measures at a site contaminated by dense non-aqueous phase liquids.

Additional recent experience includes providing staff support for a five million gallon per day groundwater supply investigation at Fort Drum, New York. Responsibilities included the development of a well field in a karst limestone and fractured sandstone aquifer, supervision of the installation of monitoring and production wells, aquifer testing and analysis, and three-dimensional groundwater modeling to evaluate long-term groundwater flow conditons and the potential impact of a sanitary landfill on the groundwater flow system.

1985 - 1986 Oklahoma State University
Research Assistant

Research Assistant involved in groundwater contamination investigations, water quality and geologic investigations. Specific duties included well installation, aquifer testing, geologic and hydrogeologic mapping, surface geophysical investigations, water quality sampling and groundwater flow and contaminant transport modeling.

Relevant experience included design of a groundwater monitoring network utilized for the detection of non-point nitrate contamination of an alluvial aquifer in north-central Oklahoma; aquifer testing of low-yield formations; monitoring well installation for the detection of trace levels of pesticides.

Education

Baldwin-Wallace College, Berea, Ohio, B.S. Biology, 1981
Oklahoma State University, Stillwater, Oklahoma, M.S. Geology, 1986

Professional Societies

Geological Society of America
Association of Groundwater Scientists and Engineers

Publications

Hagen, D.J. 1986. Spatial and Temporal Variability of Groundwater Quality in a Shallow Aquifer in North-Central Oklahoma. Unpublished M.S. Thesis, Oklahoma State University.

Pettyjohn, W.A., D.J. Hagen, R. Ross and A.W. Hanslow, 1986. Expecting the Unexpected. Proceedings from the Sixth National Symposium and Exposition on Aquifer Restoration and Groundwater Monitoring. National Water Well Association.

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

The Commons at Valley Forge, Unit 4, 1220 Valley Forge Rd.
P.O. Box 911, Valley Forge, PA 19481 (215) 935-5577

ROCK J. VITALE

QUALITY ASSURANCE CHEMIST

Fields of Competence

- Theoretical and practical knowledge of all facets of quantitative analysis for organic and inorganic pollutants by EPA methodologies.
- Determination of the adequacy of analytical data generated to support an RI/FS, ECRA (property transfers, RCRA closures, RCRA Permit B, etc.
- Preparation of quality assurance project plans (QAPP).
- Acting as technician liasion between laboratories and consultants.
- Designing specific requirements and specifications for analytical services.
- Training and management of data review staff.
- Sampling design, sampling protocols, data validation and documentation for litigation, analytical/environmental chemistry and mulitmedia fate and transport mechanisms of pollutants.
- Marketing of analytical services.

Experience Summary

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

In addition, he managed a quality assurance and data validation group with a large environmental firm with offices nationwide. Prior to that position, he had three years experience as a quality assurance chemist and staff toxicologist with a primary EPA Superfund contractor. His responsibilities included preparing quality assurance reports based upon reviews of complex analytical data for the characterization of environmental samples obtained during hazardous waste site inspections/remedial investigations. As a staff toxicologist, he is experienced in performing risk assessment of human health and the environment by various routes of exposure. This includes a working knowledge of environmental toxicology and fate and transport mechanisms of pollutants. He has also provided technical consultation to state and federal agency personnel during many CERCLA investigations.

Credentials

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

Professional Affiliations

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

Key Projects

- A contributing author of the "Functional Guidelines for Organic Data Validation" prepared for EPA Region III currently used on a nationwide basis.

- Project chemist for over 250 CERCLA site inspections for the characterization of environmental samples obtained in and around landfills/dump sites. Quality assurance reviews for all organic and inorganic analytical data generated by 60 contract laboratories were submitted to EPA.

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

- Prepared many quality assurance project plans (QAPP) which are required for all remedial investigation/feasibility studies (RI/FS). The preparation of these plans included providing input for sampling design and negotiations with the lead agency.

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

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

Key Projects

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

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

- Project chemist for a major remedial investigation in which more than 1,000 samples were obtained over a one-year period. Duties included validation of all analytical data, providing on-going changes in sampling design, providing technical input for the recommendation of additional analytical parameters, data presentation and final report to EPA.

- Project toxicologist for 20 CERCLA site inspections for the evaluation of potential risk posed to human health and the environment by various routes of exposure. Duties included a thorough interpretation of analytical data, researching toxicological literature, and providing final reports with appropriate literature citations to EPA including possible remedial alternatives.

- Contributing author in the preparation of an endangerment assessment based upon data obtained from a major remedial investigation. Sections include: Selection of Indicator Compounds, Chemical Properties and Uses of Indicator Compounds, Multimedia Fate and Transport, and several others.

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

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

The Commons at Valley Forge, Unit 4, 1220 Valley Forge Rd.
P.O. Box 911, Valley Forge, PA 19481 (215) 935-5577

TABLE 1

ITEMS REVIEWED DURING THE ESI DATA VALIDATION

Areas Examined	Applicability (Organic, Inorganic, Both)
Laboratory Chain-of-Custodies	Both
(Traffic Reports, Field Notes, Etc.)	
Laboratory Narrative and QC Summaries	
Holding Times	Both
Extraction/digestion Logs	Both
Blanks - Field and Laboratory (Accuracy)	Both
Instrument Tune	Organic
Standards	Both
Linearity	Both
Sensitivity/Stability	Both
Selectivity/Specificity	Both
EPA Criteria (SPCC and LCS)	Both
Variability of Technique)	
(internal standards)	Organic
Analyte Breakdown	Organic
Analytical Sequence	Organic
ICP Interference	Inorganic
Control Standards	Inorganic
Samples	
Detection Limits	Both
Instrument Printouts	Both
ICP Data	Inorganic
AA Data	Inorganic
GC Data	Organic
GC/MS Data	Organic
Autoanalyzer Data	Inorganic
Qualitative Identification	Both
Mass spectra	Organic
Pesticide/PCB results	Organic
Tentatively Identified Compounds	Organic
Quantitative Reliability	Both
Calculations/Equations	Both
Matrix Spikes (accuracy)	Both
Bias	
Matrix Spike duplicates	Organic
Bias	
Accuracy & Precision	
Surrogate Spikes	Organic
Bias	
Duplicates (field and laboratory)	Both
Precision	
Representativeness	
Post-Digestion Spikes	Inorganic
Matrix effects	

APPENDIX I

GTI Analytical Results

Water

o	Volatile Organics MW4	13, 14 December 1989
o	Herbicides MW2, MW4	13, 14 December 1989
o	Organochlorine Pesticides MW1-MW4	13, 14 December 1989
o	Phosphate, Nitrate, Metals MW1-MW4	13, 14 December 1989

Soil

o	Semivolatile Organics SS1, SS2, SS3	6 December 1989
o	Herbicides SS1, SS2, SS3	6 December 1989
o	Metals SS1, SS2, SS3	6 December 1989

MW4 Volatile Water

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Northeast Region
Meadowbrook Industrial Park
Milford, NH 03055
(603) 672-4835
(603) 673-8105 (FAX)

Project Number: 110-001-5544
Work Order Number: M9-12-476

February 27, 1990

Rich Hixon
Groundwater Technology
12 Walker Way
Albany, NY 12205

Dear Mr. Hixon:

Attached please find the analytical results for the samples received by GTEL on 12/15/89. The samples were received and analyzed as indicated on chain of custody number 21567, which is attached.

GTEL maintains a formal quality assurance program to ensure the integrity of the analytical results. All quality assurance criteria were achieved during the analysis unless otherwise noted in the footnotes to the analytical report.

The specific analytical methods used and cited in this report are approved by state and federal regulatory agencies.

If you have any questions regarding this analysis, or if we may service any additional analytical needs, please give us a call.

Sincerely,

GTEL Environmental Laboratories, Inc.

Roseanna Dube

Dave Reese
Extractable Organics Manager

Roseanna Dube
Quality Assurance

GTEL Milford, NH
NM912476.DOC

Project Number: 110-001-5544
Work Order Number: M9-12-476

Table 1

ANALYTICAL RESULTS

Volatile Organics in Water
Modified EPA Method 624[a]

GTEL Sample Number		01	--	--	--
Client Identification		MW-4	--	--	--
Date Analyzed		12/20/89	--	--	--
Analyte	PQL ug/L[b]	Concentration, ug/L			
Chloromethane	10	10 U	--	--	--
Bromomethane	10	10 U	--	--	--
Vinyl Chloride	10	10 U	--	--	--
Chloroethane	10	10 U	--	--	--
Methylene Chloride	5	5 U	--	--	--
Acetone	10	12	--	--	--
Carbon Disulfide	5	5 U	--	--	--
1,1-Dichloroethene	5	5 U	--	--	--
1,1-Dichloroethane	5	5 U	--	--	--
1,2-Dichloroethene (total)	5	5 U	--	--	--
Chloroform	5	5 U	--	--	--
1,2-Dichloroethane	5	5 U	--	--	--
2-Butanone	10	10 U	--	--	--
1,1,1-Trichloroethane	5	5 U	--	--	--
Carbon Tetrachloride	5	5 U	--	--	--
Vinyl Acetate	10	10 U	--	--	--
Bromodichloromethane	5	5 U	--	--	--
1,2-Dichloropropane	5	5 U	--	--	--
cis-1,3-Dichloropropene	5	5 U	--	--	--
Trichloroethene	5	5 U	--	--	--
Dibromochloromethane	5	5 U	--	--	--

Table 1 continued on next page, footnotes at end of table

Project Number: 110-001-5544
Work Order Number: M9-12-476

Table 1 (continued)

ANALYTICAL RESULTS

Volatile Organics in Water
Modified EPA Method 624[a]

GTEL Sample Number		01	--	--	--
Client Identification		MW-4	--	--	--
Date Analyzed		12/20/89	--	--	--
Analyte	PQL ug/L[b]	Concentration, ug/L			
1,1,2-Trichloroethane	5	5 U	--	--	--
Benzene	5	5 U	--	--	--
2-Chloroethylvinyl Ether	5	5 U	--	--	--
trans-1,3-Dichloropropene	5	5 U	--	--	--
Bromoform	5	5 U	--	--	--
4-Methyl-2-Pentanone	10	10 U	--	--	--
2-Hexanone	10	10 U	--	--	--
Tetrachloroethene	5	5 U	--	--	--
1,1,2,2-Tetrachloroethane	5	5 U	--	--	--
Toluene	5	5 U	--	--	--
Chlorobenzene	5	5 U	--	--	--
Ethylbenzene	5	5 U	--	--	--
Styrene	5	5 U	--	--	--
Xylenes (total)	10	10 U	--	--	--
1,2-Dichlorobenzene	5	5 U	--	--	--
1,3-Dichlorobenzene	5	5 U	--	--	--
1,4-Dichlorobenzene	5	5 U	--	--	--
Detection Limit Multiplier		1	--	--	--

Table 1 footnotes at end of table

Project Number: 110-001-5544
Work Order Number: M9-12-476

Footnotes to Table 1

ANALYTICAL RESULTS

Volatile Organics in Water
Modified EPA Method 624[a]

a	Federal Register, Volume 49, October 26, 1984. Method Modified to include additional compounds.
b	Practical quantitation limit.
c	Data Flag Definitions

U	Indicates compound was analyzed for but not detected.
J	Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the quantitation limit, but greater than zero, or when reporting an estimated concentration for a tentatively identified compound.
B	Indicates that the analyte was found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.

SECTION II

QUALITY CONTROL DATA

Project Number: 110-001-5544
Work Order Number: M9-12-476

QA NONCONFORMANCE SUMMARY

Volatile Organics in Water
Modified EPA Method 624

1.0 Sample Handling

1.1 Sample handling and holding time criteria were not met for zero samples.

2.0 Surrogate Compound Recoveries

2.1 The recovery limits were exceeded for zero surrogate compound(s) as shown in Table 2.

3.0 Matrix Spike (MS) Accuracy

3.1 The recovery limits were exceeded in the matrix spike for zero compound(s) as shown in Table 3.

4.0 Sample Duplicate Precision

4.1 The maximum percent difference (RPD) was exceeded for zero compound(s) in the duplicate samples as shown in Table 3.

5.0 Method Blanks

5.1 One target compound(s) was found in the method blank as shown in Table 4.

Client Number: 110-001-5544
Project ID: M9-12-476

Table 2

SURROGATE RECOVERY SUMMARY

Volatile Organics in Water
Modified EPA Method 8240

GTEL No.	Percent Recovery, %			
	S1 (TOL)	S2 (BFB)	S3 (DCE)	TOTAL OUT
BLA203	103	100	81.8	0
M912476-01	95.6	108	105	0
M912665-02MS	94.6	94.6	86.0	0
M912665-02MSD	92.2	91.0	95.2	0

	Surrogates		Recovery Limits[a]
S1	TOL	Toluene-d8	88-110
S2	BFB	Bromofluorobenzene	86-115
S3	DCE	1,2-Dichloroethane-d4	76-114

D Diluted out. Percent Recovery is not calculated when surrogate compound(s) are diluted out.
* Indicates values outside of acceptability limits.
a Acceptability limits are derived from USEPA Contract Laboratory Program (CLP) guidelines.

Project Number: 110-001-5544
Work Order Number: M9-12-476

Table 3

MATRIX SPIKE (MS) AND MATRIX SPIKE DUPLICATE (MSD) SUMMARY PERCENT RECOVERY AND RELATIVE PERCENT DIFFERENCE (RPD)

Volatile Organics in Water
Modified EPA Method 8240

Sample Spiked: M912665-02 Client ID: MW-2A

Analyte	Spike Added, ug/L	Sample Concentration, ug/L	MS Concentration, ug/L	MS Percent Recovery	Acceptability Limits, %[a]
1,1-Dichloroethane	50	< 5	5.6	101	61-145
Trichloroethene	50	< 5	51.7	103	71-120
Benzene	50	< 5	42.5	85.0	76-127
Toluene	50	< 5	46.2	92.4	76-125
Chlorobenzene	50	< 5	51.4	103	75-130

Analyte	Spike Added, ug/L	MSD Concentration, ug/L	MSD Percent Recovery	RPD, %	Acceptability Limits[a]	
					RPD	% Recovery
1,1-Dichloroethene	50	51.4	103	1.96	14	61-145
Trichloroethene	50	52.4	105	1.92	14	71-120
Benzene	50	41.7	83.4	1.90	11	76-127
Toluene	50	46.5	93.0	0.65	13	76-125
Chlorobenzene	50	49.6	99.2	3.76	13	75-130

* Indicates values outside of acceptability limits
a Acceptability limits are derived from USEPA Contract Laboratory Program (CLP) requirements.

RPD: 0 out of 5 outside limits.
Spike Recovery: 0 out of 10 outside limits.

