ONONDAGA LAKE
NATIONAL PRIORITIES LIST (NPL) SITE

COMPREHENSIVE REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

MAY 1996

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

I. Introduction

Pursuant to a Federal grant agreement between the New York State Department of Environmental Conservation (DEC) and the United States Environmental Protection Agency (EPA), DEC is responsible for managing the remedial program for the Onondaga Lake National Priorities List Site on behalf of EPA. This agreement requires, among other things, that DEC provide to EPA for its approval a Comprehensive Remedial Investigation/Feasibility Study (CRI/FS) Work Plan. This document is submitted to EPA in order to fulfill this requirement. For the most part, the Work Plan memorializes the scope and conceptual approach for the requisite remedial program as they have been discussed during meetings and conference calls and described in correspondence between EPA and DEC over the past eighteen months.

II. Site Background

A. Site Description

Onondaga Lake is located in Onondaga County, northwest of and contiguous to the City of Syracuse. It has been called the most polluted lake in the United States largely due to significant sewage and industrial waste discharges to its waters from numerous sources for over a century. The pollutants which affect the Lake are varied in their nature, extent, and pathways of exposure For example, some pollutants are conveyed to the lake via contaminated groundwater; surface water tributaries transport pollutants from remote sources to the lake; and historic releases contained in bottom sediments continue to impact the lake.

Onondaga Lake's watershed is predominantly urban and suburban, with some active agriculture in the uplands. While rural non-point source loading does not appear to be of major significance now, as point source loads are reduced through remedial action the non-point sources will increase in relative significance

B. Site History

Due to mercury contamination, the sediments at the bottom of Onondaga Lake are listed on the State's Registry of Inactive Hazardous Waste Sites. Fish in the lake are contaminated with mercury at levels which have resulted in an advisory recommending that no fish from the lake be eaten, although fishing is permitted. The DEC has carried out an annual fish monitoring program since 1970 and will continue to do so for the near future.

Historically, the principal source of mercury has been losses from the chlorine manufacturing facility(ies), one located at Willis Avenue, the other at Bridge Street in Solvay, which were operated by Allied Chemical (Allied), (presently AlliedSignal, Inc.) from 1947 through 1979. At one time the facility discharged approximately 20 pounds of mercury to the Lake per day. This reportedly was reduced to about one pound per day in 1971. Since the early 1980's the Bridge Street facility (then owned by LCP) had attempted to meet a discharge limit of 0.028 pounds of mercury or less per day

Allied also contributed other contaminants to the Lake. These contaminants are mainly

associated with four major production lines including 1.) Soda ash, 2.) Chlor- alkali 3.) Benzene, Toluene, and Xylene (BTX) and 4.) Chlorinated benzene manufacturing. Wastes included calcium carbonate, ammonia, chlorides and chlorobenzenes which have continued to leach into the Lake from upland disposal areas. Other substances of concern in the Lake sediments not presently known to be related to Allied activities include but are not limited to: heavy metals (other than lead and mercury), such as cadmium, copper, and chromium; BTX (petroleum-based) and PCBs. The effects and impacts of these substances must also be determined and remedial measures evaluated

On March 29, 1989, the Commissioner referred AlliedSignal to the Attorney General's Office for civil litigation seeking remediation of the lake bottom and recovery of natural resource damages. The referral names AlliedSignal, Inc. as primarily responsible for mercury contamination of the Lake. Subsequently, on June 27, 1989, a complaint was filed with the U.S. District Court in Syracuse against AlliedSignal, Inc. In the complaint, Allied is charged with disposing of pollutants into or onto waste beds, the plant site, tributaries and into the Lake causing injury to and destruction of the natural resources and creating an ongoing public nuisance affecting both the public health and the environment.

The Onondaga Lake site was placed on the National Priorities List (NPL) in December 1994. The geographic delineation of the site will be determined by investigating the sources of contamination and evaluating their impacts on Onondaga Lake. The Lake, tributaries and all

sources that have released, are releasing or are threatening to release hazardous substances to the Lake are considered part of the NPL site, and will be addressed under the Site's remedial program. Figure 1 depicts the lake's tributaries and areas which will be evaluated to determine their impact on the Site as of February 1996. Other areas will be added during the course of the NPL Site Remedial Investigation.

III. Project Direction

A Objective

The objective of the Comprehensive Remedial Investigation/Feasibility Study (CRI/FS) is to determine the nature and extent of hazardous substances at the Onondaga Lake site and to develop and evaluate remedial alternatives for its remediation. The CRI/FS will be conducted in a manner that is consistent with the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, USEPA, 1988, Interim Final; the National Contingency Plan (NCP); and relevant DEC guidance. The CRI/FS will serve as the basis for the Proposed Remedial Action Plan (PRAP) for the NPL site, which will identify the preferred remedy, and after a public presentation and comment period on the PRAP, the CRI/FS will be the basis for the Record of Decision (ROD) for the entire NPL site.

B. Approach

nondaga Lake Remed
Areas of Concern

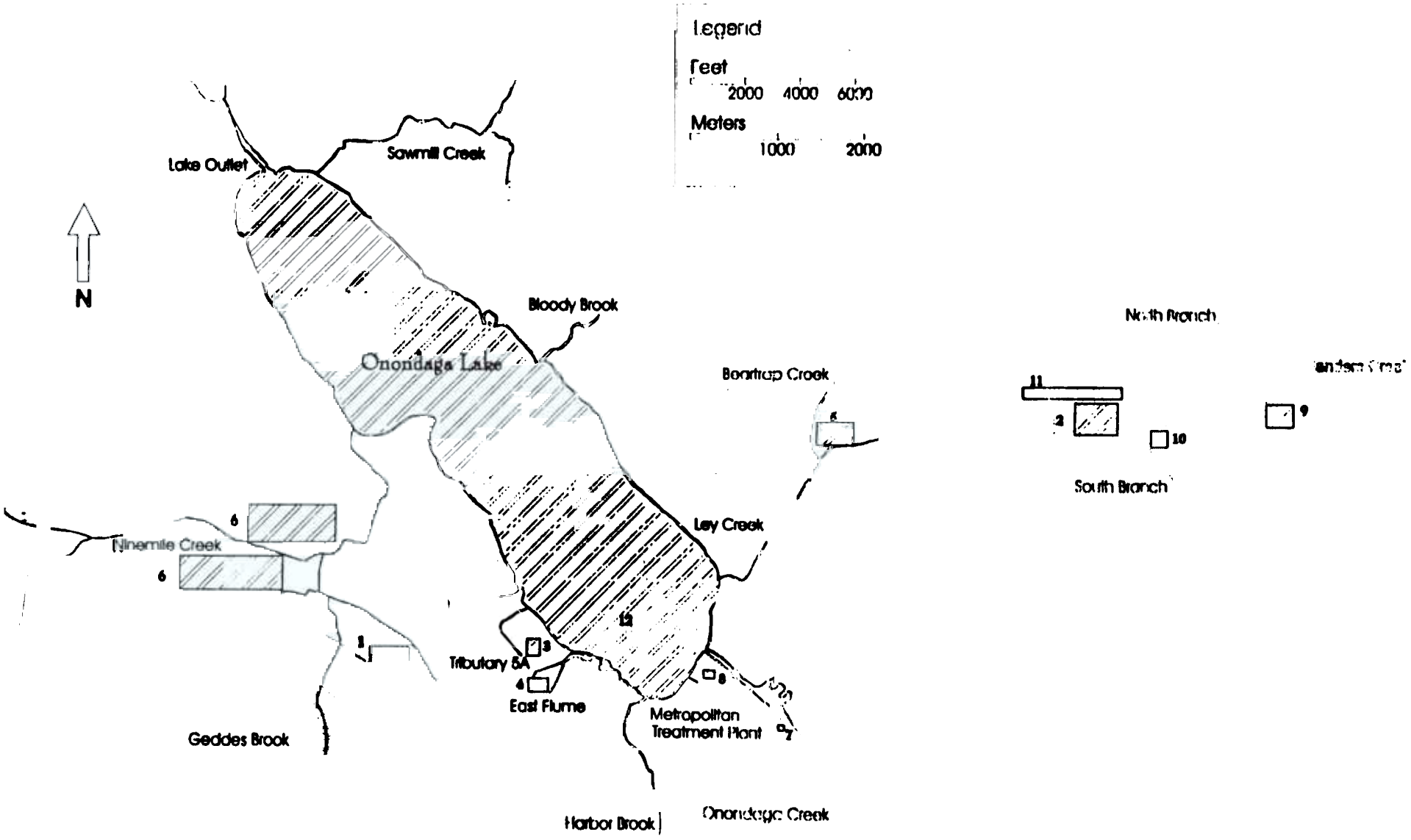

FIGURE 1

Because of the Onondaga Lake NPL site's large size and complexity, the basic approach that will be used for its remediation, will be to divide the site into manageable units which can be addressed on a focused basis. The division of units will be determined by virtue of their physical nature; e.g., geographic separation, specific contaminants, specific PRP's, etc. These areas will be referred to as "subsites" or "potential subsites". Each subsite will comprise one or more operable units of the NPL site. This approach will enable discrete remedies to move forward independently rather than waiting for the full suite of NPL site remedies to be determined. Further discussion of potential subsites and subsites is found in Section IV.

The Site, which has yet to be fully defined, is comprised of Onondaga Lake, its tributaries and a number of different State listed inactive hazardous waste sites and other areas of concern (AOC) which have been determined to be subsites. Some of these sites and AOC are along the Lake shore while others are along the Lake's tributaries. A number of these have remedial programs ongoing which commenced prior to the Lake's NPL listing. In order to avoid duplication and delay, and to ensure that individual subsite remedies are compatible and consistent with other subsite remedies, and the overall NPL site strategy, a basic component of the remedial program for the Onondaga Lake NPL site is to integrate this past and ongoing remedial work at subsites with any future remedial work at other subsites.

Another key element of the CRI/FS program is the possible implementation of Interim Remedial Measures (IRMs) at subsites. An IRM will be considered when there is a need to lessen

an obvious hazardous substance risk to the public health or the environment because of actual or threatened release of a hazardous substance from a subsite. IRMs are intended to be temporary rather than final remedial responses, however, the IRM will often serve to reduce the scope of the final remedy. IRMs which will eliminate or reduce active releases or sources of hazardous substances to the Onondaga Lake system are anticipated. The use of IRMs becomes particularly beneficial when addressing a site like Onondaga Lake which has vast and complex "residual" contamination problems which require extensive data gathering and highly sophisticated analyses in order to determine the appropriate remedy

As the various subsite and potential subsite remedial programs progress, the resultant data and information will be integrated and coordinated within the CRI/FS Utilizing this integrated system, the NYSDEC will determine if any data gaps or other informational needs exist which must be addressed in either existing subsite programs, subsite programs presently being developed, future subsite programs, or in additional subsites not yet established. To assist with the needed data and information integration, a special Analytical and Informational database and Geographical Information System (GIS) is being developed. The data gathered from the various subsites will serve as input to the database in a way that is readily accessible for use in the remediation of other subsites and/or the entire NPL site

Each subsite remedial program will consist of an Remedial Investigation/Feasibility Study (RI/FS), a proposed plan (PRAP) which identifies the preferred remedy and the basis for that

preference, a ROD selecting a remedy for the subsite, followed by a remedial design and a remedial action. Once the last subsite ROD is issued, the CRI/FS for the NPL site can be completed. However, it must be ensured that the sum of the various subsite RI/FSs and the corresponding RODs and RD/RAs result in the remediation of Onondaga Lake. Having determined this, the CRI/FS and its ROD will essentially be a summarizing document describing and demonstrating how, with the remediation of the subsites, the threats to human health and welfare and the environment of Onondaga Lake have been reduced to acceptable levels.

Since the project will require fieldwork, a general Field Activities Plan and Health and Safety Plan have been developed and are provided in Appendix A and B respectively. Site-specific field activity plans and health and safety plans will be issued and approved or accepted for each potential subsite and subsite before any field activities are undertaken.

Since it is likely that the site will consist of a number of subsites, many of which have not been yet defined, the remediation of the total site will require a number of years. An overall schedule is provided in Appendix D.

At appropriate times during the execution of the project, DEC will hold public meetings and public availability sessions, mail newsletters, etc., to inform the public of the project remediation objectives, planned and ongoing remediation activities, and status of the subsites, and; will receive public comment on the proposed plans for the remediation of the subsites. A Citizen

Participation Plan describing these efforts has been issued.

C. Organization

Since the DEC has been pursuing the remediation of Onondaga Lake for a number of years, DEC and EPA have agreed that this project be a State~lead project. Recognizing that the site consists of Onondaga Lake and many subsites and many different potentially responsible parties (PRPs) are involved~ DEC proposes to provide the following organization to manage the project.

A coordination team, that will consist of three Task Leaders, will be established that will perform the management and coordination of the entire NPL site project. This team will be responsible to the Project Team Manager who, in turn, will be responsible to the Project Director Each subsite or potential subsite will be assigned to a Remedial Project Manager, who will be responsible to the coordination team. All supporting divisions (Division of Water, Division of Fish & Wildlife, etc., and all consultants,) will report to the coordination team The project's Coordination Plan is provided in Appendix E.

D. Quality Assurance

The QA/QC protocols used by the EPA in its Superfund Program and the NYSDEC in its remedial program, which ever is more stringent, will also be utilized for the Onondaga Lake NPL site remedial program. The site -specific quality assurance requirements will be performed in accordance with the Quality Assurance/Quality Control Plan as found in **Appendix C.** All data

will be reviewed by the DEC Project QA/QC officer.

IV. Subsite Approach

The geographic extent of the NPL site will be based upon locating all sources which have released, are releasing or threaten to release a hazardous substance to the Onondaga Lake system. The DEC will search for and investigate these potential sources and determine whether to designate them as subsites of the Onondaga Lake NPL site.

The determination of a given area as a Subsite of the Onondaga Lake NPL site will be based on information which indicates that there is a release of or a threat of release of hazardous substances into the Onondaga Lake system (i.e., the lake or its tributaries). A threat of release is a condition whereby a release is likely in the absence of any mitigative measures. Those areas which are known to exhibit a release or threat of release of hazardous substances into the Lake system will be considered Subsites of the NPL site.

If information on a given area indicates that there <u>may</u> be a release or a threat of release and if additional information beyond the CERCLA §104(e) scope and other available information (i.e., NYSDEC files, reports, databases, other governmental files) is needed in order to make a determination that the area is or is not a subsite, the area will be considered a potential subsite

A. Identification of Subsites/PRPs

Determination of subsites, in part, will be based upon the review of information provided to the State and EPA by companies responding to a request for information letter pursuant to CERCLA § 104(e). The letter requests information relating to a facility's processes, waste streams, disposal practices, data reports, investigations, etc. Review of this information, and other available information (e.g., NYSDEC files, databases, reports, other governmental agency reports and data), will assist the State and EPA in determining the facilities and areas which will be designated as subsites or potential subsites. Reports will be generated which will summarize the significant factors which led the State and EPA to consider an area to be a subsite or a potential subsite. Figure 2, found on the following page, depicts a decision tree for subsite and potential subsite determination.

The procedure for subsite determination will include these steps:

1.) Send 104(e) letter to companies, or property owners/operators for which there is a reasonable basis for concern, based on DEC's review of available information, regarding the possibility of past, present or threatened release of hazardous substances due to its handling by or involvement of the above entities.

2) Review response, send out supplemental information requests, as appropriate, and accumulate additional information from agency files and databases. This additional information would include NYS Inactive Site Registry information, SPDES data, RCRA data, information from past reports and data gathering such as from Onondaga Lake Management Conference, Onondaga

Subsite Determination Process

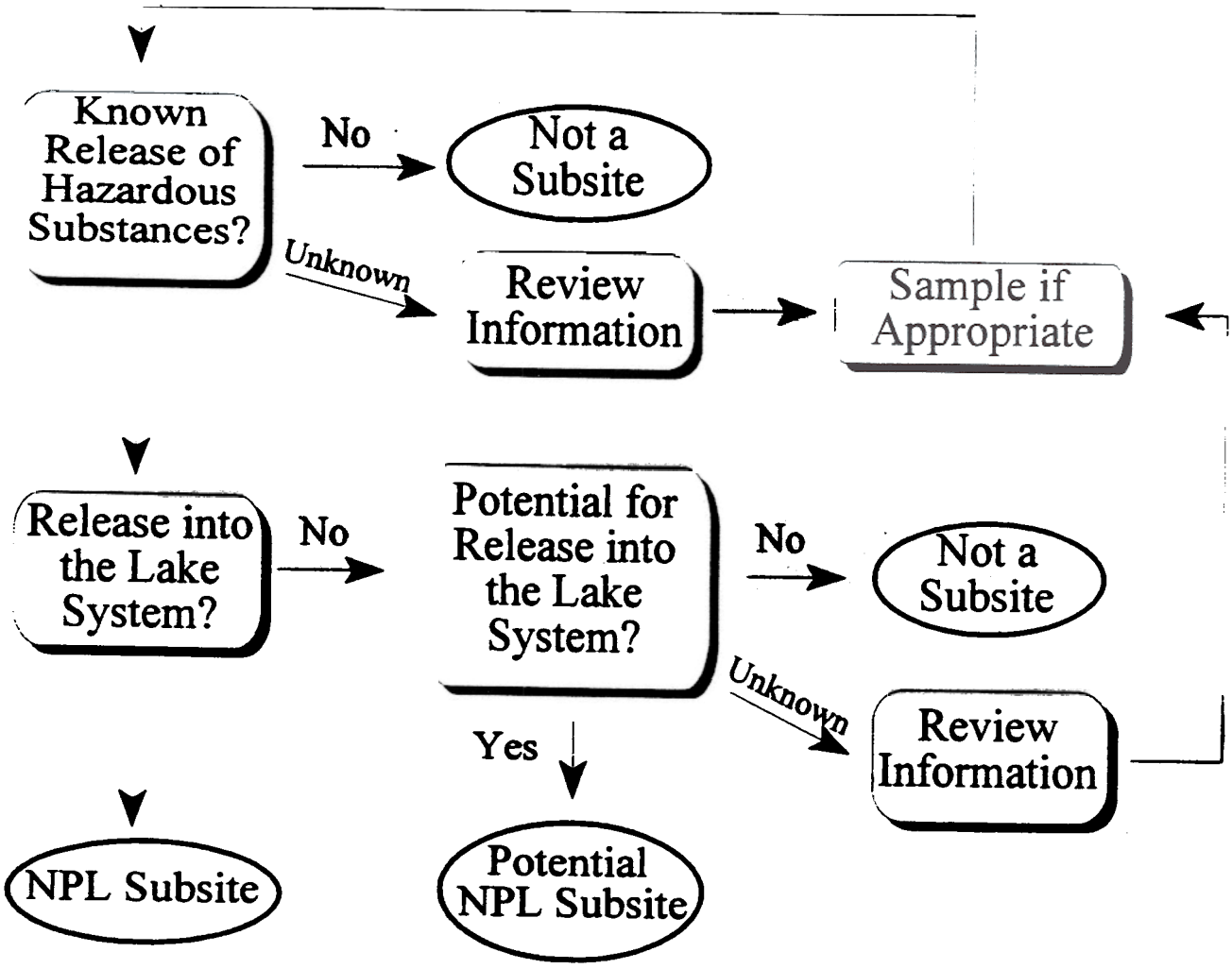

FIGURE 2

County etc.

3 Evaluate all information to determine the possibility of a hazardous substance being released, threatening to be released or having been released from a facility or area. A "Site Summary Report" will summarize the factual information that was collected for the site and its evaluation in determining whether a hazardous substance is being, is threatening to be released, or has been released into the environment from the facility or area will be issued. Data associated with non-hazardous substances will be included to the extent available or needed for determining appropriate referrals to other NYSDEC programs.

4.) Based on the "Site Summary Report", a determination will be made as to status (subsite, potential subsite, or other) of the facility or area of concern. Considerations in this determination will include

a.) the type of substance either known or suspected of being released or threatening to be released into the environment.

b.) the mobility and toxicity of the substance(s)

c.) the proximity of the contaminated media to the Onondaga Lake system

d. whether there is a release or threat of release into the Onondaga Lake system.

5.) Action will be taken following such determination as follows:

a.) Upon determining that a facility/area is releasing or threatening to release a

hazardous substance that presents a threat to the Onondaga Lake system, it will be designated a subsite. NYSDEC will then enter into a consent order with the subsite PRP to perform an RI/FS that will lead to a ROD and a remedial action for the subsite.

b.) Upon determining that the information in the Site Summary Report is not adequate to determine that a facility/area is releasing or threatening to release a hazardous substance(s) to the Onondaga Lake system, but there is a reasonable cause for concern that it is, the facility/area will be designated a potential subsite and the PRP of the facility/area will be requested to collect additional data (e.g., confirmatory sampling, preliminary site assessment (PSA), RI/FS, etc.) to allow a determination of its status.

c.) Upon determining that a facility/area is not releasing or threatening to release a hazardous substance (s) to the into the Onondaga Lake system, the facility/area will no longer be a subsite or potential subsite of the Onondaga Lake NPL site.

d.) Upon determining that a facility/area is not releasing or threatening to release a hazardous substance(s) into the Onondaga Lake system, but it is a cause for concern to the public health and/or the environment, the facility/area will not be or will no longer be designated a subsite or potential subsite. However, it will be referred to the

appropriate NYSDEC program for further action

B. Subsite Objectives

Subsites will be investigated in accordance with CERCLA, the NCP and pertinent DEC guidance. The primary enforcement tool which will govern the performance of the subsite PSAs and RI/FSs will be a consent order between DEC and the respective potentially responsible party (PRP). Where negotiations with the PRPs to perform a PSA or RI/FS fail, and the NYSDEC undertakes the activities, using funds provided in the cooperative agreement, cost recovery proceedings will be initiated by NYSDEC. The subsite investigation will proceed through the feasibility study phase to a Record of Decision for the given subsite which will also address off-site impacts as appropriate. During the RI, some subsites may be found to have significant sources of contamination to the lake system. Some such sources may be readily mitigated. If feasible, an IRM will be developed and implemented as soon as practicable. After the subsite Record of Decision is issued, the subsite will undergo remedial design and remedial action to mitigate the environmental and public health concerns related to the hazardous substances at the subsite and those that have migrated from the subsite.

Upon completion of all subsite Records of Decision, a final Record of Decision will developed for the entire NPL site. This ROD will indicate how all environmental and public health concerns have been or will be mitigated to the extent feasible.

APPENDIX A

SUPERFUND STANDBY PROGRAM
New York State
Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233-7010

CRI/FS
FIELD ACTIVITY PLAN
ONONDAGA LAKE PROJECT
Site No. 734030-002

Work Assignment Number
D003060 - 9

Prepared by

TAMS CONSULTANTS, Inc.
400 Clifton Corporate Park
Clifton Park, NY 12065-3829

APPROVED
OCT

2/25/95

December 1994

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ONONDAGA LAKE PROJECT
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1.0 INTRODUCTION

1.1 Purpose of the Project

The NYSDEC has issued this Work Assignment No. D003060-9 to secure the services of TAMS Consultants, Inc. to assist in the Department's Onondaga Lake Project (OLP). The site is the Onondaga Lake NPL Site, NYSDEC No. 734030-002. For the purpose of this Work Plan, the Onondaga Lake NPL Site will be referred to as the NPL Site. Although USEPA has nominated the Onondaga Lake System to be listed as an NPL site, as of this writing it is not formally designated as an NPL site. It is anticipated that the nomination and designation process will be completed before the close of 1994.

The objective of this Work Assignment is to facilitate the environmental restoration of Onondaga Lake by assisting the NYSDEC in assessing, selecting and implementing appropriate remedial measures for the NPL Site.

.2 Site Description and Background

The Onondaga Lake NPL site is located in the County of Onondaga, New York. The lake itself is only one portion of the site, as the site will include all areas within the watershed where hazardous substances have come to be located that are impacting or have potential to impact the lake system.

The lake is 4.5 miles long, 1 mile wide and up to 60 feet deep. Major tributaries flowing into the lake include: Onondaga Creek, Nine Mile Creek, Ley Creek, Sawmill Creek, Bloody Brook and Harbor Brook. Another major source of inflow to the lake is the treated effluent from the Metropolitan Sewage Treatment Plant (METRO). The outlet of Onondaga Lake flows into the Seneca River which ultimately flows into Lake Ontario. See Figure 1-1. Figure 1-2 shows the Onondaga Lake watershed area.

The shoreline of the lake is owned entirely by government agencies or commercial enterprises. There is no residentially owned shoreline. The City of Syracuse lies to the east and southeast of the lake. The southwestern shoreline is comprised primarily of wastebed material disposed of by soda ash manufacturing facilities. The northeastern shoreline is mainly park land owned by Onondaga County. See Figure 1-3.

In the 1800's, the lake supported commercial fishing and was known for its resorts. Beginning in 1884, the Solvay Process Company started manufacturing soda ash at facilities along the shoreline. The soda ash company used the shoreline areas to dispose of the manufacturing by-products. These wastebeds now comprise a significant portion of the southwestern shoreline and are as high as 60 feet above lake surface.

In 1918, the Syracuse Chemical Works commenced operation of a chlor-alkali plant at

Willis Ave., Solvay. In 1947, the plant expanded to include mercury cells for this process. Although not a reactive part of the process, mercury still found its way into the waste stream emanating from the plant. The waste stream ultimately discharged to Onondaga Lake. In 1953, another chlor-alkali plant, owned and operated by Allied-Signal, Inc., located on Bridge Street in Solvay, began operation using the mercury cell process. The Syracuse area has been host to a variety of industrial manufacturing, including pharmaceutical , plating, cutlery and steel companies.

In 1970, the NYSDEC banned fishing on the lake due to high levels of mercury found in the fish. In 1984, the ban was lifted and changed to a health advisory recommendation that no fish be eaten.

Local municipal works contribute pollutants to the lake as well. These include combined sewer overflow (CSOs) discharges caused by large storms, and the Metropolitan Sewage Treatment Plant effluent discharge. METRO's owner, the Onondaga County Department of Drainage and Sanitation (OCDDS), has been required via a U.S District Court order to reduce pollutant loadings to the lake.

In May, 1993, the Onondaga Lake site was nominated to the National Priorities List. The USEPA has given New York State Department of Environmental Conservation lead agency status to perform an RI/FS for the Site. The site will encompass numerous subsites that lie within the lake watershed and are adversely impacting or may impact the lake system.

1.3 Onondaga Lake Management Conference (OLMC)

The U.S. Congress created the Onondaga Lake Management Conference (OLMC) in 1990 (Public Law 101-596, Section 401) and charged it with responsibility for:

> the development, in the two-year period beginning on the date of the enactment of this Act, of a comprehensive restoration, conservation and management plan for Onondaga Lake that recommends priority corrective actions and compliance schedules for the cleanup of such Lake; and

2. the coordination of the implementation of such plan by the State of New York, the Army Corp of Engineers, the Environmental Protection Agency, and all local agencies, governments, and other groups participating in such management conference.

The completion of the Onondaga Lake Management Plan represents the fulfillment of the OLMC's initial responsibility to develop a plan of action for restoring the ecological health and recreational uses of Onondaga Lake. The Plan is intended to be dynamic, to spur action and to support the OLMC's second responsibility: the implementation of the

recommendations contained in the Plan.

The OLMC's authority, with regard to analysis of Onondaga Lake and creation and implementation of the Plan, is separate from NYSDEC's lead agency responsibilities for developing and implementing an RI/FS for the Lake system.

1.4 Project Description

The major Tasks comprising the Onondaga Lake Project are listed below. These Tasks are described in Section 2.0 of this Field Activity Plan.

1-A. Scoping and Work Plan development
1-B. Acquisition of specialists through subcontract
2. Site-wide ecological and human health risk assessment (RA)
3. Comprehensive analytical database (DBMS)
4. Data validation
5. Compilation, review and reporting of 104(e) results
6. Financial assessment of PRPs
7. Review subsite Remedial Investigations (RI)
   Perform TAMS-conducted non-PRP financed RIs
   Prepare comprehensive RI report (CRI)
8. Review subsite Feasibility Studies (FS)
   Perform TAMS-conducted non-PRP financed FSs
   Assist DEC with Proposed Remedial Action Plan (PRAP)
9. Assist DEC in preparation of final Record of Decision (ROD)
10. Support DEC's Citizen Participation program
11. Remedial Design/Construction Services (RD/CS)
    Interim Remedial Measures (IRM)

The Work Plan is a series of related documents that describe all of the work to be accomplished over the duration of the Onondaga Lake Project. Work Plan documents include:

1. Field Activity Plan (FAP) - will describe proposed activities, methods, procedures, results and deliverables for each Task;

2. Quality Assurance/Quality Control (QA/QC) Plan - will describe the procedures that TAMS and its subcontractors will use to verify that approved procedures are being followed and that the results of those procedures are valid. This will include such activities as sample collection and shipment, laboratory analytical work, computational methods, and data entry (especially re: Task 3, DBMS);

3. Health and Safety Plan (HASP) - will describe procedures to protect the

health and safety of TAMS and its subcontractors, and the general public during the conduct of field work. The initial HASP will be generic to the entire NPL Site. Subsequent subsite-specific or procedure-specific amendments will be prepared as required; and,

The annual Project Management Plan (PMP) will describe the work to be done each calendar year and will include the appropriate scope of work, schedule and budget.

SCOPE OF THE PROJECT

Task 1: Work Plan

Task 1-A: Scoping and Work Plan Development

TAMS will prepare all Work Plan documents as described above in Section 1.4, including: the initial PMP, annual updates and amendments, as necessary; and, the comprehensive project Work Plan and amendments, as necessary.

TAMS will participate in an initial site visit with NYSDEC

Task 1-B: Acquisition of Specialists through Subcontract

Immediately upon issuance of the Work Assignment, TAMS will initiate subcontract procurement of an expert experienced with the many limnological aspects and related modeling of Onondaga Lake. The scope of work for this subcontractor (specialist firm) will include review of models and technical documents related to the RI/FS work and participation in meetings as deemed necessary by the NYSDEC. The subcontract is to run for the length of the TAMS standby contract term, and will be set up such that the Department will have open and free access to the specialist firm.

TAMS will also acquire additional specialists on an as-needed basis, as determined by the NYSDEC.

The scope of work for subcontract specialists appears under the appropriate technical Task(s) below.

2.2 Task 2: Site-Wide Risk Assessment

The methods and procedures for risk assessments outlined herein and elsewhere in the Work Plan documents, pertain to initiating and performing risk assessments (RA), as well as reviewing risk assessments performed by others. Therefore, the details of a risk

assessment are presented first, followed by a summary of the review process.

The site-wide RA will serve as the basis for risk management (RM) of Onondaga Lake during remediation of the lake system environment. Information obtained during remedial investigations, or other site characterizations, will serve as the basis for conducting the risk assessment portion of Risk Information Activities in agreement with the RI/FS process. Evaluation of data during the RI assesses exposure, and when combined with available toxicity information produces a risk characterization.

In accordance with CERCLA and the NCP, and after discussions with personnel from the NYSDEC and NYS Department of Health Bureaus of Exposure Assessment and Toxicity Assessment, guidance for preparation and evaluation of risk assessments under Superfund will use the following documents:

USEPA. Risk Assessment Guidance for Superfund. Volume 1
Human Health Evaluation Manual. Part A.
EPA 540/1-89-002; December, 1989 (NTIS PB90-155581).

USEPA. Risk Assessment Guidance for Superfund. Volume II
Environmental Evaluation Manual (Interim Final).
EPA/540-1-89-001; March, 1989 (NTIS PB90-155599).

USEPA. Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference. EPA/600/3-89-013 (March, 1989).

USEPA. Exposure Factors Handbook. Office of Health and Environmental Assessment, Washington, D.C. July, 1989.

U. S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry
Health Assessment Guidance Manual (July, 1990, Draft for Public Comment).

USEPA. RAGS Volume I: Human Health Evaluation Manual Supplemental Guidance. Standard Default Exposure Factors. OSWER Directive 9285.6-03. March 25, 1991.

USEPA. Supplemental Guidance to RAGS: Calculating the Concentration Term. OSWER 9285.7-081. May, 1992.

USEPA. Dermal Exposure Assessment: Principles and Applications. OSWER. EPA/600/8-91/011B. January, 1992.

USEPA. Provisional Guidance for Quantitative Risk Assessment of Polycyclic

Aromatic Hydrocarbons. EPA/600/R-93/C89. July, 1993.

USEPA. Integrated Risk Information System (IRIS); On-line Service. 1994.

USEPA. Health Effects Assessment Summary Tables (HEAST), Annual FY 1994. OSWER EPA/540/5-94/020.

Also used by TAMS for guidance are:

USEPA. Assessing Human Health Risks from Chemically Contaminated Fish and Shellfish: A Guidance Manual. EPA-503/8-89-002, September, 1989; Office of Marine and Estuarine Protection.

USEPA Guidance for Data Useability in Risk Assessment, Interim Final. EPA/540/G-90-008, October, 1990.

NYSDEC Technical Guidance for Screening Contaminated Sediments, November, 1993.

Deliverables will include textural descriptions supporting the tabulated and/or graphical data, that clearly establish priorities for decision makers to proceed further in the process of risk management. The usability of the document will be enhanced by a straight forward, step-by-step approach taking the reader through the process of eliminating uneventful circumstances and focusing on significant risk situations. Specific changes to scopes of work to continually make the deliverables more useful to the end-user will be included in annual Project Management Plan updates.

2.2.1 Human Health Risk Assessment

The role of human health evaluation in risk assessment is to provide an analysis of risks at a site and provide a basis for determining potential health impacts of chemicals on-site, with and without remediation. A risk assessment integrates the data collected from various media (e.g., groundwater, soil, air, waste) and determines potential chemicals of concern. The role of the human health evaluation in the Superfund remedial process is shown in Figure 2.2-1.

Chemicals of concern are targeted based on remedial investigation data and available historical data. An Exposure Pathway Analysis Report will be prepared and finalized before the Risk Assessment portion of the Remedial Investigation begins. This report will describe potential pathways of concern, the receptors that will be evaluated, and the exposure parameters that will be used in the risk calculations. Once chemicals are determined, a toxicity assessment is made to evaluate the potential carcinogenic and non-

carcinogenic effects of each compound. Toxicity values will be taken from EPA's Integrated Risk Information System (IRIS), the Health Effects Assessment Summary Tables (HEAST), and the Environmental Criteria Assessment Office (ECAO).

A conceptual model consisting of source, pathway and receptor variables, and hypotheses to be tested will be evaluated. The exposure assessment based on contaminant fate and transport scenarios (an example for soil and groundwater is shown in Figure 2.2-2) combined with endpoint receptor assumptions such as chemical concentration, ingestion/adsorption rate, and exposure frequency and duration produces an estimate of substance intake and characterization of risk (Figure 2.2-3). With any such characterization there are different degrees of uncertainty to different aspects of the risk characterization (Figure 2.2-4). These uncertainties will be evaluated and discussed with respect to potential effects on the overall estimated risks. These figures are only examples; all such conceptualization will take into account known and potential pathways to include all appropriate endpoints.

2.2.2 Ecological Risk Assessment

The ecological risk assessment contains many similar components to the human health evaluation. Initially, a problem, or conceptual framework, is formulated to determine the approach of the ecological assessment. This framework: 1) qualitatively evaluates contaminant release, migration and fate; 2) identifies contaminants of ecological concern, receptors, exposure pathways and known effects; 3) selects endpoints of concern; and 4) specifies objectives and scope.

Contaminants are evaluated to determine potential ecological effects; toxicity values are taken from the literature, toxicity testing or field studies. If a species or habitat is considered sensitive (i.e., rare or endangered), then appropriate safety factors are applied when determining a toxicity value.

An exposure assessment is performed that characterizes selected species (receptors) and quantifies contaminant release, migration and fate. Exposure point evaluation considers the properties of the contaminant, the nature of the receptor and the way the organism assimilates it, and the physical properties of the media; this all must take into account the behavior of an organism and its life history. If the contaminant bioaccumulates or bioconcentrates, effects should be examined at least two trophic levels (e.g., producer, herbivore, carnivore). Both direct and indirect effects of conditions in the lake, and impacts on terrestrial and avian receptors (as through the food chain), or others secondarily affected by lake conditions, will be considered.

Risk characterization determines whether current or future impacts can be predicted based on available information, and discusses uncertainties associated with the assessment and how those uncertainties may affect the conclusions. Finally, the risk characterization

interprets the findings in terms of ecological significance, considering factors such as the nature and magnitude of effects, the spatial and temporal distribution of the effects, and the potential for recovery.

Although EPA has developed the March 1989 guidance referenced above, that document offers very little beyond an introduction to ecological terms and generalities. In February 1992 EPA released three documents stemming from a risk assessment forum. These documents will be used for guidance in performing risk assessments, and reviewing and establishing PRP risk assessment useability:

> USEPA. Framework for Ecological Risk Assessment EPA/630/R-92/001.
>
> USEPA. Report on the Ecological Risk Assessment Guidelines Strategic Planning Workshop EPA/630/ /R-92/002.
>
> USEPA. Peer Review Workshop Report on a Framework for Ecological Risk Assessment EPA/625/3-91/022.

The ecological risk assessment will be prepared in a phased approach as described in EPA's Update Developing a Work Scope for Ecological Assessments (Volume 1, No. 4, May, 1992/Publication 9345.0-05I). This will include interim work products such as initial site descriptions, initial field surveys, reports on specific studies such as toxicity test results or field data.

In addition, TAMS will utilize EPA's Wildlife Exposure Factors Handbook (2 vols.; EPA 600/R-93/18: 7A & 7B).

Formats for the ecological risk assessment are not as well defined as human health risk assessments. Having examined the state-of-the-science relative to the theories and principles available for assessing risks at the various levels of ecological organization, EPA work groups were charged with determining the feasibility of conducting ecological risk assessments in aquatic and terrestrial ecosystems. The groups focused on determining which methods and models are currently available for assessing the risk from both chemical and nonchemical stresses. [Figure 2.2-5 (taken from document EPA/630/R-92/002 referenced above) presents a matrix of the feasibility of utilizing various ecological effects endpoints assessing the utility of methods and interpretation of results stemming from these methods.]

In addition, ecological RAs should follow the guidance and outline of NYSDEC's Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites, June 18, 1991, or any update of this document during the life of the project.

Additional information will also be obtained from EPA documents such as ECO Update

and BTAG Forum which are published on an on-going basis as a continual update for ecological risk assessment guidance.

2.2.3 PRP Risk Assessment Review and Summary

The EPA Volume 1/Part A manual contains a Suggested Outline for a Baseline Risk Assessment Report which has been modified into a checklist (draft Figure 2.2- 6). This will serve to confirm whether or not the appropriate sections of the PRP reports were present and complete, not necessarily about value judgement attributed to them. A companion summary is shown in draft Figure 2.2-7. EPA also provides a Reviewer Checklist (Appendix 2.2-1), which will serve as guidance in reviewing and summarizing risk assessments performed by others, as well as for preparing TAMS-lead RAs. All issues referenced in the checklists, as well as any site-specific issues not currently addressed, will be so addressed even if not mentioned in EPA's Reviewer Checklist. These are living documents that can grow and adapt to the objectives of the project.

For ecological RAs, the various aspects looked at have been put into checklist form (draft Figure 2.2-8) that will be used to accompany a narrative summary of PRP ecological risk assessments.

Additional verification will be checking assumptions, toxicity values and a subset of calculations to determine if calculations and conclusions have been satisfactorily determined. For ecological RAs, TAMS will evaluate the professional judgement used, and determine if a valid assessment has been made.

2.3 Task 3: Comprehensive Analytical Database

TAMS will develop and maintain a comprehensive analytical database. The database will be an organized collection of information which will provide a comprehensive means for electronically filing, i.e., storing and retrieving, sampling information and environmental data, including historical data and current PRP-generated data. The database will consist of computer files that store information in the form of tables, where data are accumulated in rows (records) and columns (fields). The database will be relational in nature to allow for relationships or links among multiple database tables based on common fields, utilizing the powerful RQBE (Relational Query By Example) feature available in FoxPro.

TAMS will assemble the environmental data in an accessible format for use in site-wide activities, including the Remedial Investigation (RI), Risk Assessment (RA), and Feasibility Study (FS), as well as for potential fate and transport modeling of contaminants of concern. The database will be organized by data set and environmental medium and the tables will be organized into several basic elements, including chemical concentration data, sampling information, and reference information. Figure 2.3-1 presents a broad overview of the database parameters including the potential information

that will comprise the database as well as possible sources of data.

The analytical database for Onondaga Lake will be modeled after the TAMS/Gradient Hudson River PCB database developed for the Hudson River PCB Reassessment RI/FS for USEPA, Region II, under an ARCS Superfund contract. The RI/FS is being conducted to reassess USEPA's 1984 No-Action Record of Decision concerning PCB-contaminated sediments in the Upper Hudson River in New York State. That database consists of nearly 300,000 data records, including historical data (NYSDEC, NYSDOH, USGS, USEPA, etc.), data from investigations conducted by the PRP (General Electric Co.), and data from investigations conducted by TAMS and our subcontractors for USEPA. The Hudson River database is currently being used for risk assessment, modeling, and feasibility study activities. A menu-driven querying program was developed to perform efficient searches throughout the entire relational database, allowing for output of the required data from the database for input to statistical and graphical programs. A Geographic Information System (GIS) utilizing the Hudson River PCB database has also been used to perform various tasks, including mapping sediment hot spots and results of geostatistical analyses, PCB concentrations, bathymetry, and sediment texture.

2.3.1 Preliminary Database Structure

It is envisioned that the Onondaga Lake analytical relational database will consist of three master tables as defined below. The tables are preliminary in nature and will be modified as the project progresses. Subtables, to be developed, will be required in the analytical database which will link to certain fields in the three master tables. Also, certain fields will be defined, as described below, to allow for linkage between the analytical database (Task 3) and the 104(e) (Task 5) database. Pull-down menus or pop-up lists containing information to be included in the database for a specific field, e.g., standard pollutant/contaminant or hazardous waste names for the **Parameter** field, will be developed and incorporated into the database, where possible, to allow for efficient and consistent data entry. TAMS will also develop, as needed, programs to translate electronic data files from outside sources, e.g., a PRP's analytical database or spreadsheets, to TAMS' Onondaga Lake database. In addition, certain fields will be incorporated into the analytical database, as defined below, which will allow for a linkage between the databases and TAMS' or NYSDEC's Geographic Information System (GIS). The following tables labeled CONVENT and CONTAMIN could be combined if the resulting file is not too large.

Proposed Table:	**STATIONS**
Description:	This master table will uniquely define each environmental sample by date of collection, sampling organization, sample location, environmental medium, etc.
Proposed Field Name	Description
• **TAMS_Sample_ID**	Sample identifier designated by TAMS; this ID will be unique for a given environmental sample for a specific location, time, matrix, and data source. This will be a common field in all three master tables which will allow relationships or links among the tables.
• **Company_ID**	Sampler identifier designated by TAMS. This will identify the group (private company, agency, institution, etc.) collecting the sample. This field will be common to both the analytical (Task 3) database and the 104(e) (Task 5) database and will allow for linkages among the tables in both databases. As described below, the 104(e) database will, in addition to identifying and coding PRPs and their facilities/sites, include other agencies, institutions, or firms, conducting investigations in the watershed.
• **Company_Sample_ID**	Sample identifier designated by sampler.
• **Sample_Date**	Date of sample collection (month/day/year).
• **Sample_Time**	Time of sample collection.
• **Sample_Matrix**	Identifies the environmental medium of the sample, including surface water (whole water or total, dissolved fraction, or particulate fraction), groundwater, soil, sediment (solids and porewater), air, biota (fish species), and wastewater (sewage and industrial effluent, CSOs, etc.).
• **Location**	General sample location of waterbody or drainage basin, e.g., Onondaga Lake (lake sample), Nine Mile Creek (tributary sample), Nine Mile Creek drainage basin (land-based sample or sample from an unnamed tributary to Nine Mile Creek), etc. For wastewater sample from CSO or treatment plant outfall, location would be name of receiving water.
• **Northing**	Defines sample location (y coordinate); coordinate system based on NAD 27 datum, New York Transverse Mercator coordinate (NYTMN). This will provide a means to "map the data" in GIS.
• **Easting**	Defines sample location (x coordinate); NYTMN.

• **Survey**	Descriptor of the manner in which the coordinates were determined and the accuracy thereof, i.e., field survey, GPS, etc.
• **Base_Elevation**	Defines sample location (z coordinate); elevation referenced to USGS/NGVD datum.
• **From_Increment**	Distance below surface (ground surface, water surface, or sediment/water interface); will define depth of sample (groundwater/soil, surface water, or sediment, etc.); referenced to USGS/NGVD datum.
• **To_Increment**	Distance below surface, e.g., surface-sediment sample from 0 inches (at sediment/water interface) to 6 inches (6 inches below sediment/water interface); or depth interval for a vertically-composited surface water sample.
• **Unit_Increment**	Unit of the increment (cm, inches, ft, etc.).
• **Reference Point**	The type of reference point from which the increment is measured, i.e., ground surface (or top of well casing for groundwater sample), water surface, or sediment/water interface. For sediment samples, unless bathymetric data are available, water-surface elevations and water depths would be needed to determine a base elevation.
• **Sample_Description**	Any additional text to define the sample, e.g., river mile location on a tributary; can also include maps or site plans, e.g., well locations, which can be scanned into the database.
Input_Source	Identifies TAMS (or other) person entering data record.
Feature	Identifies the type of feature from which the sample was collected. e.g., lake, river, soil, groundwater, wetland, manhole/sewer, wastewater outfall, stormwater outfall, combined-sewer overflow (CSO), etc.
• **Basin**	NYSDEC numerical code for basin or sub-basin.

Proposed Table:	**CONVENT**
Description:	Results of analyses for conventional parameters will be reported in this table, as well as information on validation and qualifiers.

Proposed Field Name	Description
TAMS_Sample_ID	Sample identifier designated by TAMS; link to **STATIONS** table
• **Parameter**	Conventional and physical parameter code, including DO, BOD_5, TKN, TOC, bacteria/coliform, pH, conductivity, water depth, secchi depth, density, flow/discharge, fish length, fish weight, percent lipid, etc. The DHWR Parameter Identification List (PID) will be used as a pre-defined list of parameters. The PID electronic file will be appended to accommodate additional parameters and will be linked to the **Parameter** field.
• **Value**	Concentration or other value
• **Unit**	Units of measurement (mg/L, cfs, etc.)
• **Qualifier**	Data qualifier, if applicable; this will be linked to a subtable which defines the qualifier code
Technique	Analytical method used
• **Validation**	Validation status, if applicable
• **Validated_By**	Name of firm/agency performing validation, if applicable
• **Laboratory**	Name of laboratory performing analysis
• **Split**	Non-blank entry denotes a laboratory duplicate or split sample
Analysis_Date	Date of analysis, if not identical to date of collection (as defined in **Sample_Date** field in **STATIONS** table above)

Proposed Table:	**CONTAMIN**
Description:	Results of analyses for contaminants/pollutants (non-conventional parameters) will be reported in this table, as well as information on validation and qualifiers.

Proposed Field Name	Description
• **TAMS_Sample_ID**	Sample identifier designated by TAMS; link to **STATIONS** table

• **Parameter**	Non-conventional parameter code, including organic compounds (PCBs), inorganics/metals (mercury), pesticides (DDT), etc. This field will provide a linkage to the 104(e) database and hazardous waste identification table. The DHWR Parameter Identification List (PID) will be used as a pre-defined list of parameters. The PID electronic file will be appended to accommodate additional parameters and will be linked to the **Parameter** field.
• **Parameter_Category**	Pollutant category, e.g., organics, chlorinated organics, inorganics, metals, etc.
• **Value**	Concentration or other value
• **Unit**	Units of measurement (mg/L, µg/gm, etc.)
• **Qualifier**	Data qualifier; this will be linked to a sub-table which defines the qualifier code
• **Technique**	Analytical method used
• **Validation**	Validation status
• **Validated_By**	Name of firm/agency performing validation
• **Laboratory**	Name of laboratory performing analysis
• **Split**	Non-blank entry denotes a laboratory duplicate or split sample
• **Analysis_Date**	Date of analysis, if not identical to date of collection (as defined in **Sample_Date** field in **STATIONS** table above)

2.3.2 Database Security and Integrity

Use of both the analytical (Task 3) database and the 104(e) (Task 5) database will be by password only. Access to some of the primary (master) tables in both databases will be restricted to certain users (via a secondary password) responsible for their creation. To reduce errors, most of the search criteria or repetitive input information will be derived from "pop-up lists" taken from the master tables. The goal is to reduce typing of input and the associated errors in spelling, case, and different key words having the same meaning. A sample of a master table would be the definitions of the hazardous and industrial wastes (or contaminants) found on the project site. This technique of using a pre-defined list of information for a certain field will be incorporated into the data-entry and data-search (query) routines in both databases.

2.4 Task 4: Data Validation and Useability

The guidance followed in performing data validation pertains equally as well to reviewing data validations performed by others. An outline of the data validation process is presented here, followed by a description of a data validation review summary; full details are presented in the OLP Quality Assurance/Quality Control Plan.

Many sources of data will become available as the project develops. It is expected that information will be forthcoming from state PRP remedial investigations, CERCLA 104(e) responses, METRO, and different environmental and health, federal, state and local agencies. Validation according to EPA Functional Guidelines for routine Superfund Contact Laboratory Program (CLP) target parameters, in conjunction with NYSDEC ASP related work, will consist of a review and evaluation of the following data elements (beyond target compound identification and quantitation) typically found in remedial investigation Quality Assurance Project Plan objectives:

blanks	CRDL standards	ICP interference checks
holding times	ICP serial dilutions	tentatively identified compounds
initial calibration	lab control samples	system monitoring compound recovery
internal standards	continuing calibration	GC/MS instrument performance checks
matrix spikes	field and lab duplicates	

Review of these items is reported by the subcontractor data validator as a text with accompanying tables; TAMS chemistry staff then develops a brief data useability summary. Regardless of the degree to which one can develop a complex or complicated checklist and somehow arrive at a "grade" or "points" to validate (or invalidate) a particular run of data, final evaluation of the validity and useability is still a professional call by the experienced validator since sample data never really "stand alone", they're always dependent on their matrix.

Review of sampling plans from remedial investigations will assess whether work carried out was in agreement with the written plan(s). Based on a combination of RI review and data validation, the importance of sample issues will be summarized in a form similar to that of Figure 2.4-1, with a summary of uncertainty reported in a form similar to Figure 2.4-2. Figure 2.4-1, as shown, is an example, and site-specific reporting will include all pertinent media, including sediment, particulates, etc. While terms such as "biota" generally refer to end point receptors for risk assessment, herein they refer also to sampling and analysis issues, and problems which may affect data, such as fat in fish tissue and chitin in invertebrate exoskeletons. Similarly, this applies to the reporting in Figure 2.4-2. The various detailed aspects of data validation and qualification are presented in the OLP QA/QC Plan where validation and control are discussed for all aspects of quality work, not just laboratory data.

There may be some analytical testing methods such as those for alkyl mercuries (methyl mercury, ethyl mercury, etc.) for which there is no generally agreed upon and EPA-approved method adopted through regulation or community acceptance. Methods are available depending on matrix and desired sensitivity; different methods (both sampling and analytical) require different formats and review processes for validation beyond routine EPA Functional Guidelines. For instance, alkyl mercuries can be analyzed by gas-liquid chromatography and gas vapor fluorescence, two different chemistries for which a correlation would need to be developed for data comparability.

When project data are validated by TAMS Consultants, Inc. or any of its subcontractor data validators under the Superfund Standby Program, data validation for routine EPA or NYSDEC CLP or CLP-type analyses will generally follow the EPA Region 2 checklists (see the QA/QC Plan), supported by EPA Functional Guidelines. For data previously validated by others, a review of the data validation report will be summarized in a template such as Figure 2.4-3, with appropriate supporting text or comment, indicating whether these items are present and to what degree of uncertainty the data are useable.

2.5 Task 5: 104(e) Review

TAMS will provide technical review of all information received through the request for information 104(e) letters sent by the NYSDEC/USEPA in accordance with the following procedures:

The information received through the 104(e) letters will be organized into individual PRP files, sorted chronologically and indexed to allow easy access and review. TAMS will also create a suitable database capable of tracking correspondence, and searching on keywords, such as principal contaminants;

2. TAMS will monitor compliance with the NYSDEC/USEPA demands for information. In the event of a recipient's failure to comply with such demands, TAMS will notify the Department of areas of non-compliance as soon as possible;

3. TAMS will prepare a summary report of the information submitted by all potentially responsible parties; and,

4. TAMS will collect water samples and soil samples for full TCL analyses, or a subset thereof, with data validation as directed by the Department to support the PRP identification process.

2.5.1 Filing and Tracking 104(e) Responses

Upon receipt of 104(e) responses from the Department, TAMS will create a file for each PRP. Before filing, each document in the response will be stamped with a code and

number consisting of a unique PRP company identifier and a sequential document number, e.g., PRP-001. The PRP identifier will be consistent with any similar DEC PRP identifier codes and may be alphabetic or numeric. An index of all documents in each PRP response will be kept with the file to facilitate document location and retrieval. If a PRP submits multiple responses, they will be filed chronologically, with the earliest first, and the sequential numbering of PRP documents will be continuous from the earliest submittal to the latest. All responses will be stored at TAMS Clifton Park office in cardboard filing boxes to facilitate transport, e.g., to and from NYSDEC headquarters at 50 Wolf Road.

2.5.2 Compliance Monitoring and Reporting

TAMS will create a database to track responses from the 104(e) letters. It will also serve as a link to the comprehensive analytical database prepared under Task 3. This database will function as a summary of the 104(e) responses and will allow for numerous reports using the powerful RQBE (Relational Query By Example) feature available in FoxPro. By linking the 104(e) and the analytical databases, a complete record of all companies, agencies, and samples associated with the study will be maintained while still allowing both databases to function independently. Controls, e.g., access to tables by password only and pop-up lists, incorporated into the analytical database (as described in Section 2.3.2) will also be used in the 104(e) database.

TAMS will use the tracking database to monitor compliance with the NYSDEC/USEPA demands for information and will generate reports from the database to notify DEC of non-compliance. The compliance reports will show where a response was deficient and what information is lacking and will be due to DEC within 30 calendar days of TAMS' receipt of 104(e) responses. The reports could be structured to be used as an attachment to NYSDEC/USEPA demands for additional information from non-compliant PRPs.

The proposed primary functions of the 104(e) tracking database can be divided into three parts, as defined below. The tables presented below are preliminary in nature and will be modified as the project progresses.

(1) Corporate Tracking

The tables in this section will keep track of all the PRPs, state and federal agencies and institutions involved in the study, including all relevant personnel and any affiliates or subsidiaries. Examples of the proposed tables are:

Proposed Table:	**COMPANY**
Description:	Names and addresses of all PRPs, agencies, institutions, etc. involved in the study.

Proposed Field Name	Description
• **Cname**	Company Name.
• **Cstreet**	
• **Ccity**	
• **Cstate**	
• **Czip**	
• **Cphone**	
• **Cinc_state**	State where company is incorporated.
• **Cfile_loc**	Physical location - identification where this company's records are stored.
• **Company_ID**	A unique identifier assigned to this company. This identifier will serve as the linkage to all tables in the 104(e) database and will also be referenced by the analytical database.

Proposed Table:	**FACILITY**
Description:	Names and addresses of all facilities associated with a PRP where hazardous substances were/are involved.

Proposed Field Name	Description
• **Company_ID**	Unique company identifier - link to PRP.
• **Facility_ID**	Unique identifier for this facility.
• **Fname**	Facility name.
• **Fstreet**	
• **Fcity**	
• **Fstate**	
• **Fzip**	
• **Fphone**	
• **Oname**	Name of official in charge of facility.
• **Ostreet**	
• **Ocity**	
• **Ozip**	
• **Ophone**	
• **Otitle**	

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(2) Correspondence Tracking

The tables in this section will keep track of all project correspondence. TAMS proposes two types of correspondence-tracking tables. The first two tables are response checklists for the 104(e) form and are limited to information about the form itself, including the status and adequacy of responses to individual questions. Additional correspondence is not included in these tables. The third table will keep track of all other correspondence related to the PRP or other involved entities.

Proposed Table: **R104E**
Description: This table tracks the status of the responses to the 104(e) forms.

Proposed Field Name	Description
• Company_ID	Unique company identifier - link to PRP.
• Mail_num	Mailing number.
• Date_sent	The date that the form was sent.
• Date_rec	The date that form was received by the PRP.
• Cmal_rec	Certified mail receipt number.
• Date_due	Date response is due.
• Date_rec	Date response was received.
• Rname	Respondents name.
• Rtitle	Respondents title.
• Ques_resp	Were all questions answered (Y/N)?
• Ques_adeq	Were responses adequate (Y/N)?
• Warlet	Was a warning letter sent (Y/N)?
• Notes	General notes.
• Fileloc	Location where the actual 104(e) responses are stored.

Proposed Table: **R104QUES**
Description: This table tracks the status of the responses to individual questions on the 104(e) forms.

Proposed Field Name	Description
• Company_ID	Unique company identifier - link to PRP.
• Mail_num	Mailing number; links to **R104E** table.
• Ques_num	104(e) question number.
• Ques_resp	Was question answered (Y/N)?
• Ques_adeq	Was answer adequate (Y/N)?
• Notes	General notes.

Proposed Table:	**CORRES**
Description:	This table tracks additional related correspondence.

Proposed Field Name	Description
• **Sent_to**	**Company_ID** that the mailing was sent to.
• **Sent_name**	Name of person that the mailing was sent to.
• **Sent_from**	**Company_ID** that sent the mailing.
• **From_name**	Name of person that sent the mailing.
• **Date-sent**	Date the mailing was sent.
• **Date_rec**	Date the mailing was received.
• **Cmal_rec**	Certified mail receipt number.
• **Subject**	Subject of the mailing.
• **Fileloc**	Location of the hard copy of this mailing.

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(3) 104(e) Summary - Hazardous Waste Tracking

The tables in this section will summarize the data received from the responses to the 104(e) form. The intent is to give a synopsis of the pollutants generated at each facility, the media by which they entered the environment, where they entered, and the approximate dates and volumes or quantities. It is not meant to track each individual event. The tables provide the potential for numerous reports which will be finalized as the project progresses.

Proposed Table:	**HWTRACK**
Description:	This table tracks the pollutants generated at each facility.

Proposed Field Name	Description
• **Facility_ID**	Unique identifier for this facility; links to **FACILITY** table.
• **Parameter**	Hazardous or industrial waste abbreviation - taken from a master table to be generated.
• **Media**	The media in which the pollutant was discharged such as transported, storage, surface water, groundwater, soil, etc.; master tables of allowable media will be generated.
• **Location**	Location of the media.
• **Disp_pract**	Was the disposal process continuous, intermittent or an event?
• **Volume**	Volume of contaminant.
• **Units**	Units of above.
• **From_date**	The dates that summarize the duration of the disposal/discharge.
• **To date**	

Proposed Table:	**PERMIT**
Description:	This table tracks permits by company and facility

Proposed Field Name	Description
• **Facility_ID**	Unique identifier for this facility; links to **FACILITY** table.
• **Per_name**	Permit name taken from master table.
• **Per_num**	Permit number.
• **Agency**	Issuing agency.
• **Exp_date**	Expiration.

104(e) Summary Report

TAMS will prepare an individual summary report of the information provided by each PRP. The report will discuss with reference to specific sources, the results of the research performed and recommendations for future research. The report will contain a recommendation regarding each respondent's inclusion as a PRP which has, is or may impact the Onondaga Lake System; pathways of contamination (known and potential); hazardous substances and hazardous waste releases; and, maps of facility locations and pathways. Each report will contain reports from the tracking database in support of a recommendation to include or not include the subsite in the NPL site. The form and content and delivery schedule for these summary reports will be finalized after TAMS and the Department have received and reviewed the first round of PRP responses.

Supplemental Sampling and Analysis

It may be necessary to supplement the information provided by PRPs with sampling and analysis of soil and water from one or more areas of the NPL site. TAMS will conduct supplemental sampling and analysis as directed by the Department. Generic sample collection procedures are presented in Section 2.7.1.1 of this FAP. Quality control procedures are presented in the OLP QA/QC Plan. Generic procedures for the safe conduct of the work are presented in the OLP HASP. If site and/or procedure-specific circumstances dictate, TAMS will develop addenda to the FAP, OLP QA/QC Plan and HASP as necessary for the successful completion of the work.

2.6 Task 6: PRP Financial Assessment

TAMS will select, procure by subcontract and manage a firm with professional expertise in financial analysis to perform this Task.

The subcontractor will review PRP financial information and conduct a financial assessment that will describe the PRPs assets and income. Financial assessment

information might include: information on bankruptcy; published financial data from Dun & Bradstreet databases; information from the Securities and Exchange Commission; the Secretary of State; and the Uniform Commercial Code filings. For private or small companies, the assessment will consist of an estimated range of assets. The subcontractor will not determine ability to pay.

In addition to or in conjunction with the financial analysis/review, the subcontractor will conduct a review of the business identity(s), including parent/subsidiary relationships, of all persons (corporate or otherwise) identified as a potentially responsible party.

The detailed scope and deliverables for this Task will be developed with the subconsultant, yet to be selected and procured for this work, and submitted to NYSDEC for comment and approval.

2.7 Task 7: Comprehensive Remedial Investigation Report

The comprehensive remedial investigation (CRI) entails three subtasks.The first of the subtasks consists of TAMS conducting RIs on subsites for which no RI reports have been prepared by others. The second of these subtasks involves review of remedial investigation reports for individual subsites prepared by others (e.g., PRPs). The third subtask consists of integrating the RI reports prepared by both TAMS and others into a single RI Report.

Projects will be conducted and reviewed in accordance with the United States Environmental Protection Agency (EPA) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (US EPA, October 1988), and the NYSDEC Guidelines for Remedial Investigations/ Feasibility Studies, Technical and Administrative Guidance Memorandum HWR-89-4025 (March 31, 1989).

The first part of a formal remedial investigation after a preliminary site assessment or site inspection is the scoping process where existing data are evaluated, likely response scenarios and remedial action objectives are identified, and project plans are prepared. From what is known about a site at the time, a conceptual model of the site is developed. An outline example of an RI/FS Work Plan format is given below.

Introduction and Purpose

2. Site Background, Setting and Objectives
3. Initial Evaluation
   - Types and volumes of waste present
   - Potential pathways of contaminant migration/preliminary public health and environmental impacts
   - Preliminary identification of operable units
   - Preliminary identification of response objectives and remedial action

alternatives

4. Project Scope (Work Plan Rationale and Data Quality Objectives)
5. RI/FS Tasks
6. Project Schedule
7. Staffing Plan
8. Subcontracting and M/WBE Plan
9. Budget (Costs and Key Assumptions)

Three primary documents will serve to conduct a remedial investigation: the **Field Activities Plan** (FAP) provides instruction and intended uses for project related activities; the **Quality Assurance Project Plan** (QAPP, as an addendum to the OLP QA/QC Plan) describes the policy, organization, functional activities, and quality assurance and control protocols for achieving intended DQOs; and a **Health and Safety Plan** (HASP) to define the training, supervision, and protective equipment required under OSHA's 29 CFR 1910.120.

2.7.1 Field Activities Plan

A field activities plan (FAP) will have the following items:

Site Background
Sampling Objectives
Sample Location and Frequency
Sample Designation
Sampling Equipment and Procedures
Sample Handling and Analysis

Site characterization will include an investigation of site physical characteristics such as surface features, geology, soils and vadose zone, surface water hydrology, hydrogeology, meteorology, populations and land use, and ecological evaluations. The nature and extent of contamination will be determined for all pertinent media and pathways, e.g., soil, water, air, sediment, biota, etc.

Subsite specific FAPs will include, and be reviewed for, standard operating procedure for field investigations. Drilling, sampling, and other field activities will be performed in accordance with general state of the art techniques as presented, where appropriate, in the following documents:

Sampling Guidelines and Protocols, NYSDEC, Division of Water, March 1991.

Compendium of Superfund Field Operations Methods, US EPA, December 1987 (EPA/540/P-87/001)

RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, US EPA, September 1986 (OSWER-9950.1)

Soil Sampling Quality Assurance User's Guide (Second Edition), US EPA, March 1989, (EPA/600/8-89/046)

Preparation of Soil Sampling Protocol: Techniques and Strategies; US EPA, May 1983 (EPA-600/4-83-020)

Generalized Field Activities

In all cases where solids (e.g. soil, sediment, waste) or other heterogeneous materials, are collected, such material will be mixed prior to containerizing to improve the degree of homogeneity. This is typically performed by the process of "cone and quarter", or simply mixing from the bottom of the pile (of collected material) to the top in a continuous manner.

The exception will be for material collected for analysis of purgeable organics, or other similar volatile analytes, in which case various aliquots from the original in-situ placement will be containerized immediately upon sampling without mixing.

Each site/project-specific Quality Assurance Project Plan (QAPP) will contain details of sampling, including sampling container type, sample size, compatible materials and holding times.

Surface soil samples will be collected with a hand trowel at a depth up to 6 inches below the ground surface over an area of a circle approximately 6 to 12 inches in diameter. Samples will be transferred (from the ground) into a small cone-shaped pile on a clean surface (metal foil, wax paper, Teflon, etc.) and, with mixing or by collecting random aliquots from all around this small pile, will be transferred to an 8-ounce jar, slightly tamped down, filled to the top of the jar to minimize head space, and sealed with Teflon or aluminum lined plastic or metal caps depending on the analysis sought.

Sediment samples will be collected using a Ponar-type dredge, a sediment corer, or a small bucket with holes (i.e., acting as a sieve) in the bottom to scrape the sediment to a depth of approximately 6 inches and allow water to drain before removing the sediment with a spatula, spoon or hand trowel. Sediment will be transferred to glass jars, allowed to settle for a few minutes, and water will be drained before capping. Caps may be plastic or metal, with Teflon or aluminum linings depending on the analyses sought.

Groundwater sampling will begin by: unlocking the well cover; monitoring ambient air, upwind air and air directly at the top of the well; taking a water level measurement; sounding the bottom of the well and agitating/loosening accumulated silt/sediment; and

then purging the well a minimum of three volumes of standing water. Purging will utilize suction-lift pumping, bailers, submersible pump, and/or inertial pumping to remove water from the wells, as appropriate to the specific site and analyses sought. After each volume of water removed, field parameters will be analyzed to confirm that fresh water is entering the well (i.e., equilibration to steady readings), or as an indicator that conditions cannot reach a steady state. In the event that recharge is slow, the well will be purged "dry". After the water level has returned to its pre-purge level, samples will be collected from the middle of the screened portion of the well for overburden wells, or at the bottom of rock wells.

All bailers will be pre-washed by brush scrubbing using a warm, soapy solution (tap water), followed by successive rinses of clean tap water, and a final rinse of distilled/deionized water. Bailers for sample collection, if dedicated, will be Teflon, and if disposable, will be HDPE. Bailers will be bottom-filling and check-valved, and will be lowered into the well with dedicated polyethylene line. The first bailerful of water will be used to rinse the bailer and then will be discarded.

The next, and subsequent bailersful of water will be used for laboratory and field analysis. Three, 40-ml vials will be used to collect VOA (volatile organics analysis) samples by gentle pouring directly from the top of the bailer into the vial until overflowing, insuring a convex meniscus. Cap the vial, turn the vial over and tap the capped top of the vial firmly in the palm of the hand to release air pockets that may be present on the inside surfaces of the vial. Upright the vial, and if any bubbles or aggregate of bubbles rise to the top to create an air "pocket" (i.e., headspace) or bubbles larger than a group of a few typewritten periods, then dump the water and resample using the same vials. Subsequently sampled water will be collected for the remaining TCL/TAL parameters, and finally for field parameter testing.

VOA vials will be CLP grade as supplied by a vendor, and each well will be sampled in triplicate. Each VOA vial will be labeled, and wrapped in paper toweling or plastic bubble packaging, and the three vials will be placed in a labelled, dedicated "Ziploc" type of bag to be placed in the shipping container/cooler. Similarly, remaining TCL/TAL analytes will require CLP grade glass or plastic containers.

Air surveillance will be performed with a portable HNU photo-ionization detector, or equivalent, during invasive activities such as drilling, monitoring well installation, development and sampling where a conduit is provided for vapors to travel from the water table or other subsurface zones to above the ground surface. Additional equipment such as dust monitors, explosimeters, adsorbent tubes will be used pending specific site requirements.

Test pit soil samples will be collected by taking several grab samples from the floor and walls of each pit (i.e., the first two inches below each wall/floor surface), mixing them

slightly in a small pile as described above, and then containerizing appropriately. Composite VOA samples prepared from combining grab samples from within the pit will not be mixed, but will be collected by placing a little bit of material from the walls and floor into sample containers directly.

Boring soil will be sampled by opening the split barrel, slicing the core (if intact) vertically down the middle with a sharp knife or similar blade, and scooping sufficient sample from the long axis of the split core with a spoon or spatula. If the core is not intact, then upon opening the barrel the contents can be scooped directly with the spoon or spatula. If the core is not homogeneous, representative portions of each type of material within the spoon will be collected.

Subsurface characterization includes a review of existing information, maps, aerial photography, and preliminary fracture trace analysis (if appropriate) to identify bedrock features and assess pre-urban development hydrology. Other, more direct, field activities include:

* HNU split-spoon contents screening and air monitoring;
* Soil sampling and logging;
* Soil vapor sampling and field analysis;
* Oversight of installation of wells;
* Oversight of well development conducted by the drillers;
* Field analysis of groundwater pH, turbidity, specific conductance, and temperature during well development and purging; and
* Collection of water level data.

TAMS will prepare groundwater contour maps and boring/well installation logs. They will characterize overall soil and bedrock conditions, delineate stratigraphic units, and quantify hydraulic gradients and groundwater flow.

Drilling and monitor well installation services will be performed by standby subcontractor drillers retained by TAMS. Details will be found in the appropriate section of the site specific FAP.

Laboratory analytical services will be performed by TAMS laboratory standby subcontractors. Details of the laboratory work are the focus of the QAPP and are found in the various appropriate sections of that document.

Data validation services will be performed by standby subcontractors retained by TAMS. Details of data validation are a predominant item in the QAPP and are found in the appropriate section of that document.

Field surveying will be performed by a TAMS standby subcontractor New York State

licensed surveyor; details will be found in site-specific Field Activity Plans.

Geophysical survey services will be performed by TAMS standby subcontractors Details of geophysical surveying will be found in site-specific Field Activity Plans.

Quality Assurance Project Plan

Details of subsite-specific QAPPs should parallel the format of the OLP QA/QC Plan; only the basic elements are shown below.

Project Description
Project Organization and Responsibilities
QA Objectives for Measurement
Sampling Procedures
Sample Custody
Calibration Procedures
Analytical Procedures
Data Reduction, Validation, and Reporting
Internal Quality Control
Performance and System Audits
Preventative Maintenance
Data Assessment Procedures
Quality Assurance Reports.

Health and Safety Plan

The following elements will be included at a minimum in any EPA or NYSDEC sponsored remedial investigation Health and Safety Plan:

The names of site H&S Officer and key personnel, and alternates, responsible for site safety and health.
A health and safety risk analysis for existing site conditions, and for each site task and operation.
Employee training assignments.
Description of personal protective equipment to be used for each of site tasks and operations.
Medical surveillance requirements.
Site control measures.
Decontamination procedures
Standard operating procedures for the site.
A contingency plan that meets the requirements of 29 CFR 1910.120(I)(1) and (I)(2).
Entry procedures for confined spaces, if applicable and appropriate.

2.7.4 Review of PRP Remedial Investigation Reports

FAPs and QAPPs created by others will be reviewed to insure completeness of RI components being in compliance with CERCLA and NCP. In most cases this task will entail summarizing and distilling several hundred pages of technical information to a brief summary. To this end, templates are being developed which incorporate the elements of a remedial investigation (draft Figure 2.7-1) and will accompany a text summary. It is not the intention of the review to present detailed site data since the OLP comprehensive analytical database will make such information available. The purpose of these summary reviews is to identify that all relevant aspects of RI reports are present and complete, and that sufficient information is available for the NYSDEC and the public to understand the site and its characteristics and problems.

In support of the Department's review of PRP-submitted documents, the NYSDEC modeling specialist described in Task 1B will perform its required work under Task 7. Upstate Freshwater Institute (UFI) has been selected for this purpose. The activities to be completed by UFI include reviewing various documents and attending related meetings as deemed appropriate by the Department. For example, the documents to be reviewed by UFI during the first year of the Onondaga Lake Project may include but are not limited to the following:

A Model of Calcium Carbonate Precipitation in Onondaga Lake, HydroQual, Inc.;
Environmental Assessment of Lower Reaches on Nine Mile Creek and Geddes Brook, Oswego Watershed, New York, CDR Environmental Specialists;
Substance Distribution Investigation Data Report, PTI Environmental Services;
Mercury Modeling and Sediment Processes Report, PTI Environmental Services; and,
Calcite Modeling Report, PTI Environmental Services.

2.7.5 Preparation of the Comprehensive Remedial Investigation

After completion of the first two subtasks, preparation of RI reports for other subsites by TAMS, and review of RI reports by others, TAMS will integrate the various final RI reports into a single RI report. The comprehensive RI will also integrate the results of investigations or studies within the Onondaga Lake site which were conducted previously or conducted by others outside of the subsite RI/FS process.

2.8 Task 8: Feasibility Study and Proposed Remedial Action Plan

The feasibility study task entails three subtasks. The first of these subtasks involves review of feasibility study reports for individual subsites prepared by others (e.g., PRPs).

The second of the subtasks consists of TAMS conducting feasibility studies on subsites for which no FS reports have been prepared by others. The third subtask consists of assisting the Department in preparing the Proposed Remedial Action Plan. TAMS' approach to each of these three subtasks is discussed in greater detail below.

2.8.1 Review of FS Reports Prepared by Others

It is TAMS' understanding that there are currently three subsites included within the proposed Onondaga Lake NPL for which FS reports have been scheduled (i.e., Allied Willis Ave; Allied Tar Beds; and Mercury Contaminated Sediments [Allied]), although this number may increase as a result of current litigation (e.g., LCP/Bridge St. Plant) or letters currently being to PRPs under section 104(e) of CERCLA. The preparation of FS reports for NPL sites is governed by federal law and regulation, and typically utilizes Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final (EPA/540/G-89-004, October 1988) as the basis for the format and content. For the purpose of the Onondaga Lake CFS, it is assumed that TAMS will be responsible for assisting NYSDEC in monitoring and reviewing the PRP draft FS reports for compliance with the appropriate format and content requirements. TAMS will prepare checklists summarizing the requirements and the fulfillment of the requirements in the PRP FS reports as a tool to facilitate review and evaluation of the PRP FS reports. The checklists, as differentiated from the alternative evaluation scoresheets discussed later, will be developed by TAMS and are for the purpose of determining if the FS report meets the applicable requirements (e.g., the CERCLA RI/FS guidance document, or other guidance which may be specified in the PRP's administrative order on consent). The checklists will provide a quick reference for completeness, addressing such items as whether a proper range of alternatives was developed (e.g., including no action, containment, treatment, and innovative technologies). In order to evaluate subsites and alternatives on a consistent basis, TAMS will prepare the NYSDEC alternative evaluation scoresheets (see discussion below, Section 2.8.2) for subsite FS reports prepared according to CERCLA guidance, and for which the NYSDEC scoresheets were not prepared as part of the FS report. (The CERCLA guidance document does not require the preparation of checklists or scoresheets such as those developed by NYSDEC).

USEPA guidance (EPA Memorandum on CERCLA Compliance with Other Environmental Statutes, 50 FR 47946; National Environmental Policy Act regulations, 40 CFR 6.301) requires, among others, compliance with the National Historic Preservation Act (16 USC 470). This is interpreted as requiring that a Cultural Resources Survey be performed as part of the RI/FS process. If the Phase I Cultural Resources Survey performed as part of the RI indicated the need for a Phase II survey, TAMS' review of the PRP draft FS report will verify that the appropriate level of Cultural Resources Survey has been performed, and that the FS report adequately addresses any concerns resulting from the cultural resources survey.

Preparation of FS Reports by TAMS for Non-PRP Subsites

Because the Onondaga Lake site is proposed for inclusion on the federal NPL, TAMS will prepare FS reports for these sites using the EPA CERCLA (1988) RI/FS guidance document. The NYSDEC Technical and Administrative Guidance Memorandum (TAGM HWR-90-4030, Selection of Remedial Actions at Inactive Hazardous Waste Sites) will be used as supplementary guidance. Although the TAGM is similar to the FS process described in the CERCLA guidance document, there are some important differences. One important difference between the CERCLA guidance and the NYSDEC TAGM is the significance of cost during the preliminary screening of alternatives. The CERCLA guidance does utilize cost as one of three evaluation criteria; however, the NYSDEC TAGM requires that only the criteria of effectiveness and implementability be considered. Unless directed otherwise by NYSDEC, TAMS will utilized the USEPA guidance document (USEPA, 1988) as the basis for content and format for its FS reports. The second key difference between the CERCLA guidance and the NYSDEC TAGM is the implementation of both the preliminary screening and detailed evaluation of alternatives. The CERCLA guidance document does not specify any particular method for evaluating or comparing alternatives. However, the NYSDEC TAGM provides scoresheets for alternative evaluation during both the preliminary screening and the detailed evaluation of alternatives. Use of these scoresheets is not inconsistent with CERCLA, and these scoresheets will be completed by TAMS.

The TAGM provides a threshold scoring below which an alternative may be rejected by the project manager. The use of such a scoring system is not precluded by CERCLA. However, TAMS will conduct a qualitative review along with completing the scoresheets prior to recommending to NYSDEC that a low-scoring alternative be removed from further consideration.

Proposed Remedial Action Plan

After completion of the first two subtasks (review of FS reports by others; described in 2.8.1, and preparation of FS reports for other subsites by TAMS, described in 2.8.2), TAMS will assist the Department, as requested, in preparation of the PRAP. The purpose of the PRAP is to highlight key aspects of the RI/FS process, provide an analysis of remedial alternatives under consideration, identify the preferred alternative and provide the public with information on how they can participate in the remedy selection process. Upon receipt of public comments, TAMS will assist in preparation of the required Responsiveness Summary in support of ROD development.

Task 9: Record of Decision

Upon completion of the CRI/FS and the NYSDEC/USEPA selection of proposed remedial action(s), TAMS will assist in preparation of the comprehensive Record of Decision, as

requested by the Department. Also, TAMS is available to assist in the preparation of subsite RODs, as necessary.

Each ROD produced for a hazardous waste site contains information about the site that identifies the problem and describes the remedial solution. In addition, the decision-making process that yielded the remedial action is documented to demonstrate that the appropriate solution was selected. The ROD contains:

site location, description and history: provides valuable insight into the previous use of the site and identifies vulnerable areas in the surrounding environment, such as residential areas and protected wetlands, groundwater, etc.
problem identification: Describes the nature and extent of contamination and the pathways through which contaminants move in the environment.
status of enforcement actions: provides the enforcement history and current status for the site.
goals for remedial action: describes the overall goal or remediation, protection of human health and the environment, and remedial goals specific to each site -- for example, preventing contaminated groundwater migration.
discussion of remedial alternatives: presents each potential remedial action, including a "no action" alternative, to show that technical, legal, environmental and public concerns are met.
the selected remedial action: describes the planned remedy.
Responsiveness Summary: documents public comments about the selected remedy. Modifications to the remedial action based on public comment are identified in the summary.
Administrative Record: references reports and other documents developed during investigation and remedial selection.

2.10 Task 10: Citizen Participation Program

TAMS will assist the Department in preparing its Citizen Participation Plan (CPP), describing the Department's program for disseminating information and soliciting input and feedback on the Onondaga Lake Project. The program will include conducting public informational meetings, establishing information repositories, preparing responsiveness summaries, etc.

TAMS will assist the Department in preparing for and conducting public meetings, as requested. TAMS' Project Manager will attend all public meetings, but it is understood that TAMS will not act as the Department's representative at such meetings. TAMS will assist the Department in developing a comprehensive mailing list for the NPL site and in the preparation of pre-meeting fact sheet/mailers, as requested.

Task 11: Remedial Design/Construction Services

Upon acceptance of the final ROD, the Department may request that TAMS prepare remedial designs for certain subsites and/or provide oversight services during remedial construction by PRP or Department contractors. Also, the Department may direct TAMS to design and implement interim remedial measures at one or more subsites at any time during the Onondaga Lake Project.

Remedial Design

TAMS will prepare remedial design and/or review RD prepared by others, as requested by the Department. RD may include:

construction drawings;
technical specifications;
volume estimates;
cost estimates; and,
bid documents.

TAMS has developed many CADD-based standard design details and standards to significantly improve design efficiency.

Specific unit operations to be incorporated into the remedial design may include:

excavations, earthfills and site grading;
product and groundwater recovery;
contaminant and hydrologic control;
materials processing, including drum/waste removal, rock removal, soil/sediment removal, sludge transfer, and solidification;
hazardous waste transport, treatment and disposal;
soil and groundwater treatment systems, including thermal, biological and physical chemical processes; and,
personnel and equipment decontamination facilities.

2.11.2 Construction Services

TAMS will provide construction services during remedial construction by PRP or NYSDEC contractors, as requested by the Department.

Typical construction services during a NYSDEC-lead remediation may include:

review of contractor submittals;
daily observation of contractor activities;

- review of change orders;
- review of contractor payment requests;
- preparation of Record Drawings;
- preparation of Operation and Training manuals;
  plant startup and training of O&M staff.

During PRP remedial construction, TAMS will provide full-or part-time observers as necessary to monitor for compliance with the requirements of the ROD, consent order, CQA/QC plan and approved plans and specifications. The observer will notify the Department in the event that the PRP fails to perform the work as required. The observer will document all observations. The observer shall also take split samples as requested by the Department and make necessary arrangements to test those samples in a NYSDOH certified laboratory.

The observer will maintain complete and detailed records associated with all construction and related activities during the project duration. These records and reports may include but are not limited to the following:

- daily work completed and important conversations;
- records documenting PRP's deviation from work as specified in the approved ROD, consent order, CQA/QC plans, and plans and specs;
  unusual circumstances (weather conditions, labor disputes, environmental problems, health and safety hazards encountered, etc.);
  general files including correspondence and other documentation related to the project;
  construction photos; and
  telephone conversations.

The observer will assist the Department as requested in: (1) observation upon substantial completion of the work; and, (2) final observation upon project completion.

2.11.3 Interim Remedial Measures

Over the course of the CRF/FS, the Department may direct TAMS to undertake interim remedial measures at subsites determined to be an immediate threat to human health. Using the RD/CS services described in 2.11.1 and 2.11.2 above, TAMS will effect any needed IRM as quickly as possible. TAMS may subcontract remedial construction directly, if construction costs do not exceed the Department's limits for such procurement.

3.0 PROJECT SCHEDULE

The project schedule is presented in Table 3-1 and Figure 3-

4.0 STAFFING PLAN

This Staffing Plan describes TAMS' management structure for the Onondaga Lake Project. TAMS will assign a Project Manager, Quality Assurance Officer, Health & Safety Officer and Task Managers to provide for the successful completion of the work. The Staffing Plan describes the roles of and relationships between these key individuals and the NYSDEC project team, other TAMS' staff and any subcontractors required for the work.

TAMS recognizes that the Department's project team must have flexible access to key members of TAMS' staff. There must, however. be one primary channel of communication between DEC and TAMS, and that must be through their respective Project Managers. The Department's Project Manager will be responsible for the overall direction and management of the work, and will delegate responsibility to team members, including TAMS Consultants, Inc., through written and verbal communication with TAMS' Project Manager. The TAMS' PM will be responsible for the successful completion of all work done by TAMS' staff and subcontractors. TAMS' PM shall be readily available by telephone and shall be available for meetings on 24-hours notice, especially during Project development and startup.

The assignments and general responsibilities of key project personnel are listed below:

Project Manager	James P. Behan, P.E., TAMS Albany, will have responsibility for overall project management, coordination with NYSDEC and for successful project completion. The Project Manager will manage and coordinate the efforts of all Task Managers and subcontractors (except as noted below) and will be the primary point of contact in TAMS for the DEC Project Manager.
QA Officer	Sander Bonvell, TAMS Albany, will serve as Quality Assurance Officer and Senior Chemist, and will be responsible for laboratory and data validation subcontractor procurement, assignment, and management. The QA officer will be the principal author of the project QA/QC Plan.
H & S Officer	William Beckett, TAMS Bloomfield, is Health and Safety Officer and will be responsible for preparation of the project Health and Safety Plan, and tracking of its implementation.

The project organization chart for the Onondaga Lake Project is provided as Figure 4-1, and shows Task Manager assignments. Resumes of key personnel have previously been submitted to Mr. David Smith, Contract Development Section, NYSDEC.

TABLE 3 - 1
Onondaga Lake Project
PROJECT SCHEDULE

ID	Name	Duration	Start	Finish
1	1 BEGIN PROJECT	2845d	7/15/94	7/4/05
2	1.1 TASK 1 - Work Plan Development	715d	7/15/94	5/5/97
3	1.1.1 Receive WA	0d	7/15/94	7/15/94
4	1.1.2 Return Acknowledgment	2d	7/15/94	7/18/94
5	1.1.3 TASK 1A-1 - Scoping, Prepare PMP	713d	7/19/94	5/5/97
6	1.1.3.1 Scoping Meeting	1d	7/19/94	7/19/94
7	1.1.3.2 Prepare First Draft PMP	7d	7/20/94	7/28/94
8	1.1.3.3 DEC Review	6d	7/29/94	8/5/94
9	1.1.3.4 Prepare Second Draft PMP	5d	8/8/94	8/12/94
10	1.1.3.5 DEC Review	10d	8/15/94	8/26/94
11	1.1.3.6 Prepare Final PMP	10d	8/29/94	9/12/94
12	1.1.3.7 DEC Review	22d	9/13/94	10/13/94
13	1.1.3.8 DEC Issues NTP-YR 1	0d	10/13/94	10/13/94
14	1.1.3.9 DEC Issues Amendment No. 1 for YR 2	0d	7/1/95	7/1/95
15	1.1.3.10 Prepare Draft PMP	20d	7/5/95	8/1/95
16	1.1.3.11 DEC Review	30d	8/2/95	9/13/95
17	1.1.3.12 Prepare Final PMP	13d	9/14/95	10/2/95
18	1.1.3.13 DEC Review	20d	10/3/95	10/31/95
19	1.1.3.14 DEC Issues NTP-YR 2	0d	10/31/95	10/31/95
	1.1.3.15 DEC Issues WA No. 2	0d	7/15/96	7/15/96
21	1.1.3.16 WA No. 1 Ends	0d	12/31/96	12/31/96
22	1.1.3.17 Finalize Closeout of WA No. 1	90d	12/31/96	5/5/97
23	1.1.4 TASK 1A-2 - Final RI/FS Work Plan	99d	8/8/94	12/29/94
24	1.1.4.1 Site Visit	2d	9/13/94	9/14/94
25	1.1.4.2 Prepare Draft FAP, QAPP, HASP	23d	8/8/94	9/8/94
26	1.1.4.3 DEC Review	17d	9/9/94	10/3/94
27	1.1.4.4 DEC/TAMS Work Plan Meeting	1d	10/7/94	10/7/94
28	1.1.4.5 Submit Final WP	1d	12/7/94	12/7/94
29	1.1.4.6 DEC Review	15d	12/8/94	12/29/94
30	1.1.4.7 DEC Approves Work Plan	0d	12/29/94	12/29/94
31	1.1.5 TASK 1B - Procure NYSDEC Advisor/Subcontra	1d	7/15/94	7/15/94
32	1.2 TASK 2 - Comprehensive Risk Assessment	1030d	12/30/94	12/28/98
33	1.2.1 TASK 2.1 - Human Health RA	206w	12/30/94	12/28/98
34	1.2.2 TASK 2.2 - Ecological RA	206w	12/30/94	12/28/98
35	1.3 TASK 3 - Comprehensive Database	206w	12/30/94	12/28/98
36	1.4 TASK 4 - Data Validation	206w	12/30/94	12/28/98
37	1.5 TASK 5 - 104(e) Review	102w	12/30/94	12/30/96
38	1.6 TASK 6 - PRP Financial Assessment	102w	12/30/94	12/30/96
39	1.7 TASK 7 - Comprehensive Remedial Investigation	206w	12/30/94	12/28/98
40	1.8 TASK 8 - Feasibility Study and PRAP	258w	12/30/94	12/27/99
41	1.9 TASK 9 - Record of Decision	28w	12/28/99	7/10/00
42	1.10 TASK 10 - Citizen Participation	546w	12/30/94	7/4/05
43	1.11 TASK 11 - Remedial Design/Construction Services	260w	7/11/00	7/4/05
44	2 END OF PROJECT	0d	7/4/05	7/4/05

5.0 SUBCONTRACTING AND M/WBE PLAN

There are four areas of service on the Onondaga Lake Project amenable to subcontracting. These are:

Modeling Lake Systems
Laboratory Analytical Work
Data Validation
Financial Assessment of PRPs

Services for drilling, modeling analysis and data validation will be procured from standby subcontracts maintained for this purpose by TAMS.

Data Validation services will be provided by ChemWorld Environmental. Inc., (WBE) one of TAMS' standby subcontractors for this service.

Laboratory Analytical services will be provided by H2M Labs, Inc., a TAMS standby subcontractor.

Modeling services will be provided by Upstate Freshwater Institute, a TAMS standby subcontractor.

Financial assessment services will be provided by a subcontractor yet to be selected.