Project Number: 110-001-5544
Work Order Number: M9-12-476

Table 4

METHOD BLANK SUMMARY

Volatile Organics in Water
Modified EPA Method 624[a]

	GTEL Blank ID	REAGENT BLANK	
	GTEL File ID	BLA203	
	Date Analyzed	12/19/89	
Analyte	PQL, ug/L[b]	Concentration, ug/L[c]	
Chloromethane	10	10	U
Bromomethane	10	10	U
Vinyl Chloride	10	10	U
Chloroethane	10	10	U
Methylene Chloride	5	5	U
Acetone	10	10	U
Carbon Disulfide	5	5	U
1,1-Dichloroethene	5	2	J
1,1-Dichloroethane	5	5	U
1,2-Dichloroethene (total)	5	5	U
Chloroform	5	5	U
1,2-Dichloroethane	5	5	U
2-Butanone	10	10	U
1,1,1-Trichloroethane	5	5	U
Carbon Tetrachloride	5	5	U
Vinyl Acetate	10	10	U
Bromodichloromethane	5	5	U
1,2-Dichloropropane	5	5	U
cis-1,3-Dichloropropene	5	5	U
Trichloroethene	5	5	U
Dibromochloromethane	5	5	U

Table 4 continued on next page, footnotes at end of table

Table 4 (continued)

METHOD BLANK SUMMARY

Volatile Organics in Water
Modified EPA Method 624[a]

	GTEL Blank ID	REAGENT BLANK	
	GTEL File ID	BLA203	
	Date Analyzed	12/19/89	
Analyte	PQL, ug/L[b]	Concentration, ug/L[c]	
1,1,2-Trichloroethane	5	5	U
Benzene	5	5	U
2-Chloroethylvinyl Ether	5	5	U
trans-1,3-Dichloropropene	5	5	U
Bromoform	5	5	U
4-Methyl-2-pentanone	10	10	U
2-Hexanone	10	10	U
Tetrachloroethene	5	5	U
1,1,2,2-Tetrachloroethane	5	5	U
Toluene	5	5	U
Chlorobenzene	5	5	U
Ethylbenzene	5	5	U
Styrene	5	5	U
Xylenes (total)	10	10	U
1,2-Dichlorobenzene	5	5	U
1,3-Dichlorobenzene	5	5	U
1,4-Dichlorobenzene	5	5	U

Table 4 footnotes at end of table

Footnotes to Table 4

METHOD BLANK SUMMARY

Volatile Organics in Water
EPA Method 624[a]

a Federal Register, Volume 79, October 26, 1984. Method Modified to include additional compunds.

b Practical quantitation limit.

c Data Flag Definitions

- U Indicates compound was analyzed for but not detected.
- J Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the quantitation limit, but greater than zero, or when reporting an estimated concentration for a tentatively identified compound.

MW2 — MW4 water
Herbicides 12/13 12/14

GTEL
ENVIRONMENTAL
LABORATORIES, INC.
Northeast Region
Meadowbrook Industrial Park
Milford, NH 03055
(603) 672-4835
(603) 673-8105 (FAX)

Report No.
110-001-5544

Work Order No.
M9-12-484

2/13/90
Submitted to:

Richard Hixon
Groundwater Technology
12 Walker Way
Albany, NY 12205

Sample Identification:
The attached report covers 2 water samples taken on 12/13/89 & 12/14/89 at site # 110-001-5544, Corning, New York.

Method:
Analysis was performed for chlorinated herbicides by GC/ECD as per EPA Method 615. Detection limits are listed on the report. Samples that are diluted in order to maintain the calibrated range are indicated by a footnote by which the MDL is raised.

Sampling and sample handling, preservation and extraction are specified by this laboratory to be as per EPA Method 615.

Results:
Results are reported in ug/L (ppb).

Respectfully submitted,

FOR
Dave Reese
Extractable Organics Manager
DRR/sj

Roseanna Dube
Roseanna Dube
Quality Assurance

Report No.
110-001-5544

Work Order No.
M9-12-484

Herbicides Organics Analysis

Detection Limit (ug/L)

Parameter	
2,4-D	1.2
2,4-DB	0.91
2,4,5-T	0.20
2,4,5-TP (Silvex)	0.17
Dalapon	5.8
Dicamba	0.27
Dichloroprop	0.65
Dinoseb	0.07
MCPA	250
MCPP	190

Report No.
110-001-5544

Work Order No.
M9-12-484

Herbicides Organics Analysis

Sample No.	01
Sample ID.	MW-4
Date Sampled	12/14/89
Date Extracted	12/20/89
Date Analyzed	1/06/90

Parameter	Concentration ug/L
2,4-D	6.9
2,4-DB	0.91 U
2,4,5-T	0.20 U
2,4,5-TP (Silvex)	0.17 U
Dalapon	5.8 U
Dicamba	0.19 J
Dichloroprop	0.77
Dinoseb	0.070 U
MCPA	250 U
MCPP	190 U

See attached notes

Report No.
110-001-5544

Work Order No.
M9-12-484

Herbicides Organics Analysis

Sample No.	02
Sample ID.	MW-2
Date Sampled	12/13/89
Date Extracted	12/20/89
Date Analyzed	1/06/90

Parameter	Concentration	ug/L
2,4-D	1.0 J	
2,4-DB	0.91 U	
2,4,5-T	0.20 U	
2,4,5-TP (Silvex)	0.17 U	
Dalapon	5.8 U	
Dicamba	0.27 U	
Dichloroprop	0.65 U	
Dinoseb	0.070 U	
MCPA	250 U	
MCPP	190 U	

Report No.
110-001-5544

Work Order No.
M9-12-484

Notes:

U = Indicates compound was analyzed for but not detected above the quantitation limit indicated.

J = Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the detection limit, but greater than 1 ppb.

SECTION II

QUALITY CONTROL DATA

Report No.
110-001-5544

Work Order No.
M9-12-484

QA NONCONFORMANCE SUMMARY

Chlorinated Herbicides

EPA Method 615

1.0 Method Blank Analysis

1.1. Zero target compound(s) were found in the method blank.

2.0 Calibration Verification

2.1. The control limit(s) were exceeded for zero calibration check compounds.

3.0 Surrogate Compound Recoveries

3.1. The recovery limits were exceeded for zero surrogate compounds.

4.0 Matrix Spike (MS) Accuracy

4.1. The recovery limits were exceeded in the matrix spike for zero compound(s). Matrix spike performed on reagent water due to insufficient sample.

5.0 Sample Duplicate Precision

5.1. The maximum relative percent difference (RPD) was exceeded for zero compound(s) in the duplicate samples. Duplicate spikes were performed on reagent water due to insufficient sample.

6.0 Sample Integrity

6.1. Sample handling and holding time criteria were met.

Susan C. Uhler — 2/15/90

Susan C. Uhler,
Laboratory Director

Date

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Report No.
110-001-5544

Work Order No.
M9-12-484

Definition of Surrogate

DCPAA = 2,2-Dichlorophenylacetic Acid

Report No.
110-001-5544

Work Order No.
M9-12-484

Water Herbicide Surrogate Recovery

EPA Sample No.	S1 (DCPAA)#
BW1220	36.9
M912484-01	50.6
M912484-02	41.1
BW-MS	62.4
BW-MSD	59.5

	QC Limits
S1 (DCPAA) = 2,4-Dichlorophenylacetic Acid	(24-154)

\# Column used to flag recovery values
* Values outside of QC limits
D Surrogates diluted out
A Surrogates acidified out

MS = Matrix Spike
MSD= Matrix Spike Duplicate

Report No.
110-001-5544

Work Order No.
M9-12-484

WATER MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Accuracy - Aqueous Matrix Spike (MS) Recovery Data

Sample Spiked: BLANK-MS
Analysis Date: 1/06/90

Parameter	Spike Added (ug/L)	Spike Concentration (ug/L)	MS Concentration (ug/L)	MS % REC #	QC Limits % *1
2,4-D	10.0	< 1.20	6.88	68.8	20-160
Silvex	5.00	< 0.170	3.78	75.6	20-160
Dinoseb	5.00	< 0.0700	5.36	107	20-160

Parameter	Spike Added (ug/L)	MSD Concentration (ug/L)	MSD % Recovery (ug/L)	% RPD #	QC Limits % *1
2,4-D	10.0	5.62	56.2	20.2	40
Silvex	5.00	2.87	57.4	27.4	40
Dinoseb	5.00	4.05	81.0	27.7	40

*1 = Acceptability criteria for Priority Pollutants are derived from accuracy limits published in the EPA method. Limits for precision have not been established.

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 3 outside limits
Spike Recovery: 0 out of 6 outside limits

Report No.
110-001-5544

Work Order No.
M9-12-484

Herbicides Organics Analysis

Sample No. METHOD BLANK
Sample ID. BW1220
Date Analyzed 1/06/90

Parameter	Concentration ug/L
2,4-D	1.2 U
2,4-DB	0.91 U
2,4,5-T	0.20 U
2,4,5-TP (Silvex)	0.17 U
Dalapon	5.8 U
Dicamba	0.27 U
Dichloroprop	0.65 U
Dinoseb	0.07 U
MCPA	250 U
MCPP	190 U

Report No.
110-001-5544

Work Order No.
M9-12-484

Notes:

U = Indicates compound was analyzed for but not detected above the quantitation limit indicated.

J = Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the detection limit, but greater than 1 ppb.

Report No.
110-001-5544

Work Order No.
M9-12-484

Herbicide Calibration Record

I. Initial Calibration

Date: 1/05/90
Time: 17:17:16

II. Continuing Calibration

Date: 1/05/90
Time: 23:18:33

Initial Calibration:

D5 HERBS

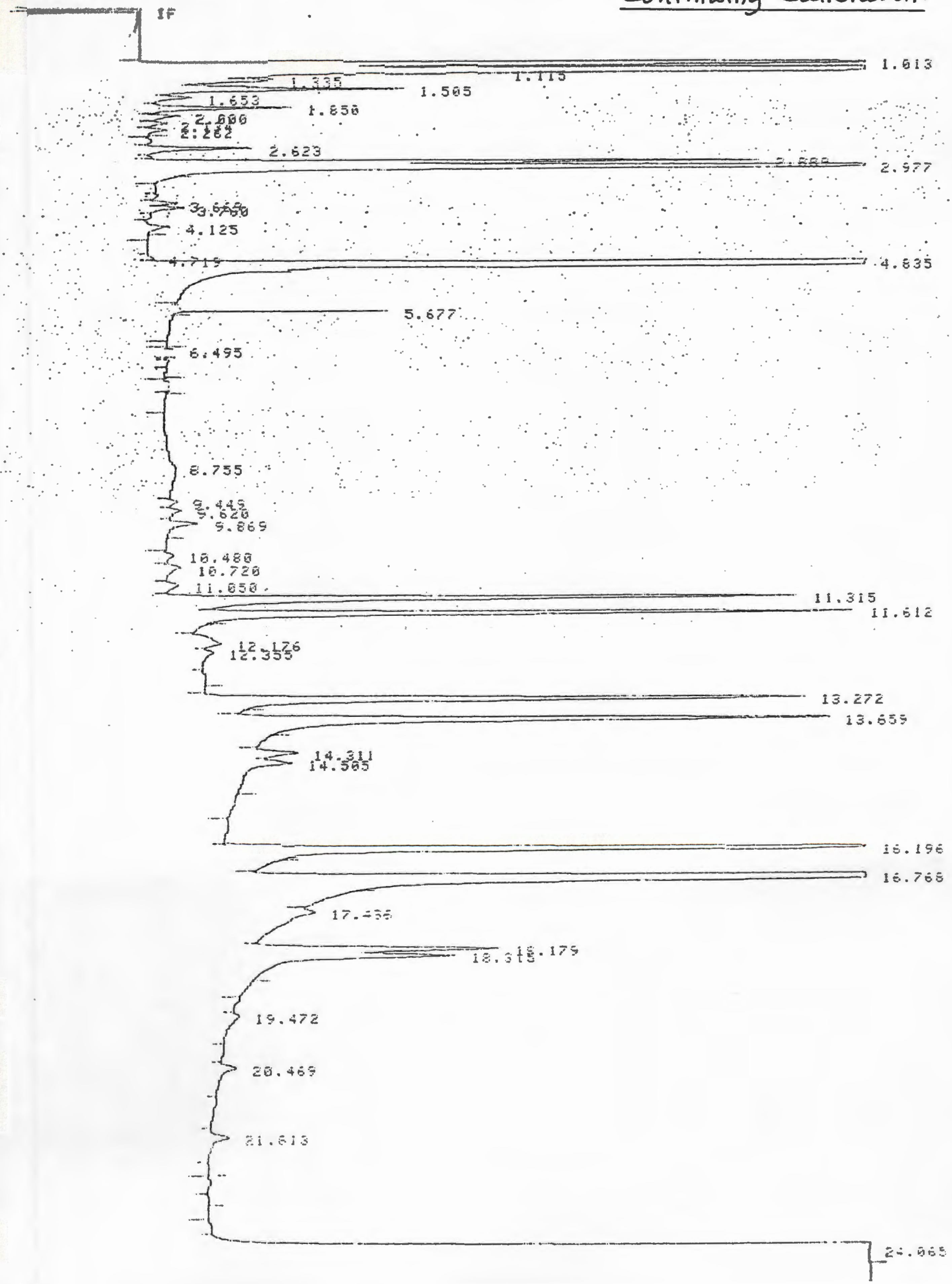
Calib table

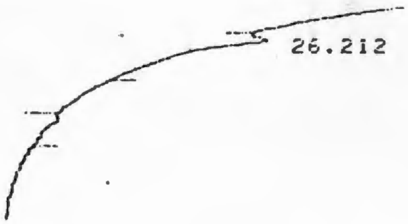
1 µl injected
of stds

```
  LIST: CALIB   @

ESTD
REF % RTW:   2.000  NON-REF % RTW:   2.000

LEVEL: 1              RECALIBRATIONS: 1

CAL#       RT     LV     AMT         AMT/AREA
  1      2.977     1 5.0000E+01   2.6072E-03
  2R    11.315     1 2.9900E+02   5.7026E-03
  3     11.612     1 1.3300E+02   1.2372E-03
  4     12.355     1 5.0000E+01   4.5030E-01
  5     13.272     1 5.9800E+02   5.1150E-03
  6     13.659     1 1.1400E+02   7.1604E-03
  7     14.311     1 5.8900E+02   2.1783E-01
  8     16.196     1 2.0000E+01   1.1718E-03
  9     16.768     1 2.5000E+01   9.6608E-04
 10     18.179     1 2.5000E+01   1.4295E-02
 11     18.315     1 1.0000E+02   2.9967E-03

CAL#      NAME
  1  DALAPON
  2  DCPAA surr
  3  DICAMBA
  4  MCPA
  5  DICHLOROPROP
  6  2,4-D
  7  MCPP
  8  SILVEX
  9  2,4,5 T
 10  2,4-DB
 11  ~~2,4-DB~~ Dinoseb

CALIBRATION OPTIONS
RF of uncalibrated peaks .... 0.0000E+00
Calibration fit ............. P
Disable post-run RT update .. NO
SAMPLE AMT .................. 0.0000E+00
MUL FACTOR .................. 1.0000E+00

*
```

*AN A:Q006SDC9.BNC
RUN # 2686   JAN .5, 1990   23:18:33
START

Continuing Calibration:





```
        STOP


Error storing signal to A:Q0068DC9.BNA
ATTEMPTED WRITE PAST END OF FILE

RUN#  2686          JAN  5, 1990  23:18:33

SAMPLE NAME: C89WS061          SAMPLE#    9


D5HERB5 1ul INJ. 1/5/90

ESTD-AREA
     RT         AREA TYPE  CAL#  ng/mL
   1.013      136850   PV              .000
   1.115      716233   VB              .000
   1.335        5775   BP              .000
   1.505       33746   PP              .000
   1.653        3768   PP              .000
   1.850       19628   PP              .000
   2.000        3991   PV              .000
   2.134        2568   VP              .000
   2.262        2491   PB              .000
   2.623       15666   PP              .000
   2.889       69726   PV              .000
   2.977      356359   VB     1     929.059
   3.669        4061   VV              .000
   3.760        6379   VV              .000
   4.125        4805   PB              .000
   4.835     1268777   PB              .000
   5.677       28315   BB              .000
   6.495        1370   BP              .000
   8.755       19446   PV              .000
   9.449        2921   VV              .000
   9.620        4549   VV              .000
   9.869        8525   VB              .000
  10.480        2043   BV              .000
  10.720        4262   VP              .000
  11.050        3522   PP              .000
  11.315      144426   PV    2R     823.604
  11.612      135169   VB     3     167.231
  12.176       11720   BV              .000
  12.355        7145   VV     4    3217.843
  13.272      132067   PB     5     675.523
  13.659      158333   BB     6    1133.727
  14.311       11563   BV     7    2518.765
  14.505       11011   VB              .000
  16.196      199099   PB     8     233.304
  16.768      380746   PB     9     367.833
  17.436        4536   BP              .000
  18.175       62955   PV    10     899.985
  18.315       66739   VB    11     199.997
  19.472        3953   PP              .000
  20.469        7186   VV              .000
  21.813        8012   PP              .000
  24.055     9420322   PB              .000
```

Daily QC check.
1 µl injected

true value

1093
957
181
2356
836
1000
2372
200
510
900
200

HERBICIDE RETENTION TIME WINDOWS

Lab Name: GTEL Milford Contract: M9-12-484

Lab Code:__________ Case No.:________ SAS No.:________ SDG No.:________

GC Column ID (1): DB-5 GC Column ID (2): DB-17

Instrument ID (1): D Instrument ID (2): D

Lab Sample ID: C89WS061 (QC check)

PESTICIDE		RETENTION TIME	RT WINDOW FROM	RT WINDOW TO
01 2,4-D	Column 1	13.659	13.625	13.693
	Column 2	18.639	18.601	18.677
02 2,4-DB	Column 1	18.179	18.145	18.179
	Column 2	24.030	23.992	24.068
03 2,4,5-T	Column 1	16.768	16.734	16.802
	Column 2	22.470	22.432	22.508
04 2,4,5-TP(Silvex)	Column 1	16.196	16.162	16.230
	Column 2	20.665	20.627	20.703
05 Dalapon	Column 1	2.977	2.943	3.011
	Column 2	3.611	3.573	3.649
06 Dicamba	Column 1	11.612	11.578	11.646
	Column 2	15.654	15.616	15.692
07 Dichloroprop	Column 1	13.272	13.238	13.306
	Column 2	17.307	17.269	17.345
08 Dinoseb	Column 1	18.315	18.281	18.349
	Column 2	22.865	22.827	22.903
09 MCPA	Column 1	12.355	12.321	12.389
	Column 2	16.500	16.462	16.538
10 MCPP	Column 1	14.311	14.277	14.345
	Column 2	18.212	18.174	18.250

Comments: ____

page 1 of 1

FORM X HERB

GTEL
ENVIRONMENTAL
LABORATORIES, INC.
Northeast Region
Meadowbrook Industrial Park
Milford, NH 03055
(603) 672-4835
(603) 673-8105 (FAX)

MW 1-4 Water
12/13, 14/89
OrgCl Pesticide

Report No.
110-001-5544

Work Order No.
M9-12-487

2/20/90

Submitted to:

Richard Hixon
Groundwater Technology
12 Walker Way
Albany, NY 12205

Sample Identification:
The attached report covers 4 water samples taken on 12/13/89 and 12/14/89 at site # 110-001-5475, Corning, New York.

Method:
Analysis was performed for organochlorine pesticides by GC/ECD as per EPA Method 608. Detection limits are listed on the report. Samples that are diluted in order to maintain the calibrated range are indicated by a footnote by which the MDL is raised.

Sampling and sample handling, preservation and extraction are specified by this laboratory to be as per EPA Method 608.

Results:
Results are reported in ug/L (ppb).

Respectfully submitted,

Dave Reese
Dave Reese
Extractable Organics Manager
DRR/sj

Roseanna Dube
Roseanna Dube
Quality Assurance

Report No.
110-001-5544

Work Order No.
M9-12-487

Pesticide Analysis

Detection Limit ug/L

Parameter	
alpha-BHC	0.03
beta-BHC	0.06
delta-BHC	0.09
gamma-BHC (Lindane)	0.04
Heptachlor	0.03
Aldrin	0.04
Heptachlor epoxide	0.83
Endosulfan I	0.14
Dieldrin	0.02
4,4'-DDE	0.04
Endrin	0.06
Endosulfan II	0.04
4,4'-DDD	0.11
Endrin Aldehyde	0.23
Endosulfan Sulfate	0.66
4,4'-DDT	0.12
Methoxychlor	1.8
Chlordane	0.14
Toxaphene	2.4

Report No.
110-001-5544

Work Order No.
M9-12-487

Pesticide Analysis

Sample No.	01	02
Sample ID.	MW-4	MW-2
Date Sampled	12/14/89	12/13/89
Date Extracted	12/19/89	12/19/89
Date Analyzed	12/22/89	12/22/89
Parameter	Concentration	ug/L
alpha-BHC	0.03 U	0.03 U
beta-BHC	0.06 U	0.06 U
delta-BHC	0.09 U	0.09 U
gamma-BHC (Lindane)	0.04 U	0.04 U
Heptachlor	0.03 U	0.03 U
Aldrin	0.04 U	0.04 U
Heptachlor epoxide	0.83 U	0.83 U
Endosulfan I	0.14 U	0.14 U
Dieldrin	0.02 U	0.02 U
4,4'-DDE	0.04 U	0.04 U
Endrin	0.06 U	0.06 U
Endosulfan II	0.04 U	0.04 U
4,4'-DDD	0.11 U	0.11 U
Endrin Aldehyde	0.23 U	0.23 U
Endosulfan Sulfate	0.66 U	0.66 U
4,4'-DDT	0.12 U	0.12 U
Methoxychlor	1.8 U	1.8 U
Chlordane	0.14 U	0.14 U
Toxaphene	2.4 U	2.4 U

Notes:

U = Indicates compound was analyzed for but not detected above the quantitation limit indicated.

Report No.
110-001-5544

Work Order No.
M9-12-487

Pesticide Analysis

Sample No.	03	04
Sample ID.	MW-3	MW-1
Date Sampled	12/13/89	12/13/89
Date Extracted	12/19/89	12/19/89
Date Analyzed	12/22/89	12/22/89
Parameter	Concentration	ug/L
alpha-BHC	0.03 U	0.03 U
beta-BHC	0.06 U	0.06 U
delta-BHC	0.09 U	0.09 U
gamma-BHC (Lindane)	0.04 U	0.04 U
Heptachlor	0.03 U	0.03 U
Aldrin	0.04 U	0.04 U
Heptachlor epoxide	0.83 U	0.83 U
Endosulfan I	0.14 U	0.14 U
Dieldrin	0.02 U	0.02 U
4,4'-DDE	0.04 U	0.04 U
Endrin	0.06 U	0.06 U
Endosulfan II	0.04 U	0.04 U
4,4'-DDD	0.11 U	0.11 U
Endrin Aldehyde	0.23 U	0.23 U
Endosulfan Sulfate	0.66 U	0.66 U
4,4'-DDT	0.12 U	0.12 U
Methoxychlor	1.8 U	1.8 U
Chlordane	0.14 U	0.14 U
Toxaphene	2.4 U	2.4 U

Notes:

U = Indicates compound was analyzed for but not detected above the quantitation limit indicated.

SECTION II

QUALITY CONTROL DATA

Report No.
110-001-5544

Work Order No.
M9-12-487

QA NONCONFORMANCE SUMMARY

Organochlorine Pesticides

EPA Method 8080

1.0 Method Blank Analysis

1.1. Zero target compound(s) were found in the method blank.

2.0 Calibration Verification

2.1. The control limit(s) were exceeded for zero calibration check compounds.

3.0 Surrogate Compound Recoveries

3.1. The recovery limits were exceeded for zero surrogate compounds.

4.0 Matrix Spike (MS) Accuracy & Sample Duplicate Precision

4.1. No MS/MSD data available due to incorrect spike of batch QC. No reextraction performed due to limited sample amount. Calibration verification QC's analyzed in control on 12/21/89 and 12/27/89 which surrounds the sample set. Extraction efficiency is shown by all surrogate recoveries being inside of the recovery limits.

5.0 Sample Integrity

5.1. Sample handling and holding time criteria were met.

Susan C. Uhler,
Laboratory Director

2/21/90
Date

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Report No.
110-001-5544

Work Order No.
M9-12-487

EPA Method 8080
Definition of Surrogates

S1 = Dibutylchorendate (abbrev - DBC)

Other = Decachlorobiphenyl (abbrev - DCBP)

Report No.
110-001-5544

Work Order No.
M9-12-487

Water Pesticide Surrogate Recovery

EPA Sample No.	S1 (DBC)#	Other (DCBP)
BW1219	101	90.0
M912487-01	79.4	71.4
M912487-02	99.1	90.1
M912487-03	97.0	86.4
M912487-04	97.0	87.3

	Advisory QC Limits
S1 (DBC) = Dibutylchlorendate	(24-154)
Other = Decachlorobiphenyl	(24-154)

\# Column used to flag recovery values
* Values outside of QC limits
D Surrogates diluted out
A Surrogates acidified out

MS = Matrix Spike
MSD= Matrix Spike Duplicate

Report No.
110-001-5544

Work Order No.
M9-12-487

WATER MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Accuracy - Aqueous Matrix Spike (MS) Recovery Data

Sample Spiked: M9-12-322-01
Analysis Date: 1/10/90

Parameter	Spike Added (ug/kg)	Spike Concentration (ug/kg)	MS Concentration (ug/kg)	MS % REC #	QC Limits % *1
Lindane	0.40	< 0.040	NA	NA	56-123
Heptachlor	0.40	< 0.030	NA	NA	40-131
Aldrin	0.40	< 0.040	NA	NA	40-120
Dieldrin	1.00	< 0.020	NA	NA	52-126
Endrin	1.00	< 0.060	NA	NA	56-121
4,4-DDT	1.00	< 0.120	NA	NA	38-127

Parameter	Spike Added (ug/kg)	MSD Concentration (ug/kg)	MSD % Recovery (ug/kg)	% RPD #	QC Limits % *1
Lindane	0.40	NA	NA	NA	15
Heptachlor	0.40	NA	NA	NA	20
Aldrin	0.40	NA	NA	NA	22
Dieldrin	1.00	NA	NA	NA	18
Endrin	1.00	NA	NA	NA	21
4,4-DDT	1.00	NA	NA	NA	27

*1 = Acceptability criteria for Priority Pollutants are derived from accuracy limits published in the EPA method. Limits for precision have not been established.

Column to be used to flag recovery and RPD values with an asterisk

NA = Not applicable. See Non Conformance Summary Section 4.1.

* Values outside of QC limits

Report No.
110-001-5544

Work Order No.
M9-12-487

Pesticide Analysis

Sample No.	METHOD BLANK
Sample ID.	BW1219
Date Analyzed	12/22/89

Parameter	Concentration ug/L
alpha-BHC	0.03 U
beta-BHC	0.06 U
delta-BHC	0.09 U
gamma-BHC (Lindane)	0.04 U
Heptachlor	0.03 U
Aldrin	0.04 U
Heptachlor epoxide	0.83 U
Endosulfan I	0.14 U
Dieldrin	0.02 U
4,4'-DDE	0.04 U
Endrin	0.06 U
Endosulfan II	0.04 U
4,4'-DDD	0.11 U
Endrin Aldehyde	0.23 U
Endosulfan Sulfate	0.66 U
4,4'-DDT	0.12 U
Methoxychlor	1.8 U
Chlordane	0.14 U
Toxaphene	2.4 U

Note:

U = Indicates compound was analyzed for but not detected above the quantitation limit indicated.

Report No.
110-001-5544

Work Order No.
M9-12-487

Pesticide Analysis

Sample No.	HEXANE BLANK
Sample ID.	INST BLANK
Date Analyzed	12/22/89

Parameter	Concentration ug/L
alpha-BHC	0.03 U
beta-BHC	0.06 U
delta-BHC	0.09 U
gamma-BHC (Lindane)	0.04 U
Heptachlor	0.03 U
Aldrin	0.04 U
Heptachlor epoxide	0.83 U
Endosulfan I	0.14 U
Dieldrin	0.02 U
4,4'-DDE	0.04 U
Endrin	0.06 U
Endosulfan II	0.04 U
4,4'-DDD	0.11 U
Endrin Aldehyde	0.23 U
Endosulfan Sulfate	0.66 U
4,4'-DDT	0.12 U
Methoxychlor	1.8 U
Chlordane	0.14 U
Toxaphene	2.4 U

Note:

U = Indicates compound was analyzed for but not detected above the quantitation limit indicated.

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Northeast Region
Meadowbrook Industrial Park
Milford, NH 03055
(603) 672-4835
(603) 673-8105 (FAX)

phosphate, [illegible] / metals
MW-4

Inorganic Analyses
NYS/DEC Data Package

Client ID: 110-001-5544

GTEL Workorder: M9-12-475

Sampling Dates: 12/13/89 & 12/14/89
Corning, New York

Prepared for:

Richard Hixon
Groundwater Technology
12 Walker Way
Albany, NY 12205

Prepared by:

GTEL Environmental Laboratories
Northeast Region
Meadowbrook Road
Meadowbrook Industrial Park
Milford, NH 03055
Report Date: February 7, 1990

Project Number: 110-001-5544
Work Order Number: M9-12-475

TABLE OF CONTENTS

Project Number: 110-001-5544
Work Order Number: M9-12-475

SECTION I

METHODOLOGY DESCRIPTION AND ANALYTICAL RESULTS

GTEL
ENVIRONMENTAL
LABORATORIES, INC.
Northeast Region
Meadowbrook Industrial Park
Milford, NH 03055
(603) 672-4835
(603) 673-8105 (FAX)

Project Number: 110-001-5544
Work Order Number: M9-12-475

February 7, 1990

Richard Hixon
Groundwater Technology, Inc.
12 Walker Way
Albany, NY 12205

Dear Mr. Hixon:

Attached please find the analytical results for the samples received by GTEL on 12/15/89. The samples were received and analyzed as indicated on chains of custody numbers 21566 and 21567, which are attached.

GTEL maintains a formal quality assurance program to ensure the integrity of the analytical results. All quality assurance criteria were achieved during the analysis unless otherwise noted in the footnotes to the analytical report.

The specific analytical methods used and cited in this report are approved by state and federal regulatory agencies.

If you have any questions regarding this analysis, or if we may service any additional analytical needs, please give us a call.

Sincerely,
GTEL Environmental Laboratories, Inc.

Roseanna Dube

Chris J. Miller
Inorganics Manager

Roseanna Dube
Quality Assurance

GTEL Milford, NH
NM912475.DOC

Project Number: 110-001-5544
Work Order Number: M9-12-475

Table 1

ANALYTICAL RESULTS

Total Phosphate in Water
Standard Methods 424 C III and 424 D[a]

Sample Identification		Date Prepared	Date Analyzed	Concentration, ug/L[b]	Dilution Factor
GTEL No.	Client ID				
01	MW-4	12/27/89	12/27/89	110	1.0
02	MW-2	12/27/89	12/27/89	200	1.0
03	MW-1	12/27/89	12/27/89	130	1.0
04	MW-3	12/27/89	12/27/89	110	1.0

[a] Standard Methods for the Examination of Water and Wastewater, 16th Edition, 1985.
[b] Instrument detection limit = 30 ug/L; analyte below this level would not be detected.

Project Number: 110-001-5544
Work Order Number: M9-12-475

Table 2

ANALYTICAL RESULTS

Nitrate in Water
EPA Method 353.3[a]

Sample Identification		Date Analyzed	Concentration, ug/L[b]
GTEL No.	Client ID		
01	MW-4	12/22/89	890
02	MW-2	12/22/89	3200
03	MW-1	12/22/89	4000
04	MW-3	12/22/89	2400

[a] EPA 600/4-79-020, March 1983 revision.

[b] Instrument detection limit = 20 ug/L; analyte below this level would not be detected.

Project Number: 110-001-5544
Work Order Number: M9-12-475

Table 3

ANALYTICAL RESULTS

Total Metals in Water
Priority Pollutant Metals

GTEL Sample Number			01	02	--	--
Client Identification			MW-4	MW-2	--	--
Date Digested			12/20/89-12/28/89	12/20/89-12/28/89	--	--
Date Analyzed			12/28/89-1/03/90	12/28/89-1/03/90	--	--
Analyte	Method[a]	Detection Limit, ug/L	Concentration, ug/L			
Antimony	EPA 200.7	60	< 300	< 60	--	--
Arsenic	EPA 206.2	5.0	49[b]	< 5.0	--	--
Beryllium	EPA 200.7	10	< 50	< 10	--	--
Cadmium	EPA 200.7	10	< 50	< 10	--	--
Chromium	EPA 200.7	10	690	< 10	--	--
Copper	EPA 200.7	25	760	< 25	--	--
Lead	EPA 239.2	5.0	209[b]	12	--	--
Mercury	EPA 245.5	1.0	< 1.0	< 1.0	--	--
Nickel	EPA 200.7	40	820	< 40	--	--
Selenium	EPA 270.2	5.0	< 5.0[b]	< 5.0	--	--
Silver	EPA 200.7	10	56	< 10	--	--
Thallium	EPA 200.7	300	1200	< 300	--	--
Zinc	EPA 200.7	20	2200	21	--	--
Detection Limit Multiplier			5.0	1.0	--	--

[a] EPA 600/4-79-020, March 1983 revision; digestion by EPA Method 200.0.
[b] Detection Limit Multiplier = 1.0

SECTION II

QUALITY CONTROL DATA

Project Number: 110-001-5544
Work Order Number: M9-12-475

QA Non-Conformance Summary

1.0 Method Blank

The concentration(s) in the method blank were below the detection limit for the analyte(s) as shown in Table 4.