TAMS utilizes MBE firms for goods and services which are not directly billable to the standby contract which also reflects our commitment to M/WBE utilization. A listing of these firms and their contribution to the TAMS' overhead costs is included in TAMS quarterly M/WBE reports to DEC.

FIGURES

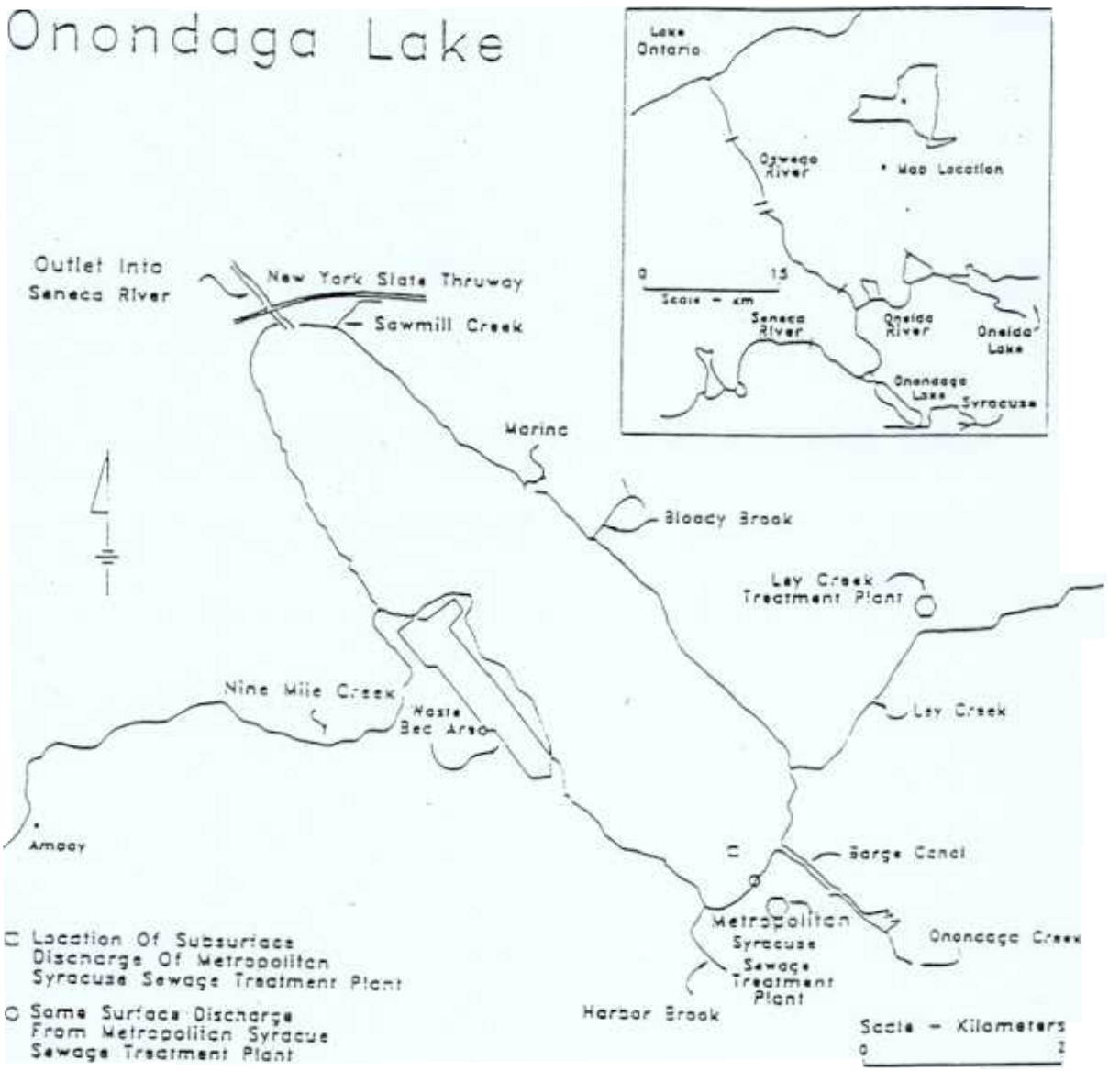
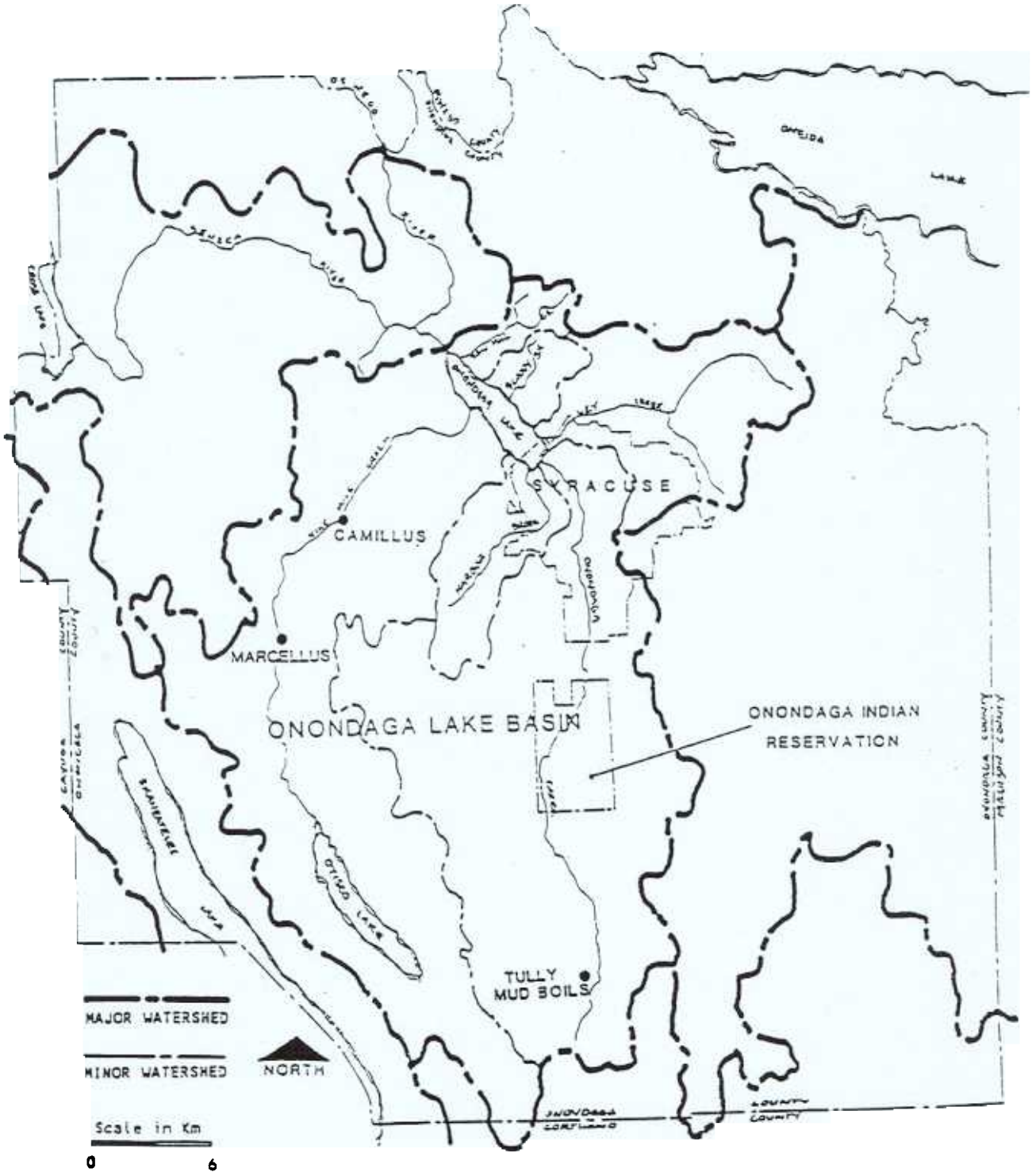


Figure 1-1
Site Location



Watersheds in Onondaga County, including drainage basin and sub-basins for Onondaga Lake.

Figure 1-2

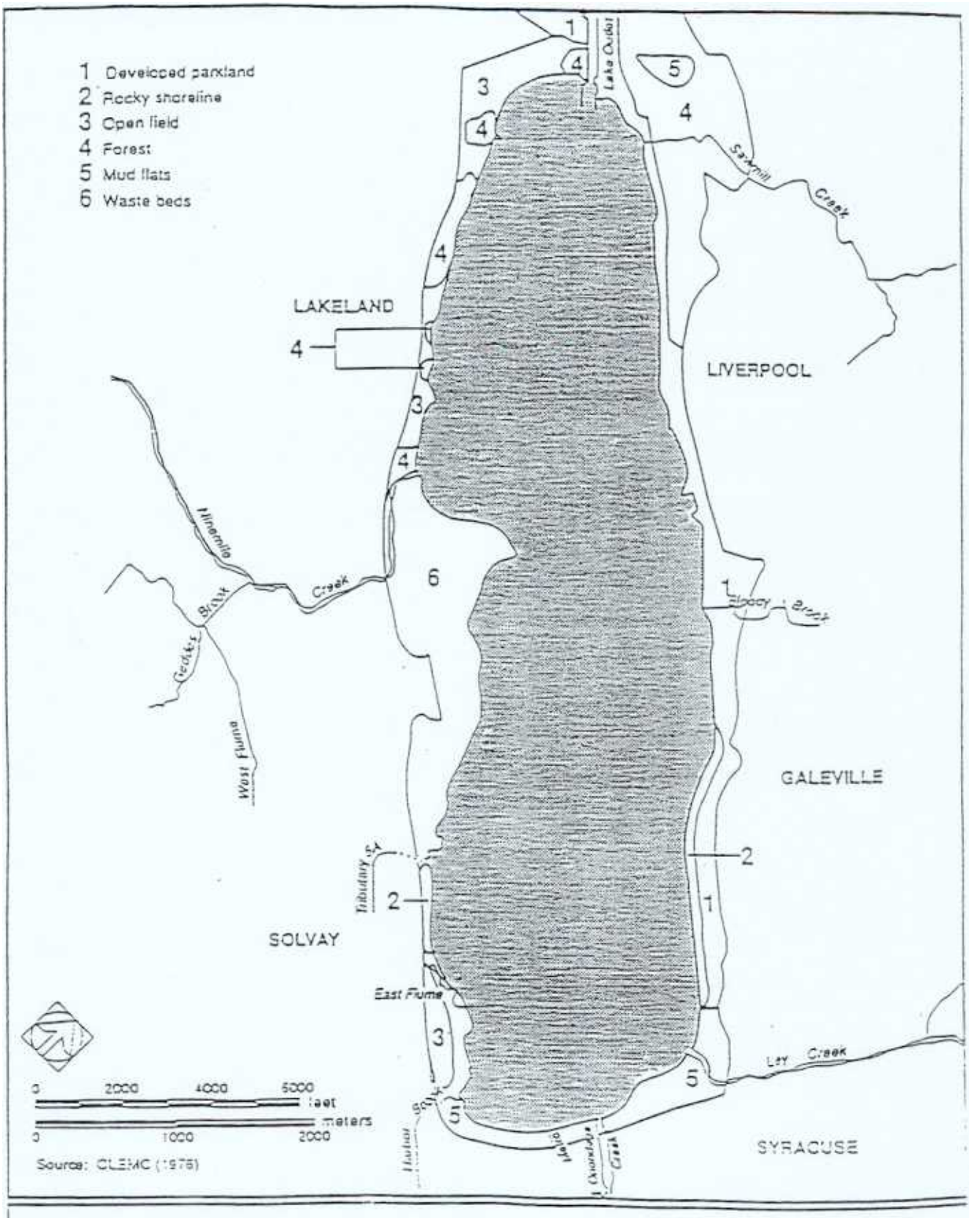
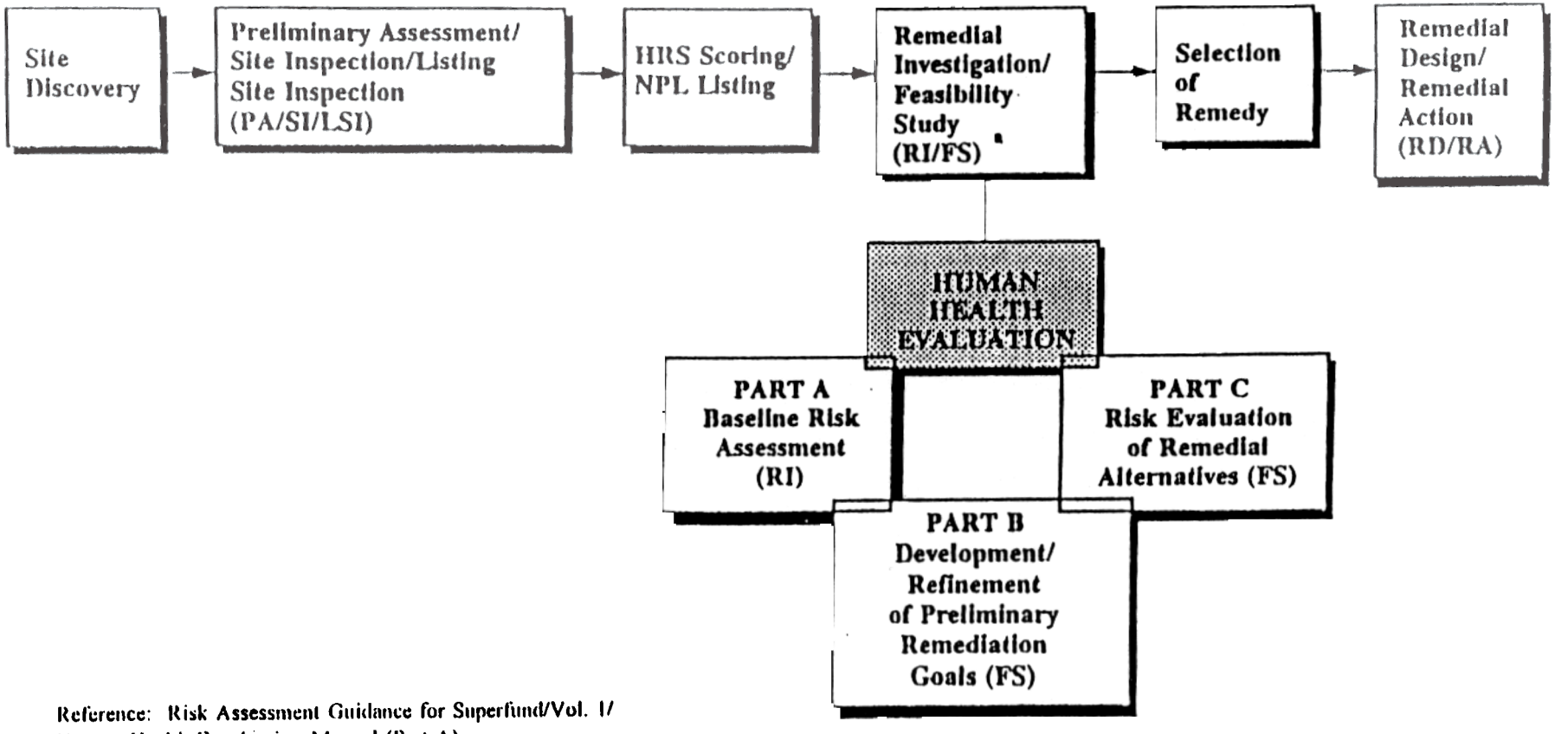


Figure 1 - 3 Onondaga Lake and Shoreline (PTI, 1991).

ROLE OF THE HUMAN HEALTH EVALUATION IN THE SUPERFUND REMEDIAL PROCESS



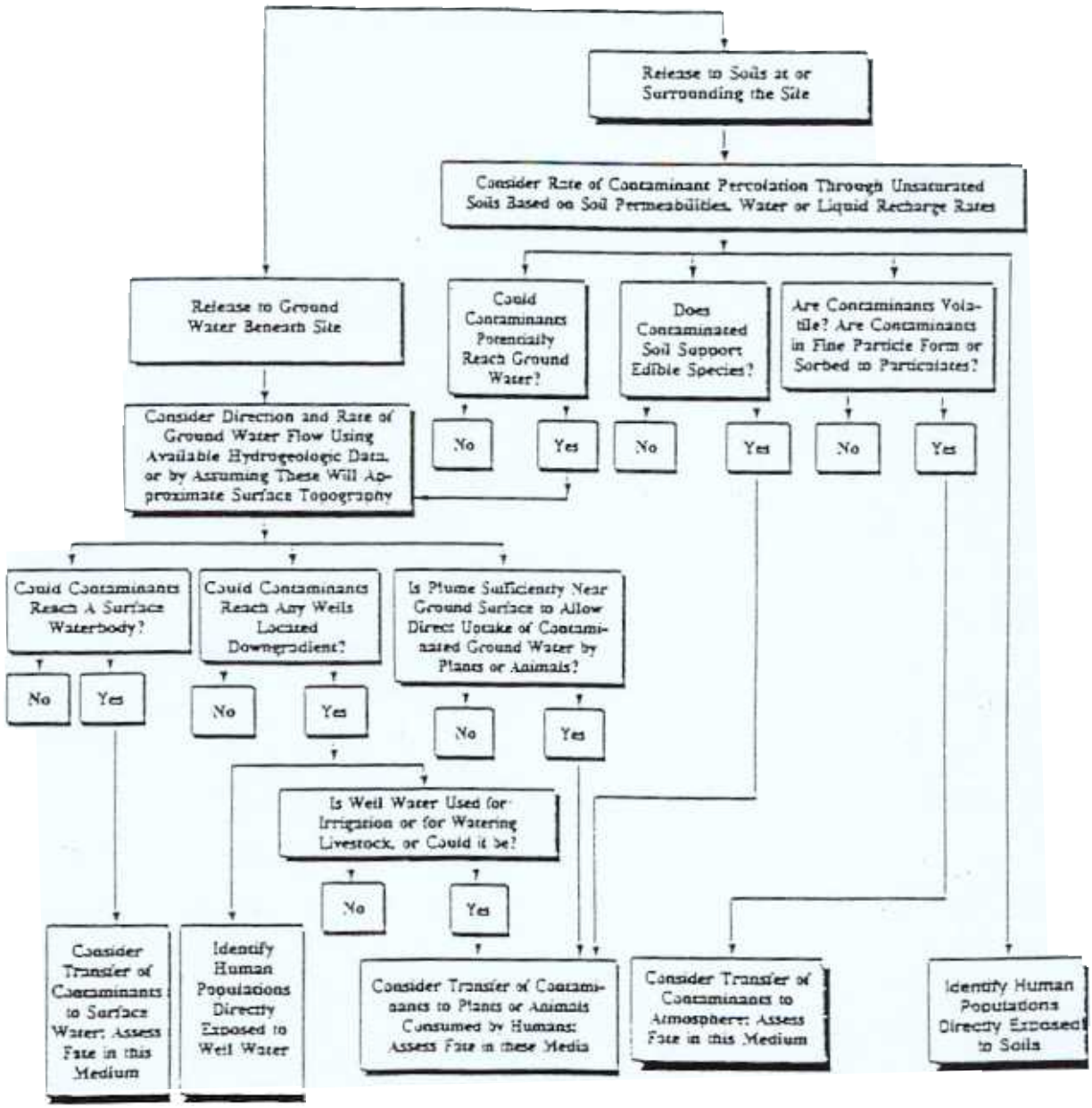
Reference: Risk Assessment Guidance for Superfund/Vol. 1/ Human Health Evaluation Manual (Part A); EPA/540/1-89/002 (December 1989)

Figure 2.2-1

FLOW CHART FOR FATE AND TRANSPORT ASSESSMENTS

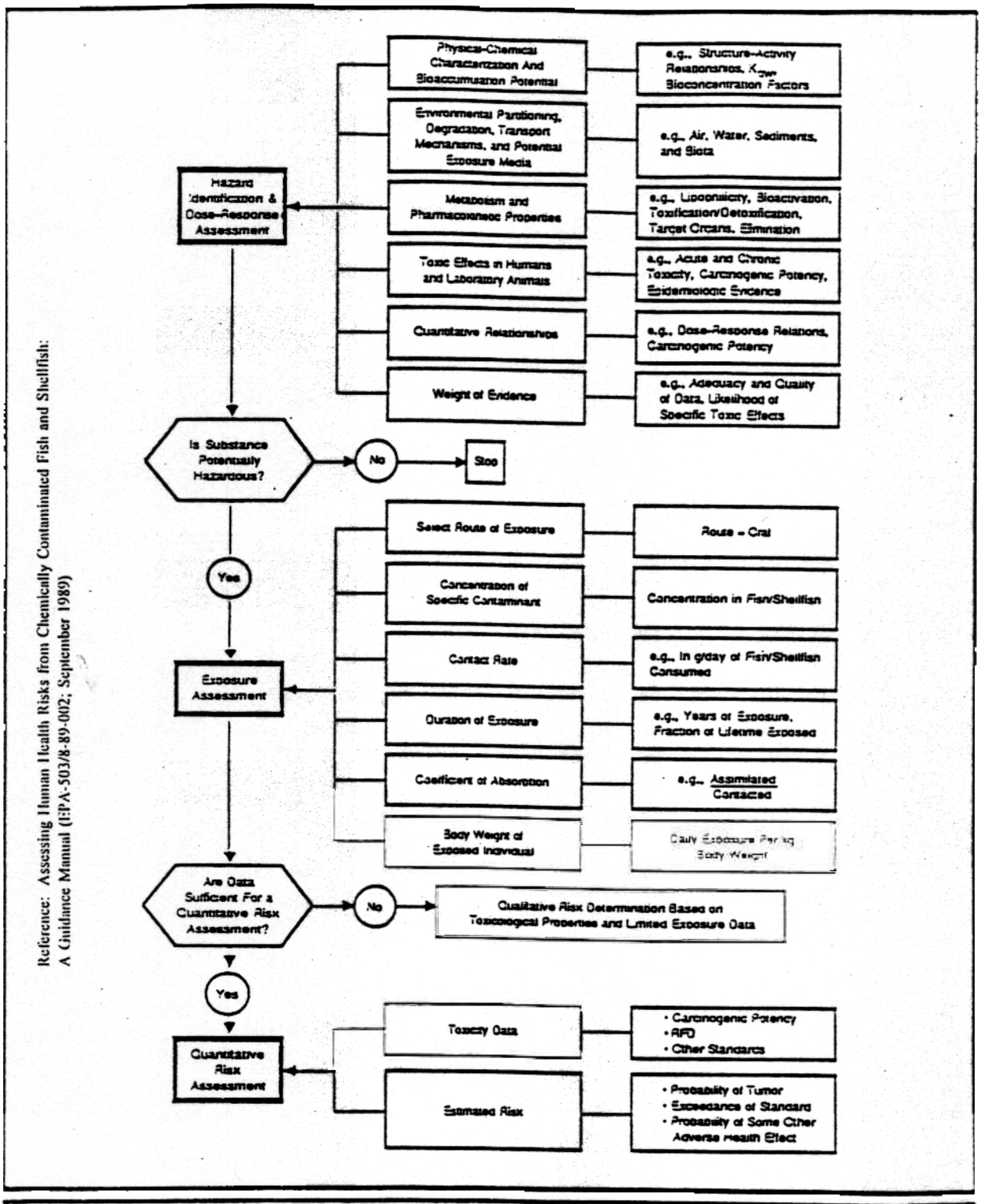
Environmental fate and transport assessment: soils and ground water

Contaminant Release



Reference: Risk Assessment Guidance for Superfund/Vol. 1/ Human Health Eevaluation Manual (Part A); EPA/540/1-89/002 (December 1989)

Figure 2.2-2



Conceptual structure of quantitative health risk assessment model.

Figure 2.2-3

- Use of inappropriate method detection limits may result in underestimates of risk.
- When insufficient number of samples are taken, methods used to estimate contaminant concentrations may result in overestimates of risk.
- Contaminant loss during sampling may result in underestimates of risk.

Exposure Assessment

- Assumptions regarding intake factors, population characteristics, and exposure patterns may not accurately characterize exposure and may result in underestimates or overestimates of risk.
- Assumption of 100 percent bioavailability of chemicals in environmental media (soil in particular) may result in overestimates of risk.
- Assumption that chemicals of potential concern do not degrade or transform in the environment may result in underestimates or overestimates of risk.
- Incremental risks associated with exposure to site-related chemicals of potential concern cannot be fully characterized. May result in underestimates of risk.
- Methods used to estimate inhalation exposure to suspended particulates or dust may overestimate intake and risk.
- Very few percutaneous absorption factors are available for chemicals of potential concern. Exposure from dermal contact may be overestimated using conservative default values.

- Extrapolation of results of toxicity studies from animals to humans may introduce error and uncertainty, inadequate consideration of differences in absorption, pharmacokinetics, and target organ systems, and variability in population sensitivity.

There is considerable uncertainty in estimates of toxicity measures. Critical toxicity measures are subject to change as new evidence becomes available. May result in overestimates or underestimates of risk.

Use of upper 95th percent confidence limit on cancer slope factor may result in overestimates of lifetime cancer risk.

Risk Characterization

- Risk/dose estimates are assumed to be additive in the absence of information on synergism and antagonism. May result in overestimates or underestimates of risk.
- Toxicity measures are not available for all chemicals of potential concern. Risks cannot be quantitatively characterized for these compounds. May result in underestimates of risk.
- In the absence of toxicity measures for polynuclear aromatic hydrocarbons (PAHs), the cancer slope factor for benzo(a)pyrene and the RfDs for naphthalene are commonly accepted. This approach may overestimate risks.

Figure 2.2-4

Feasibility Matrix

Ecosystem-Level Endpoints	Habitat: Flowing Water M	Flowing Water I	Shallow Embayment M	Shallow Embayment I	Deep Embayment M	Deep Embayment I	Wetlands M	Wetlands I
A. Biological Structure								
Biomass Partitioning - Quantify relative stocks by meaningful groups (e.g., plankton, benthos, autotrophs, heterotrophs; diatoms, flagellates, blue-green algae)	0	0-5	0	0-5	0	0-5	0	0-10
Species Enumeration - including diversity	0	0-5	0	0-5	0	0-5	0	0-5
Food Webs	0-10	0-10	0-10	0-10	0-10	0-10	0-5	10
B. Biological Function								
Total System Metabolism Integrated holistic measurement of entire system metabolism (e.g., upstream-downstream, and diel freshwater oxygen concentrations)	0	0-5	0-	0-10	0-5	0-10		10
Component Community Metabolism - (e.g., light/dark bottles, benthic chambers)	0	0-5	0	0-10	0	0-10	5	10
Carbon and Nitrogen Flow - (e.g., internal dynamics and external sources and sinks)		5-10	0	0-5	0	0-5		5-10
C. Physical Environment (i.e., substrate characterization, flow regime, depth, temperature, light, turbidity)	0	0	0	0-5	0	0	0	0-5

Population-Level Endpoints[a]	Biological Systems: Fish M	Fish I	Invertebrates M	Invertebrates I	Plankton M	Plankton I	Other Vertebrates M	Other Vertebrates I
Growth	0	0-5	0-5	5-10	0-5	0-5	0-5	0-5
Survival	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
Reproduction	0-5-10	0-5-10	0-5		0	0-5	0-5	0-5
Structure								
[illegible]	0	0-5		5-10	0-5		5-10	
size	0	0-5	[illegible]	5-10	0-5		5-10	
physical variables	0-5	5-10		5-10	0-5		5-10	

M - Feasibility of methodology
I - Feasibility of interpretation
Numbers in the table reflect the estimated number of years until methodology is available or knowledge is sufficient to interpret endpoint data. See text for additional explanation.

[a] Categories for the population matrix differ from the ecosystem matrix because the population-level endpoints are more closely related to biological systems than to habitat.

Figure 2.2-5

Reference: Report on the Ecological Risk Assessment Guidelines Strategic Planning Workshop (EPA/630/R-92/002; February 1992)

Outline for Baseline Human Health Risk Assessment Report

ONONDAGA LAKE - Site Name/Project	NYSDEC Site No.		
PRP:	PRP Contact:		
Consultant Performing RA:	Consultant Contact:		
	Section Present?	Section Complete?	Reserved
1.0 INTRODUCTION			
1.1 Overview			
* General problem at site			
* Site-specific objectives of RA			
1.2 Site Background			
* Site Description			
* Map of site			
* General history			
–Ownership			
–Operations			
–Contamination			
* Significant site reference points			
* Geographic location relative to offsite areas of interest			
* General sampling locations and media			
1.3 Scope of Risk Assessment			
* Complexity of assessment and rationale			
* Overview of study design			
1.4 Organization of RA Report			
2.0 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN			
2.1 General Site-specific Data Collection Considerations			
* Detailed historical information relevant to data collection			
* Preliminary identification of potential human exposure			
* Modeling parameter needs			
* Background sampling			
* Sampling locations and media			
* Sampling methods			
* QA/QC methods			
* Special analytical services			
2.2 General Site-specific Data Evaluation Considerations			
* Steps used			
* QA/QC mehods during evaluation			
* General data uncertainty			
2.3 Environmental Area 1 (complete for all media)			
* Area- and media-specific sample collection strategy			
* Data from site investigations			
* Evaluation of analytical methods			
* Evaluation of quantitation limits			
* Evaluation of qualified and coded data			
* Chemicals in blanks			
* Tentatively identified compounds			
* Comparison of chemical concentrations with background			
* Further limitation of number of chemicals			
* Uncertainties, limitations, gaps in quality fo collection or analysis			

Figure 2.2-6

Outline for Baseline Human Health Risk Assessment Report

ONONDAGA LAKE - Site Name/Project PRP: Consultant Performing RA:	NYSDEC Site No. PRP Contact: Consultant Contact:		
	Section Present?	Section Complete?	Reserved
2.4 Environmental Area 2 (complete for all media)			
As above, and so on for all applicalbe areas and media			
2.X Summary of Chemicals of Potential Concern			
3.0 EXPOSURE ASSESSMENT			
3.1 Characterization of Exposure Setting			
* Physical Setting			
–Climate			
–Vegetation			
–Soil type			
–Surface hydrology			
–Groundwater hydrology			
* Potentially Exposed Populations			
–Relative locations of populations with respect to the site			
–Current land use			
–Potential alternate future land uses			
–Subpopulations of potential concern			
3.2 Identification of Exposure Pathways			
* Sources and receiving media			
* Fate and transport in release media			
* Exposure points and exposure routes			
* Integration of sources, releases, fate and transport			
mechanisms, exposure points, and exposure routes			
into complete exposure pathways			
* Summary of exposure pathways to be quantified			
3.3 Quantification of Exposure			
* Exposure concentrations			
* Estimation of chemical intakes for individual pathways			
3.4 Indentification of Uncertainties			
* Current and future land-use			
* Environmental sampling and analysis			
* Exposure pathways evaluated			
* Fate and transport modeling			
* Parameter values			
3.5 Summary of Exposure Assessment			
4.0 TOXICITY ASSESSMENT			
4.1 Toxicity Information for Noncarcinogenic Effects			
* Appropriate exposure periods for toxicity values			
* Up-to-date RfDs for all chemicals			
* One-and ten-day health advisories for shorter-term oral exposures			
* Overall database and the critical study on which the			
toxicity value is based (including the criticla effect and the			
uncertainty and modifying factors used in the calculation			

Figure 2.2-6

Outline for Baseline Human Health Risk Assessment Report

ONONDAGA LAKE - Site Name/Project	NYSDEC Site No.		
PRP:	PRP Contact:		
Consultant Performing RA:	Consultant Contact:		
	Section Present?	Section Complete?	Reserved
* Effects that may appear at doses higher thatn those required			
to elicit the critical effect			
* Absorption efficiency considered			
4.2 Toxicity Information for Carcinogenic Effects			
* Exposure averaged over a lifetime			
* Up-to-date slope factors for all carcinogens			
* Weight-of evidence classification for all carcinogens			
* Type of cancer for Class A carcinogens			
* Concentration above which the dose-response curve			
is not longer linear			
4.3 Chemicals for Which no EPA Toxicity Values are Available			
* Review by ECAO			
* Qualitative evaluation			
* Documentation/justification of any new toxicity values developed			
4.4 Uncertainties Related to Toxicity Information			
* Quality of the individual studies			
* Completeness of the overall data base			
4.5 Summary of Toxicity Information			
5.0 RISK CHARACTERIZATION			
5.1 Current Land-use Conditions			
* Carcinogenic risk of individual substances			
* Chronic hazard quotient calculation (individual substances)			
* Subchronic hazard quotient calculation (individual substances)			
* Shorter-term hazard quotient calculation (individual substances)			
* Carcinogenic risk (multiple substances)			
* Chronic hazard index (multiple substances)			
* Subchronic hazard index (multiple substances)			
* Shorter-term hazard index calculation (multiple substances)			
* Segregation of hazard indices			
* Justification for combining risks across pathways			
* Noncarcinogenic hazard index (multiple pathway			
* Carcinogenic risk (multiple pathways)			
5.2 Future Land-use Conditions			
* Carcinogenic risk of individual substances			
* Chronic hazard quotient calculation (individual substances)			
* Subchronic hazard quotient calculation (individual substances)			
* Shorter-term hazard quotient calculation (individual substances)			
* Carcinogenic risk (multiple substances)			
* Chronic hazard index (multiple substances)			
* Subchronic hazard index (multiple substances)			
* Shorter-term hazard index calculation (multiple substances)			
* Segregation of hazard indices			
* Justification for combining risks across pathways			

Figure 2.2-6

Outline for Baseline Human Health Risk Assessment Report

ONONDAGA LAKE - Site Name/Project PRP: Consultant Performing RA:	NYSDEC Site No. PRP Contact: Consultant Contact:		
	Section Present?	Section Complete?	Reserved
* Noncarcinogenic hazard index (multiple pathway			
* Carcinogenic risk (multiple pathways)			
5.3 Uncertainties			
*Site-specific uncertainty factors			
–Definition of physical setting			
–Model applicability and assumptions			
–Parameter values for fate/transport and exposure calculations			
* Summary of toxicity assessment uncertainty			
–Identification of potential health effects			
–Derivation of toxicity value			
–Potential for synergistic or antagonistic interactions			
–Uncertainty in evaluation less-than-lifetime exposures			
5.4 Comparison of Risk Characterization Results to Human Studies			
* ATSDR health assessment			
* Site-specific health studies (pilot or epidemiological studies)			
* Incorporation of studies into the overall risk characterization			
5.5 Summary Discussion and Tabulation of the Risk Characterization			
* Key site-related contaminants and key exposure pathways identified			
* Types of health risk of concern			
* Level of confidence in the quantitative information used to estimate risk			
* Presentation of qualitative information on toxicity			
* Confidence in the key exposure estimates for the key exposure pathways			
* Magnitude of the carcinogenic and noncarcinogenic risk estimates			
* Major factors driving risk			
* Major factors contributing to unceratainty			
* Exposed population characteristics			
* Comparison with site-specific health studies			
6.0 SUMMARY			
6.1 Chemical of Potential Concern			
6.2 Exposure Assessment			
6.3 Toxicity Assessment			
6.4 Risk Characterization			

Figure 2.2-6

PRP Human Risk Assessment Report Review Summary

ONONDAGA LAKE NYSDEC No.	PRP	ph fax
	Consultant	ph fax
	NYSDEC	ph fax

Contaminants	Range of Conc. (ppb)	SH	Media or Location	Dermal Contact	Ingestion	Inhalation
1						
2						
3						
4						
5						
6						
7						
8						

PATHWAYS	Transport Mechanisms	PH	Media or Location	Dermal Contact	Ingestion	Inhalation
Drinking Water						
Public						
Private						
Groundwater	1 Hydrologic Communication					
	2 Volatization					
	3 Adsorption to soil particles					
	4 Precipitation from solution					
	5 Biological Uptake					
Surface Water	1 Overland Flow					
	2 Volatilization					
	3 Hydrologic Communication					
	4 Adsorption to soil/sediment					
	5 Sedimentation					
	6 Biological Uptake					
Soil	1 Runoff (soil erosion)					
(includes surface,	2 Leaching					
subsurface, sediment)	3 Volatilization					
	4 Suspension/resuspension					
	5 Biological Uptake					
	6 Soil Gas					
Air	1 Aerosolization					
	2 Atmospheric Deposition					
	3 Volatilization					
Biota/Plant/Food	1 Bioaccumulation					
	2 Bioconcentration					
	3 Biomagnification					
	4 Migration					

Figure 2.2-7

PRP Human Risk Assessment Report Review Summary

ONONDAGA LAKE NYSDEC No.	PRP	ph fax
	Consultant	
	NYSDEC	ph fax

RECEPTORS	Types	RH				
1						
2						
3						
4						
5						
6						
Source Hypotheses (SH)	Pathway Hypotheses (PH)		Receptor Hypotheses (RH)			
A Source exists and is identified	A Pathway exists		A Receptor not impacted by contaminant migration			
B Source can be contained	B Pathway can be interrupted		B Receptor can be relocated			
C Source can be removed/disposed	C Pathway can be eliminated		C Institutional controls can be applied			
D Source can be treated			D Receptor can be protected			

Figure 2.2-7

PRP Ecological Risk Assessment Report Review Summary
Figure 2.2-8

ONONDAGA LAKE -- NYSDEC Site No. 734030-002

PRP:	PRP Site No.
	PRP Contact:
PRP Consultant:	Contact Phone No.:

Evaluation of Media Toxicity		Comment
Estimation of test endpoints at each sampling station (e.g., percent mortality and biomass)		
Mapping of bioassay responses		
Analysis of spatial gradients of bioassay responses relative to sources, problem areas, and sensitive habitats		
Evaluation of suitability of the reference area		
Correlation of test endpoints with substance concentrations		
Evaluation of Macrophyte Assemblages		
Mapping of distributions, densities & species composition		
Comparison of characteristics with substances and variables in other media		
Estimation of test endpoints at each sampling location (e.g., percent mortality and biomass)		
Evaluation of suitability of the reference area		
Evaluation of Phytoplankton and Zooplankton		
Comparison of characteristics with historical information		
Comparison of temporal and spatial patterns		
[illegible]ion of potential effects of nutrient loadings		
Evaluation of Benthic Macroinvertebrates		
Estimation of mean and variance of characteristics (e.g., species richness, diversity, evenness, abundance and biomass of major taxa, and abundances of individual species.		
Mapping of assemblage characteristics		
Analysis of spatial gradients of characteristics relative to sources, problem areas, and sensitive habitats		
Evaluation of suitability of the reference area		
Comparison of assemblage characteristics in the lake with reference conditions measured in the RI/FS or obtained from literature sources		
Correlation of assemblage characteristics with substance concentrations and conventional variables in sediment and sediment toxicity to evaluate potential cause-effect		
Evaluation of Fish Assemblages		
Estimation of mean and variance of characteristics (e.g., species richness, diversity, evenness, abundance and biomass of major taxa, and abundances of individual species.		
Comparison of assemblage characteristics in the lake with reference conditions measured in the RI/FS or obtained from literature sources		
Correlation of assemblage characteristics with substance concentrations and conventional variables in sediment and [illegible]nent toxicity to evaluate potential cause-effect		
[illegible]ation of potential effects of altered levels of dissolved oxygen, substrate alterations, altered macrophyte abundances, and altered food supplies on assemblages		

PRP Ecological Risk Assessment Report Review Summary
Figure 2.2-8

ONONDAGA LAKE -- NYSDEC Site No. 734030-002

Page

'RP:	PRP Site No.
	PRP Site Name:
'RP Consultant:	PRP Contact:
	Contact Phone No.:

lapping of Ecologically Important Areas		Comment
ontaminant Location		
quatic and terrestrial habitats		
Major vegetative assemblages		
Typical vegetative species		
Vegetation Density		
reas of unusually large numbers of species		
reas that are extremely productive		
ggregation Areas		
Feeding		
Breeding		
Spawning		
Nursery		
ishing Areas		
lunting Areas		
ecreational Areas		
oads, buildings, other structures		
dentification of Sensitive Habitats		
rotected by government regulations		
Jnique or unusual habitats		
labitats that occupy relatively small areas		
mportant for continued species propagation		
Especially sensitive to disturbance		
Considered valuable by residents or user groups		
dentification of Key Ecological Receptors		
Key species - dominant, sensitive, recreationally valuable		
dentification of Species with Special Status		
Rare, threatened, or endangered		
Evaluation of Substance Concentrations in Sediments		
Mapping & contouring of spatial distribution		
Analysis of gradients/distribution relative to sources, problem areas, and sensitive habitats		
Evaluation at each sampling station to identify sources		
Evaluation of suitability of reference area		
Use of models to predict future concentrations as a result of various remedial actions		
Evaluation of Substance Concentrations in Water		
Comparison among stations in different areas		
Comparison of concentrations relative to concentrations associated with biological effects		
Use of models to predict future concentrations as a result of various remedial actions		

SOURCES OF UNCERTAINTY THAT AFFECT CONFIDENCE IN ANALYTICAL RESULTS
Onondaga Lake Project -- NYSDEC Site No. 734030-002

PRP Site No.:

PRP Site Name:

PRP Contact

Source of Uncertainty	Degree of Significance by Medium								
	Soil	Sediment	Ground Water	Surface Water	Air	Waste	Biota Fish	Biota Benthos	Other
Sampling									
Design									
Contamination									
Collection									
Preparation									
Storage									
Preservation									
Laboratory									
Storage									
Preparation									
Analysis									
Reporting									
Analyte-Specific									
Volatility									
Photodegradation									
Chemical Degradation									
Microbial Degradation									
Contamination									

Key:
+ + = Likely source of significant error or uncertainty
+ = Potentially significant source of error or uncertainty
+ +/+ = Magnitude of effect determined by examination of data

Figure 2.4-2

IMPORTANCE OF SAMPLING ISSUES BY MEDIUM

Onondaga Lake Project -- NYSDEC Site No. 734030-002

PRP Site No.:

PRP Site Name:

PRP Contact:

Major Sampling Issues	Soil	Sediment	Ground Water	Surface Water	Air	Waste	Biota Fish	Biota Benthos	Other
Contaminant Migration	+ +			+	+				
Temporal Variation			+ +	+ +	+			+	
Spacial Variation	+ +	+ +		+ +	+	+ +	+ +		
Topo./Geologic Properties	+ +		+ +		+				
Hot Spots	+ +	+ +				+ +			
Sample Collection	+		+	+ +	+ +	+	+ +	+ +	
Sample Prep'n./Handling	+ +		+ +	+ +	+ +	+		+ +	
Sample Storage		+ +	+ +	+ +	+ +				
Sample Preservation			+ +	+ +					

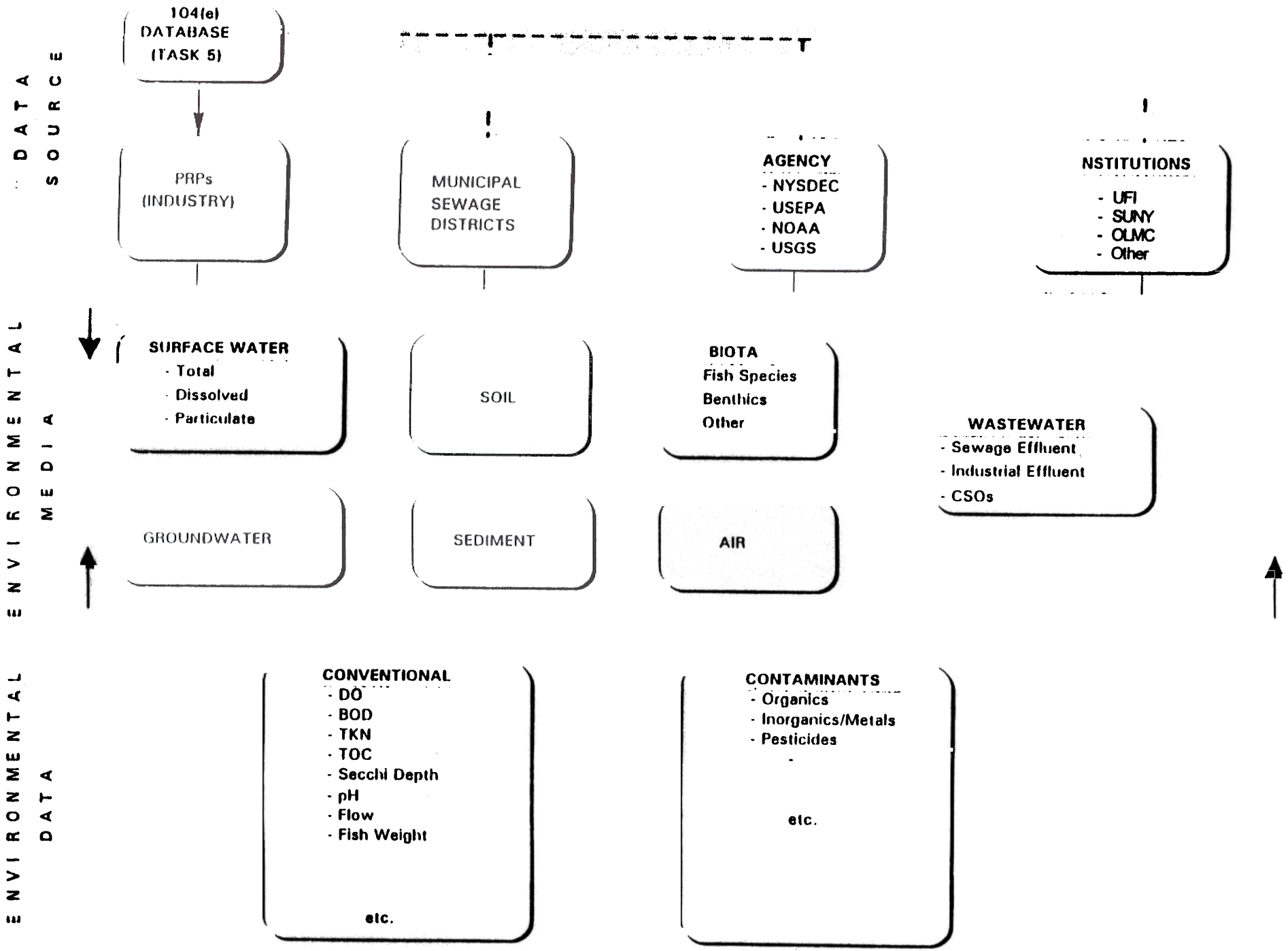
Key:

+ + = Likely source of significant sampling problem

+ = Potential source of sampling problem

Figure 2.4-1

GURE 2.3 - 1
OVERVIEW OF ONONDAGA LAKE ANALYTICAL DATABASE (TASK 3)



PRP Ecological Risk Assessment Report Review Summary
Figure 2.2-8

ONONDAGA LAKE -- NYSDEC Site No. 734030-002

PRP:	PRP Site No.
	PRP Contact:
PRP Consultant:	Contact Phone No.:

		Comment
Evaluation of Bioaccumulation		
Evaluation of spatial patterns of substances in all ecological receptors relative to sources, problem areas, and sensitive habitats		
Comparison of concentrations in tissue with reference concentrations in the literature		
Comparison of concentrations in tissues of organisms from each kind of assemblage with substance concentrations in water, sediments, and food to evaluate trophic transfer of substances		
Comparison of concentrations in sediments with concentrations associated with bioaccumulation in benthic macroinvertebrates and fished (e.g., based on available standards or guidelines)		
Evaluation of Potential Effects of Substances on Terrestrial Biota		
Use of models to predict food-chain transfer of substances		
Comparison of concentrations in benthic macroinvertebrate and fish tissue with concentrations associated with biological effects (e.g., based on available standards or guidelines)		
Evaluation of Substance Concentrations in Soil		
Mapping & contouring of spatial distribution		
Analysis of gradients/distribution relative to sources, problem areas, and sensitive habitats		
Evaluation at each sampling station to identify sources		
Evaluation of suitability of reference area		
Use of models to predict future concentrations as a result of various remedial actions		
Data Quality Objectives		
Are MDLs and PQLs appropriate for all media to identify exceedences of NYS standards, criteria or guidelinesfor impacting benthic/aquatic acute/chronic toxicity and/or wildlife bioaccumulation?		
Are analyses of supporting, non-contaminant chemistries adequate and appropriate (e.g., TOC in sediment; hardness in water)?		

Data Validation Report Review Summary

Project	Lab SDGs: 1
NYSDEC Site No.	2
Laboratory	3
Data Validator	4
Date(s) of Sampling	
Date(s) of Analysis	

Matrix:	VOA	SVOA	Pest/PCB	Inorg	Org Hg	Special
Traffic Report						
Lab Narrative						
Holding Time						
Surrogate						
Matrix Spike						
MS/MSD						
Blanks						
Sample Contamination?						
Instrument Tune						
Mass Calibration						
Internal Standards						
Field Duplicates						
TelCon Logs						
	Source of Uncertainty*					
Sampling:						
Collection						
Preservation						
Laboratory:						
Storage						
Preparation						
Analysis						
Reporting						

Comments

* + Potentially source of error or uncertainty ++ Likely source of significant error or uncertainty

Figure 2.4-3

PRP Remedial Investigation Report Summary
Onondaga Lake -- NYSDEC Site No. 734030-002

PRP:	Phone No.: Fax No.:	PRP Site No.:
Consultant:	Phone No.: Fax No.:	PRP Site Name:
NYSDEC:	Phone No.: Fax No.:	

Page 1 of 2

	Surface Features									Sub-surface Features						Sources				
												Overburden								
	Air	Lake	Stream	River	Lagoon	Surface Runoff	Sediment	Soil	Biota	Soil Gas	Ground-water	Near Surface	Sub-Surface	Deep	Bedrock	Waste	Drainage	Outfalls	Stacks	Off-Site
Contamination Characteristics																				
Target Compounds																				
Volatiles																				
Semi-volatiles																				
Pesticides/Aroclors																				
Inorganics/Metals																				
Conventional Parameters																				
Background																				
No. Locations																				
No. Samples																				
Downgradient																				
No. Locations																				
No. Samples																				
Source of Uncertainty																				
Sampling: Design																				
Collection																				
Storage																				
Volatility																				
Photodegredation																				
Chemical Degradation																				
Microbial Degradation																				
Land Use Characteristics																				
Demographic																				
Residential																				
Commercial																				
Recreational																				
Ecological																				
Endangered or Rare Species																				
Critical Habitat																				

Figure 2.7-1

PRP Remedial Investigation Report Summary
Onondaga Lake -- NYSDEC Site No. 734030-002

PRP:	Phone No.: Fax No.:	PRP Site No.:
Consultant:	Phone No.: Fax No.:	PRP Site Name:
NYSDEC:	Phone No.: Fax No.:	

Page 2 of 2

	Surface Features									Sub-surface Features						Sources				
												Overburden								
	Air	Lake	Stream	River	Lagoon	Surface Runoff	Sediment	Soil	Biota	Soil Gas	Ground-water	Near Surface	Sub-Surface	Deep	Bedrock	Waste	Drainage	Outfalls	Stacks	Off-Site
Risk Assessment																				
Exposure Assessment																				
Completed Pathways																				
Toxicity Assessment																				
Hot Spots																				
Risk																				
Carcinogenic*																				
Noncarcinogenic**																				
Environmental																				
Problem Likelihood?																				

Additional Information

Background Information	Present (Y/N)	Groundwater System	Present (Y/N)
Purpose		Confined Aquifer	
Site Description		Unconfined Aquifer	
Site History		Leaky Confined Aquifer	
Previous Investigations		Hydraulic Conductivity	
Subcontractors Identified		Transmissivity	
Field Notes		Storativity	
Site Maps/Figures		Porosity	
		Dispersivity	
		Hydraulic Gradients	
		Specific Discharge	
		Flow rate	
		Recharge and Discharge Areas	

Notes:

Problem Likelihood: +=Potential; ++=Likely

*Excess Lifetime Carcinogenic Risk
- Very Low: < = 1 per million
- Low: > 1per million to < = 1 per 10,000
- Moderate: > 1 per 10,000 to < = 1 per 1,000
- High: > 1 per 1,000 to < 1 per 10
- Very High: > = 1 per 10

** Noncarcinogenic Risk
- Minimal: < = risk reference dose (rrd)
- Low: > 1 to 5 times rrd
- Moderate: > 5 to 10 times rrd
- High: > 10 times rrd

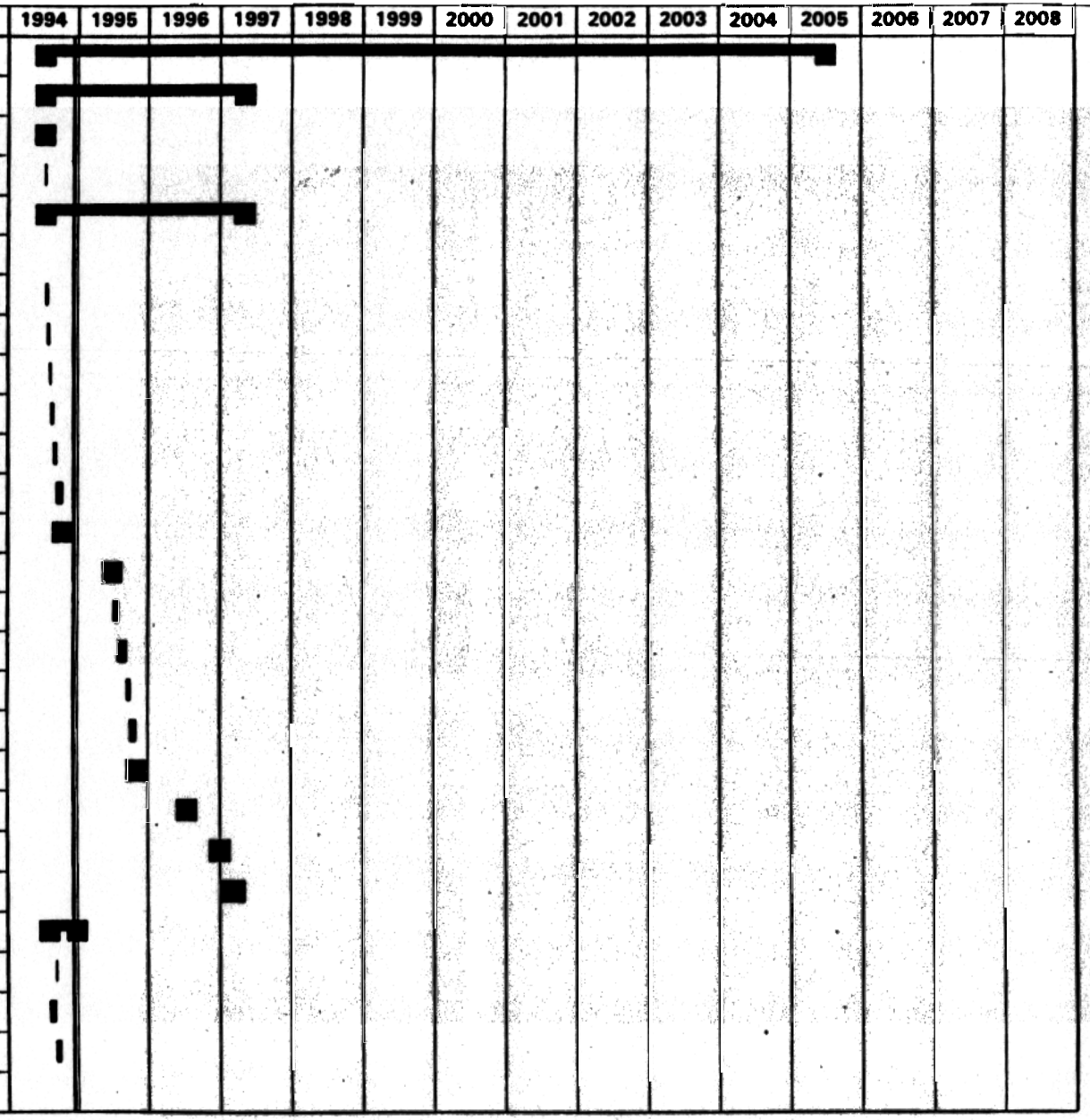
Comment

Review Status:

Figure 2.7-1

FIGURE 3 - 1 Onondaga Lake Project PROJECT SCHEDULE

ID	Name
1	1 BEGIN PROJECT
2	1.1 TASK 1 - Work Plan Development
3	1.1.1 Receive WA
4	1.1.2 Return Acknowledgment
5	1.1.3 TASK 1A-1 - Scoping, Prepare PMP
6	1.1.3.1 Scoping Meeting
7	1.1.3.2 Prepare First Draft PMP
8	1.1.3.3 DEC Review
9	1.1.3.4 Prepare Second Draft PMP
10	1.1.3.5 DEC Review
11	1.1.3.6 Prepare Final PMP
12	1.1.3.7 DEC Review
13	1.1.3.8 DEC Issues NTP-YR 1
14	1.1.3.9 DEC Issues Amendment No. 1 for YR 2
15	1.1.3.10 Prepare Draft PMP
16	1.1.3.11 DEC Review
17	1.1.3.12 Prepare Final PMP
18	1.1.3.13 DEC Review
19	1.1.3.14 DEC Issues NTP-YR 2
20	1.1.3.15 DEC Issues WA No. 2
21	1.1.3.16 WA No. 1 Ends
22	1.1.3.17 Finalize Closeout of WA No. 1
23	1.1.4 TASK 1A-2 - Final RI/FS Work Plan
24	1.1.4.1 Site Visit
25	1.1.4.2 Prepare Draft FAP, QAPP, HASP
26	1.1.4.3 DEC Review
27	1.1.4.4 DEC/TAMS Work Plan Meeting

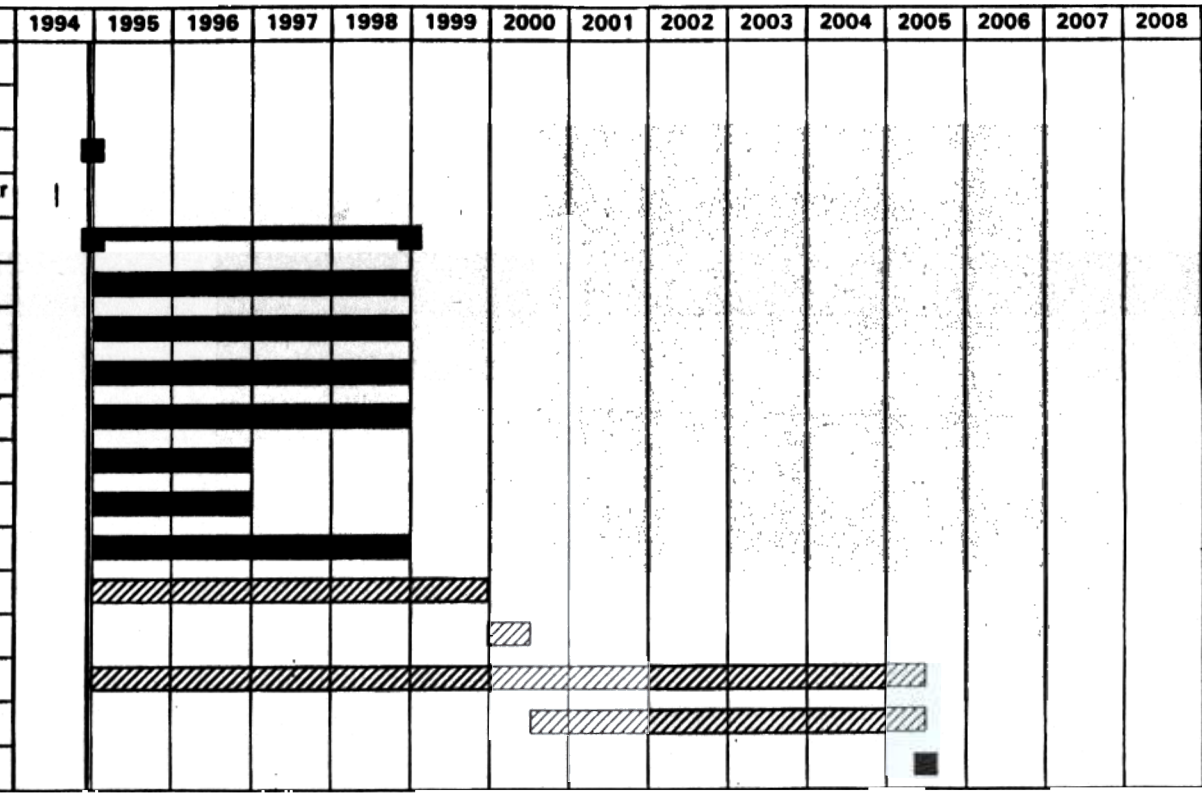


Project: Onondaga Lake Project
Date: 12/6/94

Critical
Noncritical
Progress
Milestone
Summary
Rolled Up

FIGURE 3 - 1 Onondaga Lak roject PROJECT SCHEDULE

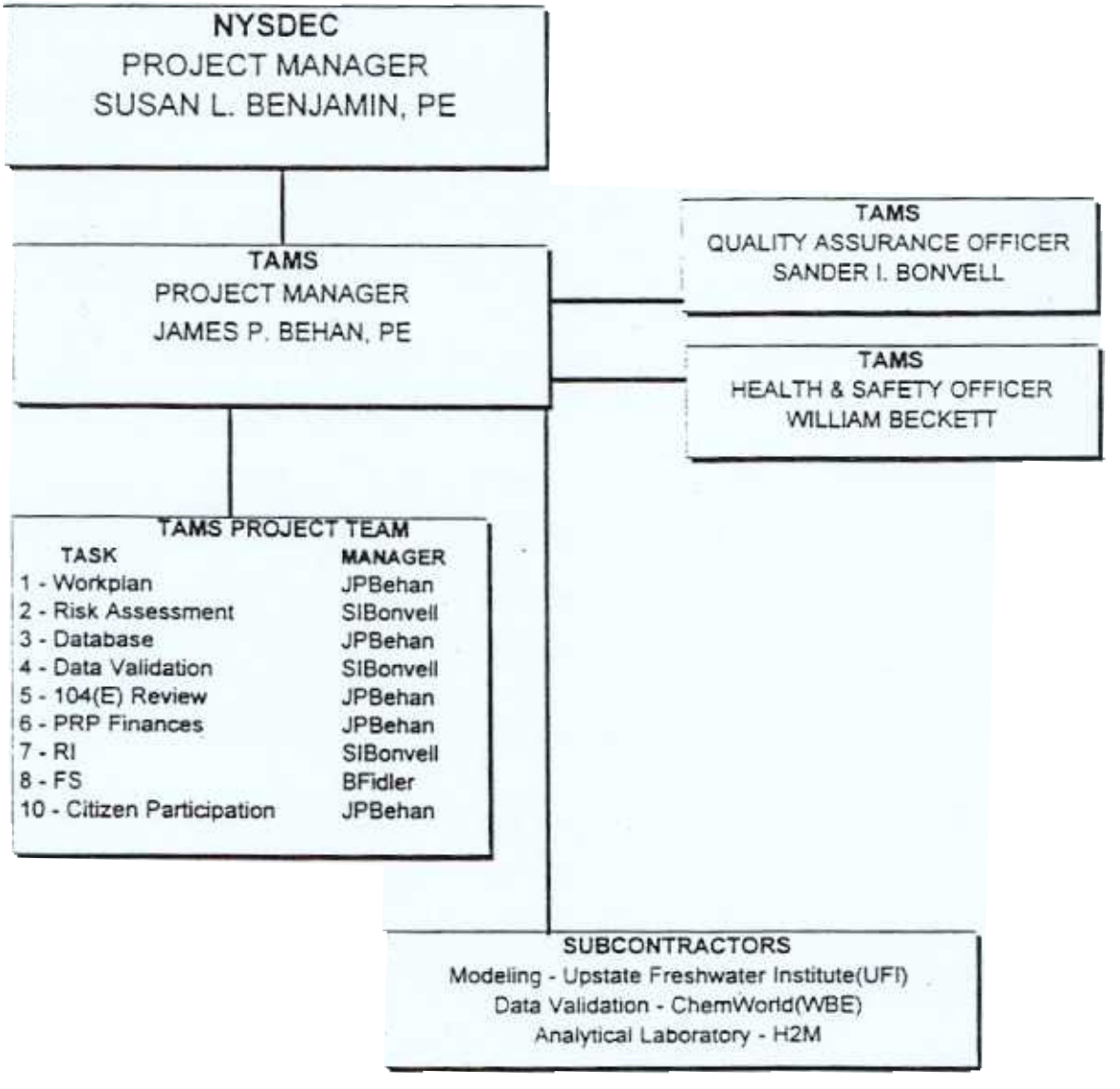
ID	Name
28	1.1.4.5 Submit Final WP
29	1.1.4.6 DEC Review
30	1.1.4.7 DEC Approves Work Plan
31	1.1.5 TASK 1B - Procure NYSDEC Advisor/Subcontr
32	1.2 TASK 2 - Comprehensive Risk Assessment
33	1.2.1 TASK 2.1 - Human Health RA
34	1.2.2 TASK 2.2 - Ecological RA
35	1.3 TASK 3 - Comprehensive Database
36	1.4 TASK 4 - Data Validation
37	1.5 TASK 5 - 104(e) Review
38	1.6 TASK 6 - PRP Financial Assessment
39	1.7 TASK 7 - Comprehensive Remedial Investigation
40	1.8 TASK 8 - Feasibility Study and PRAP
41	1.9 TASK 9 - Record of Decision
42	1.10 TASK 10 - Citizen Participation
43	1.11 TASK 11 - Remedial Design/Construction Services
44	2 END OF PROJECT



Project: Onondaga Lake Project
Date: 12/6/94

Critical
Noncritical
Progress
Milestone
Summary
Rolled Up

FIGURE 4 - 1
PROJECT ORGANIZATION CHART



APPENDIX 2.2 - 1

REVIEWER CHECKLIST

1.0 GENERAL CONCERNS

Were the site-specific objective(s) of the risk assessment stated? (HHEM - 1)

Was the scope of the assessment described (e.g., in terms of the complexity of the assessment and rationale, data needs, and overview of the study design)? (HHEM - 1.1.1, 3.5)

Was an adequate history of site activities provided, including a chronology of land use (e.g., specifying agriculture, industry, recreation, waste deposition, and residential development at the site)? (HHEM - 2.1.4, 9.1)

Was an initial qualitative overview of the nature of contamination included (e.g., specifying in a general manner the kinds of contaminants, media potentially contaminated)? (HHEM - 2.1.4, 9.1)

Was a general map of the site depicting boundaries and surface topography included, which illustrates site features, such as fences, ponds, structures, as well as geographical relationships between specific potential receptors and the site? (HHEM - 2.1.4, 9.1)

2.0 CONCERNS IN REVIEWING DATA COLLECTION AND EVALUATION

2.1 Data Collection

- Was an adequate "conceptual model" of the site discussed? (HHEM - 4.2)

  a qualitative discussion of potential or suspected sources of contamination, types and concentrations of contaminants detected at the site, potentially contaminated media, as well as potential exposure pathways and receptors

- Was an adequate Data Quality Objectives (DQO) statement provided? (HHEM - 4.1.4)

  – a statement specifying both the qualitative and quantitative nature of the sampling data, in terms of relative quality and intent for use, issued prior to data collection, which helps to ensure that the data collected will be appropriate for the intended objectives of the study

  Were key site characteristics documented? (HHEM - 4.3, 4.5)

  soil/sediment parameters (e.g., particle size, redox potential, mineral class, organic carbon and clay content, bulk density, and porosity)

  hydrogeological parameters (e.g., hydraulic gradient, pH/Eh, hydraulic conductivity, location, saturated thickness, direction, and rate of flow of aquifers, relative location of bedrock layer)

(continued)

hydrological parameters (e.g., hardness, pH, dissolved oxygen, salinity, temperature, total suspended solids, flow rates, and depths of rivers or streams; estuary and embayment parameters such as tidal cycle, range, and area; as well as lake parameters such as area, volume, depth, and depth to thermocline)

meteorological parameters (e.g., direction of prevailing wind, average wind speed, temperature, humidity, annual average and 24 hour maximum rainfall)

Were all appropriate media sampled? (HHEM - 4.4, 4.5, 4.6)

was there adequate justification for any omissions?

were literature estimates employed for omissions in background sampling and were they referenced properly?

Were all key areas sampled, based on all available information (e.g., preliminary assessment, field screening)? (HHEM - 4.4, 4.5, 4.6)

- Did sampling include media along potential routes of migration (e.g., between the contaminant source and potential future exposure points)? (HHEM - 4.5, 4.6)

Were sampling locations consistent with nature of contamination (e.g., at the appropriate depth)? (HHEM - 4.5, 4.6)

- Were sampling efforts consistent with field screening and visual observations in locating "hot spots"? (HHEM - 4.5, 4.6)

- **Were detailed sampling maps provided, indicating the location, type (e.g., grab, composite, duplicate), and numerical code of each sample? (HHEM - 5.10)**

Did sampling include appropriate QA/QC measures (e.g., replicates, split samples, trip and field blanks)? (HHEM - 4.7, 5.4)

Were background samples collected from appropriate areas (e.g., areas proximate to the site, free of potential contamination by site chemicals or anthropogenic sources, and similar to the site in topography, geology, meteorology, and other physical characteristics)? (HHEM - 4.4, 5.7)

2.2 Data Evaluation

- Were any site-related chemicals (e.g., human carcinogens) eliminated from analysis without appropriate justification? (HHEM - 5.9)

(continued)

as infrequently detected chemicals (HHEM - 5.3.3, 5.9.3)

as non-detects in a specific medium without employing a "proxy" concentration (HHEM - 5.3)

– as common laboratory contaminants even though sample concentrations were significantly higher than that found in blanks? (HHEM - 5.5)

as present at a "ubiquitous level"? (HHEM - 5.7)

- Were inappropriate "proxy concentrations" assigned to site-related chemicals? (HHEM - 5.3)

was a value of zero or the instrument detection limit (IDL) assigned?

was an erroneous sample-specific quantitation limit employed?

- Were appropriate analytical methods employed for collection of data upon which risk estimates are based? (HHEM - 5.2)

were the methods consistent with the requisite level of sensitivity?

– were established procedures with adequate QA/QC measures employed?

Did the data meet the Data Quality Objectives (DQO)? (HHEM - 4.1.4)

were the sampling methods consistent with the intended uses of data?

- Were appropriate data qualifiers employed? (HHEM - 5.4)

- Were special analytical services (SAS) employed when appropriate? (HHEM - 5.3)

was SAS employed as an adjunct to routine analysis in cases where certain contaminants were suspected at low levels, as non-TCL chemicals, in non-standard matrices, or in situations requiring a quick turnaround time?

3.0 CONCERNS IN REVIEWING THE EXPOSURE ASSESSMENT

Were "reasonable maximum exposures" considered (i.e., the highest exposures that are reasonably expected to occur)? (HHEM - 6.1.2, 6.4.1, 6.6)

Were current and future land uses considered? (HHEM - 6.1.2, 5.2)

(continued)

REVIEWER CHECKLIST

Was residential land use considered as an alternative future land use? (HHEM - 6.2.2)

– if not, was a valid rationale provided?

Were all potential sensitive subpopulations considered (e.g., elderly people, pregnant or nursing women, infants and children, and people with chronic illnesses)? (HHEM - 6.2.2)

Were all significant contaminant sources considered? (HHEM - 6.3.1)

Were all potential contaminant release mechanisms considered, such as volatilization, fugitive dust emission, surface runoff/overland flow, leaching to ground water, tracking by humans/animals, and soil gas generation? (HHEM - 6.3.1)

Were all potential contaminant transport pathways considered, such as direct air transport downwind, diffusion in surface water, surface water flow, ground-water flow, and soil gas migration? (HHEM - 6.3)

Were all relevant cross-media transfer effects considered, such as volatilization to air, wet deposition, dry deposition, ground-water discharge to surface, and ground-water recharge from surface water? (HHEM - 6.3)

Were all media potentially associated with exposure considered? (HHEM - 6.2, 6.3)

Were all relevant site-specific characteristics considered, including topographical, hydrogeological, hydrological, and meteorological parameters? (HHEM - 6.1, 6.3)

- Were all possible exposure pathways considered? (HHEM - 6.3)

  was a valid rationale offered for exclusion of any potential pathways from quantitative evaluation?

Were all "spatial relationships" adequately considered as factors that could affect the level of exposure (e.g., hot spots in an area that is frequented by children, exposure to ground water from two aquifers that are not hydraulically connected and that differ in the type and extent of contamination)? (HHEM - 6.2, 6.3)

Were appropriate approaches employed for calculating average exposure concentrations? (HHEM - 6.4, 6.5)

– was a valid rationale provided for using geometric or arithmetic means?

Were appropriate or standard default values used in exposure calculations (e.g., age-specific body weights, appropriate exposure frequency and duration values)? (HHEM - 6.4, 6.5, 6.6)

(continued)

REVIEWER CHECKLIST

4.0 CONCERNS IN REVIEWING THE TOXICITY ASSESSMENT

Was the exclusion of any carcinogen from analysis adequately justified (e.g., were "weight-of-evidence" classifications and completeness of exposure pathways considered in this decision)? (HHEM - 5.9, 7.3)

Were appropriate "route-to-route" extrapolations performed in cases where a toxicity value was applied across differing routes of exposure? (HHEM - 7.5.1, 8.1.2)

- were the extrapolations based on appropriate guidance?

- Were appropriate toxicity values employed based on the nature of exposure? (HHEM - 7.4, 7.5)

  - were subchronic vs. chronic RfDs applied correctly based on the duration of exposure?

  - were all sensitive subpopulations, such as pregnant or nursing women potentially requiring developmental RfDs (RfD_{dd}s), considered in the selection of the toxicity values used?

Were the toxicity values that were used consistent with the values contained within the Integrated Risk Information System (IRIS) or other EPA documents? (HHEM - 7.4, 7.5)

5.0 CONCERNS IN REVIEWING THE RISK CHARACTERIZATION

- Were exposure estimates and toxicity values consistently expressed as either intakes or absorbed doses for each chemical taken through risk characterization? (HHEM - 8.1.2)

  - was a valid rationale given for employing values based on absorbed dose?

Were all site-related chemicals that were analyzed in the exposure assessment considered in risk characterization? (HHEM - 8.1.2)

- were inconsistencies explained?

Were risks appropriately summed only across exposure pathways that affect the same individual or population subgroup, and in which the same individual or population subgroup faces the "reasonable maximum exposure," based on the assumptions employed in the exposure assessment? (HHEM - 8.3)

Were sources of uncertainty adequately characterized? (HHEM - 8.4)

Were current and future land uses considered?

Were all significant contaminant sources considered?

Were appropriate or standard default values used in exposure calculations?

Were the toxicity values that were used consistent with the values contained within the Integrated Risk Information System (IRIS) or other EPA documents?

Although the checklist addresses many pertinent issues, it is not a complete listing of all potential concerns, since this objective is beyond the scope of a preliminary review tool. In addition, some of the concerns listed are not necessarily appropriate for all risk assessment reports.

The recommended steps in reviewing a risk assessment report are as follows:

(1) compare the risk assessment report outline to the suggested outline in Section 9.1 of this chapter (i.e., Exhibit 9-1);

(2) use the checklist in this section (i.e., Exhibit 9-2); and

(3) conduct a comprehensive review.

The outline (Exhibit 9-1) and the checklist (Exhibit 9-2) are intended only as tools to assist in a preliminary review of a risk assessment, and are not designed to replace the good judgment needed during the comprehensive review. These two tools should provide a framework, however, for the timely screening of risk assessments by reviewers with a moderate level of experience in the area. If these steps are followed in order, then some of the major problems with a risk assessment report (if any) can be identified before significant resources are expended during the comprehensive review.

9.3 MANAGEMENT TOOLS

This section provides a concise checklist for the RPM to use in carrying out their role in the risk assessment process (see Exhibit 9-3). Other decision-makers at the site also may find this checklist useful. Specific points at which the managers should be involved, or may be called upon to become involved, during the risk assessment are discussed in Chapters 4 through 8 of the manual. This checklist extracts information from those chapters, and also includes pointers on planning and involvement for the manager. The purpose of the checklist is to involve managers in the direction and development of the risk assessment and thereby avoid serious mistakes or costly misdirections in focus or level of effort.

Although the checklist is shaped to suggest when and how the manager should become involved in the risk assessment process, it is assumed that part of the manager's involvement will require consultation with technical resources available in the region or state. The checklist advises consulting the "regional risk assessment support staff" at a number of points in the process. This contact may not be one person, but could be a number of different technical people in the region, such as a toxicologist, hydrogeologist, or other technical reviewer. The manager should become aware of the resources available to him or her, and use them when appropriate to ensure that the risk assessment developed is useful and accurate.

APPENDIX B

SUPERFUND STANDBY PROGRAM
New York State
Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233-7010

CRI/FS
HEALTH AND SAFETY PLAN
ONONDAGA LAKE PROJECT
Site No. 734030-002

Work Assignment Number
D003060 - 9

Prepared by

TAMS CONSULTANTS, Inc.
400 Clifton Corporate Park
Clifton Park, NY 12065-3829

December 1994

DOCUMENT
DATE 2/8/95

HEALTH AND SAFETY PLAN
ONONDAGA LAKE PROJECT

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1.0 APPROVALS

By their signature the undersigned designate this Health and Safety Plan to be used for the protection of the health and safety of workers during field activities associated with the Onondaga Lake Project.

Project Manager

_____ _____

James P. Behan. P.E. Date

Health & Safety Manager

_____

William Beckett Date

2.0 INTRODUCTION

2.1 Purpose and Scope

TAMS may have to conduct field work at the Onondaga Lake NPL Site under its Work Assignment with the New York State Department of Environmental Conservation. The purpose of this site specific Health and Safety Plan (HASP) is to address the health and safety risk to TAMS employees and its subcontractors working on-site should field work become necessary, and to specify appropriate measures to control unacceptable risks.

Since the type of and need for on-site field work depends on the quality and completeness of investigations that have not yet been completed or reviewed by TAMS, this HASP is intended to serve as a generic document that address potential risk to site workers in a general, non-specific sense. When it is decided to conduct field work at the site, this HASP must be updated based upon the latest available information regarding contaminants and concentrations together with descriptions of tasks, personnel, subcontractors, equipment and durations of field activities.

This HASP in its generic form assumes that any on-site work by TAMS will be mostly investigative in nature, with the possibility of some interim remedial measures. While the provisions in this HASP, as well as applicable occupational health and safety standards, must be complied with by TAMS and its subcontractor personnel, the field operations leader can adjust or specify additional safety measures according to the nature and extent of risks and hazards encountered in the field. Such changes and additions must be entered in the field log book and submitted to the TAMS Health and Safety Manager. Significant changes to safety measures in this HASP based upon unanticipated significant hazards encountered in the field or significant changes in the scope of work must be reviewed with the Health and Safety Manager prior to implementation. However, in the event of an emergency, the field operations leader decides the appropriated course of action. To facilitate such decisions, important emergency information is provided in Section 9, Emergency Response Plan.

2.2 Personnel

All TAMS personnel and subcontractor personnel performing duties or working in areas where there is the potential for exposure to hazardous materials or safety hazards (e.g., collection samples, sediment handling, decontamination) will meet the training and medical requirements of OSHA Standard 29 CFR 1910.120 before working on-site. Site personnel and their duties are outlined below. The names of personnel who have been assigned positions are listed in Table 2. Where names have not been listed, they will be added when the individuals have been selected.

1. TAMS' Project Manager is responsible for all aspects of the project, including the

safe conduct of site operations and compliance with this HASP. The Site Manager is not routinely on site. He controls the project through the on-site supervisor.

2. The TAMS Health and Safety Manager is responsible for TAMS' health and safety program for hazardous waste operations. He is not routinely on site, but may periodically check on the progress of the project and responds to incidents and emergencies. He audits the project to verify adherence to the HASP and safety standards, and identifies where corrective actions are needed. He serves as a resource to project personnel for safety matters.

3. The TAMS On-Site Supervisor or Field Team Leader reports to the TAMS Project Manager. He/she is the on-site person in charge of the project and is responsible for directing the work of the site personnel. He/she is responsible for conducting a safe operation and enforcing compliance with this HASP. This responsibility does not relieve subcontractors of their responsibility for the safety of their employees or for compliance with applicable regulations.

4. Depending on the hazards involved, number of field personnel and extent of activities, a Site Safety Officer may be designated to assist the on-site supervisor in carrying out his responsibilities. The Site Safety Officer would be the on-site person responsible for carrying out the provisions of this HASP with regard to site work, and will ensure that all personnel entering the site understand and adhere to the provisions of this plan. Any changes made in the provisions of this HASP shall be approved by the Site Safety Officer. Any personal protective equipment upgrades or downgrades shall be approved by the Site Safety Officer. The Site Safety Officer shall have the authority to stop any operation or site work if, in the opinion of the Site Safety Officer, the site conditions or the manner in which the work is being conducted present a hazard to site personnel, surrounding populations, or the environment. He/she shall monitor the discontamination procedures (see paragraph 8.0) and the emergency response procedures (see paragraph 9.0).

5. Field personnel involved in the site work are responsible for complying with this HASP, working in a safe manner, and following the directions of the Site Safety Officer and Site Supervisor. Site personnel will only perform tasks for which they have received appropriate training.

6. Site visitors who are not affiliated with TAMS, a subcontractor or Federal or New York State agencies will not be allowed into active work areas without making arrangements with the New York State Department of Environmental Conservation (NYSDEC) and TAMS well in advance of the planned visit. If no prior arrangements have been made, visitors will be allowed only into the command

post and public areas.

7. Subcontractors are responsible for complying with all OSHA standards and regulations, and with this HASP. This HASP does not address all the applicable occupational safety and health regulations. Provision of this HASP is intended to specify certain measures to reduce or eliminate hazards peculiar to this hazardous waste site. Subcontractors are not relieved of responsibility for the safety of their employees. Should Subcontractors feel that additional or different measures from those specified in this HASP are warranted for the safety of their employees on site, they shall discuss and resolve their concerns with the TAMS Site Supervisor or Project Manager before proceeding with the work. Subcontractors are also responsible to ensure that their equipment is used and employees act in a manner that would not adversely affect the safety of any site worker, visitor or the public during the conduct of work on site.

   All visitors will follow the advice and instructions of the TAMS' Site Supervisor and Site Safety Officer. Failure to follow these instructions may endanger the health and safety of the visitors and other on-site personnel.

2.3 Site Description and Background

The Onondaga Lake NPL site is located in the County of Onondaga, New York. The lake itself is only one portion of the site, as the site will include all areas within the watershed where hazardous substances have come to be located that are impacting or threatening the lake system.

The lake is 4.5 miles long, 1 mile wide and up to 60 feet deep. Major tributaries flowing into the lake include: Onondaga Creek, Nine Mile Creek, Ley Creek, Sawmill Creek, Bloody Brook and Harbor Brook. Another major source of inflow to the lake is the treated effluent from the Metropolitan Sewage Treatment Plant (METRO). The outlet of Onondaga Lake flows into the Seneca River which ultimately flows into Lake Ontario.

The shoreline of the lake is owned entirely by government agencies or commercial enterprises. There is no individually owned shoreline. The City of Syracuse lies to the east and southeast of the lake. The southwestern shoreline is comprised primarily of wastebed material disposed of by soda ash manufacturing facilities. The northeastern shoreline is mainly park land owned by Onondaga County.

In the 1800s, the lake supported commercial fishing and was known for its resorts. Beginning in 1884, the Solvay Process Company started manufacturing soda ash at facilities along the shoreline. The soda ash company used the shoreline areas to dispose of the manufacturing by-products. These wastebeds now comprise a significant portion of the southwest shoreline and are as high as 60 feet above lake surface.

In 1918, the Syracuse Chemical Works commenced operation of a chlor-alkali plant at Willis Ave., Solvay. In 1947, the plant expanded to include mercury cells for this process. Although not a reactive part of the process, mercury still found its way into the waste stream emanating from the plant. The waste stream ultimately discharged to Onondaga Lake. In 1953, another chlor-alkali plant located on Bridge Street in Solvay, began operation using the mercury cell process. The Syracuse area has been host to a variety of industrial manufacturing companies including, General Motors. General Electric, Allied Chemical, and Bristol Myers.

Since late 1800s, Onondaga Lake has received discharges of industrial and municipal waste. Presently, the most significant industrial pollutants in the lake appear to be mercury and various alkali wastes (e.g., chlorides, sodium, and calcium). About 60 tons of mercury were discharged to the lake from the chlor-alkali process. Recent sampling indicates that ongoing releases from the closed Allied Bridge Street Plant is responsible for a large portion of mercury entering the lake. High levels of mercury in the west flume of the Allied Bridge Street plant drain into the lake via Geddes Brook and Nine Mile Creek. About 100,000 tons/year of alkali wastes were released into the lake. These inorganic wastes caused increased in salinity and calcium levels, the lake no longer mixed normally and there was extensive calcite precipitation. Other industrial pollutants including aromatic hydrocarbons, semi-volatile hydrocarbons, solvents, and polychlorinated biphenyls (PCBs), have also been detected in the lake.

In 1970, the NYSDEC banned fishing on the lake due to high levels of mercury found in the fish. In 1984, the ban was lifted and changed to a health advisory recommendation that no fish be eaten.

Local municipal works contribute pollutants to the lake as well. These include combined sewer overflow (CSOs) discharges caused by large storms, and the Metropolitan Sewage Treatment Plant (METRO) effluent discharges. The Onondaga County Department of Drainage and Sanitation (OCCDDS) has been required via court order to reduce pollutant loadings to the lake.

2.4 Site Characterization

Investigations of the Onondaga Lake have been conducted that have identified health risks associated with uses of the lake and have lead to restrictions and/or advisories directed towards fishing, eating fish, and swimming. The Public Health Assessment for Onondaga Lake prepared by the Agency for Toxic Substance and Disease Registry (ATSDR) dated May 10, 1994 documents the agency's evaluation of health hazards to the public from chemical and microbial contaminants. Although the agency's evaluation is directed to public health risks, it provides information useful for assessing hazards and risks to site workers. This document has served as the principal source of information for the site characterization and hazard evaluation sections of this HASP.

The NYSDEC has entered into an agreement with at least one PRP to conduct an RI/FS. The Department is also negotiating with one PRP to install a cover over odor-emitting tar beds. Additional RIs and information may arise before TAMS would decide to conduct field work. Also, the type of field work to be done by TAMS is not known at this time. For these reasons considerably more information may be available when and if TAMS deems it necessary to conduct field work. This information must be reviewed and evaluated to improve the site characterization, hazard evaluation and other relevant sections of this HASP.

While additional information would serve to refine and clarify hazards, and, perhaps, identify new hazards, some of the assessments and conclusions from the Public Health Assessment, which are important to occupational hazards evaluation are unlikely to change significantly.

In the Public Health Assessment the ATSDR concluded that Onondaga Lake is a public health hazard. The Agency also identified contaminants causing the hazard, contamination sources, pathways of exposure and levels of risk compared to acceptable criteria. The Agency also identified: data gaps where the absence of information precluded a risk assessment; the presence of chemicals whose hazards are not known; and, equally important, numerous chemicals that are on site but do not present an unacceptable risk. The Agency dismissed contaminated groundwater as a public health hazard because the groundwater is not a source of drinking water. However, from an occupational point of view, if workers have to collect samples of the groundwater, they could be exposed to contaminants.

The public health hazard is due to 2 causes:

) lake fish contaminated with high amounts of mercury and PCBs, and

2) fecal contamination of the lake.

Neither of the above are a significant hazard for site workers. They will not eat the fish. Fecal contamination, which indicates the potential for more serious pathological microorganisms to be present in the lake water, is primarily a hazard due to ingestion. If workers enter the water, it will be while wearing waders and only in shallow water. In other words, the potential for ingestion is not a risk as it would be for swimmers. However, a worker could accidentally fall into the lake. This scenario will be addressed in subsequent sections of the HASP. Otherwise, the above 2 hazards will not be considered as an occupational hazard.

The Public Health Assessment for Onondaga Lake prepared by the Agency for Toxic Substance and Disease Registry dated May 10, 1994 evaluated contaminants in surface water, sediments, shoreline soil and air (fish and waterfowl are not relevant to occupation-

al exposure).

Surface Water

According to Public Health Assessment, Surface water was analyzed for organics and metals. The concentrations of organics were lower than the NYS Department of Health (NYSDOH) drinking water and NYS DEC Class A surface water (drinking water source) standards, except for chloride. Chloride (500 mg/l) exceeded NYS drinking water and Class A surface water standards. Because these standards are based on taste and not health risks, chloride will not be considered as an occupational hazard.

Cadmium and lead in some samples collected between 1987 and 1990 were reported to be equal to or slightly in excess of NYS drinking water standards or action levels, but more recent samples reported in 1993 did not confirm these results. Some samples also contained antimony (25 µg/l) and manganese (650 µg/l) in excess of NYS Class A surface water standard; however, these values were well below health assessment levels for recreational exposure to surface water.

Recently (Hassett, 1994), dichlorobenzenes, naphthalene, xylenes and alkyl benzenes and 2 previously unidentified compounds 1-phenyl-1-(4-methylphenyl)-ethane and 1-phenyl-1-(2,4-dimethylphenyl)-ethane were found in the water at the southern end of the lake, however, no concentrations were reported.

In 1993, PTI Environmental Services reported a visible petroleum sheen on the water surface in 2 areas at the southern end of the lake.

Sediments

According to the Public Health Assessment, lake sediments contain many chemicals at concentrations above background levels. The type of contamination varies. The southeastern part of the lake below Nine Mile Creek is more heavily contaminated than the northwestern regions of the lake.

Mercury has been found in the sediment throughout the lake and at various depths. Mercury is unevenly distributed throughout lake sediment. The surface sediments in the lake near the shoreline tend to have lower contaminant concentrations than the sediments in the lake at distances further from the shoreline (PTI, 1991). The mean detected concentration of mercury in the surface sediment is 3.8 milligrams per kilogram (mg/kg), about 7.7 times the background concentrations (PTI, 1993a). The range of concentrations of mercury in the surface sediment is 0.15 mg/kg to 68.9 mg/kg. Core samples had a higher mean of detected values (13.9 mg/kg), though the range was comparable.