2.0 Matrix Spike Recovery

Percent recovery limits were met for the analyte(s) in the matrix spike (spiked sample) as shown in Table 5.

3.0 Sample Duplicate Precision

Relative percent difference criteria were met for the analyte(s) in the sample duplicate as shown in Table 6.

4.0 Initial Calibration

The control limits were met for the analyte(s) in the initial calibratin verification as shown in Table 7.

5.0 Sample Handling

Sample handling and holding time criteria were met for all samples.

Susan C. Uhler/CSM
Susan C. Uhler
Laboratory Director

2/7/90
Date

Project Number: 110-001-5544
Work Order Number: M9-12-475

Table 4

METHOD BLANK REPORT

Analyte	Date Digested	Date Analyzed	Concentration, ug/L
Total Phosphate	12/27/89	12/27/89	< 30.0
Nitrate	12/22/89	12/22/89	< 20.0
Antimony	12/28/89	12/28/89	< 60.0
Arsenic	12/27/89	1/03/90	< 5.00
Beryllium	12/28/89	12/28/89	< 10.0
Cadmium	12/28/89	12/28/89	< 10.0
Chromium	12/28/89	12/28/89	< 10.0
Copper	12/28/89	12/28/89	< 25.0
Lead	12/27/89	1/03/90	< 5.00
Mercury	12/20/89	12/20/89	< 1.00
Nickel	12/28/89	12/28/89	< 40.0
Selenium	12/27/89	1/03/90	< 5.00
Silver	12/28/89	12/28/89	< 10.0
Thallium	12/28/89	12/28/89	< 300
Zinc	12/28/89	12/28/89	< 20.0

Project Number: 110-001-5544
Work Order Number: M9-12-475

Table 5

MATRIX SPIKE (MS) RECOVERY REPORT

Date of Analysis: *2
Sample Spiked: *3

Units: ug/L

Analyte	MS Sample Result	Sample Result	Amount Added	MS, % Recovery	Acceptability Limits, %[1]
Total Phosphate	182	93.2	100	88.8	80-120 *4
Nitrate	101000	99200	10.0	NA	80-120 *4
Antimony	1720	< 60.0	2000	86.0	75-125
Arsenic	79.3	25.6	50.0	107	75-125
Beryllium	96.0	< 10.0	100	96.0	75-125
Cadmium	421	< 10.0	400	105	75-125
Chromium	1800	< 10.0	2000	90.0	75-125
Copper	1800	< 25.0	2000	90.0	75-125
Lead	55.6	6.24	50.0	98.7	75-125
Mercury	9.62	< 1.00	10.0	96.2	75-125
Nickel	4430	< 40.0	5000	88.6	75-125
Selenium	45.1	< 5.00	50.0	90.2	75-125
Silver	167	< 10.0	200	83.5	75-125
Thallium	1810	< 300	2000	90.5	75-125
Zinc	4310	38.0	5000	86.2	75-125

1 Acceptability limits as per latest EPA CLP Statement of Work.

*2 12/27/89 for Total Phosphates; 12/22/89 for Nitrates; 12/20/89 for Mercury; 1/03/90 for Arsenic, Selenium and Lead; 12/28/89 for others.

*3 M912646-1 for Total Phosphates; M912663-1 for Nitrates; M912320-1 for Mercury; M912551-1 for Arsenic, Selenium, and Lead; and M912644-1 for others.

*4 Acceptability limits as per laboratory practice.

Project Number: 110-001-5544
Work Order Number: M9-12-475

Table 6

LABORATORY DUPLICATE SAMPLE RESULTS AND RELATIVE PERCENT DIFFERENCE (RPD) REPORT

Date of Analysis: *2
Sample Used: *3
Units: ug/L

Analyte	Sample Result	Duplicate Result	RPD, %	Maximum RPD, % (1)
Total Phosphate	93.2	103	9.99	20(4)
Nitrate	99200	99400	0.20	20(4)
Antimony	< 60.0	< 60.0	NA	20
Arsenic	25.6	24.5	4.39	20
Beryllium	< 10.0	< 10.0	NA	20
Cadmium	< 10.0	< 10.0	NA	20
Chromium	< 10.0	< 10.0	NA	20
Copper	< 25.0	< 25.0	NA	20
Lead	6.24	5.38	NA	20
Mercury	< 1.00	< 1.00	NA	20
Nickel	< 40.0	< 40.0	NA	20
Selenium	< 5.00	< 5.00	NA	20
Silver	< 10.0	< 10.0	NA	20
Thallium	< 300	< 300	NA	20
Zinc	38	34	NA	20

1 Acceptability limits as per latest EPA CLP Statement of Work.
NA Not applicable; initial sample concentration less than 10 times the instrument detection limit
*2 12/27/89 for Total Phosphate; 12/22/89 for Nitrates; 12/20/89 for Mercury; 1/03/90 for Arsenic, Selenium, and Lead; 12/28/89 for others.
*3 M912646-1 for Total Phosphates; M912663-1 for Nitrates; M912320-1 for Mercury; M912551-1 for Arsenic, Selenium, and Lead; M912644-1 for others.
(4) Acceptability limits as per laboratory practice.

Project Number: 110-001-5544
Work Order Number: M9-12-475

Table 7

INITIAL CALIBRATION VERIFICATION

Date of Analysis: *2

Analyte	Expected Result, ug/L	Observed Result, ug/L	Recovery, %	Acceptability Limits, %[1]
Total Phosphate	300	294	98.0	90-110 *3
Nitrates	400	367	91.8	90-110 *3
Antimony	1000	1010	101	90-110
Arsenic	60.0	61.9	103	90-110
Beryllium	400	406	102	90-110
Cadmium	500	500	100	90-110
Chromium	1000	1040	104	90-110
Copper	1000	1020	102	90-110
Lead	40.0	41.7	104	90-110
Mercury	10.0	9.62	96.2	90-110
Nickel	1000	1030	103	90-110
Selenium	50.0	55.0	110	90-110
Silver	200	184	92.0	90-110
Thallium	1000	1020	102	90-110
Zinc	1000	1020	102	90-110

1 Acceptability limits established by latest EPA CLP Statement of Work.
*2 12/27/89 for Total Phosphates; 12/22/89 for Nitrates; 12/20/89 for Mercury; 1/03/90 for Arsenic, Selenium and Lead; 12/28/89 for others.
*3 Acceptability limits established by laboratory practice.

GTEL
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Northeast Region
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(603) 672-4835
(603) 673-8105 (FAX)

SS 1-3 SemiVolatile Organics
12/6

Report No.
110-001-5544

Work Order No.
M9-12-292

2/14/90

Submitted to:

Richard Hixon
Groundwater Technology
12 Walker Way
Albany, NY 12205

Sample Identification:
The attached report covers 3 soil samples taken on 12/06/89 at site # 110-001-5475, Corning, New York.

Method:
Analysis was performed for organochlorine pesticides by GC/ECD as per EPA Method 8080. Detection limits are listed on the report. Samples that are diluted in order to maintain the calibrated range are indicated by a footnote by which the MDL is raised.

Sampling and sample handling, preservation and extraction are specified by this laboratory to be as per EPA Method 8080.

Results:
Results are reported in ug/kg (ppb).

Respectfully submitted,

Roseanna Dube

Dave Reese
Extractable Organics Manager
DRR/sj

Roseanna Dube
Quality Assurance

Report No.
110-001-5544

Work Order No.
M9-12-292

Semi-Volatile Organics Analysis

Sample No.	01	02	
Sample ID.	SS-1	SS-2	
Date Sampled	12/06/89	12/06/89	
Date Extracted	12/18/89	12/18/89	
Date Analyzed	12/20/89	12/20/89	
Parameter	Concentration	ug/kg	Detection Limit ug/kg
alpha-BHC	25 U	25 U	1.0
beta-BHC	50 U	50 U	2.0
delta-BHC	75 U	75 U	3.0
gamma-BHC (Lindane)	32 U	32 U	1.3
Heptachlor	25 U	25 U	1.0
Aldrin	32 U	32 U	1.3
Heptachlor epoxide	680 U	680 U	27
Endosulfan I	120 U	120 U	4.6
Dieldrin	16 U	16 U	0.66
4,4'-DDE	32 U	32 U	1.3
Endrin	50 U	50 U	2.0
Endosulfan II	32 U	32 U	1.3
4,4'-DDD	90 U	90 U	3.6
Endrin Aldehyde	50 U	50 U	2.0
Endosulfan Sulfate	550 U	550 U	22
4,4'-DDT	100 U	100 U	4.0
Methoxychlor	1400 U	1400 U	58
Chlordane	120 U	120 U	4.6
Toxaphene	2000 U	2000 U	80
	*1	*1	

Notes: ND = Not Detected
*1 = Sample diluted by a factor of 25 due to non-target interference.
U = Indicates compound was analyzed for but not detected above the quantitation limit indicated.

GTEL
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Report No.
110-001-5544

Work Order No.
M9-12-292

Semi-Volatile Organics Analysis

Sample No.	03
Sample ID.	SS-3
Date Sampled	12/06/89
Date Extracted	12/18/89
Date Analyzed	12/20/89

Parameter	Concentration ug/kg	Detection Limit ug/kg
alpha-BHC	25 U	1.0
beta-BHC	50 U	2.0
delta-BHC	75 U	3.0
gamma-BHC (Lindane)	32 U	1.3
Heptachlor	25 U	1.0
Aldrin	32 U	1.3
Heptachlor epoxide	680 U	27
Endosulfan I	120 U	4.6
Dieldrin	16 U	0.66
4,4'-DDE	32 U	1.3
Endrin	50 U	2.0
Endosulfan II	32 U	1.3
4,4'-DDD	90 U	3.6
Endrin Aldehyde	50 U	2.0
Endosulfan Sulfate	550 U	22
4,4'-DDT	100 U	4.0
Methoxychlor	1400 U	58
Chlordane	120 U	4.6
Toxaphene	2000 U	80
	*1	

Notes: ND = Not Detected
*1 = Sample diluted by a factor of 25 due to non-target interference.
U = Indicates compound was analyzed for but not detected above the quantitation limit indicated.

SECTION II

QUALITY CONTROL DATA

Report No.
110-001-5544

Work Order No.
M9-12-292

Case Narrative

No analytical problems were encountered.

Susan C. Uhler

Susan C. Uhler
Laboratory Director

2/15/90
Date

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Report No.
110-001-5544

Work Order No.
M9-12-292

EPA Method 8080
Definition of Surrogates

S1 = Dibutylchlorendate (abbrev - DBC)
Other = Decachlorobiphenyl (abbrev - DCBP)

Report No.
110-001-5475

Work Order No.
M9-12-292

SOIL PCB Surrogate Recovery

EPA Sample No.	S1 (DBC)# (%)	Other (DCBP) (%)
BS1218	92.5	102
M912292-01	D	D
M912292-01 MS	D	D
M912292-01 MSD	D	D
M912292-02	D	D
M912292-03	D	D

	Advisory QC Limits
S1 (DBC) = Dibutylchlorendate	(24-154)
Other = Decachlorobiphenyl	(24-154)

\# Column used to flag recovery values
* Values outside of QC limits
D Surrogates diluted out. Percent recovery not calculated when surrogate compounds are diluted out.

A Surrogates acidified out

MS = Matrix Spike
MSD= Matrix Spike Duplicate

Report No.
110-001-5475

Work Order No.
M9-12-292

SOIL MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Accuracy - Aqueous Matrix Spike (MS) Recovery Data

Sample Spiked: M912292-01
Analysis Date: 12/29/89

Parameter	Spike Added (ug/kg)	Spike Concentration (ug/kg)	MS Concentration (ug/kg)	MS % REC #	QC Limits % *1
Lindane	9.30	< 32.5	D	D	56-123
Heptachlor	9.30	< 25.0	D	D	40-131
Aldrin	9.30	< 32.5	D	D	40-120
Dieldrin	23.3	< 16.5	D	D	52-126
Endrin	23.3	< 50.0	D	D	56-121
4,4-DDT	23.3	< 100	D	D	38-127

Parameter	Spike Added (ug/kg)	MSD Concentration (ug/kg)	MSD % Recovery (ug/kg)	% RPD #	QC Limits % *1
Lindane	9.09	D	D	D	15
Heptachlor	9.09	D	D	D	20
Aldrin	9.09	D	D	D	22
Dieldrin	22.7	D	D	D	18
Endrin	22.7	D	D	D	21
4,4-DDT	22.7	D	D	D	27

*1 = Acceptability criteria for Priority Pollutants are derived from accuracy limits published in the EPA method. Limits for precision have not been established.

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits
D Samples diluted out due to matrix interferences. Percent recovery and percent RPD not calculated when spike compounds are diluted out.

RPD: 0 out of 6 outside limits
Spike Recovery: 0 out of 12 outside limits

Report No.
110-001-5544

Work Order No.
M9-12-292

Semi-Volatile Organics Analysis

Sample No. METHOD BLANK
Sample ID. BS1218
Date Analyzed 12/20/89

Parameter	Concentration ug/kg	Detection Limit ug/kg
alpha-BHC	1.0 U	1.0
beta-BHC	2.0 U	2.0
delta-BHC	3.0 U	3.0
gamma-BHC (Lindane)	1.3 U	1.3
Heptachlor	1.0 U	1.0
Aldrin	1.3 U	1.3
Heptachlor epoxide	27 U	27
Endosulfan I	4.6 U	4.6
Dieldrin	0.66 U	0.66
4,4'-DDE	1.3 U	1.3
Endrin	2.0 U	2.0
Endosulfan II	1.3 U	1.3
4,4'-DDD	3.6 U	3.6
Endrin Aldehyde	2.0 U	2.0
Endosulfan Sulfate	22 U	22
4,4'-DDT	4.0 U	4.0
Methoxychlor	58 U	58
Chlordane	4.6 U	4.6
Toxaphene	80 U	80

Notes:

U = Indicates compound was analyzed for but not detected above the quantitation limit indicated.

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SS1-3
12/6
Chlorinated Herbicides

Report No.
110-001-5544

Work Order No.
M9-12-308

2/13/90
Submitted to:

Rich Hixon
Groundwater Technology
12 Walker Way
Albany, NY 12205

Sample Identification:
The attached report covers 3 soil samples taken on 12/06/89 at site # 110-001-5544, Corning, New York.

Method:
Analysis was performed for chlorinated herbicides by GC/ECD as per EPA Method 8150. Detection limits are listed on the report. Samples that are diluted in order to maintain the calibrated range are indicated by a footnote by which the MDL is raised.

Sampling and sample handling, preservation and extraction are specified by this laboratory to be as per EPA Method 8150.

Results:
Results are reported in ug/kg (ppb).

Respectfully submitted,

Dave Reese
Dave Reese
Extractable Organics Manager
DRR/sj

Roseanna Dube
Roseanna Dube
Quality Assurance

Project Number: 110-001-5544
Work Order Number: M9-12-308

Table 1

ANALYTICAL RESULTS

Chlorinated Herbicides in Soil
EPA Method 8150[a]

GTEL Sample Number		01	02	03	--
Client Identification		SS-1	SS-2	SS-3	--
Date Extracted		12/20/89	12/20/89	12/20/89	--
Date Analyzed		1/09/90	1/10/90	1/10/90	--
Analyte	Detection Limit, ug/kg	Concentration, ug/kg (dry)			
2,4-D	40	1300	6000 U	3800 J	--
2,4-DB	30	300 U	4500 U	4500 U	--
2,4,5-T	6.7	21 J	1000 U	1000 U	--
2,4,5-TP (Silvex)	5.7	57 U	850 U	850 U	--
Dalapon	190	1900 U	28000 U	28000 U	--
Dicamba	9.0	90 U	1400 U	1400 U	--
Dichloroprop	22	220 U	3300 U	3300 U	--
Dinoseb	2.3	23 U	340 U	340 U	--
MCPA	8300	83000 U	1200000 U	1200000 U	--
MCPP	6400	64000 U	960000 U	960000 U	--
Detection Limit Multiplier		10	150	150	--
Percent Solids		72.1	30.6	33.1	--

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986.
U Indicates compound was analyzed for but not detected above the quantitation limit indicated.
J Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound that meets the identification criteria but the results is less than the detection limit, but greater than 1 ppb.

SECTION II

QUALITY CONTROL DATA

Report No.
110-001-5544

Work Order No.
M9-12-308

QA NONCONFORMANCE SUMMARY

Herbicide Analysis

EPA Method 8510

1.0 Method Blank Analysis

1.1. Zero target compound(s) were found in the method blank.

2.0 Calibration Verification

2.1. The control limit(s) were exceeded for zero calibration check compounds.

3.0 Surrogate Compound Recoveries

3.1. The recovery limits were exceeded for zero surrogate compounds.

4.0 Matrix Spike (MS) Accuracy

4.1. The recovery limits were exceeded in the matrix spike for two compound(s), due to matrix interferences.

5.0 Sample Duplicate Precision

5.1. The maximum relative percent difference (RPD) was exceeded for one compound(s) in the duplicate samples, due to matrix interferences.

6.0 Sample Integrity

6.1. Sample handling and holding time criteria were met.

Susan C. Uhler
Laboratory Director

2/15/90
Date

GTEL
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LABORATORIES, INC.

Report No.
110-001-5544

Work Order No.
M9-12-308

EPA Method 8150

DEFINITION OF SURROGATES

S1 = Dichlorophenylacetic Acid (abbrev - DCPAA)

Report No.
110-001-5544

Work Order No.
M9-12-308

Water Herbicide Surrogate Recovery

EPA Sample No.	S1 (DCPAA)#
BW1220	65.5
M912308-01	D
M912308-01 MS	D
M912308-01 MSD	D
M912308-02	D
M912308-03	D

	QC Limits
S1 (DCPAA) = 2,4-Dichlorophenylacetic Acid	(24-154)

\# Column used to flag recovery values
* Values outside of QC limits
D Surrogates diluted out. Percent Recovery not calculated when surrogate compound diluted out.
A Surrogates acidified out

MS = Matrix Spike
MSD= Matrix Spike Duplicate

Report No.
110-001-5544

Work Order No.
M9-12-308

SOIL MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Accuracy - Aqueous Matrix Spike (MS) Recovery Data

Sample Spiked: M912308-01
Analysis Date: 1/09/90

Parameter	Spike Added (ug/kg)	Spike Conc. (ug/kg)	MS Conc. (ug/kg)	MS % REC #	REC QC Limits % *1
2,4-D	450	1320	8220	1530 *	20-160
Silvex	225	< 57.0	< 57.0	D	20-160
Dinoseb	225	< 23.0	< 23.0	D	20-160

Parameter	Spike Added (ug/kg)	MSD Conc. (ug/kg)	MSD % Recovery (ug/kg)	% RPD #	RPD QC Limits % *1	REC QC Limits % *1
2,4-D	456	3770	727 *	72.9	40	20-160
Silvex	228	< 57.0	D	D	40	20-160
Dinoseb	228	< 23.0	D	D	40	20-160

*1 = Acceptability criteria for Priority Pollutants are derived from accuracy limits published in the EPA method. Limits for precision have not been established.

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits. See QA Nonconformance Summary.
D= Surrogates diluted out, recoveries not calculated.

RPD: 1 out of 3 outside limits
Spike Recovery: 2 out of 6 outside limits

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Report No.
110-001-5544

Work Order No.
M9-12-308

Herbicides Organics Analysis

Sample No.	METHOD BLANK
Sample ID	BS1220
Date Analyzed	1/09/90

Parameter	Concentration ug/kg
2,4-D	40 U
2,4-DB	30 U
2,4,5-T	6.7 U
2,4,5-TP (Silvex)	5.7 U
Dalapon	190 U
Dicamba	9.0 U
Dichloroprop	22 U
Dinoseb	2.3 U
MCPA	8300 U
MCPP	6400 U

Note:

U = Indicates compound was analyzed for but not detected above the quanttiation limit indicated.

GTEL
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Northeast Region
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Milford, NH 03055
(603) 672-4835
(603) 673-8105 (FAX)

Project Number: 110-001-5544
Work Order Number: M9-12-293

February 14, 1990

Richard Hixon
Groundwater Technology, Inc.
12 Walker Way
Albany, NY 12205

Dear Mr. Hixon:

Attached please find the analytical results for the samples received by GTEL on 12/09/89. The samples were received and analyzed as indicated on chain of custody number 21559, which is attached.

GTEL maintains a formal quality assurance program to ensure the integrity of the analytical results. All quality assurance criteria were achieved during the analysis unless otherwise noted in the footnotes to the analytical report.

The specific analytical methods used and cited in this report are approved by state and federal regulatory agencies.

If you have any questions regarding this analysis, or if we may service any additional analytical needs, please give us a call.

Sincerely,
GTEL Environmental Laboratories, Inc.

Roseanna Dube

Chris J. Miller
Inorganics Manager

Roseanna Dube
Quality Assurance

Project Number: 110-001-5544
Work Order Number: M9-12-293

Table 1

ANALYTICAL RESULTS

Total Metals in Soil
Priority Pollutant Metals

		GTEL Sample Number	01	02	03	--
		Client Identification	SS-1	SS-2	SS-3	--
		Date Digested	12/13/89-12/28/89	12/13/89-12/28/89	12/13/89-12/28/89	--
		Date Analyzed	12/13/89-12/28/89	12/13/89-12/28/89	12/13/89-12/28/89	--
Analyte	Method[a]	Method Detection Limit, mg/kg	Concentration, mg/kg (dry)			
Antimony	EPA 6010	32	< 32	< 32	< 32	--
Arsenic	EPA 7060	1.0	7.9	20	5.1	--
Beryllium	EPA 6010	3.2	< 3.2	< 3.2	< 3.2	--
Cadmium	EPA 6010	3.5	< 3.5	4.5	14	--
Chromium	EPA 6010	2.0	14	45	93	--
Copper	EPA 6010	2.5	27	140	200	--
Lead	EPA 7421	10	42	370	230	--
Mercury	EPA 7470	0.20	< 0.20	< 0.20	< 0.20	--
Nickel	EPA 6010	13	17	19	62	--
Selenium	EPA 7740	1.0	< 1.0	< 1.0	< 1.0	--
Silver	EPA 6010	3.2	< 3.2	< 3.2	< 3.2	--
Thallium	EPA 6010	130	< 130	< 130	< 130	--
Zinc	EPA 6010	2.0	220	1400	1100	--
Detection Limit Multiplier			1.0	1.0	1.0	--
Percent Solids			66.0	29.0	41.2	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; digestion by EPA Method 3050 (ICP) and 3020 (furnace).

SECTION II

QUALITY CONTROL DATA

Project Number: 110-001-5544
Work Order Number: M9-12-293

QA Non-Conformance Summary

1.0 Method Blank

The concentration(s) in the method blank were below the detection limit for the analyte(s) as shown in Table 2.

2.0 Matrix Spike Recovery

Percent recovery limits were not met for three analytes in the matrix spike as shown in Table 3. Redigestion and reanalysis of M912293-2 and spiked sample yielded matrix spike recoveries that were in control for Copper, Lead, and Zinc (i.e., 94.9%, 91.6%, and 93.1%, respectively). The Laboratory Control Sample was in control for Copper , Lead and Zinc (i.e., 90.3%, 92.7%, and 89.6%, respectively). The samples were heterogeneous (see section 3.0). These data suggest that the low matrix spike recoveries encountered in the original digestion batch were attributable to sample heterogeneity.

3.0 Sample Duplicate Precision

Relative percent difference criteria were not met for four analyte(s) in the sample duplicate as shown in Table 4. Redigestion and reanalysis of M912293-2 and duplicate sample yielded RPD values that were in control for Copper and Zinc (i.e., 1.8% and 1.9% respectively) and marginal for Chromium and Lead (i.e., 21.0 and 27.8%, repectively). The percent solids for the sample was 29.0 %. These data indicated that the sample was heterogeneous.

4.0 Initial Calibration Verification

The control limits were met for the analyte(s) in the initial calibration verification sample as shown in Table 5.

5.0 Sample Handling

Sample handling and holding time criteria were met for all samples.

Susan C. Uhler — 2/14/90

Susan C. Uhler
Laboratory Director

Date

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Project Number: 110-001-5544
Work Order Number: M9-12-293

Table 2

METHOD BLANK REPORT

Analyte	Date Digested	Date Analyzed	Concentration, mg/kg
Antimony	12/22/89	12/27/89	< 32.0
Arsenic	12/22/89	12/28/89	< 1.00
Beryllium	12/22/89	12/27/89	< 3.20
Cadmium	12/22/89	12/27/89	< 3.50
Chromium	12/22/89	12/27/89	< 2.00
Copper	12/22/89	12/27/89	< 2.50
Lead	12/22/89	12/27/89	< 10.0
Mercury	12/13/89	12/13/89	< 0.20
Nickel	12/22/89	12/17/89	< 13.0
Selenium	12/22/89	12/28/89	< 1.00
Silver	12/22/89	12/27/89	< 3.20
Thallium	12/22/89	12/27/89	< 130
Zinc	12/22/89	12/27/89	< 2.00

Project Number: 110-001-5544
Work Order Number: M9-12-293

Table 3

MATRIX SPIKE (MS) RECOVERY REPORT

Date of Analysis: *2
Sample Spiked: *3

Units: mg/kg

Analyte	MS Sample Result	Sample Result	Amount Added	MS, % Recovery	Acceptability Limits, %[1]
Antimony	168	< 32.0	257	65.4	NA
Arsenic	34.7	19.8	17.8	86.5	75-125
Beryllium	12.0	< 3.20	13.0	92.3	75-125
Cadmium	56.2	4.46	64.1	80.7	75-125
Chromium	236	44.6	255	75.1	75-125
Copper	284	142	255	55.7 *4	75-125
Lead	365	370	255	0 *4	75-125
Mercury	2.71	< 0.20	3.00	90.3	75-125
Nickel	562	19.0	639	85.0	75-125
Selenium	16.2	< 1.00	17.8	91.0	75-125
Silver	22.0	< 3.20	25.8	85.3	75-125
Thallium	212	< 130	255	83.1	75-125
Zinc	1300	1420	639	0 *4	75-125

1 Acceptability limits as per lates EPA CLP Statement of Work.
*2 12/13/89 for Mercury; 12/28/89 for Arsenic and Selenium; 12/27/89 for others.
*3 M912349-2 for Mercury; M912293-2 for others.
*4 Out of control; See Non-Conformance Summary.
NA There is no EPA approved digestion method for Antimony; thus, acceptability limits are not appropriate.

Project Number: 110-001-5544
Work Order Number: M9-12-293

Table 4

LABORATORY DUPLICATE SAMPLE RESULTS AND RELATIVE PERCENT DIFFERENCE (RPD) REPORT

Date of Analysis: *2
Sample Used: *3
Units: mg/kg

Analyte	Sample Result	Duplicate Result	RPD, %	Maximum RPD, % 1
Antimony	< 32.0	< 32.0	NA	20
Arsenic	19.8	18.8	5.18	20
Beryllium	< 3.20	< 3.20	NA	20
Cadmium	4.46	2.80	NA 62.9	20
Chromium	44.6	24.2	70.3 *4	20
Copper	142	110	25.4 *4	20
Lead	370	179	69.6 *4	20
Mercury	< 0.20	< 0.20	NA	20
Nickel	19.0	< 13.0	NA>68.2	20
Selenium	< 1.00	< 1.00	NA	20
Silver	< 3.20	< 3.20	NA	20
Thallium	< 130	< 130	NA	20
Zinc	1420	1010	33.7 *4	20

1 Acceptability limits as per latest EPA CLP Statement of Work.
*2 12/13/89 for Mercury; 12/28/89 for Arsenic and Selenium; 12/27/89 for others.
*3 M912349-2 for Mercury; M912293-2 for others.
*4 Out of control; See Non-Conformance Summary.
NA Not applicable; initial sample concentration less than 10 times the instrument detection limit

Project Number: 110-001-5544
Work Order Number: M9-12-293

Table 5

INITIAL CALIBRATION VERIFICATION

Date of Analysis: *2

Analyte	Expected Result, ug/L	Observed Result, ug/L	Recovery, %	Acceptability Limits, %[1]
Antimony	1000	1020	102	90-110
Arsenic	65.0	61.9	95.2	90-110
Beryllium	400	411	103	90-110
Cadmium	500	506	101	90-110
Chromium	1000	1050	105	90-110
Copper	1000	1020	102	90-110
Lead	1000	1020	102	90-110
Mercury	10	10.3	103	90-110
Nickel	1000	1050	105	90-110
Selenium	50.0	50.6	101	90-110
Silver	200	188	94.0	90-110
Thallium	1000	1030	103	90-110
Zinc	1000	1030	103	90-110

1 Acceptability limits established by latest EPA CLP Statement of Work.
*2 12/13/89 for Hg; 12/28/89 for Arsenic and Selenium; 12/27/89 for others.

Table 6

Instrument Detection Limits

Analyte	Method [a]	IDL ug/L
Antimony	EPA 6010	320
Arsenic	EPA 7060	10
Beryllium	EPA 6010	10
Cadmium	EPA 6010	10
Chromium	EPA 6010	10
Copper	EPA 6010	25
Lead	EPA 7421	100
Mercury	EPA 7470	0.5
Nickel	EPA 6010	40
Selenium	EPA 7740	10
Silver	EPA 6010	10
Thallium	EPA 6010	320
Zinc	EPA 6010	20

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; digestion by EPA Method 3050 (ICP) and 3020 (furnace).