Several additional metals were also found in lake sediments. The average concentration

detected in the surface sediment for cadmium (2.5 mg/kg), chromium (79.3 mg/kg), copper (44.9 mg/kg), nickel (26.6 mg/kg) and zinc (110 mg/kg) exceeded typical background ranges for metals in soils. The average core sample concentrations tended to be 2 to 3 fold higher than the surface sediment concentrations. Barium, cadmium, and lead were detected in some of the sediment samples at concentrations exceeding the naturally occurring range for NYS soils (NYS DEC, 1989). The concentrations of antimony and manganese in lake sediments were within the background range for NYS soils. No metals were detected at concentrations exceeding health assessment comparison values.

Several volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs) were detected in some sediment samples (PTI, 1993a), including benzene (up to 5.7 mg/kg), toluene (up to 4.2 mg/kg), chlorinated benzenes (e.g., monochlorobenzene up to 43 mg/kg; 1,4-dichlorobenzene up to 16 mg/kg; and hexachlorobenzene up to 1.2 mg/kg), bis(2-ethylhexyl)phthalate (up to 3 mg/kg), and PCBs (up to 1.1 mg/kg). The average concentrations of total polycyclic aromatic hydrocarbons (PAHs) detected exceed background levels; the higher concentrations were found in the southeastern portion of the lake. In addition, several different benzene compounds, PAHs, and aliphatic hydrocarbons were tentatively identified in some sediment samples (PTI, 1993a). Petroleum hydrocarbons were also detected at extremely elevated concentrations (up to 47,000 mg/kg) in sediment samples at the southern end of the lake (PTI, 1993a). The petroleum hydrocarbons detected have not been adequately characterized to evaluate possible public health implications. This represents a data gap that precludes further evaluation of petroleum hydrocarbons in this PHA. Although concentrations were not quantified, 1-phenyl-1-(4-methylphenyl)-ethane and 1-phenyl-1-(2,4-dimethylphenyl)-ethane were also detected in sediment at the southern end of the lake (Hassett, 1994). A potential source of these compounds are the tar beds.

There are no comparison values for evaluating exposure to metals or organic compounds in lake sediments. However, soil comparison values do exist and the concentrations for metals above background do not exceed comparison values for soil in a non-residential setting. Therefore, metals found in the lake sediment will not be considered further in this HASP. With the exception of PAHs, the values of the organic compounds detected did not exceed comparison values for soil in a non-residential setting and will not be evaluated further in this HASP.

For some of the PAHs detected in lake sediments there are no comparison values. For these compounds the comparison value for benz(a)pyrene was used by the ATSDR to evaluate concentrations of carcinogenic PAHs and the comparison value for pyrene was used to evaluate concentrations of non-carcinogenic PAHs. The average concentration of all carcinogenic PAHs detected exceeds comparison values for soil in a non-residential setting.

Shoreline Soil

According to the Public Health Assessment, the shoreline soil has been investigated for potential chemical contaminants, however, the primary emphasis of these investigations has been on the industrial regions in the southeastern portion of the lake. Soda ash wastes (Solvay) have been deposited in several waste beds along the southwestern portion of the lake. Blasland and Bouck Engineers reported in 1990 that these waste beds generally contain inorganic salts such as calcium chloride, sodium chloride, calcium carbonate, calcium silicate, magnesium hydroxide and calcium hydroxide. The waste beds are alkaline and surface water drainage from the waste beds have pHs that rang e from 7.5 to 10.6. In addition, wastes from a chlorinated benzene plant, including tar, benzene, toluene, xylene, PAHs, and chlorinated benzenes, were deposited about 200 feet from the shoreline in the Semet residue ponds (tar beds) that were built on top of a soda ash wastebed. According to the Public Health Assessment, odors apparently from the tar beds, have been detected by NYSDOH personnel several miles from the site, including several parts of the City of Syracuse. There is a large bulk petroleum storage/terminal facility, known as Oil City, on the shoreline. The presence of petroleum products in lake sediment suggests that there may be petroleum products contaminating the shoreline soils.

Data is not available for other portions of the shoreline. However, a 1973 report describes some sediment dredging operations in the outlet barge canal, the oil terminal area, and the delta near the mouth of Nine Mile Creek (USEPA, 1973). The disposition of most of the dredged sediments was not reported and is not currently known. The delta near the mouth of Nine Mile Creek was dredged in 1968 and the dredge spoils were disposed in a low area just north of the creek which was being developed as a recreational park. These spoils have not been analyzed for potential contaminants.

Air

There is no data from the lake pertaining to surface releases of compounds. Odors from the tar beds vary and tend to be stronger in the warmer weather and, according to the Public Health Assessment, apparently have been detected by local health officials two to three miles away. Therefore, depending on the wind direction they could impact the air quality at or near the lake. Elevated levels of benzene have been detected by NYSDEC, NYSDOH and the County Health Department in the region "near the tar beds" (ATSDR, 1994).

Other

Parts of the southern shoreline near Nine Mile Creek are steep and rocky and access to the lake along these areas is difficult and hazardous. The industrial and commercial sites including the tar beds and some waste beds along the shoreline have not been evaluated for physical hazards. The tar beds are fenced and posted.

3.0 HAZARD EVALUATION

3.1 Exposure Potential

Note that the Public Health Assessment, which served as a source of information about chemicals and, in some cases, their concentrations in various media, was an initial release and may be subsequently revised. However, the chemical data will not change. On the other hand, any conclusions based on the data regarding health hazards must consider uncertainties in the data. For example, the data are limited in that selected, and, in some cases, random locations were sampled. In non-sampled areas, chemicals and their concentrations may be different than the reported data. Also, some of the data were collected several years ago. Even though the data may have been accurate at the time of sampling, the chemicals and their concentrations may have changed over the years due to natural phenomena and subsequent discharges.

For these reasons, conclusions and recommendations pertaining to health hazards based on the Public Health Assessment information should favor the conservative approach. Therefore, Table 1, Chemical Hazard Assessment Summary, includes terms such as, "expected hazard", "uncertain", "unknown", and "consider hazard until shown otherwise".

On the positive side, the Public Health Assessment information uses results from investigations that occurred over a number of years, i.e., from 1987 to 1993. Some chemical concentrations were shown to decrease over that time rather than increase. The investigation became more thorough over time in that more extensive sample analyses were conducted to expand the search for chemicals.

It is important to note that the various investigations tended to focus not only on general conditions of the lake, but on likely hot spots near specific sources of pollutants. In other words, worst case scenarios.

As a result, the investigative data provides very useful information for deducing potential health hazards to site workers and should be interpreted conservatively.

Site workers should be alert to different and new hazards, and be prepared to respond accordingly. They should use monitoring instruments as recommended in Section 6.0 to assist in evaluating the presence of chemical hazards and wear the PPE recommenced in Section 5.0 to guard against existing and unforeseen hazards.

The information reported in Section 2.4, Site Characterization, has been summarized in Table 1, Chemical Hazard Assessment Summary. The hazards are divided according to media.

Surface Water

The summary indicates that site workers handling surface water will not be exposed to a significant health hazard. However, since hazardous chemicals are present, albeit in low concentrations, good work practices, such as wearing gloves, should be used to minimize contact.

Sediments

Organics, except PAHs, and metals are not present in significant concentrations. Again, good practices should be used to minimize unnecessary contact. According to the Public Health Assessment, there is a concern about hazards to the public from contact with dredged spoils. The ATSDR stated that the average concentration of all carcinogenic PAHs exceeded comparison values for soil in a non-residential setting. However, it seems that collecting sediment samples would present a potential skin hazard but not inhalation hazard due to the low vapor pressure of the components. Gloves and tyvek would protect against skin contact. Activities that require more extensive contact or handling sediments in enclosed areas would warrant closer evaluation to properly determine such risk.

Petroleum hydrocarbons have been reported as shown on the lake in 2 areas and contamination may be present in the sediments. The ATSDR stated that pet. hydrocarbons have not been adequately characterized to assess the level of risk. Used oil can present a carcinogenic risk from skin contact and an obnoxious odor from the vapors. The risk to workers can be controlled with the use of PPE to minimize skin contact. Unless a large quantity of petroleum or free product is encountered, the amount of vapor is not likely to approach toxic levels, especially working outdoors. In Appendix A, chemical hazard evaluation sheets are provided on gasoline and fuel oil to allow a comparison of hazards similar to petroleum hydrocarbons.

Two other compounds, 1-phenyl-1-(4-methylphenyl)-ethane and 1-phenyl-1-(2,4-dimethylphenyl)-ethane were identified but not assessed by the ATSDR. More information may be obtained from the RI being conducted on the tar beds. Occupational hazards from these and other compounds that may be identified will have to be factored into this HASP. At this point it seems that these compounds would have a low vapor pressure and the measures taken to minimize skin contact for routine sediment handling would protect against these 2 compounds.

Except as noted above for the possibility that petroleum hydrocarbons have contaminated parts of the southeastern shore of the lake, handling this soil will not present a hazard to workers. Petroleum contaminated soil, except where free product is noted, will most likely present only a skin contact hazard.

Tar Beds

The ATSDR did not evaluate the tar beds themselves. One of the PRPs is conducting an RI, which should provide much more information regarding risks and hazards for workers. Until information allows a better definition of hazards, it appears that, among the various media, work on or around the tar beds presents the greatest hazard of exposure to workers. The concentration of chemicals that are present have not been adequately identified, and the hazards are uncertain. Odors have been detected up to several miles from the tar beds; however, the source of the odors has not been conclusively identified as the tar beds. Elevated levels of benzene (concentration not reported) have been reported "near the tar beds" (ATSDR,1994). Depending on the nature and extent of work on or around the tar beds and future information, workers may require Level C or B protection.

Of particular note, if, as suggested in the Public Health Assessment, the tar beds are covered as an interim measure to control odors, workers who have to remove or break through the cover could be exposed to high concentrations of trapped contaminants for a short period of time.

Waste Beds

Mostly salts have been identified in these beds. Drainage water has shown a pH as high as 10.6, which is less than the EPA's pH criteria for corrosivity of 12. As a good practice workers handling material from the waste beds should wear PPE.

Air

Odors and benzene have been reported in the air "near the tar beds" (ATSDR, 1994). Only workers on or around the tar beds are expected to be exposed to a possible health hazard.

Groundwater

Although not assessed by the ATSDR because the public is not exposed, workers who handle the groundwater could be exposed to chemical contaminants. Based on current information, PPE specified for the surface water should provide adequate protection.

Toxicology and physical data for relevant compounds are provided in Chemical Hazard Evaluation Sheets in Appendix A.

Physical Hazards

Slip, Trips and Falls

There hazards are always present in field work and are enhanced in bad weather, rocky terrain, etc. Caution, the buddy system and shoes with substantial support and soles will be required.

3.2.2 Water

Working from a boat presents a risk of falling into the lake. An experienced boat operator will be on board. The buddy system will be enforced. Personal flotation devices will be available for each person on board as well as a throwable ring with 90 feet of rope. Horseplay will be prohibited. No lake work after dark. No overloading of the boat. Visible, audible or radio communication with on-shore personnel will be maintained.

3.2.3 Drilling

If necessary to do, then hard hats and safety shoes will be required within a 30 foot radius of the rig. Safety glasses will be required if within 5 feet of drill when operating. Drillers will be required to follow all OSHA regulations.

3.2.4 Excavation

Because OSHA has a complete standard for excavations, this activity, if necessary, will be addressed before the field work.

3.2.5 Confined Space Entry

Although not anticipated, this activity will be addressed before the field work for the same reason as stated in 3.2.4.

Heat Stress

If field work is done in the summer, heat stress could be a concern depending on use of PPE. Heat stress monitoring will be commenced when the temperature exceeds 70°F and wearing Level C or above. Otherwise initiate monitoring at 80°F. See Appendix B for work-rest schedules and other information.

Cold Stress

If field work is done in the winter, cold stress could be a concern. Cold stress monitoring

will be conducted for personnel working outdoors. Windchill charts and work-rest schedules will be determined according to the guidelines in Appendix B.

SITE LAYOUT AND SITE CONTROL MEASURES

4.1 Work Zones

Work zones will be established according to the nature and location of the field work when these parameters are known. A site map depicting the location of the various work zones will be attached to the HASP where the work zones have been determined, and supplement Figures 1, 2 and 3.

Site Control

All personnel and equipment will be logged in each day in the support area before proceeding to the work zone.

4.3 Site Communications

Visual and audible communications will be easy to maintain in most cases. Emergency communications will be maintained with the use of air horns. If working on the boat and out of site of shore personnel, radio communications will be used. In all cases the buddy system will be enforced.

5.0 PERSONNEL PROTECTIVE EQUIPMENT

Because the nature of possible field work is presently unknown, the following are guidelines according to media being handled based on the information in Sections 2.4 and 3. of the HASP.

Surface Water	Level D with substantial shoes
Sediments	Level D with substantial shoes
Tar Beds	Level D, C or B depending on conditions and future RI information
Waste Beds	Level D with substantial shoes
Shoreline Soil	Level D in southeastern portion of lake and area of dredged spoils
Groundwater	Level D in southeastern portion of lake and area of dredged spoils

If drilling or heavy equipment will be used, hard hats, safety shoes and eye protection will be required. If noise levels are estimated to be near or exceed OSHA's limits (have to raise voice above normal to communicate at a 3 foot distance due to noise source) then noise monitoring shall be conducted, and hearing protection provided as needed. Whether or not noise exposure exceed OSHA's limits, hearing protection shall be provided to TAMS employees who request it. The Site Safety Officer shall monitor and assure the effective use of hearing protection by employees whose exposures to noise exceed OSHA's limits.

The selection and use of PPE shall be in accordance with the personal protective equipment program included in TAMS Health & Safety Program. If specific site tasks when determined require levels of protection different than specified above, paragraph 5.0 of this HASP shall be revised in accordance with the following elements of TAMS PPE program:

- selection according to hazard
- use and limitations of PPE
- task duration
- PPE maintenance and storage
- PPE decon and disposal
- PPE training and proper fitting
- PPE donning and doffing procedure
- PPE inspection procedure prior to, during and after use
- evaluation of effectiveness of PPE program
- limitations during cold and heat stress, and other applicable medical considerations

6.0 MONITORING

The following are guidelines according to media being handled based upon the information in Sections 2.4 and 3. of this HASP.

Surface Water	Not Required
Sediment	PID and/or FID
Tar Beds	PID/FID; Benzene detector tubes, possibly more advanced air sampling.
Waste Beds	Not Required.
Shoreline Soil	PID or FID in southeastern portion of lake and area of dredged spoils.

Groundwater - PID

Contaminated airborne dust is not expected to present a potential hazard. If activities are determined to have the potential to produce airborne dust, measures will be included in this HASP to address potential health hazards, and off-site fugitive dust emissions to comply with NYSDEC TAGMS.

Noise exposures may have to be monitored if levels are estimated to exceed OSHA's limits. This may occur if drilling or heavy equipment are required to be used. Also, refer to paragraph 5.0.

All monitoring instruments shall be regularly maintained and checked to assure proper operation, and calibrated to assure accurate response. Maintenance and calibration shall be according to the minimum requirements specified in TAMS' Health & Safety Program or by the instrument manufacturer. For instruments used in the field, the appropriate manufacturer's operating instructions shall be on site.

When the specific field tasks have been determined, this paragraph shall be revised to be more specific regarding monitoring instruments and their use.

7.0 SAFE WORK PRACTICES AND ENGINEERING CONTROLS

Safe work practices and engineering controls shall be implemented where feasible to comply with OSHA 29 CFR Part 1910.120 to limit employee exposure to hazardous substances or conditions, or physical hazards. The use of personal protective equipment has limitations and presents hazards of its own (such as physical stress and interference with peripheral vision), calling for the consideration and implementation of these measures prior to beginning any site task and before the use of personal protective equipment is instituted.

The safe work practices and engineering controls to be used at the Onondaga Lake site for employee protection are outlined below. These measures as they apply to specific site tasks may also be described in Standard Operating Procedures.

7.1 Buddy System

The buddy system shall be employed for all site work which is conducted in areas out of sight of the support zone or in potentially hazardous areas.

7.2 Contaminant Avoidance

If an area is obviously contaminated, avoid the area. Never sit down or kneel, or lay equipment on the ground without laying down plastic first. Avoid unnecessary contact with on-site objects.

7.3 Electrical Installations

Electrical installations providing power for site work must conform to the 1984 National Electric Code as well as the following: all 120 volt, single-phase, 15- and 20-ampere receptacles not part of a building's permanent wiring system must be protected by approved ground-fault circuit interrupters (GFCIs) except for receptacles on a two-wire, sing-phase portable or vehicle-mounted generator rated not more than 5kW, where the circuit conductors are insulated from the generator frame and all other grounded surfaces.

7.4 Water Safety

Experienced boat operator will be on board at all times. Buddy system will be enforced. No horseplay will be permitted. A personal flotation device will be available for each person on board as well as a throwable flotation device with 90 feet of rope. Fueling of motors will be done at dock. If fuel must be carried on board it will be kept in an UL approved safety can. Also, see emergency communications in Section 9.0.

8.0 DECONTAMINATION

A personnel and equipment decontamination area will be set up between the support and the exclusion zones where practical. Decontamination is not specified where invasive activities are not involved or media not handled.

It is possible that some site work may need to be done in Level C or B protection. Complete, step by step decontamination procedures for hazardous site work are described in Appendix C for various levels of protection. The decon procedures that will be used at Onondaga Lake may vary from the step by step procedures in Appendix C; however, they will follow the inherent decon concepts of washing then rinsing contaminated clothing before removal, starting with the boot covers, the most potentially contaminated article of clothing. The last two articles to be removed are the respirator and the inner gloves. Personnel and equipment decontamination procedures are outlined below. The Site Safety Officer shall monitor the effectiveness of decontamination procedures. Deficiencies noted shall be corrected promptly. The Site Safety Officer shall upgrade the decon procedures as he/she deems necessary. All change to decon procedures and the rationale for the changed shall be documented in the site log book.

8.1 Personnel Decontamination

All personnel wearing protective clothing (PPE) should go through decontamination to remove visible contamination before leaving the exclusion zones for the support zone or other clean areas. In addition, personnel should go through decontamination if their protective clothing becomes torn. Personal protective equipment will be double bagged, labelled as non-contaminated PPE, and disposed accordingly. Facilities for personnel decontamination will be set up at each exclusion zone. Personnel will not enter the support zone without first going through decontamination. Hands and face must be thoroughly washed before eating, drinking, etc.

8.2 Equipment Decontamination

Contaminated equipment and vehicles will be decontaminated by pressure washing followed by steam cleaning. Decon will be done near the excavated area. Wash water will be drained to flow into the backfilled hole. The determination that equipment or vehicles are contaminated will be based upon measurements with direct-reading instruments or visible evidence of contamination.

EMERGENCY RESPONSE PLAN

This Emergency Response Plan applies to site work at the Onondaga Lake site. Copies of this plan are to be kept at the site command post and support areas. The list of emergency telephone numbers and directions to the nearest hospital will be prominently posted in the command post. Copies of the directions to the nearest hospital will be kept in all site vehicles that may be used to transport personnel to the hospital.

On Site Emergencies

On site emergencies can range from minor cuts and scrapes to fires, and the release of toxic gases. Apparently minor incidents at hazardous waste sites can have serious consequences or may indicate the presence of a previously unknown health and safety hazard. Fires, and the release of toxic gases will not only involve site workers, but may harm the neighboring populations and environment.

Site personnel will respond only to small spills of chemicals, incipient fires and personnel injury. In the event of large fires, etc., site personnel will notify emergency response groups and evacuate the area. Procedures are described below.

All incidents will be reported as soon as possible to the Site Manager and the Site Safety Officer who will determine the appropriate steps to be taken. The Site Safety Officer shall evaluate all incidents of an emergency nature, critiquing the effectiveness and ineffectiveness of all aspects of the response. Ineffective elements shall be corrected as soon as possible, documented and renewed as necessary. A report of the evaluation and improvements shall be provided to the Project Manager and Health and Safety Manager as soon as practical. The Health and Safety Manager shall follow-up to assure that significant changes to the procedure have been implemented and are effective.

When the incident is minor, the work may continue. When an incident is considered serious, work will be discontinued until the emergency situation has been brought under control, the incident has been evaluated, and any conditions which may have contributed to the emergency have been mitigated.

All site incidents, including "near misses," will be investigated and documented, using the Incident Report Form and Incident Follow-Up Report Form in Appendix D.

Site Personnel and Lines of Authority

A clear chain-of-command in emergency situations ensures clear and consistent communication between site personnel and results in more effective response to the emergency situation. The duties of site personnel in emergency situations is outlined below:

For small chemical spills and incipient fires, the TAMS On-Site Supervisor will direct all emergency response operations, designating duties to other site personnel and serve as liaison with government officials and emergency response teams. For fires beyond the incipient stage, etc., the On-Site Supervisor will direct evacuation operations. However, he/she will relinquish this role and responsibility to the incident commander of the primary emergency response agency upon arrival, i.e., the Fire Chief who responds to a site fire.

The TAMS Site Safety Officer (SSO) will make initial contact with off site emergency response teams (first aid, fire, police, etc.), make recommendations on work stoppage, and direct on-site first aid and rescue.

A Response Team Coordinator will be designated when no one is performing this function during normal site work. This person will maintain contact with off-site response teams and notify any additional agencies or offices that need to be contacted. He/she will direct arriving emergency response groups to the scene of the incident.

Decontamination personnel will stand by to perform emergency decontamination. Decontamination personnel will also assist the safety officer in rescue operations when necessary.

Field personnel will assist in rescue operations or take over for decontamination personnel when they are required for other duties.

Subcontractor personnel will follow the direction of the TAMS' Supervisor and Site Safety Officer regarding response to incidents, work stoppage and evacuation.

Evacuation Procedures

The site will not be fenced and evacuation will consist of upwind retreat from the site of any chemical release or fire. If the use of direct upwind retreat is somewhat limited, a viable escape route should be identified for each work site before work begins. Evacuation procedures for each work crew should be discussed as part of each daily safety meeting.

Safe Distances and Places of Refuge

No single recommendation can be given for evacuation or safe distance as it is dependent on the amounts and properties of the hazardous substance at the site involved in an incident.

9.4.1 Safe Distances

Safe distances can be determined only at the time of the emergency based on a combination of site-specific and incident-specific factors.

Factors that influence safe distances include:

Toxicological properties of the substance

Physical state of the substance

Quantity and rate of release

Method of release

Vapor pressure of the substance

Wind speed and direction

Atmospheric stability

Height of release

Air temperature and temperature change with altitude

Local topography (e.g., barriers that may enhance or retard a plume or cloud, and attenuate a blast)

Many of these factors are not known for possible releases at the Onondaga Lake site or cannot be safely determined once the release has occurred.

Should a release occur, site personnel will exit in an upwind direction toward the Support Area going away from the release. On-site wind direction indicators will help decide the best direction of movement.

9.4.2 Places of Refuge

Places of refuge or safety stations may be set for localized emergencies that do not require site evacuation. These refuges will be located in upwind locations on the periphery of each exclusion zone. This safety station will be equipped with water for decontamination, potable water for drinking and cooling during heat stress conditions, the wind direction indicator, first-aid kit, fire extinguisher, communication system with the on-site Supervisor or Site Safety Officer, table and chairs, and emergency eye wash. This

refuge will not be used for routine eating, drinking, or air changes.

Another refuge will be established in the support area and provide emergency needs such as first aid; clean, dry clothing; and water for decontamination. This refuge will be equipped with first-aid supplies, decontamination supplies, water, air tanks, 15-minute portable eyewash, and communications.

In cases of emergency, personnel will exit the active site and travel to the designated place of refuge. The Site Supervisor will then contact the Site Safety Officer and together, they will determine the severity of the emergency. If the emergency warrants the site to be evacuated, the emergency siren (or air horn) will be sounded and all personnel will report to the command post.

The Site Safety Officer will then notify the emergency authority and the NYSDEC Site Manager.

Emergency Decontamination

Decontamination procedures used in emergency situations will vary greatly with the severity and particulars of the situation. The TAMS Site Safety Officer will provide advice on the decontamination procedures to be used in each emergency situation. General guidelines for first aid and decontamination procedures are given below.

Inhalation Exposure

Remove the victim from the exposure area, only if proper protective gear is available for the rescue team, to an area with fresh air. Remove protective clothing and respiratory protective gear as soon as possible to determine if the administration of CPR is necessary. If so, complete decontamination while CPR is being administered. Continue CPR until emergency medical unit arrives. If CPR is not required, complete decontamination and transport to hospital; administer other first-aid as indicated.

9.5.2 Contact Exposure

Remove victim from area and flush affected area with water only. Be careful not to spread the contamination to other parts of the body. Remove protective clothing and flush area with water only. Consult references to determine if soap and water wash is indicated. Do not remove respirator until removal of contaminant from body is reasonably assured and the victim is well into a clean zone.

9.5.3 Physical Injury

If a physical injury occurs or worker collapses in a clean zone, first aid will be administered as indicated.

If a physical injury occurs in a contaminated zone, care must be taken to prevent contact of any contaminant with open wounds. The wound can provide easy access to the body for toxic chemicals which are not normally a skin absorption problem. Protective clothing will be removed carefully to avoid additional injury and avoid any exposure of the wound to contaminants on the clothing.

If a worker collapses or loses consciousness in a contaminated zone, remove protective clothing and respiratory protective gear as soon as possible to determine if the administration of CPR is necessary. If so, complete decontamination while CPR is being administered. Continue CPR until emergency medical units arrive. If CPR is not required, complete decontamination and transport to hospital; administer other first-aid as indicated.

9.6 Emergency Medical Treatment and First Aid

Site personnel who have been trained and certified in basic first aid and CRP and are capable of handling minor injuries, will be identified to all site workers.

A first aid kit large enough to accommodate anticipated emergencies will be kept in the support zone. In addition, each crew working more than a few minutes from the support zone will carry a smaller first aid kit for minor injuries. If an injury should require advanced medical assistance, the victim will be transported to the hospital.

Each work site will have available a vehicle for transportation to the hospital. Keys will be left in or near the ignition.

9.7 Emergency and Personal Protective Equipment

The following applies to Tar Bed activities.

The support zone will have available the following emergency equipment:

First Aid Kit
Fire Extinguisher (A,B,C Type)
Air Horn
Emergency Eye Wash (depending on the field tasks)

Each work crew will have available at the work site the following emergency equipment:

First Aid Kit as needed
Fire Extinguisher (A,B,C Type)
Air Horn
Emergency Eye Wash (depending on the field tasks)

Emergency Telephone Numbers

Emergency telephone numbers for medical and chemical emergencies are given in Table 2. These numbers will be displayed prominently near each site phone and in the Support Area.

Directions to Hospital

Directions to the nearest hospital and a map will be obtained and incorporated in this HASP before field work begins. Copies of this map will be available to site personnel and kept in every site vehicle that may be used to transport a worker to the hospital.

MEDICAL SURVEILLANCE

All personnel involved in hazardous work on the site will be participating in a medical surveillance program which meets the criteria set forth in OSHA 29 CFR Part 1910.120. This rule requires that employees engaged in hazardous waste work receive a medical examination at least annually, and the examining physician attest to their ability to work on hazardous waste sites and to wear a respirator without restrictions. All subcontractors involved in hazardous work must provide a list of names and social security numbers of their site workers to TAMS and certify that they meet the above criteria. Certificates may also be requested or provided in lieu of the list. Components of TAMS' medical exam are listed in TAMS' Health and Safety Program Manual.

Physical Examinations

Employees receive physical exams annually and at the time of termination from TAMS or reassignment from the Waste Management Division.

Personnel who are significantly exposed to hazardous materials may require special exams. The need for these tests will be determined by the attending physician after consulting with supervisors, medical monitoring coordinators, and health and safety personnel. Provision will be made to repeat tests when necessary.

Physical exams will be conducted by or under the direct supervision of a licensed physician or a medical consultant who is Board Certified or Board Eligible in Occupational Medicine by the American Board of Preventive Medicine.

The name and business address of TAMS' Supervising Physician is:

Dr. John Masloski
Life Extension Institute
437 Madison Avenue
New York, New York 10022

11.0 TRAINING

40 Hour/Field

All site workers involved in hazardous work shall satisfy the training requirements set forth in 29 CFR 1910.120. All employees engaged in hazardous waste site work shall have received 40 hours of training, or have attained an equivalent combination of experience and training, in hazardous waste site operations and safety procedures. Surveyors are required to have 24 hours of off-site health and safety training, or equivalent combination of training and experience. As part of the initial training, the 40 hour trained employees and the 24 hour trained employees shall also receive a minimum of 3 days and 1 day, respectively, actual field experience under the direct supervision of a trained, experienced supervisor. The contents of TAMS' training program is listed in TAMS' Health and Safety Program Manual.

Supervisory and Annual

On-site supervisors and managers shall have received an additional eight hours of specialized training on the safe management of site operations. All employees shall have received annual updated training. Additional training will be provided to those employees who may be exposed to unique or special hazards at the site.

Contractor Requirements

All Contractors must provide a list of names and social security numbers of their site workers to TAMS and certify that they meet the above criteria. Certificates may also be requested or provided in lieu of the list.

11.4 Site Specific

On-site safety training will consist of a detailed safety meeting and training session prior to the beginning of any field work. This meeting will cover all site activities and the safety measures that are to be employed for these activities and will also review the site emergency response plan. All site workers are required to attend this meeting. Other topics to be discussed will include donning and doffing of personal protective equipment as well as a toxicological review of site-specific known and suspected contaminants. Each site worker will sign the Field Team Review documenting his/her attendance at the site specific training.

Daily

Daily safety meetings will also be conducted prior to each day's activities. These meetings will cover the safety measures to be employed during that day's activities and

the emergency response and evacuation procedures for each work site and work crew.

11.6 Hazard Communication

All workers potentially exposed to hazardous materials brought on site shall have received training as specified in OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Hazardous materials could be brought on site for decontamination, monitoring instrument calibration, sample treatment and fuel for vehicles (only if in container other than vehicle fuel tank). Material Safety Data Sheets for all such hazardous material will be appended to this HASP and reviewed with site employees. Containers of hazardous materials will be labeled in accordance with OSHA, NYS and local regulations.

12.0 REFERENCES

Occupational Safety and Health Administration (OSHA). General Industry Standards, 29 CFR 1910.

Occupational Safety and Health Administration (OSHA). Construction Industry Standards, 29 CFR 1926.

Occupational Safety and Health Administration (OSHA). Hazardous Waste Operations and Emergency Response Standards, 29 CFR 1910.120.

Occupational Safety and Health Administration (OSHA). Hazardous Communication Standard, 29 CFR 1910.1200.

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Blasland and Bouck Engineers, P.C. Waste Bed Feasibility Study. Allied-Signal, Inc., Solvan, New York. February, 1990.

Hassett, J.P. Sources of Organic Contaminants to Onondaga Lake Progress Report, February, 1994. SUN College of Environmental Science and Forestry.

National Fire Protection Association (NFPA). NFPA-70, National Electrical Code. 1984.

New York State Department of Environmental Conservation (NYSDEC). Engineering Investigations at Inactive Hazardous Waste Sites. Phase II Investigation. Mercury Sediments - Onondaga Lake, Volume I. August, 1989.

New York State Department of Environmental Conservation (NYSDEC). Technical and Administrative Guidance Memorandum (TAGM) No. 4031. Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites. October 3, 1989.

PTI Environmental Services. Onondaga Lake RI/FS Work Plan, December, 1991.

PTI Environmental Services. Onondaga Lake RI/FS Substance Distribution, Investigation Data Report Volume I. June, 1993a.

TAMS Consultants, Inc. Health and Safety Program Manual for Hazardous Waste Operations. October, 1993.

US Environmental Protection Agency (USEPA). Office of Enforcement and General Counsel. Report of Mercury Source Investigation, Onondaga Lake, New York and Allied Chemical Corporation. Solvan, New York. 1973.

13.0 FIELD TEAM REVIEW

The Health and Safety Plan for the field activities at the Onondaga Lake site has been reviewed with me and I have had the opportunity to read it. I understand the hazards, precautionary measures, requirements and emergency response procedures, and will comply.

NAME (PRINT)	SIGNATURE	SS Number	DATE

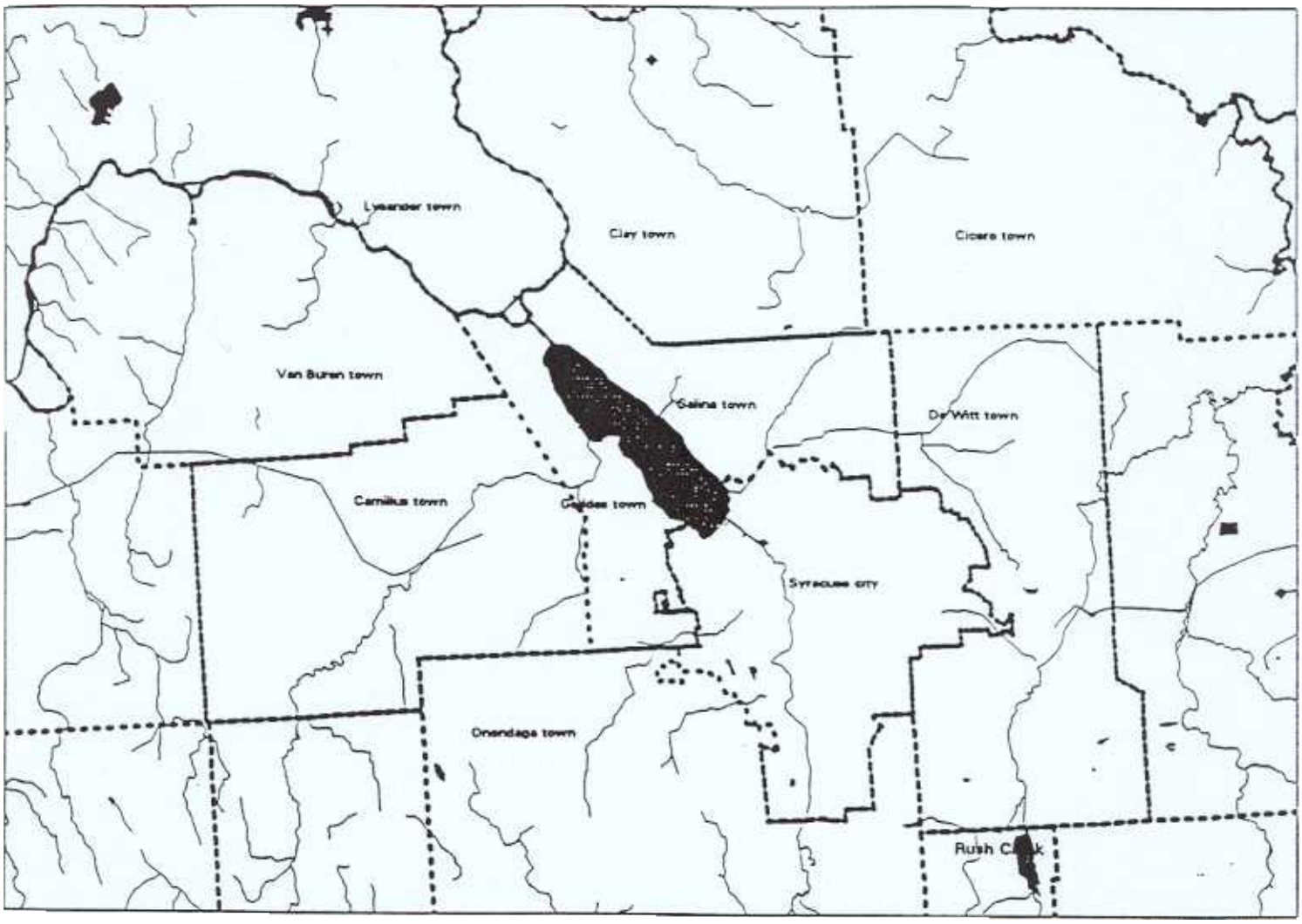
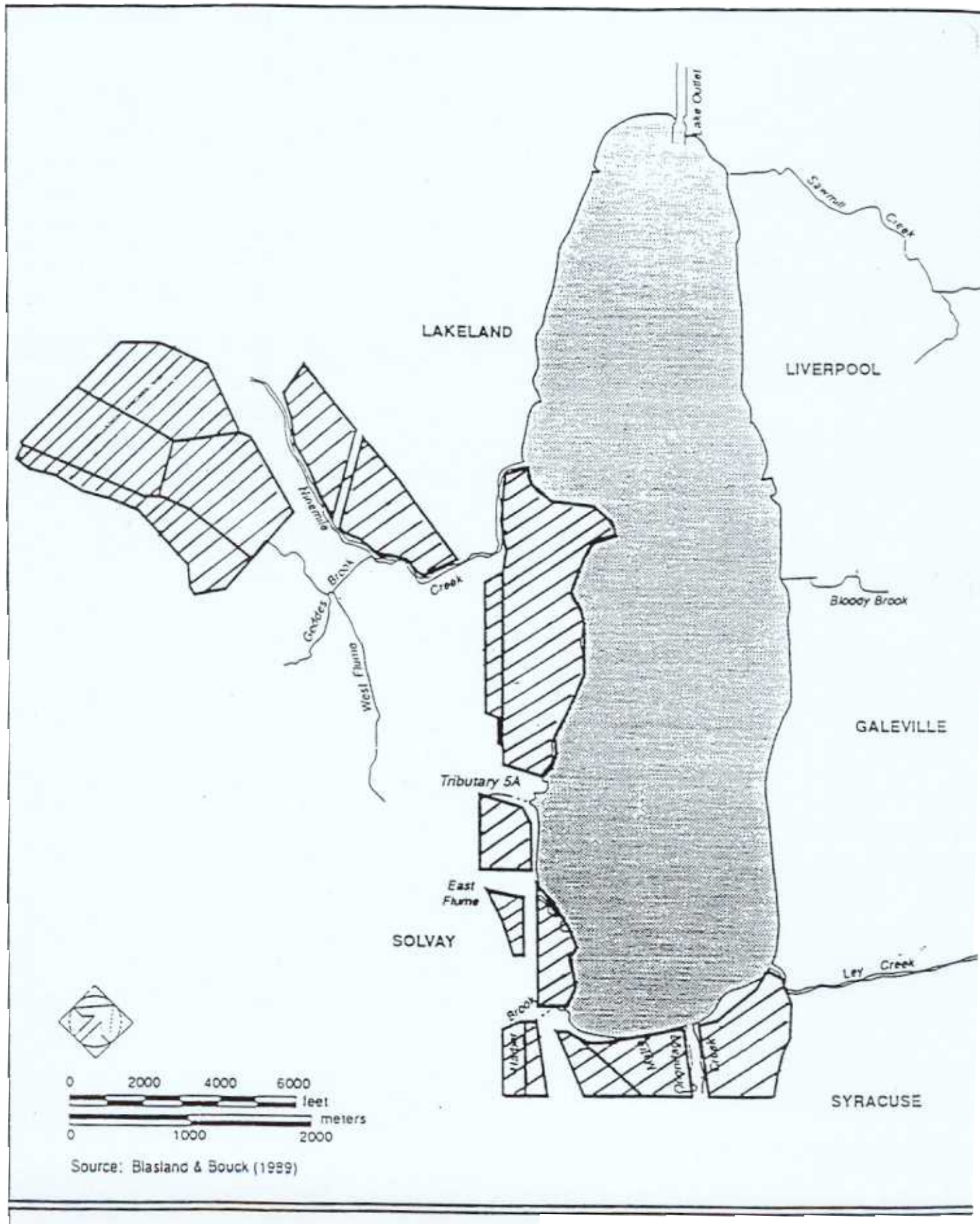


Figure 1: Location of Onondaga Lake, Onondaga County, New York (NYSDOH, 1994).



Source: Blasland & Bouck (1989)

Figure 2: Locations of Solvay waste beds.
(Adapted from RTI, 1991)

TRI Facilities in Onondaga Lake Area

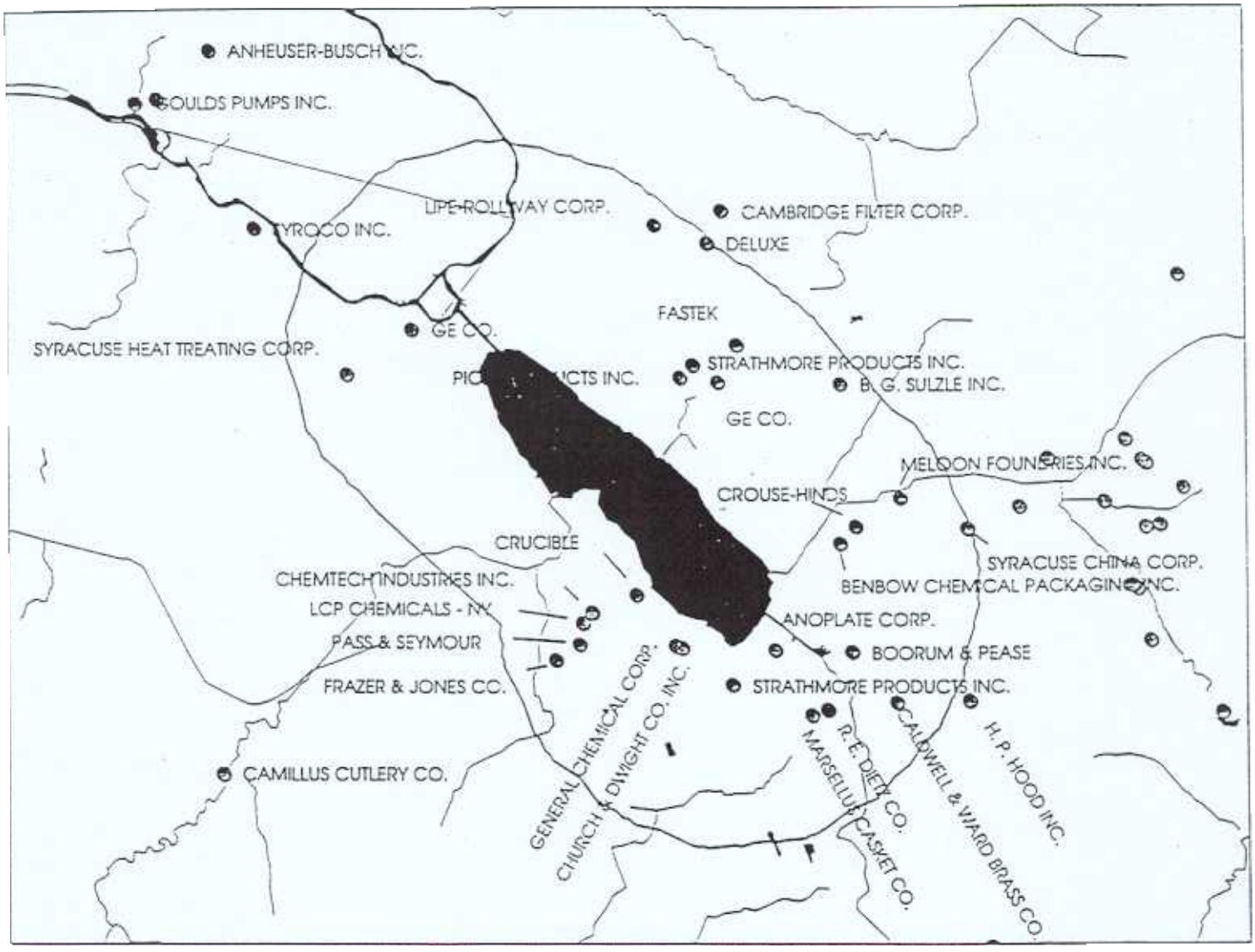


Figure 3 Approximate 2.5 mile radius around Onondaga Lake, Onondaga County, New York. (NYSDOH, 1994).

TABLE 1
ONONDAGA LAKE SITE

CHEMICAL HAZARD ASSESSMENT SUMMARY

Media	Hazard	Health Assessment Criteria		Considered Occupational Hazard		Comment
		Less than	Greater than	Yes	No	
Surface Water	Organics	X			X	Good Practice
	Metals	X			X	
	Bacteria		X	X		Possible in Emergency
Sediments	Organics (except PAHs)	X			X	Good Practice
	Metals	X			X	Good Practice. Mercury & Organic Mercury may be a concern
	PAH	Uncertain		X		Mostly in southeastern portion of lake. Hazard is expected to be slight. Good practice.
	Pet. Hydrocarbon	Uncertain		X		Mostly in southeastern portion of lake. Hazard expected to be slight. Good practices.
	a,b	Unknown		X		Mostly in southeastern portion of lake. Consider hazard until shown otherwise.
Shoreline Soil	Dredge spoils	As for Sediment		X		Deposited north of Ninemile Creek. Pet. Hydrocarbons may have contaminated shoreline.
Tar Beds	Organics PAHs a,b	Unknown		X		Most significant potential for chemical exposure. Many chemicals not fully characterized. RI in process and will yield better data. May require level C or B protection depending on nature of field work.
Waste Beds	Alkaline Discharges	pH less than EPA criteria for corrosivity		X		Good practice.
Air	Benzene & Unknown	Unknown		X		Hazard for extended work around tar beds. Elevated levels of benzene were detected near the tar beds.
Groundwater	Organics Metals	Not evaluated by ASTDR			X	Good practice.

LEGEND

* Summary based upon Public Health Assessment for Onondaga Lake prepared by the Agency for Toxic Substances and Disease Registry (ATSDR) dated May 10, 1994.

Good Practice - refers to use of PPE, such as gloves, and work practices to minimize exposure to skin even when chemicals concentrations are less than hazardous levels.

PAH - Polynuclear aromatic hydrocarbons

Pet. Hydrocarbons - Petroleum Hydrocarbons

a - 1-phenyl-1-(4-methylphenyl)-ethane

b - 1-phenyl-1-(2,4-dimethylphenyl)-ethane

TABLE 2

EMERGENCY PHONE NUMBERS
ONONDAGA LAKE

EMERGENCY INFORMATION

AMBULANCE (NAME)	FIRST AID	
POLICE		
FIRE DEPARTMENT		
PROJECT MANAGER	JIM BEHAN	(518) 371-9102
TAMS HEALTH AND SAFETY OFFICER	BILL BECKETT	(201) 338-6680
FIELD TEAM LEADER	TO BE DETERMINED	
SITE SAFETY OFFICER	TO BE DETERMINED	

SYRACUSE HOSPITALS:

SYRACUSE IS LOCATED AT THE SOUTH END OF ONONDAGA LAKE. THE HOSPITALS ARE LISTED NEAREST TO FARTHEST DISTANCE FROM THE LAKE.

ST. JOSEPH'S HOSPITAL HEALTH CENTER 301 PROSPECT AVENUE SYRACUSE, NY	(315) 448-5111
SUNY UNIVERSITY HOSPITAL 750 E. ADAMS SYRACUSE, NY	(315) 464-5540
CROUSE IRVING MEMORIAL HOSPITAL 736 IRVING AVENUE SYRACUSE, NY	(315) 470-7111
COMMUNITY GENERAL HOSPITAL OF GREATER SYRACUSE BROAD ROAD SYRACUSE, NY	(315) 492-5011

LIVERPOOL URGENT CARE:

LIVERPOOL IS A TOWN LOCATED AT THE NORTH END OF ONONDAGA LAKE.

URGENT CARE BUCKLEY AND TAFT ROAD LIVERPOOL, NY	(315) 452-2333

ROUTES TO HOSPITALS/EMERGENCY FACILITIES AND DISTANCES FROM THE WORK SITES WILL BE ADDED AFTER LOCATIONS OF FIELD ACTIVITIES ARE DETERMINED.

TABLE 2

EMERGENCY PHONE NUMBERS
ONONDAGA LAKE (Continued)

EMERGENCY CONTACTS (MEDICAL AND HEALTH)	
BILL BECKETT (TAMS HEALTH AND SAFETY OFFICER)	[HOME] (908) 852-3578
PATRICK J. McAWARD, JR. (TAMS OFFICER-IN-CHARGE)	[HOME] (914) 241-2648
CORPORATE HEALTH EXAMINER (HEALTH EXTENSION)	(212) 415-4747 AND (212) 415-4726
DR. J. MASLOSKI (TAMS CONSULTING PHYSICIAN)	[OFFICE] 212 415-4726 [HOME] (914) 271-3872
NATIONAL RESPONSE CENTER [ENVIRONMENTAL EMERGENCY ONLY)	(800) 424-8802
TAMS OFFICES	NEW YORK CITY (212) 867-1777 BLOOMFIELD (201) 338-6680

APPENDICES

APPENDIX A

CHEMICAL HAZARD EVALUATION SHEETS

- BENZENE
- BENZO(A)ANTHRACENE
- BENZO(A)PYRENE
- FUEL OILS
- GASOLINE
- MERCURY
- PYRENE
- TOLUENE
- M-XYLENE
- O-XYLENE
- P-XYLENE

CHEMICAL HAZARD EVALUATION

CHEMICAL NAME	Benzene	CAS Number:	71-43-2
SYNONYMS	Benzol, cyclohexatriene, coal tar naphtha, carbon oil bicarburet of hydrogen		
REFERENCES CONSULTED	NIOSH/OSHA Pocket Guide; CRC Handbook of Chemistry and Physics, ACGIC TLVS for 1985-86, Sax 6th ed.		

CHEMICAL PROPERTIES

Chemical Formula	C_6H_6	Vapor Pressure/Density	2.7
Molecular Weight	78.12	Specific Gravity	0.877
Physical State	Liquid	Odor Threshold	12 ppm
Solubility (H2O)	0.06%	Flash Point	7.1%
Boiling Point	176°F(80.1°C)	Flammable Limits	1.4% - 7.1%
Freezing Point	42°F(5.5°C)	Incompatibilities	Strong oxidizers, zinc in presence of steam, chlorine trifluoride, ozone, sulfuric acid, potassium, chromic anhyride; diborane
Ionization Potential	9.25 eV		
		Extinguishant	alcohol foam, carbon dioxide.

BIOLOGICAL PROPERTIES

TLV-TWA	10 ppm	PEL/STEL	25 ppm (proposed for deletion)
Odor Characteristics	Aromatic	Carcinogen	2000 ppm
Route of Exposure	Inhalation, ingestion, direct contact, skin absorption	Human	Carcinogen
		Rat/Mouse	Carcinogen

HANDLING RECOMMENDATIONS (Personal protective measures)

Impermeable protecting clothing, gloves and boots; eye protection; respirator required at 1 ppm; SCBAs required at 10 ppm.

HEALTH HAZARDS AND FIRST AID

Eyes: wash immediately with large amounts of water

Skin: wash with soap (mild detergent) and water

Inhalation: move person to fresh air; perform artificial respiration if breating stopped

Ingestion: do not induce vomiting, remove by gastric lavage and catharsis; get immediate medical attention

SYMPTOMS

Acute: Excitation, euphoria, headache, drowsiness, dizziness, vomiting, delirium, unconsciousness, blurred vision, tremors, shallow respiration

Chronic: Headache, anorexia, drowsiness, nervousness, pallor, anemia, bleeding under skin and eyes, reduced clotting ability, possibly leukemia, liver and kidney damage

CHEMICAL HAZARD EVALUATION

CHEMICAL NAME	Benzo(a)anthracene	CAS Number	: 56-55-3
SYNONYMS	Benz(a) anthracene: 1.2-benzanthracene		
REFERENCES CONSULTED	Sax. I. 6th ed: ATSDR Tox. Profiles. 1987: NIOSH Pocket Guide. 1990		

CHEMICAL PROPERTIES			V: 2.2x10-8 mmHG
Chemical Formula	$C_{18}H_{12}$	Vapor Pressure/Density:	20°C d: 1.274@20°C
Molecular Weight	228.30	Specific Gravity	:
Physical State	colorless plates or leaflets	Odor Threshold	:
Solubility (H_2O)	9-14 ug/L	Flash Point	: Unknown
Boiling Point	400°C	Flammable Limits	: Unknown
Freezing Point	160°C	Incompatibilities	:
		strong oxidizers	

BIOLOGICAL PROPERTIES			
TLV-TWA	0.2 mg/m^3	PEL/STEL	0.2 mg/m^3
Odor Characteristics	Unknown	IDLH	700 mg/m^3
Route of Exposure	dermal: inhalation. ingestion	Mouse	Skin: TDLO:18 mg/kg: NEO
			Skin: TD:240 mg/kg/1Wl:NEO

HANDLING RECOMMENDATIONS (Personal protective measures)

Gloves. tyvek. SCBA

HEALTH HAZARDS AND FIRST AID

Eye: irrigate immediate
Skin: wash with soap
Inhalation: respiratory support

SYMPTOMS

Animal carcinogen in skin. Possible mutagen. Scrotal cancer when exposed to polyaromatic hydrocarbon mixtures. Stored in adipose tissue.

CHEMICAL HAZARD EVALUATION

CHEMICAL NAME	Benzo(a)pyrene	CAS Number	50-32-8
SYNONYMS	Benzo(d,e,f)chrysene: 3,4-benzopyrene		
REFERENCES CONSULTED	Sax, I., 7th ed.; ATSDR Toxicological Profile for PAHs, 1989; Patty's Industrial Hygiene		

CHEMICAL PROPERTIES			
Chemical Formula	$C_{20}H_{12}$	Vapor Pressure/Density	VD: 1.351 VP: 5.6×10^{-9} mm Hg @25°C
Molecular Weight	252.32	Specific Gravity	:
Physical State	yellow crystals	Odor Threshold	:
Solubility (H_2O)	insoluble	Flash Point	: Unknown
Boiling Point	312°C @ 10mm	Flammable Limits	: Unknown
Freezing Point	179°C	Incompatibilities	:

BIOLOGICAL PROPERTIES			
TLV-TWA	0.2 mg/m^3*	PEL/STEL	0.2 mg/m^3
Odor Characteristics	Unknown	IDLH	
Route of Exposure	dermal contact, inhalation, oral	Mouse	: oral-TD_{Lo}: 100 mg/kg(7-16D preg)
		Human	: inh-TC_{Lo}: 70 ng/m^3 cont.1Y->tumors

HANDLING RECOMMENDATIONS (Personal protective measures)

Impervious clothing, gloves, respirator

HEALTH HAZARDS AND FIRST AID

Eyes: irrigate immediately
Skin: wash with soap immediately
Inhalation: remove to fresh air and perform artificial respiration
Ingestion: give large quantities of water and induce vomiting.

SYMPTOMS

Acute: At high levels, death occurs due to bone marrow depression

Chronic: Aplastic anemia, pancytopenia. Skin effects such as wart-like lesions leading to cancers. Cancers include skin and lungs. Teratogenic effects, tumors, and neoplasia noted in laboratory animals.
*Suspected human carcinogen for skin and bronchial carcinoma.

CHEMICAL HAZARD EVALUATION

CHEMICAL NAME: Fuel Oils CAS Number:

SYNONYMS: Fuel Oil No. 1, No. 2, No. 4, No. 5, No. 6, Kerosene

REFERENCES CONSULTED: IRP Tox Guide, Patty's Industrial Hygiene and Toxicology

CHEMICAL PROPERTIES

Chemical Formula	C10-C15 Hydrocarbons	Vapor Pressure/Density	2.12 to 26.4
Molecular Weight		Specific Gravity	
Physical State		Odor Threshold	
Solubility (H2O)		Flash Point	38°C - 169°C
Boiling Point		Flammable Limits	0.6% - 7.5°
Freezing Point		Incompatibilities	Strong oxidizers

BIOLOGICAL PROPERTIES

TLV-TWA		PEL/STEL	500 ppm
Odor Characteristics	Kerosene characteristics	IDLH	
Route of Exposure	Inhalation, ingestion, contact	Human	

HANDLING RECOMMENDATIONS (Personal protective measures)

Skin and eye protection: Level C at greater than 300 ppm; organic vapor cartridge: Level B at greater than 1,000 ppm.

HEALTH HAZARDS AND FIRST AID

Ingestion: do not induce vomiting.

Inhalation: move to fresh air; administer CPR if necessary

Skin: wash with soap and water

SYMPTOMS

Acute: Headache, nausea, confusion, drowsiness, convulsions, coma. Irritating to skin. Ingestion - nausea, vomiting, aspiration, may cause lung damage.

Chronic: Kidney damage

CHEMICAL HAZARD EVALUATION

CHEMICAL NAME	Gasoline	CAS Number:	8006-61-9
SYNONYMS	Petrol. Motor Spirits. Benzin		
REFERENCES CONSULTED	ACGIH TLVs. IRP Tox Guide. Patty's Industrial Hygiene and Toxicology		

CHEMICAL PROPERTIES

Chemical Formula	C5 - C11 Hydrocarbons	Vapor Pressure/Density	263 - 675 mm/Hg
Molecular Weight		Specific Gravity	0.732
Physical State		Odor Threshold	0.25 ppm
Solubility (H2O)		Flash Point	-38 to -46°C
Boiling Point		Flammable Limits	1.2% - 7.6°
Freezing Point		Incompatibilities	Oxidizers

BIOLOGICAL PROPERTIES

TLV-TWA	30 ppm - STEL 500 ppm	PEL/STEL	
Odor Characteristics		IDLH	
Route of Exposure		Human	

HANDLING RECOMMENDATIONS (Personal protective measures)

Skin and eye protection: Level C at greater than 200 ppm; organic vapor cartridges; Level B at greater than 500 ppm.

HEALTH HAZARDS AND FIRST AID

Ingestion: do not induce vomiting.

Inhalation: move to fresh air; administer CPR if necessary

Skin: wash with water for one hour

Skin: flush with water

SYMPTOMS

Acute: CNS depresent. May cause flushing, confusion, stagger, slurred speech, narcosis, coma, death.

Irritating to skin and mucous membranes. Aspiration may cause chemical pneumonitis, pulmonary endema and hemorrhage.

Chronic: Kidney damage. Some components are classified as caracinogens.

CHEMICAL HAZARD EVALUATION

CHEMICAL NAME	Mercury	CAS Number	7439-97-6
SYNONYMS	Quicksilver. NA 2809. CHS 14020		
REFERENCES CONSULTED	NIOSH. OSHA Pocket Guide: Merck Index		

CHEMICAL PROPERTIES

Chemical Formula	Hg	Vapor Pressure/Density	0.0012 mmHg/7.0
Molecular Weight	200.6	Specific Gravity	13.59
Physical State	Liquid	Odor Threshold	–
Solubility (H_2O)	0.002%	Flash Point	Nonflammable
Boiling Point	674 F(357 C)	Flammable Limits	N/A
Freezing Point	-38 F(-39 C)	Incompatibilities gases	Acetylenes. ammonia

BIOLOGICAL PROPERTIES

TLV-TWA	0.05 mg/m^3/0.05 mg/m^3	PEL/STEL	0.1 mg/m^3 ceiling
Odor Characteristics	Odorless	IDLH	28 mg/m^3
Route of Exposure	Inhalation. absorption. skin & eye contact	Human	LD_{LO} 1429 mg/kg
		Carcinogen	Indefinite animal

HANDLING RECOMMENDATIONS (Personal protective measures)

Prevent skin contact: wear impervious clothing, gloves. and boots: face shields: respirators required at 0.1 mg/m^3: SCBAs required at 28 mg/m^3. Eye protection should be worn.

HEALTH HAZARDS AND FIRST AID

Radiation hazard at 7 x 10^{-7} uCi/ml in air: avoid exposure for long periods: flush eyes with water: wash skin with soap and water.
Skin: wash with soap and water
Eye: flush with water
Inhalation: remove to fresh air: perform artificial respiration if necessary
Ingestion: water: induce vomiting

SYMPTOMS

Acute: Coughing, dyspnea. dermatitis. salivation. lacrimation. thirst. metallic taste. nausea. vomiting, gastrointestinal pain. headaches. chest pains.
Chronic: Pneumonia. bronchitis. acidosis. leukopenia. hematuria. proteinuria. diarrhea. blood stools. gingival lead line. central nervous system depression. anorexia. anemia. paresthesia. hallucinations. mental depression. nerviousness. incoordination. insomnia. headache. weight loss. tremors. convulsions. cardiac depression. liver damage, kidney damage, numbness in extremities. fatigue.

CHEMICAL HAZARD EVALUATION

CHEMICAL NAME	Pyrene	CAS Number	129-00-0
SYNONYMS	Benzo(d,e,f)phenanthrene; beta-pyrene		
REFERENCES CONSULTED	IRIS; ATSDR Toxicological Profile of PAHs. 1989		

CHEMICAL PROPERTIES

Chemical Formula	$C^{16}H^{10}$	Vapor Pressure/Density:	2.5×10^{-6} torr@25°C/Not found
Molecular Weight	202.26	Specific Gravity	:
Physical State	solid	Odor Threshold	: No data
Solubility (H_2O)	0.135 mg/L	Flash Point	: Not found
Boiling Point	759°F; 404°C	Flammable Limits	: Not found
Melting Point	156°C	Incompatibilities	: Not found

BIOLOGICAL PROPERTIES

TLV-TWA	0.2 mg/m^3(coal tar pitch VOC)	PEL/STEL	0.2 mg/m^3(coal tar pitch VOC)
Odor Characteristics	No data	IDLH	400 mg/m^3
Route of Exposure	ingestion, dermal contact, inhalation	Mouse Human	

HANDLING RECOMMENDATIONS (Personal protective measures)

Gloves, impervious clothing, cartridge respirator

HEALTH HAZARDS AND FIRST AID

Eyes: irrigate immediately
Skin: wash with soap immediately
Inhalation: respiratory support
Ingestion: get medical attention immediately

SYMPTOMS

Chronic ingestion yields kidney lesions. Not classified as a human carcinogen. No mutagenic data. Human teratogen

Acute: skin irritant

CHEMICAL HAZARD EVALUATION

CHEMICAL NAME	Toluene	CAS Number:	108-88-3
SYNONYMS	Methyl benzene; phenylmethane		
REFERENCES CONSULTED	NIOSH/OSHA Pocket Guide. CRC Handbook of Chemistry and Physics: ACGIH TLVs for 1987-88; Sax 6th Ed.. Patty's Industrial Hygiene and Toxicology		

CHEMICAL PROPERTIES

Chemical Formula	$C_6H_5CH_3$	Vapor Pressure/Density	22 mm @ 20°C/3.14
Molecular Weight	92.2	Specific Gravity	.867
Physical State	Liquid	Odor Threshold	2.5 ppm
Solubility (H2O)	0.05%	Flash Point	40°F (4°C)
Boiling Point	111°C	Flammable Limits	1.3% - 7.0%
Freezing Point	-95°C	Incompatibilities	Strong oxidizers

BIOLOGICAL PROPERTIES

TLV-TWA/PEL	100 ppm	STEL	150 ppm
Odor Characteristics	Sweet, pungent, benzene-like	IDLH	2000 ppm
Route of Exposure	Inhalation, ingestion, skin and eye contact	Human	moderate toxicant: non-carcinogenic
		Rat/Mouse	LD_{50} 7 g/kg; LC_{50} 8000 ppm

HANDLING RECOMMENDATIONS (Personal protective measures)

Impermeable protecting clothing, gloves, and boots; eye protection, respirator required at 100 ppm; SCBAs required at 2000 ppm.

HEALTH HAZARDS AND FIRST AID

Eyes: wash immediately with large amounts of water

Skin: wash with soap (mild detergent) and water

Inhalation: move person to fresh air; perform artificial respiration if breathing stopped

Ingestion: do not induce vomiting, remove by gastric lavage and catharsis; get immediate medical attention

SYMPTOMS

Acute: Central nervous system depressant, headache, drowsiness, fatigue, weakness, delirium, unconsciousness

Chronic: Possible skin, liver and kidney damage

CHEMICAL HAZARD EVALUATION

CHEMICAL NAME	m-Xylene	CAS Number:	108-38-3
SYNONYMS	1,3-dimethylbenzene, xylol		
REFERENCES CONSULTED	Patty's Industrial Hygiene; Sax; NIOSH/OSHA Pocket Guide, 1990		

CHEMICAL PROPERTIES

Chemical Formula	C_8H_{10}	Vapor Pressure/Density	5 mm Hg @ 20°C
Molecular Weight	106.17	Specific Gravity	0.8684 @ 15 C
Physical State	Liquid	Odor Threshold	1 ppm (4.3 mg/m³)
Solubility (H2O)	146 mg/l @ 25 C	Flash Point	77 F
Boiling Point	139 F	Flammable Limits	1.0% to 6.0%
Freezing Point	-47.9 F	Incompatibilities	Oxidizers

BIOLOGICAL PROPERTIES

TLV-TWA	435 mg/m³ (100 ppm)	PEL/STEL	655 mg/m³ (150 ppm)
Odor Characteristics	Aromatic	IDLH	1000 ppm
Route of Exposure	Inhalation, ingestion, dermal contact	Human	

HANDLING RECOMMENDATIONS (Personal protective measures)

Impervious boots, gloves, and clothing; eye protection; respirators with organic cartridges at levels of 100 ppm; SCBAs at 10,000 ppm

HEALTH HAZARDS AND FIRST AID

Remove from exposure; perform artificial respiration if necessary; wash skin with soap and water; irrigate eyes with water; do not induce vomiting, if swallowed; seek medical attention.

SYMPTOMS

Dermal: burning, drying and defatting of the skin

Eye: irritation

Inhalation: irritant to eyes, nose, throat; respiratory tract irritation; eventual lung congestion, brain hemorrhage; unconsciousness

CNS impairments; kidney damage; leukopenia; decreased pulmonary function; weakly mutagenic.

CHEMICAL HAZARD EVALUATION

CHEMICAL NAME	p-Xylene	CAS Number:	106-42-3
SYNONYMS	1.4-dimethylbenzene. xylol		
REFERENCES CONSULTED	Patty's Industrial Hygiene: Sax: NIOSH/OSHA Pocket Guide. 1990		

CHEMICAL PROPERTIES

Chemical Formula	C_8H_{10}	Vapor Pressure/Density	6.5 mm Hg @ 20°C
Molecular Weight	106.17	Specific Gravity	0.8611 @ 20°C
Physical State	Liquid	Odor Threshold	1 ppm (4.3 mg/m³)
Solubility (H2O)	156 mg/l @ 25°C	Flash Point	77°F
Boiling Point	138.3°F	Flammable Limits	1.0% to 6.0%
Freezing Point	13-14	Incompatibilities	Acetic acid + air: nitric acid:1.3-dichloro-5.5-dimethyl-2.4-imid-azolidindione

BIOLOGICAL PROPERTIES

TLV-TWA	435 mg/m³ (100 ppm)	PEL/STEL	655 mg/m³ (150 ppm)
Odor Characteristics	Aromatic	IDLH	1000 ppm
Route of Exposure	Inhalation. ingestion. dermal contact	Human Tox.	Greater than 100 mg/l

HANDLING RECOMMENDATIONS (Personal protective measures)

Impervious gloves. clothing, and boots: eye protection: respirators with organic cartridges at levels of 100 ppm: SCBAs at 10.000 ppm

HEALTH HAZARDS AND FIRST AID

Remove from exposure: perform artificial respiration if necessary: wash skin with soap and water: irrigate eyes with water: do not induce vomiting, if swallowed: seek medical attention.

SYMPTOMS

Dermal: burning. drying and defatting of the skin

Eye: irritation

Inhalation: irritant to eyes. nose. throat: respiratory tract irritation: eventual lung congestion. brain hemorrhage; unconsciousness

CNS impairments: kidney damage; leukopenia: decreased pulmonary function: weakly mutagenic.

CHEMICAL HAZARD EVALUATION

CHEMICAL NAME	o-Xylene	CAS Number:	95-47-6
SYNONYMS	1.2-dimethylbenzene. xylol		
REFERENCES CONSULTED	Patty's Industrial Hygiene: Sax: NIOSH/OSHA Pocket Guide. 1990		

CHEMICAL PROPERTIES

Chemical Formula	C_8H_{10}	Vapor Pressure/Density	5 mm: Hg @ 20°C
Molecular Weight	106.17	Specific Gravity	0.880 @ 20/4°C
Physical State	Liquid	Odor Threshold	1 ppm (4.3 mg/m³)
Solubility (H2O)	170.5 mg/l @ 25°C	Flash Point	62.6°F
Boiling Point	144.4°F	Flammable Limits	1.0% to 6.0%
Freezing Point	-25.2°F	Incompatibilities	Oxidizers

BIOLOGICAL PROPERTIES

TLV-TWA	435 mg/m³ (100 ppm)	PEL/STEL	655 mg/m³ (150 ppm)
Odor Characteristics	Aromatic	IDLH	1000 ppm
Route of Exposure	Inhalation. ingestion. dermal contact	Human Tox.	Greater than 100 mg/l
		Rat	LD_{50} 5g/kg

HANDLING RECOMMENDATIONS (Personal protective measures)

Impervious gloves. clothing, and boots: eye protection: respirators with organic cartridges at levels of 100 ppm: SCBAs at 10.000 ppm

HEALTH HAZARDS AND FIRST AID

Remove from exposure: perform artificial respiration if necessary: wash skin with soap and water: irrigate eyes with water: do not induce vomiting, if swallowed: seek medical attention.

SYMPTOMS

Dermal: burning, drying and defatting of the skin

Eye: irritation

Inhalation: irritant to eyes, nose. throat: respiratory tract irritation: eventual lung congestion. brain hemorrhage; unconsciousness

CNS impairments: kidney damage: leukopenia: decreased pulmonary function: weakly mutagenic.

APPENDIX B

HEAT STRESS/COLD STRESS

HEAT STRESS

Field operations during the summer months can create a variety of hazards to the employee. Heat cramps, heat exhaustion, and heat stroke can be experienced; and if not remedied, can threaten life or health. Therefore, it is important that all employees be able to recognize symptoms of these conditions and be capable of arresting the problem as quickly as possible.

A. THE EFFECTS OF HEAT

As the result of normal oxidation processes within the body, a predictable amount of heat is generated. If the heat is liberated as it is formed, there is no change in body temperature. If the heat is liberated more rapidly, the body cools to a point at which the production of heat is accelerated and the excess is available to bring the body temperature back to normal.

Interference with the elimination of heat leads to its accumulation and thus to the elevation of body temperature. As a result, the person is said to have a fever. When such a condition exists, it produces a vicious cycle in which certain body processes speed up and generate additional heat. Then the body must eliminate not only the normal but also the additional quantities of heat.

Heat produced within the body is brought to the surface largely by the bloodstream and escapes to the cooler surroundings by conduction and radiation. If air movement or a breeze strikes the body, additional heat is lost by convection. However, when the temperature of the surrounding air becomes equal to or rises above that of the body, all of the heat must be lost by vaporization of the moisture or sweat from the skin surface. As the air becomes more humid, vaporization from the skin slows down. Thus, on a day when the temperature is 95°F to 100°F, with high humidity and little or no breeze, conditions are ideal for the retention of heat within the body. It is on such a day, or more commonly a succession of such days (a heat wave), that medical emergencies due to heat are likely to occur. Such emergencies are classified in three categories: heat cramps, heat exhaustion, and heat stroke.

1. HEAT CRAMPS

Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps of the leg and abdominal muscles. Heat cramps also may result from drinking iced liquids either too quickly or in too large a quantity.

3. HEAT STROKE

Heat stroke is a profound disturbance of the heat-regulation mechanism, associated with high fever and collapse. Sometimes this condition results in convulsions, unconsciousness, and even death. Direct exposure to sun, poor air circulation, poor physical condition, and advanced age (over 40) bear directly on the tendency to heat stroke. It is a serious threat to life and carries a 20 percent mortality rate. Alcoholics are extremely susceptible.

Heat Stroke Symptoms The symptoms of heat stroke are:

- Sudden onset;
- Dry, hot, and flushed skin;
- Dilated pupils;
- Early loss of consciousness;
- Full and fast pulse;
- Breathing deep at first, later shallow and almost absent;
- Muscle twitching, growing into convulsions; and
- Body temperature reaching 105°F to 106°F or higher.

Heat Stroke Emergency Care

Remember that this is a true emergency. Transportation to a medical facility should not be delayed. Remove the patient to a cool environment if possible, and remove as much clothing as possible. Assure an open airway. Reduce body temperature promptly, preferably by wrapping in a wet sheet or else by dousing the body with water.

If cold packs are available, place the under the arms, around the neck, at the ankles, or at any place where blood vessels that lie close to the skin can be cooled. Protect the patient from injury during convulsions, especially from tongue biting.

B. AVOIDANCE OF HEAT-RELATED EMERGENCIES

Please note that in the case of heat cramps or heat exhaustion, "Gatorade" or its equivalent is suggested as past of the treatment regime. The reason for this type of liquid refreshment is that such beverages will return much-needed electrolytes to the system. Without these electrolytes, body systems cannot function properly, thereby increasing the represented health hazard. Therefore, when personnel are working in situations where the ambient temperatures and humidity are high, and especially in situations where personal protection Levels B and C are required, the site safety officer must:

- Assure that all employees drink plenty of fluids ("Gatorade" or its Equivalent) and drink frequently (e.g., one cup every 20 minutes);

C. REST-RECOVERY REGIME

One method of measuring the effectiveness of employees' rest-recovery regime is by monitoring the heart rate. The "Brouha Guideline" is one such method:

- During a three-minute period, count the pulse rate for the last 30 seconds of the first minute, the last 30 seconds of the second minute, and the last 30 seconds of the third minute.
- Double the count

If the recovery pulse rate during the last 30 seconds of the first minute is at 110 beats/minute or less, and the deceleration between the first, second, and third minutes is at least 10 beats/minute, the work-recovery regime is acceptable. If the employee's rate is above that specified, a longer rest period is required, accompanied by an increase intake of fluids.

COLD STRESS TRAINING PROGRAM

.0 PURPOSE

The purpose of this training is:

- To establish procedures for the implementation, maintenance, and monitoring of a cold stress control, prevention, evaluation, and response program.

- To describe signs and symptoms that characterize excessive exposure of field personnel to cold environments.

- To recognize the signs and symptoms of cold stress and initiate prompt corrective action to prevent injury or death.

- To identify better methods for the control and prevention of cold stress.

2.0 APPLICABILITY

This work instruction is applicable to the performance of all field work activities.

3.0 DEFINITIONS

Frostbite - Local tissue damage caused by exposure to low temperature environmental conditions. Severe occurrence may lead to deep tissue damage, gangrene, and loss of the affected part.

Frost nip - A whitened area of skin which is painful or gives a slight burning sensation.

Hypothermia - Lowering of the body's core temperature due to prolonged exposure to cold.

Thermoregulatory Centers - Centers in the hypothalmus that regulate heat production and heat loss, so that normal body temperature is maintained. They are influenced by nervous impulses from cutaneous (skin) receptors and by the temperature of the blood flowing through them.

mary objective o s work instruction is to have employees recognize the signs and symptoms of cold stress and apply first aid as needed. also gives methods of controlling and preventing cold stress while in the field.

RESPONSIBILITIES

The Regional Health and Safety Representative (RHSR) or his designee will provide training instruction on cold stress to all NUS employees engaged in field activities.

Project Managers (PM) and Site Safety Officers (SSO) are responsible for ensuring that all personnel are completely knowledgeable of the signs and symptoms of cold stress, the methods to prevent it, and the first aid required.

All site personnel must be completely knowledgeable of the signs and symptoms of cold stress, the methods to prevent it, and the first aid required.

PROCEDURES

7.1 Cold Exposure

Persons working outdoors in temperatures at or below freezing may experience frostbite. Extreme cold for a short time may cause severe injury to the surface of the body or result in profound generalized cooling, causing death. Areas of the body that have a high surface area to volume ratio, such as fingers, toes, and ears are the most susceptible.

Prolonged exposure to extreme cold produces the following manifestations: shivering, numbness, low body temperature, drowsiness, and marked muscular weakness.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Windchill (Table 1) is used to describe the chilling effect of moving air in combination with low temperature. For example, 10°F with a wind of 15 mph is equivalent in chilling effect to still air at -18°F.

As a general rule, the greatest incremental increase in windchill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when personal protective equipment is removed if the clothing underneath is soaked with perspiration.

tiess, and sleepy; these symptoms may ollowed b weakness, inability to alk, and repeated alling. Later tages onsist collapse, tupor, nconsciousness, and death not treated

If a victim is found in a remote area, it is important to know that despite his/her deathlike appearance, he/she can be saved. All efforts should be made to resuscitate this person. The medical dictim "not dead until warm and dead" applies o this condition.

7.4.1 First Aid For Frostbite

he objectives of first aid for frostbite are to protect the frozen area from further njury, to warm the affected area rapidly, and to maintain respiration. It is mportant to never allow a thawed area to refreeze. This will cause more severe damage and may lead to amputation.

First aid for frostbite is described below:

- Cover the frozen part.
- Provide extra clothing and blankets.
- Bring the victim indoors as soon as possible.
- Give the victim a warm drink
- Rewarm the frozen part quickly by immersing it in water that is warm, but <u>not hot</u>. (Test by pouring some water over the inner surface of your forearm). The best way is to soak the part at a temperature of 102-105°F. This may take up to 30 minutes, and the victim will feel more and more pain as the tissues thaw.
- If warm water is not available or practical to use, wrap the affected part gently in a sheet and warm blankets.
- Since severe swelling develops very rapidly after thawing, <u>discontinue</u> warming the victim as soon as the affected part becomes flushed.

  Once the affected part is rewarmed, have the victim exercise it.

  If fingers or toes are involved, place dry, sterile gauze between them to keep them separated.

  If travel is necessary, cover the affected parts with sterile or clean clothes and keep the injured parts elevated.

  Obtain medical assistance as soon as possible.

n more severe cases of hypothermia, implement the above treatment, but also stitute some type of active rewarming. This includes

- Electric pads or blankets
- Commercially available hyperthermal (heating) pads
- Hot-air blowers or heaters
- Heated blankets, sheets, or clothes
- Use of human body heat

It is also important to watch for signs of return of normal thermoregulatory mechanisms (shivering, teeth chattering, goose flesh) and to monitor mental status.

Victim should be transferred to a medical facility after these steps are initiated and should not be allowed to return to work for at least 48 hours.

If there has been severe hypothermia, the victim is not to be considered dead despite his/her appearance. Treat the victim as stated above and prepare for transfer to a medical facility. If the victim is pulseless and not breathing, perform CPR.

Trauma sustained in freezing or subzero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues, in addition to providing first aid treatment.

7.5 Work Practices

Work Practices at or below 10°F Equivalent Chill Temperature (ECT)

For work practices at or below 10°F ECT, the following shall apply:

- The work rate should not be so high as to cause sweating that will result in wet clothing.

  Precautions shall be taken to ensure that employees become accustomed to the working conditions and required protective clothing.

7.6 Special Considerations

Employees shall be excluded from work in cold at 30°F or below if they are suffering from diseases or taking medication which interferes with normal body temperature regulation or reduces tolerance to work in cold environments (Table 4). Workers who are routinely exposed to air temperatures below 0°F with wind speeds less than 5 miles per hour should be medically certified as suitable for such exposures. At air temperatures of 36°F or less, any worker who becomes immersed in water or whose clothing becomes wet will be immediately provided a change of clothing and be treated for hypothermia.

TABLE 2

SIGNS OF HYPOTHERMIA

Core Temperature		Clinical Signs
°C	°F	
37.6	99.6	"Normal" rectal temperature.
37	98.6	"Normal" oral temperature.
36	96.8	Metabolic rate increases in an attempt to compensate for heat loss.
35	95.0	Maximum shivering.
34	93.2	Victim conscious and responsive, with normal blood pressure.
33	91.4	Severe hypothermia below this temperature.
32 31	89.4 87.8	Consciousness clouded, blood pressure becomes difficult to obtain but react to light; shivering ceases.
30 29	86.0 84.2	Progressive loss of consciousness; muscular rigidity increases; pulse and blood pressure difficult to obtain; respiratory rate decreases.
28	82.4	Ventricular fibrillation possible with myocardial irritability.
27	80.6	Voluntary motion ceases; pupils nonreactive to light; deep tendon and superficial reflexes absent.
26	78.8	Victim seldom conscious
25	77.0	Ventricular fibrillation may occur spontaneously.
24	75.2	Pulmonary edema
22 21	71.6 69.8	Maximum risk of ventricular fibrillation.
20	68.0	Cardiac standstill
18	64.4	Lowest accidental hypothermia victim to recover.
17	62.6	Isoelectric electroencephalogram.
9	48.2	Lowest artificially cooled hypothermia patient to recover.

TABLE 4

Medications which interfere with the physiologic response to cold, stress or increase the risk of frostbite.

Phenothiazine and related compounds

Chlorpromazine (Thorazine)

Promazine (Sparine)

Fluphenazine (Prolixin)

Perphenazine (Trilafon)

Prochlorperazine (Compazine)

Trifluoperazine (Stelazine)

Thioridizine (Mellaril)

Trimethobenzamide (Tigan)

Promethazine (Phenergan)

Beta Blocker Agents

Propranolol (Inderal)

Metoprolol (Lopressor)

Nadolol (Corgard)

Timolol (Blocadren)

Atenolol (Tenorim)

Pindolol (Viskin)

Ergot Alkaloids (vasoconstrictors)

Ergotamine Tartrate (Wyamine, Cafergot, Gynergen)

Methygergide (Sansert)

APPENDIX C

DECONTAMINATION PROCEDURES

PERSONNEL DECONTAMINATION PROCEDURES

A. EQUIPMENT WORN

The full decontamination procedure outlined is for personnel wearing Level B and Level C protection (with taped joints between gloves, boots, and suit) consisting of:

One-piece, hooded (optional), chemical-resistant splash suit.
Full-face mask, air-purifying respirators with cartridges or self-contained breathing apparatus (SCBA).
Hard hat.
Chemical-resistant, steel toe and shank boots (neoprene or similar material boots that meet or exceed ANSI Z41.1-1967/75).
Inner and outer gloves.

B. DECONTAMINATION PROCEDURES

Station 1: Equipment Drop

Deposit equipment used onsite such as sampling devices and containers, tools, etc, on a plastic dropcloth.

Station 2: PPE Wash

Scrub outer protective equipment (boots, gloves, Tyvek/Saranex covers) with Alconox and water

Equipment: wash tub, alconox/water solution; scrub brushes

Station 3: PPE Rinse

Rinse off decon solution from Station 2.

Equipment: Wash tub; high pressure sprayer

Station 4: (optional) Cartridge/Tank Change

Support personnel change tanks/cartridges. Worker returns to duty.

APPENDIX D

ON-SITE INCIDENT REPORT FORM

TABLE 4-3

TAMS CONSULTANTS, INC.

INCIDENT REPORT FORM
Page 1 of 3

PERSONAL INFORMATION DATE:

Name: _____ Age: Sex:

Home Address: _____

Home Office: _____ Position/Title:

SITE INFORMATION

Site Name: _____ Project No.: _____

Location: _____ Project Manager:

Location: _____ Safety Officer: _____

Hazardous materials on site: _____

Activity on site: _____

INCIDENT INFORMATION

Date of incident: _____ Time:

Type: Exposure Possible Exposure Physical Injury

Brief Description of injury/exposure and area affected:

_____

_____

Where onsite did the incident occur?

_____

_____

TABLE 4-3

TAMS CONSULTANTS, INC.

INCIDENT REPORT FORM
Page 2 of 3

If First Aid, describe extent of treatment, who administered and location.

_____

_____

If medical treatment:

Facility Name _____ Phone _____

Address _____

Physician _____

Date of Care _____ Out-Patient _____ In-Patient _____

Witnesses (name, address, phone, company):

_____

_____

Contributing Factors (double check primary cause):

Weather	Machinery _____	Unsafe Act _____
Illumination	Vehicle _____	Failure of Control Measure _____
Object _____	Equipment _____	Lack of Knowledge/Skill
Chemical _____	Tools _____	Conditions _____
Electrical _____	Fall _____	Hazard Not Recognized
Other (Specify) _____		

Explain how and why applicable factors contributed to incident:

_____

_____

_____

_____

TABLE 4-3

TAMS CONSULTANTS, INC.

INCIDENT REPORT FORM
Page 3 of 3

RESPONSE

Persons informed of incident:

_____

Was medical attention received? Yes (Date) No

Briefly describe attention received:

_____

_____

Where (include address)?

_____

_____

Physician's Name: _____

Preventive measures to avert recurrence of the type of incident:

_____

_____

_____

PROVIDE ADDITIONAL INFORMATION ON THE BACK OF THIS FORM
ATTACH ALL OTHER RELEVANT INFORMATION

_____
Employee Signature Date

_____
Site Safety Officer Date

_____
Project Manager Date

APPENDIX E

MEDICAL DATA SHEET

MEDICAL DATA SHEET
SITE HEALTH AND SAFETY PLAN

This medical Data sheet will be completed by all on-site personnel and will be kept in the Command Post during the conduct of site operations. Completion is required in addition to compliance with any medical test requirements described in the Health and Safety Plan. This form will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

Project Onondaga Lake Site

Name _____ Home Telephone

Address _____

Age _____ Height _____ Weight _____

Emergency Contact _____ Phone No _____

Drug or other Allergies _____

Particular Sensitivities _____

Do You Wear Contacts? _____

Provide a Checklist of Previous Illness Related to Exposure to

Hazardous Chemicals _____

_____

What medications are you presently using? _____

_____

_____

Do you have any medical restrictions? _____

_____

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

_____

_____

_____

_____

_____ _____

Signature Date

APPENDIX F

OSHA POSTER

JOB SAFETY & HEALTH PROTECTION

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

Employers

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

Employees

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

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

Inspection

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

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

Complaint

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

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

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

Citation

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

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

Proposed Penalty

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

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

Voluntary Activity

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

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

Consultation

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

More Information

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

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

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

Washington, D.C.
1985
OSHA 2203

William E. Brock, Secretary of Labor

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

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

APPENDIX C

SUPERFUND STANDBY PROGRAM
New York State
Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233-7010

QA / QC PLAN
ONONDAGA LAKE

Site No. 734030-002

Work Assignment Number
D003060-9

Prepared by

TAMS CONSULTANTS, Inc.

400 Clifton Corporate Park
Clifton Park, NY 12065-3829

January 27, 1995

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.0 INTRODUCTION

1.1 Purpose and Objective

The purpose of this Quality Assurance/Quality Control (QA/QC) Plan is to document planned investigative activities and establish the criteria for performing these activities at a pre-determined quality, and to review and summarize such work performed by others, as relates to the Onondaga Lake Project (OLP) being performed under the TAMS Consultants, Inc./New York State Department of Environmental Conservation (NYSDEC) Superfund Standby Contract Work Assignment No. D003060-9.

The project will be designed and conducted in accordance with the United States Environmental Protection Agency (EPA) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (US EPA, October 1988) which is in agreement with the NYSDEC Guidelines for Remedial Investigations/ Feasibility Studies, Technical and Administrative Guidance Memorandum HWR-89-4025 (March 31, 1989).

An objective of this program is to prepare for NYSDEC site summaries of investigative and remedial work performed by others, and to design and implement similar activities handled directly by TAMS. This QA/QC Plan is generic in that specific sites or specific field activities are not detailed, but rather, typical remedial investigation attributes normally associated with data quality objectives are discussed. Specific site investigations will have a Quality Assurance Project Plan (QAPP) addendum addressing specific items.

Due to the regulatory nature of this project and the shared responsibilities of the EPA and the NYSDEC, comparisons will be made on an on-going basis of policies affecting issues specific to this project, and the more stringent of the federal or state requirements or recommendations will be applied.

1.2 Project Background

Onondaga Lake is located in Onondaga County in upstate New York, northwest of and contiguous to the City of Syracuse (Figure 1-1). It has been called the most polluted lake in the United States largely due to significant sewage and industrial waste discharges to its waters from numerous sources for over a century. The pollutants which affect the lake are varied in their nature, extent, and pathways of exposure. The lake itself is only one portion of the site, as the site will include all areas within the watershed (Figure 1-2) where hazardous substances have come to be located that are impacting or threatening the lake system.

The lake is 4.5 miles long, 1 mile wide and up to 60 feet deep. Major tributaries flowing into the lake include: Onondaga Creek, Nine Mile Creek, Ley Creek, Sawmill Creek, Bloody Brook and Harbor Brook. Another major source of inflow to the lake is the treated effluent from the Metropolitan Sewage Treatment Plant (METRO). The outlet of Onondaga Lake flows into the Seneca River which ultimately flows into Lake Ontario.

The shoreline of the lake is owned entirely by government agencies or commercial enterprises. There is no individually owned shoreline. The City of Syracuse lies to the east and southeast of the lake. The southwestern shoreline is comprised primarily of wastebed material disposed of by soda ash manufacturing facilities. The northeastern shoreline is mainly park land owned by Onondaga County.

In the 1800's the lake supported commercial fishing and was known for its resorts. Beginning in 1884, the Solvay Process Company started manufacturing soda ash at facilities along the shoreline. The soda ash company used the shoreline areas to dispose of the manufacturing by-products. These wastebeds now comprise a significant portion of the southwestern shoreline and are as high as 60 feet above lake surface.

In 1918 the Syracuse Chemical Works began operation of a chlor-alkali plant at Willis Avenue, Solvay. In 1947 the plant expanded to include mercury cells for this process. Although not a reactive part of the process, mercury still found its way into the plant waste stream which ultimately discharged to Onondaga Lake. In 1953 another chlor-alkali plant located on Bridge Street in Solvay began operation using the

mercury cell process. The Syracuse area has been host to a variety of industrial manufacturing companies including General Motors, General Electric, Allied Chemical, and Bristol Myers. Figure 1-3 shows waste disposing industries reporting air emissions under the Toxics Release Inventory (TRI).

In 1970 the NYSDEC banned fishing on the lake due to high levels of mercury found in fish. In 1984 the ban was lifted and changed to a health advisory recommendation that no fish be eaten. Local municipal works contribute pollutants to the lake as well. These include combined sewer overflow (CSO) discharges caused by large storms, and the METRO effluent discharge. The Onondaga County Department of Drainage and Sanitation (OCDDS) has been required via a court order to reduce pollutant loadings to the lake.

In May 1993 the Onondaga Lake site was nominated to the National Priorities List. The US EPA has given New York State lead agency status to perform an RI/FS for the site. The site will encompass numerous subsites that lie within the lake watershed and are adversely impacting or threatening the lake system.

The U.S. Congress created the Onondaga Lake Management Conference (OLMC) in 1990 (Public Law 101-596, Section 401) and charged it with responsibility for:

> the development, in the two-year period beginning on the date of the enactment of this Act, of a comprehensive restoration, conservation and management plan for Onondaga Lake that recommends priority corrective actions and compliance schedules for the cleanup of the Lake; and
>
> the coordination of the implementation of such plan by the State of New York, the Army Corp of Engineers, the U.S. Environmental Protection Agency, and all local agencies, governments, and other groups participating in the management conference.

The completion of the Onondaga Lake Management Plan represents the fulfillment of the OLMC's initial responsibility to develop a plan for restoring the ecological health and recreational uses of Onondaga Lake. The Plan is intended to be dynamic, to spur action, and to support the OLMC's second responsibility, the implementation of the recommendations contained in the Plan.

1.3 Project Description

Individual subsites within the project scope will have a specific project description defined in this section. The QA/QC Plan is part of the RI/FS Work Plan and will serve as the format for quality control field activities generating and influencing analytical and other measurement data. Future changes or additions to other phases of work, or to this phase, will be added as addenda to this QA/QC Plan.

This QA/QC Plan will be the quality control basis for the scope of work which is described in the Project Management Plan, scheduled and budgeted for the period July 1994 through December 1995. The major tasks comprising the OLP described more fully in the Field Activities Plan (FAP) are:

- Scoping and Work Plan development
- Acquisition of specialists through subcontract
- Site-wide ecological and human health risk assessments
- Comprehensive analytical database
- Data validation
- Compilation, review and reporting of CERCLA 104(e) results
- Financial assessment of PRPs
- Review subsite Remedial Investigations (RI), perform TAMS-conducted RIs, and prepare a comprehensive RI report
- Review subsite Feasibility Studies (FS), perform TAMS- conducted FSs, and prepare a comprehensive FS report
- Assist NYSDEC in preparation of a Final Record of Decision
- Support NYSDEC's Citizen Participation (CP) Program and prepare a CP Plan

Remedial Design/Construction Services and Interim
Remedial Measures

1.4 Project Management and Organization

1.4. Personnel

The general responsibilities of key project personnel are listed below:

Project Manager	James P. Behan, P.E., TAMS (Albany, New York) Regional Office Manager will have responsibility for overall project management and coordination with NYSDEC.
RI Task Manager	Sander I. Bonvell, TAMS (Albany, New York), Manager of Chemistry and Life Sciences will serve as RI Task Manager for PRP RI report review, including management of data validation and risk assessment tasks.
FS Task Manager	Bruce Fidler, P.E., TAMS (Bloomfield, New Jersey) will serve as the FS Task Manager for PRP FS review, and overall FS work.
QA Officer	Sander Bonvell, TAMS (Albany, New York) will serve as Quality Assurance Officer and Senior Chemist, and will be responsible for laboratory and data validation subcontractor assignment.
H & S Officer	William Beckett, TAMS (Bloomfield, New Jersey) will serve as the Health and Safety Officer.

Figure 1-4 provides an outline of project responsibilities.

.4.2 Specific Tasks and Services

TAMS has obtained subcontractor specialists for services relating to limnology, hydrogeology, drilling and monitoring well installation, laboratory services (*), data validation services (**), field surveying, soil gas surveys, and geophysical surveys, etc. :

American Auger & Ditching Co.
Atlas Fence, Inc.
CEA Drilling Services Co. Inc
Central Control Systems, Inc.
ChemWorld Environmental, Inc.**
Environmental Quality Associates, Inc.**
Enviroscience, Inc.**
GZA GeoEnvironmental of NY
H2M Labs, Inc. *
YEC, Inc.
Recra Environmental, Inc.*
Hager-Richter Geoscience, Inc.
Laboratory Resources, Inc.*
New York State Fence, Inc.
Nothnagle Drilling
Om P. Popli, P.E. L.S. P.C.
Roger's Fence Company, Inc.
SJB Services, Inc.
Upstate Freshwater Institute

2.0 SITE INVESTIGATION PROCEDURES AND RATIONALE

The overall site, which may be as large as the Onondaga Lake watershed, contains numerous known and potential pollution contributors. Since field work performed by TAMS or its subcontractors will be dependent on gaps and deficiencies identified from PRP or other previous work, no specific items are addressed at this time.

Environmental sampling and other field activities will be performed in accordance with general state of the art techniques as presented, where appropriate, in the following guidance documents:

Sampling Guidelines and Protocols, NYSDEC, Division of Water, March 1991

Compendium of Superfund Field Operations Methods, US EPA, December 1987 (EPA/540/P-87/001

RCRA Ground-Water Monitoring: Draft Technical Guidance, US EPA, November 1992 (EPA/530-R-93-001)

Soil Sampling Quality Assurance User's Guide (Second Edition), US EPA, March 1989, (EPA/600/8-89/046

Preparation of Soil Sampling Protocol: Techniques and Strategies, US EPA, May 1983 (EPA-600/4-83-020)

Region II CERCLA Quality Assurance Manual, US EPA, October 1989, Revision 1-Final Copy

Appropriate NYSDEC Department of Hazardous Waste Remediation Technical and Administrative Guidance Memoranda (TAGM).

Much of the work carried out during this first phase of the work assignment pertains to reviewing work performed by others. To insure a proper and adequate knowledge of the sites and their problems, the appropriate project personnel will visit these sites for detailed facility and site inspections. This may include documenting the visit on videotape for other project members to view.

TAMS-lead field investigations will indicate in project-specific QAPP addenda any particular differences in technical issues or method selections. Typical field activities common to most RIs are described in the following sections.

2. Groundwater Sampling

Details of groundwater monitoring well installation and development are presented in the project Field Activity Plan (FAP); site specific variances or additional details will be presented in the site-specific FAP addenda to the general project-wide FAP.

Groundwater sampling will begin by: taking notes about the well and the surrounding area, and unlocking the well cover; surveying ambient air, upwind air, and air directly at the top of the well; taking a water level measurement; sounding the bottom of the well and agitating/loosening accumulated silt/sediment (this assumes sounding indicates minimal sediment accumulation and no immediate need for well development); and then purging the well of three volumes of standing water. Purging will utilize suction-lift pumping, bailers, and/or inertial pumping to remove water from the wells. After each volume of water removed, field parameters (pH, turbidity, temperature and specific conductance) will be analyzed to confirm the presence of fresh water in the well (i.e., equilibration to steady readings), or as an indicator that conditions cannot reach a steady state; prior to sample collection, the variability of field testing results between successive well volumes should not vary by more than 10%, with a minimum of three well volumes purged,

and an upper limit of five volumes. In the event that recharge is slow, the purging process will continue until the well is purged "dry". After the water level has returned to its pre-purge level, samples will be collected from the middle of the screened portion of the well for overburden wells, or at the bottom of rock wells. If the water level is slow to recharge and does not reach its pre-purge level within several hours, then samples can be collected after sufficient water has recharged, and the degree of recharge indicated in field notes with time and depth to water noted.

When bailers are used for sample collection they will be bottom-filling and check-valved, and options include: dedicated, disposable or non-disposable, PVC, Teflon, or HDPE. Bailers will be lowered gently with minimal water agitation into the well with dedicated polyethylene or polypropylene line. EPA Region II requires bailers of stainless steel or Teflon; in accordance with NYSDEC, dedicated Teflon bailers will be used in low concentration wells, and disposable bailers of PVC or HDPE will be used in highly contaminated wells. When information about groundwater quality is not known, the more conservative approach using Teflon bailers will be adopted. All bailers will be pre-washed by brush scrubbing using a detergent solution (tap water), followed by successive rinses of clean tap water, and a final rinse of distilled/deionized water. "Dedicated" will be defined as selective use of a clean bailer for one well only, during any one particular round of monitoring at any one site. Following the single use during the specific round of monitoring, all the bailers for that round of monitoring will be decontaminated off-site (at the contractor or laboratory facility), and subsequently will be useable for other wells, during other rounds of monitoring, even at other sites within the Onondaga Lake project. At subsequent rounds of sampling when bailers are reused, 10% of the bailers used, or a specific number of bailers based on the site-specific chemistry/details will be used to generate field blanks prior to sampling wells. This applies only to collection of groundwater of low level contamination. Dedicated bailers will be permanently labelled and a history of the groundwater chemistry from each well at which the bailer is used will be kept. "Low level contamination" will be defined on a case-by-case basis and will be discussed in detail in site-specific QAPP addenda. Once cleaned, bailers will be stored by wrapping in aluminum foil.

When pumps are used to collect samples, low flow pumps such as bladder pumps, helical rotor submersible pumps, gas-drive piston pumps, and submersible centrifugal pumps capable of acheiving flow rates of approximately 100ml/min, can be used. Also available is the WaTerra HydroLift pump (Appendix L), a reciprocating pump designed to recover water using an inertial lift principle. Where groundwater samples can be collected by pumping, the specific advantages and disadvantages of each pump type for the analytes of interest will be reviewed with the NYSDEC during initial project scoping. In general, the rate at which a well is sampled should not exceed the rate at which the well was purged. Ideally, the rate of sample collection should be approximately the same as the actual groundwater flow rate. Since this is typically not possible, low sampling rates at approximately 100 ml/min will be sought to minimize particulates, immobile in the subsurface under ambient conditions, from being entrained in the sample; to minimize stripping of volatile compounds, sampling should be performed at even lower rates.

The first bailerful of water taken from a well may be used to rinse the bailer and then discarded. This is not necessary if the bailer was used to purge the well, and will not be done if acclimating the bailer by discharging the first bailerful would unnecesarily agitate the water column, causing loss of volatile compounds, or other physico-chemical changes that would not provide a representative sample. Therefore, the first bailerful of water will be collected for volatile organics or other light weight/volatile compound analyses.

Three, 40-ml VOA vials (with Teflon septums) will be used to collect VOA (volatile organics analysis) samples by gentle pouring directly from the top of the bailer directly into the vial until gently overflowing, insuring a convex meniscus. Cap the vial, turn the vial over and tap the capped top of the vial firmly in the palm of the hand to release air pockets/bubbles that may be present on the inside surfaces of the vial. Upright the vial, and if any bubbles or aggregate of bubbles rise to the top to create an air "pocket" (i.e., headspace) or a bubble(s) larger than a "few periods", then dump the water and resample using the same vial. VOA vials will not contain any chemical preservative, and thus the holding time for VOAs will be 7 days from the lab's verified time of sample receipt (VTSR). Subsequently sampled water will be

collected for the remaining organic and inorganic parameters (semiVOAs, pesticides/herbicides/PCBs, metals, cyanide), wet chemistry testing, and field parameter testing.

To fill the sample containers (excluding VOA vials), a little bit of each bailerful of water will be put into each sample container sequentially until each is filled, as opposed to filling one bottle at a time. This order should not make any difference if the water is turbid free, or otherwise homogeneous; but if the water is turbid, or otherwise not homogeneous, then sequential filling is important. If bottles are filled one at at ime and the water is turbid or non-homogeneous, the character of the water quality will vary and analysis will not provide a representative sample.

Groundwater sampling for metals will be performed in accordance with NYSDEC TAGM HWR-88-4015 (Alteration of Groundwater Samples Collected for Metals Analysis) and EPA Region II CERCLA QA Manual (page 63-65). At a minimum, all groundwater samples will be collected for total matrix metals analysis. In the event that turbidity of the sample exceeds 50 NTU, then filtered samples will be collected in addition to the total matrix samples. Filtered samples will be kept preserved at the laboratory but not analyzed until results of the total matrix analyses have been evaluated. This does not apply to surface water, sump liquid or drainage ditch water which will be collected only for total matrix analysis, unless otherwise specified for the particular project.

Filter devices may be pressure-type or vacuum-type, and should be made of polyethylene, polypropylene or borosilicate glass. The unit should be pre-cleaned by rinsing with a 10% nitric acid solution followed by a demonstrated, analyte-free, deionized water rinse, and should be cleaned in the same manner between samples. A field rinse blank of the filter device will be collected whenever filtered samples are collected. Demonstrated, analyte-free, deionized water for the rinse will either: 1) be provided by the laboratory and shipped with the empty sample containers, or 2) be purchaed commercially with an aliquot submitted as a unique sample for determination of background analyte levels, if for reasons now unknown the former is not practical or possible. The second option, however, does not meet EPA's requirement to document the analyte-free water prior to sample collection unless such information is obtained from the vendor.

The filter used should be a cellulose-based membrane filter of 0.45 micron (um) nominal pore size. Samples will be filtered immediately after their collection to minimize changes in the concentration of the substances of interset. Samples are passed through the filtration apparatus only once, they are not to be passed through repeatedly [until they are free of turbidity]. Although EPA requires preservation of samples with undiluted nitric acid, bringing fuming acid into the field poses unnecessary risks, and as such, samples will instead be preserved [immediately] with a 1:1 diluted, ultrapure nitric acid and checked to ensure proper pH has been attained. Filtering is limited to metals analysis and no samples for cyanide, conventional parameters, or organics will be filtered in this manner. All paperwork accompanying the samples to the laboratory will clearly state that the samples have been field filtered, in order to avoid a second filtration at the lab.

VOA vials and containers for all CLP TCL/TAL compounds will be EPA CLP grade as supplied by a vendor and will meet the "Specifications and Guidance for Contaminant-Free Sample Containers" (OSWER directive 9240.0-05A, December 1992; Appendix A herein). Each VOA vial will be labeled, wrapped in paper toweling or plastic bubble packaging, and then the three vials will be placed in a labelled, dedicated "Ziploc" plastic bag to be placed in the shipping container/cooler. Larger glass containers will be protected accordingly, such as with bubble wrap packaging or alternating placement in the coolers with plastic containers. Samples which require cooling (at a minimum all TCL organics) will be placed, immediately after sampling and containerizing, in the cooler surrounded by ice or synthetic ice packs, to maintain them at 4 degrees Celsius during remaining field activities and shipment to the laboratory.

2.2 Air Surveillance and Monitoring

Air surveillance screening of volatile compounds for health and safety concerns will be performed with a portable HNU photoionization detector, or equivalent, during invasive activities such as drilling, monitoring

well installation and development, and sampling, where a conduit is provided for vapors to travel from the water table or other subsurface zones to above the ground surface, and/or into the breathing zone. Additional air monitoring for particulates, where appropriate, will be completed using a dust monitor. Details are presented in the Health and Safety Plan. Analyte-specific issues not generically covered will be addressed in subsite specific addenda to the HASP, or as a QAPP addenda to the QA/QC Plan, if ambient monitoring for other than health and safety issues is involved. No ambient air monitoring for specific compounds will be performed unless the objectives for such monitoring and the criteria for evaluation of the data are established beforehand. Future subsite QA air monitoring plans will clearly document the following:

contaminants of concern
contaminant concentrations
receptors of concern
input requirements of any future dispersion models to be used in conjunction with the data
action levels or regulatory levels to which the data will be compared
QC samples that will be collected to ensure data quality needs are met
locations of monitors and the basis for their selection
duration of each sampling event and number of events
sample collection methods to be used, e.g., Summa canisters or Tenax/CMS sorbent tubes, including sampling SOPs. Note: sampling flow rates must be specified
analytical methods
laboratory to be analyzing the samples

Other monitoring such as particulate-adsorbed substances collected by filters or adsorbent tubes will be addressed in specific subsite projects. Analysis of air for specific compounds will be covered under specific QAPP addenda for specific subsites. Quantitative air monitoring for organic target compounds will use EPA's Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (EPA/600/4-89/017; June 1988), as an aid for planning and establishing air monitoring programs, it is not used as the sole source for defining the air monitoring analytical program. Final project specifics will be document-sourced and will be approved by NYSDEC. Due to the complexity of air monitoring, consideration will be given, if apppropriate, to using available dispersion models as screening aids to assess ambient air concentrations at specific receptor locations based on surface soil data and historical meteorological data. Ambient air monitoring will be warranted depending on the activity levels at the site and the nearness of receptors.

2.3 Soil Sampling

All soil samples with the exception of those for VOA will be homogenized using the "coning and quartering" procedure. The soil/sediment will be removed from the sampling equipment and transferred to a clean surface (plastic, metal foil, wax paper, Teflon, etc.) and, with the exception of VOA samples, mixed to provide a more homogeneous sample to the lab; VOA samples will not be mixed but will be placed directly from the sampling equipment into the VOA vial sample container, minimizing air space where and when possible.

Remove rocks, twigs, leaves and other debris if they are not considered part of the sample. The sample is then placed in a clean stainless steel pan or on another clean, inert surface, and thoroughly mixed using a decontaminated stainless steel spoon or similar clean, inert device. The soil/sediment will be scraped from the sides, corners, and bottom of the clean pan/surface, rolled to the middle of the pan/surface, and initially mixed. The sample will then be quartered and moved to the four corners of the mixing pan/surface; each quarter/corner of the mixing pan/surface will be mixed individually, and then rolled to the center of the pan/surface and the entire sample mixed again. An aliquot of this final pile will then be transferred to a 4 - 8 ounce jar, slightly tamped down, filled to the top of the jar to minimize head space, and sealed with Teflon or aluminum lined plastic or metal caps.

To avoid cross contamination, sampling equipment wil be cleaned according to the following procedure:

disposable gloves will be worn and changed betweeen sampling points
wash and scrub with low phosphate detergent
tap water rinse
rinse with 10% nitric acid, ultrapure (if metals are of interest)
tap water rinse
methanol rinse (if organics are of interest)
thoroughly rinse with deionized, demonstrated analyate free water
air dry, and
wrap in aluminum foil for transport

Tap water may be used from any municipal water treatment system; the use of an untreated potable water supply is not an acceptable substitute. If it is necessary to use split spoons, or other sampling devices, composed of carbon steel instead of stainless steel, the nitric acid rinse may be lowered to a concentration of 1% instead of 10 % so as to reduce the possibility of leaching metals from the equipment itself.

Surface soils will be collected generally over a circular area 6 to 12 inches in diameter with a stainless steel spoon or hand trowel. The depth of sampling will depend on the objective of the task. Preliminary investigations will be sampled generally from 0 to 4 inches, or 0 to 6 inches below grade (depending on the overall sampling objectives), and confirmation sampling (e.g., post remedial) will cover usually no more than a depth of 2 inches below grade.

Test pit soil will be sampled by taking several grab samples from the floor and walls of each pit (i.e., the first two inches below each wall/floor surface), mixing them slightly in a small pile as described above, and then containerized appropriately. VOA samples will not be mixed but will be placed into sample containers directly, a little bit from each wall and the floor. There may also be situations where it will be appropriate to grab-sample specific zones due to textural variations, the presence of apparent staining, or "hot spot" preliminary screening results.

Boring soil will be sampled by opening the split barrel, slicing the core (if intact) vertically down the middle with a sharp knife or similar blade, and scooping sufficient sample from the long axis of the split core with a spoon or spatula. If the core is not intact, then upon opening the barrel the contents can be scooped directly with the spoon or spatula. If the core is not homogeneous, insure that representative portions of each type of material within the spoon are collected. There may also be situations where it will be appropriate to grab-sample specific zones due to textural variations, the presence of apparent staining, or "hot spot" preliminary screening results.

Soil screening will be performed in two ways: by waving the probe of the HNU photoionizer directly over the sample, and/or by headspace screening with a portable gas chromatograph (GC) in the field.

Headspace soil screening will be performed by a heated headspace method similar to EPA Method 3810 (SW-846; Revision 0/September 1986; Appendix J. Specifics such as: sample size; vial size; heat "bath" source, temperature and time duration; and spike concentrations will be presented in individual site-specific QAPPs for NYSDEC comment and approval. Although the typical 40 ml VOA vial with sample headspce withdrawal through the septum with a syringe can be used for head space screening, an alternative is to use a wide mouth 4 or 8 ounce glass container to greatly increase the surface area of the sample for volatile off-gassing. Soil will be placed loosely in the container to approximately three-fourths of the container volume, covering the opening of the container tightly with aluminum foil, and then capping the container tight to keep the foil in place and prevent air from leaking in or out. The container will then be placed in a controlled, heated compartment (oven, sand bath, etc.) for a time to be determined on a site-specific basis; following this equilibration period, the container cap is removed leaving the aluminum foil in place. The foil is then punctured with a pin or sewing needle to make a hole just small enough to accomodate the syringe, and the air sampled by the syringe will be injected into the gas chromatograph.

2.4 Soil Vapor Study

Soil vapor studies (SVS) will be conducted using a grid system over an area (where not occupied by structures); additional samples may be collected in areas identified as contaminated or potentially so. Generally, grid points will be 50 feet on center, although the actual grid size will be dependent upon the size and nature of the area of interest. The spacing density may be based on evaluations from prior knowledge of the site, or determined by geologic and hydrogeologic considerations.

2.4. Active Soil Vapor Study

Soil-gas probes will be decontaminated (see Section 2.3 above) prior to delivery to the site. The soil gas probe (stainless steel, galvanized steel, or aluminum pending specific site requirements and cost considerations) will be decontaminated by purging ambient air until background readings are achieved on an HNU (or equivalent organic vapor monitor). For stubborn contamination, rinse with methanol and water, then air dry.

A clean soil gas probe (as defined above by ambient air purging and obtaining background readings) will be used for each sampling location during a particular round of soil vapor survey. Clean, high density polyethylene (HDPE) tubing will be used at each sample location and discarded. Should analysis of blank samples indicate potential contamination, the affected equipment will not be used until appropriately cleaned as indicated by subsequent blank sample testing.

Soil vapor samples will be collected by driving a 1/4-inch steel probe with a removable tip to the desired depth (4 feet) with a slide hammer and/or vibratory rotary hammer. The probe is pulled back slightly to free the removable tip; HDPE tubing is inserted into the top of the probe and soil vapor sampled from the HDPE tubing into a syringe from a "T" adapter in the vacuum line. The sample will be injected directly into the GC for analysis. The annulus around the probe will be sealed at ground surface with [bentonite] clay, and the tubing will be sealed into the probe using compression fittings, to prevent air intrusion. A sampling manifold, attached to the end of the HDPE tubing, will consist of a sampling tee (for collecting soil gas samples with the gas tight syringe), a vacuum gauge, an air-sampling pump and an organic vapor detector (i.e., HNU PI101 or similar/equivalent for "screening" purposes only) arranged in series. The ambient air within the system will be purged until the photoionization detector reaches its maximum response. Samples of soil gas will be collected for GC testing after at least three probe volumes of air have been removed and the organic vapor detector indicates its maximum stabilized response. For the actual field GC testing, there may be particular site-specific analytes not sensitive to photoionization detection (which is commonly used instrumentation), in which case a site-specific GC detector will be recommended for NYSDEC comment and approval. Appendix H contains EPA's Standard Operating Procedure No. 2149 for Soil Gas Sampling taken from EPA's Compendium of ERT Soil Sampling and Surface Geophysics Procedures, EPA/540/P-91/006; OSWER Directive 9360.4-02, January 1991. Figure 2-1 shows a typical diagram of soil gas sampling apparatus.

In the event that sampling runs faster than the instrumental analysis, soil vapor samples may be collected in air-tight Tedlar bags or glass sampling bulbs and held for no longer than two hours before field GC analysis. Detection and reporting limits will be subsite specific to meet the particular project objectives and will be addressed in QAPP addenda.

The following quality control/quality assurance measures will be taken during soil gas surveys

Blank Samples

During each day of field work a blank sample will be run to evaluate the presence of residual contamination within the soil probe, sampling equipment, etc. These samples will be obtained by assembling the probe and sampling equipment (e.g., pump tubing, etc.) at ground surface away from suspected contaminant sources. A "blank" sample will be collected using the sample pump to pull "clean" ambient air through the

sampling equipment. This sample will be injected into the GC for analysis. Should compounds be detected, the probes and other equipment will be recleaned and/or tubing replaced until subsequent blank samples do not contain detectable concentrations of compounds.

Spike Samples

A spike sample may be collected, where appropriate, and analyzed at a rate of approximately one per 20 soil gas samples. Spike samples will be prepared by placing a known quantity of several of the listed compounds in a clean Tedlar bag. The spiked sample will be passed through a soil gas probe and the sampling manifold to monitor for system losses. System losses will be documented.

Duplicate Analysis

Duplicate field analysis will be done at a rate not to exceed one per 20 soil gas samples. Duplicate analysis will be analyzed by making two injections of the same soil vapor sample collected from a given location. Should the duplicate sample vary by more than 20 percent from the original sample, the equipment will be checked and the cause of the variation will be rectified.

Standards and Calibration

A daily, three to five point calibration using standard samples for each of the analytes of interest at concentrations spanning the instrument detection limit and approximately ten times the instrument detection limit (or at the highest [linear] concentration expected), will be prepared and analyzed. A mid-range continuing calibration standard will be run at least three times daily; an average response factor will be used for calculations to quantify compounds. Standards may be bought commercially as containerized gases, or prepared as headspace over neat (i.e., pure) solvent in accordance with Appendix H2.

Laboratory Analysis

Duplicate samples at a rate of ten percent will be collected to confirm field identifications, and submitted to a laboratory for GC/MS confirmation of volatile organics. Two options are available for confirmation sample collection:

Samples can be collected by inserting a 500-1000 ml glass bulb (stopcock at each end with a side-port septum for gas withdrawal via syringe) into the sampling train between the source and the pump. Soil vapor will be allowed to pass through the bulb, and then the stopcock nearest the pump will be closed first; then the other stopcock will be closed and the bulb will be removed from the sampling train.

An alternative is to use sorbent tubes for easier handling; this also increases the 7 day holding time of glass bulb collected samples to 14 days. Details of tube sampling such as sorbent type, period of air flow throught the tube, and flow rate will be elaborated in the sub-site specific QAPP addenda.

Tubes or bulbs will be labeled, preserved by chilling, and delivered to the laboratory for analysis of volatiles. At the laboratory, the tube/glass bulb will be allowed to come to ambient temperature before an aliquot of soil vapor (50 to 100 mls initially if bulbs are used) is withdrawn with a syringe from the septum side-port of the bulb, or the tube is desorbed. An aliquot of the bulb will be injected directly into a gas chromatograph, or into an instrument such as an Envirochem Model 8916 Tube Desorber (or equivalent), in which an internal adsorbent will capture the soil gas sample and subsequently thermally desorb it and analyze it via mass spectrometry in keeping with EPA Method T0-1. If a sorbent tube is used, it will be desorbed directly by the desorber, or by solvent extraction, and subsequently injected into the GC.

Laboratories for soil gas GC/MS confirmation are not currently under subcontract, so sufficient lead time must be allowed for RFP (Request for Proposal) preparation (including NYSDEC comment and approval), as well as NYSDEC comment and approval of the successful RFP bid response.

Laboratories responding to such an RFP must have method detection limit studies complete and available for review, including calibration linearity data. They should also have data such as continuous testing over time from the same laboratory standards and/or field samples to support holding time requirments, as well as spike and/or surrogate recovery data.

Quality control samples to be analyzed at the laboratory along with field samples during actual site projects, will include trip blanks (one per day per shipping cooler), spike samples (5% of confirmation samples or a minimum of one spike sample), and duplicate samples (5% of confirmation samples or a minimum of one duplicate sample).

2.4.2 Passive Soil Vapor Study - PETREX System

Because active soil vapor sampling has the disadvantage of perturbing local VOC concentrations by pumping through a hollow probe, the concentration of these pollutants may vary considerably with depth as a function of moisture conditions, air-filled porosity, depth to groundwater, and compound characteristics such a volatility and solubility. Active sampling does not permit the establishment of equilibrium, thus the concentrations of pollutants collected may be biased toward the lighter more volatile species. Passive soil vapor sampling allows an equilibrium to develop between the soil gases and the sorbent, and averages out concentration fluctuations produced by changes in environmental conditions such as variations in barometric pressure, temperature, moisture, and interactions of pollutant species.

A method employing the advantages of a passive static collector with the advantages of mass spectrometry has been developed at Northeast Research Institute, Inc. (NERI; Farmington, CT.) This method known as the PETREX Technique adapted a soil gas surveying system developed at the Colorado School of Mines for application at sites with complex contamination histories. This method has been developed into a rapid, high resolution soil gas and groundwater analytic technique capable of detecting volatile organics and many semi-volatile organics (VOC/SVOC's).

The PETREX passive collector traps VOC/SVOc's using predetermined seive-sized activated charcoal applied to the tip (1 cm) of a ferromagnetic wire. The collectors are cleaned by heating to 358 degrees Celsius in a high vacuum system, and sealed into a borosilicate glass culture tube under an inert atmosphere. The passive collectors are activated in the field by removing the cap and seal and placing them in an inverted position into cored holes at a depth of 45 cm in the grid pattern throughout the survey site. The holes are backfilled, and flagged for easy location. The collectors are allowed to equilibrate with soil vapors for periods of hours to several days, and retrieved for analysis by desorption into the ion source of an interfaced quadrupole mass spectrometer (MS) via Curie-point thermal desorption (TD). The scan range normally used is 30 to 240 amu with an average 2 minute analysis time per sample. The mass spectrometer is tuned using the internal standard perfluorobutylamine (PFTBA) to maintain correct mass assignment and peak resolution. The identification of compounds is accomplished by comparing mass spectra of the survey samples to a computerized mass spectral reference library.

This integrative collection method overcomes variations in geology, time and atmospheric conditions that produce substantial deviations when using active methods. The collector design incorporates multiple adsorption wires in the same collection device. A routine fingerprint analysis is performed on one wire taken from the collector, and where necessary, because of the complexity of the mixture of pollutants, the second wire is analyzed using additional MS procedures. The use of GC for separation of coeluting species whose mass spectra are obtained during the elution process facilitiates identification of unknowns, although this must be requested as it is not generally part of the Petrex system. GC retention indices coupled with the employment of authentic standards enhances and confirms the mass spectral identification of unknowns.

2.5 Surface Water

Where possible, sample bottles will be lowered below the water surface and allowed to fill. After capping, bottles will be dried with a paper towel. In the event that the water is visibly contaminated, or suspected

of low levels of substances which may not be visible but assumed to be hazardous, an intermediate glass or Teflon dipper bottle will be used to collect the water with subsequent transfer to the final (lab) sample container. For sample bottles containing preservataives, a dipper bottle will be used to avoid losing the preservative to the environment which may occur if such containers are immersed.

2.6 Sediment

Sediment samples will be collected using techniques and instrumentation such as a sediment corer (with a removable Teflon or glass liner to ensure integrity of the surface layer of sediment and minimize loss of fine grained material), a Ponar dredge, or a small (weighted, if necessary) bucket with holes (i.e., acting as a sieve) in the bottom to scrape the sediment to a depth of approximately 6 inches and allow water to drain before removing the sediment with a stainless steel spatula, spoon or hand shovel. Depending on site requirements, specific sampling recommendations will be made for NYSDEC comment and approval based on objectives for grain size, inert surfaces for sampling equipment, integrity of sediment and fines, and othe criteria dependent on sampling technique. With the exception of VOA samples which must be collected immediately (with no mixing) after retrieval of the sampling equipment, sediment will be transferred to 8 ounce glass jars, allowed to settle for a few minutes, excess water drained (if appropriate), and then mixed in accordance with instructions for soil as described above.

2.7 Storage and Disposal of Hazardous Waste Groundwater

Groundwater generated during remedial investigations at or downgradient of Class 2 inactive hazardous waste sites shall be presumed to be a hazardous waste until sampled, analyzed and determined not to be a hazardous waste. When necessary, suitable containers shall be used to store groundwater generated during remedial investigations. Representative samples of the groundwater shall be taken and analyzed to determine if the groundwater is or is not a hazardous waste. To the maximum extent practical, groundwater which is presumed or determined to be a hazardous waste shall be stored subject to the following conditions:

The water shall be stored in suitable containers;
Drummed water shall be placed on pallets;
Secondary containment should be provided. Temporary facilities such as an asphalt berm on a paved and sealed surface, a plastic liner within a bermed area, etc., may suffice;
Containers used to store water shall be of a type which will not be damaged by freezing conditions;
Access to the storage area shall be restricted, and proper signs shall be posted; and
Arrangement for proper disposal shall be made a quickly as possible.

Five alternatives for the disposal of contaiminated groundwater generated during remedial investigations at inactive hazardous waste sites are presented below. Contaminated groundwater may be encountered during the installation, development, and sampling of monitoring wells, and the conducting of pump tests. It is important that such contaminated groundwater is properly handled, stored, and disposed. Care must be taken to ensure that the remedial activities do not result in a worsening of site conditions.

The five alternatives described below provide guidance; other methods of disposal of contaminated groundwater may be appropriate. Use of any alternative not described below will be proposed to NYSDEC for comment and approval.

<u>Alternative 1:</u> <u>Transport off-site to an authorized RCRA treatment facility.</u>

The groundwater shall be transported by a permitted hauler in accordance with 6NYCRR, Part 364 and shall be accompanied by a manifest in accordance with 6NYCRR, Part 372.

Alternative 2: Discharge directly to a sanitary sewer.

Discharge may be allowed to a sanitary sewer for treatment at a publicly-owned treatment works (POTW) provided the following conditions are satisfied:

The owner/operator of the POTW is give prior written notification of the quantity and quality of the groundwater to be discharged, and the owner/operator gives prior written approval (copy to NYSDEC Project Manager);
If necessary, the water is pretreated to comply with all local ordinances;
The groundwater will not cause a violation of the POTW SPDES Permit;
The groundwater will reach the POTW and will not be by-passed (combined sewers with overflows to surface waters may not be acceptable); and
The NYSDEC Regional Water Engineer is notified and approves.

Alternative 3: On-site treatment

Larger volumes of groundwater which are presumed or determined to be a hazardous waste may be treated on-site. During the conduct of pump tests, the volume of groundwater generated may be sufficiently large to warrant on-site treatment. Following treatment, the water may be discharged to a storm sewer or receiving stream subject to a temporary authorization by the NYSDEC Regional Water Engineer. Effluent standards for the treatment water will be established by the Division of Water and will be based upon stream classifiction, Best Available Technology, volume and duration of the discharge, and the type of contamination. Larger volumes of water may also be discharged directly to a POTW subject to all the conditions in Alternative 2, above.

Alternative 4: Transport by truck to a POTW

Transport of contaminated groundwater may be made by a truck to a POTW subject to the following conditions:

All the conditions in Alternative 2 above are satisfied;
The POTW obtains an identification number from US EPA;
The hauler is licensed in accordance with 6NYCRR, Part 364;
The transported water is accompanied with a completed manifest in accordance with 6NYCRR, Part 372;
The owner/operator of the POTW completes the manifest as a receiver of the hazardous waste; and
The POTW complies with NYCRR, Part 373-1.1(d)(3)(iii).

Alternative 5: On-site disposal by ground infiltration.

Groundwater may be disposed on-site by allowing it to infiltrate into the ground. The use of this alternative for the disposal of contaminated groundwater is subject to the following considerations:

There must be a defined site which is the source of the groundwater contamination;

If the groundwater is allowed to infiltrate into the ground, all necessary precautions shall be taken to preclude run-off from the site. Access to the area used must be restricted and appropriate warning signs must be posted. The area used, "recharge pit", shall be covered with clean soil when it is no longer needed; and

The infiltrating groundwater will not significantly contribute to the spread of groundwater pollution from the site.

2.8 Disposal of Non-Hazardous Waste Groundwater

In order to determine if groundwater encountered during remedial investigations at Class 2 sites in not a hazardous waste, representative samples shall be collected and analyzed using NYSDEC Contract Laboratory Program protocols for the Target Compound List parameters, and any other site-specific analytes known to be present at the site. Groundwater which has been sampled, analyzed, and determined not to be a hazardous waste may be discharged to the ground, a storm sewer, a sanitary sewer, or a surface water body subject to the following coniditions:

If to a surface water body, the NYSDEC Regional Water Engineer is give prior notice and approves;

If to a POTW, the owner/operator of the POTW is given prior notice and approves; and

If to the ground, the infiltrating groundwater will not significantly contribute to the spread of groundwater pollution from the site.

3.0 SAMPLE HANDLING

3.1 Sample Identification/Labeling

All samples will have unique identifications using the site name, the type of media or sample (i.e., QC), and the location of the collection point. In all cases, OLP stands for Onondaga Lake Project, and X is the PRP or other site designation yet to be determined. In the event that these unique identifications have too many numbers/letters that are not compatible with the lab tracking/reporting software, it is understood that the lab may assign alternative sample identificaions that are keyed to those coming from the field on the chains of custody.

Soil boring samples will be designated:

OLP-X-SB7-4/6	where:	SB7	=	Soil Boring No. 7
		4/6	=	The 4 to 6 feet depth interval of the split barrel

Groundwater samples will be designated:

OLP-X-MW2s/r-12	where:	MW2	=	Monitoring Well No. 2, soil/rock
		2	=	12' sampling depth/center of screen

Sediment samples will be designated:

OLP-X-Sed1-4	where:		=	Sampling location
		4	=	Depth of sampling, in inches.

Surface Water will be designated:

OLP-X-SW-	where	SW	=	surface water

Soil vapor samples will be designated:

OLP-X-SVS 1	where	SVS	=	Soil vapor sample

Quality control field samples will be designated:

OLP-X-DUP1	where	DUP1	=	Duplicate sample
OLP-X-1-TB	where	TB		Trip blank
OLP-X-1-MS(D)	where	MS	=	Matrix spike (or MS duplicate)
OLP-X-1-FB	where	FB	=	Field blank

Test pit soil samples will be designated

OLP-X-TP1-4	where	TP1	=	Test pit no. 1
		4	=	Depth in no. of feet below surface

Waste samples will be designated

OLP-X-WST1-4	where WST1	=	Waste sample or waste pile no. 1
	4	=	Depth in no. of feet below surface/ground

QC field duplicate samples will be submitted blind to the laboratory; sample identifications will be marked in the field book and on the copy of the chain-of-custody kept by the sampler and copied to the project manager. All samples will be labeled in the field prior to the collection of samples. Affixed to each sampling container will be a non-removable label on which the following information will be recorded with a permanent water-proof ink (Note: do not use permanent water-proof markers or felt pens containing VOC solvent for VOA):

* Site name, location, and job number
* Sample identification code
* Date and time
* Sampler's name
* Preservative
* Type of sample (e.g., water, soil, sludge, sediment)
  Requested analyses

3.2 Bottles, Preservation, and Holding Time

The selection of sample containers used to collect samples is based on the criteria of: sample matrix, analytical method, potential contaminants of concern, reactivity of container material with the sample, QA/QC requirements and any regulatory protocol requirements.

Holding times are judged from the verified time of sample receipt (VTSR) by the laboratory; samples will be shipped from the field and arrive at the lab no later than 24 hours from the time of sample collection. Appendix A contains EPA's Specifications and Guidance for Contaminant-Free Sample Containers. Appendix D contains a list of CLP TCL/TAL analytes and CRQL/CRDL, and Appendix H3 contains a list of non-CLP analyte methodology, and preservation, holding time and bottle requirements. When NYSDEC and EPA CLP holding times differ, the more conservative will be used; at this time those differences identified are listed below (in days from VTSR):

	NYSDEC	EPA
Volatiles (without preservative)	7/7	10/10
Extractable organics - extraction	5/5*	10/5
Extractable organics - analysis	40/40	40/40

x/x = solid/aqueous

* Extraction shall be started within 5 days and completed within 7 days of VTSR; if a reextraction and reananlysis must be performed (e.g., surrogate recoveries outside of acceptance criteria), the reextraction must be started within 10 days and completed within 12 days of VTSR.

3.3 Chain of Custody and Shipping

A chain of custody form (Appendix B or equivalent) will trace the path of sample containers from the project site to the laboratory. Sample/bottle tracking sheets or the chain of custody will be used to track the containers from the laboratory to the containers' destination. The project manager will notify the laboratory of upcoming field sampling events and the subsequent transfer of samples. This notification will include information concerning the number and type of samples, and the anticipated date of arrival. Insulated sample shipping containers (typically coolers) will be provided by the laboratory for shipping

samples. All sample bottles within each shipping container will be individually labelled with an adhesive-held identification label provided by the laboratory. Shipping coolers will be numbered, or otherwise identified, and this identification will be entered into the chain of custody form.

In addition to sealing coolers for transport with nylon strapping, or a similar shipping tape, each sample shipping cooler will be sealed with two adhesive tags assigned with unique identification numbers and signatures. The seal number will be recorded on the chain of custody. Separate numbered seal tags will be provided by the laboratory for the return shipment.

TAMS project personnel receiving the sample containers from the laboratory will check each cooler for the integrity of the seals prior to field work . Coolers with both seals broken will be returned to the laboratory with the containers unused.

Once the sample containers are filled, they will be immediately placed in the cooler with ice (in Ziploc plastic bags to prevent leaking) or synthetic ice packs to maintain the samples at 4 degrees Celsius. The field sampler will indicate the sample designation/location number in the space provided on the chain of custody form for each sample. The chain of custody forms will be signed and placed in a sealed plastic Ziploc bag in the cooler. The completed shipping container will be closed, and two paper seals will be affixed to the lid. The seals must be broken to open the cooler and will indicate tampering if the seals are broken before receipt at the laboratory. A label may be affixed identifying the cooler as containing "Environmental Samples"; and the cooler will be hand delivered or shipped via a delivery service to the laboratory depending on the location of the chosen laboratory and the site. The identification numbers of each cooler shipped will be written on the chain of custody form and the respective shipping manifest. When the laboratory receives the coolers, the custody seals will be checked and lab personnel will sign the chain of custody.

4.0 DATA QUALITY REQUIREMENTS

4.1 Analytical Methods

In the absence of specific testing requirements, it is assumed that unless otherwise directed by NYSDEC or by the specifics of a particular subsite, analyses will include Superfund Contract Laboratory Program (CLP) Target Compound List analytes:

CLP Volatile Organics	NYSDEC Method 91-1 (a)
CLP Semivolatile Organics	NYSDEC Method 91-2 (a)
CLP Pesticides/PCBs	NYSDEC Method 91-3 (a)
CLP Inorganics	NYSDEC Metals Methods (b)
Total Cyanide	US EPA Method 335 (c)

Analytical methods used during this project are presented in the NYSDEC Analytical Services Protocol (ASP), September 1989, revised December, 1991. Specific methods and references for each parameter are shown above. It is the laboratory's responsibility to be familiar with this document and all procedures and deliverables within it pertaining to New York State Superfund work. The laboratory must be familiar with the specific CLP requirements of ASP Volume 1, Exhibits A (Sections I and II), B and C; Volume 2, Exhibit D, Parts I-V; and Volume 8, Exhibit E, Parts I-VII.

(a) NYSDEC Analytical Services Protocol (ASP), September 1989, revised December, 1991.
(b) Methods for Chemical Analysis of Water and Waste, EPA 600/4-79-020, March 1983, modified in reference (a); either Method 200.7 (inductively coupled plasma) or individual metal specific methods by atomic absorption.
(c) Reference (b) unmodified.

Copies of "wet chemistry" field methods are found in Appendix C. Listings of individual compounds within each of the CLP methodologies, along with Practical Quantitation Limits, are found in Appendix D.

TAMS has obtained three laboratories under subcontracts approved by NYSDEC. Parameters for which there are no EPA or State approved methods will have methods adopted from other sources (e.g., literature) and presented to EPA and NYSDEC for approval. Prior to the final assignment of a laboratory for a specific subsite investigation, the lab will need to insure TAMS that they are capable of performing all of the site-specific required analyses, especially those not covered in the TAMS/Lab subcontract under the NYSDEC Superfund Standby Program. This will include documentation of experience, method detection limit studies, and criteria for quantitation limits.

A major Onondaga Lake remedial investigation currently underway is being performed by Allied-Signal, Inc. (ASI) and its contractor, PTI Environmental, under consent order with the NYSDEC. In ASI's RI/FS Work Plan, the following major substances have been identified in media of Onondaga Lake or its tributaries, and some, or all, are expected to be target compounds for specific subsites:

Metals	Organic Compounds	Other Substances
methyl mercury	chlorinated benzenes	ammonia (unionized)
total mercury	polychlorinated biphenyls (PCBs)	ammonia (total)
cadmium	BTEX*	calcite
chromium	polycyclic aromatic hydrocarbons (PAHs)	chloride
copper	pesticides**	total dissolved solids
lead		bacteria***
nickel		
zinc		

benzene, toluene, ethylbenzene and xylenes
DDD, DDE, DDT, chlordane, dieldrin and endrin
E. coli and Enterococci

4.2 Quality Assurance Objectives

Data quality objectives (DQO) for measurement data in terms of precision, accuracy, representativeness, comparability, and completeness (PARCC) are established to ensure that the data collected are sufficient and of adequate quality for their intended uses. Data collected and analyzed in conformance with the DQO process described in this QAPP will be used in assessing the uncertainty associated with decisions related to this site.

Sensitivity

The sensitivity or detection limit desired for each analysis or compound is established by NYSDEC as part of the Analytical Services Protocol (ASP) Superfund Contract Laboratory Program (CLP); the quantitation limits for the compounds of concern are listed in the tables of Appendix D. It is understood that such limits are dependent upon matrix interferences. In addition, the laboratory will be required to submit copies of its method detection limit (MDL) studies for all parameters analyzed.

Detection limits for semi-quantitative tests such as soil vapor analysis are determined by field gas chromatography based on the following:

The instrument response to standard compounds at concentrations near the instrument detection limit (IDL) (as identified by the manufacturer) and at ten times the IDL or at the highest concentration expected at the site;

The instrument signal/noise level;

The instrument gain setting;

Interference from other compounds present at the site; and

Sample dilution.

Accuracy

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical method on similar samples. Percent Recovery Criteria, published by the NYSDEC as part of the ASP, and those determined from laboratory performance data are used to evaluate accuracy in matrix spike and blank spike quality control samples. A matrix spike and blank spike will be performed once for every twenty samples as specified in the ASP-CLP. This will apply to inorganic testing, and organic volatiles, semi-volatiles and pesticides/herbicides/PCBs analyses.

Accuracy measures the bias in a measurement system; it is difficult to measure for the entire data collection activity. Accuracy will be assessed through use of known QC samples.

Accuracy values can be presented in a variety of ways. The average error is one way of presenting this information; however, more commonly accuracy is presented as percent bias or percent recovery. Percent bias is a standardized average error, that is, the average error divided by the actual or spiked concentration and converted to a percentage. Percent bias is unitless and allows accuracy of analytical procedures to be compared easily.

Percent recovery provides the same information as percent bias. routine organic analytical protocol requires a surrogate spike in each sample. Percent recovery will be defined as:

$$\% \text{ Recovery} = (R/S) \times 100$$

where

S = spike surrogate concentration
R = reported surrogate concentration
% Bias = % Recovery - 100

This equation is taken from Data Quality Objectives for Remedial Response Activities (EPA/540/G-87/003; March 1987).

Precision

The laboratory objective for precision is to equal or exceed the precision demonstrated for the applied analytical methods on similar samples. Precision is evaluated by the analyses of laboratory and field duplicates. Laboratory duplicate analyses will be performed once for every twenty samples as specified in the NYSDEC ASP-CLP.

Relative Percent Difference (RPD) criteria, prescribed by the NYSDEC, and those determined from laboratory performance data, are used to evaluate precision between duplicates. A matrix spike duplicate will be performed once for every twenty samples.

Precision measures the reproduceability of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. Precision is usually stated in terms of standard deviation but other estimates such as the coefficient of variation, relative standard deviation, range (maximum value minus minimum value), and relative range are common, and may be used pending review of the data.

The overall precision of measurement data is a mixture of sampling and analytical factors. analytical precision is much easier to control and quantify than sampling precision; there are more historical data related to individual method performance and the"universe" is not limited to the samples received in the laboratory. In contrast, sampling precision is unique to each site or project.

Overall system precision will be determined by collecting field duplicate samples. Analytical results from laboratory duplicate samples will provide data on overall measurement precision. Subtracting the analytical precision from the overall precision will define the sampling precision.

Precision will be determined from duplicate samples for metals analyses, and matrix spikes and matrix spike duplicates for organic analyses; it will be expressed as the relative percent difference (% RPD):

$$\% \text{ RPD} = 100 \times 2(X_1 - X_2) / (X_1 + X_2)$$

where X1 and X2 are reported concentrations for each duplicate sample and subtracted differences represent absolute values. The equation is taken from Data Quality Objectives for Remedial Response Activities (EPA/540/G-87-003; March 1987).

Representativeness

The representativeness of data is only as good as the representativeness of the samples collected. Sampling and handling procedures, and laboratory practices are designed to provide a standard set of performance - driven criteria to provide data of the same quality as other analyses of similar matrices using the same methods under similar conditions. Representativeness will be determined by a comparison of the quality controls for these samples against data from similar samples analyzed at the same time.

Comparability

Comparability of analytical data among laboratories becomes more accurate and reliable when all labs follow the same procedure and share information for program enhancement. Some of these procedures include:

Instrument standards traceable to National Institute of Standards and Technology (NIST), the U.S. Environmental Protection Agency (EPA), or the New York State Departments of Health or Environmental Conservation.
Using standard methodologies.
Reporting results for similar matrices in consistent units.
Applying appropriate levels of quality control within the context of the laboratory quality assurance program.
Participation in inter-laboratory studies to document laboratory performance.

By using traceable standards and standard methods, the analytical results can be compared to other labs operating similarly. The QA Program documents internal performance. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance.

Completeness

The goal of completeness is to generate the maximum amount possible of valid data. The highest degree of completeness would be to find all deliverables flawless, valid and acceptable; contrary, the lowest level of completeness is excessive failure to meet established acceptance criteria and consequent rejection of data.

4.3 Field Quality Assurance

Blank water generated for use during this project must be "demonstrated analyte-free". The criteria for analyte-free water is based on the EPA assigned values for the Contract Required Detection Limits (CRDLs) and Contract Required Quantitation Limits (CRQLs) (see Appendices A and D). If the levels of detection needed on a specific site are lower than the CLP CRDLs/CRQLs, then those levels are used to define the criteria for analyte-free water:

purgeable organics	<10 ppb
semi-volatile organics	< CRQL
pesticides	< CRQL
PCBs	< CRQL
Inorganics	< CRDL

However, specifically for the common laboratory contaminants listed below, the allowable limits are three times the respective CRQLs:

methylene chloride
actone
toluene
2-butanone
phthalates

The analytical testing required for the water to be demonstrated as analyte free must be performed prior to the start of sample collection; thus, it is likely that such water will be supplied by the laboratory along with an analysis of the water.

If potable water is used during the drilling process and is introduced into the borehole, a sample of the water should be collected and analyzed to ensure that contaminants are not being introduced via the water supply.

4.3. Rinse Blanks

Rinse blanks consist of demonstrated, analyte-free water that show if sampling equipment has the potential for contaminant carry-over to give a false impression of contamination in a real sample. When rinse blank water is used to rinse a piece of sampling equipment (before it is used to sample), the rinsate is collected and analyzed to see if sampling could be biased by contamination from the equipment.

Field Duplicate Samples

Field duplicate samples are used to assess the variability of a matrix at a specific sampling point and to assess the reproducibility of the sampling method. These samples are defined as second samples collected from the same location, at the same time, in the exact same manner as the first, and placed into a separate container (with appropriate mixing/homogenization, except for VOAs). Each duplicate sample will be analyzed for the same parameters as the original sample collected that day. Thus, both total and component (field vs. lab) variability can be determined. Duplicates will be collected as matrix spike duplicates and/or blind field duplicates. Acceptance and control limits for the laboratory will follow NYSDEC ASP guidelines. The blind field duplicate Relative Percent Difference (RPD) control limit will be 50 percent for all matrices.

Split Samples

Split samples are used for performance audits or inter-laboratory comparability of data. A split sample will be defined as at least two separate sub-samples taken from a single original sample which has been thoroughly mixed or homogenized prior to the formation of the split samples. The exception to this is samples for volatile organics analysis which will not be homogenized.

Trip Blanks

The purpose of a VOA trip blank (using demonstrated analyte-free water) is to place a mechanism of control on sample bottle preparation and blank water quality, and sample handling. The trip blank travels from the lab to the site with the empty sample bottles and back from the site with the collected samples. There will be a minimum of 1 trip blank per shipping cooler per day of sampling. US EPA requires that trip blanks will be collected only when aqueous volatiles are being sampled.

Field Testing QC

Field testing of groundwater will be performed during monitoring well development and following purging of wells prior to sampling for laboratory samples. Field QA check control limits for pH, specific conductance (conductivity) and turbidity are detailed below.

pH If the pH QC control sample (pH 10.0 buffer after initial calibration with pH 4.0 and 7.0 buffers) exceeds +/- 0.5 pH units from the true value, the source of the error will be determined and the instrument recalibrated. If a continuing calibration check with pH 7.0 buffer is off by +/- 0.5 pH units, the instrument will be recalibrated.

SC Specific conductance QC samples will be on the order of 0.01 or 0. molar potassium chloride solutions, and must be within 10 percent of the true values.

Turb The turbidity QC sample will be a commercially prepared polymer standard (Advanced Polymer System,Inc., or equivalent).

Background Samples

Background samples will be taken from uncontaminated upgradient or unaffected areas to compare with samples of the same medium taken from downgradient or affected areas. At least one background sample will be collected for each medium such as groundwater, sediment, surface water, and surface soil.

4.4 Laboratory Quality Assurance

4.4. Method Blanks

A method blank is laboratory water on which every step of the method is performed and analyzed along with the samples. They are used to assess the background variability of the method and to assess the introduction of contamination to the samples by the method, technique, or instruments as the sample is prepared and analyzed in the laboratory. Method blanks will be analyzed at a frequency of one for every twenty samples analyzed.

4.4.2 Laboratory Duplicates

Laboratory duplicates are sub-samples taken from a single aliquot of sample after the sample has been thoroughly mixed or homogenized (with the exception of volatiles), and assess the precision or reproducibility of the analytical method on a sample of a particular matrix. Laboratory duplicates will be performed on spiked samples as a Matrix Spike and a Matrix Spike Duplicate (MS/MSD) for volatiles and extractables, and as a Matrix spike and regular duplicate for metals and cyanide. Straight duplicates will be run for alkalinity and hardness.

Spiked Samples

Two types of spiked samples will be prepared and analyzed as quality controls: Matrix Spikes and Matrix Spike Duplicates (MS/MSD) are analyzed to evaluate instrument and method performance and performance on samples of similar matrix. MS/MSD will be analyzed at a frequency of one (pair) for every 20 samples. In addition, method blank spikes (MBS) will also be run by the lab as part of the NYSDEC CLP.

4.4.4 Soil Vapor Confirmation

Often soil vapor confirmation is requested by NYSDEC, although there is no "official" sampling and analytical approved methodology. As described in Section 2.4, the laboratory chosen for this work will conform to the following quality controls for soil vapor GC/MS confirmation that will include at a minimum: verified MDL study and linear calibration, including initial and continuing calibration data; trip blanks; spike (recovery) samples; and duplicate samples. This laboratory will need to be selected in the future since the current three subcontracted laboratories do not offer this service.

5.0 DATA DOCUMENTATION

5.1 Field Notebook

Field notebooks will be initiated at the start of on-site work. Each subcontractor in the field will have a notebook dedicated to record all pertinent activities. In addition to any forms that will be filled out summarizing field work (and become part of the project file), legible photocopies of all pertinent notebook pages will be submitted by the contractors with their finished written report or product. The field notebook will include the following daily information for all site activities:

* Date
* Meteorological conditions
* Site conditions (e.g., dry, damp, dusty, etc.)
  Identification of crew members/ other field personnel
  Description of field activities
  Location(s) where work is performed
* Problems and corrective actions taken
  Records of all field measurements or descriptions recorded, and
  Notice of all modifications to the scope of work.

During drilling operations, the supervising geologist will add the following information:

Drill rig type
Documentation of materials used
Downtime
Time work is performed at an elevated or lowered level of respiratory protection
Description of soil or rock strata, and
Diagram of well or piezometer construction.

During sampling of wells and surface water, field samplers will add the following:

Sampling point locations and test results such as pH, conductance, etc.
Information about sample collection
Chain of custody information, and
Field equipment calibration

5.2 Field Reporting Forms

Field reporting forms (or their equivalent) to be utilized in this investigation are presented in Appendix E. These include a daily field form, boring log, monitoring log, monitoring well completion log, well record and chain of custody form. These forms, when completed, will become part of the permanent project file.

6.0 EQUIPMENT CALIBRATION AND MAINTENANCE

6.1 Standard Water and Air Quality Field Equipment

Field equipment used during the collection of environmental samples, includes a turbidimeter (turbidity per EPA Method 180.1), pH meter (pH per EPA Method 150.1), conductivity meter (specific conductance per EPA Method 120.1), thermometer, and photoionization detector.

Calibration and standardization for the field water quality tests will be in conformance with the above referenced test methods (see Appendix C).

The pH meter will be fully recalibrated (three points) at least two times daily and it will be checked with pH 7 buffer every 5 samples, two hours, or every time it has been turned off for more than two hours and then turned on, whichever occurs first.

The specific conductance meter will be calibrated at the beginning and in the middle of the work day.

Temperature will be measured with an NBS/NIST traceable thermometer, or with a platinum electrode, factory calibrated and coupled to the pH meter, or similar meter.

The HNU (or equivalent organic vapor analyzer) use for soil screening and health & safety ambient air monitoring will be calibrated following the manufacturer's instructions, at the beginning of the day, whenever the instrument is shut-off for more than two hours, and at the field technician's discretion.

6.2 Laboratory Equipment

All laboratory equipment will be calibrated according to the requirements of the 1991 Revised NYSDEC ASP, Superfund Contract Laboratory Program for each parameter or group of similar parameters, and maintained following professional judgement and the manufacturer's specifications.

7.0 CORRECTIVE ACTIONS

If instrument performance or data fall outside acceptable limits, then corrective actions will be taken. These actions may include: recalibration or standardization of instruments, acquiring new standards, replacing equipment, repairing equipment, and reanalyzing samples or redoing sections of work.

Subcontractors providing analytical services should perform their own internal laboratory audits and calibration procedures with data review conducted at a frequency so that errors and problems are detected early, thus avoiding the prospect of redoing large segments of work.

All situations related to this project requiring corrective action will be documented and made part of the project file. For each measurement system identified requiring corrective action, identify the responsible individual for initiating the corrective action will be identified and also the individual responsible for approving the corrective action, if necessary.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

The guidance followed to perform quality data validation, and the methods and procedures outlined herein and elsewhere in the Work Plan, pertain to initiating and performing data validation , as well as reviewing data validations performed by others, in principal, by PRPs (potentially responsible parties). An outline of the data validation process is presented here, followed by a description of data validation review summaries.

Many sources of data will become available as the project develops. It is expected that much of the data will be forthcoming from state PRP remedial investigations. Figure 8-1 (Exhibit 3-3 from Guidance for Data Useability in Risk Assessment - Interim Final (EPA/540 G-90-008; October 1990) lists such sources and their use in risk assessment. Much of this information will be databased.

8.1 Laboratory Data Reduction

The laboratory will meet all applicable documentation, data reduction, and reporting protocols as specified in the 1991 revision of the NYSDEC ASP CLP. With full CLP documentation, deliverables will include, but not be limited to:

Organics	Inorganics
Chains of Custody	Chains of Custody
Blanks	Holding Times
Holding Times	Blanks
Internal Standards	Furnace AA QC
Field and Laboratory Duplicates	CRDL Standards
Tentatively Identified Compounds	ICP Serial Dilutions
GC/MS Instrument Performance Check	Lab Control Samples
System Monitoring Compound Recovery	Field & Lab Duplicates
Matrix Spike & Matrix Spike Duplicates	ICP Interference Check
GC/MS Tuning	Spiked Sample Recovery
Surrogate Recoveries	

Copies of the laboratory's generic Quality Assurance Plan (QAP), and the audit performed by TAMS as part of subcontractor procurement are on file at TAMS and with the NYSDEC. The laboratory's QAP or audit will indicate the standard methods and practices for obtaining and assessing data, and how data are reduced from the analytical instruments to a finished report, indicating levels of review along the way.

8.2 Data Validation

TAMS, or its subcontractors will review and validate CLP data. Data validation will be performed by following guidelines established in the US EPA Region 2 SOP No. HW-6, "CLP Organics Data Review" (Revision No. 8, January 1992); and SOP No. HW-2, "Evaluation of Metals Data for the Contract Laboratory Program (CLP)" (based on SOW 3/90; January 1992). These documents (Appendix I) are check lists which are designed to investigate the degree of accuracy and completeness exhibited by a package of CLP data. In addition, the following EPA Functional Guidelines will also be used:

> US EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review , Publication 9240.1-05; EPA-540/R-94/012; PB94-963501; February, 1993.
>
> US EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review , Publication 9240.1-05-01; EPA-540/R-94/013; PB94-963502; February, 1994.

Validation reports will consist of tabular and text results of the review. Tabulation will consist of target and non-target compounds with corresponding method blank data, spike and surrogate recoveries, sample

data , and a final note of validation decision or qualification, along with any pertinent footnote references. NYSDEC ASP CLP validation criteria will be assessed according to the State's specific requirements, especially for holding times, mass spectrometer tuning, minimum relative response factors, continuing calibration percent differences, initial calibration relative standard deviations, system performance (i.e., surrogate recoveries) and spike recoveries.

There may be some tests such as alkyl mercuries (methyl mercury, ethyl mercury, etc.) for which there is no generally agreed upon and EPA-approved routine method adopted through regulation or community acceptance. Methods are available depending on matrix and desired sensitivity; different method (both sampling and analytical) require different formats and review processes for validation beyond the routine EPA Functional Guideline parameters. For instance, alkyl mercuries can be analyzed by gas-liquid chromatography or gas vapor fluorescence, two different chemistries for which a correlation needs to be developed for data comparability. In general, non-CLP work will be validated against CLP validation criteria as much as possible. When this is not appropriate for such non-routine methods, data validation criteria will be created by TAMS chemistry staff under an additional scope of work, or as part of the sub-site investigation work plan development.

EPA has recently released SOP No. HW-18, Standard Operating Procedure for Validating Volatile Organic Analysis of Ambient Air in Canister (Revision 0, April 1994; Appendix K). This will be used for validating SUMMA Canister analysis, and as a starting point for quantitative air analysis by other collection means.

For data previously validated by others, a review of the data validation report will be summarized in a template such as Figure 8-2, with appropriate supporting text or comment, indicating whether these items are present and to what degree of uncertainty the data are viable.

8.3 Data Usability

Review of these items is reported from the subcontractor data validator as a text with accompanying tables; TAMS chemistry staff then follows with a brief data useability summary. Regardless of the degree to which one can develop a complex or complicated checklist and somehow arrive at a "grade" or "points" to validate (or invalidate) a particular data or run of data, final evaluation of the validity and useability is still a professional call by the experienced validator. Sample data never really "stand alone", they're always dependent on their matrix.

Under separate tasks, review of sampling plans from remedial investigations will assess whether work carried out was in agreement with the written plan(s). The relative importance of the sampling and analysis issues is outlined in Figure 8-3. The data and documentation required for the risk assessment are outlined in Figure 8-4.

Based on a combination of RI review and data validation, the importance of sample issues will be summarized in a form similar to that of Figure 8-5, with a summary of uncertainty reported in a form similar to Figure 8-6.

8.4 Field Data

Field chemistry data collected during air monitoring, soil screening, and water monitoring (i.e., pH, turbidity, specific conductance, and temperature) will be presented in tabular form with any necessary supporting text. Unless activities resulted in significant unexpected results, field data comments can be added as footnotes to the tables.

8.5 Database Management

A database tied to a geographical information system will be developed by TAMS to track data obtained from 104(e) responses, that will also serve as a link to the comprehensive database prepared for analytical data such as that from remedial investigation laboratory analyses.

This database will allow for numerous reporting possibilities using the powerful 'Relational Query By Example' (RQBE) feature available in FoxPro. By linking the 104(e) and the analytical databases, a complete record of all companies, agencies and monitorings associated with the project will be maintained while still allowing both databases to function independently. Data presentation will be modified as the project progresses.

Use of the database will be by password only. Access to some of the primary tables will be restricted (via a secondary password) to certain users responsible for their creation. To reduce errors, most of the search criteria or repetitve input information will be derived from pop-up lists taken from the master tables. The goal is to reduce typing of input and the associative errors in spelling , case, and different key words having the same meaning. A sample of a master table would be the definitions of the hazardous and industrail wastes defined for the project.

9.0 PERFORMANCE AND SYSTEM AUDITS

9.1 Site Activities Audit

All site investigations and activities will proceed according to the requirements and specifications outlined in this QAPP. The QA Officer or his appointed designee will be responsible for providing QA supervision and guidance to TAMS personnel and subcontractors. Field audits will be performed by the TAMS QA Officer, or his appointed designee during each of the following activities: all media sampling, and drilling and monitoring well installation, and other activities which produce data used to make remedial decisions.

Example forms to be filled out during the audit are found in Appendix F.

9.2 Laboratory Audit

As part of the laboratory subcontractor procurement process under the TAMS/NYSDEC Superfund Standby Contract, three laboratories chosen by TAMS have been audited. Therefore, an audit of the laboratory(s) during a particular project will not be performed unless warranted by a problem(s) that cannot be resolved by any other means, or at the discretion of TAMS and the NYSDEC. Qualifications for labs chosen to be in this program are found in Appendix G. Subcontractor laboratories are listed in Section 1.4.2.

10.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Monthly project status reporting to the NYSDEC will include aspects of quality control that were pertinent during the month's activities. Any problems revealed during review of the month's activities will be documented and addressed. These reports will include a description of completed and on-going activities, and an indication how each task is progressing relative to the project schedule.

The project manager, through task managers, will be responsible for ensuring that all records and files related to this project are stored appropriately and are retrievable.

The laboratory will submit as part of its deliverables package, any internal memos or correspondences related to quality control of this project's samples.

FIGURES

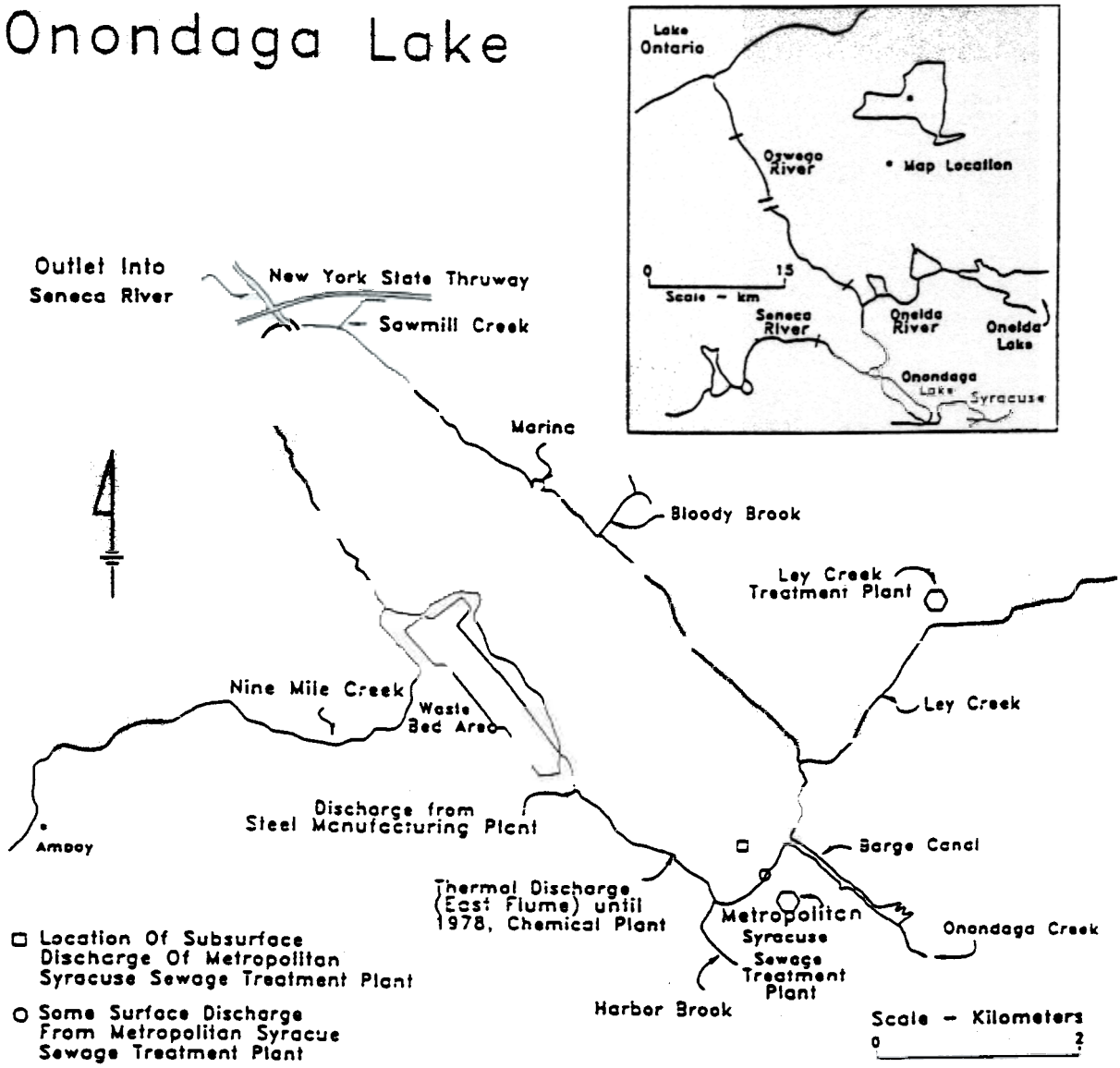

Figure 1-1
Site Location

SYRACUSE
CAMILLUS
MARCELLUS
ONONDAGA LAKE BASIN
ONONDAGA INDIAN
RESERVATION
TULLY
MUD BOILS
MAJOR WATERSHED
MINOR WATERSHED
NORTH
Scale in Km
0
6

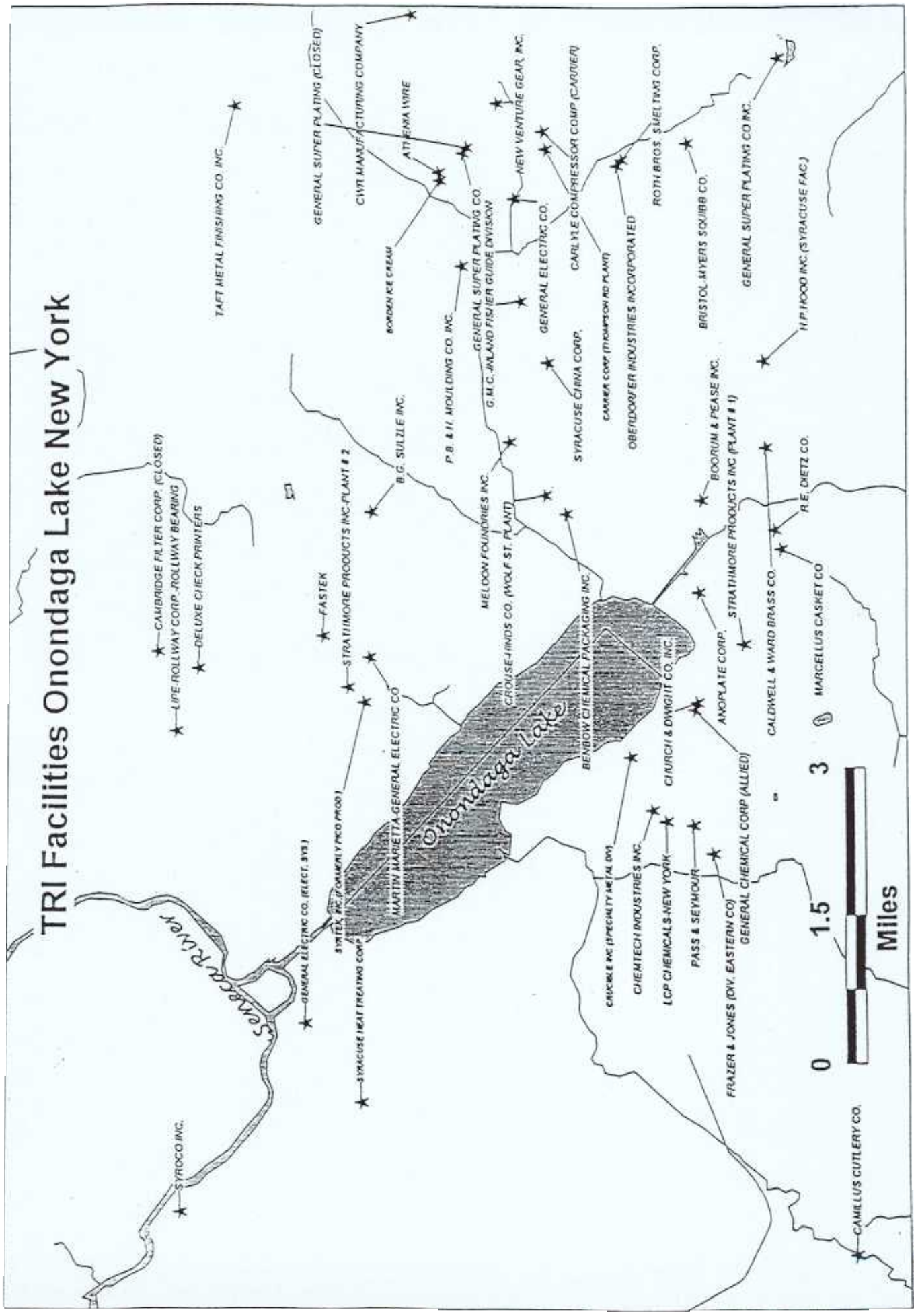
TRI Facilities Onondaga Lake New York
Onondaga Lake
Seneca River
TAFT METAL FINISHING CO. INC.
GENERAL SUPER PLATING (CLOSED)
CIVIT MANUFACTURING COMPANY
ATTEXMA WIRE
NEW VENTURE GEAR, INC.
CARLYLE COMPRESSOR COMP (CARRIER)
ROTH BROS. SMELTING CORP.
BORDEN ICE CREAM
GENERAL SUPER PLATING CO.
GENERAL ELECTRIC CO.
CARRIER CORP. (THOMPSON RD PLANT)
BRISTOL-MYERS SQUIBB CO.
GENERAL SUPER PLATING CO INC.
P.B. & H. MOULDING CO. INC.
G.M.C. INLAND FISHER GUIDE DIVISION
SYRACUSE CHINA CORP.
OBERDORFER INDUSTRIES INCORPORATED
H.P. HOOD INC. (SYRACUSE FAC.)
B.G. SULZLE INC.
BOORUM & PEASE INC.
CAMBRIDGE FILTER CORP. (CLOSED)
LIFE-ROLLWAY CORP.-ROLLWAY BEARING
DELUXE CHECK PRINTERS
STRATHIMORE PRODUCTS INC-PLANT # 2
MELDOW FOUNDRIES INC.
STRATHIMORE PRODUCTS INC (PLANT # 1)
R.E. DIETZ CO.
FASTEK
CROUSE-HINDS CO. (WOLF ST. PLANT)
BENBOW CHEMICAL PACKAGING INC.
ANOPLATE CORP.
CALDWELL & WARD BRASS CO.
MARCELLUS CASKET CO
GENERAL ELECTRIC CO
CHURCH & DWIGHT CO. INC.
GENERAL ELECTRIC CO. (ELECT. SYS.)
SYTEX INC. (FORMERLY PKO PROD.)
MARTIN MARIETTA
CRUCIBLE INC (SPECIALTY METAL DIV.)
CHEMTECH INDUSTRIES INC.
LCP CHEMICALS-NEW YORK
PASS & SEYMOUR
GENERAL CHEMICAL CORP (ALLIED)
FRAZER & JONES (DIV. EASTERN CO)
SYRACUSE HEAT TREATING CORP.
SYROCO INC.
CAMILLUS CUTLERY CO.
0
1.5
3
Miles

Figure 1-3

PROJECT ORGANIZATION CHART

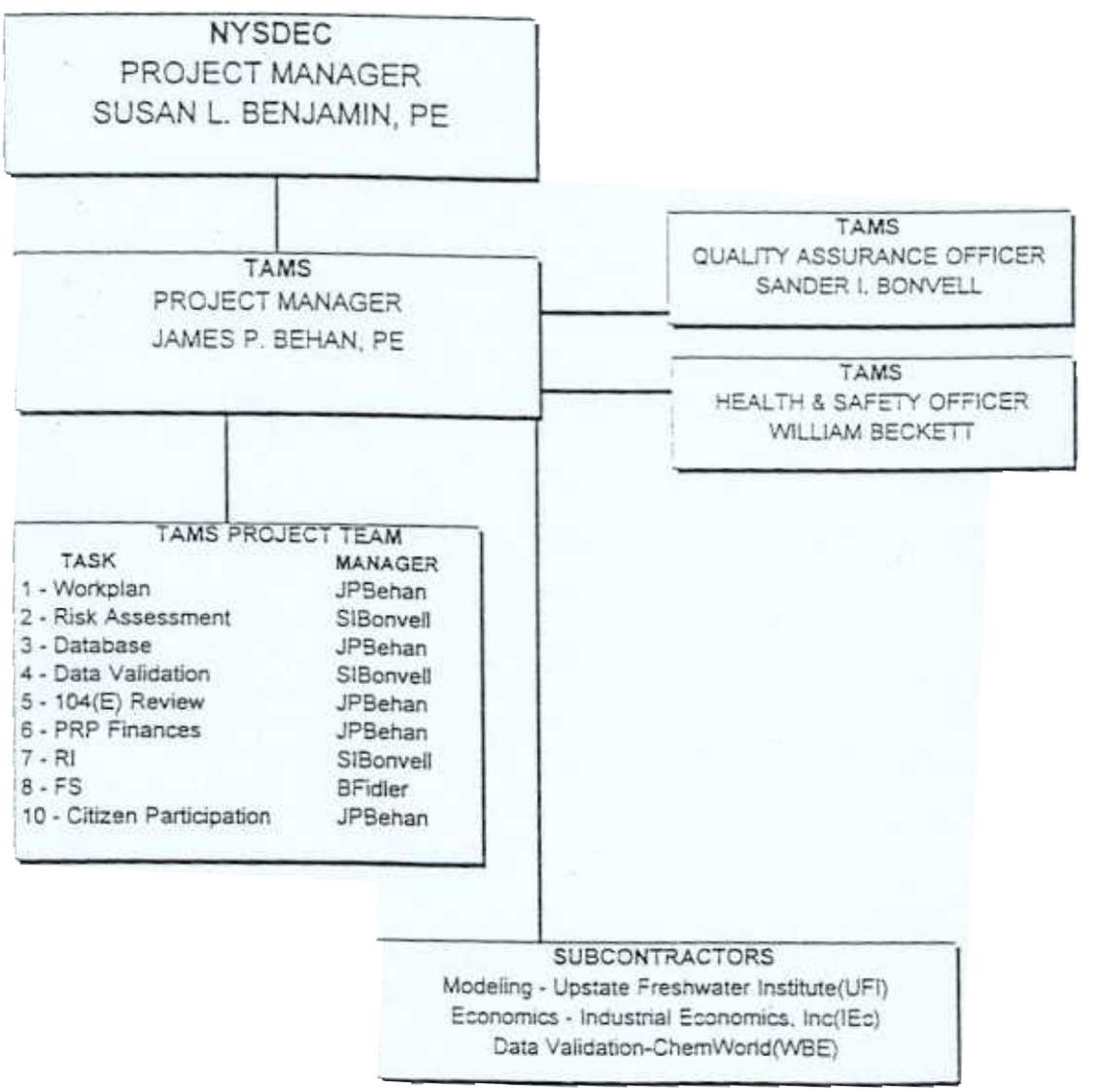

Figure 1-4

Typical Soil Gas Sampling Apparatus

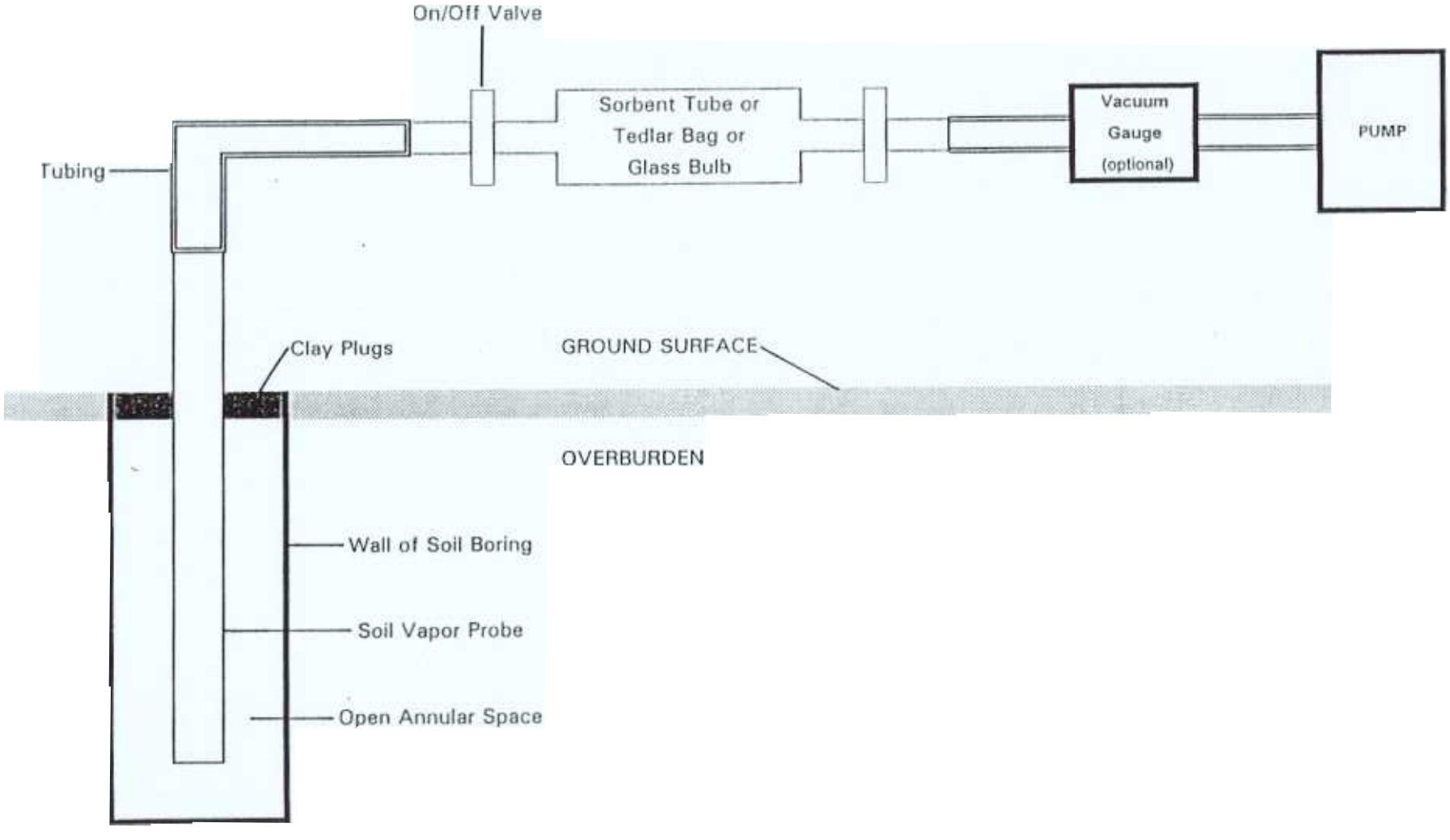

Figure 2-1

DATA SOURCES AND THEIR USE IN RISK ASSESSMENT

Available Data Sources	Data Type	Primary Use(s)
PA/SI Data	Analytical	- Quantitative Risk Assessment - Trends
Hazard Ranking System (HRS) Documentation	Site records, Manifests, PA/SI, Analytical	- Quantitative Risk Assessment - Trends - Planning (chemicals present)
Listing Site Inspection (LSI)	Site records, PA/SI, Analytical	- Quantitative Risk Assessment - Trends - Planning (chemicals present)
Site Records on Removal and Disposal	Administrative	- Planning (chemicals present)
Toxic Release Inventory System (TRIS): Industry-Specific	Chemical discharge	- Planning (chemicals present)
Site, Source and Media Characteristics	Physical parameters (e.g., meteor-ological, geological)	- Fate and Transport - Define Exposure Pathways
Field Screening	Analytical	- Preliminary Assessment - Site Characterization
Field Analytical	Analytical	- Quantitative Risk Assessment - Site Characterization
Fixed Laboratory[1] - CLP, Non-CLP (EPA, State, PRP, Private)	Analytical	- Quantitative Risk Assessment - Reference - Broad Screen - Confirmatory - Site Characterization

[1] Mobile laboratories often have available the same instrumentation as fixed laboratories with the exception of ICP or MS.

Figure 8-1

Data Validation Report Review Summary

Project	Lab SDGs: 1
NYSDEC Site No.	2
Laboratory	3
Data Validator	4
Date(s) of Sampling	
Date(s) of Analysis	

Matrix:	VOA	SVOA	Pest/PCB	Inorg	Org Hg	Special
Traffic Report						
Lab Narrative						
Matrix Spike						
MS/MSD						
Blanks						
Mass Calibration						
TICs Significant?						
Initial Calibration						
Continuing Calibration						
Internal Standards						
Field Duplicates						
TelCon Logs						
Sample Preparation Log						
Target Compounds Detected?						
ICP Interference Check						
ICP Serial Dilution						
CRDL Standards						
	Source of Uncertainty*					
Sampling:						
Collection						
Preservation						
Laboratory:						
Storage						
Preparation						
Analysis						
Reporting						

Comments

* Potentially source of error or uncertainty

++ Likely source of significant error or uncertainty

Figure 8-2

RELATIVE IMPORTANCE OF SAMPLING AND ANALYSIS PLAN AND RECORDS IN PLANNING FOR RISK ASSESSMENT

DOCUMENTATION	IMPORTANCE
Sampling and Analysis Plan	
• Selection and Identification of Sampling Points	Critical
• Sample Collection SOP	High
• Analytical Procedures or Protocols	High
• Data Reporting and Review SOP	High
• QA Project Plan	High
• Method-Specific QC Procedures	Medium
• QA/QC Procedures	Medium
• Documented Procedures for Corrective Action	Medium
• Instrument Monitoring SOP Including Corrective Action and Maintenance	Medium
• Sample Preservation and Shipping SOP	Medium
• Sample Receipt, Custody, Tracking and Storage SOP	Low
• Installation and Monitoring of Equipment SOP	Low
Field and Analytical Records	
• Field Log Records	High
• Field Information Describing Weather Conditions, Physical Parameters or Site-Specific Geology	High
• Documentation for Deviations from SAP and SOPs	High
• Field Decisions/Documentation	High
• Data from Analysis - raw data such as instrument output, spectra, chromotograms and laboratory narrative	Medium
• Internal Laboratory Records	Low

KEY
- Critical - Essential to the useability of data for risk assessment.
- High - Should be addressed in planning for risk assessment.
- Medium - Primarily impacts how data are qualified in risk assessment.
- Low - Has little effect on useability of data for risk assessment.

Figure 8-3

DATA AND DOCUMENTATION NEEDED FOR RISK ASSESSMENT

DATA AND DOCUMENTATION	IMPORTANCE
• Site description with a detailed map indicating site location, showing the site relative to surrounding structures, terrain features, population or receptors, indicating air and water flow, and describing the operative industrial process if appropriate.	Critical
• Site map with sample locations identified.	Critical
• Description of sampling design and procedures including rationale.	Critical
• Description of analytical method used and detection limits including sample-specific quantitation limits (SQLs) and detection limits for non-detect data.	Critical
• Results given on a per-sample basis, qualified for analytical limitations and error, and accompanied by SQLs.	Critical
• Field conditions and physical parameter data as appropriate for the media involved in the exposure assessment.	Critical
• Narrative explanation of qualified data on an analyte and sample basis, indicating direction of bias.	High
• QC data results such as blanks, replicates and spikes for field and laboratory.	High
• Estimated quantities of compounds/tentatively identified compounds.	High
• Definitions and descriptions of flagged data.	High
• Results given in summary tables in alphabetical order.	Medium
• Raw data (instrument output, chromatograms, spectra).	Medium
• Definitions of technical jargon used in narratives.	Low

KEY
- Critical - Essential to the useability of data for risk assessment.
- High - Should be addressed in planning for risk assessment.
- Medium - Primarily impacts how data are qualified in risk assessment.
- Low - Has little effect on useability of data for risk assessment.

Figure 8-4

IMPORTANCE OF MAJOR SAMPLING ISSUES IN EACH MEDIUM

MAJOR SAMPLING ISSUES	PROBLEM LIKELIHOOD BY MEDIUM					
	SOIL	GROUND WATER	SURFACE WATER	AIR	BIOTA	HAZARDOUS WASTE
Contaminant Migration	++		+	+		++
Temporal Variation		++	++	+	+	
Spacial Variation	++		++	+		++
Topographic/ Geological Properties	++	++		+		
Hot Spots	++					++
Sample Collection	+	+	++	++	+	+
Sample Preparation/ Handling	++	++	++	++	++	+
Sample Storage		++	++	++	++	
Sample Preservation		++	++		++	

Key: ++ = Likely source of significant sampling problem.