APPENDIX J

NYSDOH Analytical Results

Water

o	Retention Pond Water	5 September 1989
o	Retention Pond Water	13 September 1989
o	Drywell, Flower and Garden	13 September 1989
o	Water Supply Well, Carwash	13 September 1989
o	Method Blank for Water Samples	

Soil and Ash

o	Soil, West of Retention Pond	13 September 1989
o	Ash from Fire	13 September 1989
o	Method Blank for Ash Samples	

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER FOR LABORATORIES AND RESEARCH

PAGE 1 RESULTS OF EXAMINATION FINAL REPORT

SAMPLE ID: 893950 SAMPLE RECEIVED:89/09/06/ CHARGE: 20.40
PROGRAM: 110:STATE SUPERFUND ANALYTICAL SERVICES
SOURCE ID: DRAINAGE BASIN:05 GAZETTEER CODE:5032
POLITICAL SUBDIVISION:S. CORNING V. COUNTY:STEUBEN
LATITUDE: . LONGITUDE: . Z DIRECTION:
LOCATION: AGWAY - S.CORNING
DESCRIPTION:POND, SURFACE WATER
REPORTING LAB: TOX:LAB FOR ORGANIC ANALYTICAL CHEMISTRY
TEST PATTERN: XP-P-H-A:ORGANOCHLORINE, N/P PESTICIDES, PCBS, HERBICIDES
SAMPLE TYPE: 210:SURFACE WATER
TIME OF SAMPLING: 89/09/05 16: DATE PRINTED:89/10/04

ANALYSIS: XPEST-PCB ORGANOCHLORINE PESTICIDES & PCB'S (DES310-2)
DATE REPORTED: 89/09/15 REPORT MAILED OUT

----------PARAMETER----------	----------RESULT----------
HCH,ALPHA	< 0.04 MCG/L
HCH,BETA	< 0.04 MCG/L
HCH,GAMMA (LINDANE)	0.49 MCG/L [CR]
HCH,DELTA	< 0.04 MCG/L
HEPTACHLOR	< 0.05 MCG/L
ALDRIN	< 0.02 MCG/L
HEPTACHLOR EPOXIDE	< 0.05 MCG/L
ENDOSULFAN I	< 0.05 MCG/L
4,4'-DDE	< 0.05 MCG/L
DIELDRIN	< 0.02 MCG/L
ENDRIN	< 0.02 MCG/L
4,4'-DDD	< 0.05 MCG/L
ENDOSULFAN II	< 0.05 MCG/L
ENDRIN ALDEHYDE	< 0.02 MCG/L
ENDOSULFAN SULFATE	< 0.05 MCG/L
4,4'-DDT	< 0.05 MCG/L
METHOXYCHLOR	5.0 MCG/L [RC]
TOXAPHENE	< 1.0 MCG/L
CHLORDANE	< 0.1 MCG/L
MIREX	< 0.05 MCG/L
PCB,AROCLOR 1221	< 0.05 MCG/L
PCB,AROCLOR 1016/1242	< 0.05 MCG/L
PCB,AROCLOR 1248	< 0.05 MCG/L
PCB,AROCLOR 1254	< 0.05 MCG/L
PCB,AROCLOR 1260	< 0.05 MCG/L

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WADSWORTH CENTER FOR LABORATORIES AND RESEARCH

RESULTS OF EXAMINATION

FINAL REPORT

SAMPLE ID: 893950 SAMPLE RECEIVED:89/09/06/ CHARGE: 20.40
POLITICAL SUBDIVISION:S. CORNING V. COUNTY:STEUBEN
LOCATION: AGWAY - S.CORNING
TIME OF SAMPLING: 89/09/05 16: DATE PRINTED:89/10/04

ANALYSIS: AMA NITROGEN/PHOSPHORUS PESTICIDES (DES 310-23)
DATE PRINTED: 89/10/04 FINAL REPORT

-----------PARAMETER-----------	-----------RESULT-----------
EPTC (EPTAM)	< 1. MCG/L
BUTYLATE (SUTAN)	1. MCG/L [MS]
TRIFLURALIN	3. MCG/L
ATRAZINE	< 1. MCG/L
DIAZINON (SPECTRACIDE)	20. MCG/L [MS]
ALACHLOR (LASSO)	< 0.4 MCG/L
METOLACHLOR (DUAL)	< 1. MCG/L
CHLORPYRIFOS (DURSBAN)	1. MCG/L
MALATHION	20. MCG/L [MS]
CYANAZINE (BLADEX)	< 1. MCG/L
AZINPHOS-METHYL (GUTHION)	< 1. MCG/L

ANALYSIS: HERB HERBICIDES (DES 310-3)
DATE REPORTED: 89/09/18 REPORT MAILED OUT

-----------PARAMETER-----------	-----------RESULT-----------
2,4-D	120. MCG/L
SILVEX (2,4,5-TP)	< 0.1 MCG/L

**** END OF REPORT ****

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PAGE 1                        RESULTS OF EXAMINATION               FINAL REPORT

SAMPLE ID:     894088       SAMPLE RECEIVED:89/09/14/        CHARGE:    78.40
PROGRAM:          110:STATE SUPERFUND ANALYTICAL SERVICES
SOURCE ID:                  DRAINAGE BASIN:05             GAZETTEER CODE:5032
POLITICAL SUBDIVISION:S. CORNING V.                       COUNTY:STEUBEN
LATITUDE:          .        LONGITUDE:          .         Z DIRECTION:
LOCATION:    AGWAY,S.CORNING
DESCRIPTION:RETENTON POND
REPORTING LAB:          TOX:LAB FOR ORGANIC ANALYTICAL CHEMISTRY
TEST PATTERN:     VH05021:VOLATILE HALOGENATED ORGANICS
SAMPLE TYPE:            210:SURFACE WATER
TIME OF SAMPLING: 89/09/13 14:                          DATE PRINTED:89/11/22

ANALYSIS:     VH05021    VOLATILE HALOGENATED ORGANICS (DES 310-29)
                         DATE REPORTED: 89/10/05          REPORT MAILED OUT

 -----------PARAMETER-----------             ----------RESULT----------
 CHLOROMETHANE                               < 500. MCG/L
 BROMOMETHANE                                < 500. MCG/L
 VINYL CHLORIDE                              < 500. MCG/L
 DICHLORODIFLUOROMETHANE (FREON-12)          < 500. MCG/L
 CHLOROETHANE                                < 500. MCG/L
 METHYLENE CHLORIDE (DICHLOROMETHANE)        < 500. MCG/L
 TRICHLOROFLUOROMETHANE (FREON-11)           < 500. MCG/L
 1,1-DICHLOROETHENE                          < 500. MCG/L
 1,1-DICHLOROETHANE                          < 500. MCG/L
 TRANS-1,2-DICHLOROETHENE                    < 500. MCG/L
 CIS-1,2-DICHLOROETHENE                      < 500. MCG/L
 CHLOROFORM                                  < 500. MCG/L
 1,2-DICHLOROETHANE                          < 500. MCG/L
 DIBROMOMETHANE                              < 500. MCG/L
 1,1,1-TRICHLOROETHANE                        1000. MCG/L
 CARBON TETRACHLORIDE                        < 500. MCG/L
 BROMODICHLOROMETHANE                        < 500. MCG/L
 2,3-DICHLOROPROPENE                         < 500. MCG/L
 1,2-DICHLOROPROPANE                         < 500. MCG/L
 CIS-1,3-DICHLOROPROPENE                     < 500. MCG/L
 TRICHLOROETHENE                             < 500. MCG/L
 1,3-DICHLOROPROPANE                         < 500. MCG/L
 DIBROMOCHLOROMETHANE                        < 500. MCG/L
 TRANS-1,3-DICHLOROPROPENE                   < 500. MCG/L
 1,1,2-TRICHLOROETHANE                       < 500. MCG/L
 1,2-DIBROMOETHANE (EDB)                     < 500. MCG/L
 2-CHLOROETHYLVINYL ETHER                    < 500. MCG/L
 BROMOFORM                                   < 500. MCG/L
 1,1,1,2-TETRACHLOROETHANE                   < 500. MCG/L
 1,2,3-TRICHLOROPROPANE                      < 500. MCG/L
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AGE 2                     RESULTS OF EXAMINATION                 FINAL REPORT

AMPLE ID:     894088       SAMPLE RECEIVED:89/09/14/       CHARGE:    78.40
OLITICAL SUBDIVISION:S. CORNING V.                     COUNTY:STEUBEN
OCATION:   AGWAY,S.CORNING
IME OF SAMPLING: 89/09/13 14:                         DATE PRINTED:89/11/22

-----------PARAMETER-----------                ----------RESULT----------
1,1,2,2-TETRACHLOROETHANE                      < 500. MCG/L
TETRACHLOROETHENE                              < 500. MCG/L
PENTACHLOROETHANE                              < 500. MCG/L
1-CHLOROCYCLOHEXENE-1                          < 500. MCG/L
CHLOROBENZENE                                  < 500. MCG/L
BIS(2-CHLOROETHYL)ETHER                        < 500. MCG/L
1,2-DIBROMO-3-CHLOROPROPANE                    < 500. MCG/L
BROMOBENZENE                                   < 500. MCG/L
O-CHLOROTOLUENE                                < 500. MCG/L
BIS(2-CHLOROISOPROPYL)ETHER                    < 500. MCG/L
1,3-DICHLOROBENZENE                            < 500. MCG/L
1,2-DICHLOROBENZENE                            < 500. MCG/L
1,4-DICHLOROBENZENE                            < 500. MCG/L

          FOLLOWING PARAMETERS NOT PART OF TEST PATTERN

ANALYSIS:  XPEST-PCB    ORGANOCHLORINE PESTICIDES & PCB'S (DES310-2)
                        DATE REPORTED: 89/09/28          REPORT MAILED OUT

-----------PARAMETER-----------                ----------RESULT----------
HCH,ALPHA                                      < 0.04 MCG/L
HCH,BETA                                       < 0.04 MCG/L
HCH,GAMMA (LINDANE)                              0.23 MCG/L
HCH,DELTA                                        0.04 MCG/L [PL]
HEPTACHLOR                                     < 0.05 MCG/L
ALDRIN                                         < 0.02 MCG/L
HEPTACHLOR EPOXIDE                             < 0.05 MCG/L
ENDOSULFAN I                                   < 0.05 MCG/L
4,4'-DDE                                       < 0.05 MCG/L
DIELDRIN                                       < 0.02 MCG/L
ENDRIN                                         < 0.02 MCG/L
4,4'-DDD                                       < 0.05 MCG/L
ENDOSULFAN II                                  < 0.05 MCG/L
ENDRIN ALDEHYDE                                < 0.02 MCG/L
ENDOSULFAN SULFATE                             < 0.05 MCG/L
4,4'-DDT                                       < 0.05 MCG/L
METHOXYCHLOR                                    < 1.0 MCG/L
TOXAPHENE                                       < 1.0 MCG/L
CHLORDANE                                       < 0.1 MCG/L
MIREX                                          < 0.05 MCG/L
PCB,AROCLOR 1221                               < 0.05 MCG/L
PCB,AROCLOR 1016/1242                          < 0.05 MCG/L
PCB,AROCLOR 1248                               < 0.05 MCG/L
PCB,AROCLOR 1254                               < 0.05 MCG/L
PCB,AROCLOR 1260                               < 0.05 MCG/L
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AGE 3                    RESULTS OF EXAMINATION                FINAL REPORT

AMPLE ID:    894088      SAMPLE RECEIVED:89/09/14/       CHARGE:    78.40
OLITICAL SUBDIVISION:S. CORNING V.                   COUNTY:STEUBEN
OCATION:   AGWAY,S.CORNING
IME OF SAMPLING: 89/09/13 14:                       DATE PRINTED:89/11/22

NALYSIS:        AMA    NITROGEN/PHOSPHORUS PESTICIDES (DES 310-23)
                       DATE PRINTED: 89/11/21                FINAL REPORT

-------------PARAMETER-----------          ----------RESULT----------
EPTC (EPTAM)                                 < 1. MCG/L
BUTYLATE (SUTAN)                             < 1. MCG/L
TRIFLURALIN                                  < 1. MCG/L
ATRAZINE                                     < 1. MCG/L
DIAZINON (SPECTRACIDE)                         8. MCG/L [MS]
ALACHLOR (LASSO)                            < 0.4 MCG/L
METOLACHLOR (DUAL)                           < 1. MCG/L
CHLORPYRIFOS (DURSBAN)                       < 1. MCG/L
MALATHION                                    < 1. MCG/L
AZINPHOS-METHYL (GUTHION)                    < 1. MCG/L

ANALYSIS:       HERB   HERBICIDES (DES 310-3)
                       DATE REPORTED: 89/09/22         REPORT MAILED OUT

-------------PARAMETER-----------          ----------RESULT----------
2,4-D                                         78. MCG/L
SILVEX (2,4,5-TP)                           < 2.0 MCG/L

         FOLLOWING PARAMETERS NOT PART OF TEST PATTERN

ANALYSIS:   DIOX-H2O   DIOXINS &/OR DIBENZOFURANS IN LIQUIDS (GC/MS)
                       DATE REPORTED: 89/10/19         REPORT MAILED OUT

-------------PARAMETER-----------          ----------RESULT----------
2,3,7,8-TETRACHLORODIBENZODIOXIN            < 38. PG/L
1,2,3,7,8-PENTACHLORODIBENZODIOXIN          < 56. PG/L
1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN         < 82. PG/L
1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN         < 73. PG/L
1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN         < 94. PG/L
1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN        62. PG/L
OCTACHLORODIBENZODIOXIN                      280. PG/L
2,3,7,8-TETRACHLORODIBENZOFURAN             < 35. PG/L
1,2,3,7,8-PENTACHLORODIBENZOFURAN           < 37. PG/L
2,3,4,7,8-PENTACHLORODIBENZOFURAN           < 53. PG/L
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN            90. PG/L
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN          < 49. PG/L
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN          < 58. PG/L
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN          < 51. PG/L
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN        500. PG/L
OCTACHLORODIEENZOFURAN                      1900. PG/L
TOTAL TETRACHLORODIBENZODIOXINS             < 38. PG/L
TOTAL PENTACHLORODIBENZODIOXINS             < 56. PG/L
TOTAL HEXACHLORODIBENZODIOXINS              < 82. PG/L
TOTAL HEPTACHLORODIBENZODIOXINS               97. PG/L
TOTAL TETRACHLORODIBENZOFURANS              < 35. PG/L
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RESULTS OF EXAMINATION   FINAL REPORT

AMPLE ID: 894088   SAMPLE RECEIVED:89/09/14/   CHARGE: 78.40
OLITICAL SUBDIVISION:S. CORNING V.   COUNTY:STEUBEN
OCATION: AGWAY,S.CORNING
IME OF SAMPLING: 89/09/13 14:   DATE PRINTED:89/11/22

---------PARAMETER-----------	----------RESULT----------
TOTAL PENTACHLORODIBENZOFURANS	< 37. PG/L
TOTAL HEXACHLORODIBENZOFURANS	140. PG/L
TOTAL HEPTACHLORODIBENZOFURANS	540. PG/L

**** END OF REPORT ****

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PAGE 1 RESULTS OF EXAMINATION FINAL REPORT

SAMPLE ID: 894089 SAMPLE RECEIVED:89/09/14/ CHARGE: 70.40
PROGRAM: 110:STATE SUPERFUND ANALYTICAL SERVICES
SOURCE ID: DRAINAGE BASIN:05 GAZETTEER CODE:5032
POLITICAL SUBDIVISION:S. CORNING V. COUNTY:STEUBEN
LATITUDE: . LONGITUDE: . Z DIRECTION:
LOCATION: AGWAY,S.CORNING
DESCRIPTION:DRY WELL, CORNER OF FLOWER & GARDEN
REPORTING LAB: TOX:LAB FOR ORGANIC ANALYTICAL CHEMISTRY
TEST PATTERN: XP-P-H-A:ORGANOCHLORINE, N/P PESTICIDES, PCBS, HERBICIDES
SAMPLE TYPE: 210:SURFACE WATER
TIME OF SAMPLING: 89/09/13 13:40 DATE PRINTED:89/11/22

<> SIMAZINE = 100. MCG/L (MS CONFIRMATION) <>

ANALYSIS: XPEST-PCB ORGANOCHLORINE PESTICIDES & PCB'S (DES310-2)
DATE REPORTED: 89/09/28 REPORT MAILED OUT

PARAMETER	RESULT
HCH,ALPHA	< 0.04 MCG/L
HCH,BETA	< 0.04 MCG/L
HCH,GAMMA (LINDANE)	< 0.04 MCG/L
HCH,DELTA	< 0.04 MCG/L
HEPTACHLOR	< 0.05 MCG/L
ALDRIN	< 0.02 MCG/L
HEPTACHLOR EPOXIDE	< 0.05 MCG/L
ENDOSULFAN I	< 0.05 MCG/L
4,4'-DDE	< 0.05 MCG/L
DIELDRIN	< 0.02 MCG/L
ENDRIN	< 0.02 MCG/L
4,4'-DDD	< 0.05 MCG/L
ENDOSULFAN II	< 0.05 MCG/L
ENDRIN ALDEHYDE	< 0.02 MCG/L
ENDOSULFAN SULFATE	< 0.05 MCG/L
4,4'-DDT	< 0.05 MCG/L
METHOXYCHLOR	< 1.0 MCG/L
TOXAPHENE	< 1.0 MCG/L
CHLORDANE	< 0.1 MCG/L
MIREX	< 0.05 MCG/L
PCB,AROCLOR 1221	< 0.05 MCG/L
PCB,AROCLOR 1016/1242	< 0.05 MCG/L
PCB,AROCLOR 1248	< 0.05 MCG/L
PCB,AROCLOR 1254	< 0.05 MCG/L
PCB,AROCLOR 1260	< 0.05 MCG/L