+ = Potential source of sampling problem.

Source: Keith 1990b.

Figure 8-5

SOURCES OF UNCERTAINTY THAT FREQUENTLY AFFECT CONFIDENCE IN ANALYTICAL RESULTS

SOURCE OF UNCERTAINTY	DEGREE OF SIGNIFICANCE BY MEDIUM				
	SOIL	WATER	AIR	BIOTA	HAZARDOUS WASTE
SAMPLING					
Design	++	+	++		+
Contamination	++	+	+		
Collection	+	++	++		+
Preparation	++			++	
Storage		++	++		
Preservation		++		++	
LABORATORY					
Storage	++	++	++	++	
Preparation	++/+	++/+		+	++
Analysis	++		+	++	++
Reporting			+		++
ANALYTE-SPECIFIC					
Volatility	++	+	+		
Photodegradation		+	+		
Chemical Degradation	+	++			
Microbial Degradation	++	++			
Contamination	++		++		

KEY:

++ = Likely source of significant error or uncertainty.
+ = Potentially significant source of error or uncertainty.
++/+ = Magnitude of effect determined by examination of data.

Figure 8-6

TABLES

TABL .

Sampling and Analysis Matrix
Onondaga Lake Restoration
Subsite: XYZ

Sample Media	Volatile Organics CLP 91-1	Semi/Volatile (BNA) Organics CLP 91-2	Pesticides PCBs CLP 91-3	Inorganics Metals/Cyanide CLP	Aqueous Field (a) Parameters	Soil Vapor Field GC Screen	Moisture Content ASTM D2216	Atterberg Limit ASTM D4318	Grain Size ASTM D422	Total Organic Carbon Lloyd Kahn	Volatile Organics, Modified EPA T01	Hardness EPA 130.2 & Alkalinity EPA 310.1
sample bottle requirements-water*	8	A,K	A,K	C,L/C,H	C,E,F,L	+ +				B	+	C,E,F,L
sample bottle requirements-soil*	D	E,F,H,J	E,F,H,J	E,F					E,F,J	E,F,G		
extraction holding time**		5	5							-		
analysis holding time**	7	40	40	***						28		14 & 180
aqueous preservation	X	X	X	Y/Z						X		W & X
Test Pit Soil	6	6	6	6		6						
Matrix Spike	1	1	1									
Matrix Spike Dup.	1	1	1									
Borings Soil	20	20	20	20		60	20	10	20	10		
Matrix Spike	1	1	1	1								
Matrix Spike Dup.	1	1	1	1								
Overburden Well Soil						20						
Bedrock Well Soil						10						
Groundwater - Overburden***	22	22	22	22	22							22
Matrix Spike	1	1	1	1								
Matrix Spike Dup.	1	1	1	1								
Groundwater-Bedrock	8	8	8	8	8							8
Surface Water	3	3	3	3	3							3
Matrix Spike	1	1	1	1								
Matrix Spike Dup	1	1		1								
Surface Soil	6	6	6	6		6						
Matrix Spike	1	1	1	1								
Matrix Spike Dup.	1	1	1	1								
Sediment	4	4	4	4								
Matrix Spike	1	1	1	1								
Matrix Spike Dup	1	1	1	1								
Sump Liquid	9	9	9	9	9							9
Matrix Spike	1	1	1	1								
Matrix Spike Dup.	1	1	1	1								
Trip Blanks	8*	0	0	0								
Soil Vapor						80						
TOTALS	98**	90**	90**	90**	42	182	20	10	20	10		42

* See attached footnotes
** Days from VTSR
*** 6 months, acid preserved, except: mercury, 28 days; cyanide, 12 days
\+ Sorbent tube
\++ Direct syringe, glass bulb, or Tedlar bag

W = HNO_3 or H_2SO_4, pH <2
X = Chill to 4 degrees C
Y = HNO_3, pH <2
Z = NaOH, pH > 12

1/25/95
a:\onondaga\qapp\smtrx.xls

SAMPLE CONTAINER SPECIFICATIONS

Container Type	Specifications
	Container: 80-oz amber glass, ring handle bottle/jug, 38-mm neck finish. Closure: polypropylene or phenolic cap, 38-430 size; 0.015-in Teflon liner. Total Weight: 2.45 lbs.
B	Container: 40-mL glass vial, 24-mm neck finish. Closure: polypropylene or phenolic, open-top, screw cap, 15-cm opening, 24-400 size. Septum: 24-mm disc of 0.005-in Teflon bonded to 0.120-in silicon for total thickness of 0.125-in. Total Weight: 0.72 oz.
	Container: 1-L high-density polyethylene, cylinder-round bottle, 28-mm neck finish. Closure: polyethylene cap, ribbed, 28-410 size; F217 polyethylene liner. Total Weight: 1.89 oz.
D	Container: 120-mL wide mouth, glass vial, 48-mm neck finish. Closure: polypropylene cap, 48-400 size; 0.015-in Teflon liner. Total Weight: 4.41 oz.
E	Container: 16-oz tall, wide mouth, straight-sided, flint glass jar, 63-mm neck finish. Closure: polypropylene or phenolic cap, 63-400 size; 0.015-in Teflon liner. Total Weight: 9.95 oz.
	Container: 8-oz short, wide mouth, straight-sided, flint glass jar, 70-mm neck finish. Closure: polypropylene or phenolic cap, 70-400 size; 0.015-in Teflon liner. Total Weight: 7.55 oz.
G	Container: 4-oz tall, wide mouth, straight-sided, flint glass jar, 48-mm neck finish. Closure: polypropylene or phenolic cap, 48-400 size; 0.015-in Teflon liner. Total Weight: 4.70 oz.
H	Container: 1-L amber, Boston round, glass bottle, 33-mm pour-out neck finish. Closure: polypropylene or phenolic cap, 33-430 size; 0.015-in Teflon liner. Total Weight: 1.11 lbs.
	Container: 32-oz tall, wide mouth, straight-sided, flint glass jar, 89-mm neck finish. Closure: polypropylene or phenolic cap, 89-400 size; 0.015-in Teflon liner. Total Weight: 1.06 lbs.
K	Container: 4-L amber glass, ring handle bottle/jug, 38-mm neck finish. Closure: polypropylene or phenolic cap, 38-430 size; 0.015-in Teflon liner. Total Weight: 2.88 lbs.
	Container: 500-mL high-density polyethylene, cylinder-round bottle, 28-mm neck finish. Closure: polypropylene cap, ribbed, 28-410 size; F217 polyethylene liner. Total Weight: 1.20 oz.

APPENDIX A

OSWER Directive # 9240.0-05A
December 1992

SPECIFICATIONS AND GUIDANCE

FOR

CONTAMINANT-FREE SAMPLE CONTAINERS

Office of Emergency and Remedial Response
Office of Solid Waste and Emergency Response
U.S. Environmental Protection Agency
Washington, DC 20460

NOTICE

This guidance manual does not constitute a rulemaking by the Agency. The policies set forth in this Directive are intended solely as guidance. They are not intended, nor can they be relied upon, to create any substantive or procedural rights enforceable by any party in litigation with the United States. EPA officials may decide to follow the guidance provided in this Directive, or may take action that is at variance with the guidance, policies, and procedures in this Directive, on the basis of an analysis of specific circumstances. The Agency also reserves the right to change this Directive at any time without public notice. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

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5285 Port Royal Road
Springfield, VA 22161
(703)487-4650

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SECTION

INTRODUCTION

In August 1989, the Environmental Protection Agency's (EPA) Office of Emergency and Remedial Response (OERR) decentralized Superfund's Sample Container Repository program (OSWER Directive #9240.0-05). In conjunction with the decentralization of Superfund's bottle program, OERR issued specifications and guidance for preparing contaminant-free sample containers to assist the Regions in obtaining appropriate sample containers from commercially available suppliers.

The December 1992 version of "Specifications and Guidance for Contaminant-Free Sample Containers" revises the specifications and provides a single source of standardized specifications and guidance on appropriate cleaning procedures for preparing contaminant-free sample containers that meet all Contract Laboratory Program (CLP) detection/quantitation limits, including those for low concentration analyses.[1] Although the specifications and guidance procedures contained in this document are based on CLP low concentration requirements, they also are suitable for use in other analytical programs.

Specifications and guidance for preparing contaminant-free sample containers are provided in the sections that follow and are intended to describe one approach for obtaining cleaned, contaminant-free sample containers for use by groups performing sample collection activities under Superfund and other hazardous waste programs. Although other cleaning procedures may be used, sample containers must meet the criteria specified in Section II. In certain instances, the user of the sample containers may require exact adherence to the cleaning procedures and/or quality control analysis described in this document. In other instances, the user may require additional or different cleaning procedures and/or quality control analysis of the sample containers. The specific needs of the bottle user will determine the requirements for the cleaning and quality control analysis of the sample containers as long as the minimum criteria are met. It is the responsibility of the bottle user to define the sample container preparation, cleaning, and quality control requirements.

The document has been extensively reviewed and revised since the August 1989 iteration, and important enhancements have been incorporated, including:

- Removing references to the color of the closures;
- Allowing the use of polypropylene closures as an alternative to phenolic closures;
- Referencing CLP Low Concentration Organics and Inorganics Statements of Work for the analysis of calibration verification solutions and blanks;
- Including cleaning and quality control procedures for fluoride and nitrate/nitrite;
- Removing the hexane rinse from the cleaning procedure for container types A, E, F, G, H, J, and K (semivolatile organics, pesticides, metals, cyanide, and fluoride in soils and water);

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[1] Because this document does not address the procurement of contaminant-free sample containers, the title was changed from "Specifications and Guidance for Obtaining Contaminant-Free Sample Containers" to "Specifications and Guidance for Contaminant-Free Sample Containers."

- Adding the recommendation that the bottle vendor establish and submit a Quality Assurance Plan (QAP);

- Changing the QA/QC documentation requirements so that copies of the raw data from the analyses of the QC containers are available upon request and not automatically sent to the bottle purchaser;

- Changing the permanent lot number assignment to a nine-digit number from an eight-digit number, where the extra digit represents the analysis parameter;

- Adding Chemical Abstract Services (CAS) registry number for the inorganic analytes in Table 1; and

- Recommending an annual demonstration of the bottle vendor's ability to meet detection limits and establish reproducibility of the cleaning techniques.

OERR and the EPA Regions decided to use the most stringent CLP requirements available to set the specifications for obtaining contaminant-free sample containers. As a result, the CLP Inorganics and Organics Low Concentration Statement of Work (SOW) requirements were selected as the basis for these specifications. Major factors in this decision included the desire to have a set of bottle cleaning specifications that met or exceeded all analytical requirements and the related need to avoid potential misuse of cleaned bottles (e.g., using a container cleaned by a multi-concentration procedure for a low concentration sample). OERR will reevaluate this decision if the low concentration requirements are deemed to be too stringent.

Most environmental sampling and analytical applications offer numerous opportunities for sample contamination. For this reason, contamination is a common source of error in environmental measurements. The sample container itself represents one such source of sample contamination. Hence, it is vital that sample containers used within the Superfund program meet strict specifications established to minimize contamination which could affect subsequent analytical determinations. Superfund sampling and analysis activities require all component materials (caps, liners, septa, packaging materials, etc.) provided by the bottle preparer to meet the criteria limits of the bottle specifications listed within Section II.

Section III provides guidance on cleaning procedures for preparing contaminant-free sample containers that meet the specifications contained in Section II. The procedures provided in this section are intended to provide sample containers that meet all current CLP Low Concentration Inorganics and Organics detection/quantitation levels.

In selecting cleaning procedures for sample containers, it is important to consider all of the parameters of interest. Although a given cleaning procedure may be effective for one parameter or type of analysis, it may be ineffective for another. When multiple determinations are performed on a single sample or on a subsample from a single container, a cleaning procedure may actually be a source of contamination for some analytes while minimizing contamination in others. It should be the responsibility of the bottle supplier to verify that the cleaning procedures actually used satisfy the quality control requirements set forth in Section IV.

Two aspects of quality assurance (i.e., quality control and quality assessment) must be applied to sample containers as well as to the analytical measurements. Quality control includes the application of good laboratory practices and standard operating procedures especially designed for the cleaning of sample containers. The cleaning operation should be based on protocols especially designed for specific contaminant problems. Strict adherence to these cleaning protocols is imperative. Quality assessment of the cleaning process depends largely on monitoring for adherence to the respective protocols. Because of their critical role in the quality assessment of the cleaning operation, protocols must be carefully designed and followed. Guidance is provided in Section IV on design and implementation of quality assurance and quality control protocols.

SECTION II

SAMPLE CONTAINER AND COMPONENT MATERIAL SPECIFICATIONS

This Section identifies sample containers commonly used in the Superfund program and provides specifications for contaminant-free sample containers for each bottle type.

A. CONTAINER MATERIAL

A variety of factors affect the choice of containers and cap material. These include resistance to breakage, size, weight, interferences with analytes of interest, cost, and availability.

Container types A through L (Figure 1, pages 6-7) are designated as the type of sample containers that have been used successfully in the past. Kimax or Pyrex brand borosilicate glass is inert to most materials and is recommended where glass containers are used (i.e., pesticides and other organics). Conventional polyethylene is recommended when plastic is acceptable because of its lower cost and lower adsorption of metal ions. The specific sampling situation will determine the use of plastic or glass.

While the sample containers shown in Figure 1 are utilized primarily for Superfund sampling activities, they also may be used for sampling activities under other programs, such as the Resource Conservation and Recovery Act (RCRA).

B. MAXIMUM CONTAMINANT LEVEL SPECIFICATIONS FOR SAMPLE CONTAINERS

The CLP, through a series of technical caucuses, has established inorganic Contract Required Detection Limits (CRDL) and organic Contract Required Quantitation Limits (CRQL) which represent the minimum quantities needed to support the hazardous substance identification and monitoring requirements necessary for remedial and other actions at hazardous waste sites.

For inorganic sample containers, the CRDLs listed in Table 1, page 8, are the specifications for maximum trace metal contamination. Concentration at or above these limits on any parameter should preclude these containers from use in collecting inorganic samples.

The CRQL specifications for organic sample containers are listed in Table 2, pages 9-13. When the CRQL in Table 2 is multiplied by the appropriate factor listed below, the resulting value then represents the maximum concentration allowed for particular sample containers based on organic CLP sample sizes for routine analyses.

Container type	Multiple of CRQL
A	1.0
B	0.5
D	10.0
E	8.0
F	4.0
G	2.0
H	0.5
	0.5
K	2.0

The philosophy used for determining the maximum permissible amount of contamination in a sample container was to consider the number of aliquots of sample that are available in the container and assume that the contamination present would be uniformly distributed in all of the aliquots. This assumption, and the assumption that there should be no more than one-half the CRQL contributed by the container, resulted in the establishment of contamination limits by container type. For example, the volume of container type D is sufficient to allow 20 volatile determinations. Therefore, if 10 times the CRQL of contaminant is present in the cleaned bottle, each aliquot tested will contain one-half of the CRQL of contaminant due to the contribution from the bottle.

C. GROSS CONTAMINATION

Gross contamination is defined as greater than two hundred times the acceptable concentration values in Tables 1 or 2 (multiplied by the appropriate factor), unless the cleaning procedure is successful in reducing the amount of contamination to within specifications. If this is not achieved, the grossly contaminated materials should be discarded and replaced to prevent cross contamination with other batches of containers. The bottle preparer should inspect all materials to ensure conformance with the required specifications.

FIGURE 1

SAMPLE CONTAINER SPECIFICATIONS

Container Type	Specifications
A	Container: 80-oz amber glass, ring handle bottle/jug, 38-mm neck finish. Closure: polypropylene or phenolic cap, 38-430 size; 0.015-in Teflon liner. Total Weight: 2.45 lbs.
B	Container: 40-mL glass vial, 24-mm neck finish. Closure: polypropylene or phenolic, open-top, screw cap, 15-cm opening, 24-400 size. Septum: 24-mm disc of 0.005-in Teflon bonded to 0.120-in silicon for total thickness of 0.125-in. Total Weight: 0.72 oz.
C	Container: 1-L high-density polyethylene, cylinder-round bottle, 28-mm neck finish. Closure: polyethylene cap, ribbed, 28-410 size; F217 polyethylene liner. Total Weight: 1.89 oz.
D	Container: 120-mL wide mouth, glass vial, 48-mm neck finish. Closure: polypropylene cap, 48-400 size; 0.015-in Teflon liner. Total Weight: 4.41 oz.
E	Container: 16-oz tall, wide mouth, straight-sided, flint glass jar, 63-mm neck finish. Closure: polypropylene or phenolic cap, 63-400 size; 0.015-in Teflon liner. Total Weight: 9.95 oz.
F	Container: 8-oz short, wide mouth, straight-sided, flint glass jar, 70-mm neck finish. Closure: polypropylene or phenolic cap, 70-400 size; 0.015-in Teflon liner. Total Weight: 7.55 oz.

FIGURE 1

SAMPLE CONTAINER SPECIFICATIONS (Continued)

Container Type	Specifications
G	Container: 4-oz tall, wide mouth, straight-sided, flint glass jar, 48-mm neck finish. Closure: polypropylene or phenolic cap, 48-400 size; 0.015-in Teflon liner. Total Weight: 4.70 oz.
H	Container: 1-L amber, Boston round, glass bottle, 33-mm pour-out neck finish. Closure: polypropylene or phenolic cap, 33-430 size; 0.015-in Teflon liner. Total Weight: 1.11 lbs.
J	Container: 32-oz tall, wide mouth, straight-sided, flint glass jar, 89-mm neck finish. Closure: polypropylene or phenolic cap, 89-400 size; 0.015-in Teflon liner. Total Weight: 1.06 lbs.
K	Container: 4-L amber glass, ring handle bottle/jug, 38-mm neck finish. Closure: polypropylene or phenolic cap, 38-430 size; 0.015-in Teflon liner. Total Weight: 2.88 lbs.
L	Container: 500-mL high-density polyethylene, cylinder-round bottle, 28-mm neck finish. Closure: polypropylene cap, ribbed, 28-410 size; F217 polyethylene liner. Total Weight: 1.20 oz.

TABLE 1

INORGANIC ANALYTE
SPECIFICATIONS

	Analyte	CAS Number	CRDL[1] (µg/L)
1.	Aluminum	7429-90-5	100
2.	Antimony	7440-36-0	5
3.	Arsenic	7440-38-2	2
4.	Barium	7440-39-3	20
5.	Beryllium	7440-41-7	
6.	Cadmium	7440-43-9	
7.	Calcium	7440-70-2	500
8.	Chromium	7440-47-3	10
9.	Cobalt	7440-48-4	10
10.	Copper	7440-50-8	10
11.	Iron	7439-89-6	500
12.	Lead	7439-92-1	2
13.	Magnesium	7439-95-4	500
14.	Manganese	7439-96-5	10
15.	Mercury	7439-97-6	0.2
16.	Nickel	7440-02-0	20
17.	Potassium	7440-09-7	750
18.	Selenium	7782-49-2	3
19.	Silver	7440-22-4	10
20.	Sodium	7440-23-5	500
21.	Thallium	7440-28-0	10
22.	Vanadium	7440-62-2	10
23.	Zinc	7440-66-6	20
24.	Cyanide	57-12-5	10
25.	Fluoride	16984-48-8	200
26.	Nitrate/Nitrite	1-005	100

CRDLs are based on the CLP Inorganics Low Concentration SOW

TABLE 2

ORGANIC COMPOUND SPECIFICATIONS

	Volatiles	CAS Number	CRQL[1] (µg/L)
1.	Chloromethane	74-87-3	
2.	Bromomethane	74-83-9	
3.	Vinyl Chloride	75-01-4	1
4.	Chloroethane	75-00-3	
5.	Methylene Chloride	75-09-2	2
6.	Acetone	67-64-1	5
7.	Carbon Disulfide	75-15-0	
8.	1,1-Dichloroethene	75-35-4	
9.	1,1-Dichloroethane	75-34-3	1
10.	cis-1,2-Dichloroethene	156-59-4	
11.	trans-1,2-Dichloroethene	156-60-5	
12.	Chloroform	67-66-3	
13.	1,2-Dichloroethane	107-06-2	
14.	2-Butanone	78-93-3	5
15.	Bromochloromethane	74-97-5	
16.	1,1,1-Trichloroethane	71-55-6	
17.	Carbon Tetrachloride	56-23-5	1
18.	Bromodichloromethane	75-27-4	
19.	1,2-Dichloropropane	78-87-5	1
20.	cis-1,3-Dichloropropene	10061-01-5	
21.	Trichloroethene	79-01-6	1
22.	Dibromochloromethane	124-48-1	1
23.	1,1,2-Trichloroethane	79-00-5	1
24.	Benzene	71-43-2	1
25.	trans-1,3-Dichloropropene	10061-02-6	1
26.	Bromoform	75-25-2	1
27.	4-Methyl-2-pentanone	108-10-1	5
28.	2-Hexanone	591-78-6	5
29.	Tetrachloroethene	127-18-4	
30.	1,1,2,2-Tetrachloroethane	79-34-5	1

[1] CRQLs are based on the CLP Organics Low Concentration SOW

TABLE 2 (cont.)

ORGANIC COMPOUND
SPECIFICATIONS

	Volatiles	CAS Number	CRQL[1] (μg/L)
31.	1,2-Dibromoethane	106-93-4	1
32.	Toluene	108-88-3	1
33.	Chlorobenzene	108-90-7	1
34.	Ethylbenzene	100-41-4	1
35.	Styrene	100-42-5	1
36.	Xylenes (total)	1330-20-7	1
37.	1,3-Dichlorobenzene	541-73-1	1
38.	1,4-Dichlorobenzene	106-46-7	
39.	1,2-Dichlorobenzene	95-50-1	
40.	1,2-Dibromo-3-chloropropane	96-12-8	1

[1] CRQLs are based on the CLP Organics Low Concentration SOW

TABLE 2 (cont.)

ORGANIC COMPOUND SPECIFICATIONS

	Semivolatiles	CAS Number	CRQL[1] (μg/L)
	Phenol	108-95-2	5
2.	bis-(2-Chlorethyl)ether	111-44-4	5
3.	2-Chlorophenol	95-57-8	5
4.	2-Methylphenol	95-48-7	5
5.	2,2'-oxybis-(1-Chloropropane)	108-60-1	
6.	4-Methylphenol	106-44-5	5
7.	N-Nitroso-di-n-dipropylamine	621-64-7	5
8.	Hexachloroethane	67-72-1	5
9.	Nitrobenzene	98-95-3	5
10.	Isophorone	78-59-1	5
11.	2-Nitrophenol	88-75-5	5
12.	2,4-Dimethylphenol	105-67-9	5
13.	bis-(2-Chloroethoxy)methane	111-91-1	5
14.	2,4-Dichlorophenol	120-83-2	5
15.	1,2,4-Trichlorobenzene	120-82-1	5
16.	Naphthalene	91-20-3	5
17.	4-Chloroaniline	106-47-8	5
18	Hexachlorobutadiene	87-68-3	5
19.	4-Chloro-3-methylphenol	59-50-7	5
20.	2-Methylnaphthalene	91-57-6	5
21.	Hexachlorocyclopentadiene	77-47-4	5
22.	2,4,6-Trichlorophenol	88-06-2	5
23.	2,4,5-Trichlorophenol	95-95-4	20
24.	2-Chloronaphthalene	91-58-7	5
25.	2-Nitroaniline	88-74-4	20
26.	Dimethylphthalate	131-11-3	5
27.	Acenaphthylene	208-96-8	5
28.	2,6-Dinitrotoluene	606-20-2	5
29.	3-Nitroaniline	99-09-2	20
30.	Acenaphthene	83-32-9	5

[1] CRQLs are based on the CLP Organics Low Concentration SOW

TABLE 2 (cont.)

ORGANIC COMPOUND SPECIFICATIONS

	Semivolatiles	CAS Number	CRQL[1] (μg/L)
31.	2,4-Dinitrophenol	51-28-5	20
32.	4-Nitrophenol	100-02-7	20
33.	Dibenzofuran	132-64-9	5
34.	2,4-Dinitrotoluene	121-14-2	5
35.	Diethylphthalate	84-66-2	5
36.	4-Chlorophenyl-phenylether	7005-72-3	5
37.	Fluorene	86-73-7	5
38.	4-Nitroaniline	100-01-6	20
39.	4,6-Dinitro-2-methylphenol	534-52-1	20
40.	N-Nitrosodiphenylamine	86-30-6	5
41.	4-Bromophenyl-phenylether	101-55-3	5
42.	Hexachlorobenzene	118-74-1	5
43.	Pentachlorophenol	87-86-5	20
44.	Phenanthrene	85-01-8	5
45.	Anthracene	120-12-7	5
46.	Di-n-butylphthalate	84-74-2	5
47.	Fluoranthene	206-44-0	5
48	Pyrene	129-00-0	5
49.	Butylbenzylphthalate	85-68-7	5
50.	3,3'-Dichlorobenzidine	91-94-1	5
51.	Benz[a]anthracene	56-55-3	5
52.	Chyrsene	218-01-9	5
53.	bis-(2-Ethylhexyl)phthalate	117-81-7	5
54.	Di-n-octylphthalate	117-84-0	5
55.	Benzo[b]fluoranthene	205-99-2	5
56.	Benzo[k]fluoranthene	207-08-9	5
57.	Benzo[a]pyrene	50-32-8	5
58.	Indeno(1,2,3-cd)pyrene	193-39-5	
59.	Dibenz[a,h]anthracene	53-70-3	5
60.	Benzo[g,h,i]perylene	191-24-2	5

[1] CRQLs are based on the CLP Organics Low Concentration SOW

TABLE 2 (cont.)

ORGANIC COMPOUND SPECIFICATIONS

	Pesticides/PCBs	CAS Number	CRQL[1] (μg/L)
	alpha-BHC	319-84-6	0.01
2.	beta-BHC	319-85-7	0.01
3.	delta-BHC	319-86-8	0.01
4.	gamma-BHC (Lindane)	58-89-9	0.01
5.	Heptachlor	76-44-8	0.01
6.	Aldrin	309-00-2	0.01
7.	Heptachlor epoxide	1024-57-3	0.01
8.	Endosulfan I	959-98-8	
9.	Dieldrin	60-57-1	0.02
10.	4,4'-DDE	72-55-9	0.02
11.	Endrin	72-20-8	0.02
12.	Endosulfan II	33213-65-9	0.02
13.	4,4'-DDD	72-54-8	
14.	Endosulfan sulfate	1031-07-8	0.02
15.	4,4'-DDT	50-29-3	0.02
16.	Methoxychlor	72-43-5	0.10
17.	Endrin ketone	53494-70-5	0.02
18	Endrin aldehyde	7421-36-3	0.02
19.	alpha-Chlordane	5103-71-9	0.01
20.	gamma-Chlordane	5103-74-2	0.01
21.	Toxaphene	8001-35-2	1.0
22.	Aroclor-1016	12674-11-2	0.20
23.	Aroclor-1221	11104-28-2	0.20
24.	Aroclor-1232	11141-16-5	0.40
25.	Aroclor-1242	53469-21-9	0.20
26.	Aroclor-1248	12672-29-6	0.20
27.	Aroclor-1254	11097-69-1	0.20
28.	Aroclor-1260	11096-82-5	0.20

[1] CRQLs are based on the CLP Organics Low Concentration SOW

SECTION III

SAMPLE CONTAINER PREPARATION AND CLEANING PROCEDURES

This Section is provided as guidance for the preparation of sample containers that meet the contaminant-free specifications contained in Section II. There are various procedures for cleaning sample containers depending upon the analyses to be performed on the sample. The following cleaning procedures are modeled after those specified for the Superfund Sample Container Repository program. Other suitable cleaning procedures exist and may be used as long as the sample containers meet the criteria established in Section II. In some instances, the specific needs of the bottle user may dictate exact adherence to the sample container preparation and cleaning procedures that follow; while in other instances, modifications may be required. It is the responsibility of the bottle user to define the sample container preparation, cleaning, and quality control requirements.

A. Cleaning Procedure for Container Types: A, E, F, G, H, J, and K

1. Sample Type: Semivolatile Organics, Pesticides, Metals, Cyanide, and Fluoride in Soils and Water.

   a. Wash glass bottles, Teflon liners, and caps with hot tap water using laboratory grade nonphosphate detergent.

   b. Rinse three times with copious amounts of tap water to remove detergent.

   c. Rinse with 1:1 nitric acid (reagent grade HNO_3, diluted with ASTM Type I deionized water).

   d. Rinse three times with ASTM Type I organic free water.

   e. Oven dry bottles, liners, and caps at 105-125°C for one hour.

      Allow bottles, liners, and caps to cool to room temperature in an enclosed contaminant-free environment.

   g. Rinse bottles with pesticide grade methylene chloride (or other suitable solvents specified by the bottle user) using 20 mL for ½-gallon containers; 10 mL for 32-oz and 16-oz containers; and 5 mL for 8-oz and 4-oz containers.

   h. Oven dry bottles, liners, and caps at 105-125°C for one hour.

      Allow bottles, liners, and caps to cool to room temperature in an enclosed contaminant-free environment.

      Place liners in lids and cap containers.

   k. Label each container with the lot number and pack in a case.

      Label exterior of each case with the lot number.

   m. Store in a contaminant-free area.

2. Sample Type: Nitrate/Nitrite in Soils and Water.

a. Substitute reagent grade sulfuric acid (H_2SO_4) for nitric acid in step A.1.c.

b. Follow all other steps in the cleaning procedure described in part A.1 above.

B. Cleaning Procedure for Container Types: B, D

Sample Type Purgeable (Volatile) Organics in Soils and Water.

a. Wash glass vials, Teflon-backed septa, Teflon liners, and caps in hot water using laboratory grade nonphosphate detergent.

b. Rinse three times with copious amounts of tap water to remove detergent

c. Rinse three times with ASTM Type I organic-free water.

d. Oven dry vials, caps, septa, and liners at 105-125°C for one hour.

e. Allow vials, caps, septa, and liners to cool to room temperature in an enclosed contaminant-free environment.

f. Seal 40-mL vials with septa (Teflon side down) and cap.

g. Place liners in lids and cap 120-mL vials.

h. Label each vial with the lot number and pack in a case.

Label exterior of each case with the lot number.

Store in a contaminant-free area.

C Cleaning Procedure for Container Types: C, L

Sample Type: Metals, Cyanide, and Fluoride in Soils and Water.

a. Wash polyethylene bottles and caps in hot tap water using laboratory-grade nonphosphate detergent.

b. Rinse three times with copious amounts of tap water to remove detergent.

c. Rinse with 1:1 nitric acid (reagent grade HNO_3, diluted with ASTM Type I deionized water).

d. Rinse three times with ASTM Type I deionized water.

e. Invert and air dry in a contaminant-free environment.

f. Cap bottles.

g. Label each container with the lot number and pack in a case.

h. Label exterior of each case with the lot number.

Store in a contaminant-free area.

2. Sample Type: Nitrate/Nitrite in Soils and Water.

a. Substitute reagent grade sulfuric acid (H_2SO_4) for nitric acid in step C.1.c.

b. Follow all other steps in the cleaning procedure described in part C.1 above.

SECTION IV

SAMPLE CONTAINER QUALITY ASSURANCE AND QUALITY CONTROL REQUIREMENTS

A. Quality Assurance

The objectives of this Section are to: (1) present procedures for evaluating quality assurance (QA) information to ensure that specifications identified in Section II have been met; and (2) discuss techniques for the quality control (QC) analysis of sample containers to be used in conjunction with the cleaning procedures contained in Section III.

The bottle vendor should establish a Quality Assurance Plan (QAP) with the objective of providing sound analytical chemical measurements, production procedures, and tracking systems. The QAP should incorporate procedures for the inspection of incoming raw materials; preparation, cleaning, and labeling of container lots; quality control analyses of cleaned container lots; document control, including all documentation required for analysis, packing, shipping, and tracking of container lots; any necessary corrective actions; and any quality assessment measures implemented by management to ensure acceptable performance. The QAP should be available and provided to the bottle purchaser upon request.

Major QA/QC activities should include the inspection of all incoming materials, QC analysis of cleaned lots of containers, and monitoring of the container storage area. Complete documentation of all QC inspection results (acknowledging acceptance or rejection) should be kept as part of the permanent bottle preparation files. QA/QC records (e.g., preparation/QC logs, analytical data, data tapes, storage log) also should be stored in a central location within the facility.

Documentation indicating that the container lot has passed all QA/QC requirements should be provided by the bottle vendor to the bottle purchaser with each container lot. Documentation should include a signed and dated cover statement affirming that all QA/QC criteria were met. Copies of raw data from applicable analyses of the QC containers, laboratory standards, check samples, and blanks should be available and provided upon request. Original documentation should be retained for at least 10 years. Minimum documentation that should be available, if applicable, for each lot of containers includes:

- A statement that "Sample container lot ____ meets or exceeds all QA/QC criteria established in 'Specifications and Guidance for Contaminant-Free Sample Containers;'
- Reconstructed Ion Chromatographs (RICs) from volatile and semivolatile organics determinations, including calibration verification standards, check samples, and blanks;
- GC chromatographs from pesticides determinations, including calibration verification standards, check samples, and blanks;
- ICP, hydride-ICP, or ICP-MS instrument readouts from metals determinations, including calibration verification standards, check samples, and blanks;
- AA raw data sheets and instrument readouts from metals determinations, including calibration verification standards, check samples, and blanks; and
- Cyanide, fluoride, and nitrate/nitrite raw data sheets and instrument readouts from these determinations, including calibration verification standards, check samples, and blanks.

Prior to the first shipment of containers, and at least annually thereafter, the bottle vendor should demonstrate its ability to meet the CRDLs and CRQLs, and establish the reproducibility of the cleaning techniques for each bottle type. The ability to meet the CRDLs and CRQLs is accomplished through the determination of instrument detection limits (IDLs). The bottle vendor should use the procedures in the current CLP Low Concentration Inorganics and Organics SOWs to determine IDLs. IDLs should be below the CRDLs or CRQLs. To establish the reproducibility for each bottle type, the bottle vendor should randomly pick seven containers from a cleaned lot and analyze as described in the Quality Control Analysis part of this Section. Parameter concentrations should be at or below the CRDL or CRQL for each bottle type. Documentation from these analyses should be available and provided upon request.

Incoming Materials Inspection:

A representative item from each case of containers should be checked for conformance with specifications provided in Section II. Any deviation should be considered unacceptable. A log of incoming shipments should be maintained to identify material type, purchase order number, and delivery date. The date of incoming inspection and acceptance or rejection of the material should also be recorded on this log.

Quality Control Inspection of Cleaned Lots of Containers:

Following container cleaning and labeling, containers should be randomly selected from each container lot to be used for QC purposes. The two categories of QC containers should be as follows:

Analysis QC Containers:

One percent of the total number of containers in each lot should be designated as the analysis QC container(s). For lots of less than 100 containers, one container should be designated as the analysis QC container. The sample container preparer should analyze the analysis QC container(s) to check for contamination prior to releasing the associated container lot for shipment. The QC analyses procedures specified in the Quality Control Analysis part of this Section for determining the presence of semivolatile and volatile organics, pesticides, metals, cyanide, fluoride, and nitrate/nitrite should be utilized.

For each analysis QC container(s), an appropriate QC number should be assigned that cross-references the QC container to the related lot of containers. For example, the QC number could be a seven-digit number sequentially assigned to each lot that has undergone QC analysis. Under this numbering scheme, the first alphabetical character would be the container type letter from Figure 1, the next four digits would be assigned sequentially in numerical order starting with "0001" for the first lot to undergo QC analyses, the sixth character would indicate the number of QC container for the lot, (e.g., "1' for the first QC container in the lot, "2" for the second, etc.) and the last character would be either a "C" to indicate clearance or an "R" to indicate rejection.

If the representative analysis QC container(s) passes QC inspection, the related lot of containers should be released, and the appropriate QC number should be entered in the preparation/QC log to indicate clearance of the lot for shipment.

If the analysis QC container(s) are found to be contaminated per the specified QC analysis procedures, the appropriate QC rejection number should be assigned and entered in the preparation/QC log. Any container labels should be removed and the entire lot returned for reprocessing under a new lot number. Excessive QC rejection for a particular container type should be noted for future reference.

A laboratory standard, check sample, and a blank should be run with each QC analysis. A calibration verification standard should be analyzed once every 12 hours. All QC analysis results should be kept in chronological order by QC report number in a central QC file. The QC numbers assigned should be documented in the preparation/QC log, indicating acceptance or rejection and date of analysis.

A container lot should not be released for shipment prior to QC analysis and clearance. Once the containers have passed QC inspection, the containers should be stored in a contaminant-free area until packaging and shipment.

b. Storage QC Containers:

One QC container per lot should be designated as the storage QC container. The storage QC container should be separated from the lot after cleaning and labeling and should be stored in a designated contaminant-free area for one year. The date the container is placed in the storage area should be recorded in the storage QC container log.

If contamination of the particular container lot comes into question at any time following shipment, the storage QC container should be removed from the storage area and analyzed using the QC analysis procedures for that container type (see Quality Control Analysis, this Section). Upon removal, containers should be logged out of the storage area.

The designated storage area should be monitored continuously for volatile contaminants in the following manner. A precleaned, 40-mL vial that has passed a QC inspection should be filled with ASTM Type I organic-free water and be placed in the storage area. This vial should be changed at one-week intervals. The removed vial should be subjected to analysis for volatile organics as described in the Quality Control Analysis part of this Section. Any peaks indicate contamination. Identify contaminants, if present, and include the results in a report to all clients who purchased bottles from the affected lot(s).

B. Quality Control Analysis

The types of QC analyses correlate with the types of containers being analyzed and their future use in sample collection. The QC analyses are intended for the determination of:

- Semivolatile organics and pesticides;
- Volatile organics;
- Metals;
- Cyanide;
- Fluoride; and
- Nitrate/Nitrite.

QC analyses should be performed according to the container type and related sample type and utilize the specific method(s) described below.

1. Determination of Semivolatile Organics and Pesticides:

Container Types: A, E, F, G, H, J, and K

a. Sample Preparation:

Add 60 mL of pesticide-grade methylene chloride to the container and shake for two minutes.

Transfer the solvent to a Kuderna-Danish (KD) apparatus equipped with a three-ball Snyder column. Concentrate to less than 10 mL on a steam bath. Split the solvent into two 5 mL fractions for semivolatile and pesticide determinations.

Add 50 mL of pesticide-grade hexane (for pesticide determinations only) to the KD apparatus by slowly pouring down through the Snyder column. Concentrate to less than 10 mL to effect solvent replacement of hexane for methylene chloride.

Concentrate the solvent to 1 mL using a micro-Snyder column.

Prepare a solvent blank by adding 60 mL of the rinse solvent used in step "g" of the cleaning procedure for container types A, E, F, G, H, J, and K (Section III page 14) directly to a KD apparatus, and proceed as above.

b. Semivolatile Organics Sample Analysis:

Instrument calibration should be performed as described in the most recent CLP Low Concentration Organics SOW with the following exceptions:

(1) If problems are encountered meeting the %RSD criteria on the initial calibration for semivolatiles, the high concentration point should be deleted and a four-point calibration used.

(2) The low concentration standard should be used for the continuing calibration standard for semivolatile analyses.

(3) The percent difference window should be widened to ± 30 percent for all compounds.

Inject 1 μL of solvent into a gas chromatograph/mass spectrometer (GC/MS).

Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Organics SOW.

Blanks should be run as described in the most recent CLP Low Concentration Organics SOW.

If compounds other than those listed in Table 2 are found in the container blank that are not in the solvent blank at a peak height or peak area greater than 20 percent of the nearest internal standard, the containers should be rejected (See Section II, Table 2 for compound specifications).

Identify and quantitate any contaminant(s) that cause rejection of a container lot.

A standard mixture of the nine semivolatile organic compounds listed in Table 3 (page 26) with concentrations in the 5-20 ppb range should be analyzed to ensure that sensitivities are achieved that will meet contract required quantitation limits. This standard should be prepared from a different source from the calibration standards.

c. Pesticides Sample Analysis

Instrument calibration should be performed as described in the most recent CLP Low Concentration Organics SOW.

Inject 1 μL of solvent into a gas chromatograph (GC) equipped with an electron capture detector (ECD).

Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Organics SOW.

Blanks should be run as described in the most recent CLP Low Concentration Organics SOW.

If compound peaks other than those listed in Table 2 are at a peak height or peak area greater than 5 percent of the peak height or peak area of tetra chloro-m-xylene, the containers should be rejected (See Section II, Table 2).

Identify and quantitate any contaminant(s) that cause rejection of a container lot.

A standard mixture of the seven pesticide compounds listed in Table 3 (page 26) with concentrations in the 0.01 to 1 ppb range should be analyzed to ensure that sensitivities are achieved that will meet contract required quantitation limits. This standard should be prepared from a different source from the calibration standards.

2. Determination of Volatile Organics:

Container Types: B and D

Sample Preparation:

Fill the container with ASTM Type I organic-free water.

Cap the container and let stand for 48 hours.

b. Sample Analysis

Instrument calibration should be performed as described in the most recent CLP Low Concentration Organics SOW with the following exceptions:

1) If problems are encountered meeting the %RSD criteria on the initial calibration for volatiles, the high concentration point should be deleted and a four-point calibration used.

(2) The low concentration standard should be used for the continuing calibration standard for volatile analyses.

(3) The percent difference window should be widened to ± 30 percent.

Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Organics SOW.

Blanks should be run as described in the most recent CLP Low Concentration Organics SOW. The blank should consist of an aliquot of the ASTM Type I water used in the sample preparation.

If compounds other than those listed in Table 2 are found in the container blank that are not in the solvent blank at a peak height or peak area greater than 20 percent of the nearest internal standard, the containers should be rejected (See Section II, Table 2 for compound specifications).

Identify and quantitate any contaminant(s) that cause rejection of a container lot.

A standard mixture of the five volatile organic compounds listed in Table 3 (page 26) with concentrations in the 1-5 ppb range should be analyzed to ensure that sensitivities are achieved that will meet contract required quantitation limits. This standard should be prepared from a different source from the calibration standards.

3. Determination of Metals:

Container Types: A, C, E, F, G, H, J, K and L

a. Sample Preparation:

Add 100 mL of ASTM Type I deionized water to the container, and acidify with 1.0 mL of reagent-grade HNO_3. Cap and shake for three to five minutes.

Cap the container and let stand for 48 hours.

Treat the sample as a dissolved metals sample. Analyze the undigested water using the most recent CLP Low Concentration Inorganics SOW.

b. Sample Analysis:

Instruments used for the analysis of the samples should meet the contract required detection limits in Table 1.

The ASTM Type I deionized water should be analyzed before use on the bottles that are designated for analysis to ensure that contaminated water is not used for rinsing the bottles.

Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW.

Blanks should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW. A calibration blank is a solution made up exactly like the sample preparation solution. The calibration blank should be less than the values contained in Table 1.

A set of standards in the expected working range should be analyzed with each analytical run. The acid matrix of the standards, blank, and quality control samples should match that of the samples.

Concentrations at or above the detection limit for each parameter (listed in Table 1) should be cause for rejection of the lot of containers. NOTE: The sodium detection limit for container types A, E, F, G, H, J, and K is 5000 μg/L unless the containers will be used for low concentration analyses, then the detection limit is 500 μg/L.

4. Determination of Cyanide:

Container Types: A, C, E, F, G, H, J, K and L

a. Sample Preparation:

Place 250 mL of ASTM Type I deionized water in the container. Add 1.25 mL of 6*N* NaOH (for container types F and G use 100 mL of ASTM Type I deionized water and 0.5 mL of 6*N* NaOH). Cap the container and shake vigorously for two minutes.

b. Sample Analysis:

Analyze an aliquot as described in the most recent CLP Low Concentration Inorganics SOW.

The detection limit should be 10 μg/L or lower.

Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW.

Blanks should be run as described in the most recent CLP Low Concentration Inorganics SOW. The calibration blank should consist of an aliquot of the ASTM Type I water used above.

A set of standards in the expected working range, a check sample, and blank should be prepared exactly as the sample was prepared.

The detection of 10 μg/L cyanide (or greater) should be cause for rejection of the lot of containers. NOTE: Contamination could be due to the container, the cap, or the NaOH.

5. Determination of Fluoride:

Container Types: A, C, E, F, G, H, J, K and L

a. Sample Preparation:

Place 250 mL of ASTM Type I deionized water in the container (for container types F and G use 100 mL of ASTM Type I deionized water). Cap the container and shake vigorously for two minutes.

b. Sample Analysis:

Analyze an aliquot as described in the most recent CLP Low Concentration Inorganics SOW.

The detection limit should be 200 μg/L or lower.

Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW.

Blanks should be run as described in the most recent CLP Low Concentration Inorganics SOW. The calibration blank should consist of an aliquot of the ASTM Type I water used above.

A set of standards in the expected working range, a check sample, and blank should be prepared exactly as the sample was prepared.

The detection of 200 µg/L (or greater) of fluoride should be cause for rejection of the lot of containers. NOTE: Contamination could be due to the container or the cap.

6. Determination of Nitrate/Nitrite:

Container Types: A, C, E, F, G, H, J, K and L

a. Sample Preparation:

Place 250 mL of ASTM Type I deionized water in the container (for container types F and G use 100 mL of ASTM Type I deionized water). Cap the container and shake vigorously for two minutes.

b. Sample Analysis:

Analyze an aliquot as described in the most recent CLP Low Concentration Inorganics SOW.

The detection limit should be 100 µg/L or lower.

Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW.

Blanks should be run as described in the most recent CLP Low Concentration Inorganics SOW. The calibration blank should consist of an aliquot of the ASTM Type I water used above.

A set of standards in the expected working range, a quality control sample, and blank should be prepared exactly as the sample was prepared.

The detection of 100 µg/L (or greater) of nitrate/nitrite should be cause for rejection of the lot of containers. NOTE: Contamination could be due to the container or the cap.

C. Preparation and Labeling

Sampling for environmental specimens requires that sample containers be transported to field sites prior to sample collection. As a result, considerable time may elapse between the receipt of sample containers and collection of the samples. Because of the large number of samples taken at any one site, accounting for all sample containers can become extremely difficult. The following guidance on the identification and tracking of sample containers is based on procedures that have been used successfully in the CLP bottle program.

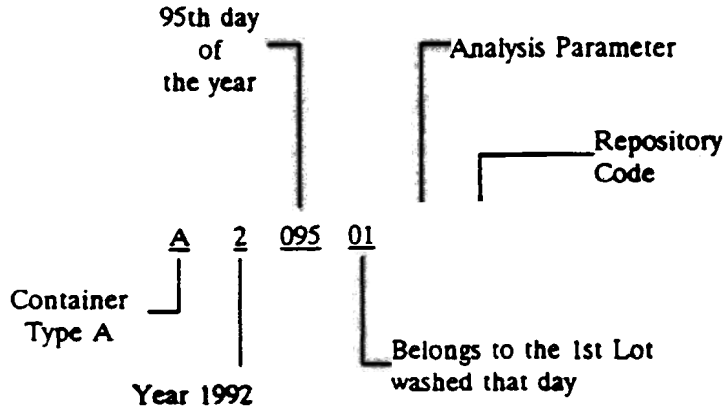
Each shipment should be inspected to verify that the requested number of cleaned and prepared sample containers have been supplied and meet the requirements specified in Section II (Tables and 2). If any shipment fails to meet the required specifications, it should be discarded and replaced with a supply of sample containers that meet the required criteria.

2. The sample containers should be removed and prepared in accordance with the methods designated below.

3. A permanent nine-digit lot number should be assigned to each lot of sample containers for identification and tracking purposes throughout the life of the containers. Figure 2 provides an example of a lot number sequence.

FIGURE 2

LOT NUMBER SEQUENCE



a The first digit represents the container type in Section II (Figure 1).

b. The second digit represents the last digit of the calendar year.

c. The next three digits represents the day of the year on which the sample containers were washed.

d. The sixth and seventh digits represent the daily lot number

e. The eighth digit represents the analysis parameter where:

A = Semivolatile organics, pesticides, metals, cyanide, and fluoride;
B = Metals, cyanide, and fluoride;
V = Volatile organics;
S = Semivolatile organics and/or pesticides;
M = Metals;
C = Cyanide;
F = Fluoride; and
N = Nitrate/nitrite.

The final digit represents the identification of the person who prepared the lot.

4 The lot number for each container should be entered, along with the date of washing, type of container, and number of containers per lot, into the preparation/QC log book.

Lot numbers printed with solvent resistant ink on a nonremovable label should remain with the corresponding containers throughout the cleaning procedure.

6. After sample container cleaning and drying, the label should be affixed to the containers in a permanent manner.

7. At least one face should be clearly marked, excluding the top and bottom faces, of each case of sample containers with the assigned lot numbers.

TABLE 3

STANDARD MIXTURES OF ORGANIC COMPOUNDS TO VERIFY SENSITIVITY

Volatiles	Semivolatiles	Pesticides
Methylene Chloride	Nitrobenzene	Gamma-BHC
Acetone	4-Chloroaniline	Heptachlor
2-Butanone	2,6-Dinitrotoluene	Aldrin
Trichloroethene	Diethylphthalate	Dieldrin
Toluene	4-Bromophenyl-phenylether	Endrin
	Hexachlorobenzene	4,4'-DDT
	Pentachlorophenol	Aroclor 1260
	Di-n-butylphthalate	
	bis(2-Ethylhexyl)phthalate	

*U.S. G.P.O.:1993-341-835:81056

APPENDIX B

TAMS Co sul Inc.

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TAMS

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
SAMPLERS: *(Signature)*	

STA. NO	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS							REMARKS

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

APPENDIX C

Calibration and Maintenance of Field Equipment

Instrument	Calibration	Maintenance
Turbidimeter	Twice daily, the meter will be calibrated to a NTU standard between 5 and 80 NTU. EPA Method 180.1.	Do not shake sample (bubbles give erroneous readings). Clean cells between samples with deionized water and soft paper towels. Charge overnight after use.
Photoionization Detector (HNU)	Daily, the meter will be calibrated to to a benzene surrogate standard gas.	Clean ultraviolet lamp with soap and water if calibration is difficult; high humidity conditions, or after high sample readings were encountered. Keep meter dry. Recharge overnight after use.
Explosimeter	Daily, the meter will be checked against a methane standard which should read approximately 50% LEL.	Change prefilters once a week or if extremely dusty conditions are encountered. Recharge overnight after use. Change oxygen sensor once a year.
pH Meter	Twice daily, the meter will be calibrated to pH buffers of 7.00 and 4.00 to adjust slope. Prior to each group of measurements, the meter will be standardized to a buffer of 7.00.	The electrodes should be kept moist with buffer solution when stored for a long period. Change batteries when needed (20-60 hours of use).
Conductivity Meter	Daily, the meter will be calibrated to a standard of 1140 umhos (or 11,400 umhos if samples have high conductivity values). EPA Method 120.1.	Keep conductivity probe in beaker of deionized water while in use. Change batteries when needed (approximately every 100 hours).

TURBIDITY
Method 180.1 (Nephelometric)

STORET NO. 00076

1. Scope and Application
   1.1 This method is applicable to drinking, surface, and saline waters in the range of turbidity from 0 to 40 nephelometric turbidity units (NTU). Higher values may be obtained with dilution of the sample.
   NOTE 1: NTU's are considered comparable to the previously reported Formazin Turbidity Units (FTU) and Jackson Turbidity Units (JTU).
2. Summary of Method
   2.1 The method is based upon a comparison of the intensity of light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension. The higher the intensity of scattered light, the higher the turbidity. Readings, in NTU's, are made in a nephelometer designed according to specifications outlined in Apparatus. A standard suspension of Formazin, prepared under closely defined conditions, is used to calibrate the instrument.
      2.1.1 Formazin polymer is used as the turbidity reference suspension for water because it is more reproducible than other types of standards previously used for turbidity standards.
      2.1.2 A commercially available polymer standard is also approved for use for the National Interim Primary Drinking Water Regulations. This standard is identified as AMCO-AEPA-1 available from Amco Standard International, Inc.
3. Sample Handling and Preservation
   3.1 Preservation of the sample is not practical; analysis should begin as soon as possible. Refrigeration or icing to 4°C, to minimize microbiological decomposition of solids, is recommended.
4. Interferences
   4.1 The presence of floating debris and coarse sediments which settle out rapidly will give low readings. Finely divided air bubbles will affect the results in a positive manner.
   4.2 The presence of true color, that is the color of water which is due to dissolved substances which absorb light, will cause turbidities to be low, although this effect is generally not significant with finished waters.
5. Apparatus
   5.1 The turbidimeter shall consist of a nephelometer with light source for illuminating the sample and one or more photo-electric detectors with a readout device to indicate the intensity of light scattered at right angles to the path of the incident light. The turbidimeter should be so designed that little stray light reaches the detector in the

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absence of turbidity and should be free from significant drift after a short warm-up period.

5.2 The sensitivity of the instrument should permit detection of a turbidity difference of 0.02 unit or less in waters having turbidities less than 1 unit. The instrument should measure from 0 to 40 units turbidity. Several ranges will be necessary to obtain both adequate coverage and sufficient sensitivity for low turbidities.

5.3 The sample tubes to be used with the available instrument must be of clear, colorless glass. They should be kept scrupulously clean, both inside and out, and discarded when they become scratched or etched. They must not be handled at all where the light strikes them, but should be provided with sufficient extra length, or with a protective case, so that they may be handled.

5.4 Differences in physical design of turbidimeters will cause differences in measured values for turbidity even though the same suspension is used for calibration. To minimize such differences, the following design criteria should be observed:

5.4.1 Light source: Tungsten lamp operated at a color temperature between 2200–3000°K.

5.4.2 Distance traversed by incident light and scattered light within the sample tube: Total not to exceed 10 cm.

5.4.3 Detector: Centered at 90° to the incident light path and not to exceed ±30° from 90°. The Detector, and filter system if used, shall have a spectral peak response between 400 and 600nm.

5.5 The Hach Turbidimeter, Model 2100 and 2100 A, is in wide use and has been found to be reliable; however, other instruments meeting the above design criteria are acceptable.

6. Reagents

6.1 Turbidity-free water: Pass distilled water through a 0.45*u* pore size membrane filter if such filtered water shows a lower turbidity than the distilled water.

6.2 Stock formazin turbidity suspension:

Solution 1: Dissolve 1.00 g hydrazine sulfate, $(NH_2)_2 \cdot H_2SO_4$, in distilled water and dilute to 100 ml in a volumetric flask.

Solution 2: Dissolve 10.00 g hexamethylenetetramine in distilled water and dilute to 100 ml in a volumetric flask.

In a 100 ml volumetric flask, mix 5.0 ml Solution 1 with 5.0 ml Solution 2. Allow to stand 24 hours at 25 ±3°C, then dilute to the mark and mix.

6.3 Standard formazin turbidity suspension: Dilute 10.00 ml stock turbidity suspension to 100 ml with turbidity-free water. The turbidity of this suspension is defined as 40 units. Dilute portions of the standard turbidity suspension with turbidity-free water as required.

6.3.1 A new stock turbidity suspension should be prepared each month. The standard turbidity suspension and dilute turbidity standards should be prepared weekly by dilution of the stock turbidity suspension.

6.4 The AMCO-AEPA-1 standard as supplied requires no preparation or dilution prior to use.

7 Procedure

7.1 Turbidimeter calibration: The manufacturer's operating instructions should be followed. Measure standards on the turbidimeter covering the range of interest. If the instrument is already calibrated in standard turbidity units, this procedure will check the accuracy of the calibration scales. At least one standard should be run in each instrument range to be used. Some instruments permit adjustments of sensitivity so that scale values will correspond to turbidities. Reliance on a manufacturer's solid scattering standard for setting overall instrument sensitivity for all ranges is not an acceptable practice unless the turbidimeter has been shown to be free of drift on all ranges. If a pre-calibrated scale is not supplied, then calibration curves should be prepared for each range of the instrument.

7.2 Turbidities less than 40 units: Shake the sample to thoroughly disperse the solids. Wait until air bubbles disappear then pour the sample into the turbidimeter tube. Read the turbidity directly from the instrument scale or from the appropriate calibration curve.

7.3 Turbidities exceeding 40 units: Dilute the sample with one or more volumes of turbidity-free water until the turbidity falls below 40 units. The turbidity of the original sample is then computed from the turbidity of the diluted sample and the dilution factor. For example, if 5 volumes of turbidity-free water were added to 1 volume of sample, and the diluted sample showed a turbidity of 30 units, then the turbidity of the original sample was 180 units.

7.3.1 The Hach Turbidimeters, Models 2100 and 2100A, are equipped with 5 separate scales: 0–0.2, 0–1.0, 0–100, and 0–1000 NTU. The upper scales are to be used only as indicators of required dilution volumes to reduce readings to less than 40 NTU. NOTE 2: Comparative work performed in the MDQAR Laboratory indicates a progressive error on sample turbidities in excess of 40 units.

Calculation

8.1 Multiply sample readings by appropriate dilution to obtain final reading

8.2 Report results as follows:

NTU	Record to Nearest
0.0 - 1.0	0.05
1 - 10	0.1
10 - 40	
40 - 100	5
100 - 400	10
400 - 1000	50
> 1000	100

9. Precision and Accuracy

9.1 In a single laboratory (EMSL), using surface water samples at levels of 26, 41, 75 and 180 NTU, the standard deviations were ±0.60, ±0.94, ±1.2 and ±4.7 units, respectively.

9.2 Accuracy data are not available at this time.

Bibliography

1. Annual Book of ASTM Standards, Part 31, "Water", Standard D1889–71, p 223 (1976).
2. Standard Methods for the Examination of Water and Wastewater, 14th Edition, p 132, Method 214A, (1975).

CONDUCTANCE

Method 120.1 (Specific Conductance, umhos at 25°C)

STORET NO. 00095

Scope and Application

1.1 This method is applicable to drinking, surface, and saline wates, domestic and industrial wastes and acid rain (atmospheric deposition).

2. Summary of Method

2.1 The specific conductance of a sample is measured by use of a self-contained conductivity meter, Wheatstone bridge-type, or equivalent.

2.2 Samples are preferable analyzed at 25°C. If not, temprature corrections aremade and results reported at 25°C.

3. Comments

3.1 Instrument must be standardized with KCl solution before daily use.

3.2 Conductivity cell must be kept clean.

3.3 Field measurements with comparable instruments are reliable.

3.4 Temperature variations and corrections represent the largest source of potential error.

4. Sample Handling and Preservation

4.1 Analyses can be performed either in the field or laboratory.

4.2 If analysis is not completed within 24 hours of sample collection, sample should be filtered through a 0.45 micron filter and stored at 4°C. Filter and apparatus must be washed with high quality distilled water and pre-rinsed with sample before use.

5. Apparatus

5.1 Conductivity bridge, range 1 to 1000 μmho per centimeter.

5.2 Conductivity cell, cell constant 1.0 or micro dipping type cell with 1.0 constant. YSI #3403 or equivalent.

5.4 Thermometer

6. Reagents

6.1 Standard potassium chloride solutions, 0.01 M: Dissolve 0.7456 gm of pre-dried (2 hour at 105°C) KCl in distilled water and dilute to 1 liter at 25°C.

7. Cell Calibration

7.1 The analyst should use the standard potassium chloride solution (6.1) and the table below to check the accuracy of the cell constant and conductivity bridge.

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Conductivity 0.01 m KCl

°C	Micromhos/cm
21	1305
22	1332
23	1359
24	1386
25	1413
26	1441
27	1468
28	1496

8. Procedure

8.1 Follow the direction of the manufacturer for the operation of the instrument.

8.2 Allow samples to come to room temperature (23 to 27°C), if possible.

8.3 Determine the temperature of samples within 0.5°C. If the temperature of the samples is not 25°C, make temperature correction in accordance with the instruction in Section 9 to convert reading to 25°.

9. Calculation

9.1 These temperature corrections are based on the standard KCl solution.

9.1.1 If the temperature of the sample is below 25°C, add 2% of the reading per degree.

9.1.2 If the temperature is above 25°C, subtract 2% of the reading per degree.

9.2 Report results as Specific Conductance, µmhos/cm at 25°.

10. Precision and Accuracy

10.1 Forty-one analysts in 17 laboratories analyzed six synthetic water samples containing increments of inorganic salts, with the following results:

Increment as Specific Conductance	Precision as Standard Deviation	Accuracy as Bias, %	Accuracy as Bias, µmhos/cm
100	7.55	-2.02	-2.0
106	8.14	-0.76	-0.8
808	66.1	-3.63	-29.3
848	79.6	-4.54	-38.5
1640	106	-5.36	-87.9
1710	119	-5.08	-86.9

(FWPCA Method Study 1, Mineral and Physical Analyses.)

10.2 In a single laboratory (EMSL) using surface water samples with an average conductivity of 536 µmhos/cm at 25°C, the standard deviation was ±6.

Bibliography

1. The procedure to be used for this determination is found in:
   Annual Book of ASTM Standards Part 31, "Water," Standard D1125-64, p. 120 (1976).
2. Standard Methods for the Examination of Water and Wastewater, 14th Edition, p. 71, Method 205 (1975).
3. Instruction Manual for YSI Model 31 Conductivity Bridge.
4. Peden, M. E., and Skowron. "Ionic Stability of Precipitation Samples," Atmospheric Environment, Vol. 12, p. 2343-2344, 1978.

pH

Method 150.1 (Electrometric)

STORET NO.
Determined on site 00400
Laboratory 00403

1. Scope and Application
   1.1 This method is applicable to drinking, surface, and saline waters, domestic and industrial wastes and acid rain (atmospheric deposition).
2. Summary of Method
   2.1 The pH of a sample is determined electrometrically using either a glass electrode in combination with a reference potential or a combination electrode.
3. Sample Handling and Preservation
   3.1 Samples should be analyzed as soon as possible preferably in the field at the time of sampling.
   3.2 High-purity waters and waters not at equilibrium with the atmosphere are subject to changes when exposed to the atmosphere, therefore the sample containers should be filled completely and kept sealed prior to analysis.
4. Interferences
   4.1 The glass electrode, in general, is not subject to solution interferences from color, turbidity, colloidal matter, oxidants, reductants or high salinity.
   4.2 Sodium error at pH levels greater than 10 can be reduced or eliminated by using a "low sodium error" electrode.
   4.3 Coatings of oily material or particulate matter can impair electrode response. These coatings can usually be removed by gentle wiping or detergent washing, followed by distilled water rinsing. An additional treatment with hydrochloric acid (1 + 9) may be necessary to remove any remaining film.
   4.4 Temperature effects on the electrometric measurement of pH arise from two sources. The first is caused by the change in electrode output at various temperatures. This interference can be controlled with instruments having temperature compensation or by calibrating the electrode-instrument system at the temperature of the samples. The second source is the change of pH inherent in the sample at various temperatures. This error is sample dependent and cannot be controlled, it should therefore be noted by reporting both the pH and temperature at the time of analysis.
5. Apparatus
   5.1 pH Meter-laboratory or field model. A wide variety of instruments are commercially available with various specifications and optional equipment.

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5.2 Glass electrode.

5.3 Reference electrode–a calomel, silver-silver chloride or other reference electrode of constant potential may be used.

NOTE 1: Combination electrodes incorporating both measuring and reference functions are convenient to use and are available with solid, gel type filling materials that require minimal maintenance.

5.4 Magnetic stirrer and Teflon-coated stirring bar.

5.5 Thermometer or temperature sensor for automatic compensation.

6. Reagents

6.1 Primary standard buffer salts are available from the National Bureau of Standards and should be used in situations where extreme accuracy is necessary.

6.1.1 Preparation of reference solutions from these salts require some special precautions and handling[1] such as low conductivity dilution water, drying ovens, and carbon dioxide free purge gas. These solutions should be replaced at least once each month.

6.2 Secondary standard buffers may be prepared from NBS salts or purchased as a solution from commercial vendors. Use of these commercially available solutions, that have been validated by comparison to NBS standards, are recommended for routine use.

7. Calibration

7.1 Because of the wide variety of pH meters and accessories, detailed operating procedures cannot be incorporated into this method. Each analyst must be acquainted with the operation of each system and familiar with all instrument functions. Special attention to care of the electrodes is recommended.

7.2 Each instrument/electrode system must be calibrated at a minimum of two points that bracket the expected pH of the samples and are approximately three pH units or more apart.

7.2.1 Various instrument designs may involve use of a "balance" or "standardize" dial and/or a slope adjustment as outlined in the manufacturer's instructions. Repeat adjustments on successive portions of the two buffer solutions as outlined in procedure 8.2 until readings are within 0.05 pH units of the buffer solution value.

8. Procedure

8.1 Standardize the meter and electrode system as outlined in Section 7.

8.2 Place the sample or buffer solution in a clean glass beaker using a sufficient volume to cover the sensing elements of the electrodes and to give adequate clearance for the magnetic stirring bar.

8.2.1 If field measurements are being made the electrodes may be immersed directly in the sample stream to an adequate depth and moved in a manner to insure sufficient sample movement across the electrode sensing element as indicated by drift free (<0.1 pH) readings.

8.3 If the sample temperature differs by more than 2°C from the buffer solution the measured pH values must be corrected. Instruments are equipped with automatic or manual

[1] National Bureau of Standards Special Publication 260

compensators that electronically adjust for temperature differences. Refer to manufacturer's instructions.

8.4 After rinsing and gently wiping the electrodes, if necessary, immerse them into the sample beaker or sample stream and stir at a constant rate to provide homogeneity and suspension of solids. Rate of stirring should minimize the air transfer rate at the air water interface of the sample. Note and record sample pH and temperature. Repeat measurement on successive volumes of sample until values differ by less than 0.1 pH units. Two or three volume changes are usually sufficient.

8.5 For acid rain samples it is most important that the magnetic stirrer is not used. Instead, swirl the sample gently for a few seconds after the introduction of the electrode(s). Allow the electrode(s) to equilibrate. The air-water interface should not be disturbed while measurement is being made. If the sample is not in equilibrium with the atmosphere, pH values will change as the dissolved gases are either absorbed or desorbed. Record sample pH and temperature.

9. Calculation

9.1 pH meters read directly in pH units. Report pH to the nearest 0.1 unit and temperature to the nearest °C.

10. Precision and Accuracy

10.1 Forty-four analysts in twenty laboratories analyzed six synthetic water samples containing exact increments of hydrogen-hydroxyl ions, with the following results:

pH Units	Standard Deviation pH Units	Accuracy as Bias, %	Accuracy as Bias, pH Units
3.5	0.10	–0.29	–0.01
3.5	0.11	–0.00	
7.1	0.20	+1.01	+0.07
7.2	0.18	–0.03	–0.002
8.0	0.13	–0.12	–0.01
8.0	0.12	+0.16	+0.01

(FWPCA Method Study , Mineral and Physical Analyses)

10.2 In a single laboratory (EMSL), using surface water samples at an average pH of 7.7, the standard deviation was ±0.1.

Bibliography

1. Standard Methods for the Examination of Water and Wastewater, 14th Edition, p 460, (1975)
2. Annual Book of ASTM Standards, Part 31, "Water", Standard D1293–65, p 178 (1976).
3. Peden, M. E. and Skowron, L. M., Ionic Stability of Precipitation Samples, Atmospheric Environment, Vol. 12, pp. 2343-2349, 1978.

TEMPERATURE

Method 170.1 (Thermometric)

STORET NO. 00010

1. Scope and Application
   1.1 This method is applicable to drinking, surface, and saline waters, domestic and industrial wastes.
2. Summary of Method
   2.1 Temperature measurements may be made with any good grade of mercury-filled or dial type centigrade thermometer, or a thermistor.
3. Comments
   3.1 Measurement device should be routinely checked against a precision thermometer certified by the National Bureau of Standards.
4. Precision and Accuracy
   4.1 Precision and accuracy for this method have not been determined.
5. Reference
   5.1 The procedure to be used for this determination is found in:
   Standard Methods for the Examination of Water and Wastewater, 14th Edition, p 125, Method 212 (1975).

Approved for NPDES
Issued 1971

APPENDIX D

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

	Volatiles	CAS Number	Quantitation Limits* Water µg/L	Low Soil µg/Kg	Med Soil µg/Kg	On Column (ng)
1.	Chloromethane	74-87-3	10	10	1200	(50)
2.	Bromomethane	74-83-9	10	10	1200	(50)
3.	Vinyl chloride	75-01-4	10	10	1200	(50)
4.	Chloroethane	75-00-3	10	10	1200	(50)
5.	Methylene chloride	75-09-2	10	10	1200	(50)
6.	Acetone	67-64-1	10	10	1200	(50)
7.	Carbon Disulfide	75-15-0	10	10	1200	(50)
8.	1,1-Dichloroethylene	75-35-4	10	10	1200	(50)
9.	1,1-Dichloroethane	75-35-3	10	10	1200	(50)
10.	1,2-Dichloroethylene(total)	540-59-0	10	10	1200	(50)
11.	Chloroform	67-66-3	10	10	1200	(50)
12.	1,2-Dichloroethane	107-06-2	10	10	1200	(50)
13.	2-Butanone	78-93-3	10	10	1200	(50)
14.	1,1,1-Trichloroethane	71-55-6	10	10	1200	(50)
15.	Carbon tetrachloride	56-23-5	10	10	1200	(50)
16.	Bromodichloromethane	75-27-4	10	10	1200	(50)
17.	1,2-Dichloropropane	78-87-5	10	10	1200	(50)
18.	cis-1,3-Dichloropropene	10061-01-5	10	10	1200	(50)
19.	Trichloroethene	79-01-6	10	10	1200	(50)
20.	Dibromochloromethane	124-48-1	10	10	1200	(50)
21.	1,1,2-Trichloroethane	79-00-5	10	10	1200	(50)
22.	Benzene	71-43-2	10	10	1200	(50)
23.	trans-1,3-Dichloropropene	10061-02-6	10	10	1200	(50)
24.	Bromoform	75-25-2	10	10	1200	(50)
25.	4-Methyl-2-pentanone	108-10-1	10	10	1200	(50)
26.	2-Hexanone	591-78-6	10	10	1200	(50)
27.	Tetrachloroethene	127-18-4	10	10	1200	(50)
28.	Toluene	108-88-3	10	10	1200	(50)
29.	1,1,2,2-Tetrachloroethane	79-34-5	10	10	1200	(50)
30.	Chlorobenzene	108-90-7	10	10	1200	(50)
31.	Ethyl Benzene	100-41-4	10	10	1200	(50)
32.	Styrene	100-42-5	10	10	1200	(50)
33.	Total Xylenes	1330-20-7	10	10	1200	(50)

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

Note that the CRQL values listed on the preceding page may not be those specified in previous Analytical Services Protocols. These values are set at concentrations in the sample equivalent to the concentration of the lowest calibration standard specified in Exhibit D, Part II. Lower quantitation limits may be achievable for water samples by employing the methods in Exhibit D, Part X for Low Concentration Water for Organic Analyses.

VOLATILES

Water Samples

A 5 mL volume of water is purged with an inert gas at ambient temperature. The volatiles are trapped on solid sorbents, and desorbed directly onto the GC/MS. For a sample with compound X at the CRQL of 10 µg/L:

(10 µg/L) (5 mL) (10^{-3} L/mL) = 50 x 10^{-3} ug = 50 ng on the GC column

Low Level Soil/Sediment Samples

A 5 g aliquot of the soil/sediment sample is added to a volume of water in a purge tube heated, and purged with an inert gas. The volatiles are trapped, and later desorbed directly onto the GC/MS. For a sample with compound X at the CRQL of 10 µg/Kg:

(10 µg/Kg) (5 g) (10^{-3} Kg/g) = 50 x 10^{-3} µg = 50 ng on the GC column

Medium Level Soil/Sediment Samples

A 4 g aliquot of soil/sediment is extracted with 10 mL of methanol, and filtered through glass wool. Only 1 mL of the methanol extract is taken for screening and analysis. Based on the results of a GC/FID screen, an aliquot of the methanol extract is added to 5 mL of reagent water and purged at ambient temperature. The largest aliquot of extract considered in Exhibit D, Part III is 100 uL. For a sample with compound X at the CRQL of 1200 µg/Kg:

(1200 µg/Kg) (4 g) (10^{-3} Kg/g) = 4800 x 10^{-3} µg = 4800 ng

This material is contained in the 10 mL methanol extract:

(4800 ng) / 10 mL = 480 ng/mL

Of which, 100 µL are purged from the reagent water

(480 ng/mL) (100 µL) (10^{-3} mL/µL) = 480 x 10^{-1} ng = 50 ng on the GC column

Note that for both low and medium soil/sediment samples, while it may affect the purging efficiency, the volume of reagent water used in the purging process does not affect the calculations.

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

	Semivolatiles	CAS Number	Quantitation Limits* Water µg/L	Low Soil µg/Kg	Med Soil µg/Kg	On Column (ng)
34.	Phenol	108-95-2	10	330	10,000	(20)
35.	bis(2-Chloroethyl) ether	111-44-4	10	330	10,000	(20)
36.	2-Chlorophenol	95-57-8	10	330	10,000	(20)
37.	1,3-Dichlorobenzene	541-73-1	10	330	10,000	(20)
38.	1,4-Dichlorobenzene	106-46-7	10	330	10,000	(20)
39.	1,2-Dichlorobenzene	95-50-1	10	330	10,000	(20)
40.	2-Methylphenol	95-48-7	10	330	10,000	(20)
41.	2,2'-oxybis(1-Chloro-propane) #	108-60-1	10	330	10,000	(20)
42.	4-Methylphenol	106-44-5	10	330	10,000	(20)
43.	N-Nitroso-di-n-propylamine	621-64-7	10	330	10,000	(20)
44.	Hexachloroethane	67-72-1	10	330	10,000	(20)
45.	Nitrobenzene	98-95-3	10	330	10,000	(20)
46.	Isophorone	78-59-1	10	330	10,000	(20)
47.	2-Nitrophenol	88-75-5	10	330	10,000	(20)
48.	2,4-Dimethylphenol	105-67-9	10	330	10,000	(20)
49.	bis(2-Chloroethoxy) methane	111-91-1	10	330	10,000	(20)
50.	2,4-Dichlorophenol	120-83-2	10	330	10,000	(20)
51.	1,2,4-Trichlorobenzene	120-82-1	10	330	10,000	(20)
52.	Naphthalene	91-20-3	10	330	10,000	(20)
53.	4-Chloroaniline	106-47-8	10	330	10,000	(20)
54.	Hexachlorobutadiene	87-68-3	10	330	10,000	(20)
55.	4-Chloro-3-methylphenol	59-50-7	10	330	10,000	(20)
56.	2-Methylnaphthalene	91-57-6	10	330	10,000	(20)
57.	Hexachlorocyclopentadiene	77-47-4	10	330	10,000	(20)
58.	2,4,6-Trichlorophenol	88-06-2	10	330	10,000	(20)
59.	2,4,5-Trichlorophenol	95-95-4	25	800	25,000	(50)
60.	2-Chloronaphthalene	91-58-7	10	330	10,000	(20)
61.	2-Nitroaniline	88-74-4	25	800	25,000	(50)
62.	Dimethyl phthalate	131-11-3	10	330	10,000	(20)
63.	Acenaphthylene	208-96-8	10	330	10,000	(20)
64.	2,6-Dinitrotoluene	606-20-2	10	330	10,000	(20)
65.	3-Nitroaniline	99-09-2	25	800	25,000	(50)
66.	Acenaphthene	83-32-9	10	330	10,000	(20)

Previously known by the name bis(2-Chloroisopropyl) ether

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

	Semivolatiles	CAS Number	Quantitation Limits* Water µg/L	Low Soil µg/Kg	Med Soil µg/Kg	On Column (ng)
67.	2,4-Dinitrophenol	51-28-5	25	800	25,000	(50)
68.	4-Nitrophenol	100-02-7	25	800	25,000	(50)
69.	Dibenzofuran	132-64-9	10	330	10,000	(20)
70.	2,4-Dinitrotoluene	121-14-2	10	330	10,000	(20)
71.	Diethylphthalate	84-66-2	10	330	10,000	(20)
72.	4-Chlorophenyl phenyl ether	7005-72-3	10	330	10,000	(20)
73.	Fluorene	86-73-7	10	330	10,000	(20)
74.	4-Nitroaniline	100-01-6	25	800	25,000	(50)
75.	4,6-Dinitro-2-methylphenol	534-52-1	25	800	25,000	(50)
76.	N-nitrosodiphenylamine	86-30-6	10	330	10,000	(20)
77	4-Bromophenyl phenyl ether	101-55-3	10	330	10,000	(20)
78.	Hexachlorobenzene	118-74-1	10	330	10,000	(20)
79.	Pentachlorophenol	87-86-5	25	800	25,000	(50)
80.	Phenanthrene	85-01-8	10	330	10,000	(20)
81.	Anthracene	120-12-7	10	330	10,000	(20)
82	Carbazole	86-74-8	10	330	10,000	(20)
83.	Di-n-butyl phthalate	84-74-2	10	330	10,000	(20)
84.	Fluoranthene	206-44-0	10	330	10,000	(20)
85.	Pyrene	129-00-0	10	330	10,000	(20)
86.	Butyl benzyl phthalate	85-68-7	10	330	10,000	(20)
87.	3,3'-Dichlorobenzidine	91-94-1	10	330	10,000	(20)
88.	Benz(a)anthracene	56-55-3	10	330	10,000	(20)
89.	Chrysene	218-01-9	10	330	10,000	(20)
90.	bis(2-Ethylhexyl)phthalate	117-81-7	10	330	10,000	(20)
91.	Di-n-octyl phthalate	117-84-0	10	330	10,000	(20)
92.	Benzo(b)fluoranthene	205-99-2	10	330	10,000	(20)
93.	Benzo(k)fluoranthene	207-08-9	10	330	10,000	(20)
94.	Benzo(a)pyrene	50-32-8	10	330	10,000	(20)
95.	Indeno(1,2,3-cd)pyrene	193-39-5	10	330	10,000	(20)
96.	Dibenz(a,h)anthracene	53-70-3	10	330	10,000	(20)
97.	Benzo(g,h,i)perylene	191-24-2	10	330	10,000	(20)

Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the Laboratory for soil/sediment, calculated on dry weight basis as required by the Protocol, will be higher.

SEMIVOLATILES

Water Samples

A 1 L volume of water is extracted in a continuous liquid-liquid extractor with methylene chloride at a pH of approximately 2. This extract is reduced in volume to 1.0 mL, and a 2 µL volume is injected onto the GC/MS for analysis. For a sample with compound X at the CRQL of 10 µg/L:

(10 µg/L) (1 L) = 10 µg in the original extract

When the extract is concentrated, this .material is contained in the 1 mL concentrated extract, of which 2 µL are injected into the instrument:

(10 µg/mL) (2 µL) (10^{-3} mL/µL) = 20 x 10^{-3} µg = 20 ng on the GC column

Low Soil Samples

A 30 g soil sample is extracted three times with methylene chloride/acetone at ambient pH, by sonication or Soxhlet. The extract is reduced in volume to 1.0 mL, and a 2 µL volume is injected onto the GC/MS for analysis. For a sample with compound X at the CRQL of 330 µg/Kg:

(330 µg/Kg) (30 g) (10^{-3} Kg/g) = 9900 x 10^{-3} µg = 9.9 µg

When the sample extract is to be subjected to Gel Permeation Chromatography (required) to remove high molecular weight interferences, the volume of the extract is initially reduced to 10 mL. This 10 mL is put through the GPC column, and only 5 mL are collected off the GPC. That 5 mL volume is reduced to 0.5 mL prior to analysis. Therefore:

(9.9 µg/10 mL) (5 mL) = 4.95 µg

This material is contained in the 0.5 mL extract, of which 2 µL are injected Into the instrument:

(4.95 µg/0.5 mL) (2 µL) (10^{-3} mL/µL) = (1.98 x 10^{-2} µg) 20 ng on the GC column

Medium Soil Samples

A 1 g soil sample is extracted once with 10 mL of methylene chloride/acetone, which is filtered through glass wool to remove particles of soil. The filtered extract is then subjected to GPC clean up, and only 5 mL of extract are collected after GPC. This extract is reduced in volume to 0.5 mL, of which 2 µL are injected onto the GC/MS. For a sample with compound X at the CRQL of 10,000 µg/Kg:

(10,000 µg/Kg) (1 g) (10^{-3} Kg/g) = 10 µg

(continued)

Semivolatiles, Medium Soil, continued -

This material is contained in the 10 mL extract, of which only 5 mL are collected after GPC:

(10 µg) (5 mL/10 mL) = 5 ug

The volume of this extract is reduced to 0.5 mL, of which 2 µL are injected into the instrument:

(5 µg/0.5 mL) (2 µL) (10^{-3} mL/µL) = 20 x 10^{-3} ug = 20 ng on the GC column

Eight semivolatile compounds are calibrated using only a four point initial calibration, with the lowest standard at 50 ng. Therefore, the CRQL values for these eight compounds are 2.5 times higher for all matrices and levels.

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

	Pesticides/Aroclors	CAS Number	Quantitation Limits* Water µg/L	Soil µg/Kg	On Column (ng)
98.	alpha-BHC	319-84-6	0.05	1.7	5
99.	beta-BHC	319-85-7	0.05	1.7	5
100.	delta-BHC	319-86-8	0.05	1.7	5
101.	gamma-BHC (Lindane)	58-89-9	0.05	1.7	5
102.	Heptachlor	76-44-8	0.05	1.7	5
103.	Aldrin	309-00-2	0.05	1.7	5
104.	Heptachlor epoxide	1024-57-3	0.05	1.7	5
105.	Endosulfan I	959-98-8	0.05	1.7	5
106.	Dieldrin	60-57-1	0.10	3.3	10
107.	4,4'-DDE	72-55-9	0.10	3.3	10
108.	Endrin	72-20-8	0.10	3.3	10
109.	Endosulfan II	33213-65-9	0.10	3.3	10
110.	4,4'-DDD	72-54-8	0.10	3.3	10
111.	Endosulfan sulfate	1031-07-8	0.10	3.3	10
112.	4,4'-DDT	50-29-3	0.10	3.3	10
113.	Methoxychlor	72-43-5	0.50	17.0	50
114.	Endrin ketone	53494-70-5	0.10	3.3	10
115.	Endrin aldehyde	7421-36-3	0.10	3.3	10
116.	alpha-Chlordane	5103-71-9	0.05	1.7	5
117.	gamma-Chlordane	5103-74-2	0.05	1.7	5
118.	Toxaphene	8001-35-2	5.0	170.0	500
119.	AROCLOR-1016	12674-11-2	1.0	33.0	100
120.	AROCLOR-1221	11104-28-2	1.0	67.0	200
121.	AROCLOR-1232	11141-16-5	1.0	33.0	100
122.	AROCLOR-1242	53469-21-9	1.0	33.0	100
123.	AROCLOR-1248	12672-29-6	1.0	33.0	100
124.	AROCLOR-1254	11097-69-1	1.0	33.0	100
125.	AROCLOR-1260	11096-82-5	1.0	33.0	100

Quantitation Limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the Laboratory for soil/sediment, calculate on dry weight basis, as required by the Protocol, will be higher.

Water Samples

A 1 L volume of water is extracted three times with methylene chloride or by a continuous liquid-liquid extractor. This extract is reduced in volume to approximately 3 - 5 mL, and diluted up to 10.0 mL with clean solvent. When Gel Permeation Chromatography is performed, only 5 of the 10 mL of extract are collected after GPC.

Regardless of whether GPC is performed, either 1.0 or 2.0 mL of the 10.0 mL of the original extracts are taken through the remaining clean up steps (Florisil and sulfur removal). The volume taken through Florisil cleanup and the final volume of the extract after the clean up steps depends on the requirements of the autosampler. If the autosampler can handle 1.0 mL final extract volumes, this is the volume taken through Florisil and the final volume. If the autosampler cannot reliably handle 1.0 mL volumes, the volume is 2.0 mL. When using an autosampler, the injection volume may be 1.0 or 2.0 µL. Manual injections must use a 2.0 µL injection volume.

For a sample with compound X at the CRQL of 0.05 µg/L and an autosampler requiring a 1.0 mL volume:

(0.05 µg/L) (1 L) = 0.05 µg in the original extract

This material is contained in the 10.0 mL of extract:

(0.05 µg)/ (10.0 mL) = 0.005 µg/mL

Of which, only 1.0 mL is carried through the remaining clean up steps. For a final extract volume of 1.0 mL and a 1 µL injection volume:

(0.005 µg/L) (1 µL) (10^{-3} mL/µL) = 5 x 10^{-6} µg = 5 pg on the GC column

Soil Samples

There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of pesticides/Aroclors. A 30 g soil sample is extracted three times with methylene chloride/acetone by sonication or Soxhlet extraction. The extract is reduced in volume to 10.0 mL and subjected to Gel Permeation Chromatography. After GPC, only 5.0 mL of extract are collected. However, as with the water sample described above, either 1.0 or 2.0 mL of that extract are subjected to the other clean up steps, so no loss of sensitivity results from the use of GPC. From this point on, the soil sample extract is handled in the same fashion as the extract of a water sample. For a sample with compound X at the CRQL of 1.7 µg/Kg:

(1.7 µg/Kg) (30 g) (10^{-3} Kg/g) = 51 x 10^{-3} µg = 51 ng in the original extract

This material is contained in the 10.0 mL of extract:

(51 ng)/10 mL = 5.1 ng/mL
(continued)

of which, only 1.0 or 2.0 mL are carried through the remaining cleanup steps For a final extract volume of 1.0 mL and a 1 µL injection volume:

$(5.1\ ng/mL)(1\ \mu L)(10^{-3}\ mL/\mu L) = 5.1 \times 10^{-3}\ ng = 5\ pg$ on the GC column.

For either water or soil samples, if the autosampler used requires a 2.0 mL final volume, the concentration in the 10.0 mL of extract above remains the same.

Using a 2 µL injection volume, twice the total number of picograms are injected onto the GC column. However, because the injection volume must be the same for samples and standards, twice as much material is injected onto the column during calibration, and thus the amount of compound X injected from the sample extract is equivalent to the amount of compound X injected from the calibration standard, regardless of injection volume.

If a single injection is used for two GC columns attached to a single injection part, it may be necessary to use an injection volume greater than 2 µL.

SECTION II

SUPERFUND-CLP INORGANICS

Superfund Target Compound List (TCL) and Contract Required Quantitation Limit

Parameter	Contract Required Quantitation Level (µg/L)
1. Aluminum	200
2. Antimony	60
3. Arsenic	10
4. Barium	200
5. Beryllium	5
6. Cadmium	5
7. Calcium	5000
8. Chromium	10
9. Cobalt	50
10. Copper	25
11. Iron	100
12. Lead	3
13. Magnesium	5000
14. Manganese	15
15. Mercury	0.2
16. Nickel	40
17. Potassium	5000
18. Selenium	5
19. Silver	10
20. Sodium	5000
21. Thallium	10
22. Vanadium	50
23. Zinc	20
24. Cyanide	10

1 Any analytical method specified in Exhibit D, CLP-Inorganics may be utilized as long as the documented instrument or method detection limits meet the Contract Required Quantitation Level (CRQL) requirements. Higher quantitation levels may only be used in the following circumstance:

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

For lead:
Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample concentration = 220
Contract Required Quantitation Level (CRQL) = 3

The value of 220 may be reported even though instrument detection limit is greater than Contract Required Quantitation Limit. The instrument or method detection limit must be documented as described in Exhibit E.

2: These CRQLs are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E. The quantitation limits for samples may be considerably higher depending on the sample matrix.

APPENDIX E

TAMS CONSULTANTS, INC.

DAILY FIELD SUMMARY

Project _____ Location _____

Owner _____ Contractor _____

Weather Conditions _____

Remarks _____

Date _____

Sheet _____ of _____

Summary No. _____

REPORT

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Prepared by

_____

TAMS CONSULTANTS, Inc.

PROJECT	CONTRACTOR	PAGE 1 OF
PROJECT NO.	LOCATION	DATE
SURFACE ELEVATION	DATUM | DRILLER	TAMS REP.

WATER LEVELS				DRILLING AND SAMPLING				
DATE	TIME	DEPTH	CASING		CASING	SAMPLER	CORE	TUBE
				TYPE				
				I.D.				
				WT/Fall				

Depth (ft)	Casing Blows	Sample Number	Blows per/6"	Recovery (Inches)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
-- 0					
-- 1					
-- 2					
-- 3					
-- 4					
-- 5					
-- 6					
-- 7					
-- 8					
-- 9					
--10					
--11					
--12					
--13					
--14					
--15					
--16					
--17					
--18					

TAMS CONSULTANTS, INC. BORING/WELL LOG Boring No.

PROJECT

PROJECT NO. PAGE OF

Depth (ft)	Casing Blows	Sample Number	Blows per/6"	Recovery (Inches)	SAMPLE DESCRIPTION, REMARKS AND STRATUM CHANGES
--					
--					
--					
--					
--					
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--					
--					
--					
--					
--					
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--					
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--					
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--					

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS

CA	California Sampler	VS	Vane Shear
SS	Split Spoon - 1 3/8" I.D., 2" O.D. unless otherwise noted	OS	Osterberg Sampler - 3" Shelby Tube
ST	Shelby Tube - 2" O.D. unless otherwise noted	HS	Hollow Stem Auger
PA	Power Auger	WS	Wash Sample
DB	Diamond Bit - NX, BX, AX	FT	Fish Tail
AS	Auger Sample	RB	Rock Bit
JS	Jar Sample	BS	Bulk Sample
		PM	Pressuremeter test in situ

Standard N, Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split spoon except where noted.