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PAGE 2                     RESULTS OF EXAMINATION                  FINAL REPORT

SAMPLE ID:     894089      SAMPLE RECEIVED:89/09/14/        CHARGE:    70.40
POLITICAL SUBDIVISION:S. CORNING V.                    COUNTY:STEUBEN
LOCATION:   AGWAY,S.CORNING
TIME OF SAMPLING: 89/09/13 13:40                       DATE PRINTED:89/11/22

ANALYSIS:          AMA     NITROGEN/PHOSPHORUS PESTICIDES (DES 310-23)
                           DATE PRINTED: 89/11/21                 FINAL REPORT

 ------------PARAMETER-----------           ----------RESULT----------
 EPTC (EPTAM)                                 < 1. MCG/L
 BUTYLATE (SUTAN)                             < 1. MCG/L
 TRIFLURALIN                                  < 1. MCG/L
 ATRAZINE                                      40. MCG/L [MS]
 AZINPHOS-METHYL (GUTHION)                    < 1. MCG/L

ANALYSIS:         HERB     HERBICIDES (DES 310-3)
                           DATE REPORTED: 89/09/22         REPORT MAILED OUT

 ------------PARAMETER-----------           ----------RESULT----------
 2,4-D                                       1800. MCG/L
 SILVEX (2,4,5-TP)                           < 2.0 MCG/L

          FOLLOWING PARAMETERS NOT PART OF TEST PATTERN

ANALYSIS:   DIOX-H2O       DIOXINS &/OR DIBENZOFURANS IN LIQUIDS (GC/MS)
                           DATE REPORTED: 89/10/19         REPORT MAILED OUT

 ------------PARAMETER-----------           ----------RESULT----------
 2,3,7,8-TETRACHLORODIBENZODIOXIN            < 47. PG/L
 1,2,3,7,8-PENTACHLORODIBENZODIOXIN          < 68. PG/L
 1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN        < 100. PG/L
 1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN         < 90. PG/L
 1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN        < 120. PG/L
 1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN       210. PG/L
 OCTACHLORODIBENZODIOXIN                     1200. PG/L
 2,3,7,8-TETRACHLORODIBENZOFURAN             < 43. PG/L
 1,2,3,7,8-PENTACHLORODIBENZOFURAN           < 45. PG/L
 2,3,4,7,8-PENTACHLORODIBENZOFURAN           < 64. PG/L
 1,2,3,4,7,8-HEXACHLORODIBENZOFURAN            67. PG/L
 1,2,3,6,7,8-HEXACHLORODIBENZOFURAN          < 57. PG/L
 2,3,4,6,7,8-HEXACHLORODIBENZOFURAN          < 68. PG/L
 1,2,3,7,8,9-HEXACHLORODIBENZOFURAN          < 59. PG/L
 1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN        280. PG/L
 OCTACHLORODIBENZOFURAN                     1,000. PG/L
 TOTAL TETRACHLORODIBENZODIOXINS             < 47. PG/L
 TOTAL PENTACHLORODIBENZODIOXINS             < 68. PG/L
 TOTAL HEXACHLORODIBENZODIOXINS                77. PG/L
 TOTAL HEPTACHLORODIBENZODIOXINS              410. PG/L
 TOTAL TETRACHLORODIBENZOFURANS              < 43. PG/L
 TOTAL PENTACHLORODIBENZOFURANS                35. PG/L
 TOTAL HEXACHLORODIBENZOFURANS                110. PG/L
 TOTAL HEPTACHLORODIBENZOFURANS               330. PG/L
                        **** END OF REPORT ****
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0540               NEW YORK STATE DEPARTMENT OF HEALTH
            WADSWORTH CENTER FOR LABORATORIES AND RESEARCH

PAGE 1                     RESULTS OF EXAMINATION                 FINAL REPORT

SAMPLE ID:     894086       SAMPLE RECEIVED:89/09/14/       CHARGE:   70.40
PROGRAM:          110:STATE SUPERFUND ANALYTICAL SERVICES
SOURCE ID:                 DRAINAGE BASIN:05          GAZETTEER CODE:5032
POLITICAL SUBDIVISION:S. CORNING V.                   COUNTY:STEUBEN
LATITUDE:          .       LONGITUDE:          .      Z DIRECTION:
LOCATION:   AGWAY,S.CORNING
DESCRIPTION:WELL FOR CAR WASH
REPORTING LAB:         TOX:LAB FOR ORGANIC ANALYTICAL CHEMISTRY
TEST PATTERN:   XP-P-H-A:ORGANOCHLORINE, N/P PESTICIDES, PCBS, HERBICIDES
SAMPLE TYPE:           120:PRIVATE WATER SUPPLY - DRILLED WELL
TIME OF SAMPLING: 89/09/13 16:40                       DATE PRINTED:89/11/22

ANALYSIS:  XPEST-PCB    ORGANOCHLORINE PESTICIDES & PCB'S (DES310-2)
                        DATE REPORTED: 89/09/28          REPORT MAILED OUT

 -----------PARAMETER-----------              ----------RESULT----------
 HCH,ALPHA                                    < 0.04 MCG/L
 HCH,BETA                                     < 0.04 MCG/L
 HCH,GAMMA (LINDANE)                          < 0.04 MCG/L
 HCH,DELTA                                    < 0.04 MCG/L
 HEPTACHLOR                                   < 0.05 MCG/L
 ALDRIN                                       < 0.02 MCG/L
 HEPTACHLOR EPOXIDE                           < 0.05 MCG/L
 ENDOSULFAN I                                 < 0.05 MCG/L
 4,4'-DDE                                     < 0.05 MCG/L
 DIELDRIN                                     < 0.02 MCG/L
 ENDRIN                                       < 0.02 MCG/L
 4,4'-DDD                                     < 0.05 MCG/L
 ENDOSULFAN II                                < 0.05 MCG/L
 ENDRIN ALDEHYDE                              < 0.02 MCG/L
 ENDOSULFAN SULFATE                           < 0.05 MCG/L
 4,4'-DDT                                     < 0.05 MCG/L
 METHOXYCHLOR                                  < 1.0 MCG/L
 TOXAPHENE                                     < 1.0 MCG/L
 CHLORDANE                                     < 0.1 MCG/L
 MIREX                                        < 0.05 MCG/L
 PCB,AROCLOR 1221                             < 0.05 MCG/L
 PCB,AROCLOR 1016/1242                        < 0.05 MCG/L
 PCB,AROCLOR 1248                             < 0.05 MCG/L
 PCB,AROCLOR 1254                             < 0.05 MCG/L
 PCB,AROCLOR 1260                             < 0.05 MCG/L
                   **** CONTINUED ON NEXT PAGE ****




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     ROCHESTER, N.Y. 14608
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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER FOR LABORATORIES AND RESEARCH

RESULTS OF EXAMINATION

FINAL REPORT

SAMPLE ID: 894086 SAMPLE RECEIVED:89/09/14/ CHARGE: 70.40
POLITICAL SUBDIVISION:S. CORNING V. COUNTY:STEUBEN
LOCATION: AGWAY,S.CORNING
TIME OF SAMPLING: 89/09/13 16:40 DATE PRINTED:89/11/22

ANALYSIS: AMA NITROGEN/PHOSPHORUS PESTICIDES (DES 310-23)
DATE PRINTED: 89/11/21 FINAL REPORT

PARAMETER	RESULT
EPTC (EPTAM)	< 1. MCG/L
BUTYLATE (SUTAN)	< 1. MCG/L
TRIFLURALIN	< 1. MCG/L
ATRAZINE	< 1. MCG/L
DISULFOTON (DI-SYSTON)	< 1. MCG/L
DIAZINON (SPECTRACIDE)	< 1. MCG/L
PROMETON (PRAMITOL)	< 1. MCG/L
ALACHLOR (LASSO)	< 0.4 MCG/L
LINURON (LORAX)	< 1. MCG/L
METOLACHLOR (DUAL)	< 1. MCG/L
PARATHION	< 1. MCG/L
CHLORPYRIFOS (DURSBAN)	< 1. MCG/L
MALATHION	< 1. MCG/L
CYANAZINE (BLADEX)	< 1. MCG/L
ISOFENPHOS (OFTANOL)	< 1. MCG/L
ETHION	< 1. MCG/L
TRIAZOPHOS (HOSTATHION)	< 1. MCG/L
PHOSALONE (ZOLONE)	< 1. MCG/L
AZINPHOS-METHYL (GUTHION)	< 1. MCG/L

ANALYSIS: HERB HERBICIDES (DES 310-3)
DATE REPORTED: 89/09/22 REPORT MAILED OUT

PARAMETER	RESULT
2,4-D	< 0.5 MCG/L
SILVEX (2,4,5-TP)	< 0.1 MCG/L

FOLLOWING PARAMETERS NOT PART OF TEST PATTERN

ANALYSIS: DIOX-H20 DIOXINS &/OR DIBENZOFURANS IN LIQUIDS (GC/MS)
DATE REPORTED: 89/10/11 REPORT MAILED OUT

PARAMETER	RESULT
2,3,7,8-TETRACHLORODIBENZODIOXIN	< 33. PG/L
1,2,3,7,8-PENTACHLORODIBENZODIOXIN	< 49. PG/L
1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN	< 67. PG/L
1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN	< 59. PG/L
1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN	< 71. PG/L
1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN	< 79. PG/L
OCTACHLORODIBENZODIOXIN	600. PG/L
2,3,7,8-TETRACHLORODIBENZOFURAN	< 31. PG/L
1,2,3,7,8-PENTACHLORODIBENZOFURAN	< 30. PG/L
2,3,4,7,8-PENTACHLORODIBENZOFURAN	< 40. PG/L
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	< 38. PG/L
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	< 45. PG/L

**** CONTINUED ON NEXT PAGE ****

SAMPLE ID: 894086 SAMPLE RECEIVED:89/09/14/ CHARGE: 70.40
POLITICAL SUBDIVISION:S. CORNING V. COUNTY:STEUBEN
LOCATION: AGWAY,S.CORNING
TIME OF SAMPLING: 89/09/13 16:40 DATE PRINTED:89/11/22

----------PARAMETER----------	----------RESULT----------
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	< 48. PG/L
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	< 45. PG/L
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	< 67. PG/L
OCTACHLORODIBENZOFURAN	< 96. PG/L
TOTAL TETRACHLORODIBENZODIOXINS	< 33. PG/L
TOTAL PENTACHLORODIBENZODIOXINS	< 49. PG/L
TOTAL HEXACHLORODIBENZODIOXINS	< 67. PG/L
TOTAL HEPTACHLORODIBENZODIOXINS	< 79. PG/L
TOTAL TETRACHLORODIBENZOFURANS	< 31. PG/L
TOTAL PENTACHLORODIBENZOFURANS	< 30. PG/L
TOTAL HEXACHLORODIBENZOFURANS	< 38. PG/L
TOTAL HEPTACHLORODIBENZOFURANS	< 67. PG/L

**** END OF REPORT ****

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER FOR LABORATORIES AND RESEARCH

PAGE 1 RESULTS OF EXAMINATION FINAL REPORT

SAMPLE ID: 894169 SAMPLE RECEIVED:89/09/20/ CHARGE: 50.00
PROGRAM: 110:STATE SUPERFUND ANALYTICAL SERVICES
SOURCE ID: DRAINAGE BASIN: GAZETTEER CODE:5032
POLITICAL SUBDIVISION:S. CORNING V. COUNTY:STEUBEN
LATITUDE: . LONGITUDE: . Z DIRECTION:
LOCATION: AGWAY S. CORNING
DESCRIPTION:METHOD BLANK FOR WATER SAMPLES
REPORTING LAB: TOX:LAB FOR ORGANIC ANALYTICAL CHEMISTRY
TEST PATTERN: DIOX:DIOXIN/DIBENZOFURAN ANALYSIS
SAMPLE TYPE: 298:INTERNAL LABORATORY BLANK
TIME OF SAMPLING: / / : DATE PRINTED:89/10/11

ANALYSIS: DIOX DIOXIN/DIBENZOFURAN ANALYSIS
DATE PRINTED: 89/10/11 FINAL REPORT

FOLLOWING PARAMETERS NOT PART OF TEST PATTERN

ANALYSIS: DIOX-H2O DIOXINS &/OR DIBENZOFURANS IN LIQUIDS (GC/MS)
DATE PRINTED: 89/10/11 FINAL REPORT

PARAMETER	RESULT	
2,3,7,8-TETRACHLORODIBENZODIOXIN	< 31. PG/L	picograms/liter
1,2,3,7,8-PENTACHLORODIBENZODIOXIN	< 41. PG/L	
1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN	< 53. PG/L	
1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN	< 49. PG/L	
1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN	< 63. PG/L	
1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN	< 62. PG/L	
OCTACHLORODIBENZODIOXIN	97. PG/L	
2,3,7,8-TETRACHLORODIBENZOFURAN	< 30. PG/L	
1,2,3,7,8-PENTACHLORODIBENZOFURAN	< 33. PG/L	
2,3,4,7,8-PENTACHLORODIBENZOFURAN	< 44. PG/L	
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	< 35. PG/L	
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	< 38. PG/L	
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	< 47. PG/L	
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	< 41. PG/L	
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	< 41. PG/L	
OCTACHLORODIBENZOFURAN	< 64. PG/L	
TOTAL TETRACHLORODIBENZODIOXINS	< 31. PG/L	
TOTAL PENTACHLORODIBENZODIOXINS	< 41. PG/L	
TOTAL HEXACHLORODIBENZODIOXINS	< 53. PG/L	
TOTAL HEPTACHLORODIBENZODIOXINS	< 62. PG/L	
TOTAL TETRACHLORODIBENZOFURANS	< 30. PG/L	
TOTAL PENTACHLORODIBENZOFURANS	< 33. PG/L	
TOTAL HEXACHLORODIBENZOFURANS	< 35. PG/L	
TOTAL HEPTACHLORODIBENZOFURANS	< 41. PG/L	

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0511

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER FOR LABORATORIES AND RESEARCH

PAGE 1 RESULTS OF EXAMINATION FINAL REPORT

SAMPLE ID: 894087 SAMPLE RECEIVED:89/09/14/ CHARGE: 78.50
PROGRAM: 110:STATE SUPERFUND ANALYTICAL SERVICES
SOURCE ID: DRAINAGE BASIN:05 GAZETTEER CODE:5032
POLITICAL SUBDIVISION:S. CORNING V. COUNTY:STEUBEN
LATITUDE: . LONGITUDE: . Z DIRECTION:
LOCATION: AGWAY,S.CORNING
DESCRIPTION:SOIL,WEST OF RETENTION POND
REPORTING LAB: TOX:LAB FOR ORGANIC ANALYTICAL CHEMISTRY
TEST PATTERN: MULTI-1:MULTI-ANALYSIS FOR ORGANIC COMPOUNDS
SAMPLE TYPE: 600:SOIL, SAND
TIME OF SAMPLING: 89/09/13 14:45 DATE PRINTED:89/11/06