WATER LEVEL MEASUREMENT SYMBOLS

WL	Water Level
WCI	Wet Cave In
DCI	Dry Cave In
WS	While Sampling
WD	While Drilling
BCR	Before Casing Removal
ACR	After Casing Removal
AB	After Boring

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable ground water levels. In impervious soils, the accurate determination of ground water elevations is not possible in even several days observation, and additional evidence of ground water elevations must be sought.

MOISTURE CONTENT VISUAL DESCRIPTION

Dry	Below Plastic Limit
Slightly Damp	Difficult to Mold
Damp	Below Optimum Moisture Content
Moist	At Optimum Moisture Content
Wet	Above Optimum Moisture Content
Saturated	Fluid

GRADATION DESCRIPTION & TERMINOLOGY

Coarse Grained or Granular soils have more than 50% of their dry weight retained on a #200 sieve. They are described as boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve. They are described as clays or clayey if they are cohesive, and silts if they are non-cohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density, and fine grained soils on the basis of their strength or consistency, and their plasticity.

Major Component Of Sample	Size Range	Descriptive Terms Of Components Also Present In Sample	Dry Weight Coarse	Dry Weight Fine
Boulders	Over 8 in. (200mm)	Trace	1 - 9	0 - 5
Cobbles	8 in. to 3 in. (200mm to 75mm)	Little	10 - 19	
Gravel	3 in. to #4 sieve (75mm to 2mm)	Some	20 - 29	6 - 12
Sand	#4 to #200 sieve (2mm to 0.074mm)	component	30 - 44	13 - 44
	Passing #200 sieve (0.074mm to 0.005mm)	And	45 - 50	45 - 50
Clay	Smaller than 0.005mm			

CONSISTENCY OF COHESIVE SOILS

Unconfined Comp Strength Qu (tsf)	Consistency
<0.25	Very Soft
0.25 - 0.49	Soft
0.50 - 0.99	Medium (Firm)
1.00 - 1.99	Stiff
2.00 - 3.99	Very Stiff
4.00 - 8.00	Hard
>8.00	Very Hard

RELATIVE DENSITY OF GRANULAR SOILS

N - Blows/ft	Relative Density
0 - 3	Very Loose
4 - 9	Loose
10 - 29	Medium Dense
30 - 49	Dense
50 - 80	Very Dense
80 -	Extremely Dense

Qu = Unconfined compressive strength in tons per square foot (TSF) obtained with calibrated penetrometer

GROUNDWATER SAMPLING RECORD

Client _____ Date _____
Job # _____
Well # _____ Well Diameter _____
Location _____

Water level measurements (from top of inner casing) in Feet.
Total Well Depth:
Depth to Water:
Height of Water Column:
Volume Conversion Factor:
Gallons in the Well:

Conversion Factor
0.16 = 2" ID
0.65 = 4" ID
1.47 = 6" ID

II. Well Evacuation

Pumping: Submersible
Positive Displacement
Centrifugal

Bailing
Teflon
Stainless Steel
Combination
Other (Describe)

Time Pump On:
Time Pump Off:
Pumping Time:
Pumping Rate:
Gallons Removed:

Bailing Started:
Bailing Stopped:
Gallons Removed:

III. Sampling

Withdrawal: Pumped (described)
Bailed (describe)

PID: Upwind:
At Well:
Downwind:

Time:
Date:
Sampling I.D. #:
Trip Blank #:
No. of Containers Filled (primary lab.):
No. of Containers Filled (replicate samples).
Physical appearance and odor:
Refrigerated: Date:
Time:

Field Tests (After Evacuation)

Temperature (°C/°F):	Vol. 1	Vol. 2	Vol. 3	Vol. 4	Vol. 5
pH					
Spec. Cond. (umhos / cm):					

Weather: _____

Comments: _____

WELL DEVELOPMENT RECORD

DATE

PROJECT

TAMS ENGINEER _____

WELL ID _____

TOTAL DEVELOPMENT TIME _____

TYPE OF PUMP/BAILER

TOTAL VOLUME PURGE _____

WELL VOLUME

MEASURING REFERENCE POINT _____

REFERENCE POINT ELEVATION

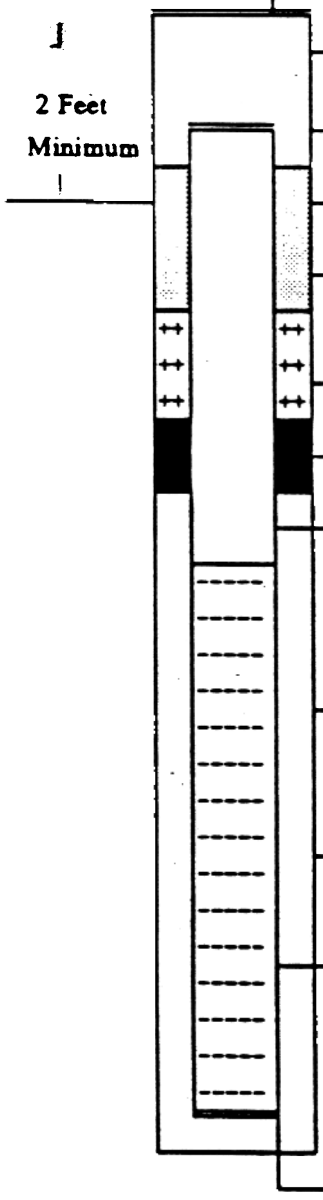
TIME	DEPTH TO WATER	RATE	TURBIDITY	pH	SPECIFIC CONDUCTANCE	TEMP	REMARKS

WELL VOLUME 4" WELL = (TOTAL DEPTH OF WELL - DEPTH TO WATER) * 0.65 GALLONS/LINEAR FEET

WELL VOLUME 2" WELL = (TOTAL DEPTH OF WELL - DEPTH TO WATER) * 0.16 GALLONS/LINEAR FEET

TAMS CONSULTANTS, Inc. WELL LOG Well No.

Project	Location	Page of		
Project No.	Contractor	Water Levels		
Surface Elevation	Driller	Date	Time	Depth
Top of Riser Elevation	Well Permit Number			
	TAMS Rep.			
Datum	Date of Completion			



Lockable Cover with Padlock

inch ID Protective Casing

Protective Cap, Type:

Ground Surface

Concrete Seal, from _____ feet to _____ feet

Bentonite Slurry, from _____ feet to _____ feet

Bentonite Pellet Seal, from _____ feet to _____ feet

inch ID Riser Pipe from _____ feet to _____ feet

Sand Pack, from _____ feet to _____ feet
Sand Size, Number _____

inches, Borehole Diameter

_____ inch ID Well Screen, from _____ feet to _____ feet
Type: _____ Slot size: _____ Sch: _____

Bottom Cap at _____ feet, Type: _____

Note: All measurements based on ground surface at 0 feet, (+) above grade, (-) below grade.

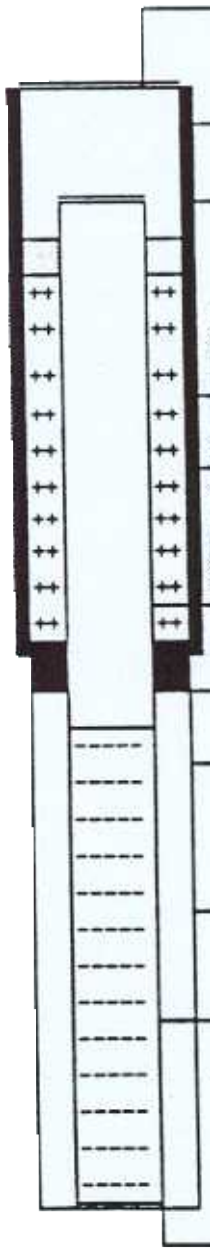
(NOT TO SCALE)

TAMS CONSULTANTS, Inc. **WELL LOG** **Well No.**

Project	**Location**	**Page of**		
Project No.	**Contractor**	**Water Levels**		
Surface Elevation	**Driller**	**Date**	**Time**	**Depth**
	Well Permit Number			
Top of Riser Elevation	**TAMS Rep.**			
Datum	**Date of Completion**			

Lockable Cover with Padlock

2 Feet Minimum



_____ inch ID Protective Casing

Protective Cap, Type:_____

Ground Surface

Concrete Seal, from_____ feet to_____ feet

4 inch ID Steel Casing, from _____ to _____ feet.

Bentonite Slurry, from_____ feet to_____ feet

_____ inch ID Riser Pipe from_____ feet to _____ feet

Bentonite Pellet Seal, from_____ feet to_____ feet

Sand Pack, from _____ feet to_____ feet

Sand Size, Number _____

_____ inches, Borehole Diameter

_____ inch ID Well Screen, from_____ feet to_____ feet

Type: _____ Slot size:_____ Sch:_____

Bottom Cap at _____ feet, Type:_____

Note: All measurements based on ground surface at 0 feet, (+) above grade, (-) below grade.

(NOT TO SCALE)

APPENDIX F

QUALITY ASSURANCE FIELD AUDIT CHECKLIST

COVER SHEET

ict one

Reques By

ICU

QA QC

ummary es nessed

on-Con rming

As an

B. GENERAL INFORMATION

1. Personnel On-Site:

NAME	AFFILIATION	PHONE NO

2. Weather Conditions:

Temperature: _____ Wind Direction and Speed:
Humidity: _____

3. Level of Personnel Protection Required _____

4 Level of Personnel Protection Witnessed: _____

5. Field Air Monitoring Equipment:

TYPE: _____
MANUFACTURER: _____
CALIBRATION GAS: _____
CALIBRATION SETTING: _____
SPAN SETTING: _____
LAST CALIBRATION DATE AND TIME: _____

TYPE: _____
MANUFACTURER: _____
CALIBRATION GAS: _____
CALIBRATION SETTING: _____
SPAN SETTING: _____
LAST CALIBRATION DATE AND TIME: _____

COMMENTS: _____

C. QA/QC INFORMATION

1. Laboratory Name and Telephone Number: _____

2. Laboratory Contact Person: _____

3. Chain-of-Custody Forms Completed:

   YES NO

4. List the following Sample Container Information:

Sample Container Type	Sample Container Size/Volume	Sample Container Preservative

5. Were All Sample Containers Laboratory-Cleaned?

   YES NO

6. Holding Time of Sample Containers: _____

7. Are All Sample Containers Properly Labeled?

   YES NO

8. Were the proper decontamination procedures (as specified in the Field Sampling/Testing Plan) utilized in the field?

   YES NO

9. Field Blanks:

   YES NO

   Frequency: _____

   Method Used to Collect Field Blanks: _____

10. Trip Blanks:

    YES NO

    Frequency: _____

11. Sample Shuttles/Coolers:

Custody Seals Used: YES NO

Ice Packs Used: YES NO

12. Are samples maintained at 4°C while on site and during shipment?

_____YES _____NO

13. Comments: _____

D. FIELD SAMPLING AND COLLECTION FOR AQUEOUS MATRIX

1. Aqueous Matrix Source: _____

2. Source Location: _____

3. Sample ID#: _____

4. Date and Collection Time: _____

5. Analytical Parameters Required: _____

6. Sampling Device Utilized: _____

7. Evacuation Method Utilized: _____

8. Pump Type: _____

9. Pump Rate: _____

10. Number of Volumes Purged _____

11 Dedicated Hose: YES

12. Was the material and equipment used [illegible] evacuat[illegible] [illegible] decontaminated (as per the requirements and pr[illegible]res specified in the QAPP)? _____YES _____NO

13. Well Construction:

_____ Stainless Steel
_____ PVC
_____ Teflon
_____ Other

14. Well Specifications:

Diameter: _____
Depth of Well: _____
Depth of Water: _____
Elevation of Reference Point: _____
Screen Length: _____
Screen Interval: _____
Formation: _____

15. Locking Cap: YES NO

16. Field Measurement Data

pH: _____ Turbidity: _____
Time: _____ Other: _____
Temperature: _____
Conductivity:

17. Field Monitoring Instrument Readings:

Type of Instrument: _____
Reading Location: _____
Concentration: _____

18. Level of Personnel Protection:

19. Disposable Gloves Worn: _YES _NO

20. Comments : _____

E. FIELD SAMPLING AND COLLECTION FOR NON-AQUEOUS MATRIX

1. Aqueous Matrix Source: _____

2. Source Location: _____

3. Sample ID#: _____

4. Date and Collection Time: _____

5. Analytical Parameters Required: _____

6. Sampling Device Utilized: _____
_____
_____

7. Was the equipment used to collect the sample properly decontaminated (per QAPP specifications)?

YES NO

8. Field Monitoring Instrument Readings:

Type of Instrument: _____
Reading Location: _____
Concentration: _____

9. Level of Personnel Protection:

10. Disposable Gloves Worn: YES NO

11. Comments: _____
_____
_____
_____
_____
_____

APPENDIX G

ANALYTICAL LABORATORY TERMS

DIVISION OF HAZARDOUS WASTE REMEDIATION

When obtaining the services of an analytical laboratory in response to investigations conducted under the regulatory authority of the Division of Hazardous Waste Remediation or Division of Environmental Enforcement, the consultant or potentially responsible party will be responsible for providing the services in accordance with the following terms:

(A) Determination of Analytical Capability:

The Department, through the Division of Water, contracts directly with laboratories to provide services for Departmental programs. The DOW publishes a set of protocols, the NYSDEC Analytical Services Protocol, which provides criteria for personnel qualifications, instrument qualifications and analytical protocol requirements. For reasons of consistency, the Division of Hazardous Waste Remediation is adopting the same criteria for any laboratory functioning as a subcontractor. The following are the minimum requirements to be met by these laboratories:

1. In order to be qualified to submit a bid, the laboratory must be certified by the New York State Department of Health Environmental Laboratory Approval Program (ELAP) for all categories of solid and hazardous waste, and all categories of CLP (Volatiles, Semi-Volatiles, Pesticide/PCBs and metals). This criteria is established in 10 NYCRR Subpart 55-2 etseq.

2. The laboratory must have successfully analyzed a performance check sample within the previous six months. This check sample must have covered all of the analytical protocols covered by the applicant laboratory's stated performance capabilities. These performance check samples must have been obtained from the NYSDEC-Analytical Services Protocol Program, the NYSDOH-ELAP program, or the EPA CLP program. The applicant laboratory is required to provide full documentation supporting the successful completion of the performance evaluation check sample requirement.

3. The laboratory must pass a systems audit. The audit covers the following areas:

   a. The laboratory's physical plant and complement of equipment and analytical instrumentation are evaluated to determine if they are sufficient to carry out the analytical work load required by the specific project(s) for which the laboratory is being retained.

   b. The laboratory personnel are interviewed to determine if they possess the training and experience necessary to carry out the responsibilities assigned to them. These criteria are defined in Volume I of the NYSDEC ASP.

c. Analytical protocols and standard operating procedures are reviewed to determine whether they conform to the requirements of the current NYSDEC-ASP. Attendant to this review, the laboratory is required to provide sufficient documentation to assure the audit team that these protocols and procedures have been reduced to standard practice by the analysts charged with their implementation.

d. Sample tracking and in-house chain-of-custody procedures are evaluated to assure the audit team that all samples and the digestates or extracts derived from them are secure, uniquely identified and properly maintained during the analytical process.

e. The laboratory must have in place, as part of its standard operating procedures, a quality assurance/quality control program that complies in all parts with the requirements of the latest edition of the NYSDEC-ASP or consistent with the NYSDOH ELAP program. The laboratory quality assurance officer must provide required documentation to assure the audit team that such a program is an integral part of the laboratory's normal operation.

f. The laboratory must have a data system capable of producing analytical report/documentation packages that are consistent with the reporting and deliverables requirements of the latest edition of the NYSDEC-ASP.

4. Prior to the audit, the laboratory must submit for review and approval by the audit team, copies of laboratory standard operating procedures (SOPs), the laboratory QA manual and a data package produced in compliance with the most recent edition of the NYSDEC-ASP.

The laboratory SOPs will be laboratory specific (a photocopy of the relevant ASP or CLP method is unacceptable) and must include the following elements:

a. Revision Number and Effective Date
b. Scope and Application
c. Analytes
d. Laboratory Specific Instrumentation
e. Standard Preparation
f. Detection Limits
g. Applicable matrices
h. Dynamic range
i. Corrective Actions Needed
j. Method Summary
k. Name of author
l. Sign off for laboratory management approval and date
m. Sign off for Quality Assurance Officer and date

The SOPs must address, at a minimum, the following topics:

a. Employee training and documentation to determine employee proficiency in accordance with NYSDEC ASP requirements.

b. Chain-of-Custody procedures originating from bottle distribution to sample receipt and extract tracking.

c. Sample receipts and distribution for analysis throughout the laboratory.

d. Bottle preparation and shipping.

e. Maintenance of analyst bench logs, run logs, instrument maintenance logs, standard preparation logs.

f. Analytical methods covered under site-specific requirements. SOPs will include minimum detection limit studies (MDL).

g. Sample preparation for liquid, solid and pure products for all analytical methods covered under site-specific requirements.

h. Glassware preparation for organics and inorganics.

i. Standard preparation

j. Analytical Cleanups

- gel permeation chromatography (GPC)
- alumina
- fluorisil
- silica gel
- sulfuric acid

k. Data acquisition and reduction.

l Waste disposal.

Upon completion of the audit, the audit team will convey its findings to the laboratory management. The laboratory management will be given the opportunity to obtain copies of any and all check sheets and scoring forms developed during the audit. Laboratory management will be given the opportunity to provide a written record of their comments concerning the audit. These comments will become part of the audit report (see attached sample audit report).

Qualifications of the Audit Team:

The consultant/contractor charged with conduc ing a laboratory audit will provide evidence that audit team members meet the following qualifications or the consultant will provide evidence that the audit team members have equivalent qualifications. The Department must approve the selection of the audit team as a subcontractor/subconsultant under the contract.

1. All members of the audit team must possess a degree (B.S. or higher) in chemistry or a related science.

2. All members of the audit team must possess three years experience in the general field of analytical chemistry, one year of which must be in the field of environmental analysis.

3. The audit team must be composed of equivalent experience in the following areas:

   Gas Chromatography (GC) - 2 years
   Gas Chromatograph/Mass Spectrometry (GC/MS) - 2 years
   High Performance Liquid Chromatography (HPLC) - 1 year
   Atomic Absorption (AA) - 2 years
   Inductively Coupled Plasma Spectroscopy (ICP) - 2 years
   Sample Preparation - 2 years

   In addition to expertise in the above areas, all members of the audit team must have a sound working knowledge of all of the above areas. A sound working knowledge is defined as knowledge of the protocols and their application in the most recent edition of the NYS ASP.

4 All members of the audit team must have sufficient background in the area of laboratory quality control to conduct a critical review of procedures, protocols and the attendant control charts and quality control summaries.

Responsibilities of the Audit Team:

1. Conduct a laboratory audit of the primary laboratory and any analytical subcontractors of the primary laboratory, involved in the analysis of site-specific samples.

2. Verify ELAP certification in all categories of solid and hazardous waste and when such categories become part of the ELAP program, maintain certification in all categories of CLP.

3. Obtain copies of the laboratory SOPs, Quality Assurance Manuals, and a data package produced in compliance with the most recent edition of the NYSDEC Analytical Services Protocols. The laboratory may choose any sample or standard run to compile a data package for ASP compliance.

4. Review relevant SOPs, QA manuals and a data package for compliance with the most recent NYSDEC Analytical Services Protocol and the requirements delineated herein. A data package is reviewed for compliance and assurance that the laboratory understands the protocols and can comply with the scheduling requirements and sample capacity as stated in the laboratory subcontract.

NOTE: While it is possible for one person to conduct a full laboratory audit, it is recommended that a team of at least two be used.

(D) Required Documentation:

Once a laboratory has complied with the aforementioned requirements, this determination must be documented and the resulting documentation shall be submitted as an addendum to the quality assurance project plan (QAPjP). This documentation shall include the following:

1. Copies of the requisite NYSDOH-ELAP certification.

2. Results of the most recent performance evaluation check sample.

3. A copy of the completed laboratory audit report (see attached report). The consultant may use an equivalent audit check list, if desired.

References

1. EPA, CERCLA Manual, October 1989

2. RCRA Groundwater Monitoring Systems, Laboratory Audit Inspection Guidance, September 1989

3. Handbook of Quality Assurance for the Analytical Chemistry Laboratory James P. Dux, Van Nostrand Reinhold, New York, 1986

4 The Laboratory Quality Assurance System, Thomas A. Hatchett, Van Nostrand Reinhold, New York, 1990

5. Quality Assurance Principles for Analytical Laboratories, AOAC, 1984 Fredrick Garrfield

6 NEIC Procedures Manual for the Evidence Audit of Enforcement Investigation, EPA-330/9-81-003-R, April 1984

Contract Evidence Audit Team Products and Serv Manual USEPA, November 1987

8 ASTM D3856, Evaluating Laboratories Engaged in Sampling and Analysis of Water and Waste - Waters, ASTM Philadelphia, PA 19103

9 ASTM E-548, Standard Recommended Practice for General Criteria for Use in Evaluation of Testing and/or Inspection Agencies, ASTM Philadelphia, PA 19103

10. G.A. Berman, Ed., Testing Laboratory Performance: Evaluation and Accreditation, NBS Special Publication 591, National Bureau of Standards, Gaithersburg, MD 20899

11 J.K. Taylor, Essential Features of a Laboratory Quality Assurance Program in Statistics in Environmental Sciences, ASTM STP 845, ASTM Philadelphia, PA 19103

APPENDIX H1

3.0 SOIL GAS SAMPLING: SOP #2149

3.1 SCOPE AND APPLICATION

Soil gas monitoring provides a quick means of waste site evaluation. Using this method, underground contamination can be identified, and the source, extent, and movement of the pollutants can be traced.

This Standard Operating Procedure (SOP) outlines the methods used by EPA/ERT in installing soil gas wells; measuring organic levels in the soil gas using an HNU PI 101 Portable Photoionization Analyzer and/or other air monitoring devices; and sampling the soil gas using Tedlar bags, Tenax sorbent tubes, and SUMMA canisters.

3.2 METHOD SUMMARY

A 3/8-inch diameter hole is driven into the ground to a depth of 4 to 5 feet using a commercially available "slam bar". (Soil gas can also be sampled at other depths by the use of a longer bar or bar attachments.) A 1/4-inch O.D. stainless steel probe is inserted into the hole. The hole is then sealed at the top around the probe using modeling clay. The gas contained in the interstitial spaces of the soil is sampled by pulling the sample through the probe using an air sampling pump. The sample may be stored in Tedlar bags, drawn through sorbent cartridges, or analyzed directly using a direct reading instrument.

The air sampling pump is not used for SUMMA canister sampling of soil gas. Sampling is achieved by soil gas equilibration with the evacuated SUMMA canister. Other field air monitoring devices, such as the combustible gas indicator (MSA CGI/02 Meter, Model 260) and the organic vapor analyzer (Foxboro OVA, Model 128), can also be used depending on specific site conditions. Measurement of soil temperature using a temperature probe may also be desirable. Bagged samples are usually analyzed in a field laboratory using a portable Photovac GC.

Power driven sampling probes may be utilized when soil conditions make sampling by hand unfeasible (i.e., frozen ground, very dense clays, pavement, etc.). Commercially available soil gas sampling probes (hollow, 1/2-inch O.D. steel probes) can be driven to the desired depth using a power hammer (e.g., Bosch Demolition Hammer). Samples can be drawn through the probe itself, or through Teflon tubing inserted through the probe and attached to the probe point. Samples are collected and analyzed as described above.

3.3 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

3.3.1 Tedlar Bag

Soil gas samples are generally contained in 1-L Tedlar bags. Bagged samples are best stored in coolers to protect the bags from any damage that may occur in the field or in transit. In addition, coolers ensure the integrity of the samples by keeping them at a cool temperature and out of direct sunlight. Samples should be analyzed as soon as possible, preferably within 24 to 48 hours.

3.3.2 Tenax Tube

Bagged samples can also be drawn into Tenax or other sorbent tubes to undergo lab GC/MS analysis. If Tenax tubes are to be utilized, special care must be taken to avoid contamination. Handling of the tubes should be kept to a minimum, and samplers must wear nylon or other lint-free gloves. After sampling, each tube should be stored in a clean, sealed culture tube; the ends packed with clean glass wool to protect the sorbent tube from breakage. The culture tubes should be kept cool and wrapped in aluminum foil to prevent any photodegradation of samples (see Section 3.7.4.).

3.3.3 SUMMA Canister

The SUMMA canisters used for soil gas sampling have a 6-L sample capacity and are certified clean by GC/MS analysis before being utilized in the field. After sampling is completed, they are stored and shipped in travel cases.

3.4 INTERFERENCES AND POTENTIAL PROBLEMS

3.4.1 HNU Measurements

A number of factors can affect the response of the HNU PI 101. High humidity can cause lamp fogging and decreased sensitivity. This can be significant when soil moisture levels are high, or when a soil gas well is actually in groundwater. High concentrations of methane can cause a downscale deflection of the meter. High and low temperature, electrical fields, FM radio transmission, and naturally occurring compounds, such as terpenes in wooded areas, will also affect instrument response.

Other field screening instruments can be affected by interferences. Consult the manufacturers' manuals.

3.4.2 Factors Affecting Organic Concentrations in Soil Gas

Concentrations in soil gas are affected by dissolution, adsorption, and partitioning. Partitioning refers to the ratio of component found in a saturated vapor above an aqueous solution to the amount in the solution; this can, in theory, be calculated using the Henry's Law constants. Contaminants can also be adsorbed onto inorganic soil components or "dissolved" in organic components. These factors can result in a lowering of the partitioning coefficient.

Soil "tightness" or amount of void space in the soil matrix, will affect the rate of recharging of gas into the soil gas well.

Existence of a high, or perched, water table, or of an impermeable underlying layer (such as a clay lens or layer of buried slag) may interfere with sampling of the soil gas. Knowledge of site geology is useful in such situations, and can prevent inaccurate sampling.

3.4.3 Soil Probe Clogging

A common problem with this sampling method is soil probe clogging. A clogged probe can be identified by using an in-line vacuum gauge or by listening for the sound of the pump laboring. This problem can usually be eliminated by using a wire cable to clear the probe (see procedure #3 in Section 3.7.1).

3.4.4 Underground Utilities

Prior to selecting sample locations, an underground utility search is recommended. The local utility companies can be contacted and requested to mark the locations of their underground lines. Sampling plans can then be drawn up accordingly. Each sample location should also be screened with a metal detector or magnetometer to verify that no underground pipes or drums exist.

3.5 EQUIPMENT/APPARATUS

3.5.1 Slam Bar Method

slam bar (one per sampling team)
soil gas probes, stainless steel tubing, 1/4-inch O.D., 5 foot length

- flexible wire or cable used for clearing the tubing during insertion into the well
- "quick connect" fittings to connect sampling probe tubing, monitoring instruments, and Gilian pumps to appropriate fittings on vacuum box

modeling clay
vacuum box for drawing a vacuum around Tedlar bag for sample collection (one per sampling team)

- Gilian pump Model HFS113A adjusted to approximately 3.0 L/min (one to two per sampling team)
- 1/4-inch Teflon tubing, 2 to 3 foot lengths, for replacement of contaminated sample line
- Tedlar bags, 1 liter, at least one bag per sample point
- soil gas sampling labels, field data sheets, logbook, etc.

HNU Model PI 101, or other field air monitoring devices, (one per sampling team)

- ice chest, for carrying equipment and for protection of samples (two per sampling team)
- metal detector or magnetometer, for detecting underground utilities/pipes/drums (one per sampling team)
- Photovac GC, for field-lab analysis of bagged samples
- SUMMA canisters (plus their shipping cases) for sample, storage and transportation

Power Hammer Method

- Bosch demolition hammer
- 1/2-inch O.D. steel probes, extensions, and points
- dedicated aluminum sampling points
- Teflon tubing, 1/4-inch O.D.
- "quick connect" fittings to connect sampling probe tubing, monitoring instruments, and Gilian pumps to appropriate fittings on vacuum box
  modeling clay
- vacuum box for drawing a vacuum around Tedlar bag for sample collection (one per sampling team)
- Gilian pump Model HFS113A adjusted to approximately 3.0 L/min (one to two per sampling team)
  1/4-inch Teflon tubing, 2 to 3 foot lengths, for replacement of contaminated sample line
- Tedlar bags, 1 liter, at least one bag per sample point
  soil gas sampling labels, field data sheets, logbook, etc.
- HNU Model PI 101, or other field air monitoring devices, (one per sampling team)
  ice chest, for carrying equipment and for protection of samples (two per sampling team)
- metal detector or magnetometer, for detecting underground utilities/ pipes/drums (one per sampling team)
  Photovac GC, for field-lab analysis of bagged samples
- SUMMA canisters (plus their shipping cases) for sample, storage and transportation
- generator with extension cords
- high lift jack assembly for removing probes

REAGENTS

HNU Systems Inc. Calibration Gas for HNU Model PI 101, and/or calibration gas for other field air monitoring devices

- deionized organic-free water, for decontamination
  methanol, HPLC grade, for decontamination
- ultra-zero grade compressed air, for field blanks
  standard gas preparations for Photovac GC calibration and Tedlar bag spikes

3.7 PROCEDURES

3.7.1 Soil Gas Well Installation

1. Initially, make a hole slightly deeper than the desired depth. For sampling up to 5 feet, use a 5-foot single piston slam bar. For deeper depths, use a piston slam bar with threaded 4-foot-long extensions. Other techniques can be used, so long as holes are of narrow diameter and no contamination is introduced.

2. After the hole is made, carefully withdraw the slam bar to prevent collapse of the walls of the hole. Then insert the soil gas probe.

3. It is necessary to prevent plugging of the probe, especially for deeper holes. Place a metal wire or cable, slightly longer than the probe, into the probe prior to inserting into the hole. Insert the probe to full depth, then pull it up 3 to 6 inches, then clear it by moving the cable up and down. The cable is removed before sampling.

4. Seal the top of the sample hole at the surface against ambient air infiltration by using modeling clay molded around the probe at the surface of the hole.

5. If conditions preclude hand installation of the soil gas wells, the power driven system may be employed. Use the generator-powered demolition hammer to drive the probe to the desired depth (up to 12 feet may be attained with extensions). Pull the probe up 1 to 3 inches if the retractable point is used. No clay is needed to seal the hole. After sampling, retrieve the probe using the high lift jack assembly.

6. If semi-permanent soil gas wells are required, use the dedicated aluminum probe points. Insert these points into the bottom of the power-driven probe and attach it to the Teflon tubing. Insert the probe as in step 5. When the probe is removed, the point and Teflon tube remain in the hole, which may be sealed by backfilling with sand, bentonite, or soil.

3.7.2 Screening with Field Instruments

1. The well volume must be evacuated prior to sampling. Connect the Gilian pump, adjusted to 3.0 L/min, to the sample probe using a section of Teflon tubing as a connector. Turn the pump on, and a vacuum is pulled through the probe for approximately 15 seconds. A longer time is required for sample wells of greater depths.

   After evacuation, connect the monitoring instrument(s) to the probe using a Teflon connector. When the reading is stable, or peaks, record the reading. For detailed procedures on HNU field protocol, see appendix B, and refer to the manufacturer's instructions.

3. Some readings may be above or below the range set on the field instruments. The range may be reset, or the response recorded as a figure greater than or less than the range. Consider the recharge rate of the well with soil gas when sampling at a different range setting.

3.7.3 Tedlar Bag Sampling

1. Follow step 1 in section 3.7.2 to evacuate well volume. If air monitoring instrument screening was performed prior to sampling, evacuation is not necessary.

2. Use the vacuum box and sampling train (Figure 3 in Appendix A) to take the sample. The sampling train is designed to minimize the introduction of contaminants and losses due to adsorption. All wetted parts are either Teflon or stainless steel. The vacuum is drawn indirectly to avoid contamination from sample pumps.

3. Place the Tedlar bag inside the vacuum box, and attach it to the sampling port. Attach the sample probe to the sampling port via Teflon tubing and a "quick connect" fitting.

4. Draw a vacuum around the outside of the bag, using a Gilian pump connected to the vacuum box evacuation port, via Tygon tubing and a "quick connect" fitting. The vacuum causes the bag to inflate, drawing the sample.

5. Break the vacuum by removing the Tygon line from the pump. Remove the bagged sample from the box and close valve. Label bag, record data on data sheets or in logbooks. Record the date, time, sample location ID, and the HNU, or other instrument reading(s) on sample bag label.

CAUTION: Labels should not be pasted directly onto the bags, nor should bags be labeled directly using a marker or pen. Inks and adhesive may diffuse through the bag material, contaminating the sample. Place labels on the edge of the bags, or tie the labels to the metal eyelets provided on the bags. Markers with inks containing volatile organics (i.e., permanent ink markers) should not be used.

3.7.4 Tenax Tube Sampling

Samples collected in Tedlar bags may be sorbed onto Tenax tubes for further analysis by GC/MS.

Additional Apparatus

Syringe with a luer-lock tip capable of drawing a soil gas or air sample from a Tedlar bag onto a Tenax/CMS sorbent tube. The syringe capacity is dependent upon the volume of sample being drawn onto the sorbent tube.

- Adapters for fitting the sorbent tube between the Tedlar bag and the sampling syringe. The adapter attaching the Tedlar bag to the sorbent tube consists of a reducing union (1/4-inch to 1/16-inch O.D. -- Swagelok cat. # SS-400-6-ILV or equivalent) with a length of 1/4-inch O.D. Teflon tubing replacing the nut on the 1/6-inch (Tedlar bag) side. A 1/4-inch I.D. silicone O-ring replaces the ferrules in the nut on the 1/4-inch (sorbent tube) side of the union.

  The adapter attaching the sampling syringe to the sorbent tube consists of a reducing union (1/4-inch to 1/16-inch O.D. -- Swagelok Cat. # SS-400-6-ILV or equivalent) with a 1/4-inch I.D. silicone O-ring replacing the ferrules in the nut on the 1/4-inch (sorbent tube) side and the needle of a luer-lock syringe needle inserted into the 1/16-inch side (held in place with a 1/16-inch ferrule). The

luer-lock end of the needle can be attached to the sampling syringe. It is useful to have a luer-lock on/off valve situated between the syringe and the needle.

- Two-stage glass sampling cartridge (1/4-inch O.D. x 1/8-inch I.D. x 5 1/8 inch) contained in a flame-sealed tube (manufactured by Supelco Custom Tenax/Spherocarb Tubes or equivalent) containing two sorbent sections retained by glass wool:

  Front section: 150 mg of Tenax-GC
  Back section: 150 mg of CMS (Carbonized Molecular Sieve)

  Sorbent tubes may also be prepared in the lab and stored in either Teflon-capped culture tubes or stainless steel tube containers. Sorbent tubes stored in this manner should not be kept more than 2 weeks without reconditioning. (See SOP #2052 for Tenax/CMS sorbent tube preparation).

  Teflon-capped culture tubes or stainless steel tube containers for sorbent tube storage. These containers should be conditioned by baking at 120°C for at least 2 hours. The culture tubes should contain a glass wool plug to prevent sorbent tube breakage during transport. Reconditioning of the containers should occur between usage or after extended periods of disuse (i.e., 2 weeks or more).

- Nylon gloves or lint-free cloth. (Hewlett Packard Part # 8650-0030 or equivalent.)

Sample Collection

Handle sorbent tubes with care, using nylon gloves (or other lint-free material) to avoid contamination.

2. Immediately before sampling, break one end of the sealed tube and remove the Tenax cartridge. For in-house prepared tubes, remove cartridge from its container.

3. Connect the valve on the Tedlar bag to the sorbent tube adapter. Connect the sorbent tube to the sorbent tube adapter with the Tenax (white granular) side of the tube facing the Tedlar bag.

4. Connect the sampling syringe assembly to the CMS (black) side of the sorbent tube. Fittings on the adapters should be very tight.

5. Open the valve on the Tedlar bag.

6. Open the on/off valve of the sampling syringe.

7. Draw a predetermined volume of sample onto the sorbent tube. (This may require closing the syringe valve, emptying the syringe and then repeating the procedure, depending upon the syringe capacity and volume of sample required.)

8. After sampling, remove the tube from the sampling train with gloves or a clean cloth. **Do not label or write on the Tenax/CMS tube.**

9. Place the sorbent tube in a conditioned stainless steel tube holder or culture tube. Culture tube caps should be sealed with Teflon tape.

Sample Labeling

Each sample tube container (not tube) must be labeled with the site name, sample station number, sample date, and sample volume.

Chain of custody forms must accompany all samples to the laboratory.

Quality Assurance

Before field use, a QA check should be performed on each batch of sorbent tubes by analyzing a tube with thermal desorption/cryogenic trapping GC/MS.

At least one blank sample must be submitted with each set of samples collected at a site. This trip blank must be treated the same as the sample tubes except no sample will be drawn through the tube.

Sample tubes should be stored out of UV light (i.e., sunlight) and kept on ice until analysis.

Samples should be taken in duplicate, when possible.

3.7.5 SUMMA Canister Sampling

1. Follow item 1 in step 3.7.2 to evacuate well volume. If HNU analysis was performed prior to taking a sample, evacuation is not necessary.

2. Attach a certified clean, evacuated 6-L SUMMA canister via the 1/4-inch Teflon tubing.

3. Open the valve on SUMMA canister. The soil gas sample is drawn into the canister by pressure equilibration. The approximate sampling time for a 6-L canister is 20 minutes.

4. Site name, sample location, number, and date must be recorded on a chain of custody form and on a blank tag attached to the canister.

CALCULATIONS

Field Screening Instruments

Instrument readings are usually read directly from the meter. In some cases, the background level at the soil gas station may be subtracted:

Final Reading = Sample Reading - Background

Photovac GC Analysis

Calculations used to determine concentrations of individual components by Photovac GC analysis are beyond the scope of this SOP and are covered in ERT SOP #2109, Photovac GC Analysis for Soil, Water and Air/Soil Gas.

QUALITY ASSURANCE/ QUALITY CONTROL

3.9.1 Field Instrument Calibration

Consult the manufacturers' manuals for correct use and calibration of all instrumentation. The HNU should be calibrated at least once a day.

3.9.2 Gilian Model HFS113A Air Sampling Pump Calibration

Flow should be set at approximately 3.0 L/min; accurate flow adjustment is not necessary. Pumps should be calibrated prior to bringing into the field.

3.9.3 Sample Probe Contamination

Sample probe contamination is checked between each sample by drawing ambient air through the probe via a Gilian pump and checking the response of the HNU PI 101. If HNU readings are higher than background, replacement or decontamination is necessary.

Sample probes may be decontaminated simply by drawing ambient air through the probe until the HNU reading is at background. More persistent contamination can be washed out using methanol and water, then air drying. Having more than one probe per sample team will reduce lag times between sample stations while probes are decontaminated.

3.9.4 Sample Train Contamination

The Teflon line forming the sample train from the probe to the Tedlar bag should be changed on a daily basis. If visible contamination (soil or water) is drawn into the sampling train, it should be changed immediately. When sampling in highly contaminated areas, the sampling train should be purged with ambient air, via a Gilian pump, for approximately 30 seconds between each sample. After purging, the sampling train can be checked using an HNU, or other field monitoring device, to establish the cleanliness of the Teflon line.

3.9.5 Field Blank

Each cooler containing samples should also contain one Tedlar bag of ultra-zero grade air, acting as a field blank. The field blank should accompany the samples in the field (while being collected) and when they are delivered for analysis. A fresh blank must be provided to be placed in the empty cooler pending additional sample collection. One new field blank per cooler of samples is required. A chain of custody form must accompany each cooler of samples and should include the blank that is dedicated to that group of samples.

3.9.6 Trip Standard

Each cooler containing samples should contain a Tedlar bag of standard gas to calibrate the

analytical instruments (Photovac GC, etc.). This trip standard will be used to determine any changes in concentrations of the target compounds during the course of the sampling day (e.g., migration through the sample bag, degradation, or adsorption). A fresh trip standard must be provided and placed in each cooler pending additional sample collection. A chain of custody form should accompany each cooler of samples and should include the trip standard that is dedicated to that group of samples.

Tedlar Bag Check

Prior to use, one bag should be removed from each lot (case of 100) of Tedlar bags to be used for sampling and checked for possible contamination as follows: the test bag should be filled with ultra-zero grade air; a sample should be drawn from the bag and analyzed via Photovac GC or whatever method is to be used for sample analysis. This procedure will ensure sample container cleanliness prior to the start of the sampling effort.

SUMMA Canister Check

From each lot of four cleaned SUMMA canisters, one is to be removed for a GC/MS certification check. If the canister passes certification, then it is re-evacuated and all four canisters from that lot are available for sampling.

If the chosen canister is contaminated, then the entire lot of four SUMMA canisters must be recleaned, and a single canister is re-analyzed by GC/MS for certification.

3.9.9 Options

Duplicate Samples

A minimum of 5% of all samples should be collected in duplicate (i.e., if a total of 100 samples are to be collected, five samples should be duplicated). In choosing which samples to duplicate, the following criterion applies: if, after filling the first Tedlar bag, and, evacuating the well for 15 seconds, the second HNU (or other field monitoring device being used) reading matches or is close to (within 50%) the first reading, a duplicate sample may be taken.

Spikes

A Tedlar bag spike and Tenax tube spike may be desirable in situations where high concentrations of contaminants other than the target compounds are found to exist (landfills, etc.). The additional level of QA/QC attained by this practice can be useful in determining the effects of interferences caused by these non-target compounds. SUMMA canisters containing samples are not spiked.

3.10 DATA VALIDATION

For each target compound, the level of concentration found in the sample must be greater than three times the level (for that compound) found in the field blank which accompanied that sample to be considered valid. The same criteria apply to target compounds detected in the Tedlar bag pre-sampling contamination check.

3.11 HEALTH AND SAFETY

Because the sample is being drawn from underground, and no contamination is introduced into the breathing zone, soil gas sampling usually occurs in Level D, unless the sampling location is within the hot zone of a site, which requires Level B or Level C protection. However, to ensure that the proper level of protection is utilized, constantly monitor the ambient air using the HNU PI 101 to obtain background readings during the sampling procedure. As long as the levels in ambient air do not rise above background, no upgrade of the level of protection is needed.

Also, perform an underground utility search prior to sampling (see section 3.4.4). When working with potentially hazardous materials, follow U.S. EPA, OSHA, and specific health and safety procedures.

APPENDIX H2

GENERATING STANDARDS

Generating your own standards is inexpensive, easy and straight forward. You simply inject a known volume of liquid phase compound into a one liter container. Knowing the specific gravity and molecular weight of the compound and using the ideal gas law will enable you to compute the gas concentration in ppm of the standard generated.

$PV = nRT$ where P is pressure in atmospheres (A)
V is volume in microliters (ul)
n is the number of moles
R is the gas constant in cm^3 x A/moleK
T is temperature in degrees Kelvin (K)

To generate a 1 ppm standard (1 microliter in a 1 liter container) of any gas, we need to compute the number of moles required. At standard temperature and pressure,

$P = 1$ A
$V = 1$ ul $= 10^{-3} cm^3$
$T = 25$ degrees C + 273.1 = 298.1 K
$R = 82.056 \frac{ccA}{moleK}$

$PV = nRT$

$n = \frac{PV}{RT}$

$n = 4.0882 \times 10^{-8}$ moles

Therefore, if we want to make a 1 ppm standard of any gas in a 1 liter container, we need to inject 4.0882×10^{-8} moles into that container.

To find the number of ul that corresponds to the number of moles use the following equation:

$$\text{number of ul of liquid} = \frac{[c]n(mw)}{D} \times 10^3$$

where mw is molecular weight in grams/mole
D is density in grams/cm^3
[c] is concentration of standard in ppm

We want to generate a 1000 ppm gas standard of TCE. How much liquid phase TCE should we inject into a 1 liter bomb?

Given: $D_{TCE} = 1.4832\ g/cm^3$
$mw_{TCE} = 131.39\ g/mole$

$$\text{number of ul of liquid} = \frac{[c]n(mw)}{D} \times 10^3$$

$$\frac{1000}{1.4832}\ (4.0882 \times 10^{-8})\ (131.39)\ (10^3)$$

number of ul of liquid = 3.62 ul

Therefore, 3.62 ul of liquid TCE injected into a 1 liter container will yield a gas concentration of 1000 ppm.

The following is a list of some commonly detected compounds with their molecular weights and densities:

Compound	Molecular Weight	Density
chloroform	119.38	1.464
TCE	131.39	1.4832
1,1,1 TCA	133.41	1.339
1,1 DCE	96.94	1.218
trans 1,2 DCE	96.94	1.2565
benzene	78	0.88
toluene	92.15	0.8669
m-xylene	106.17	0.8642
o-xylene	106.17	0.8802
p-xylene	106.17	0.8611

APPENDIX H3

(c) "Regional Administrator" means one of the EPA Regional Administrators.

(d) "Director" means the Director of the State Agency authorized to carry out an approved National Pollutant Discharge Elimination System Program under section 402 of the Act.

(e) "National Pollutant Discharge Elimination System (NPDES)" means the national system for the issuance of permits under section 402 of the Act and includes any State or interstate program which has been approved by the Administrator, in whole or in part, pursuant to section 402 of the Act.

(f) "Detection limit" means the minimum concentration of an analyte (substance) that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero as determined by the procedure set forth at Appendix B of this part.

[38 FR 28758, Oct. 16, 1973, as amended at 49 FR 43250, Oct. 26, 1984]

§ 136.3 Identification of test procedures.

(a) Parameters or pollutants, for which methods are approved, are listed together with test procedure descriptions and references in Tables IA, IB, IC, ID, and IE. The full text of the referenced test procedures are incorporated by reference into Tables IA, IB, IC, ID, and IE. The references and the sources from which they are available are given in paragraph (b) of this section. These test procedures are incorporated as they exist on the day of approval and a notice of any change in these test procedures will be published in the FEDERAL REGISTER. The discharge parameter values for which reports are required must be determined by one of the standard analytical test procedures incorporated by reference and described in Tables IA, IB, IC, ID, and IE, or by any alternate test procedure which has been approved by the Administrator under the provisions of paragraph (d) of this section and §§ 136.4 and 136.5 of this Part 136. Under certain circumstances (§ 136.3 (b) or (c) or 40 CFR 401.13) other test procedures may be used that may be more advantageous when such other test procedures have been previously approved by the Regional Administrator of the Region in which the discharge will occur, and providing the Director of the State in which such discharge will occur does not object to the use of such alternate test procedure.

TABLE IA—LIST OF APPROVED BIOLOGICAL TEST PROCEDURES

Parameter and units	Method [1]	EPA [2]	Reference (Method Number or Page)		
			Standard Methods 15th Ed.	ASTM	USGS
Bacteria:					
1. Coliform (fecal) number per 100 ml.	MPN, 5 tube, 3 dilution; or, membrane filter (MF)[4]; single step.	Page 132.	908C		
2. Coliform (fecal) in presence of chlorine number per 100 ml.	MPN, 5 tube, 3 dilution; or, MF[4]; single step.[5]	p. 124	909		B-0050-77
3. Coliform (total) number per 100 ml.	MPN, 5 tube, 3 dilution; or, MF[4] single step or two step.	p. 114	908A		
		p. 108	909A		B-0025-77
4. Coliform (total) in presence of chlorine, number per 100 ml.	MPN, 5 tube, dilution; or MF[4] with enrichment.	p. 114	908A		
		p. 111	909 (A–A.5c)		
5. Fecal streptococci, number per 100 ml	MPN, 5 tube, 3 dilution; MF[4] or, plate count.	p. 139	910A		
	p. 136		910B		B0055-77[3]
	p. 143		910C		

Table IA Notes

[1] The method used must be specified when results are reported.

[2] "Microbiological Methods for Monitoring the Environment, Water and Waste, 1978" EPA-600/8-78-017 U.S. Environmental Protection Agency.

[2] Greeson, P.E., *et al.*, "Methods for Collection and Analysis of Aquatic Biological and Microbiological Samples." U.S. Geological Survey, Techniques of Water-Resources Investigations, Book 5, Chapter A4, Laboratory Analysis, 1977.

[3] 0.45 μm membrane filter or other pore size certified by the manufacturer to fully retain organisms to be cultivated, and free of extractables which could interfere with their growth and development.

[4] Since the membrane filter technique usually yields low and variable recovery from chlorinated wastewaters, the MPN method will be required to resolve any controversies.

[5] Approved only if dissolution of the KF Streptococcus Agar (Section 5.1, USGS Method 8-0055-77) is made in a boiling water bath to avoid scorching of the medium.

TABLE 1B—LIST OF APPROVED INORGANIC TEST PROCEDURES

Parameter, units, and method	Reference (method No. or page)				
	EPA 1979	Standard methods 16th Ed.	ASTM	USGS [1]	Other
1. Acidity, as $CaCO_3$ mg/L: Electrometric end point or phenolphthalein end point.	305.1	402(4.a)	1067-82(E)		
2. Alkalinity, as $CaCO_3$ mg/L:					
Electrometric or colorimetric titration to pH 4.5, manual, or.	310.1	403	D1067-82(B)		33.014[2]
Automated	310.2			I-2030-84	
3. Aluminum—Total [3] mg/L: Digestion [5] followed by:					
AA direct aspiration	202.1	303C		I-3051-84	
AA furnace	202.2	304			
Inductively coupled plasma, or					200.7 [4]
Colorimetric (Eriochrome cyanine R)		309B			
4. Ammonia (as N), mg/L: Manual distillation (at pH 9.5) [6] followed by:	350.2	417A			33.057.[2]
Nesslerization	350.2	417B	D1426-79(A)		
Titration	350.2	417D			
Electrode	350.3	417 E or F	D1426-79(D)		
Automated phenate or	350.1	417G	D1426-79(C)	I-4523-84	
Automated electrode					Note 6.
5. Antimony—Total [3] mg/L: Digestion [5] followed by:					
AA direct aspiration	204.1	303A			
AA furnace, or	204.2	304			
Inductively coupled plasma					200.7.[4]
6. Arsenic—Total [3]. mg/L: Digestion [5] followed by	206.5				
AA gaseous hydride	206.3	303E	D2972-84(B)		
AA furnace	206.2	304			
Inductively coupled plasma, or					200.7.[4]
Colorimetric (SDDC)	206.4	307B	D2972-84(A)	I-3060-84	
7. Barium—Total [3]. mg/L: Digestion [5] followed by:					
AA direct aspiration	208.1	303C		I-3084-84	
AA furnace, or	208.2	304			
Inductively coupled plasma					200.7.[4]
8. Beryllium—Total [3] mg/L: Digestion [5] followed by:					
AA direct aspiration	210.1	303C	D3654-84(A)	I-3095-84	
AA furnace	210.2	304			
Inductively coupled plasma, or					200.7.[4]
Colorimetric (aluminon)		309B			
9. Biochemical oxygen demand (BOD$_5$), mg/L:					
Dissolved Oxygen Depletion	405.1	507		I-1578-78 [7]	33.019 [2], p. 17.[8]
10. Boron—Total, mg/L:					
Colorimetric (curcumin)	212.3	404A		I-3112-84	
or Inductively Coupled plasma					200.7.[4]
11. Bromide, mg/L: Titrimetric	320.1		D1246-82(C)	I-1125-84	p. 344.[8]
12. Cadmium—Total [3], mg/L: Digestion [5] followed by:					
AA direct aspiration	213.1	303 A or B	D3557-84 (A or B).	I-3135-84 or I-3136-84.	33.089 [2], p. 37.[8]
AA furnace	213.2	304			
Inductively coupled plasma					200.7
Voltammetry [10], or			D3557-84(C)		
Colorimetric (Dithizone)		310B			
13. Calcium—Total [3], mg/L: Digestion [5] followed by:					
AA direct aspiration	215.1	303A	D511-84(B)	I-3152-84	

TABLE 1B—LIST OF APPROVED INORGANIC TEST PROCEDURES—Continued

Parameter, units, and method	Reference (method No. or page)				
	EPA 1979	Standard methods 16th Ed.	ASTM	USGS [1]	Other
Inductively coupled plasma, or					200.7.[4]
Titrimetric (EDTA)	215.2	311C	D511-84(A)		
14. Carbonaceous biochemical oxygen demand (CBOD$_5$), mg/L [11]: Dissolved Oxygen Depletion with nitrification inhibitor.		507(5.e.6)			
15. Chemical oxygen demand (COD), mg/L:					
Titrimetric, or	410.1, 410.2, or 410.3	508A	D1252-83	I-3560-84 or I-3562-84.	33.034 [3], p. 17.[4]
Spectrophotometric, manual or automated.	410.4			I-3561-84	Notes 12 or 13.
16. Chloride, mg/L:					
Titrimetric (silver nitrate)		407A	D512-81(B)	I-1183-84	
or (Mercuric nitrate), or	325.3	407B	D512-81(A)	I-1184-84	33.067 [3]
Colorimetric, manual or			D512-81(C)	I-1187-84	
Automated (Ferricyanide)	325.1, or 325.2	407D		I-2187-84	
17. Chlorine—Total residual, mg/L:					
Titrimetric:					
Amperometric direct	330.1	408C	D1253-78(A)		
Starch end point direct	330.3	408A	D1253-78(B)		
			Part 18.3		
Back titration either end point [14], or.	330.2	408B			
DPD-FAS	330.4	408D			
Spectrophotometric, DPD	330.5	408E			
Or Electrode					Note 15.
18. Chromium VI dissolved, mg/L: 0.45 micron filtration followed by:					
AA chelation-extraction, or	218.4	303B		I-1232-84	
Colorimetric (Diphenylcarbazide)				I-1230-84	307B.[14]
19. Chromium—Total [3], mg/L: Digestion [3] followed by:					
AA direct aspiration	218.1	303A	D1687-84(D)	I-3236-84	33.089.[3]
AA chelation extraction	218.3	303B			
AA furnace	218.2	304			
Inductively coupled plasma or					200.7.[4]
Colorimetric (Diphenylcarbazide)		312B	D1687-84(A)		
20. Cobalt—Total [3], mg/L: Digestion [3] followed by:					
AA direct aspiration	219.1	303 A or B	D3558-84 (A or B).	I-3239-84 or I-3240-84	P. 37.[4]
AA furnace, or	219.2	304			
Inductively coupled plasma					200.7.[4]
21. Color platinum cobalt units or dominant wavelength, hue, luminance purity:					
Colorimetric (ADMI), or	110.1	204D			Note 17.
(Platinum cobalt), or	110.2	204A		I-1250-84	
Spectrophotometric	110.3	204B			
22. Copper—Total [3] mg/L: Digestion [3] followed by:					
AA direct aspiration	220.1	303 A or B	D1688-84 (D or E).	I-3270-84 or I-3271-84.	33.089[3], p. 37.[4]
AA furnace	220.2	304			
Inductively coupled plasma					200.7.[4]
Colorimetric (Neocuproine), or		313B	D1688-84(A)		
(Bicinchoninate)					Note 18
23. Cyanide—Total, mg/L: Manual distillation with $MgCl_2$ followed by		412B			
Titrimetric, or		412C			p. 22.[4]
Spectrophotometric, manual or	335.2	412D	D2036-82(A)	I-3300-84	
Automated [15]	335.3		D2036-82(A)		

TABLE 1B—LIST OF APPROVED INORGANIC TEST PROCEDURES—Continued

Parameter, units, and method	Reference (method No. or page)				
	EPA 1979	Standard methods 16th Ed.	ASTM	USGS [1]	Other
24. Cyanide amenable to chlorination, mg/L: Manual distillation with $MgCl_2$ followed by titrimetric or spectrophotometric.	335.1	412F	D2036-82(B)		
25. Fluoride—Total, mg/L: Manual distillation[3] followed by:		413A			
Electrode, manual or	340.2	413B	D1179-80(B)		
Automated				I-4327-84	
Colorimetric (SPADNS)	340.1	413C	D1179-80(A)		
Or Automated complexone	340.3	413E			
26. Gold—Total[3], mg/L: Digestion[3] followed by:					
AA direct aspiration, or	231.1	303A			
AA furnace	231.2	304			
27. Hardness—Total, as $CaCO_3$, mg/L:					
Automated colorimetric	130.1				
Titrimetric (EDTA), or Ca plus Mg as their carbonates, by inductively coupled plasma or AA direct aspiration. (See Parameters 13 and 33.).	130.2	314B			
28. Hydrogen ion (pH), pH units:					
Electrometric, measurement, or	150.1	423	D1293-84 (A or B).	I-1586-84	33.006.[2]
Automated electrode					Note 20.
29. Indium—Total[3], mg/L: Digestion[3] followed by:					
AA direct aspiration, or	235.1	303A			
AA furnace	235.2	304			
30. Iron—Total[3], mg/L: Digestion[3] followed by:					
AA direct aspiration	236.1	303 A or B	D1068-84 (C or D).	I-3381-84	
AA furnace	236.2	304			
Inductively coupled plasma, or					
Colorimetric (Phenanthroline)		315B	D1068-84(A)		
31. Kjeldahl nitrogen—Total, (as N), mg/L: Digestion and distillation followed by:	351.3	420 A or B	D3590-84(A)		
Titration	351.3	417D	D3590-84(A)		33.051.[4]
Nesslerization	351.3	417B	D3590-84(A)		
Electrode	351.3	417 E or F			
Automated phenate	351.1			I-4551-78 [7]	
Semi-automated block digestor, or	351.2		D3590-84(A)		
Potentiometric	351.4		D3590-84(A)		
32. Lead—Total[3], mg/L: Digestion[3] followed by:					
AA direct aspiration	239.1	303 A or B	D3559-85 (A or B).	I-3399-84	33.089.[4]
AA furnace	239.2	304			
Inductively coupled plasma					200.7.[6]
Voltammetry [10], or			D3559-85(C)		
Colorimetric (Dithizone)		316B			
33. Magnesium—Total[3], mg/L: Digestion[3] followed by:					
AA direct aspiration	242.1	303A		I-3447-84	33.089.[4]
Inductively coupled plasma, or					200.7.[6]
Gravimetric		318B	D511-77(A)		
34. Manganese—Total[3], mg/L: Digestion[3] followed by:					
AA direct aspiration	243.1	303 A or B	D858-84 (B or (C).	I-3454-84	33.089.[4]
AA furnace	243.2	304			
Inductively coupled plasma, or					200.7.[6]
Colorimetric (Persulfate), or		319B	D858-84(A)		33.126.[4]
(Periodate)					Note 22.

TABLE 1B—LIST OF APPROVED INORGANIC TEST PROCEDURES—Continued

Parameter, units, and method	Reference (method No. or page)				
	EPA 1979	Standard methods 16th Ed.	ASTM	USGS [1]	Other
35. Mercury—Total [3], mg/L:					
Cold vapor, manual or	245.1	303F	D3223-80	I-3462-84	33.095.[5]
Automated	245.2				
36. Molybdenum—Total [3], mg/L: Digestion [3] followed by:					
AA direct aspiration	246.1	303C		I-3490-84	
AA furnace, or	246.2	304			
Inductively coupled plasma					200.7.[4]
37. Nickel—Total [3], mg/L: Digestion [3] followed by:					
AA direct aspiration	249.1	303 A or B	D1886-84 (C or D).	I-3499-84	
AA furnace	249.2	304			
Inductively coupled plasma, or					200.7.[4]
Colorimetric (Heptoxime)		321B			
38. Nitrate (as N), mg/L: Colorimetric (Brucine sulfate), or Nitrate-nitrite N minus Nitrite N (See parameters 39 and 40).	352.1		D992-71		33.063.[5], 419D.[10], p. 28.[6]
39. Nitrate-nitrite (as N), mg/L: Cadmium reduction, Manual or	353.3	418C	D3867-85(B)		
Automated, or	353.2	418F	D3867-85(A)	I-4545-84	
Automated hydrazine	353.1				
40. Nitrite (as N), mg/L: Spectrophotometric:					
Manual or	354.1	419	D1254-67		Note 24.
Automated (Diazotization)				I-4540-84	
41. Oil and grease—Total recoverable, mg/L: Gravimetric (extraction).	413.1	503A			
42. Organic carbon—Total (TOC), mg/L: Combustion or oxidation.	415.1	505	D2579.85 (A or B).		33.044.[5], p. 4.[23]
43. Organic nitrogen (as N) mg/L: Total Kjeldahl N (Parameter 31) minus ammonia N (Parameter 4.).					
44. Orthophosphate (as P), mg/L: Ascorbic acid method:					
Automated or	365.1	424G		I-4601-84	33.116.[5]
Manual single reagent	365.2	424F	D515-82(A)		33.111.[5]
or Manual two reagent	365.3				
45. Osmium—Total [3], mg/L: Digestion [3] followed by:					
AA direct aspiration, or	252.1	303C			
AA furnace	252.2	304			
46. Oxygen dissolved, mg/L: Winkler (Azide modification), or	360.2	421B	D888-81(C)	I-1575-78 [7]	
Electrode	360.1	421F		I-1576-78 [7]	
47. Palladium—Total [3], mg/L: Digestion [3] followed by:					
AA direct aspiration, or	253.1				P. S27.[9]
AA furnace	253.2				P. S28.[9]
48. Phenols, mg/L:					
Manual distillation [20]	420.1		D1783-80 (A or B).		Note 26.
Followed by:					
Colorimetric (4AAP) manual, or	420.1				Note 26.
Automated [19]	420.2				
49. Phosphorus (elemental) mg/L: Gas-liquid chromatography.					Note 27.
50. Phosphorus—Total, mg/L: Persulfate digestion followed by	365.2	424C(III)			33.111.[5]
Manual or	365.2 or 365.3	424F	D515-82(A)		
Automated ascorbic acid reduction, or.	365.1	424G		I-4600-84	33.116.[5]
Semi-automated block digestor	365.4				

TABLE 1B—LIST OF APPROVED INORGANIC TEST PROCEDURES—Continued

Parameter, units, and method	Reference (method No. or page)				
	EPA 1979	Standard methods 16th Ed.	ASTM	USGS [1]	Other
51. Platinum—Total [5], mg/L: Digestion [3] followed by:					
AA direct aspiration, or	255.1	303A			
AA furnace	255.2	304			
52. Potassium—total [5], mg/L: Digestion followed by:					
AA direct aspiration	258.1	303A		I-3630-84	33.103.[3]
Inductively coupled plasma					200.7.[4]
Flame photometric, or		322B	D1428-82(A)		
Colorimetric (Cobaltinitrite)					317B.[16]
53. Residue—Total, mg/L: Gravimetric, 103–105°C.	160.3			I-3750-84	
54. Residue—filterable, mg/L: Gravimetric, 180°C.	160.1	209B		I-1750-84	
55. Residue—nonfilterable, (TSS), mg/L: Gravimetric, 103–105°C post washing of residue.	160.2			I-3765-84	
56. Residue—settleable, mg/L: Volumetric, (Imhoff cone) or gravimetric.	160.5				
57. Residue—Volatile, mg/L: Gravimetric, 550°C.	160.4			I-3753-84	
58. Rhodium—Total [5], mg/L: Digestion [3] followed by:					
AA direct aspiration, or	265.1	303A			
AA furnace	265.2	304			
59. Ruthenium—Total [5], mg/L: Digestion [3] followed by:					
AA direct aspiration, or	267.1	303A			
AA furnace	267.2	304			
60. Selenium—Total [5], mg/L: Digestion [3] followed by:					
AA furnace	270.2	304			
Inductively coupled plasma, or					200.7.[4]
AA gaseous hydride	270.3	303E	D3859-84(A)	I-3667-84	
61. Silica—Dissolved, mg/L: 0.45 micron filtration followed by:					
Colorimetric, Manual or	370.1	425C	D859-80(B)	I-1700-84	
Automated (Molybdosilicate), or				I-2700-84	
Inductively coupled plasma					200.7.[4]
62. Silver—Total [2,6], mg/L: Digestion [3] followed by:					
AA direct aspiration	272.1	303 A or B		I-3720-84	33.089 [3], p. 37.[6]
AA furnace	272.2	304			
Colorimetric (Dithizone), or					319B.[16]
Inductively coupled plasma					200.7.[4]
63. Sodium—Total [5], mg/L: Digestion [3] followed by:					
AA direct aspiration	273.1	303A		I-3735-84	33.107.[3]
Inductively coupled plasma, or					200.7.[4]
Flame photometric		325B	D1428-82(A)		
64. Specific conductance, micromhos/cm at 25°C: Wheatstone bridge	120.1	205	D1125-82(A)	I-1780-84	33.002.[3]
65. Sulfate (as SO_4), mg/L:					
Automated colorimetric, (barium chloranilate).	375.1				
Gravimetric, or	375.3	426 A or B	D516-82(A)		33.124.[3]
Turbidimetric	375.4		D516-82(B)		426C.[19]
66. Sulfide (as S), mg/L:					
Titrimetric (iodine) or	376.1	427D		I-3840-84	228A.[20]
Colorimetric (methylene blue)	376.2	427C			
67. Sulfite (as SO_3), mg/L: Titrimetric (iodine-iodate).	377.1	428A	D1339-84(C)		
68. Surfactants, mg/L: Colorimetric (methylene blue).	425.1	512B	D2330-82(A)		
69. Temperature, °C: Thermometric	170.1	212			Note 31.

TABLE 1B—LIST OF APPROVED INORGANIC TEST PROCEDURES—Continued

Parameter, units, and method	Reference (method No. or page)				
	EPA 1979	Standard methods 16th Ed.	ASTM	USGS [1]	Other
70. Thallium—Total [2], mg/L: Digestion [3] followed by:					
AA direct aspiration	279.1	303A			
AA furnace, or	279.2	304			
Inductively coupled plasma					200.7.[4]
71. Tin—Total [2], mg/L: Digestion [3] followed by:					
AA direct aspiration, or	282.1	303A		I-3850-78 [7]	
AA furnace	282.2	304			
72. Titanium—Total [2], mg/L: Digestion [3] followed by:					
AA direct aspiration, or	283.1	303C			
AA furnace	283.2	304			
73. Turbidity, NTU: Nephelometric	180.1	214A	D1889-81	I-3860-84	
74. Vanadium, Total [2], mg/L: Digestion [3] followed by:					
AA direct aspiration	286.1	303C			
AA furnace	286.2	304			
Inductively coupled plasma, or					200.7.[4]
Colorimetric (Gallic acid)		327B	D3373-84(A)		
75. Zinc-Total [2], mg/L: Digestion [3] followed by:					
AA direct aspiration	289.1	303A or B	D1691-84 (C or D).	I-3900-84	33.089 [8], p. 37.[4]
AA furnace	289.2	304			
Inductively coupled plasma, or					200.7.[4]
Colorimetric (Dithizone) or		328C			
(Zincon)					Note 32.

[1] "Methods for Analysis of Inorganic Substances in Water and Fluvial Sediments," U.S. Department of the Interior, U.S. Geological Survey, Open-File Report 85-495, 1986, unless otherwise stated.

[2] "Official Methods of Analysis of the Association of Official Analytical Chemists," methods manual, 14th ed. (1985).

[3] For the determination of total metals the sample is not filtered before processing. A digestion procedure is required to solubilize suspended material and to destroy possible organic-metal complexes. Two digestion procedures are given in "Methods for Chemical Analysis of Water and Wastes, 1979." One (section 4.1.3), is a vigorous digestion using nitric acid. A less vigorous digestion using nitric and hydrochloric acids (Section 4.1.4) is preferred; however, the analyst should be cautioned that this mild digestion may not suffice for all sample types. Particularly, if a colorimetric procedure is to be employed, it is necessary to ensure that all organo-metallic bonds be broken so that the metal is in a reactive state. In those situations, the vigorous digestion is to be preferred making certain that at no time does the sample go to dryness. Samples containing large amounts of organic materials would also benefit by this vigorous digestion. Use of the graphite furnace technique, inductively coupled plasma, as well as determinations for certain elements such as arsenic, the noble metals, mercury, selenium, and titanium require a modified digestion and in all cases the method write-up should be consulted for specific instruction and/or cautions.

NOTE: If the digestion included in one of the other approved references is different than the above, the EPA procedure must be used.

Dissolved metals are defined as those constituents which will pass through a 0.45 micron membrane filter. Following filtration of the sample, the referenced procedure for total metals must be followed. Sample digestion for dissolved metals may be omitted for AA (direct aspiration or graphite furnace) and ICP analyses provided the sample solution to be analyzed meets the following criteria:

a. has a low COD (<20)
b. is visibly transparent with a turbidity measurement of 1 NTU or less,
c. is colorless with no perceptable odor, and
d. is of one liquid phase and free of particulate or suspended matter following acidification.

[4] The full text of Method 200.7, "Inductively Coupled Plasma Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes," is given at Appendix C of this Part 136.

[5] Manual distillation is not required if comparability data on representative effluent samples are on company file to show that this preliminary distillation step is not necessary; however, manual distillation will be required to resolve any controversies.

[6] Ammonia, Automated Electrode Method, Industrial Method Number 379-75 WE, dated February 19, 1976, Technicon AutoAnalyzer II, Technicon Industrial Systems, Tarrytown, NY, 10591.

[7] The approved method is that cited in "Methods for Determination of Inorganic Substances in Water and Fluvial Sediments", USGS TWRI, Book 5, Chapter A1 (1979).

[8] American National Standard on Photographic Processing Effluents, Apr. 2, 1975. Available from ANSI, 1430 Broadway, New York, NY 10018.

[9] "Selected Analytical Methods Approved and Cited by the United States Environmental Protection Agency," Supplement to the Fifteenth Edition of *Standard Methods for the Examination of Water and Wastewater* (1981).

[10] The use of normal and differential pulse voltage ramps to increase sensitivity and resolution is acceptable.

[11] Carbonaceous biochemical oxygen demand ($CBOD_5$) must not be confused with the traditional BOD_5 test which measures "total BOD." The addition of the nitrification inhibitor is not a procedural option, but must be included to report the $CBOD_5$ parameter. A discharger whose permit requires reporting the traditional BOD_5 may not use a nitrification inhibitor in the procedure for reporting the results. Only when a discharger's permit specifically states $CBOD_5$ is required, can the permittee report data using the nitrification inhibitor.

[12] OIC Chemical Oxygen Demand Method, Oceanography International Corporation, 512 West Loop, P.O. Box 2980, College Station, TX 77840.

[13] Chemical Oxygen Demand, Method 8000, Hach Handbook of Water Analysis, 1979, Hach chemical Company, P.O. Box 389, Loveland, CO 80537.

[14] The back titration method will be used to resolve controversy.

[15] Orion Research Instruction Manual, Residual Chlorine Electrode Model 97-70, 1977, Orion Research Incorporated, 840 Memorial Drive, Cambridge, MA 02138.

[16] The approved method is that cited in *Standard Methods for the Examination of Water and Wastewater*, 14th Edition, 1976.

[17] National Council of the Paper Industry for Air and Stream Improvement, (Inc.) Technical Bulletin 253, December 1971.

[18] Copper, Bicinchoninate Method, Method 8506, Hach Handbook of Water Analysis, 1979, Hach Chemical Company, P.O. Box 389, Loveland, CO 80537.

[19] After the manual distillation is completed, the autoanalyzer manifolds in EPA Methods 335.3 (cyanide) or 420.2 (phenols) are simplified by connecting the re-sample line directly to the sampler. When using the manifold setup shown in Method 335.3, the buffer 6.2 should be replaced with the buffer 7.6 found in Method 335.2.

[20] Hydrogen Ion (pH) Automated Electrode Method, Industrial Method Number 378-75WA, October 1976, Technicon Auto-Analyzer II, Technicon Industrial Systems, Tarrytown, NY 10591.

[21] Iron, 1,10-Phenanthroline Method, Method 8008, 1980, Hach Chemical Company, P.O. Box 389, Loveland, CO 80537.

[22] Manganese, Periodate Oxidation Method, Method 8034, Hach Handbook of Wastewater Analysis, 1979, pages 2-113 and 2-117, Hach Chemical Company, Loveland, CO 80537.

[23] Goerlitz, D., Brown, E., "Methods for Analysis of Organic Substances in Water," U.S. Geological Survey Techniques of Water-Resources Inv., book 5, ch. A3, page 4 (1972).

[24] Nitrogen, Nitrite, Method 8507, Hach Chemical Company, P.O. Box 389, Loveland, CO 80537.

[25] Just prior to distillation, adjust the sulfuric-acid-preserved sample to pH 4 with 1 + 9 NaOH.

[26] The approved method is that cited in *Standard Methods for the Examination of Water and Wastewater*, 14th Edition. The colorimetric reaction is conducted at a pH of 10.0±0.2. The approved methods are given on pp. 576–81 of the 14th Edition: Method 510A for distillation, Method 510B for the manual colorimetric procedure, or Method 510C for the manual spectrophotometric procedure.

[27] R. F. Addison and R. G. Ackman, "Direct Determination of Elemental Phosphorus by Gas-Liquid Chromatography," *Journal of Chromatography*, vol. 47, No. 3, pp. 421–426, 1970.

[28] Approved methods for the analysis of silver in industrial wastewaters at concentrations of 1 mg/L and above are inadequate where silver exists as an inorganic halide. Silver halides such as the bromide and chloride are relatively insoluble in reagents such as nitric acid but are readily soluble in an aqueous buffer of sodium thiosulfate and sodium hydroxide to a pH of 12. Therefore, for levels of silver above 1 mg/L, 20 mL of sample should be diluted to 100 mL by adding 40 mL each of 2 M $Na_2S_2O_3$ and 2M NaOH. Standards should be prepared in the same manner. For levels of silver below 1 mg/L the approved method is satisfactory.

[29] The approved method is that cited in *Standard Methods for the Examination of Water and Wastewater*, 15th Edition.

[30] The approved method is that cited in *Standard Methods for the Examination of Water and Wastewater*, 13th Edition.

[31] Stevens, H. H., Ficke, J. F., and Smoot, G. F., "Water Temperature—Influential Factors, Field Measurement and Data Presentation," U.S. Geological Survey, Techniques of Water Resources Investigations, Book 1, Chapter D1, 1975.

[32] Zinc, Zincon Method, Method 8009, Hach Handbook of Water Analysis, 1979, pages 2-231 and 2-233, Hach Chemical Company, Loveland, CO 80537.

TABLE IC—LIST OF APPROVED TEST PROCEDURES FOR NON-PESTICIDE ORGANIC COMPOUNDS

Parameter [1]	EPA Method Number [2] [3]			Other
	GC	GC/MS	HPLC	
1. Acenaphthene	610	625, 1625	610	
2. Acenaphthylene	610	625, 1625	610	
3. Acrolein	603	[4]624, 1624		
4. Acrylonitrile	603	[4]624, 1624		
5. Anthracene	610	625, 1625	610	
6. Benzene	602	624, 1624		
7. Benzidine		[5]625, 1625	605	Note 3, p. 1
8. Benzo(a)anthracene	610	625, 1625	610	
9. Benzo(a)pyrene	610	625, 1625	610	
10. Benzo(b)fluoranthene	610	625, 1625	610	
11. Benzo(g,h,i)perylene	610	625, 1625	610	
12. Benzo(k)fluoranthene	610	625, 1625	610	
13. Benzyl chloride				Note 3, p. 130; Note 6, p. S102.
14. Benzyl butyl phthalate	606	625, 1625		
15. Bis(2-chloroethoxy) methane	611	625, 1625		
16. Bis(2-chloroethyl) ether	611	625, 1625		
17. Bis(2-ethylhexyl) phthalate	606	625, 1625		
18. Bromodichloromethane	601	624, 1624		
19. Bromoform	601	624, 1624		
20. Bromomethane	601	624, 1624		
21. 4-Bromophenylphenyl ether	611	625, 1625		
22. Carbon tetrachloride	601	624, 1624		Note 3, p. 130;
23. 4-Chloro-3-methylphenol	604	625, 1625		
24. Chlorobenzene	601, 602	624, 1624		Note 3, p. 130;
25. Chloroethane	601	624, 1624		
26. 2-Chloroethylvinyl ether	601	624, 1624		

TABLE IC—LIST OF APPROVED TEST PROCEDURES FOR NON-PESTICIDE ORGANIC COMPOUNDS—Continued

Parameter [1]	EPA Method Number [2]			Other
	GC	GC/MS	HPLC	
27. Chloroform	601	624, 1624		Note 3, p. 130;
28. Chloromethane	601	624, 1624		
29. 2-Chloronaphthalene	612	625, 1625		
30. 2-Chlorophenol	604	625, 1625		
31. 4-Chlorophenylphenyl ether	611	625, 1625		
32. Chrysene	610	625, 1625	610	
33. Dibenzo(a,h)anthracene	610	625, 1625	610	
34. Dibromochloromethane	601	624, 1624		
35. 1,2-Dichlorobenzene	601, 602, 612	624, 625, 1625		
36. 1,3-Dichlorobenzene	601, 602, 612	624, 625, 1625		
37. 1,4-Dichlorobenzene	601, 602, 612	625, 1624, 1625		
38. 3,3'-Dichlorobenzidine		625, 1625	605	
39. Dichlorodifluoromethane	601			
40. 1,1-Dichloroethane	601	624, 1624		
41. 1,2-Dichloroethane	601	624, 1624		
42. 1,1-Dichloroethene	601	624, 1624		
43. trans-1,2-Dichloroethene	601	624, 1624		
44. 2,4-Dichlorophenol	604	625, 1625		
45. 1,2-Dichloropropane	601	624, 1624		
46. cis-1,3-Dichloropropene	601	624, 1624		
47. trans-1,3-Dichloropropene	601	624, 1624		
48. Diethyl phthalate	606	625, 1625		
49. 2,4-Dimethylphenol	604	625, 1625		
50. Dimethyl phthalate	606	625, 1625		
51. Di-n-butyl phthalate	606	625, 1625		
52. Di-n-octyl phthalate	606	625, 1625		
53. 2,4-Dinitrophenol	604	625, 1625		
54. 2,4-Dinitrotoluene	609	625, 1625		
55. 2,6-Dinitrotoluene	609	625, 1625		
56. Epichlorohydrin				Note 3, p. 130; Note 6, p. S102.
57. Ethylbenzene	602	624, 1624		
58. Fluoranthene	610	625, 1625	610	
59. Fluorene	610	625, 1625	610	
60. Hexachlorobenzene	612	625, 1625		
61. Hexachlorobutadiene	612	625, 1625		
62. Hexachlorocyclopentadiene	612	[3]625, 1625		
63. Hexachloroethane	612	625, 1625		
64. Ideno(1,2,3-cd)pyrene	610	625, 1625	610	
65. Isophorone	609	625, 1625		
66. Methylene chloride	601	624, 1624		Note 3, p. 130;
67. 2-Methyl-4,6-dinitrophenol	604	625, 1625		
68. Naphthalene	610	625, 1625	610	
69. Nitrobenezene	609	625, 1625		
70. 2-Nitrophenol	604	625, 1625		
71. 4-Nitrophenol	604	625, 1625		
72. N-Nitrosodimethylamine	607	625, 1625		
73. N-Nitrosodi-n-propylamine	607	[3]625, 1625		
74. N-Nitrosodiphenylamine	607	[3]625, 1625		
75. 2,2'-Oxybis(1-chloropropane)	611	625, 1625		
76. PCB-1016	608	625		Note 3, p. 43;
77. PCB-1221	608	625		Note 3, p. 43;
78. PCB-1232	608	625		Note 3, p. 43;
79. PCB-1242	608	625		Note 3, p. 43;
80. PCB-1248	608	625		Note 3, p. 43;
81. PCB-1254	608	625		Note 3, p. 43;
82. PCB-1260	608	625		Note 3, p. 43;
83. Pentachlorophenol	604	625, 1625		Note 3, p. 140;
84. Phenanthrene	610	625, 1625	610	
85. Phenol	604	625, 1625		
86. Pyrene	610	625, 1625	610	
87. 2,3,7,8-Tetrachlorodibenzo-p-dioxin		[4]613		
88. 1,1,2,2-Tetrachloroethane	601	624, 1624		Note 3, p. 130;
89. Tetrachloroethene	601	624, 1624		Note 3, p. 130;
90. Toluene	602	624, 1624		
91. 1,2,4-Trichlorobenzene	612	625, 1625		Note 3, p. 130;

TABLE IC—LIST OF APPROVED TEST PROCEDURES FOR NON-PESTICIDE ORGANIC COMPOUNDS—Continued

Parameter [1]	EPA Method Number [2, 7]			Other
	GC	GC/MS	HPLC	
92. 1,1,1-Trichloroethane	601	624, 1624		Note 3, p. 130;
93. 1,1,2-Trichloroethane	601	624, 1624		
94. Trichloroethene	601	624, 1624		
95. Trichlorofluoromethane	601	624		
96. 2,4,6-Trichlorophenol	604	625, 1625		
97. Vinyl chloride	601	624, 1624		

Table IC Notes

[1] All parameters are expressed in micrograms per liter (µg/L).

[2] The full text of Methods 601–613, 624, 625, 1624, and 1625, are given at Appendix A, "Test Procedures for Analysis of Organic Pollutants," of this Part 136. The standardized test procedure to be used to determine the method detection limit (MDL) for these test procedures is given at Appendix B, "Definition and Procedure for the Determination of the Method Detection Limit," of this Part 136.

[3] "Methods for Benzidine, Chlorinated Organic Compounds, Pentachlorophenol and Pesticides in Water and Wastewater," U.S. Environmental Protection Agency, September, 1978.

[4] Method 624 may be extended to screen samples for Acrolein and Acrylonitrile. However, when they are known to be present, the preferred method for these two compounds is Method 603 or Method 1624.

[5] Method 625 may be extended to include benzidine, hexachlorocyclopentadiene, N-nitrosodimethylamine, and N-nitrosodiphenylamine. However, when they are known to be present, Methods 605, 607, and 612, or Method 1625, are preferred methods for these compounds.

[6] 625, Screening only.

[7] "Selected Analytical Methods Approved and Cited by the United States Environmental Protection Agency," Supplement to the Fifteenth Edition of *Standard Methods for the Examination of Water and Wastewater* (1981).

[8] Each analyst must make an initial, one-time, demonstration of their ability to generate acceptable precision and accuracy with Methods 601–613, 624, 625, 1624, and 1625 (See Appendix A of this Part 136) in accordance with procedures each in section 8.2 of each of these Methods. Additionally, each laboratory, on an on-going bases must spike and analyze 10% (5% for Methods 624 and 625 and 100% for methods 1624, and 1625) of all samples to monitor and evaluate laboratory data quality in accordance with sections 8.3 and 8.4 of these Methods. When the recovery of any parameter falls outside the warning limits, the analytical results for that parameter in the unspiked sample are suspect and cannot be reported to demonstrate regulatory compliance.

NOTE: These warning limits are promulgated as an "interim final action with a request for comments."

TABLE ID—LIST OF APPROVED TEST PROCEDURES FOR PESTICIDES [1]

Parameter µg/L)	Method	EPA [2, 7]	Standard Methods 15th Ed	ASTM	Other
1. Aldrin	GC	608	509A	D3086	Note 1, p. 7; Note 4, p. 30.
	GC/MS	625			
2. Ametryn	GC				Note 1, p. 83; Note 6, p. S68.
3. Aminocarb	TLC				Note 1, p. 94; Note 6, p. S16.
4. Atrazin	GC				Note 1, p. 83; Note 6, p. S68.
5. Atrazine	GC				Note 1, p. 83; Note 6, p. S68.
6. Azinphos methyl	GC				Note 1, p. 25; Note 6, p. S51.
7. Barban	TLC				Note 1, p. 104; Note 6, p. S84.
8. α-BHC	GC	608	509A	D3086	Note 3, p. 7.
	GC/MS	[6] 625			
9. β-BHC	GC	608		D3086	
	GC/MS	625			
10. δ-BHC	GC	608		D3086	
	GC/MS	[6] 625			
11. γ-BHC (Lindane)	GC	608	509A	D3086	Note 1, p. 7; Note 4, p. 30.
	GC/MS	625			
12. Captan	GC		509A		Note 3, p. 7.
13. Carbaryl	TLC				Note 1, p. 94; Note 6, p. S80.
14. Carbophenothion	GC				Note 4, p. 30; Note 6, p. S73.
15. Chlordane	GC	608	509A	D3086	Note 3, p. 7.
	GC-MS	625			
16. Chloropropham	TLC				Note 1, p. 104; Note 6, p. S84.
17. 2,4-D	GC		509B		Note 1, p. 115; Note 4, p. 35.
18. 4,4'-DDD	GC	608	509A	D3086	Note 1, p. 7; Note 4, p. 30.
	GC-MS	625			
19. 4,4'-DDE	GC	608	509A	D3086	
	GC/MS	625			
20. 4,4'-DDT	GC	608	509A	D3086	
	GC/MS	625			

TABLE ID—LIST OF APPROVED TEST PROCEDURES FOR PESTICIDES [1]—Continued

Parameter µg/L	Method	EPA [2,7]	Standard Methods 15th Ed	ASTM	Other
21. Demeton-O	GC				Note 3, p. 25; Note 6, p. S51.
22. Demeton-S	GC				Note 3, p. 25; Note 6, p. S51.
23. Diazinon	GC				Note 3, p. 25; Note 4, p. 30; Note 6, p. S51.
24. Dicamba	GC				Note 3, p. 115.
25. Dichlofenthion	GC				Note 4, p. 30; Note 6, p. S73.
26. Dichloran	GC		509A		Note 3, p. 7.
27. Dicofol	GC			D3086	
28. Dieldrin	GC	608	509A		Note 3, p. 7; Note 4, p. 30.
	GC/MS	625			
29. Dioxathion	GC				Note 4, p. 30; Note 6, p. S73.
30. Disulfoton	GC				Note 3, p. ; Note 6, p. S51.
31. Diuron	TLC				Note 3, p. 104; Note 6, p. S64.
32. Endosulfan I	GC	608	509A	D3086	Note 3, p. 7.
	GC/MS	[8] 625			
33. Endosulfan II	GC	608	509A	D3086	Note 3, p. 7.
	GC/MS	[8] 625			
34. Endosulfan sulfate	GC	608			
	GC/MS	625			
35. Endrin	GC	608	509A	D3086	Note 3, p. 7; Note 4, p. 30.
	GC/MS	[8] 625			
36. Endrin aldehyde	GC	608			
	GC/MS	625			
37. Ethion	GC				Note 4, p. 30; Note 6, p. S73.
38. Fenuron	TLC				Note 3, p. 104; Note 6, p. S64.
39. Fenuron-TCA	TLC				Note 3, p. 104; Note 6, p. S64.
40. Heptachlor	GC	608	509A	D3086	Note 3, p. 7; Note 4, p. 30.
	GC/MS	625			
41. Heptachlor epoxide	GC	608	509A	D3086	Note 3, p. 7; Note 4, p. 30; Note 6, p. S73.
	GC/MS	625			
42. Isodrin	GC				Note 4, p. 30; Note 6, p. S73.
43. Linuron	TLC				Note 3, p. 104; Note 6, p. S64.
44. Malathion	GC		509A		Note 3, p. 25; Note 4, p. 30; Note 6, p. S51.
45. Methiocarb	TLC				Note 3, p. 94; Note 6, p. S60.
46. Methoxychlor	GC		509A	D3086	Note 3, p. 7; Note 4, p. 30.
47. Mexacarbate	TLC				Note 3, p. 94; Note 6, p. S60.
48. Mirex	GC		509A		Note 3, p. 7.
49. Monuron	TLC				Note 3, p. 104; Note 6, p. S64.
50. Monuron-TCA	TLC				Note 3, p. 104; Note 6, p. S64.
51. Neburon	TLC				Note 3, p. 104; Note 6, p. S64.
52. Parathion methyl	GC		509A		Note 3, p. 25; Note 4, p. 30.
53. Parathion ethyl	GC		509A		Note 3, p. 25.
54. PCNB	GC		509A		Note 3, p. 7.
55. Perthane	GC			D3086	
56. Prometon	GC				Note 3, p. 83; Note 6, p. S68.
57. Prometryn	GC				Note 3, p. 83; Note 6, p. S68.
58. Propazine	GC				Note 3, p. 83; Note 6, p. S68.
59. Propham	TLC				Note 3, p. 104; Note 6, p. S64.
60. Propoxur	TLC				Note 3, p. 94; Note 6, p. S60.
61. Secbumeton	TLC				Note 3, p. 83; Note 6, p. S68.
62. Siduron	TLC				Note 3, p. 104; Note 6, p. S64.
63. Simazine	GC				Note 3, p. 83; Note 6, p. S68.
64. Strobane	GC		509A		Note 3, p. 7.
65. Swep	TLC				Note 3, p. 104; Note 6, p. S64.
66. 2,4,5-T	GC		509B		Note 3, p. 115; Note 4, p. 35.
67. 2,4,5-TP (Silvex)	GC		509B		Note 3, p. 115.
68. Terbuthylazine	GC				Note 3, p. 83; Note 6, p. S68.
69. Toxaphene	GC	608	509A	D3086	Note 3, p. 7; Note 4, p. 30.
	GC/MS	625			
70. Trifluralin	GC		509A		Note 3, p. 7

Table ID Notes

[1] Pesticides are listed in this table by common name for the convenience of the reader. Additional pesticides may be found under Table IC, where entries are listed by chemical name.

[1] The full text of methods 608 and 625 are given at Appendix A, "Test Procedures for Analysis of Organic Pollutants," of this Part 136. The standardized test procedure to be used to determine the method detection limit (MDL) for these test procedures is given at Appendix B, "Definition and Procedure for the Determination of the Method Detection Limit", of this Part 136.

[2] "Methods for Benzidine, Chlorinated Organic Compounds, Pentachlorophenol and Pesticides in Water and Wastewater," U.S. Environmental Protection Agency, September, 1978. This EPA publication includes thin-layer chromatography (TLC) methods.

[3] "Methods for Analysis of Organic Substances in Water," U.S. Geological Survey, Techniques of Water-Resources Investigations, Book 5, Chapter A3 (1972).

[4] The method may be extended to include α-BHC, β-BHC, endosulfan I, endosulfan II, and endrin. However, when they are known to exist, Method 608 is the preferred method.

[5] "Selected Analytical Methods Approved and Cited by the United States Environmental Protection Agency," Supplement to the Fifteenth Edition of *Standard Methods for the Examination of Water and Wastewater* (1981).

[6] Each analyst must make an initial, one-time, demonstration of their ability to generate acceptable precision and accuracy with Methods 608 and 625 (See Appendix A of this Part 136) in accordance with procedures given in section 8.2 of each of these methods. Additionally, each laboratory, on an on-going basis, must spike and analyze 10% of all samples analyzed with Method 608 or 5% of all samples analyzed with Method 625 to monitor and evaluate laboratory data quality in accordance with Sections 8.3 and 8.4 of these methods. When the recovery of any parameter falls outside the warning limits, the analytical results for that parameter in the unspiked sample are suspect and cannot be reported to demonstrate regulatory compliance.

NOTE: These warning limits are promulgated as an "Interim final action with a request for comments."

TABLE IE—LIST OF APPROVED RADIOLOGICAL TEST PROCEDURES

Parameter and units	Methods	EPA [1]	Reference (method No. or page)		
			Standard methods 16th ed.	ASTM	USGS [2]
1. Alpha-Total, pCi per liter	Proportional or scintillation counter.	900.0	703	D1943-81	pp. 75 and 78.[3]
2. Alpha-Counting error, pCi per liter.	Proportional or scintillation counter.	Appendix B	703	D1943-81	p. 79.
3. Beta-Total, pCi per liter	Proportional counter	900.0	703	D1890-81	pp. 75 and 78.[3]
4. Beta-Counting error, pCi	Proportional counter	Appendix B	703	D1890-81	p. 79.
5. (a) Radium-Total, pCi per liter.	Proportional counter	903.0	705	D2460-70	
(b) ^{226}Ra, pCi per liter	Scintillation counter	903.1	706	D3454-79	p. 81.

TABLE IE NOTES:

[1] "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA-600/4-80-032 (1980 update), U.S. Environmental Protection Agency, August 1980.

[2] Fishman, M.J. and Brown, Eugene, "Selected Methods of the U.S. Geological Survey of Analysis of Wastewaters," U.S. Geological Survey, Open-File Report 76-177 (1976).

[3] The method found on p. 75 measures only the dissolved portion while the method on p. 78 measures only the suspended portion. Therefore, the two results must be added to obtain the "total."

(b) The full texts of the methods from the following references which are cited in Tables IA, IB, IC, ID, and IE are incorporated by reference into this regulation and may be obtained from the sources identified. All costs cited are subject to change and must be verified from the indicated sources. The full texts of all the test procedures cited are available for inspection at the Office of the Federal Register, Room 8301, 1110 L Street, NW., Washington, DC 20408.

REFERENCES, SOURCES, COSTS, AND TABLE CITATIONS:

(1) The full texts of Methods 601-613, 624, 625, 1624, and 1625 are printed in Appendix A of this Part 136. The full text for determining the method detection limit when using the test procedures is given in Appendix B of this Part 136. The full text of Method 200.7 is printed in Appendix C of this Part 136. Cited in: Table IB, Note 4; Table IC, Note 2; and Table ID, Note 2.

(2) "Microbiological Methods for Monitoring the Environment, Water and Wastes," U.S. Environmental Protection Agency, EPA-600/8-78-017, 1978. Available from: ORD Publications, CERI, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268. Table IA, Note 2.

(3) "Methods for Chemical Analysis of Water and Wastes," U.S. Environmental Protection Agency, EPA-600/4-79-020, March, 1979. Available from ORD Publications, CERI, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268. Table IB.

(4) "Methods for Benzidine, Chlorinated Organic Compounds, Pentachlorophenol and Pesticides in Water and Wastewater," U.S. Environmental Protection Agency, 1978. Available from: ORD Publications, CERI, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268. Table IC, Note 3; Table ID, Note 3.

(5) "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," U.S. Environmental Protection Agency, EPA-600/4-80-032, 1980. Available from ORD Publications, CERI, U.S. Environmen-

tal Protection Agency, Cincinnati, Ohio 45268. Table IE, Note 1.

(6) *Standard Methods for the Examination of Water and Wastewater*, Joint Editorial Board, American Public Health Association, American Water Works Association, and Water Pollution Control Federation, 16th Edition, 1985. Available from: American Public Health Association, 1015 Fifteenth Street, NW., Washington, DC 20036. Cost: $90.00. Tables IB and IE.

(7) Ibid, 15th Edition. Table IA; Table IB, note 29; Table ID.

(8) Ibid, 14th Edition. Table IB, Notes 16 and 26.

(9) Ibid, 13th Edition. Table IB, Note 30.

(10) "Selected Analytical Methods Approved and Cited by the United States Environmental Protection Agency," Supplement to the 15th Edition of *Standard Methods for the Examination of Water and Wastewater*, 1981. Available from: American Public Health Association, 1015 Fifteenth Street NW. Washington, DC 20036. Cost available from publisher. Table IB, Note 9; Table IC, Note 6; Table ID, Note 6.

(11) "Annual Book of Standards, section 11, Water," American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103. Cost available from publisher. Tables IB, ID, and IE.

(12) "Methods for Collection and Analysis of Aquatic Biological and Microbiological Samples," edited by P.E. Greason, T.A. Ehlke, G.A. Irwin, B.W. Lium, and K.V. Slack, U.S. Geological Survey, Techniques of Water Resources Investigation (USGS TWRI), Book 5, Chapter A4 (1977). Available from: U.S. Geological Survey, Branch of Distribution, 1200 South Eads Street, Arlington, VA 22202. Cost: $9.25 (subject to change). Table IA.

(13) "Methods for Determination of Inorganic Substances in Water and Fluvial Sediments," by M.J. Fishman and Linda C. Friedman; U.S. Geological Survey Open File Report 85-495 (1986). Available from U.S. Geological Survey, Western Distribution Branch, Box 24525, Denver Federal Center, Denver, CO 80225. Cost $108.75 (subject to change). Table IB, Note 1.

(14) "Methods for Determination of Inorganic Substances in Water and Fluvial Sediments," N.W. Skougstad and others, editors, USGS TWRI, Book 5, Chapter A1 (1979). Available from U.S. Geological Survey, Branch of Distribution, 1200 South Eads Street, Arlington, VA 22202. Cost $10.00 (subject to change). Table IB, Note 7.

(15) "Methods for Analysis of Organic Substances in Water," by D.F. Goerlitz and Eugene Brown: USGS TWRI, Book 5, Chapter A3 (1972). Available from U.S. Geological Survey, Branch of Distribution, 1200 South Eads Street, Arlington, VA 22202. Cost $0.90 (subject to change). Table IB, Note 23; Table ID, Note 4.

(16) "Water Temperature--Influential Factors, Field Measurement and Data Presentation," by H.H. Stevens, Jr., J. Ficke, and G.F. Smoot: USGS TWRI Book 1, Chapter D1, 1975. Available from U.S. Geological Survey, Branch of Distribution, 1200 South Eads Street, Arlington, VA 22202. Cost $1.60 (subject to change). Table IB, Note 31.

(17) "Selected Methods of the U.S. Geological Survey of Analysis of Wastewaters," by M.J. Fishman and Eugene Brown: U.S. Geological Survey Open File Report 76-77 (1976). Available from U.S. Geological Survey, Branch of Distribution, 1200 South Eads Street, Arlington, VA 22202. Cost $13.50 (subject to change). Table IE, Note 2.

(18) Official Methods of Analysis of the Association of Official Analytical Chemicals, methods manual, 14th Edition (1985). Price: $145.50. Available from: The Association of Official Analytical Chemicals, 1111 N. 19th Street, Suite 210, Arlington, VA 22209. Table IB, Note 2.

(19) "American National Standard on Photographic Processing Effluents," April 2, 1975. Available from: American National Standards Institute, 1430 Broadway, New York, New York 10018. Table IB, Note 8.

(20) "An Investigation of Improved Procedures for Measurement of Mill Effluent and Receiving Water Color," NCASI Technical Bulletin No. 253, December 1971. Available from: National Council of the Paper Industry for Air and Stream Improvements, Inc., 260 Madison Avenue. Cost available from publisher. Table IB, Note 17.

(21) Ammonia, Automated Electrode Method, Industrial Method Number 379-75WE, dated February 19, 1976. Technicon AutoAnalyzer II. Method and price available from Technicon Industrial Systems, Tarrytown, New York 10591. Table IB, Note 6.

(22) Chemical Oxygen Demand, Method 8000, Hach Handbook of Water Analysis, 1979. Method and price available from Hach Chemical Company, P.O. Box 389, Loveland, Colorado 80537. Table IB, Note 13.

(23) OIC Chemical Oxygen Demand Method. Method and price available from Oceanography International Corporation, 512 West Loop, P.O. Box 2980, College Station, Texas 77840. Table IB, Note 12.

(24) ORION Research Instruction Manual, Residual Chlorine Electrode Model 97-70, 1977. Method and price available from Orion Research Incorporation, 840 Memorial Drive, Cambridge, Massachusetts 02138. Table IB, Note 15.

(25) Bicinchoninate Method for Copper, Method 8506, Hach Handbook of Water Analysis, 1979. Method and price available from Hach Chemical Company, P.O. Box 300, Loveland, Colorado 80537. Table IB, Note 18.

(26) Hydrogen Ion (pH) Automated Electrode Method, Industrial Method Number 378-75WA, October 1976, Technicon AutoAnalyzer II. Method and price available from Technicon Industrial Systems, Tarrytown, New York 10591. Table IB, Note 20.

(27) 1, 10-Phenanthroline Method for Iron, Hach Method 8008. Method and price available from Hach Chemical Company, P.O. Box 389, Loveland, Colorado 80537. Table IB, Note 21.

(28) Periodate Oxidation Method for Manganese, Method 8034. Hach Handbook for Water Analysis, 1979. Method and price available from Hach Chemical Company, P.O. Box 389, Loveland, Colorado 80537. Table IB, Note 22.

(29) Nitrite Nitrogen, Hach Method 8507. Method and price available from Hach Chemical Company, P.O. Box 389, Loveland, Colorado 80537. Table IB, Note 24.

(30) Zincon Method for Zinc, Method 8009, Hach Handbook for Water Analysis, 1979. Method and price available from Hach Chemical Company, P.O. Box 389, Loveland, Colorado 80537. Table IB, Note 32.

(31) "Direct Determination of Elemental Phosphorus by Gas-Liquid Chromatography," by R.P. Addison and R.G. Ackman, Journal of Chromatography, Volume 47, No. 3, pp. 421–426, 1970. Available in most public libraries. Back volumes of the Journal of Chromatography are available from Elsevier/North-Holland, Inc., Journal Information Centre, 52 Vanderbilt Avenue, New York, NY 10164. Cost available from publisher. Table IB, Note 27.

(c) Under certain circumstances the Regional Administrator or the Director in the Region or State where the discharge will occur may determine for a particular discharge that additional parameters or pollutants must be reported. Under such circumstances, additional test procedures for analysis of pollutants may be specified by the Regional Administrator or the Director upon the recommendation of the Director of the Environmental Monitoring and Support Laboratory, Cincinnati.

(d) Under certain circumstances, the Administrator may approve, upon recommendation by the Director, Environmental Monitoring and Support Laboratory, Cincinnati, additional alternate test procedures for nationwide use.

(e) Sample preservation procedures, container materials, and maximum allowable holding times for parameters cited in Tables IA, IB, IC, ID, and IE are prescribed in Table II. Any person may apply for a variance from the prescribed preservation techniques, container materials, and maximum holding times applicable to samples taken from a specific discharge. Applications for variances may be made by letters to the Regional Administrator in the Region in which the discharge will occur. Sufficient data should be provided to assure such variance does not adversely affect the integrity of the sample. Such data will be forwarded by the Regional Administrator to the Director of the Environmental Monitoring and Support Laboratory in Cincinnati, Ohio for technical review and recommendations for action on the variance application. Upon receipt of the recommendations from the Director of the Environmental Monitoring and Support Laboratory, the Regional Administrator may grant a variance applicable to the specific discharge to the applicant. A decision to approve or deny a variance will be made within 90 days of receipt of the application by the Regional Administrator.

TABLE II—REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES

Parameter No./name	Container [1]	Preservation [2,3]	Maximum holding time [4]
Table IA—Bacterial Tests:			
1–4. Coliform, fecal and total	P, G	Cool, 4°C, 0.008% $Na_2S_2O_3$ [5]	6 hours.
5. Fecal streptococci	P, G	do	Do.
Table IB—Inorganic Tests:			
1. Acidity	P, G	Cool, 4°C	14 days.
2. Alkalinity	P, G	do	Do.
4. Ammonia	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days.
9. Biochemical oxygen demand	P, G	Cool, 4°C	48 hours.
11. Bromide	P, G	None required	28 days.
14. Biochemical oxygen demand, carbonaceous.	P, G	Cool, 4°C	48 hours.
15. Chemical oxygen demand	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days.
16. Chloride	P, G	None required	Do.

TABLE II—REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES—Continued

Parameter No./name	Container [1]	Preservation [2,3]	Maximum holding time [4]
17. Chlorine, total residual	P, G	do	Analyze immediately.
21. Color	P, G	Cool, 4°C	48 hours.
23–24. Cyanide, total and amenable to chlorination.	P, G	Cool, 4°C, NaOH to pH>12, 0.6g ascorbic acid [5].	14 days. [6]
25. Fluoride	P	None required	28 days.
27. Hardness	P, G	HNO_3 to pH<2, H_2SO_4 to pH<2.	6 months.
28. Hydrogen ion (pH)	P, G	None required	Analyze immediately.
31, 43. Kjeldahl and organic nitrogen	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days.
Metals: [7]			
18. Chromium VI	P, G	Cool, 4°C	24 hours.
35. Mercury	P, G	HNO_3 to pH<2	28 days.
3, 5–8, 10, 12, 13, 19, 20, 22, 26, 29, 30, 32–34, 36, 37, 45, 47, 51, 52, 58–60, 62, 63, 70–72, 74, 75. Metals, except chromium VI and mercury.	P, G	do	6 months.
38. Nitrate	P, G	Cool, 4°C	48 hours.
39. Nitrate-nitrite	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days.
40. Nitrite	P, G	Cool, 4°C	48 hours.
41. Oil and grease	G	Cool, 4°C, H_2SO_4 to pH<2	28 days.
42. Organic carbon	P, G	Cool, 4°C, HCl or H_2SO_4 to pH<2.	Do.
44. Orthophosphate	P, G	Filter immediately, Cool, 4°C	48 hours.
46. Oxygen, Dissolved Probe	G Bottle and top.	None required	Analyze immediately.
47. Winkler	do	Fix on site and store in dark	8 hours.
48. Phenols	G only	Cool, 4°C, H_2SO_4 to pH<2	28 days.
49. Phosphorus (elemental)	G	Cool, 4°C	48 hours.
50. Phosphorus, total	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days.
53. Residue, total	P, G	Cool, 4°C	7 days.
54. Residue, Filterable	P, G	do	7 days.
55. Residue, Nonfilterable (TSS)	P, G	do	7 days.
56. Residue, Settleable	P, G	do	48 hours.
57. Residue, volatile	P, G	do	7 days.
61. Silica	P	do	28 days.
64. Specific conductance	P, G	do	Do.
65. Sulfate	P, G	do	Do.
66. Sulfide	P, G	Cool, 4°C add zinc acetate plus sodium hydroxide to pH>9.	7 days.
67. Sulfite	P, G	None required	Analyze immediately.
68. Surfactants	P, G	Cool, 4°C	48 hours.
69. Temperature	P, G	None required	Analyze.
73. Turbidity	P, G	Cool, 4°C	48 hours.
Table IC—Organic Tests. [8]			
13, 18–20, 22, 24–28, 34–37, 39–43, 45–47, 56, 66, 68, 69, 92–95, 97. Purgeable Halocarbons.	G, Teflon-lined septum.	Cool, 4°C, 0.008% $Na_2S_2O_3$ [9]	14 days.
6, 57, 90. Purgeable aromatic hydrocarbons	do	Cool, 4°C, 0.008% $Na_2S_2O_3$ [9], HCl to pH2 [9].	Do.
3, 4. Acrolein and acrylonitrile	do	Cool, 4°C, 0.008% $Na_2S_2O_3$ [9]; Adjust pH to 4–5 [10].	Do.
23, 30, 44, 49, 53, 67, 70, 71, 83, 85, 98. Phenols [11].	G, Teflon-lined cap.	Cool, 4°C, 0.008% $Na_2S_2O_3$ [9]	7 days until extraction. 40 days after extraction.
7, 38. Benzidines [11]	do	do	7 days until extraction. [12]
14, 17, 48, 50–52. Phthalate esters [11]	do	Cool, 4°C	7 days until extraction; 40 days after extraction.
72–74. Nitrosamines [11,13]	do	Cool, 4°C, store in dark, 0.008% $Na_2S_2O_3$ [9].	Do.
78–82. PCBs [11] acrylonitrile	do	Cool, 4°C	Do.
54, 55, 65, 69. Nitroaromatics and isophorone [11]	do	Cool, 4°C, 0.008% $Na_2S_2O_3$ [9] store in dark.	Do.
1, 2, 5, 8–12, 32, 33, 58, 59, 64, 68, 84, 86. Polynuclear aromatic hydrocarbons. [11]	do	do	Do.
15, 16, 21, 31, 75. Haloethers [11]	do	Cool, 4°C, 0.008% $Na_2S_2O_3$ [9]	Do.
29, 35–37, 60–63, 91. Chlorinated hydrocarbons [11]	do	Cool, 4°C	Do.
87. TCDD [11]	do	Cool, 4°C, 0.008% $Na_2S_2O_3$ [9]	Do.

TABLE II—REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES—Continued

Parameter No./name	Container [1]	Preservation [2,3]	Maximum holding time [4]
Table ID—Pesticides Tests:			
1-70. Pesticides [11]	do	Cool, 4°C, pH 5-9 [12]	Do.
Table IE—Radiological Tests:			
1-5. Alpha, beta and radium	P, G	HNO_3 to pH<2	6 months.

Table II Notes

[1] Polyethylene (P) or Glass (G).

[2] Sample preservation should be performed immediately upon sample collection. For composite chemical samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.

[3] When any sample is to be shipped by common carrier or sent through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of Table II, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

[4] Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of samples under study are stable for the longer time, and has received a variance from the Regional Administrator under § 136.3(e). Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show that this is necessary to maintain sample stability. See § 136.3(e) for details.

[5] Should only be used in the presence of residual chlorine.

[6] Maximum holding time is 24 hours when sulfide is present. Optionally all samples may be tested with lead acetate paper before pH adjustments in order to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.

[7] Samples should be filtered immediately on-site before adding preservative for dissolved metals.

[8] Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.

[9] Sample receiving no pH adjustment must be analyzed within seven days of sampling.

[10] The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within 3 days of sampling.

[11] When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to 4°C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9; samples preserved in this manner may be held for seven days before extraction and for forty days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote 5 (re the requirement for thiosulfate reduction of residual chlorine), and footnotes 12, 13 (re the analysis of benzidine).

[12] If 1,2-diphenylhydrazine is likely to be present, adjust the pH of the sample to 4.0±0.2 to prevent rearrangement to benzidine.

[13] Extracts may be stored up to 7 days before analysis if storage is conducted under an inert (oxidant-free) atmosphere.

[14] For the analysis of diphenylnitrosamine, add 0.008% $Na_2S_2O_3$ and adjust pH to 7-10 with NaOH within 24 hours of sampling.

[15] The pH adjustment may be performed upon receipt at the laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% $Na_2S_2O_3$.

[38 FR 28758, Oct. 16, 1973, as amended at 41 FR 52781, Dec. 1, 1976; 49 FR 43251, 43258, 43259, Oct. 26, 1984; 50 FR 691, 692, 695, Jan. 4, 1985; 51 FR 23693, June 30, 1986]

EDITORIAL NOTE: Information collection requirements contained in § 136.3(e) have not been approved by the Office of Management and Budget and are not effective, pending OMB approval.

§ 136.4 Application for alternate test procedures.

(a) Any person may apply to the Regional Administrator in the Region where the discharge occurs for approval of an alternative test procedure.

(b) When the discharge for which an alternative test procedure is proposed occurs within a State having a permit program approved pursuant to section 402 of the Act, the applicant shall submit his application to the Regional Administrator through the Director of the State agency having responsibility for issuance of NPDES permits within such State.

(c) Unless and until printed application forms are made available, an application for an alternate test procedure may be made by letter in triplicate. Any application for an alternate test procedure under this paragraph (c) shall:

(1) Provide the name and address of the responsible person or firm making the discharge (if not the applicant) and the applicable ID number of the existing or pending permit, issuing

CLP CONTRACTUAL PRESERVATION AND HOLDING TIME REQUIREMENTS*

ANALYTE	MATRIX	HOLDING TIME	PRESERVATION	CONTAINER
Volatile Organics	Solid	7 days**	cool to 4 degrees C	2x40 ml glass Teflon septum
Extractable Organics	Solid	5 days to extraction,** 40 days to analysis	cool to 4 degrees C	8 oz glass
Cyanide	Solid	12 days	cool, 4 degrees C	8 oz glass
Metals	Solid	6 months	none	8 oz glass
Mercury	Solid	26 days	cool to 4 degrees C	8 oz glass
Dioxin (2,3,7,8-TCDD)	Solid	6 months	none	low conc.: 4 oz glass high conc.: 6 oz glass
Volatile Organics	Aqueous	~~preserved:~~ SB 7 days**	cool 4 degrees C	2x40 ml glass Teflon septum
Extractable Organics	Aqueous	5 days to extraction, 40 days to analysis	low/medium conc.: cool 4 degrees C high conc.: none	4 liters amber glass, med/high conc.: 6 oz glass
Cyanide	Aqueous	12 days	cool 4 degrees C NaOH pH>12, ascorbic acid if oxidizer present cadmium carbonate if S^{2-} present	low conc.: 1 liter PE med conc.: 16 oz glass high conc.: 6 oz glass
Metals	Aqueous	6 months	low/med conc.: cool 4 degrees C, HNO_3 pH<2 high conc.: none	low conc.: 1 liter PE med conc.: 16 oz glass high conc.: 6 oz glass
Mercury	Aqueous	26 days	low/med conc.: cool 4 degrees C, HNO_3 pH<2 high conc.: none	low conc.: 1 liter PE med conc.: 16 oz glass high conc.: 6 oz glass
Dioxin (2,3,7,8-TCDD)	Aqueous	10 days to extraction, 40 days to analysis	cool 4 degrees C	2 liter amber glass

* Contractual holding times being on date of Verified Time of Sample Receipt.

Taken from: EPA Region II CERCLA QUALITY ASSURANCE MANUAL/Appendix IV (October 1989)

** Modified to meet NYSDEC criteria.

APPENDIX I

SOP NO. HW-6
Revision #8

CLP ORGANICS DATA REVIEW AND PRELIMINARY REVIEW

BY: Leon Lazarus — Date: January 2, 1992
Leon Lazarus, Environmental Scientist
Toxic and Hazardous Waste Section

BY: George Karras — Date: January 3, 1992
George Karras, Chemist
Toxic and Hazardous Waste Section

BY: Stelios Gerazounis — Date: 1/3/1992
Stelios Gerazounis, Chemist
Toxic and Hazardous Waste Section

CONCURRED BY: Kevin W. Kubik — Date: 1/7
Kevin Kubik, Chief
Toxic and Hazardous Waste Section

APPROVED BY: Robert A. Runyon — Date: 1/7/92
Robert Runyon, Chief
Monitoring Management Branch

YES NO N/A

PACKAGE COMPLETENESS AND DELIVERABLES
CASE NUMBER:_____ LAB:_____

SITE:_____

Data Completeness and Deliverables

Have any missing deliverables been received and added to the data package? [ ]

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If lab cannot provide them, note the effect on review of the package under the "Contract Problems/Non-Compliance" section of reviewer narrative.

Was SMO CCS checklist included with package? [ ]

2.0 Cover Letter SDG Narrative

Is the Narrative or Cover Letter Present? [ ]

Are Case Number and/or SAS number contained in the Narrative or Cover letter? [ ]

3.0 Data Validation Checklist

The following checklist is divided into three parts. Part A is filled out if the data package contains any VOA analyses, Part B for any BNA analyses and Part C for Pesticide/PCBs.

Does this package contain:

VOA Data?

BNA Data?

Pesticide/PCB data?

Action: Complete corresponding parts of checklist.

YES NO N/A

PART A: VOA ANALYSES

1.0 Traffic Reports and Laboratory Narrative

1.1 Are the Traffic Report Forms present for all samples? [ ]

ACTION: If no, contact lab for replacement of missing or illegible copies.

1.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data? [ ]

ACTION: If any sample analyzed as a soil, other than TCLP, contains 50%-90% water, all data should be flagged as estimated (J). If a soil sample other than TCLP contains more than 90% water, all data should be qualified as unusable (R).

ACTION: If samples were not iced upon receipt at the laboratory, flag all positive results "J" and all Non-Detects "UJ".

ACTION: If both VOA vials for a sample have air bubbles or the VOA vial analyzed had air bubbles, flag all positive results "J" and all non-detects "R".

YES NO N/A

2.0 Holding Times

2.1 Have any VOA technical holding times, determined from date of collection to date of analysis, been exceeded? [ ]

If unpreserved, aqueous samples maintained at 4°C which are to be analyzed for aromatic hydrocarbons must be analyzed within 7 days of collection. If preserved with HCl (pH<2) and stored at 4°C, then aqueous samples must be analyzed within 14 days of collection. If uncertain about preservation, contact sampler to determine whether or not samples were preserved.

The holding time for soils is 10 days.

Table of Holding Time Violations

Sample ID	Sample Matrix	Preserved?	Date Sampled	(See Traffic Report) Date Lab Received	Date Analyzed
____	_____	_____	_____	_____	_____
____	_____	_____		_____	_____
	_____	_____			
____	_____	_____		_____	_____

ACTION: If technical holding times are exceeded, flag all positive results as estimated ("J") and sample quantitation limits as estimated ("UJ"), and document in the narrative that holding times were exceeded. If analyses were done more than 14 days beyond holding time, either on the first analysis or upon re-analysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. At a minimum, all results must be qualified "J", but the reviewer may determine that non-detect data are unusable (R). If holding times are exceeded by more than 28 days, all detect data are unusable (R).

YES NO N/A

3.0 System Monitoring Compound (SMC) Recovery (Form II)

3.1 Are the VOA SMC Recovery Summaries (Form II) present for each of the following matrices:

a. Low Water [ ]

b. Low Soil [ ]

c. Med Soil

3.2 Are all the VOA samples listed on the appropriate System Monitoring Compound Recovery Summary for each of the following matrices:

a. Low Water

b. Low Soil

c. Med Soil

ACTION: Call lab for explanation/ resubmittals. If missing deliverables are unavailable, document effect in data assessments

3.3 Were outliers marked correctly with an asterisk? [ ]

ACTION: Circle all outliers in red.

3.4 Was one or more VOA system monitoring compound recovery outside of contract specifications for any sample or method blank? [ ]

If yes, were samples re-analyzed? [ ]

Were method blanks re-analyzed? [ ]

YES NO N/A

ACTION: If recoveries are > 10% but 1 or more compounds fail to meet SOW specifications:

1. All positive results are qualified as estimated (J).
2. Flag all non-detects as estimated detection limits ("UJ") where recovery is less than the lower acceptance limit.
3. If SMC recoveries are above allowable levels, do not qualify non-detects.

If any system monitoring compound recovery is <10% :

1. Flag all positive results as estimated ("J").
2. Flag all non-detects as unusable ("R").

Professional judgement should be used to qualify data that only have method blank SMC recoveries out of specification in both original and re-analyses. Check the internal standard areas.

Are there any transcription/calculation errors between raw data and Form II? [ ]

ACTION: If large errors exist, call lab for explanation/resubmittal, make any necessary corrections and note errors in the data assessment.

4.0 Matrix Spikes (Form III)

Is the Matrix Spike/Matrix Spike Duplicate Recovery Form (Form III) present? [ ]

YES NO N/A

Were matrix spikes analyzed at the required frequency for each of the following matrices:

a. Low Water [ ]

b. Low Soil [ ]

c. Med Soil [ ]

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

How many VOA spike recoveries are outside QC limits?

Water	Soils
out of 10	out of 10

How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

Water	Soils
out of 5	out of 5

ACTION: No action is taken based on MS/MSD data alone. However, using informed professional judgement, the MS/MSD results may be used in conjunction with other QC criteria to determine the need for qualification of the data.

5.0 Blanks (Form IV)

Is the Method Blank Summary (Form IV) present? [ ]

5.2 Frequency of Analysis: for the analysis of VOA TCL compounds, has a reagent/method blank been analyzed for each SDG or every 20 samples of similar matrix (low water, low soil, medium soil), whichever is more frequent? [ ]

YES NO N/A

Has a VOA method/instrument blank been analyzed at least once every twelve hours for each concentration level and GC/MS system used? [ ]

ACTION: If any method blank data are missing, call lab for explanation/ resubmittal. If method blank data are not available, reject (R) all associated positive data. However, using professional judgement, the data reviewer may substitute field blank or trip blank data for missing method blank data.

Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.

Is the chromatographic performance (baseline stability) for each instrument acceptable for VOAs? [ ]

ACTION: Use professional judgement to determine the effect on the data

6.0 Contamination

NOTE: "Water blanks", "drill blanks", and distilled water blanks" are validated like any other sample, and are not used to qualify data. Do not confuse them with the other QC blanks discussed below.

6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for VOAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample dilution factor and corrected for % moisture when necessary. [ ]

6.2 Do any field/trip/rinse blanks have positive VOA results (TCL and/or TIC)? [ ]

ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)

YES NO N/A

NOTE: All field blank results associated to a particular group of samples (may exceed one per case) must be used to qualify data. Trip blanks are used to qualify only those samples with which they were shipped and are not required for non-aqueous matrices. Blanks may not be qualified because of contamination in another blank. Field Blanks & Trip Blanks must be qualified for system monitoring compound, instrument performance criteria, spectral or calibration QC problems.

ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks. If any blanks are grossly contaminated, all associated data should be qualified as unusable (R).

	Sample conc > CRQL but < 10x blank value	Sample conc < CRQL & <10x blank value	Sample conc > CRQL & >10x blank value
Methylene Chloride Acetone Toluene 2-Butanone	Flag sample result with a "U;	Report CRQL & qualify "U"	No qualification is needed

	Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > CRQL value & > 5x blank value
Other Contam-inants	Flag sample result with a "U"	Report CRQL & qualify "U"	No qualification is needed

NOTE: Analytes qualified "U" for blank contamination are still considered as "hits" when qualifying for calibration criteria.

YES NO N/A

ACTION: For TIC compounds, if the concentration in the sample is less than five times the concentration in the most contaminated associated blank, flag the sample data "R" (unusable).

Are there field/rinse/equipment blanks associated with every sample? [ ]

ACTION: For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks.

7.0 GC/MS Instrument Performance Check (Form V)

7.1 Are the GC/MS Instrument Performance Check Forms (Form V) present for Bromofluorobenzene (BFB)? [ ]

7.2 Are the enhanced bar graph spectrum and mass/charge (m/z) listing for the BFB provided for each twelve hour shift? [ ]

Has an instrument performance compound been analyzed for every twelve hours of sample analysis per instrument? [ ]

YES NO N/A

ACTION: List date, time, instrument ID, and sample analysis for which no associated GC/MS tuning data are available.

DATE	TIME	INSTRUMENT	SAMPLE NUMBERS
		_____	
		_____	_____
		_____	

ACTION: If lab cannot provide missing data, reject ("R") all data generated outside an acceptable twelve hour calibration interval.

Have the ion abundances been normalized to m/z 95? [ ]

ACTION: If mass assignment is in error, qualify all associated data as unusable (R).

7.5 Have the ion abundance criteria been met for each instrument used? [ ]

ACTION: List all data which do not meet ion abundance criteria (attach a separate sheet).

ACTION: If ion abundance criteria are not met, the Region II TPO must be notified.

Are there any transcription/calculation errors between mass lists and Form Vs? (Check at least two values but if errors are found, check more.) ___ [ ]

YES NO N/A

Have the appropriate number of significant figures (two) been reported? [ ]

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and document effect in data assessments.

Are the spectra of the mass calibration compound acceptable? [ ]

ACTION: Use professional judgement to determine whether associated data should be accepted, qualified, or rejected.

8.0 Target Compound List (TCL) Analytes

8.1 Are the Organic Analysis Data Sheets (Form I VOA) present with required header information on each page, for each of the following:

a. Samples and/or fractions as appropriate [ ]

b. Matrix spikes and matrix spike duplicates [ ]

c. Blanks [ ]

Are the VOA Reconstructed Ion Chromatograms, the mass spectra for the identified compounds, and the data system printouts (Quant Reports) included in the sample package for each of the following?

a. Samples and/or fractions as appropriate [ ]

b. Matrix spikes and matrix spike duplicates (Mass spectra not required) [ ]

c. Blanks [ ]

ACTION: If any data are missing, take action specified in 3.2 above.

	YES	NO	N/A
Are the response factors shown in the Quant Report?	[ ]		
Is chromatographic performance acceptable with respect to:			
Baseline stability?	[ ]		
Resolution?	[ ]		
Peak shape?	[ ]		
Full-scale graph (attenuation)?	[ ]		
Other: _____	[ ]		

ACTION: Use professional judgement to determine the acceptability of the data.

Are the lab-generated standard mass spectra of the identified VOA compounds present for each sample?	[ ]		

ACTION: If any mass spectra are missing, take action specified in 3.2 above. If lab does not generate their own standard spectra, make note in "Contract Problems/Non-compliance".

Is the RRT of each reported compound within 0.06 RRT units of the standard RRT in the continuing calibration?	[ ]		
Are all ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the sample mass spectrum?	[ ]		

YES NO N/A

8.8 Do sample and standard relative ion intensities agree within 20%? [ ]

ACTION: Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected (R), flagged "N" (presumptive evidence of the presence of the compound) or changed to not detected (U) at the calculated detection limit. In order to be positively identified, the data must comply with the criteria listed in 8.6, 8.7, and 8.8.

ACTION: When sample carry-over is a possibility, professional judgement should be used to determine if instrument cross-contamination has affected any positive compound identification.

9.0 Tentatively Identified Compounds (TIC)

Are all Tentatively Identified Compound Forms (Form I Part B) present; and do listed TICs include scan number or retention time, estimated concentration and "JN" qualifier? [ ]

Are the mass spectra for the tentatively identified compounds and associated "best match" spectra included in the sample package for each of the following:

a. Samples and/or fractions as appropriate [ ]

b. Blanks [ ]

ACTION: If any TIC data are missing, take action specified in 3.2 above.

ACTION: Add "JN" qualifier if missing.

YES NO N/A

Are any TCL compounds (from any fraction) listed as TIC compounds (example: 1,2-dimethylbenzene is xylene- a VOA TCL analyte - and should not be reported as a TIC)?___ [_]

ACTION: Flag with "R" any TCL compound listed as a TIC.

Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum? [_]

9.5 Do TIC and "best match" standard relative ion intensities agree within 20%? [_]

ACTION: Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate.

Also, when a compound is not found in any blank, but is detected in a sample and is a suspected artifact of a common laboratory contaminant, the result should be qualified as unusable (R). (i.e. Common Lab Contaminants: CO_2 (M/E 44), Siloxanes (M/E 73) Hexane, Aldol Condensation Products, Solvent Preservatives, and related by products - see Functional Guidelines for more guidance).

YES NO N/A

10.0 Compound Quantitation and Reported Detection Limits

10.1 Are there any transcription/calculation errors in Form I results? Check at least two positive values. Verify that the correct internal standard, quantitation ion, and RRF were used to calculate Form I result. Were any errors found?

10.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, sample moisture? [ ]

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors under "Conclusions".

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" and its associated value on the original Form I and substituting the data from the analysis of the diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

11.0 Standards Data (GC/MS)

11.1 Are the Reconstructed Ion Chromatograms, and data system printouts (Quant. Reports) present for initial and continuing calibration? [ ]

ACTION: If any calibration standard data are missing, take action specified in 3.2 above.

YES NO N/A

12.0 GC/MS Initial Calibration (Form VI)

12.1 Are the Initial Calibration Forms (Form VI) present and complete for the volatile fraction at concentrations of 10, 20, 50, 100, 200 ug/l? Are there separate calibrations for low water/med soils and low soil samples? [ ]

ACTION: If any calibration standard forms are missing, take action specified in 3.2 above.

12.2 Were all low level soil standards, blanks and samples analyzed by heated purge? [ ]

ACTION: If low level soil samples were not heated during purge, qualify positive hits "J" and non-detects "R"

12.3 Are response factors stable for VOA's over the concentration range of the calibration (%Relative Standard Deviation (%RSD) <30.0%)? [ ]

ACTION: Circle all outliers in red.

NOTE: Although 11 VOA compounds have a minimum RRF and no maximum %RSD, the technical criteria are the same for all analytes.

ACTION: If %RSD > 30.0%, qualify associated positive results for that analyte "J" and non-detects using professional judgement. When RSD > 90%, flag all non-detects for that analyte R (unusable)

NOTE: Analytes previously qualified "U" for blank contamination are still considered as "hits" when qualifying for initial calibration criteria.

12.4 Are the RRFs above 0.05?

Action: Circle all outliers in red.
Action: If any RRF are < 0.05, qualify associated non-detects (R) and flag associated positive data as estimated (J).

YES NO N/A

12.5 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or %RSD? (Check at least 2 values, but if errors are found, check more.) [ ]

13.0 GC/MS Continuing Calibration (Form VII)

13.1 Are the Continuing Calibration Forms (Form VII) present and complete for the volatile fraction? [ ]

13.2 Has a continuing calibration standard been analyzed for every twelve hours of sample analysis per instrument? [ ]

ACTION: List below all sample analyses that were not within twelve hours of the previous continuing calibration analysis.

_____

_____

_____

ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation/resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").

13.3 Do any volatile compounds have a % Difference (% D) between the initial and continuing RRF which exceeds the ± 25% criteria? [ ]

ACTION: Circle all outliers in red.

ACTION: Qualify both positive results and non-detects for the outlier compound(s) as estimated. When % D is above 90%, reject all non-detects for that analyte (R) unusable

YES NO N/A

13.4 Do any volatile compounds have a RRF <0.05? [ ]

ACTION: Circle all outliers in red.

ACTION: If the RRF <0.05, qualify associated non-detects as unusable (R) and "J" associated positive values.

13.5 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or %difference (%D) between initial and continuing RRFs? (Check at least two values but if errors are found, check more.) [ ]

ACTION: Circle errors in red.

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors under "Conclusions".

14.0 Internal Standard (Form VIII)

14.1 Are the internal standard areas (Form VIII) of every sample and blank within the upper and lower limits (-50% to + 100%) for each continuing calibration? [ ]

ACTION: List all the outliers below.

Sample #	Internal Std	Area	Lower Limit	Upper Limit

(Attach additional sheets if necessary.)

YES NO N/A

ACTION: 1. If the internal standard area count is outside the upper or lower limit, flag with "J" all positive results quantitated with this internal standard.

2. Non-detects associated with IS area counts > 100% should not be qualified.

3. If IS area is below the lower limit (< 50%), qualify all associated non-detects (U values) "J". If extremely low area counts are reported, (< 25%) or if performance exhibits a major abrupt drop off, flag all associated non-detects as unusable ("R").

14.2 Are the retention times of the internal standards within 30 seconds of the associated calibration standard?

ACTION: Professional judgement should be used to qualify data if the retention times differ by more than 30 seconds.

15.0 Field Duplicates

15.1 Were any field duplicates submitted for VOA analysis?

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation between duplicate results must be addressed in the reviewer narrative. However, if large differences exist, identification of field duplicates should be confirmed by contacting the sampler.

YES NO N/A

PART B: BNA ANALYSES

1.0 Traffic Reports and Laboratory Narrative

1.1 Are the Traffic Report Forms present for all samples? [ ]

ACTION: If no, contact lab for replacement of missing or illegible copies.

1.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ___ [ ]

ACTION: If any sample analyzed as a soil, other than TCLP, contains 50%-90% water, all data should be flagged as estimated ("J"). If a soil sample, other than TCLP, contains more than 90% water, all data should be qualified as unusable (R).

ACTION: If samples were not iced upon receipt at the laboratory, flag all positive results "J" and all non-detects "UJ".

2.0 Holding Times

2.1 Have any BNA technical holding times, determined from date of collection to date of extraction, been exceeded? ___ [ ]

Continuous extraction of water samples for BNA analysis must be started within seven days of the date of collection. Soil/ sediment samples must be extracted within 7 days of collection. Extracts must be analyzed within 40 days of the date of extraction.

YES NO N/A

Table of Holding Time Violations

(See Traffic Report)

Sample	Sample Matrix	Date Sampled	Date Lab Received	Date Extracted	Date Analyzed
_____	_____				

ACTION: If technical holding times are exceeded, flag all positive results as estimated ("J") and sample quantitation limits as estimated ("UJ"), and document in the narrative that holding times were exceeded.

If analyses were done more than 14 days beyond holding time, either on the first analysis or upon reanalysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. At a minimum, all results should be qualified "J", but the reviewer may determine that non-detect data are unusable ("R"). If holding times are exceeded by more than 28 days, all non detect data are unusable (R).

3.0 Surrogate Recovery (Form II)

3.1 Are the BNA Surrogate Recovery Summaries (Form II) present for each of the following matrices:

a. Low Water

b. Low Soil

c. Med Soil [ ]

YES NO N/A

3.2 Are all the BNA samples listed on the appropriate Surrogate Recovery Summaries for each of the following matrices:

a. Low Water

b. Low Soil [ ] ___

c. Low Soil

ACTION: Call lab for explanation/resubmittals. If missing deliverables are unavailable, document effect in data assessments.

3.3 Were outliers marked correctly with an asterisk? [ ]

ACTION: Circle all outliers in red

3.4 Were two or more base-neutral OR acid surrogate recoveries out of specification for any sample or method blank? [ ]

If yes, were samples reanalyzed? [ ] ___

Were method blanks reanalyzed? [ ]

ACTION: If all BNA surrogate recoveries are > 10% but two within the base-neutral or acid fraction do not meet SOW specifications, for the affected fraction only (i.e. base-neutral or acid compounds):

1. Flag all positive results as estimated ("J").
2. Flag all non-detects as estimated detection limits ("UJ") when recoveries are less than the lower acceptance limit.
3. If recoveries are greater than the upper acceptance limit, do not qualify non-detects.

YES NO N/A

If any base-neutral or acid surrogate has a recovery of <10%:

1. Positive results for the fraction with <10% surrogate recovery are qualified with "J".

2. Non-detects for that fraction should be qualified as unusable (R) .

Professional judgement should be used to qualify data that have method blank surrogate recoveries out of specification in both original and reanalyses. Check the internal standard areas.

Are there any transcription/calculation errors between raw data and Form II? ___ [ ]

ACTION: If large errors exist, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

4.0 Matrix Spikes (Form III)

Is the Matrix Spike/Matrix Spike Duplicate Recovery Form (Form III) present? [ ]

Were matrix spikes analyzed at the required frequency for each of the following matrices:

a. Low Water [ ]

b. Low Soil [ ]

c. Med Soil [ ]

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

YES NO N/A

How many BNA spike recoveries are outside QC limits?

Water	Soils
out of 22	out of 22

How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

Water	Soils
out of 11	out of 11

ACTION: No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer may use the matrix spike and matrix spike duplicate results in conjunction with other QC criteria and determine the need for some qualification of the data.

5.0 Blanks (Form IV)

Is the Method Blank Summary (Form IV) present? [ ]

5.2 Frequency of Analysis:

Has a reagent/method blank analysis been reported per 20 samples of similar matrix, or concentration level, and for each extraction batch? [ ]

5.3 Has a BNA method blank been analyzed for each GC/MS system used? [ ]
(See SOW p. D - 59/SV, Section 8.7)

ACTION: If any method blank data are missing, call lab for explanation/resubmittal. If not available, use professional judgement to determine if the associated sample data should be qualified.

YES NO N/A

5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.

Is the chromatographic performance (baseline stability) for each instrument acceptable for BNAs? [ ]

ACTION: Use professional judgement to determine the effect on the data.

6.0 Contamination

Note: "Water blanks", "drill blanks" and "distilled water blanks" are validated like any other sample and are not used to qualify the data. Do not confuse them with the other QC blanks discussed below.

Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for BNAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample dilution factor and corrected for % moisture where necessary. ___ [ ]

Do any field/rinse/ blanks have positive BNA results (TCL and/or TIC)? ___ [ ]

ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)

Note: All field blank results associated to a particular group of samples (may exceed one per case) must be used to qualify data. Blanks may not be qualified because of contamination in another blank . Field Blanks must be qualified for surrogate, spectral, instrument performance or calibration QC problems.

YES NO N/A

ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks. If gross contamination exists, all data in the associated samples should be qualified as unusable (R).

Sample conc > CRQL but < 10x blank	Sample conc <CRQL & is< 10x blank value	Sample conc > CRQL value & >10x blank
Common Phthalate Esters		
Flag sample result with a "U";	Report CRQL & qualify "U"	No qualification is needed
Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > CRQL value & >5 blank value
Other Contaminants		
Flag sample result with a "U";	Report CRQL & qualify "U"	No qualification is needed

NOTE: Analytes qualified "U" for blank contamination are still considered as "hits" when qualifying for calibration criteria.

ACTION: For TIC compounds, if the concentration in the sample is less than five times the concentration in the most contaminated associated blank, flag the sample data "R" (unusable).

6.3 Are there field/rinse/equipment blanks associated with every sample? [ ]

ACTION: For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks.

YES NO N/A

7.0 GC/MS Instrument Performance Check

7.1 Are the GC/MS Instrument Performance Check Forms (Form V) present for Decafluorotriphenylphosphine (DFTPP)? [ ]

Are the enhanced bar graph spectrum and mass/charge (m/z) listing for the DFTPP provided for each twelve hour shift? [ ]

Has an instrument performance check solution been analyzed for every twelve hours of sample analysis per instrument? [ ]

ACTION: List date, time, instrument ID, and sample analyses for which no associated GC/MS tuning data are available.

DATE	TIME	INSTRUMENT	SAMPLE NUMBERS
		_____	_____
		_____	_____
		_____	_____

ACTION: If lab cannot provide missing data, reject ("R") all data generated outside an acceptable twelve hour calibration interval.

ACTION: If mass assignment is in error, flag all associated sample data as unusable (R).

7.4 Have the ion abundances been normalized to m/z 198? [ ]

YES NO N/A

Have the ion abundance criteria been met for each instrument used? [ ]

ACTION: List all data which do not meet ion abundance criteria (attach a separate sheet).

ACTION: If ion abundance criteria are not met, the Region II TPO must be notified.

Are there any transcription/calculation errors between mass lists and Form Vs? (Check at least two values but if errors are found, check more.) ___ [ ]
Have the appropriate number of significant figures (two) been reported? [ ]

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and document effect in data assessments.

7.8 Are the spectra of the mass calibration compound acceptable? [ ]

ACTION: Use professional judgement to determine whether associated data should be accepted, qualified, or rejected.

8.0 Target Compound List (TCL) Analytes

8.1 Are the Organic Analysis Data Sheets (Form I BNA) present with required header information on each page, for each of the following:

a. Samples and/or fractions as appropriate [ ]

b. Matrix spikes and matrix spike duplicates [ ]

c. Blanks [ ]

YES NO N/A

8.2 Has GPC cleanup been performed on all soil/ sediment sample extracts?

ACTION: If data suggests that GPC was not performed, use professional judgement. Make note in "Contract Problems/Non-Compliance".

8.3 Are the BNA Reconstructed Ion Chromatograms, the mass spectra for the identified compounds, and the data system printouts (Quant Reports) included in the sample package for each of the following?

a. Samples and/or fractions as appropriate

b. Matrix spikes and matrix spike duplicates (Mass spectra not required) [ ]

c. Blanks [ ]

ACTION: If any data are missing, take action specified in 3.2 above.

8.4 Are the response factors shown in the Quant Report? [ ]

8.5 Is chromatographic performance acceptable with respect to:

Baseline stability? [ ]

Resolution? [ ]

Peak shape? [ ]

Full-scale graph (attenuation)? [ ]

Other:_____ [ ]

ACTION: Use professional judgement to determine the acceptability of the data.

YES NO N/A

Are the lab-generated standard mass spectra of identified BNA compounds present for each sample? [ ]

ACTION: If any mass spectra are missing, take action specified in 3.2 above. If lab does not generate their own standard spectra, make note in "Contract Problems/ Non-compliance". If spectra are missing, reject all positive data.

8.7 Is the RRT of each reported compound within 0.06 RRT units of the standard RRT in the continuing calibration? [ ]

Are all ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the sample mass spectrum? [ ]

Do sample and standard relative ion intensities agree within 20%? [ ]

ACTION: Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected (R), flagged "N" (Presumptive evidence of the presence of the compound) or changed to not detected (U) at the calculated detection limit. In order to be positively identified, the data must comply with the criteria listed in 8.7, 8.8, and 8.9.

ACTION: When sample carry-over is a possibility, professional judgement should be used to determine if instrument cross-contamination has affected any positive compound identification.

9.0 <u>Tentatively Identified Compounds (TIC)</u>

9.1 Are all Tentatively Identified Compound Forms (Form I, Part B) present; and do listed TICs include scan number or retention time, estimated concentration and "JN" qualifier? [ ]

YES NO N/A

9.2 Are the mass spectra for the tentatively identified compounds and associated "best match" spectra included in the sample package for each of the following:

a. Samples and/or fractions as appropriate

b. Blanks

ACTION: If any TIC data are missing, take action specified in 3.2 above.

ACTION: Add "JN" qualifier if missing.

9.3 Are any TCL compounds (from any fraction) listed as TIC compounds (example: 1,2-dimethylbenzene is xylene a VOA TCL - and should not be reported as a TIC)? ___ [ ]

ACTION: Flag with "R" any TCL compound listed as a TIC.

9.4 Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum?

9.5 Do TIC and "best match" standard relative ion intensities agree within 20%?

ACTION: Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate. Also, when a compound is not found in any blank, but is a suspected artifact of a common laboratory contaminant, the result should be qualified as unusable (R).

YES NO N/A

10.0 Compound Quantitation and Reported Detection Limits

10.1 Are there any transcription/calculation errors in Form I results? Check at least two positive values. Verify that the correct internal standard, quantitation ion, and RRF were used to calculate Form I result. Were any errors found? ___ [ ]

10.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, sample moisture? [ ]

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" and it's associated value on the original Form I and substituting the data from the analysis of the diluted sample. Specify which Form I is to be used, then draw a red " X" across the entire page of all Form I's that should not be used, including any in the summary package.

11.0 Standards Data (GC/MS)

11.1 Are the Reconstructed Ion Chromatograms, and data system printouts (Quant, Reports) present for initial and continuing calibration? [ ]

ACTION: If any calibration standard data are missing, take action specified in 3.2 above.

YES NO N/A

12.0 GC/MS Initial Calibration (Form VI)

12.1 Are the Initial Calibration Forms (Form VI) present and complete for the BNA fraction?

ACTION: If any calibration standard forms are missing, take action specified in 3.2 above.

12.2 Are response factors stable for BNAs over the concentration range of the calibration? (% Relative standard deviation (%RSD) < 30.0%)

ACTION: Circle all outliers in red.

NOTE: Although 20 BNA compounds have a minimum RRF and no maximum %RSD, the technical criteria are the same for all analytes.

ACTION: If the % RSD is > 30.0%, qualify positive results for that analyte "J" and non-detects using professional judgement. When RSD > 90%, flag all non-detect results for that analyte R (unusable)

NOTE: Analytes previously qualified "U" due to blank contamination are still considered as "hits" when qualifying for calibration criteria.

12.3 Are all BNA compound RRFs > 0.05? [ ]

ACTION: Circle all outliers in red.

ACTION: If any RRF < 0.05
1. "R" all non-detects.
2. "J" all positive results.

12.4 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or % RSD? (Check at least two values but if errors are found, check more.) ___ [ ]

ACTION: Circle Errors in red.

YES NO N/A

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors in data assessments.

13.0 GC/MS Continuing Calibration (Form VII)

13.1 Are the Continuing Calibration Forms (Form VII) present and complete for the BNA fraction?

13.2 Has a continuing calibration standard been analyzed for every twelve hours of sample analysis per instrument?

ACTION: List below all sample analyses that were not within twelve hours of a continuing calibration analysis for each instrument used.

_____

_____

_____

ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation/ resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").

13.3 Do any semivolatile compounds have a % Difference (% D) between the initial and continuing RRF which exceeds the + 25.0% criteria? ___ [ ]

ACTION: Circle all outliers in red.

ACTION: Qualify both positive results and non-detects for the outlier compound(s) as estimated (J). When %D is above 90%, reject all non-detects for that analyte (R) unusable.

YES NO N/A

13.4 Do any semivolatile compounds have a RRF <0.05?

ACTION: Circle all outliers in red.

ACTION: If RRF <0.05, qualify as unusable (R) associated non-detects and "J" associated positive values.

13.5 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or % difference (%D) between initial and continuing RRFs? (Check at least two values but if errors are found, check more).

ACTION: Circle errors in red.

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

14.0 Internal Standards (Form VIII)

14.1 Are the internal standard areas (Form VIII) of every sample and blank within the upper and lower limits (-50% to + 100%) for each continuing calibration? [ ] ___

ACTION: List all the outliers below.

Sample #	Internal Std	Area	Lower Limit	Upper Limit
	_____		_____	
	_____		_____	
	_____		_____	
	_____		_____	

(Attach additional sheets if necessary.)

ACTION: 1. If the internal standard area count is outside the upper or lower limit, flag with "J" all positive results and non-detects (U values) quantitated with this internal standard.

YES NO N/A

2. Non-detects associated with IS areas > 100% should not be qualified.

3. If the IS area is below the lower limit (<50%), qualify all associated non-detects (U-values) "J". If extremely low area counts are reported (<25%) or if performance exhibits a major abrupt drop off, flag all associated non-detects as unusable (R).

14.2 Are the retention times of the internal standards within 30 seconds of the associated calibration standard? L

ACTION: Professional judgement should be used to qualify data if the retention times differ by more than 30 seconds.

15.0 Field Duplicates

15.1 Were any field duplicates submitted for BNA analysis?

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate results must be addressed in the reviewer narrative. However, if large differences exist, identification of field duplicates should be confirmed by contacting the sampler.

YES NO N/A

PART C: PESTICIDE/PCB ANALYSIS

1.0 Traffic Reports and Laboratory Narrative

1.1 Are Traffic Report Forms present for all samples? [ ]

ACTION: If no, contact lab for replacement of missing or illegible copies.

1.2 Do the Traffic Reports or SDG Narrative indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?___ [ ]

ACTION: If any sample analyzed as a soil, other than TCLP, contains 50%-90% water, all data should be qualified as estimated (J). If a soil sample, other than TCLP, contains more than 90% water, all data should be qualified as unusable (R).

ACTION: If samples were not iced upon receipt at the laboratory, flag all positive results "J" and all non-detects "UJ".

2.0 Holding Times

2.1 Have any PEST/PCB technical holding times, determined from date of collection to date of extraction, been exceeded? [ ]

Water and soil samples for PEST/PCB analysis must be extracted within 7 days of the date of collection. Extracts must be analyzed within 40 days of the date extraction.

YES NO N/A

ACTION: If technical holding times are exceeded, flag all positive results as estimated (J) and sample quantitation limits (UJ) and document in the narrative that holding times were exceeded. If analyses were done more than 14 days beyond holding time, either on the first analysis or upon re-analysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. At a minimum, all the data should at least be qualified "J", but the reviewer may determine that non-detects are unusable (R).

3.0 Surrogate Recovery (Form II)

3.1 Are the PEST/PCB Surrogate Recovery Summaries (Form II) present for each of the following matrices?

a. Low Water

b. Soil

3.2 Are all the PEST/PCB samples listed on the appropriate Surrogate Recovery Summary for each of the following matrices?

a. Low Water

b. Soil

ACTION: Call lab for explanation/resubmittals. If missing deliverables are unavailable, document effect in data assessments.

3.3 Were outliers marked correctly with an asterisk? [ ]

ACTION: Circle all outliers in red.

3.4 Were surrogate recoveries of TCX or DCB outside of the contract specification for any sample or blank? (60-150%) ___ [ ]

YES NO N/A

ACTION: No qualification is done if surrogates are diluted out. If recovery for both surrogates is below the contract limit, but above 10%, flag all results for that sample 'J". If recovery is < 10% for either surrogate, qualify positive results 'J" and flag non-detects "R". If recovery is above the contract advisory limits for both surrogates qualify positive values "J".

3.5 Were surrogate retention times (RT) within the windows established during the initial 3-point analysis of Individual Standard Mixture A? [ ]

ACTION: If the RT limits are not met, the analysis may be qualified unusable (R) for that sample on the basis of professional judgement.

3.6 Are there any transcription/calculation errors between raw data and Form II? ___ [ ]

ACTION: If large errors exist, call lab for explanation/resubmittal. Make any necessary corrections and document effect in data assessments.

4.0 Matrix Spikes (Form III)

4.1 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form (Form III) present?

4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices? (1 MS/MSD must be performed for every 20 samples of similar matrix or concentration level)

a. Low Water

b. Soil

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

YES NO N/A

How many PEST/PCB spike recoveries are outside QC limits?

Water	Soil
out of 12	___ out of 12

How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

Water	Soil
out of 6	out of 6

ACTION: No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer may use the matrix spike and matrix spike duplicate results in conjunction with other QC criteria and determine the need for some qualification of the data.

5.0 Blanks (Form IV)

5.1 Is the Method Blank Summary (Form IV) present? [ ]

5.2 Frequency of Analysis: For the analysis of Pesticide/PCB TCL compounds, has a reagent/ method blank been analyzed for each SDG or every 20 samples of similar matrix or concentration or each extraction batch, whichever is more frequent? [ ]

ACTION: If any blank data are missing, take the action specified above in 3.2. If blank data is not available, reject (R) all associated positive data. However, using professional judgement, the data reviewer may substitute field blank data for missing method blank data.

5.3 Has a PEST/PCB instrument blank been analyzed at the beginning of every 12 hr. period following the initial calibration sequence? (minimum contract requirement)

YES NO N/A

ACTION: If any blank data are missing, call lab for explanation/resubmittals. If missing deliverables are unavailable, document the effect in data assessments.

5.4 Chromatography: review the blank raw data - chromatograms, quant reports or data system printouts.

Is the chromatographic performance (baseline stability) for each instrument acceptable for PEST/PCBs?

ACTION: Use professional judgement to determine the effect on the data.

6.0 Contamination

NOTE: "Water blanks", "distilled water blanks" and "drilling water blanks" are validated like any other sample and are not used to qualify the data. Do not confuse them with the other QC blanks discussed below.

6.1 Do any method/instrument/reagent/cleanup blanks have positive results for PEST/PCBs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution Factor and corrected for % moisture when necessary. ___ [ ]

6.2 Do any field/rinse blanks have positive PEST/PCB results? ___ [ ]

ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet)

NOTE: All field blank results associated to a particular group of samples (may exceed one per case or one per day) may be used to qualify data. Blanks may not be qualified because of contamination in another blank. Field blanks must be qualified for surrogate, or calibration QC problems.

YES NO N/A

ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks.

Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > CRQL & > 5x blank value
Flag sample result with a "U";	Report CRQL & qualify "U"	No qualification is needed

NOTE: If gross blank contamination exists, all data in the associated samples should be qualified as unusable (R).

Are there field/rinse/equipment blanks associated with every sample? [ ]

ACTION: For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks.

7.0 Calibration and GC Performance

Are the following Gas Chromatograms and Data Systems Printouts for both columns present for all samples, blanks, MS/MSD?

a. peak resolution check [ ]

b. performance evaluation mixtures [ ]

c. aroclor 1016/1260 [ ]

d. aroclors 1221, 1232, 1242, 1248, 1254 [ ]

e. toxaphene [ ]

f. low points individual mixtures A & B [ ]

g. med points individual mixtures A & B [ ]

h. high points individual mixtures A & B [ ]

YES NO N/A

i. instrument blanks [ ]

ACTION: If no, take action specified in 3.2 above.

Are Forms VI - PEST 1-4 present and complete for each column and each analytical sequence? [ ]

ACTION: If no, take action specified in 3.2 above.

Are there any transcription/calculation errors between raw data and Forms VI? ___ [ ]

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and document effect in data assessments.

Do all standard retention times, including each pesticide in each level of Individual Mixtures A & B, fall within the windows established during the initial calibration analytical sequence? (For Initial Calibration Standards, Form VI - PEST - 1). [ ] ___

ACTION: If no, all samples in the entire analytical sequence are potentially affected. Check to see if the chromatograms contain peaks within an expanded window surrounding the expected retention times. If no peaks are found and the surrogates are visible, non-detects are valid. If peaks are present and cannot be identified through pattern recognition or using a revised RT window, qualify all positive results and non-detects as unusable (R).
For aroclors, RT may be outside the RT window, but the aroclor may still be identified from the individual pattern.

7.5 Are the linearity criteria for the initial analyses of Individual Standards A & B within limits for both columns? (% RSD must be < 20.0% for all analytes except for the 2 surrogates, which must not exceed 30.0 % RSD). See Form VI PEST - 2. [ ]

YES NO N/A

ACTION: If no, qualify all associated positive results generated during the entire analytical sequence "J" and all non-detects "UJ". When RSD >90%, flag all non-detect results for that analyte R (unusable).

Is the resolution between any two adjacent peaks in the Resolution Check Mixture > 60.0% for both columns? (Form VI-PEST - 4) [ ]

ACTION: If no, positive results for compounds that were not adequately resolved should be qualified "J". Use professional judgement to determine if non-detects which elute in areas affected by co-eluting peaks should be qualified "N" as presumptive evidence of presence or unusable (R).

7.7 Is Form VII - Pest-1 present and complete for each Performance Evaluation Mixture analyzed during the analytical sequence for both columns? [ ]

ACTION: If no, take action as specified in 3.2 above.

Has the individual % breakdown exceeded 20.0% on either column. ___ [ ]

- for 4,4' - DDT? ___ [ ]

- for endrin? ___ [ ]

Has the combined % breakdown for 4,4'- DDT/ Endrin exceeded 30.0% on either column? (required in all instances) ___ [ ]

ACTION: 1. If any % breakdown has failed the QC criteria in either PEM in steps 2 and 17 in the initial calibration sequence (p. D-38/Pest SOW 3/90), qualify all sample analyses in the entire analytical sequence as described below.

YES NO N/A

2. If any % breakdown has failed the QC criteria in a PEM Verification calibration, review data beginning with the samples which followed the last in-control standard until the next acceptable PEM & qualify the data as described below.

a. 4,4'-DDT Breakdown: If 4,4'-DDT breakdown is greater than 20.%:

   i. Qualify all positive results for DDT with 'J". If DDT was not detected, but DDD and DDE are positive, then qualify the quantitation limit for DDT as unusable (R).

   ii. Qualify positive results for DDD and/or DDE as presumptively present at an approximated quantity (NJ).

b. Endrin Breakdown: If endrin breakdown is greater than 20.0%:

   i. Qualify all positive results for endrin with "J". If endrin was not detected, but endrin aldehyde and endrin ketone are positive, then qualify the quantitation limit for endrin as unusable (R).

   ii. Qualify positive results for endrin ketone and endrin aldehyde as presumptively present at an approximated quantity (NJ).

c. Combined Breakdown: If the combined 4,4'-DDT and endrin breakdown is greater than 30.0%:

   i. Qualify all positive results for DDT and endrin with "J". If endrin was not detected, but endrin aldehyde and endrin ketone are positive, then qualify the quantitation limit for endrin as unusable (R). If DDT was not detected, but DDD and DDE are positive, then qualify the quantitation limit for DDT as unusable (R).

YES NO N/A

ii. Qualify positive results for endrin ketone and endrin aldehyde as presumptively present at an approximated quantity (NJ). Qualify positive results for DDD and/or DDE as presumptively present at an approximated quantity (NJ).

7.9 Are the relative percent difference (RPD) values for all PEM analytes <25.0%? (Form VII-PEST-1) [ ]

ACTION: If no, qualify all associated positive results generated during the analytical sequence "J" and sample quantitation limits "UJ".

NOTE: If the failing PEM is part of the initial calibration. all samples are potentially affected. If the offending standard is a verification calibration, the associated samples are those which followed the last in-control standard until the next passing standard.

7.10 Have all samples been injected within a 12 hr. period beginning with the injection of an Instrument Blank?

ACTION: If no, use professional judgement to determine the severity of the effect on the data and qualify accordingly.

7.11 Is Form VII - Pest-2 present and complete for each INDA and INDB Verification Calibration analyzed?

ACTION: If no, take action specified in 3.2 above.

7.12 Are there any transcription/calculation errors between raw data and Form VII - Pest-2? [ ]

ACTION: If large errors exists, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments. under "Conclusions".

YES NO N/A

7.13 Do all standard retention times for each INDA and INDB Verification Calibration fall within the windows established by the initial calibration sequence? [ ]

ACTION: If no, beginning with the samples which followed the last in-control standard, check to see if the chromatograms contain peaks within an expanded window surrounding the expected retention times. If no peaks are found and the surrogates are visible, non-detects are valid. If peaks are present and cannot be identified through pattern recognition or using a revised RT window, qualify all positive results and non-detects as unusable (R).

7.14 Are RPD values for all verification calibration standard compounds < 25.0%? [ ]

ACTION: If the RPD is >25.0% for the compound being quantitated, qualify all associated positive results "J" and non-detects "UJ". The "associated samples" are those which followed the last in-control standard up to the next passing standard containing the analyte which failed the criteria. If the RPD is >90%, flag all non-detects for that analyte R (unusable).

8.0 Analytical Sequence Check (Form VIII-PEST)

8.1 Is Form VIII present and complete for each column and each period of analyses? [ ]

ACTION: If no, take action specified in 3.2 above.

8.2 Was the proper analytical sequence followed for each initial calibration and subsequent analyses? (see CLP SOW p. D-39 & D-41/PEST) [ ]

ACTION: If no, use professional judgement to determine the severity of the effect on the data and qualify it accordingly. Generally, the effect is negligible unless the sequence was grossly altered or the calibration was also out of limits.

YES NO N/A

9.0 Cleanup Efficiency Verification (Form IX)

Is Form IX - Pest-1 present and complete for each lot of Florisil Cartridges used? (Florisil Cleanup is required for all Pest/PCB extracts.) [ ]

ACTION: If no, take action specified in 3.2 above If data suggests that florisil cleanup was not performed, make note in "Contract Problems/Non-Compliance".

9.2 Are all samples listed on the Pesticide Florisil Cartridge Check Form? [ ]

ACTION: If no, take action specified in 3.2 above.

If GPC Cleanup was performed, (mandatory for all soil sample extracts) is Form IX - Pest-2 present? [ ]

ACTION: If no, take action specified in 3.2 above.

ACTION: If GPC was not performed when required, make note in" Contract Problems/Non-Compliance" section of data assessment.

9.4 Are percent recoveries (% R) of the pesticide and surrogate compounds used to check the efficiency of the cleanup procedures within QC limits:

80-120% for florisil cartridge check? [ ]

80-110% for GPC calibration? [ ]

Qualify only the analyte(s) which fail the recovery criteria as follows:

ACTION: If % R are < 80%, qualify positive results "J" and quantitation limits "UJ". Non-detects should be qualified "R" if zero %R was obtained for pesticide compounds. Use professional judgement to qualify positive results if recoveries are greater than the upper limit.

YES NO N/A

NOTE: Sample data should be evaluated for potential interferences if recovery of 2,4,5-trichlorophenol was > 5% in the Florisil Cartridge Performance Check analysis. Make note in Contract Problems/ Non-Compliance section of reviewer narrative.

NOTE: The raw data of the GPC Calibration Check analysis is evaluated for pattern similarity with previously run Aroclor standards.

10.0 Pesticide/PCB Identification

10.1 Is Form X complete for every sample in which a pesticide or PCB was detected? [ ]

ACTION: If no, take action specified in 3.2 above.

10.2 Are there any transcription/calculation errors between raw data and Forms 6E, 6G, 7E, 7D, 8D, 9A, B, 10A. ___ [ ]

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and note error under "Conclusions".

10.3 Are retention times (RT) of sample compounds within the established RT windows for both analyses?

Was GC/MS confirmation provided when required (when compound concentration is > 10 ug/ml in final extract)?

Action: Use professional judgement to qualify positive results which were not confirmed by GC/MS. Qualify as unusable (R) all positive results which were not confirmed by second GC column analysis. Also qualify as unusable (R) all positive results not meeting RT window unless associated standard compounds are similarly biased. (see Functional Guidelines) The reviewer should use professional judgement to assign an appropriate quantitation limit.

YES NO N/A

10.4 Is the percent difference (% D) calculated for the positive sample results on the two GC columns < 25.0%? [ ]

ACTION: If the reviewer finds neither column shows interference for the positive hits, the data should be flagged as follows:

% Difference	Qualifier
25-50 %	J
50-90 %	JN
> 90 %	R

NOTE: The lower of the two values is reported on Form I. If using professional judgement, the reviewer determines that the higher result was more acceptable, the reviewer should replace the value and indicate the reason for the change in the data assessment.

10.5 Check chromatograms for false negatives, especially the multiple peak compounds toxaphene and PCBs. Were there any false negatives? ___

ACTION: Use professional judgement to decide if the compound should be reported. If the appropriate PCB standards were not analyzed, qualify the data unusable (R).

11.0 Compound Quantitation and Reported Detection Limits

11.1 Are there any transcription/calculation errors in Form I results? Check at least two positive values. Were any errors found? ___

NOTE: Single-peak pesticide results can be checked for rough agreement between quantitative results obtained on the two GC columns. The reviewer should use professional judgement to decide whethera much larger concentration obtained on one column versus the other indicates the presence of an interfering compound. If an interfering compound is indicated, the lower of the two values should be reported and qualified as presumptively present at an approximated quantity (NJ). This necessitates a determination of an estimated concentration on the confirmation column. The narrative should indicate that the presence of interferences has interfered with the evaluation of the second column confirmation.

YES NO N/A

11.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, % moisture? [ ]

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

ACTION: Quantitation limits affected by large, off-scale peaks should be qualified as unusable (R). If the interference is on-scale, the reviewer can provide an approximated quantitation limit (UJ) for each affected compound.

12.0 Chromatogram Quality

12.1 Were baselines stable? [ ]

12.2 Were any electropositive displacement (negative peaks) or unusual peaks seen? ___ [ ]

ACTION: Address comments under System Performance of data assessment.

YES NO N/A

13.0 Field Duplicates

13.1 Were any field duplicates submitted for PEST/PCB analysis? [ ]

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate results must be addressed in the reviewer narrative. However, if large differences exist, identification of field duplicates should be confirmed by contacting the sampler.

CLP DATA ASSESSMENT

Functional Guidelines for Evaluating Organic Analysis

Case No._____SDG No. LABORATORY_____SITE_____

DATA ASSESSMENT:

The current Functional Guidelines for evaluating organic data have been applied.

All data are valid and acceptable except those analytes which have been qualified with a "J" (estimated), "N" (presumptive evidence for the presence of the material), "U" (non-detects), "R" (unusable),or "JN" (presumptive evidence for the presence of the material at an estimated value). All action is detailed on the attached sheets.

Two facts should be noted by all data users. First, the "R" flag means that the associated value is unusable. In other words, due to significant QC problems, the analysis is invalid and provides no information as to whether the compound is present or not. "R" values should not appear on data tables because they cannot be relied upon, even as a last resort. The second fact to keep in mind is that no compound concentration, even if it has passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data but any value potentially contains error.

Reviewer's
Signature:_____Date:___/____/199__

Verified By:_____Date:___/_____/199_

DATA ASSESSMENT

1. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detects (sample quantitation limits) will be flagged as estimated, "J", or unusable, "R", if the holding times are grossly exceeded.

The following analytes in the samples shown were qualified because of holding time:

DATA ASSESSMENT

2. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross- contamination of samples during field operations. If the concentration of the analyte is less than 5 times the blank contaminant level (10 times for the common contaminants), the analytes are qualified as non- detects, "U". The following analytes in the samples shown were qualified with "U" for these reasons:

A) Method blank contamination

B) Field or rinse blank contamination ("water blanks" or "distilled water blanks" are validated like any other sample)

C) Trip blank contamination

DATA ASSESSMENT

3. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds, and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for volatile organics is bromofluorobenzene (BFB) and for semi-volatiles is decafluorotriphenyl- phosphine (DFTPP).

If the mass calibration is in error, or missing, all associated data will be classified as unusable, "R". The following samples shown were qualified with "R" because of tuning:

DATA ASSESSMENT

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument is capable of producing acceptable quantitative data. An initial calibration demonstrates that the instrument is capable of giving acceptable performance at the beginning of an experimental sequence. The continuing calibration verifies that the instrument is giving satisfactory daily performance.

A) RESPONSE FACTOR

The response factor measures the instrument's response to specific chemical compounds. The response factor for the VOA/BNA Target Compound List (TCL) must be $\geq$ 0.05 in both the initial and continuing calibrations. A value < 0.05 indicates a serious detection and quantitation problem (poor sensitivity). If the mean RRF of the initial calibration or the continuing calibration has a response factor <0.05 for any analyte, those analytes detected in environmental samples will be qualified as estimated, "J". All non-detects for those compounds will be rejected ("R"). The following analytes in the samples shown were qualified because of response factor:

DATA ASSESSMENT

5. CALIBRATION:

A) PERCENT RELATIVE STANDARD DEVIATION (%RSD) AND PERCENT DIFFERENCE (%D):

Percent RSD is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent D compares the response factor of the continuing calibration check to the mean response factor (RRF) from the initial calibration. Percent D is a measure of the instrument's daily performance. Percent RSD must be <30% and %D must be <25%. A value outside of these limits indicates potential detection and quantitation errors. For these reasons, all positive results are flagged as estimated, "J"; and non-detects are flagged "UJ". If %RSD and %D grossly exceed QC criteria, non-detect data may be qualified "R".

For the PCB/PESTICIDE fraction, if %RSD exceeds 20% for all analytes except for the 2 surrogates (which must not exceed 30% RSD), qualify all associated positive results "J" and non-detects "UJ".

The following analytes in the samples shown were qualified for %RSD and %D:

DATA ASSESSMENT

6. SURROGATES/ SYSTEM MONITORING COMPOUNDS (SMC):

All samples are spiked with surrogate/ SMC compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate/ SMC concentrations were outside contract specifications, qualifications were applied to the samples and analytes as shown below. The following analytes for the samples shown were qualified because of surrogate/ SMC recovery:

DATA ASSESSMENT

7. INTERNAL STANDARDS PERFORMANCE:

Internal Standard (IS) performance criteria ensure that the GC/MS sensitivity and response are stable during every experimental run. The internal standard area count must not vary by more than a factor of 2 (-50% to +100%) from the associated continuing calibration standard. The retention time of the internal standard must not vary more than ±30 seconds from the associated continuing calibration standard. If the area count is outside the (-50% to +100%) range of the associated standard, all of the positive results for compounds quantitated using that IS are qualified as estimated, "J", and all non-detects as "UJ" only if IS area is < 50%. Non detects are qualified as "R" if there is a severe loss of sensitivity (< 25% of associated IS area counts).

If an internal standard retention time varies by more than 30 seconds, the reviewer will use professional judgment to determine either partial or total rejection of the data for that sample fraction. The following analytes in the samples shown were qualified because of internal standards performance:

DATA ASSESSMENT

8. COMPOUND IDENTIFICATION:

A) VOLATILE AND SEMI-VOLATILE FRACTIONS

TCL compounds are identified on the GC/MS by using the analyte's relative retention time (RRT) and ion spectra. For the results to be a positive hit, the sample peak must be within ± 0.06 RRT units of the standard compound, and have an ion spectra which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. For tentatively identified compounds (TIC), the ion spectra must match accurately. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications. The following analytes in the samples shown were qualified for compound identification:

B) PESTICIDE FRACTION:

The retention times of reported compounds must fall within the calculated retention time windows for the two chromatographic columns. The percent difference (%D) of the positive results obtained on the two GC columns should be ≤25% The following analytes in the samples shown were qualified because of compound identification:

DATA ASSESSMENT

9. MATRIX SPIKE/SPIKE DUPLICATE, MS/MSD:

The MS/MSD data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD may be used in conjunction with other QC criteria for some additional qualification of data. The following analytes, for the samples shown, were qualified because of MS/MSD:

DATA ASSESSMENT

OTHER QC DATA OUT OF SPECIFICATION:

SYSTEM PERFORMANCE AND OVERALL ASSESSMENT (continued on next page if necessary):

12. CONTRACTUAL NON-COMPLIANCE:

This package contains re-extraction, re-analysis or dilution. Upon reviewing the QA results, the following form I(s) are identified to be used:

DATA ASSESSMENT

11. SYSTEM PERFORMANCE AND OVERALL ASSESSMENT (continued):

Attachment 3

REJECTION SUMMARY FORM
(No. of Compounds/No. of Fractions (Samples)

SOP NO: HW-6
Date: February 1989

Type of Review: _____ Into: _____ Case #: _____

Project: _____ Lab Name: _____

Reviewer's Initials: _____ Number of Samples: _____

Analytes Rejected Due to Exceeding Review Criteria:

	Surrogates	Holding Time	Calibration	Contamination	ID	Other	Total # Samples	Total # Rejected/ Total # in all Samples
Acids (15)								
B/N (50)								
VOA (35)								
PEST (20)								
PCB (7)								
TCDD (1)								

Analytes Estimated Due to Exceeding Review Criteria for:

Acids (15)								
B/N (50)								
VOA (35)								
PEST (20)								
PCB (7)								
TCDD (1)								

DPO: [ ] ACTION [ ] FYI Region_____

ORGANIC REGIONAL DATA ASSESSMENT SUMMARY

ASE NO. _____ LABORATORY _____

SDG NO. _____ DATA USER _____

SOW _____ REVIEW COMPLETION DATE _____

NO. OF SAMPLES WATER SOIL OTHER

REVIEWER [ ] ESD [ ] ESAT [ ] OTHER, CONTRACT/CONTRACTOR _____

	VOA	BNA	PEST	OTHER
1. HOLDING TIMES				
2. GC-MS TUNE/ GC PERFORMANCE				
3. INITIAL CALIBRATIONS				
4. CONTINUING CALIBRATIONS				
5. FIELD BLANKS ("F" = not applicable)				
6. LABORATORY BLANKS				
7. SURROGATES				
8. MATRIX SPIKE/DUPLICATES				
9. REGIONAL QC ("F" = not applicable)				
10. INTERNAL STANDARDS				
11. COMPOUND IDENTIFICATION				
12. COMPOUND QUANTITATION				
13. SYSTEM PERFORMANCE				
14. OVERALL ASSESSMENT				

O = No problems or minor problems that do not affect data usability.
X = No more than *about* 5% of the data points are qualified as either estimated or unusable.
M = More than *about* 5% of the data points are qualified as estimated.
Z = More than *about* 5% of the data points are qualified as unusable. (R)

DPO ACTION ITEMS: _____

_____

_____

_____

AREAS OF CONCERN: _____

_____

_____

_____

Evaluation of Metals Data for the Contract Laboratory Program (CLP)

based on

SOW. 3/90

HW-2

(SOP Revision XI)

EPARED BY: _____ DATE: 1-30-92
Hanif Sheikh, Quality Assurance Chemist
Toxic and Hazardous Waste Section

PROVED BY: _____ DATE: 1-30-92
Kevin Kubik, Chief
Toxic and Hazardous Waste Section

PROVED BY: _____ DATE: 1/30/92
Robert Runyon, Chief
Monitoring Management Branch

le: Evaluation of Metals Data for the Contract Laboratory Program

Date: Jan. 1992
Number: HW-2
Revision: 11

Scope

1 This procedure is applicable to inorganic data obtained from contractor laboratories working for Hazardous Waste Site Contract Laboratory Program (CLP).

2 The data validation is based upon analytical and quality assurance requirements specified in Statement of Work (SOW) 3/90 .

Responsibilities - Data reviewers will complete the following tasks as assigned by the Data Review Coordinator:

1. For a total review:

1.1 Data Assessment - "Total Review-Inorganics" Checklist Appendix (A.1).
The reviewer must answer every question on the checklist.

1.2 Data Assessment - Data Assessment Narrative (Appendix A.2)
The answer on the checklist must match the action in the narrative (appendix A.2) and on Form I's. Do not use pencil to write the narrative.

1.3 Contract Non-Compliance - SMO Report (Appendix A.3)
This report is to be completed only when a serious contract violation is encountered, or upon the request of the Data Validation Task Monitor, or Technical Project Officer (TPO). Forward 5 copies: one each for internal files, appropriate Regional TPO, Sample Management Office (SMO) and last two addresses of Mailing List for Data Reviewers (Appendix A.4). In other cases, all contract violations should be appended to the end of the Data Assessment Narrative (Sec. A.2.2).

1.4 CLP Data Assessment Summary Forms

4.1 Appendix A.5
Fill in the total number of analytes analyzed by different analyses and the number of analytes rejected or flagged as estimated due to corresponding quality control criteria. Place an "X" in boxes where analyses were not performed, or criteria do not apply.

4.2 Appendix A.6
Data reviewer is also required to fill out Inorganic Regional Data Assessment form (Appendix A.7) provided by EPA Headquarters. Codes listed on the form will be used to describe the Data Assessment Summary.

.5 Data Review Log: It is recommended that each data reviewer should maintain a log of the reviews completed to include: a. date of start of case review

b. date of completion of case review
c. site
d. case number
e. contract laboratory
f. number of samples
g. matrix
h. hours worked
i. reviewer's initials

.6 Telephone Record Log - the data reviewer should enter the bare facts of inquiry, before initiating any phone conversation with CLP laboratory. After the case review has been completed, mail white copy of Telephone Record Log to the laboratory and pink copy to SMO. File yellow copy in the Telephone Record Log folder, and attach a xerox copy of the Telephone Record Log to the completed Data Assessment Narrative (Appendix A.2).

.7 Forwarded Paperwork

7.1 Upon completion of review, the following are to be forwarded to the Regional Sample Control Center (RSCC) located in the Surveillance and Monitoring Branch:
a. data package
b. completed data assessment checklist (Appendix A.1,original)
c. SMO Contract Compliance Screening (CCS)
d. Record of Communication (copy)
e. CLP Reanalysis Request/Approval Record (original + 3 copies)
f. Appendix A.6 (original).

7.2 Forward 2 copies of completed Data Assessment Narrative (Appendix A.2) along with 2 copies of the Inorganic Data Assessment Form (Appendix A.6) and Telephone Record Log , if any,: one each for appropriate Regional TPO, and the other one to EPA EMSL office in Las Vegas. The addresses of TPOs and EPA office in Las Vegas are given in Appendix A-4.

8 Filed Paperwork - Upon completion of review, the following are to be filed within MMB files:
a. Two copies of completed Data Assessment Narrative (Appendix A.2) each carrying Appendix A.6.
b. Telephone Record Log (copy)
c. SMO Report (copy Appendix A-3)
d. CLP Reanalysis Request/Approval Record (copy)

) Data Completeness
Each data package is checked by a Regional Sample Control Coordinator (RSSC) for completeness. A data package is assumed to be complete when all the deliverables required under the contract are present. If a data package is incomplete,the RSSC would call the laboratory for missing document(s). If the laboratory does not respond within a week, SMO and MMB coordinator of Region II will be notified.

Rejection of Data - All values determined to be unacceptable on the Inorganic Analysis Data Sheet (Form I) must be lined over with a red pencil. As soon as any review criteria causes data to be rejected, that data can be eliminated from any further review or consideration.

Acceptance Criteria - In order that reviews be consistent among reviewers, acceptance criteria as stated in Appendix A.1 (pages 4-25) should be used. Additional guidance can be found in the National Inorganic Functional Guidelines of October 1, 1989.

SMO Contract Compliance Screening (CCS) - This is intended to aid reviewer in locating any problems, both corrected and uncorrected. However, the validation should be carried out even if CCS is not present. Resubmittals received from laboratory in response to CCS must be used by the reviewer.

Request for Reanalysis - Data reviewers must note all items of contract non-compliance within Data Assessment Narrative.If holding times and sample storage times have not been exceeded, TPO may request reanalysis if items of non-compliance are critical to data assessment. Requests are to be made on "CLP Re-Analysis Request/Approval Record".

Record of Communication - Provided by the Regional Sample Control Center (RSCC) to indicate which data packages have been received and are ready to be reviewed.

Rounding off numbers - The data reviewer will follow the standard practice.

	YES	NO	N/A
.1 Contract Compliance Screening Report (CCS) - Present?	[___]		
ACTION: If no, contact RSCC.			
.2 Record of Communication (from RSCC) - Present?			
ACTION: If no, request from RSCC.			
.3 Trip Report - Present and complete?	[___]		
ACTION: If no, contact RSCC for trip report.			
Sample Traffic Report - Present?			
Legible?	[___]		
ACTION: If no, request from Regional Sample Control Center (RSCC).			
5 Cover Page - Present?	[___]		
Is cover page properly filled in and signed by the lab manager or the manager's designee?	[___]		
ACTION: If no, prepare Telephone Record Log, and contact laboratory.			
Do numbers of samples correspond to numbers on Record of Communication?	[___]		
Do sample numbers on cover page agree with sample numbers on:			
(a) Traffic Report Sheet?	[ ]		
(b) Form I's?	[___]		
ACTION: If no for any of the above, contact RSCC for clarification.			

		Yes	No	N/A
.6	Form I to IX			
.6.1	Are all the Form I through Form IX labeled with:			
	Laboratory name?			
	Case/SAS number?			
	EPA sample No.?	[___]		
	SDG No.?	[___]		
	Contract No.?	[___]		
	Correct units?			
	Matrix?	[___]		

ACTION: If no for any of the above, note under Contract Problem/Non-Compliance section of the "Data Assessment Narrative".

.6.2 Do any computation/transcription errors exceed 10% of reported values on Forms I-IX for:

(NOTE: Check all forms against raw data.)

(a) all analytes analyzed by ICP? [___]

(b) all analytes analyzed by GFAA? [___]

(c) all analytes analyzed by AA Flame? [___]

(d) Mercury? [___]

(e) Cyanide? [___]

ACTION: If yes, prepare Telephone Log, contact laboratory for corrected data and correct errors with red pencil and initial.

	YES	NO	N/A
Raw Data			
Digestion Log* for flame AA/ICP (Form XIII) present?			
Digestion Log for furnace AA Form XIII present?			
Distillation Log for mercury Form XIII present?			
Distillation Log for cyanides Form XIII present?			
Are pH values (pH<2 for all metals, pH>12 for cyanide) present?			
*Weights, dilutions and volumes used to obtain values.			
Percent solids calculation present for soils/sediments?			
Are preparation dates present on sample preparation logs/bench sheets?			

7.2 Measurement read out record present?

ICP	[___]
Flame AA	[
Furnace AA	[
Mercury	[___]
Cyanides	[___]

7.3 Are all raw data to support all sample analyses and QC operations present? [___]

Legible? [___]

Properly Labeled?

ACTION: If no for any of the above questions in sections A.1.7.1 through A.1.7.3, write Telephone Record Log and contact laboratory for resubmittals.

Compliance (Total Review)

		YES	NO	N/A
8	Holding Times - (aqueous and soil samples)			
	(Examine sample traffic reports and digestion/distillation logs.)			
	Mercury analysis (28 days). . . . . exceeded?			
	Cyanide distillation (14 days). . . . . exceeded?			
	Other Metals analysis (6 months). . . . exceeded?		[___]	
	NOTE: Prepare a list of all samples and analytes for which holding times have been exceeded. Specify the number of days from date of collection to the date of preparation (from raw data). Attach to checklist.			
	ACTION: If yes, reject (red-line) values less than Instrument Detection Limit (IDL) and flag as estimated (J) the values above IDL even though sample(s) was preserved properly.			
8.2	Is pH of aqueous samples for:			
	Metals Analysis >2?		[___]	
	Cyanides Analysis <12?		[___]	
	Action: If yes, flag the associated metals and cyanides data as estimated.			
9	Form I (Final Data)			
9.1	Are all Form I's present and complete?		[___]	
	ACTION: If no, prepare telephone record log and contact laboratory for submittal.			
9.2	Are correct units (ug/l for waters and mg/kg for soils) indicated on Form I's?		[___]	
	Are soil sample results for each parameter corrected for percent solids?		[___]	
	Are all "less than IDL" values properly coded with "U"?		[___]	

		YES	NO	N/A
	Are the correct concentration qualifiers used with final data?	[___]		
	ACTION: If no for any of the above, prepare Telephone Record Log, and contact laboratory for corrected data.			
.9.3	Are EPA sample # s and corresponding laboratory sample ID # s the same as on the Cover Page, Form I's and in the raw data?	[___]		
	Was a brief physical description of samples given on Form I's?	[___]		
	Was the dilution of any sample diluted beyond the requirements of the contract noted on Form I or Form XIV?		[___]	
	ACTION: If no for any of the above, note under Contract-Problem/Non-Compliance of the"Data Assessment Narrative".			
.10	Calibration			
.10.1	Is record of at least 2 point calibration present for ICP analysis?	[___]		
	Is record of 5 point calibration present for Hg analysis?	[___]		
	Is record of 4 point calibration present for:			
	Flame AA?	[___]		
	Furnace AA?	[___]		
	Cyanides?	[ ]		
	Is one calibration standard at the CRDL level for all AA (except Hg) and cyanides analyses?	]		

ACTION: If no for any of the above, write in the Contract Problem/Non-Compliance section of the "Data Assessment Narrative".