ANALYSIS: HERBS HERBICIDES IN SOIL/SEDIMENT (DES 312-6)
DATE PRINTED: 89/11/03 FINAL REPORT

------------PARAMETER-----------	----------RESULT----------
2,4-D	0.1 MCG/G [PL]
SILVEX (2,4,5-TP)	< 0.02 MCG/G

ANALYSIS: AMA-SOIL NITROGEN/PHOSPHORUS PESTICIDES-SOIL (DES 312-7)
DATE PRINTED: 89/11/03 FINAL REPORT

------------PARAMETER-----------	----------RESULT----------
EPTC (EPTAM)	< 0.03 MCG/G
BUTYLATE (SUTAN)	< 0.03 MCG/G
TRIFLURALIN	< 0.03 MCG/G
ATRAZINE	< 0.03 MCG/G
DISULFOTON (DI-SYSTON)	< 0.03 MCG/G
DIAZINON (SPECTRACIDE)	< 0.03 MCG/G
PROMETON (PRAMITOL)	< 0.03 MCG/G
ALACHLOR (LASSO)	< 0.03 MCG/G
LINURON (LORAX)	< 0.03 MCG/G
METOLACHLOR (DUAL)	< 0.03 MCG/G
PARATHION	< 0.03 MCG/G
CHLORPYRIFOS (DURSBAN)	< 0.03 MCG/G
MALATHION	< 0.03 MCG/G
CYANAZINE (BLADEX)	< 0.03 MCG/G
ISOFENPHOS (OFTANOL)	< 0.03 MCG/G
ETHION	< 0.03 MCG/G
TRIAZOPHOS (HOSTATHION)	< 0.03 MCG/G
PHOSALONE (ZOLONE)	< 0.03 MCG/G
AZINPHOS-METHYL (GUTHION)	< 0.03 MCG/G

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WADSWORTH CENTER FOR LABORATORIES AND RESEARCH

AGE 2 RESULTS OF EXAMINATION FINAL REPORT

AMPLE ID: 894087 SAMPLE RECEIVED:89/09/14/ CHARGE: 78.50
OLITICAL SUBDIVISION:S. CORNING V. COUNTY:STEUBEN
OCATION: AGWAY,S.CORNING
IME OF SAMPLING: 89/09/13 14:45 DATE PRINTED:89/11/06

NALYSIS: XPESTPS PESTICIDES & PCB'S - SOIL/SEDIMENT (DES 312-2)
DATE PRINTED: 89/11/03 FINAL REPORT

PARAMETER	RESULT	
HCH,ALPHA	< 0.0008 MCG/G	
HCH,BETA	< 0.0008 MCG/G	
HCH,GAMMA (LINDANE)	< 0.0008 MCG/G	
HCH,DELTA	< 0.0008 MCG/G	
HEPTACHLOR	< 0.001 MCG/G	
ALDRIN	< 0.0004 MCG/G	
HEPTACHLOR EPOXIDE	< 0.001 MCG/G	
ENDOSULFAN I	< 0.001 MCG/G	
4,4'-DDE	0.002 MCG/G	
DIELDRIN	< 0.0004 MCG/G	
ENDRIN	< 0.0004 MCG/G	
4,4'-DDD	0.001 MCG/G	[PL]
ENDOSULFAN II	< 0.001 MCG/G	
ENDRIN ALDEHYDE	< 0.0004 MCG/G	
ENDOSULFAN SULFATE	< 0.001 MCG/G	
4,4'-DDT	< 0.001 MCG/G	
METHOXYCHLOR	< 0.02 MCG/G	
TOXAPHENE	< 0.02 MCG/G	
CHLORDANE	< 0.002 MCG/G	
MIREX	0.001 MCG/G	[PL]
PCB,AROCLOR 1221	< 0.001 MCG/G	
PCB,AROCLOR 1016/1242	< 0.001 MCG/G	
PCB,AROCLOR 1248	< 0.001 MCG/G	
PCB,AROCLOR 1254	< 0.001 MCG/G	
PCB,AROCLOR 1260	< 0.001 MCG/G	

ANALYSIS: DIOX-PPT1 DIOXINS &/OR DIBENZOFURANS - IN SOLIDS (GC/MS)
DATE PRINTED: 89/11/03 FINAL REPORT

PARAMETER	RESULT
2,3,7,8-TETRACHLORODIBENZODIOXIN	< 63. PG/G
1,2,3,7,8-PENTACHLORODIBENZODIOXIN	< 100. PG/G
1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN	< 130. PG/G
1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN	< 120. PG/G
1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN	< 150. PG/G
1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN	230. PG/G
OCTACHLORODIBENZODIOXIN	1600. PG/G
2,3,7,8-TETRACHLORODIBENZOFURAN	< 55. PG/G
1,2,3,7,8-PENTACHLORODIBENZOFURAN	< 64. PG/G
2,3,4,7,8-PENTACHLORODIBENZOFURAN	< 90. PG/G
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	< 84. PG/G
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	< 91. PG/G
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	< 110. PG/G
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	< 99. PG/G
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	48. PG/G

**** CONTINUED ON NEXT PAGE ****

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WADSWORTH CENTER FOR LABORATORIES AND RESEARCH

RESULTS OF EXAMINATION FINAL REPORT

SAMPLE ID: 894087 SAMPLE RECEIVED:89/09/14/ CHARGE: 78.50
POLITICAL SUBDIVISION:S. CORNING V. COUNTY:STEUBEN
LOCATION: AGWAY,S.CORNING
TIME OF SAMPLING: 89/09/13 14:45 DATE PRINTED:89/11/06

----------PARAMETER----------	----------RESULT----------
OCTACHLORODIBENZOFURAN	180. PG/G
TOTAL TETRACHLORODIBENZODIOXINS	< 63. PG/G
TOTAL PENTACHLORODIBENZODIOXINS	< 100. PG/G
TOTAL HEXACHLORODIBENZODIOXINS	< 130. PG/G
TOTAL HEPTACHLORODIBENZODIOXINS	390. PG/G
TOTAL TETRACHLORODIBENZOFURANS	< 55. PG/G
TOTAL PENTACHLORODIBENZOFURANS	< 64. PG/G
TOTAL HEXACHLORODIBENZOFURANS	< 84. PG/G
TOTAL HEPTACHLORODIBENZOFURANS	150. PG/G

**** END OF REPORT ****

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WADSWORTH CENTER FOR LABORATORIES AND RESEARCH

PAGE 1 RESULTS OF EXAMINATION FINAL REPORT

SAMPLE ID: 894091 SAMPLE RECEIVED:89/09/14/ CHARGE: 50.10
PROGRAM: 110:STATE SUPERFUND ANALYTICAL SERVICES
SOURCE ID: DRAINAGE BASIN:05 GAZETTEER CODE:5032
POLITICAL SUBDIVISION:S. CORNING V. COUNTY:STEUBEN
LATITUDE: . LONGITUDE: . Z DIRECTION:
LOCATION: AGWAY-S.CORNING
DESCRIPTION:ASH FROM SOUTHWEST CORNER OF BUILDING (ASH FROM FIRE)
REPORTING LAB: TOX:LAB FOR ORGANIC ANALYTICAL CHEMISTRY
TEST PATTERN: DIOX-PPT1:DIOXINS &/OR DIBENZOFURANS
SAMPLE TYPE: 601:SOLID MATERIAL, MISCELLANEOUS
TIME OF SAMPLING: 89/09/13 14:45 DATE PRINTED:89/11/16

ANALYSIS: DIOX-PPT1 DIOXINS &/OR DIBENZOFURANS - IN SOLIDS (GC/MS)
DATE REPORTED: 89/11/06 REPORT MAILED OUT

PARAMETER	RESULT
2,3,7,8-TETRACHLORODIBENZODIOXIN	< 81. PG/G
1,2,3,7,8-PENTACHLORODIBENZODIOXIN	< 110. PG/G
1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN	< 150. PG/G
1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN	< 140. PG/G
1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN	< 170. PG/G
1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN	140. PG/G
OCTACHLORODIBENZODIOXIN	550. PG/G
2,3,7,8-TETRACHLORODIBENZOFURAN	< 78. PG/G
1,2,3,7,8-PENTACHLORODIBENZOFURAN	< 84. PG/G
2,3,4,7,8-PENTACHLORODIBENZOFURAN	< 120. PG/G
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	< 86. PG/G
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	< 93. PG/G
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	< 110. PG/G
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	< 100. PG/G
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	< 130. PG/G
OCTACHLORODIBENZOFURAN	< 360. PG/G
TOTAL TETRACHLORODIBENZODIOXINS	170. PG/G
TOTAL PENTACHLORODIBENZODIOXINS	< 110. PG/G
TOTAL HEXACHLORODIBENZODIOXINS	< 150. PG/G
TOTAL HEPTACHLORODIBENZODIOXINS	250. PG/G
TOTAL TETRACHLORODIBENZOFURANS	150. PG/G
TOTAL PENTACHLORODIBENZOFURANS	< 84. PG/G
TOTAL HEXACHLORODIBENZOFURANS	< 86. PG/G
TOTAL HEPTACHLORODIBENZOFURANS	< 130. PG/G

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            WADSWORTH CENTER FOR LABORATORIES AND RESEARCH

AGE 2                    RESULTS OF EXAMINATION                   FINAL REPORT

AMPLE ID:     894091      SAMPLE RECEIVED:89/09/14/        CHARGE:    50.10
OLITICAL SUBDIVISION:S. CORNING V.                COUNTY:STEUBEN
OCATION:    AGWAY-S.CORNING
IME OF SAMPLING: 89/09/13 14:45                      DATE PRINTED:89/11/16

       FOLLOWING PARAMETERS NOT PART OF TEST PATTERN

  GROUP:        HOLD    HOLDING FOR TEST PATTERN/PARAMETERS
                        DATE PRINTED: 89/11/16                    FINAL REPORT

-----------PARAMETER-----------             ----------RESULT----------
HOLDING FOR PARAMETERS                      CANCEL
                            **** END OF REPORT ****
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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER FOR LABORATORIES AND RESEARCH

PAGE 1 RESULTS OF EXAMINATION FINAL REPORT

SAMPLE ID: 894331 SAMPLE RECEIVED:89/10/02/ CHARGE: 50.00
PROGRAM: 110:STATE SUPERFUND ANALYTICAL SERVICES
SOURCE ID: DRAINAGE BASIN: GAZETTEER CODE:5032
POLITICAL SUBDIVISION:S. CORNING V. COUNTY:STEUBEN
LATITUDE: . LONGITUDE: . Z DIRECTION:
LOCATION: METHOD BLANK FOR ASH SAMPLE FROM AGWAY FIRE
DESCRIPTION:
REPORTING LAB: TOX:LAB FOR ORGANIC ANALYTICAL CHEMISTRY
TEST PATTERN: DIOX:DIOXIN/DIBENZOFURAN ANALYSIS
SAMPLE TYPE: 298:INTERNAL LABORATORY BLANK
TIME OF SAMPLING: / / : DATE PRINTED:89/10/11

ANALYSIS: DIOX DIOXIN/DIBENZOFURAN ANALYSIS
DATE PRINTED: 89/10/11 FINAL REPORT

FOLLOWING PARAMETERS NOT PART OF TEST PATTERN

ANALYSIS: DIOX-PCG DIOXINS &/OR DIBENZOFURANS (GC/MS)
DATE PRINTED: 89/10/11 FINAL REPORT

----------PARAMETER----------	----------RESULT----------
2,3,7,8-TETRACHLORODIBENZODIOXIN	< 32. PICOGRAM
1,2,3,7,8-PENTACHLORODIBENZODIOXIN	< 44. PICOGRAM
1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN	< 61. PICOGRAM
1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN	< 54. PICOGRAM
1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN	< 69. PICOGRAM
1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN	< 73. PICOGRAM
OCTACHLORODIBENZODIOXIN	< 130. PICOGRAM
2,3,7,8-TETRACHLORODIBENZOFURAN	< 29. PICOGRAM
1,2,3,7,8-PENTACHLORODIBENZOFURAN	< 33. PICOGRAM
2,3,4,7,8-PENTACHLORODIBENZOFURAN	< 46. PICOGRAM
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	< 34. PICOGRAM
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	< 39. PICOGRAM
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	< 50. PICOGRAM
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	< 41. PICOGRAM
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	< 48. PICOGRAM
OCTACHLORODIBENZOFURAN	< 81. PICOGRAM
TOTAL TETRACHLORODIBENZODIOXINS	< 32. PICOGRAM
TOTAL PENTACHLORODIBENZODIOXINS	< 44. PICOGRAM
TOTAL HEXACHLORODIBENZODIOXINS	< 61. PICOGRAM
TOTAL HEPTACHLORODIBENZODIOXINS	< 73. PICOGRAM
TOTAL TETRACHLORODIBENZOFURANS	69. PICOGRAM
TOTAL PENTACHLORODIBENZOFURANS	63. PICOGRAM
TOTAL HEXACHLORODIBENZOFURANS	< 34. PICOGRAM
TOTAL HEPTACHLORODIBENZOFURANS	< 48. PICOGRAM

**** END OF REPORT ****

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NEW YORK STATE DEPARTMENT OF HEALTH
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SUBMITTED BY:PAPURA

APPENDIX K

New York State Department of Environmental Conservation Dioxin Toxic Equivalency Calculation Methodology

TABLE 1
Calculation of 2,3,7,8-TCDD Equivalents: Polychlorinated Dioxins
Retention Pond Soil Samples

DIOXINS HOMOLOGUES & ISOMERS	ISOMER FRACTION 2378/TOTAL	SAMPLE VALUES (concentration)		TOXICITY EQUIVALENCE FACTORS (TEFs) NYS-89	2,3,7,8-TCDD EQUIVALENTS NYS-89
		MEASURED	PREDICTED		
Mono- to Tri-				0.00005	0.00E+00
2,3,7,8-TCDD	1/22		0.00	1	0.00E+00
Other TCDDs	21/22		0.00	0.01	0.00E+00
Total TCDDs	--			--	--
1,2,3,7,8-PeCDD	1/14		0.00	0.5	0.00E+00
Other PeCDDs	13/14		0.00	0.005	0.00E+00
Total PeCDDs	--			--	--
1,2,3,4,7,8-HxCDD	1/10		0.00	0.05	0.00E+00
1,2,3,6,7,8-HxCDD	1/10		0.00	0.05	0.00E+00
2,3,4,6,7,8-HxCDD	1/10		0.00	0.05	0.00E+00
Other HxCDDs	7/10		0.00	0.0005	0.00E+00
Total HxCDDs	--			--	--
1,2,3,4,6,7,8-HpCDD	1/2	62	0.00	0.005	3.10E-01
Other HpCDDs	1/2		35.00	0.00005	1.75E-03
Total HpCDDs	--	97		--	--
OCDD	1	280		0.005	1.40E+00
				TOTAL PCDD CONTRIBUTION:	1.71E+00

TABLE 2

Calculation of 2,3,7,8-TCDD Equivalents: Polychlorinated Dibenzofurans Retention Pond Soil Samples

DIOXINS HOMOLOGUES & ISOMERS	ISOMER FRACTION 2378/TOTAL	SAMPLE VALUES (concentration)		TOXICITY EQUIVALENCE FACTORS (TEFs) NYS-89	2,3,7,8-TCDD EQUIVALENTS NYS-89
		MEASURED	PREDICTED		
Mono-to Tri-				0.00005	0.00E+00
2,3,7,8-TCDF	1/38		0.00	0.1	0.00E+00
Other TCDFs	37/38		0.00	0.001	0.00E+00
Total TCDFs	--			--	--
1,2,3,7,8-PeCDF	1/28		0.00	0.05	0.00E+00
2,3,4,7,8-PeCDF	1/28		0.00	0.5	0.00E+00
Other PeCDFs	26/28		0.00	0.005	0.00E+00
Total PeCDFs	--			--	--
1,2,3,4,7,8-HxCDF	1/16	90	0.00	0.1	9.00E+00
1,2,3,6,7,8-HxCDF	1/16		3.33	0.1	3.33E-01
1,2,3,7,8,9-HxCDF	1/16		3.33	0.1	3.33E-01
2,3,4,6,7,8-HxCDF	1/16		3.33	0.1	3.33E-01
Other HxCDFs	12/16		40.00	0.001	4.00E-02
Total HxCDFs	--	140		--	--
1,2,3,4,6,7,8-HpCDF	1/4	500	0.00	0.005	2.50E+00
1,2,3,4,7,8,9-HpCDF	1/4		13.33	0.005	6.67E-02
Other HpCDFs	2/4		26.67	0.00005	1.33E-03
Total HpCDFs	--	540		--	--
Total OCDF	1	1900		0.005	9.50E+00
			Total PCDF Contribution:		2.21E+01
			Total 2,3,7,8-TCDD TEF's:		2.38E+01