		YES	NO	N/A
10.2	Is correlation coefficient less than 0.995 for:			
	Mercury Analysis?	___	[___]	
	Cyanide Analysis?	___	[___]	
	Atomic Absorption Analysis?	___	[___]	

ACTION: If yes, flag the associated data as estimated.

NOTE: The data validator shall calculate the correlation coefficient using concentrations of the standards and the corresponding instrument response (e.g. absorbance, peak area, peak height, etc.).

10.3 In the instance where less than 4 standards are measured in absorbance (or peak area, peak height,etc.) mode, are the remaining standards analyzed in concentration mode immediately after calibration within ±10% of the true values? [___]

ACTION: If no, flag the associated data as estimated if standards are not within ±10% of true values. Do not flag the data as estimated in linear range indicated by good recovery of standard(s).

11 Form II A (Initial and Continuing Calibration Verification)-

11.1 Present and complete for every metal and cyanide? [___]

Present and complete for AA and ICP when both are used for the same analyte? [___]

ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory.

11.2 Circle on each Form IIA all percent recoveries that are outside the contract windows.
Are all calibration standards (initial and continuing) within control limits:

Metals- 90-110%R? [___]

Hg - 80-120%R? [___]

Cyanides- 85-115%R? [___]

	YES	NO	N/A
ACTION: Flag as estimated (J) all positive data (not flagged with a "U") analyzed between a calibration standard with %R between 75-89% (65-79% for Hg; 70-84% for CN) or 111-125% (121-135% for Hg; 116-130% for CN) recovery and nearest good calibration standard. Qualify results <IDL as estimated (UJ) if the ICV or CCV %R is 75-89% (CN, 70-84% ; HG, 65-79%). Reject (red-line) as unacceptable data if recovery of the ICV or CCV is outside the range 75-125% (CN, 70-130%; Hg, 65-135%). Qualify five samples on either side of verification standard out of control limits.			
11.3 Was continuing calibration performed every 10 samples or every 2 hours?			
Was ICV for cyanides distilled?	[___]		
TION: If no for any of the above, write in the Contract-Problem/Non-Compliance section of the "Data Assessment Narrative".			
12 Form II B (CRDL Standards for AA and ICP) -			
12.1 Was a CRDL standard (CRA) analyzed after initial calibration for all AA metals (except Hg)?	___		
Was a mid-range calib. verification standard distilled and analyzed for cyanide analysis?	]		
Was a 2xCRDL (or 2xIDL when IDL>CRDL) analyzed (CRI) for each ICP run? (Note: CRI for AL,Ba,Ca,Fe,Mg,Na,or K is not required.)	___]		
ACTION: If no for any of the above, flag as estimated all data falling within the affected ranges. The affected ranges are: AA Analysis - **True Value ± CRDL; ICP Analysis - **True Value ± 2CRDL; CN Analysis - **True Value ± 0.5 x True Value.			

ue value of CRA, CRI or mid-range standard. Substitute IDL for CRDL when IDL > CRDL.
ute the concentration of the missing mid-range standard from the calibration range.

		YES	NO	N/A
1.12.2	Was CRI analyzed after ICV/ICB and before the final CCV/CCB, and twice every eight hours of ICP run?	[___]		

ACTION: If no, write in Contract Problem/Non-Compliance Section of the "Data Assessment Narrative".

.12.3 Circle on each Form IIB all the percent recoveries that are outside the acceptance windows.

Are CRA and CRI standards within control limits:

Metals 80 - 120%R?]

Is mid-range standard within control limits:

Cyanide 80 - 120%R?

ACTION: Flag as estimated all sample results within the affected range if the recovery of the standard is between 50-79%; flag only positive data within the affected range if the recovery is between 121-150%; reject all data within the affected range if the recovery is less than 50%; reject only positive data within the affected range if the recovery is greater than 150%. Qualify 50% of the samples on either side of CRI standard outside the control limits.

Note: Flag or reject the final results only when sample raw data are within the affected ranges and the CRDL standards are outside the acceptance windows.

.13 Form III (Initial and Continuing Calibration Blanks)

.13.1	Present and complete?	[___]		
	For both AA and ICP when both are used for the same analyte?	[___]		
	Was an initial calibration blank analyzed?	[___]		
	Was a continuing calibration blank analyzed after every 10 samples or every 2 hours (which ever is more frequent)?	[___]		

YES NO N/A

ACTION: If no, prepare Telephone Record Log, contact laboratory and write in the Contract-Problems/ Non-Compliance section of the "Data Assessment Narrative"

13.2 Circle on each Form III all calibration blank values that are above CRDL (or 2 x IDL when IDL > CRDL).

Are all calibration blanks (when IDL<CRDL) less than or equal to the Contract Required Detection Limits (CRDLs)? [___]

Are all calibration blanks less than two times Instrument Detection Limit (when IDL>CRDL)? [___]

ACTION: If no for any of the above, flag as estimated (J) positive sample results when raw sample value is less than or equal to calibration blank value analyzed between calibration blank with value over CRDL (or 2xIDL) and nearest good calibration blank.
Flag five samples on either side of the calibration blank outside the control limits.

14 FORM III (Preparation Blank) -
(Note: The preparation blank for mercury is the same as the calibration blank.)

14.1 Was one prep. blank analyzed for:

each Sample Delivery Group (SDG)? [___]

each batch of digested samples?

each matrix type?

both AA and ICP when both are used for the same analyte? [___]

ACTION: If no for any of the above, flag as estimated (J) all the associated positive data <10 x IDLs for which prep. blank was not analyzed.

NOTE: If only one blank was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).

		YES	NO	N/A
.14.2	Is concentration of prep. blank value greater than the CRDL when IDL is less than or equal to CRDL?	___	[___]	
	If yes, is the concentration of the sample with the least concentrated analyte less than 10 times the prep.blank?		[___]	
	ACTION: If yes, reject (red-line) all associated data greater than CRDL concentration but less than ten times the prep. blank value.			
.14.3	Is concentration of prep. blank value (Form III) less than two times IDL, when IDL is greater than CRDL?	[___]		
	ACTION: If no, reject (red-line) all positive sample results when sample raw data are less than 10 times the prep. blank value.			
.14.4	Is concentration of prep. blank below the negative CRDL?		[___]	
	ACTION: If yes, reject (red-line) all associated sample results less than 10xCRDL.			
15	Form IV (ICP Interference Check Sample)			
.15.1	Present and complete?	[___]		
	(NOTE: Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.)			
	Was ICS analyzed at beginning and end of run (or at least twice every 8 hours)?	[___]		
	ACTION: If no, flag as estimated (J) all the samples for which AL, Ca, Fe, or Mg is higher than in ICS.			
15.2	Circle all values on each Form IV that are more than ± 20% of true or established mean value.			
	Are all Interference Check Sample results inside the control limits (± 20%)?	[___]		
	If no, is concentration of Al, Ca, Fe, or Mg lower than the respective concentration in ICS?	[___]		

YES NO N/A

ACTION: If no, flag as estimated (J) those positive results for which ICS recovery is between 121-150%; flag all sample results as estimated if ICS recovery falls within 50-79%; reject (red-line) those sample results for which ICS recovery is less than 50%; if ICS recovery is above 150%, reject positive results only (not flagged with a "U").

.16 Form V A (Spiked Sample Recovery - Pre-Digestion/Pre-Distillation)- (Note: Not required for Ca, Mg, K, and Na (both matrices), Al, and Fe (soil only.)

16.1 Present and complete for: each SDG?

each matrix type?

each conc. range (i.e. low, med., high)? [___]

For both AA and ICP when both are used for the same analyte? [___]

ACTION: If no for any of the above, flag as estimated (J) all the positive data less than four times the spiking levels specified in SOW for which spiked sample was not analyzed

NOTE: If one spiked sample was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).

16.2 Was field blank used for spiked sample? [___]

ACTION: If yes, flag all positive data less than 4 x spike added as estimated (J) for which field blank was used as spiked sample.

16.3 Circle on each Form VA all spike recoveries that are outside control limits (75% to 125%).

Are all recoveries within control limits?

If no, is sample concentration greater than or equal to four times spike concentration?

	YES	NO	N/A

ACTION: If yes, disregard spike recoveries for analytes whose concentrations are greater than or equal to four times spike added. If no, circle those analytes on Form V for which sample concentration is less than four times the spike concentration.

Are results outside the control limits (75-125%) flagged with "N" on Form I's and Form VA? [___]

ACTION: If no, write in the Contract - Problem/Non - Compliance section of "Data Assessment Narrative".

16.4 Aqueous

Are any spike recoveries:

(a) less than 30%? ___ [___]

(b) between 30-74%? ___ [___]

(c) between 126-150%? ___ [___]

(d) greater than 150%? [___]

ACTION: If less than 30%, reject all associated aqueous data; if between 30-74%, flag all associated aqueous data as estimated (J); if between 126-150%, flag as estimated (J) all associated aqueous data not flagged with a "U"; if greater than 150%, reject (red-line) all associated aqueous data not flagged with a "U".

16.5 Soil/Sediment

Are any spike recoveries:

(a) less than 10%? [___]

(b) between 10-74%? [___]

(c) between 126-200%? ___ [___]

(d) greater than 200%? ___ [___]

YES NO N/A

ACTION: If less than 10%, reject all associated data; if between 10-74%, flag all associated data as estimated; if between 126-200%, flag as estimated all associated data was not flagged with a "U"; if greater than 200%, reject all associated data not flagged with a "U".

17 Form VI (Lab Duplicates)

17.1 Present and complete for: each SDG?

each matrix type? [___]

each concentration range (i.e. low, med., high)? [___]

both AA and ICP when both are used for the same analyte? [___]

ACTION: If no for any the above, flag as estimated (J) all the data ≥CRDL* for which duplicate sample was not analyzed.

Note: 1. If one duplicate sample was analyzed for more than 20 samples, then first 20 samples do not have to be flagged as estimated.

2. If percent solids for soil sample and its duplicate differ by more than 1%, prepare a Form VI for each duplicate pair, report concentrations in ug/L on wet weight basis and calculate RPD or Difference for each analyte.

17.2 Was field blank used for duplicate analysis? ___ [___

ACTION: If yes, flag all data ≥CRDL* as estimated (J) for which field blank was used as duplicate.

.17.3 Are all values within control limits (RPD 20% or difference ≤ ±CRDL)?

If no, are all results outside the control limits flagged with an * on Form I's and VI? [___]

ACTION: If no, write in the Contract - Problems/Non-Compliance section of "Data Assessment Narrative".

* Substitute IDL for CRDL when IDL > CRDL.

	YES	NO	N/A

NOTE: 1. RPD is not calculable for an analyte of the sample - duplicate pair when both values are less than IDL.
2. If the result of lab duplicate analyzed by GFAA is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria to metals analyzed by GFAA.

.17.4 Aqueous

Circle on each Form VI all values that are:

RPD > 50%, or
Difference > CRDL*

Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times *CRDL? [___]

Is any difference** between sample and duplicate greater than *CRDL where sample and/or duplicate is less than 5 times *CRDL? ___ [___]

ACTION: If yes, flag the associated data as estimated.

17.5 Soil/Sediment

Circle on each Form VI all values that are:

RPD > 100%, or

Difference > 2 x CRDL*

Is any RPD (where sample and duplicate are both greater than or equal to 5 times *CRDL) :

> 100%?]

Is any **difference between sample and duplicate (where sample and/or duplicate is less than 5x*CRDL) :

> 2x*CRDL? [___]

Substitute IDL for CRDL when IDL > CRDL.
Use absolute values of sample and duplicate to calculate the difference.

YES NO N/A

ACTION: If yes, flag the associated data as estimated.

18 Field Duplicates

18.1 Were field duplicates analyzed? [___]

ACTION: If yes, prepare a Form VI for each aqueous field duplicate pair. Prepare a Form VI for each soil duplicate pair, if percent solids for sample and its duplicate differ by more than 1%; report concentrations of soils in ug/l on wet weight basis and calculate RPDs or Difference for each analyte.

NOTE: 1. Do not calculate RPD when both values are less than IDL.
2. Flag all associated data only for field duplicate pair.

18.2 Aqueous

Circle all values on self prepared Form VI for field duplicates that are:

RPD > 50%, or
Difference > CRDL*

Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times *CRDL? ___ [ ]

Is any **difference between sample and duplicate greater than *CRDL where sample and/or duplicate is less than 5 times *CRDL? ___ [___]

ACTION: If yes, flag the associated data as estimated.

* Substitute IDL for CRDL when IDL > CRDL.
** Use absolute values of sample and duplicate to calculate the difference.

	YES	NO	N/A

18.3 Soil/Sediment

Circle all values on self prepared Form VI for field duplicates that are:

RPD >100%, or

Difference > 2 x CRDL*

Is any RPD (where sample and duplicate are both greater than 5 times *CRDL) :

>100%?

Is any **difference between sample and duplicate (where sample and/or duplicate is less than 5x *CRDL):

>2x *CRDL?

ACTION: If yes, flag the associated data as estimated.

19 Form VII (Laboratory Control Sample) (Note: LCS - not required for aqueous Hg and cyanide analyses.)

19.1 Was one LCS prepared and analyzed for:

each SDG? [___]

each batch samples digested/distilled? [___]

both AA and ICP when both are used for the same analyte? [___]

ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory for submittal of results of LCS. Flag as estimated (J) all the data for which LCS was not analyzed.

NOTE: If only one LCS was analyzed for more than 20 samples, then first 20 samples close to LCS do not have to be flagged as estimated.

Substitute IDL for CRDL when IDL > CRDL.
Use absolute values of sample and duplicate to calculate the difference.

YES NO N/A

1.19.2 Aqueous LCS

Circle on each Form VII the LCS percent recoveries outside control limits (80 - 120%) except for aqueous Ag and Sb.

Is any LCS recovery: less than 50%? [___]

between 50% and 79%? [___]

between 121% and 150%?

greater than 150%? ___ [___]

ACTION: Less than 50%, reject (red-line) all data; between 50% and 79%, flag all associated data as estimated (J); between 121% and 150%, flag all positive (not flagged with a "U") results as estimated; greater than 150%, reject all positive results.

19.3 Solid LCS

NOTE: 1. If "Found" value of LCS is rejectable due to duplicate injections or analytical spike recovery criteria, regardless of LCS recovery, flag the associated data as estimated (J).
2. If IDL of an analyte is equal to or greater than true value of LCS, disregard the "Action" below even though LCS is out of control limits.

Is LCS "Found" value higher than the control limits on Form VII?

ACTION: If yes, qualify all associated positive data as estimated.

Is LCS "Found" value lower than the Control limits on Form VII? [___]

ACTION: If yes, qualify all associated data as estimated.

		YES	NO	N/A
20	Form IX (ICP Serial Dilution) -			
	NOTE: Serial dilution analysis is required only for initial concentrations equal to or greater than 10 x IDL.			
	Was Serial Dilution analysis performed for:			
	each SDG?	[___]		
	each matrix type?	[___]		
	each concentration range (i.e. low, med.)?	[___]		
	ACTION: If no for any of the above, flag as estimated all the positive data ≥ 10xIDLs or ≥ CRDL when 10xIDL ≤ CRDL for which Serial Dilution Analysis was not performed.			
	Was field blank(s) used for Serial Dilution Analysis?		[___]	
	ACTION: If yes, flag all associated data ≥ 10 x IDL as estimated (J). If 10xIDL ≤ CRDL, flag all data ≥ CRDL.			
20.3	Are results outside control limit flagged with an "E" on Form I's and Form IX when initial concentration on Form IX is equal to 50 times IDL or greater.	[___]		
	ACTION: If no, write in the Contract-Problem/Non-Compliance section of the "Data Assessment Narrative".			
.20.4	Circle on each Form IX all percent difference that are outside the control limits for initial concentrations equal to or greater than 10 x IDLs only.			
	Are any % difference values:			
	> 10%?		[___]	
	> 100%?		[___]	

YES NO N/A

ACTION: Flag as estimated (J) all the associated sample data ≥ 10xIDLs (or ≥ CRDL when 10xIDL ≤ CRDL) for which percent difference is greater than 10% but less than 100%. Reject (red-line) all the associated sample results equal to or greater than 10xIDLs (or ≥ CRDL when 10xIDL ≤ CRDL) for which PD is greater than or equal to 100%.

Note: Flag or reject on Form I's only the sample results whose associated raw data are ≥ 10xIDL (or ≥ CRDL when 10xIDL≤ CRDL)

1.21 Furnace Atomic Absorbtion (AA) QC Analysis

1.1 Are duplicate injections present in furnace raw data (except during full Method of Standard Addition) for each sample analyzed by GFAA?

ACTION: If no, reject the data on Form I's for which duplicate injections were not performed.

1.21.2 Do the duplicate injection readings agree within 20% Relative Standard Deviation (RSD) or Coefficient of Variation (CV) for concentration greater than CRDL?

Was a dilution analyzed for sample with analytical spike recovery less than 40%?

ACTION: If no for any of the above, flag all the associated data as estimated.

1.21.3 Is *analytical spike recovery outside the control limits (85-115%) for any sample? [___]

ACTION: If yes, flag the affected sample results if the recovery is between 10-84%; if the recovery is between 115-200%, flag the associated positive sample results as estimated; reject the associated sample results if the recovery is less than 10%; reject positive sample results if the recovery is greater than 200%.

Analytical spike is not required on the pre-digestion spiked sample.

		YES	NO	N/A
	NOTE: Reject or flag the data only when the affected sample(s) was not subsequently analyzed by Method of Standard Addition.			
.22	**Form VIII (Method of Standard Addition Results)**			
22.1	Present?	[___]		
	If no, is any Form I result coded with "S" or a "+"?		[___]	
	ACTION: If yes, write request on Telephone Record Log and contact laboratory for submittal of Form VIII			
	Is coefficient of correlation for MSA less than 0.990 for any sample?	___	[___]	
	ACTION: If yes, reject (red-line) the affected data.			
22.3	Was *MSA required for any sample but not performed?	___	[___]	
	Is coefficient of correlation for MSA less than 0.995?		[ ]	
	Are MSA calculations outside the linear range of the calibration curve generated at the beginning of the analytical run?		[	
	ACTION: If yes for any of the above, flag all the associated data as estimated (J).			
22.4	Was proper quantitation procedure followed correctly as outlined in the SOW on page E-23?	[___]		
	ACTION: If no, note exception under Contract Problem/ Non-Compliance section of the "Data Assessment Narrative", and prepare a separate list.			

* MSA is not required on LCS and prep. blank.

		YES	NO	N/A
	Dissolved/Total or Inorganic/Total Analytes -			
.23.1	Were any analyses performed for dissolved as well as total analytes on the same sample(s).		[___]	
	Were any analyses performed for inorganic as well as total (organic + inorganic) analytes on the same sample(s)?	___	[___]	
	NOTE: 1. If yes, prepare a list comparing differences between all dissolved (or inorganic) and total analytes. Compute the differences as a percent of the total analyte only when dissolved concentration is greater than CRDL as well as total concentration. 2. Apply the following questions only if inorganic (or dissolved) results are (i) above CRDL, and (ii) greater than total constituents. 3. At least one preparation blank, ICS, and LCS should be analyzed in each analytical run.			
.23.2	Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 10%?		[___]	
.23.3	Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 50%?	___	[___]	
	ACTION: If more than 10%, flag both dissolved (or inorganic) and total values as estimated (J); if more than 50%, reject (red-line) the data for both values.			
	Form I (Field Blank)			
	(Note: Designate "Field Blank" as such on Form I.)			
1.24.1	Circle all field blank values on Form I that are greater than CRDL, (or 2 x IDL when IDL > CRDL).			
	Is field blank concentration less than CRDL (or 2 x IDL when IDL > CRDL) for all parameters of associated aqueous and soil samples?	[___]		

	YES	NO	N/A

If no, was field blank value already rejected due to other QC criteria?

ACTION: If no, reject (except field blank results) all associated positive sample data less than or equal to five times the field blank value. Reject on Form I's the soil sample results that when converted to ug/L on wet basis are less than or equal to five times the field blank value in ug/L.

1.25 Form X, XI, XII (Verification of Instrumental Parameters).

1.25.1 Is verification report present for:

Instrument Detection Limits (quarterly)? [___]

ICP Interelement Correction Factors (annually)? [___]

ICP Linear Ranges (quarterly)? [ ]

ACTION: If no, contact TPO of the lab.

1.25.2 Form X (Instrument Detection Limits) - (Note: IDL is not required for Cyanide.)

1.25.2.1 Are IDLs present for: all the analytes? [___]

all the instruments used? [___]

For both AA and ICP when both are used for the same analyte? [___]

ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory.

1.25.2.2 Is IDL greater than CRDL for any analyte? [___]

If yes, is the concentration on Form I of the sample analyzed on the instrument whose IDL exceeds CRDL, greater than 5 x IDL. [___]

	YES	NO	N/A

Action : If no, flag as estimated all values less than five times IDL of the instrument whose IDL exceeds CRDL.

.25.3 **Form XI (Linear Ranges)**

.25.3.1 Was any sample result higher than high linear range of ICP. [___]

Was any sample result higher than the highest calibration standard for non-ICP parameters? [___]

If yes for any of the above, was the sample diluted to obtain the result on Form I? [___]

ACTION: If no, flag the result reported on Form I as estimated(J).

26 **Percent Solids of Sediments**

26.1 Are percent solids in sediment(s):

< 50%? [___]

< 10%? [___]

ACTION: If yes, qualify as estimated all the results of a sample that has per cent solids between 10%-50% (i.e. moisture content between 50%-90%). Reject all the results of a sample that has per cent solids less than 10% (i.e. moisture content greater than 90%).

NOTE: Reject or flag(J) only the sample results that were not previously rejected or flaged due to other QC criteria.

Site _____ Matrix: Soil

3# _____ Lab _____ Water_

tractor _____ Reviewer _____ Other_

.1 Validation Flags- The following flags have been applied in red by the data validator and must be considered by the data user.

J- This flag indicates the result qualified as estimated

Red- Line- A red-line drawn through a sample result indicates unusable value. The red-lined data are known to contain significant errors based on documented information and must not be used by the data user.

Fully Usable Data- The results that do not carry "J" or "red-line" are fully usable

Contractual Qualifiers- The legend of contractual qualifiers applied by the lab on Form I's is found on page B-20 of SOW ILM01.0.

.2 The data assessment is given below and on the attached sheets.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

2 (continuation)

.2 (continuation)

2.3 Contract-Problem/Non-Compliance

MMB/ESAT Rviewer: _____ Date: _____
Signature

ntractor Reviewer: _____ Date: _____
Signature

Verified by: _____ Date: _____

CONTRACT NON-COMPLIANCE
(SMO REPORT)

Regional Review of Uncontrolled Hazardous Waste
Site Contract Laboratory Data Package

CASE NO._____

e hardcopied (laboratory name)_____
organic data package received at Region II has been reviewed and the quality assurance and rformance data summarized. The data reviewed included:
O Sample No.:_____

nc. & Matrix:_____

ntract No.(_____) requires that specific analytical work be done and at associated reports be provided by the contractor to the Regions, EMSL-LV, and SMO. The neral criteria used to determine the performance were based on an examination of:

- Data Completeness
- Matrix Spike Results
- Calibration Standards Results
- Duplicate Analysis Results
- Blank Analysis Results
- MSA Results

ems of non-compliance with the above contract are described below.

ments:_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Reviewer's Initial

Date

MEO/MAILING LIST FOR DATA REVIEWERS

1. USEPA Region I (ESD)
60 Westview Street
Lexington, MA 02173
Dal Slaro
(617) 861-6312
CT, ME, MA, NH, RI, VT
CAA, Resource Analysts, York,
EJI, Skinner, IDA

2. USEPA Region II (ESD)
Woodbridge Avenue
Edison, New Jersey 08837

(201) 321-6676
NJ, NY, PR, VI
Century, Chemtech, US Test, Nanco,
ETC, Gadson, EMS, Galson, ICM

3. USEPA Region III (CRL)
839 Bestgate Road
Annapolis, MD 21401
Chuck Sands
(301) 266-9180
DE, MD, PA, VA, WV, DC
Centec, Mitman, JTC, MACK, VERSAR,
JTAS, Weston, MMTS, EA Engineering
Subject Tech., Key PA

4. USEPA Region IV (ESD)
Analytical Support Branch
College Station Road
Athens, GA 30613
Tom Bennett, Jr.
(404) 546-3112
AL, FL, GA, KY, MS, NC, SC, TN
Computer, EMS, ESI, PESAL,
Triangle Labs

5. USEPA Region V (ESD)
536 South Clark Street
Tenth Floor, CRL
Chicago, IL 60605
Pat Churchill
312-353-9087
IL, IN, MI, MN, OH, WI
NCI, IAI/IDC

6. USEPA Region VI (ESD)
Monterey Park Plaza, Bldg. C
6604 Hornwood Drive
Houston, TX 77074
David Stockton
(713) 953-3425
AR, LA, NM, TX, OK
ANALCHEM, RADIAN, SPECS, ECS, Gleicher
Research, Inc., SFL Inc., SAIC,
Allied, Key TX, ERA

7. USEPA Region VII Laboratory
25 Funston Road
Kansas City, KS 66115
Debra Money
(913) 236-3851
IA, KS, NE, MO
Wilson, Kansas City Scientific
Enterprises, Eagle Picher

8. USEPA Region VIII Laboratory
BOX 25366
Denver Federal Center
Lakewood, CO 80225
Eva Hoffman
(303) 236-7371
CO, ND, SD, UT, WY, MT
ACCU, CSMRI, MRAL, Data Chem, Centec

9. USEPA Region IX (ESD)
QA Management Section
215 Fremont Street
San Francisco, CA 94105
Kent Kitchingman
(415) 974-0524
AZ, CA, HI, NV, American Samoa,
Outer Trust Territories of Pacific
Islands, Wake Island
ALL, CAL Weston, S-Cubed, IT-CA,
Vegas

10. USEPA Region X Laboratory
P.O. BOX 549
Manchester, WA 98353
Gerald Muth
(206) 442-0370
AK, ID, OR, WA
Laucks Testing Labs, Century Testing
Labs (For VOA Only), Weyerhauser Co.
Columbia Testing, Silver Valley

11. Carla Dempsey - (DS-230)
USEPA
401 "M" Street, S.W.
Washington, DC 20460
FTS 382-5766

12. Edward Kantor
USEPA
EMSL-LV
944 E. Harmon Avenue
BOX 93478
Las Vegas, NV 89119

13. Sample Management Office
Viar and Company
P.O. BOX 818
Alexandria, VA 22313

CLP DATA ASSESSMENT SUMMARY FORM (INORGANICS)

f Review: _____ Date: _____ Case #: _____

_____ Lab Name: _____

er's Initials: _____ Number of Samples: _____

Analytes Rejected Due to Exceeding Review Criteria:*

	Holding Times	Calibration	Prep Blank	Field Blank	Inter-ferences	Spike Recovery	Duplicates Lab	Duplicates Field	Detection Limits	LCS	Serial Dilution	MSA	Total Analytes	Rejection
AA														
ce AA														
ry														

Analytes Flagged as Estimated (J) Due to Exceeding Criteria For:*

AA														
ce AA														
ry														

:erisk (*) Indicates additional exceedances of review criteria.

INORGANIC REGIONAL DATA ASSESSMENT Region____

NO._____ SITE_____

RATORY_____ NO. OF SAMPLES/
MATRIX_____

_____ REVIEWER (IF NOT ESD)_____

_____ REVIEWER'S NAME_____

ACTION_____ FYI_____ COMPLETION DATE_____

DATA ASSESSMENT SUMMARY

	ICP	AA	Hg	CYANIDE
HOLDING TIMES				
CALIBRATIONS				
BLANKS				
ICS				
LCS				
DUPLICATE ANALYSIS				
MATRIX SPIKE				
MSA				
SERIAL DILUTION				
SAMPLE VERIFICATION				
OTHER QC				
OVERALL ASSESSMENT				

) = Data has no problems/or qualified due to minor problems.
1 = Data qualified due to major problems.
Z = Data unacceptable.
X = Problems, but do not affect data.

N ITEMS:_____

_____

_____

S OF CONCERN:_____

_____

_____

PERFORMANCE:_____

_____

_____

APPENDIX J

METHOD 3810

HEADSPACE

SCOPE AND APPLICATION

1.1 Method 3810 was formerly Method 5020 in the second edition of this manual.

1.2 Method 3810 is a static headspace technique for extracting volatile organic compounds from samples. It is a simple method that allows large numbers of samples to be screened in a relatively short period of time. It is ideal for screening samples prior to using the purge-and-trap method. Detection limits for this method may vary widely among samples because of the large variability and complicated matrices of waste samples. The method works best for compounds with boiling points of less than 125°C. The sensitivity of this method will depend on the equilibria of the various compounds between the vapor and dissolved phases.

1.3 Due to the variability of this method, this procedure is recommended for use only as a screening procedure for other, more accurate determinative methods (Methods 8010, 8015, 8020, 8030, and 8240).

SUMMARY OF METHOD

2.1 The sample is collected in sealed glass containers and allowed to equilibrate at 90°C. A sample of the headspace gas is withdrawn with a gas-tight syringe for screening analysis using the conditions specified in one of the GC or GC/MS determinative methods (8010, 8015, 8020, 8030, or 8240).

INTERFERENCES

3.1 Samples can be contaminated by diffusion of volatile organics (particularly chlorofluorocarbons and methylene chloride) through the sample container septum during shipment and storage. A field sample blank prepared from reagent water and carried through sampling and subsequent storage and handling can serve as a check on such contamination.

3.2 Contamination by carryover can occur whenever high-level and low-level samples are sequentially analyzed. To reduce carryover, the sample syringe must be rinsed out between samples with reagent water. Whenever an unusually concentrated sample is encountered, it should be followed by an analysis of reagent water. It may be necessary to wash out the syringe with detergent, rinse with distilled water, and dry in a 105°C oven between analyses.

3.3 Before processing any samples, the analyst should demonstrate daily through the analysis of an organic-free water or solvent blank that the entire analytical system is interference-free.

Post-it® Fax Note 7671	Date 10/27	# of pages ▸ 5
To S. Bonwell	From A. Chakraborti	
Co./Dept. TAMS	Co. NYS DEC	
Phone #	Phone # 518-457-3252	
Fax # 371-9104	Fax # 518-457-8989	

Revision 0
Date September 1986

4.0 APPARATUS AND MATERIALS

4.1 Refer to the specific determinative method for appropriate apparatus and materials.

4.2 Vials: 125-mL Hypo-Vials (Pierce Chemical Co., #12995, or equivalent), four each.

Septa: Tuf-Bond (Pierce #12720 or equivalent).

Seals: Aluminum (Pierce #13214l or equivalent).

Crimper: Hand (Pierce #13212 or equivalent).

4.6 Syringe: 5-mL, gas-tight with shutoff valve and chromatographic needles.

4.7 Microsyringe: 250- or 500-uL.

4.8 Water bath: Heated, with concentric ring cover, capable of temperature control (±5°C). The bath should be used in a hood.

5.0 REAGENTS

5.1 Refer to the specific determinative method and Method 8000 for preparation of calibration standards.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 Refer to the introductory material to this chapter, Organic Analytes, Section 4.1.

7.0 PROCEDURE

7.1 Gas chromatographic conditions and Calibration: Refer to the specific determinative method for GC operating conditions and to Method 8000, Section 7.4, for calibration procedures.

7.2 Sample preparation:

7.2.1 Place 10.0 g of a well-mixed waste sample into each of two separate 125-mL septum-seal vials.

7.2.2 Dose one sample vial through the septum with 200 uL of a 50 ng/uL calibration standard containing the compounds of interest. Label this "1-ppm spike."

7.2.3 Dose a separate (empty) 125-mL septum seal vial with 200 uL of the same 50 ng/uL calibration standard. Label this "1-ppm standard."

7.2.4 Place the sample, 1-ppm-spike, and 1-ppm-standard vials into a 90°C water bath for 1 hr. Store the remaining sample vial at 4.0°C for possible future analysis.

7.3 Sample analysis:

7.3.1 While maintaining the vials at 90°C, withdraw 2 mL of the headspace gas with a gas-tight syringe and analyze by direct injection into a GC. The GC should be operated using the same GC conditions listed in the method being screened (8010, 8015, 8020, 8030, or 8240).

7.3.2 Analyze the 1-ppm standard and adjust instrument sensitivity to give a minimum response of at least 2 times the background. Record retention times (RT) and peak areas of compounds of interest.

7.3.3 Analyze the 1-ppm spiked sample in the same manner. Record RTs and peak areas.

7.3.4 Analyze the undosed sample as in Paragraph 7.3.3.

7.3.5 Use the results obtained to determine if the sample requires dilution or methanolic extraction as indicated in Method 5030.

8.0 QUALITY CONTROL

8.1 Before processing any samples, the analyst should demonstrate through the analysis of a distilled water method blank that all glassware and reagents are interference-free. Each time a set of samples is extracted or there is a change in reagents, a method blank should be processed as a safeguard against chronic laboratory contamination. The blank samples should be carried through all stages of the sample preparation and measurement.

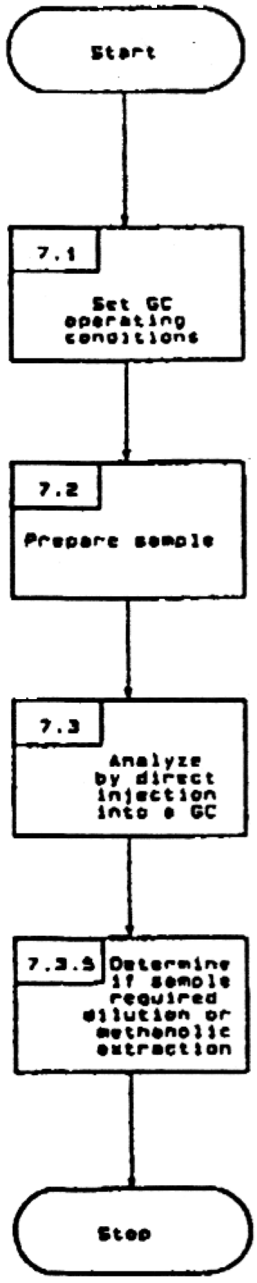
8.2 Standard quality assurance practices should be used with this method. Fortified samples should be carried through all stages of sample preparation and measurement; they should be analyzed to validate the sensitivity and accuracy of the analysis. If the fortified waste samples do not indicate sufficient sensitivity to detect less than or equal to 1 ug/g of sample, then the sensitivity of the instrument should be increased.

9.0 METHOD PERFORMANCE

9.1 No data provided.

1. Hachenberg, H. and A. Schmidt, Gas Chromatographic Headspace Analysis, Philadelphia: Hayden & Sons Inc., 1979.

2. Friant, S.L. and I.H. Suffet, "Interactive Effects of Temperature, Salt Concentration and pH on Headspace Analysis for Isolating Volatile Trace Organics in Aqueous Environmental Samples," Anal. Chem. 51, 2167-2172, 1979.


Start
7.1
Set GC operating conditions
7.2
Prepare sample
7.3
Analyze by direct injection into a GC
7.3.5
Determine if sample required dilution or methanolic extraction
Stop

APPENDIX K

SOP NO. HW-18

STANDARD OPERATING PROCEDURE

FOR

VALIDATING

VOLATILE ORGANIC ANALYSIS OF AMBIENT AIR IN CANISTER

(VCAA01.0)

Revision 0, April, 1994

Prepared by the EPA Region II
Organic ESAT Team

By: George Karras Date: 8/16/94
George Karras, Organic Task Monitor/Chemist
Toxic and Hazardous Waste Section

By: Avraham Teitz Date: 8/17/94
Avraham Teitz, Environmental Scientist
Air and Water Section

CONCURRED BY: Kevin W. Kubik Date: 8/17/94
Kevin Kubik,
Toxic and Hazardous Waste Section

APPROVED BY: Robert Runyon Date: 8/18/94
Robert Runyon, Chief
Monitoring Management Branch

CKAGE COMPLETENESS AND DELIVERABLES

SE NUMBER:_____ LAB:_____

SITE:_____

This Region II SOP document is based on the Draft USEPA CLP SOW: Volatile Organics Analysis of Ambient Air in Canisters December 1991, Revision VCAA01.0.

NO

Data Completeness and Deliverables

1.1 Have any missing deliverables been received and added to the data package?

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If lab cannot provide them, note the effect on review of the package under the "Contract Problems/Non-Compliance" section of reviewer narrative.

1.2 Is the Complete SDG File (CSF) Document Inventory Sheet (Form AADC-2) filled out correctly?

Cover Letter, Narrative, and Data Reporting Forms

2.1 Is the Narrative and Cover Page - AAVC present?

2.2 Is Case Number contained in the Narrative or Cover letter?

2.3 Are the following Data Reporting Forms present?

Analysis Data Sheet [Form I - AAVC-1 and -2]

Tentatively Identified Compounds [Form I-AAVC-TIC]

Blank Summary [Form II - AAVC]

Laboratory Control Sample Data Sheet [FormIII - AAVC]

GC/MS Instrument Performance Check and Mass Calibration [Form IV - AAVC]

NO

Initial Calibration Data Sheet
[Form V - AAVC-1 and -2]

Continuing Calibration Data Sheet
[Form VI - AAVC-1 and -2]

Internal Standard Area and RT Summary
[Form VII - AAVC]

Canister Certification [Form VIII - AAVC-1, AAVC-2, and AAVC-3]

Analytical Sequence [Form IX - AAVC] [ ]

.0 Canister Receipt/Log-in Sheet

Receipt of each canister is recorded in a laboratory notebook dedicated to this use. The sample receipt/log-in sheet (Form AADC-1) must demonstrate that the information on custody records, traffic reports, and sample tags agree for each sample.

3.1 Do all info items on Form AADC-1 agree with each sample ? [ ]

ACTION: If these documents are not consistent, contact SMO and attach a record of resolution.

0 Traffic Reports and Laboratory Narrative

4.1 Are the Traffic Report Forms present for all samples?

ACTION: If no, contact lab for replacement of missing or illegible copies.

YES NO N/A

.0 Holding Times

5.1 Have any VOA technical holding times, determined from the date of sample receipt (VTSR) to the date of analysis, been exceeded?

Analysis of air samples in canisters must be completed within 14 days of the VTSR for nonpolar compounds. Polar compounds such as methanol, acetonitrile, ethanol, butanol, and methyl ethyl ketone have been found to be less stable than the more nonpolar VOCs, when stored in canisters over seven days. Note that ethanol, butanol, and methyl ethyl ketone are not target compounds.

NOTE: The contract requires that samples must be retained from VTSR until 45 days after delivery of a complete sample data package to the Agency.

VOA Table of Holding Time Violations

Sample ID	Sample Matrix	Date Lab Received	Date Analyzed

ACTION: If technical holding times have been exceeded, flag all positive results as estimated ("J") and sample quantitation limits as estimated ("UJ"), and document in the data assessment that holding times were exceeded. At a minimum, all results must be qualified "J", but the reviewer may determine that non-detect data are unusable ("R"). Use **Table 1** below as a guide.

TABLE 1 VOA Technical Holding Time

e following table summarizes the technical holding time criteria and the data qualification idelines for all associated field samples.

Nonpolar Compounds HOLDING TIME	NOT QUALIFIED	J	R
Detects	0 - 14 days	> 14 days	
Non-detects	0 - 14 days	> 14 days	> 28 days
Polar Compounds HOLDING TIME	**NOT QUALIFIED**	**J**	**R**
Detects	0 - 7 days	> 7 days	
Non-detects	0 - 7 days	> 7 days	> 28 days

YES NO N/A

5.0 Leak Test Evaluation

6.1 All canisters are leak tested prior to each sampling use.
Form VIII - AAVC summarizes the canister certification for each canister. The initial gauge pressure should be approximately 206 kPa (30 psi) with zero air.

Does the final pressure decrease by more than 0.2 kPa (0.029psi) within 24 hours? [ ]

ACTION: If the canister does not meet the leak-tight criteria all results should be flagged "R".

6.2 All canisters must undergo an evacuation test. Each canister is evacuated to <0.05 mm Hg and the initial vacuum reading is reported on Form VIII-AAVC.

Is the final vacuum reading within 0.02 mm Hg of the initial reading, after 24 hours?

ACTION: If the reading exceeds the 0.02 mm Hg range all results should be flagged "R".

YES NO N/A

Canister Certification Form VIII-AAVC-1

Canister certification involves two procedures: blank analysis and spike analysis.

7.1 Blank Analysis

All canisters have to be checked after cleaning. Check values on Form VIII-AAVC-1. Is any target analyte higher than its CRQL?

ACTION: The lab has to reclean the canisters if a) any target compound exceeds its CRQL or b) the total concentration of all target and non-target compounds together exceeds 10 ppbv. If the lab failed to do so, it should be noted under contract non-compliance. The contamination analyte should then be rejected "R".

7.2 Spike Analysis

For the spiked canister, the acceptable % Difference, after seven days, for any target compound at a nominal 10 ppbv concentration in humidified zero air is < ± 30%. If the above criteria is not met, the lab is required to resolve the problem and reclean the canister. The canister shall undergo a spike analysis and be subjected to the same criteria for cleanliness. If after reanalysis, the %D is still outside the ± 30% criteria for any compound, the canister must not be used. (High %D values can be caused, for instance, by canister leak at seams or active sites in the canister).

Are any analytes exceeding ± 30 %D? ☐

ACTION: If yes, reject all sample analytes. The particular canister should have been reanalyzed or set aside.

NO N/A

7.3 Is the pressure recorded on the canister ID tag significantly different (greater than 10%) from the gauge pressure measured at canister receipt? (see header on Form I-AAVC for each sample)

ACTION: If yes, the integrity of the sample is suspect and the data must be flagged "R".

Note: If gauge pressure is <83 kPa (<12 psi), the lab may wish to pressurize the canister, as an option, with humid zero air up to a gauge pressure of approximately 137 kPa (20 psi) to enable sample flow during analysis.

8.0 Laboratory Control Samples

8.1 Is an LCS Data Sheet (Form III-AAVC) present and complete for each LCS?

8.2 Was an LCS prepared (10ppbv) and analyzed at the required frequency (once per 12 hour analytical sequence, and concurrently with the samples in the SDG)?

ACTION: Call lab for explanation/resubmittals. If missing deliverables or information is unavailable, document the effect in the data assessment.

8.3 Are there any transcription/calculation errors between the raw data and Form III-AAVC? Check LCS target compound recoveries. [ ]

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and document the effects in the data assessment.

8.4 Is the % recovery within 60-140 % for <u>each LCS target compound</u> reported on Form III-AAVC?

ACTION: Professional judgement should be used to qualify the impact on sample data, if the recoveries are outside the given limits.

NO N/A

8.5 Is the RT of each reported LCS compound within the windows established during the most recent valid calibration?

If the most recent calibration is the initial calibration use mid level standard (10 ppbv).

ACTION: Professional judgement should be used to qualify sample data, if retention times differ by more than 20 seconds.

8.6 Do the Internal Standards meet the requirements specified in Sections 18.1 and 18.2?

ACTION: If not, see Sections 18.1 and 18.2.

8.7 LCS acceptance criteria must be met before any field samples, PE sample, and required blanks are analyzed. Samples outside the LCS technical acceptance criteria, given in Sections 8.4 and 8.5 will require reanalysis at no additional cost to the Agency. Was any sample reanalyzed? If no, proceed with the following actions and note under contract non-compliance.

ACTION: Circle outliers in red

ACTION:

1. If one or two LCS compounds are outside the specified limits, the associated sample results for the outlying compounds should be qualified as indicated in **Table 2** below.

2. If more than two LCS compounds are outside the acceptable recovery limits upon reanalysis, or the reanalysis was not performed, then all associated sample data should be qualified as specified in Table 2 below and documented in the data assessment under "Contract Non-Compliance" and "System Performance" sections.

3. If the absolute RT for any LCS compound is outside the established windows, then qualify positive results and non-detects in

NO N/A

the associated environmental sample data for that LCS compound(s) (See Table 2). All non-LCS compounds should be qualified using professional judgement.

AAVC Laboratory Control Samples

TABLE 2

The following table summarizes the LCS criteria and the data qualification guidelines all associated field samples.

LCS	NOT QUALIFIED	J	R
% RECOVERY			
Detects	60 - 140%	< 60%, > 140%	
Not Detects	≥ 60%	10 - 59%	< 10%
ABSOLUTE RT OF LCS COMPOUNDS			
LCS Compounds in samples RT: (min)	± 0.33		> ± 0.33

0 GC/MS Instrument Performance Check

9.1 Are the GC/MS Instrument Performance Check Forms (Form IV-AAVC) present for Bromofluorobenzene (BFB)?

9.2 Are the enhanced bar graph spectrum and mass/charge (m/z) listing for the 50 ng BFB provided for each twelve hour shift?

9.3 Has the instrument performance compound been analyzed for every twelve hours of sample analysis per instrument?

YES NO N/A

ACTION: List date, time, instrument ID, and sample analysis for which no associated GC/MS tuning data are available.

DATE	TIME	INSTRUMENT	SAMPLE NUMBERS

ACTION: If lab cannot provide missing data, reject ("R") all data generated outside an acceptable twelve hour calibration interval.

Have the ion abundances been normalized to m/z 95? [ ]

ACTION: If mass assignment is in error, qualify all associated data as unusable (R)

Have the ion abundance criteria been met for each instrument used? [ ]

ACTION: List all data which do not meet ion abundance criteria (attach a separate sheet).

ACTION: If ion abundance criteria are not met, the Region II TPO must be notified.

Are there any transcription/calculation errors between mass lists and Form Vs? (Check at least two values but if errors are found, check more.) [ ]

Have the appropriate number of significant figures (two) been reported? [ ]

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and document effect in data assessments.

9.8 Are the spectra of the mass calibration compound acceptable? [ ]

NO N/A

ACTION: Use professional judgement to determine whether associated data should be accepted, or qualified.

10.0 Performance Evaluation Sample

10.1 The PE sample will assist the Agency in monitoring Contractor performance. The lab will not be informed as to which compounds are contained in the PE samples or the concentrations. Was a PE sample submitted from the Agency with each SDG?

10.2 PE samples must be validated like environmental samples. There is no holding time for PE samples. If the data results do not comply with the Agencies' spike results use professional judgement together with other QC criteria in order to determine usability of the other data in the SDG. If the associated data was rejected because of PE results, the EPA technical project officer must be notified.

10.3 Do the Internal Standards meet the requirements specified in Sections 18.1 and 18.2? [ ]

ACTION: If not, see Sections 18.1 and 18.2

0 Laboratory Blanks

11.1 Is an Analysis Data Sheet (Form II -AAVC) present and complete for each method blank?

11.2 Frequency of analysis:

Has a method blank analysis been reported per sample batch of 20 or less, per instrument for each 12-hour analytical sequence?

Has a method blank been analyzed after the initial calibration or a valid calibration check standard, and before the LCS, prior to sample analysis?

ACTION: If any blank data are missing, call lab for explanation/resubmittals. If missing deliverables are unavailable, reject ("R") all positive data.

NO N/A

11.3 Chromatography: review the blank raw data - chromatograms, quant reports and data system printouts. Is the chromatographic performance (baseline stability) for each instrument acceptable?

ACTION: Use professional judgement to determine the effect on the data.

11.4 Do the Internal Standards meet the requirements specified in Sections 18.1 and 18.2?

ACTION: If not, see section 18.1 and 18.2.

.2.0 Blank Contamination

12.1 Do any method blanks have positive target and non-target VOA results ? [ ]

ACTION: Use **Table** 3 below to qualify samples with target compound results also present in the associated blank. Use the largest value from all the associated method blanks if more than one method blank was run.

VOA Laboratory Blanks
TABLE 3

ıe following table summarizes the laboratory blank criteria and the data qualification ıidelines for all associated field samples.

SAMPLES	NOT QUALIFIED	U
Target compounds	> 5 x Blank Level	≤ 5 x Blank Level *

*** If sample result is also less than CRQL, report as not detected (U) at [CRQL].**
ɔte that the dilution factor has to be taken into account when calculating the Blank Level.

	NO	N/A
13.0 AAC-VOA Target Compound Analytes		
13.1 Are the Organic Analysis Data Sheets (Form I-AAVC-1, Form I-AAVC-2), VOA chromatograms, and data system printouts present and complete with required header information for each of the following:		
a. Samples?	[ ]	
b. Method blanks?	[ ]	
c. Laboratory Control Sample (LCS)?	[ ]	
d. Performance Evaluation Sample (PES)?	[ ]	
ACTION: If any data are missing, take action specified in 1.1 above.		
13.2 Is chromatographic performance acceptable with respect to:		
a. Baseline stability?	[ ]	
b. Resolution?	[ ]	
c. Peak shape?	[ ]	
d. Full-scale graph (attenuation)?	[ ]	
e. Other:	[ ]	
13.3 Were any electropositive displacement (negative peaks) or unusual peaks seen?		[ ]
ACTION: Use professional judgement to determine the acceptability of the data. Address comments under "System Performance" section of data assessment.		
13.4 Is the sample component relative retention time (RRT) within ± 0.06 RRT units of the RRT of the standard component from the most recent continuing calibration?		
NOTE If the most recent calibration is a calibration curve, the mean RRT ($\overline{RRT}$) should be used for comparison.		
ACTION: If the above criteria is not met, professional judgement should be used to qualify sample data		

NO N/A

13.5 Was Nafion dryer used? [ ]

ACTION: In cases where Nafion tubing is used to dry the sample stream, polar target and nontarget compounds must not be reported

ACTION: Reject all polar compounds if reported as nondetects. Polar compounds reported as positive hits should be flagged "J".

14.0 Tentatively Identified Compounds (TIC)

14.1 Are all Tentatively Identified Compound Forms (Form I-AAVC-TIC) present and are retention time, estimated concentration and "JN" qualifier listed corresponding to each TIC?

14.2 Are the mass spectra for the tentatively identified compounds and associated "best match" spectra included in the sample package for each of the following?

a. Samples

b. Blanks

ACTION: If any TIC data are missing, take action specified in 1.1 above.

ACTION: Add "JN" qualifier if missing

14.3 Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum?

14.4 Do TIC and "best match" standard relative ion intensities agree within 20%?

ACTION: Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some

NO N/A

less specific identification (example: "C3 substituted benzene") as appropriate.

Also, when a compound is not found in any blanks, but is detected in a sample and is a suspected artifact of a common laboratory contaminant, the result should be qualified as unusable (R). (e.g., Common Lab Contaminants: CO_2 (M/E 44), Siloxanes (M/E 73), Aldol Condensation Products, Solvent Preservatives, and related by products - see Functional Guidelines for more guidance).

Initial Calibration and System Performance

15.1 Are the Initial Calibration Forms (Form V-AAVC-1, -2) present and complete for the volatile fraction at concentrations of 2, 5, 10, 20, and 50 ppbv.

ACTION: If any calibration standard forms or raw data are missing, take action specified in section 1.1 above.

15.2 Was the same volume introduced into the trap consistently for all field and QC-sample analyses? [ ]

15.3 Was the percent area response change (%ARC) at each calibration level within ± 40% of the mean area response over the initial calibration range for each internal standard?

ACTION: If the range exceeds ± 40% for particular compounds, flag these compounds "J" for positive and non-detects in the associated samples. If the %ARCs exceeds ± 90%, associated sample compounds should be rejected.

15.4 Are the relative retention times (RRT) for each of the target compounds at each calibration level within ± 0.06 RRT units of the mean relative retention time for the compound?

ACTION: If no, reject the associated sample compounds

NO N/A

15.5 Are response factors stable for VOAs over the concentration range of the calibration (%Relative Standard Deviation (%RSD)) ≤30.0%?

ACTION: Circle all outliers in red

ACTION: If %RSD > 30.0%, qualify associated positive results for that analyte "J" and non-detects using professional judgement. When RSD > 90%, flag all non-detects for that analyte R (unusable).

NOTE: Analytes previously qualified "U" for blank contamination are still considered as "hits" when qualifying for initial calibration criteria.

15.6 Are the RRFs above 0.05?

ACTION: Circle all outliers in red

ACTION: If any RRFs are < 0.05, qualify associated non-detects (R) and flag associated positive data as estimated (J).

15.7 Are there any transcription/calculation errors in the reporting of average response factors (RRFs) or %RSDs? (Check at least 2 values, but if errors are found, check more.) [ ]

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and document effects in data assessment.

16.0 Continuing Calibration (Form VI-AAVC-1, -2)

16.1 Are the Continuing Calibration Forms (Form VI-AAVC-1, -2) present and complete for the volatile fraction?

	NO	N/A
16.2 Has a continuing calibration standard (10 ppbv) been analyzed for every twelve hours of sample analysis per instrument after the BFB tuning analysis?	[ ]	

ACTION: List below all sample analyses that were not within twelve hours of the continuing calibration analysis.

_____

_____

_____

ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation/resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").

16.3 Do any volatile compounds have a % Difference (% D) between the initial and continuing RRFs which exceed the ± 25% criteria?

ACTION: Circle all outliers in red.

ACTION: Qualify both positive results and non-detects for the outlier compound(s) as estimated. When % D is above 90%, reject all non-detects for that analyte (R) unusable

16.4 Do any volatile compounds have a RRF <0.05?

ACTION: Circle all outliers in red.

ACTION: If the RRF <0.05, qualify associated non-detects as unusable (R) and "J" associated positive values.

NO N/A

16.5 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or %difference (%D) between initial and continuing RRFs? (Check at least two values but if errors are found, check more.) [ ]

ACTION: Circle errors in red

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors under "Conclusions".

Compound Quantitation and Reported Detection Limits

17.1 Are there any transcription/calculation errors in Form I-AAVC-1, Form I-AAVC-2 results? Check at least two positive values. Verify that the correct mid point relative response factors RRF_{10} of the initial calibration, or the RRF_{10} of the associated continuing calibration were used to calculate Form I results? [ ]

17.2 Are the reported detection limits adjusted to reflect sample dilutions?

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors under "Conclusions".

NOTE: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Cross out "E" from the original analysis. Replace the concentrations in the original analysis with the ones from the diluted sample. Specify which Form I is to be used. Draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

	NO	N/A
17.3 Have any target compound concentrations exceeded the calibration range of the GC?	[ ]	

ACTION: If yes, flag as estimated ("J").

17.4 Was more than one method of quantitation used to calculate sample results within a batch or 12 hr. analytical sequence?	[ ]	

17.5 Did the lab report the target compounds below CRQLs with the suffix "J"?

ACTION: When appropriate, include suffix "J"

.0 Internal Standard (Form VII-AAVC)

18.1 Are the 3 internal standard areas (Form VII-AAVC) of every sample, LCS, PE, and blank within the upper and lower limits (+40% to -40%) for each continuing calibration or 10 ppbv level of initial calibration?

ACTION: List all the outliers below

	Internal Std	Area	Lower Limit	Upper Limit

ACTION:

1. If the internal standard area count is outside the limit, flag all positive results quantitated with this internal standard with a "J."
2. Non-detects associated with IS area counts > 100% should not be qualified
3. If IS area is below the lower limit (< 60%), qualify all associated non-detects (U values) "J". If extremely low area counts are reported, (< 25%), or if performance exhibits a major abrupt drop off, flag all associated non-detects as unusable ("R").

NO N/A

18.2 Are the internal standard retention times in each sample, LCS, PE, and blank within 20 seconds of the corresponding retention times in the associated calibration standard?

ACTION: Professional judgement should be used to qualify sample data if the internal standard retention times differ by more than 20 seconds

9.0 Analytical Sequence Check (Form IX-AAVC)

19.1 Is Form IX-AAVC present and complete for each column and each period of analyses?

ACTION: If no, take action specified in 1.1 above.

19.2 Was the proper analytical sequence followed for each initial calibration and subsequent analyses?

ACTION: If no, use professional judgement to determine the severity of the effect on the data and qualify it accordingly Note under "Contract Non-Compliance"

0.0 Field Duplicates

20.1 Were any field duplicates submitted for VOA analysis? [ ]

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation in the results of the duplicates must be addressed in the reviewer narrative. If, however large differences exist, identification of field duplicates should be confirmed by contacting the sampler.

DATA ASSESSMENT

This Data Assessment is based on the USEPA Region II SOP: Volatile Organics Analysis of Ambient Air in Canisters, April 1994.

SDG No. **LABORATORY:**

SITE

All data are valid and acceptable except those analytes which have been qualified with a "J" (estimated), "U"(non-detects), or "R" (unusable). All action is detailed on the attached sheets.

Two facts should be noted by all data users. First, the "R" flag means that the associated value is unusable. In other words, due to significant QC problems, the analysis is invalid and provides no information as to whether the compound is present or not. "R" values should not appear on data tables because they cannot be relied upon, even as a last resort. The second fact to keep in mind is that no compound concentration, even if it has passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data but any value potentially contains error.

actions are detailed below and on the attached sheets:

Reviewer's Signature:_____ Date: /____/199

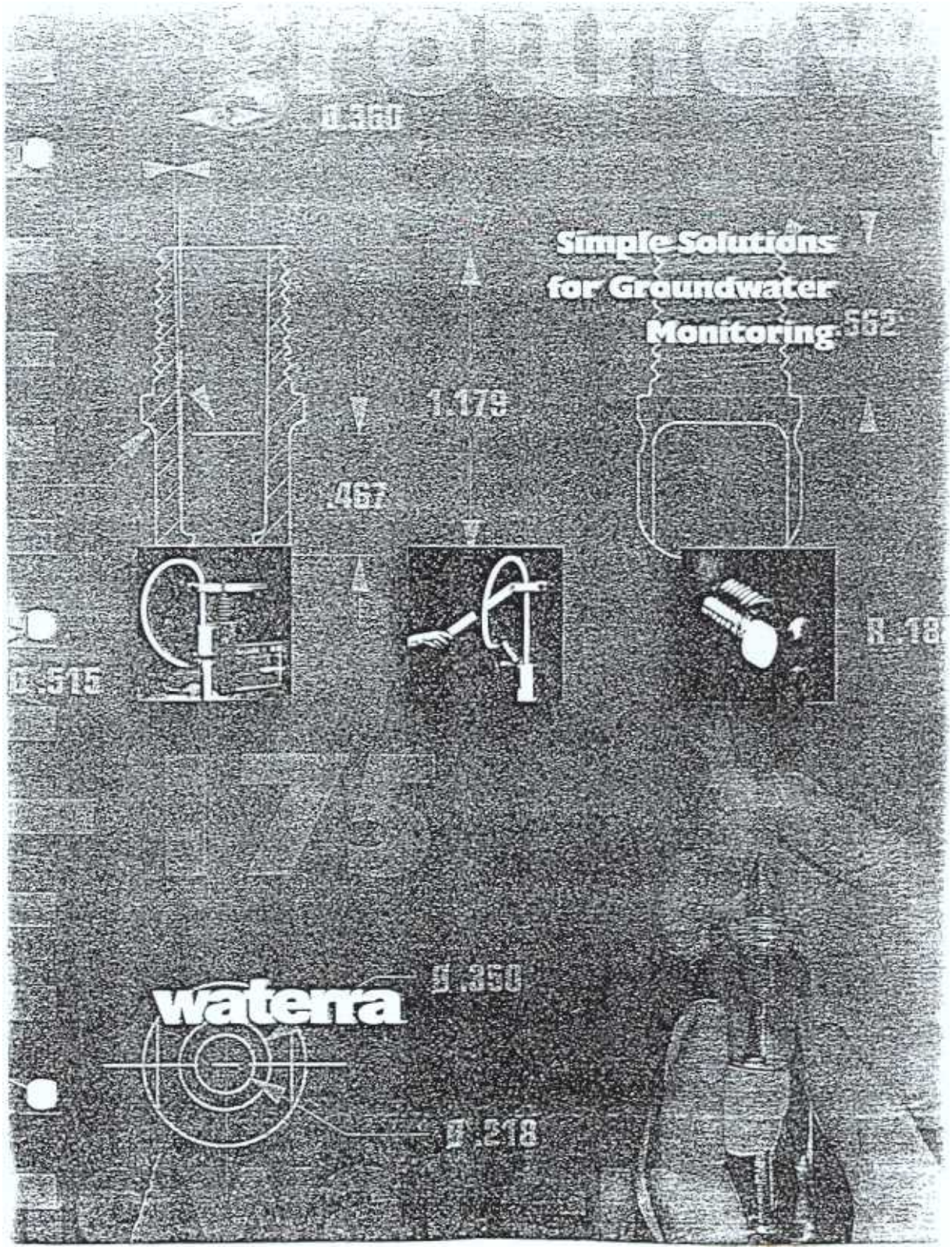
Verified By:_____ Date: /____/199

Case#_____

Case#_____
Site:_____
Lab :_____

Contract Non-Compliance:

APPENDIX L


Simple Solutions
for Groundwater
Monitoring
waterra

Waterra Inertial Pumps

Designed for Simplicity

The Waterra Inertial pump was designed from the onset to meet four goals: simplicity, performance and quality sample collection in a package affordable enough to dedicate to every well. Waterra found that by eliminating complex and over-engineered components like bladders, pistons and submersible motors that a low cost, easy to operate pump could be produced. The final product consists only of a footvalve and a length of plastic tubing that when oscillated up and down in the well produces a flow of water. Our clients have found that our simple, reliable and versatile sampling system excels in performance, yet is easily affordable. In the field, Waterra has always performed beyond the expectations of such a simple design.

How it Works

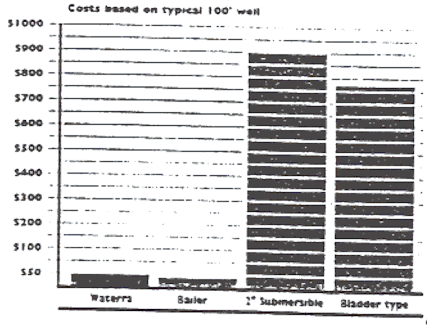
1. Tubing/Valve assembly is installed in well. Water level inside tubing rises to that in well.
2. A rapid upstroke closes the foot valve and lifts the water column inside the tubing a distance equal to the stroke.
3. At the end of the upstroke, the water column continues to rise due to its momentum. A further column of water is thus simultaneously drawn into the tube.
4. Pushing the tubing down immediately after the upstroke forces a further column of water into the tubing due to the inertia of the water column.
5. The cycle is repeated and water rises in pulses to discharge at the surface.

Cost Effective Dedicated Sampling Pumps

A Better Solution: Dedicated sampling systems are regarded by groundwater professionals to provide better quality and more representative samples at a dramatically reduced cost. Waterra pumps cost little more than bailers to dedicate, yet equal or exceed far more costly pumps in performance.

Reduced Sampling Costs: Installing dedicated pumps to all your wells eliminates costly field blanks, lowers the risk and associated costs of cross contamination and reduces labor expenses by minimizing tedious tasks and poorly utilized field labor.

Price Advantage: The Waterra Inertial System offers dedicated installations at a price comparable to that of bailers, but with superior performance and flexibility. Waterra further extends system range and capabilities by providing reliable and easy to use manual, electric or gas powered actuators.



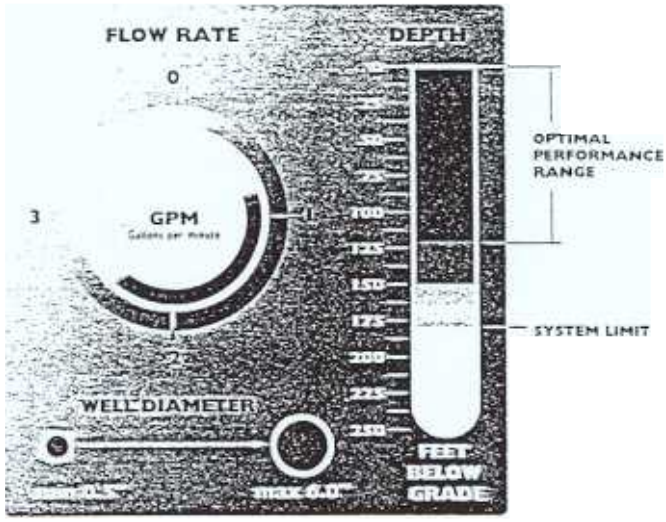
'Waterra pumps cost little more than bailers to dedicate, yet equal or exceed far more costly pumps in performance.'

waterra

Pump Selection Guide

Using the Performance Chart

The Performance Chart shown below is an example of how Waterra has classified the performance capabilities of its four Inertial Pump Systems. This chart is intended to assist you with the selection of the most suitable system for your specific site. Please note that the ratings have been calculated by actual field testing in a variety of well conditions and therefore may seem somewhat conservative in value.



Flow Rate

DEPICTS FULL RANGE OF FLOW FROM THE MAXIMUM POSSIBLE TO THE LOWEST SUSTAINABLE FLOW

TYPICAL FLOW RATES USUALLY FALL BETWEEN THE TWO VALUES

EXPECT THE BEST FLOW RATES IN HIGH YIELD (MINIMUM DRAWDOWN) WELLS WITH LARGE WATER COLUMNS

Well Diameter

SMALLEST DIAMETER WELL SUITABLE FOR THE SYSTEM

LARGEST DIAMETER WELL WHERE THE USE OF THE SYSTEM IS PRACTICAL

Depth Capability

OPTIMAL PERFORMANCE AT THESE DEPTHS

NEARING SYSTEM LIMITATIONS AT THESE DEPTHS - EXPECT SOME REDUCTION IN PERFORMANCE

OPERATION QUESTIONABLE AT THESE DEPTHS - EXPECT SHARPLY REDUCED PERFORMANCE

SYSTEM LIMIT

The Basics

- Waterra Pumps are available in four (4) performance ranges:
  Micro Flow
  Low Flow
  Standard Flow
  High Flow

- The performance of each flow range is defined by its tubing diameter - the larger the tubing the greater the flow rate and depth capability.

- Within each flow range are an assortment of different footvalves and tubing for different sampling requirements.
  See the sections marked 'Optional Equipment'.

- Each Flow Range has specific performance capabilities and limitations - use the Performance Chart to select the optimum r[illegible] and equipment for your site.

waterra

10. Calculation

10.1 Calculate the solids content of the individual samples from the data obtained in 9.2 as follows:

$$S = A/B$$

where:

A = weight in grams of sample after drying,
B = original weight in grams of sample, and
S = solid content, g/g.

Average the two values obtained. Record as the solids content.

11. Report

11.1 The report shall include the following:

11.1.1 Source of the solid waste, date of sampling, and sample preservation used,

11.1.2 Description of the solid waste including physical characteristics and particle size, if known (9.1),

11.1.3 Solids content (9.2) (see Test Method D 2216),

11.1.4 Sample weight if other than 70 g,

11.1.5 Drying time and temperature if other than 16 to 20 h at 104 ± 2°C,

11.1.6 pH and results of specific analyses calculated in appropriate units. State analytical procedures used, and filter used if other than 0.45 μm,

11.1.7 Observation of changes in test material or leaching solution recorded in 9.8.

11.1.8 Date leach testing started, preservation used for extract, and date of analysis.

12. Precision and Bias

12.1 No information is presently available as to the precision or bias of the analysis of specific constituents in the extract. It is recommended that users of this test method validate the applicability of their chosen methods of detection by spiking portions of the extract, before using these test methods for the analysis of the extract.

12.2 Based on a collaborative series of tests on five solid wastes including fly ash, cutting waste, aluminum industry waste, foundry waste, and non-ferrous foundry waste, the overall precision of this test method was improved. The above data was presented at the second ASTM D-34 Solid Waste Symposium.[9]

12.3 The precision of this test method may vary depending on the solid waste being tested and on the element being extracted.

12.4 Determination of the bias of this test method is not possible, as no standard reference material exists.

[9] Contact Dr Robert Paule, National Institute of Standards and Technology, Gaithersburg, MD 20899, on availability of a copy of this paper "Statistical Analysis and Description of Factors Affecting the ASTM Leaching Test".

APPENDIX

X1. AGITATION TECHNIQUES AND RATE, AND LIQUID/SOLID RATIOS

X1.1 While a major effort relative to development of the test method has been undertaken to determine the optimum agitation rate, equipment, and liquid/solid ratios specified in the test method, it is recognized that these variables may significantly influence the results on certain solid wastes, and that they may not be adequate for certain solid wastes, such as monolithic, solidified, or organic wastes.

X1.2 The possible effects of varying the agitation technique and rate include degree of mixing, rate of release of constituents, and particle abrasion effects. The precision of the test method may also be influenced.

X1.3 The possible effects of varying the dilution ratio include degree of mixing, rate of release of constituents (and possible concentration effects, depending on availability), and particle abrasion effects.

X1.4 Efforts are underway to develop test methods that are more suitable for use with organic, monolithic, and solidified wastes.

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, PA 19103.

laboratory (see Practice E 122).

7.4 It is important that the sample of the solid waste be representative with respect to surface area, as variations in surface area would directly affect the leaching characteristics of the sample. Solid waste samples should contain a representative distribution of particles sizes.

7.5 Keep samples in closed containers appropriate to the sample type prior to the extraction in order to prevent sample contamination or constituent loss. Where it is desired to extract biologically or chemically active samples in their existing state, store the samples at 4°C (Practices D 3370) and start the extraction within 8 h. Where it is desired to extract such samples in a state representative of the results of biological or chemical activities, the samples may be specifically handled to simulate such activities. Record the storage conditions and handling procedures in the report.

8. Sample Preparation

8.1 For free-flowing particulate solid wastes, obtain a sample of the approximate size required in the test by quartering the sample (Section 7) received for testing on an impermeable sheet of glazed paper, oil cloth, or other flexible material as follows:

8.1.1 Empty the sample container into the center of the sheet.

8.1.2 Flatten out the sample gently with a suitable straightedge until it is spread uniformly to a depth at least twice the maximum particle diameter particle size.

8.1.3 Remix the sample by lifting a corner of the sheet and drawing it across, low down, to the opposite corner in a manner that the material is made to roll over and over and does not merely slide along. Continue operation with each corner, proceeding in a clockwise direction. Repeat this operation ten times.

8.1.4 Lift all four corners of the sheet towards the center and holding all four corners together, raise the entire sheet into the air to form a pocket for the sample.

8.1.5 Repeat 8.1.2.

8.1.6 With a straightedge at least as long as the flattened mound of sample (such as a thin-edged yard stick), gently divide the sample into quarters. An effort should be made to avoid using pressure on the straightedge sufficient to cause damage to the particles.

8.1.7 Discard alternate quarters.

8.1.8 If further reduction of sample size is necessary, repeat 8.1.3 through 8.1.7. A minimum sample size of 70 g is recommended for each extraction. Additional samples should be provided for determination of solids content. If smaller samples are used in the test, report this fact.

8.2 For field-cored solid wastes or castings produced in the laboratory, cut a representative section weighing approximately 70 or 140 g for testing, plus samples for determination of solids content. Shape the sample so that the leaching solution will cover the material to be leached.

8.3 For fluid solid wastes, mix thoroughly in a manner that does not incorporate air to assure uniformity before withdrawing a 70 or 140 g sample for test. Take samples for determination of solids content at the same time as the test samples.

9. Procedure

9.1 Record the physical description of the sample to be tested including particle size so far as it is known.

9.2 *Solids Content*—Determine the solids content of separate portions of the sample as follows:

9.2.1 Dry to constant weight two dishes or pans of size suitable to the solid waste being tested at 104 ± 2°C. Cool in a desiccator and weigh. Record the value to ± 0.1 g.

9.2.2 Put an appropriately sized portion of sample of the solid waste to be tested into each pan. Scale the weight used to the physical form of the solid waste tested. Use a minimum of 50 g but use larger samples where particles larger than 10-mm in average diameter are being tested. Weigh. Record the weight to ± 0.1 g.

9.2.3 Dry 16 to 20 h at 104 ± 2°C. Certain solid wastes, such as scrubber sludges, may contain compounds that are subject to calcination at the specified drying temperature. Dry these compounds at lower temperatures. For example, gypsum may be successfully dried at 45°C (Test Methods C 471) and $CaSO_3 \cdot 1/2H_2O$ wastes at 85°C. Record the actual temperature and time of the drying period.

9.2.4 Cool to room temperature in a desiccator and reweigh. Record the weight to ± 0.1 g.

9.3 *Shake Procedure*—Weigh or tare the container to be used in the shake test to the nearest or within 1 g.

9.4 Add to the container approximately 70 g of solid waste (Section 8) and determine and record the weight of sample used to ½ g. If weights other than 70 g are used, note in the report.

9.5 Add to the container a volume of test water (6.2) equal in millilitres to 20 times the weight in grams of the sample used in 9.4. See discussion of dilution ratio in Appendix (Example: 70 g sample = 1400 mL water).

9.6 Agitate continuously for 18 ± 0.25 h at 18 to 27°C.

9.7 Open the container. Observe and record any physical changes in the sample and leaching solution.

9.8 Let the sample settle for 5 min; then separate the bulk of the aqueous phase from the solid phase by decantation, centrifugation, or filtration through a coarse filter paper as appropriate. Then vacuum or pressure filter the liquid through a 0.45-μm filter. If the separation method results in prolonged filtering time, an 8-μm filter or other device may be used. Record any deviations in the report.

9.9 The filtrate obtained in 9.8 is the extract mentioned elsewhere in this test method. Measure the pH of the extract immediately, then preserve the extract in a manner consistent with the chemical analysis or biological testing procedures to be performed (Practices D 3370). If sufficient liquid phase is not available for the analyses, so indicate in the report and do not continue the procedure; or alternatively, perform the extraction procedure on additional samples of the solid waste to obtain sufficient liquid phase. Where phase separation occurs during the storage of the extract, appropriate mixing should be used to ensure the homogeneity of the extract prior to its use in such analysis or testing.

9.10 Analyze the extract for specific constituents or properties or use the extract for biological testing procedures as desired using appropriate ASTM standard methods. Where no appropriate ASTM methods exist, other methods may be used and recorded in the report.

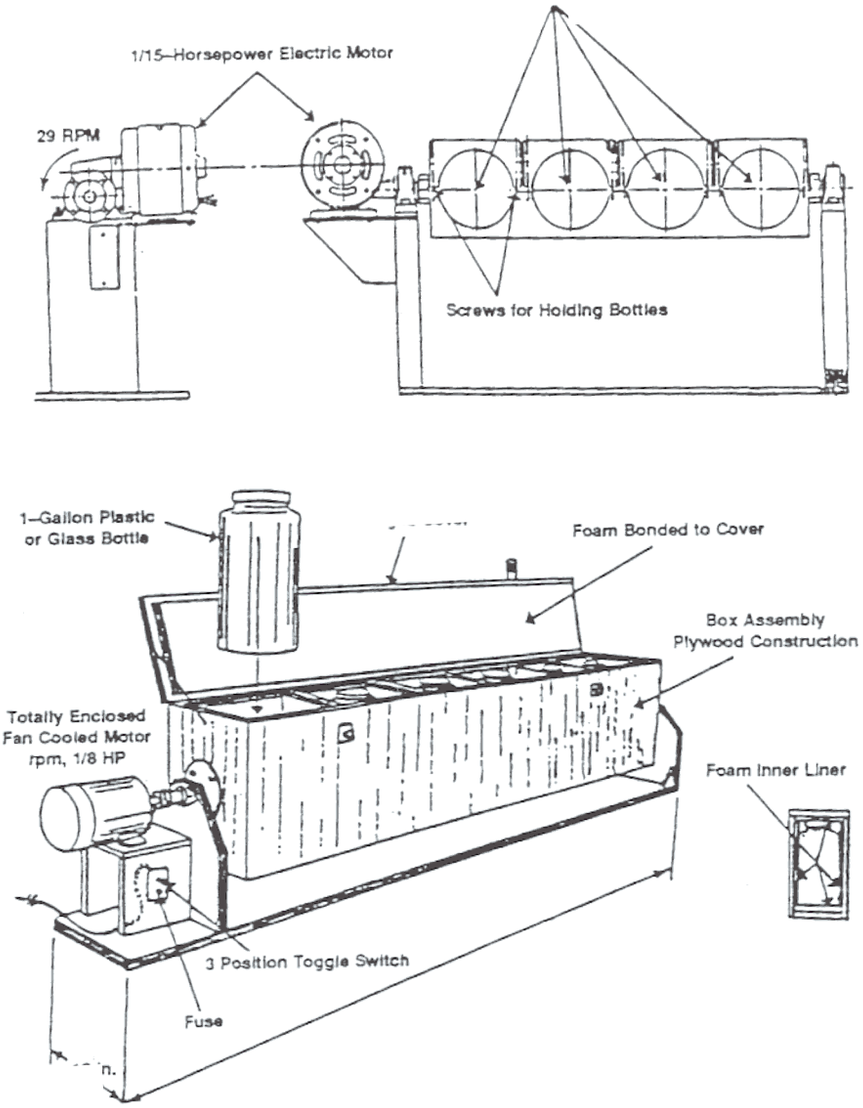

FIG. 1 Extractor

potential to affect the concentration of volatile extracts in the extract.) Containers should be cleaned in a manner consistent with the analyses to be performed.

6. Reagents

6.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the American Chemical Society, where such specifications are available.[8] Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

6.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean Type IV reagent water at 18 to 27°C (Specification D 1193). The method by which the Type IV water is prepared, that is, distillation, ion exchange, reverse osmosis, electrodialysis, should remain constant throughout testing.

7. Sampling

7.1 Obtain a representative sample of the solid waste to be tested using ASTM sample methods developed for the specific industry where available. (See Practices D 75 and D 420 and Test Methods D 2234.)

7.2 Where no specific methods are available, sampling methodology for materials of similar physical form shall be used.

7.3 A minimum sample of 5000 g shall be sent to the

[8] "Reagent Chemicals, American Chemical Society Specifications." Am. Chemical Soc., Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see "Reagent Chemicals and Standards," by h Rosin. D. Van Nostrand Co., Inc., New York, NY, and the "United States acopeia."

AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Shake Extraction of Solid Waste with Water[1]

This standard is issued under the fixed designation D 3987; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers a procedure for leaching of solid waste to obtain an aqueous solution to be used to determine the materials leached under the specified testing conditions.

1.2 This test method provides for the shaking of a known weight of waste with water of specified composition and the separation of the aqueous phase for analysis.

1.3 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

C 471 Test Methods for Chemical Analysis of Gypsum and Gypsum Products[2]

D 75 Practice for Sampling Aggregates[3]

D 420 Practice for Investigating and Sampling Soil and Rock for Engineering Purposes[4]

D 1129 Terminology Relating to Water[5]

D 1193 Specification for Reagent Water[5]

D 2216 Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock[4]

D 2234 Test Methods for Collection of a Gross Sample of Coal[6]

D 3370 Practices for Sampling Water[5]

E 122 Practice for Choice of Sample Size to Estimate a Measure of Quality for a Lot or Process[7]

3. Definitions

3.1 For definitions of terms used in this test method, see Terminology D 1129.

4. Significance and Use

4.1 This test method is intended as a rapid means for obtaining an extract of solid waste. The extract may be used to estimate the release of certain constituents of the solid waste under the laboratory conditions described in this procedure.

4.2 This test method is not intended to provide an extract that is representative of the actual leachate produced from a solid waste in the field or to produce extracts to be used as the sole basis of engineering design.

4.3 This test method is not intended to simulate site-specific leaching conditions. It has not been demonstrated to simulate actual disposal site leaching conditions.

4.4 The intent of this test method is that the final pH of the extract reflect the interaction of the extractant with the buffering capacity of the solid waste.

4.5 The intent of this test method is that the water extraction simulate conditions where the solid waste is the dominant factor in determining the pH of the extract.

4.6 The test method produces an extract that is amenable to the determination of both major and minor constituents. When minor constituents are being determined, it is especially important that precautions are taken in sample storage and handling to avoid possible contamination of the samples.

4.7 This test method has been tested to determine its applicability to certain inorganic components in the solid waste. The test method has not been tested for applicability to organic substances and volatile matter (see 5.3).

4.8 The agitation technique, rate, and liquid-to-solid ratio specified in the procedure may not be suitable for extracting all types of solid wastes. (See Sections 7, 8, and the discussion in Appendix X1.)

5. Apparatus

5.1 *Agitation Equipment*, of any type that rotates about a central axis at a rate of 29 r/min, Fig. 1. (See discussion of agitation in Appendix X1.)

5.2 *Membrane Filter Assembly*—A borosilicate glass or stainless steel funnel with a flat, fritted base of the same material and membrane filters.

5.3 *Containers*, round, wide-mouth, of a composition suitable to the nature of the solid waste and the analyses to be performed, and constructed of materials that will not allow sorption of constituents of interest. One-gallon (or 4-L) containers should be used with 140-g samples and ½-gallon (or 2-L) containers with 70-g samples. Multiples of these sizes may be used for larger samples. The containers should be of the same approximate geometry as the 2-L and 4-L bottles. These sizes were selected to establish suitable geometry and provide that the sample plus liquid would occupy approximately 80 to 90 % of the container. Containers must have a watertight closure. Containers for samples where gases may be released should be provided with a venting mechanism. (Note that the venting of the container has the

[1] This test method is under the jurisdiction of Committee D-34 on Waste Management and is the direct responsibility of Subcommittee D34.02 on Extraction and Leachate Testing.

Current edition approved Oct. 21, 1985. Published March 1986. Originally published as D 3987 - 81. Last previous edition D 3987 - 81.

[2] *Annual Book of ASTM Standards*, Vol 04.01.

[3] *Annual Book of ASTM Standards*, Vol 04.03.

[4] *Annual Book of ASTM Standards*, Vol 04.08.

[5] *Annual Book of ASTM Standards*, Vol 11.01.

[6] *Annual Book of ASTM Standards*, Vol 05.05.

[7] *Annual Book of ASTM Standards*, Vol 14.02.

APPENDIX M

Thomey, N., Ogle, R., Jackson, J.
1991 "A Comparison of Results for Samples Collected with Bailers Constructed of Different Materials" Proceedings of the 1991 Outdoor Action Conference, May 13-16, Las Vegas, NV, pp. 577-582

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1984 "A Laboratory Evaluation of Ground Water Sampling Mechanisms" Ground Water Monitoring Review, V. 4, No.2, pp. 32-41

Barker, J.F., Dickhout, R.
1988 "An Evaluation of Some Systems for Sampling Gas - Charged Ground Water Monitoring Wells" Ground Water Monitoring Review, V. 8, No. 4, pp

Devlin, J.F.
1986 "Evaluation of Some Materials and Pumping Systems Available for Use in Sampling Ground Water Contaminated with Volatile Organics" Proceedings of the Third Annual Eastern Regional Ground Water Conference, July 28-30, Springfield, IL pp. 503-526

Gillham, R.W., O'Hannesin, S.F.
1988 "Sorption of Aromatic Hydrocarbons by Materials Used in the Construction of Groundwater Sampling Wells" ASTM Symposium: Standard development for groundwater and vadose zone monitoring investigation., Jan 27-29, Albuquerque, NM.

Neilsen, D.M., Yeates, G.L.
1985 "A Comparison of Sampling Mechanisms Available for Small-Diameter Ground Water Monitoring Wells" Ground Water Monitoring Review, V. 5, No. 2, pp. 83-99

Reynolds, G.W., Gillham, R.W.
1985 " Adsorption of Halogenated Organic Compounds by Polymer Materials Commonly used in Ground Water Monitors" Presented at the Second Annual Canadian/American Conference on Hydrogeology, June 25-29, Banff, Alberta, 19 pp.

Rannie, E.H., Nadon, R.L.
1988 "An Inexpensive, Multi Use, Dedicated Pump for Ground Water Monitoring Wells" Ground Water Monitoring Review, V. 8, No. 4, pp. 100-107

Schalla, R., Myers, D.A., Simmons, M.A., Thomas, J.M., Toste, A.P.
1988 "The Sensitivity of Four Monitoring Well Sampling Systems to Low Concentrations of Three Volatile Organics" Ground Water Monitoring Review, V. 9, No. 3. pp. 83-99

with the Waterra consistently producing the higher result. These samples are also from the wells that had the highest level of contamination.

Conclusions

The analytical results from the Kansas City and Tucson sites are consistent with observations of Schalla et al.(1988) in that different sampling devices usually give good agreement in duplicate samples when dealing with low levels of contamination. Although the data sets are not of sufficient size to make firm conclusions, it seems that the Inertial pump may be better able to provide a less disturbed sample of more severely contaminated groundwater than some other devices.

The review of published information clearly demonstrates that the use of HDPE in the place of Teflon does not produce any detectable difference in sample chemistry. The impact of materials is further reduced if the routine of standard field procedures are considered. Normally the device used to purge the monitoring well is the same as that use to collect the sample. This prolonged flushing during well purging essentially eliminates any difference between all polymer materials.

continued..

Monitoring Well		DCE	TCE	Vinyl Chloride
45-L	Bailer	120	51	ND
	Waterra	116	46	ND
	Bailer	62 (76*)	13 (16*)	ND (ND*)
	Waterra	75 (76*)	12 (12*)	ND (11*)
24	Bailer	17 (18*	ND (ND*	13 (18*)
	Waterra	19	ND	16
83-L	Bailer	18	ND	ND
	Waterra	14	ND	ND
95-L	Bailer	570	48	69
	Waterra	2000 1500*)	100 (ND*	280 (250*
	Bailer	126	ND	6
	Waterra	240	ND	ND
	Bailer	35	5	ND
	Waterra	29	ND	ND
33-L	Bailer	40 (36*	54 (50*)	ND (ND*)
	Waterra	40	61	12
139-L	Bailer	ND	ND	ND
	Waterra	ND	ND	ND
38-L	Bailer	ND	ND	ND
	Waterra	ND	ND	ND

* duplicate sample

The sample set from Kansas City produced some interesting results. Firstly it seems that the laboratory occasionally had problems detecting vinyl chloride and TCE because these compounds appeared erratically in the results. The TCE analysis from some of the bailer and Waterra samples in 95-L and 115-U as well as the vinyl chloride results in 106 were inconsistent.

Other than the periodic problems in the TCE and vinyl chloride analysis, these sample results show good relative correlation between the sampling devices except in monitoring wells 115-L, 95-L and 32-M. In these wells there are marked differences between the Waterra and the bailer,

continued..

Well#	Bladder #1	Bladder #2	Bailer	Waterra
UG06-L	15.2	15.0	8.9	9.7
MW074-L	18.9	16.0	1.3	16.7

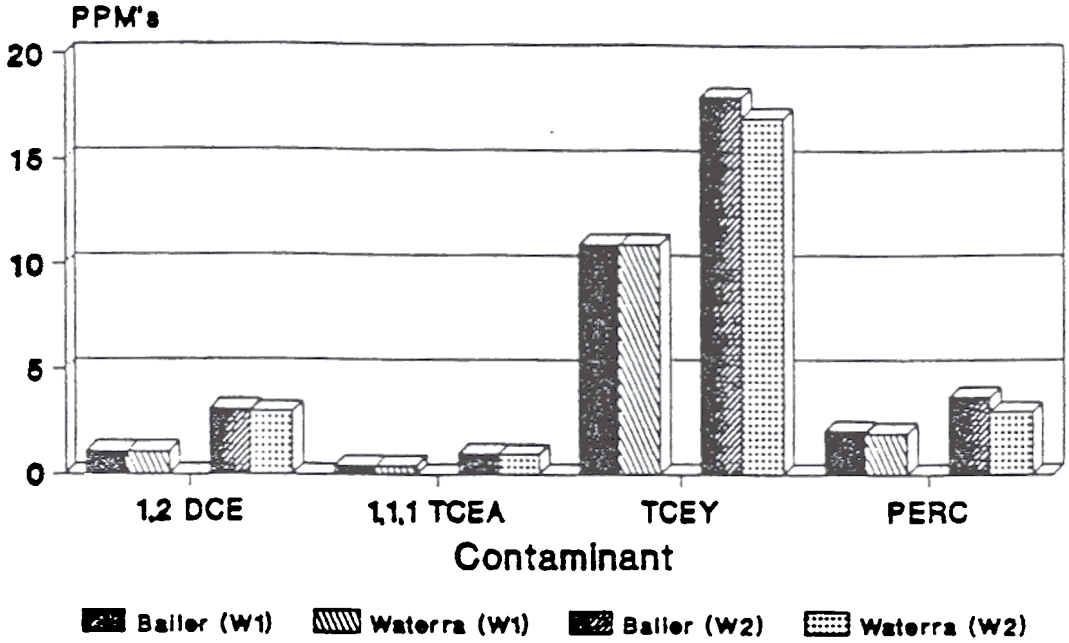
From this sample set only one sample, from the bailer in well MW074-L, showed a dramatic variation from those collected by the other devices. All other samples show good agreement between all sampling devices.

Oak Ridge National Labs proceeded to further evaluate the Waterra Inertial pump at a site in Kansas City, KS. This site was more severely contaminated and three different contaminants were found in the analysis, dichloroethylene (DCE), TCE and vinyl chloride. Eighteen monitoring wells were sampled with Teflon bailers and Standard Waterra Inertial pumps. Four bailer duplicates and three Waterra duplicates were collected.

Monitoring Well		DCE	TCE	Vinyl Chloride
113-U	Bailer	72	27	53
	Waterra	68	21	45
113-L	Bailer	62	ND	28
	Waterra	65	ND	28
114-U	Bailer	109	ND	53
	Waterra	111	ND	58
114-L	Bailer	308	62	67
	Waterra	420	66	73
115-U	Bailer	1000 (1000*	62 (ND*	84 83*
	Waterra	1500	60	86
115-L	Bailer	990	76	47
	Waterra	1200 (1300*	114 120*)	51 46*
66-L	Bailer	74	8	12
	Waterra	78	8	12
40-L	Bailer	14	ND	ND
	Waterra	14	ND	ND

Waterra - Bailer Comparison (NJ, USA)

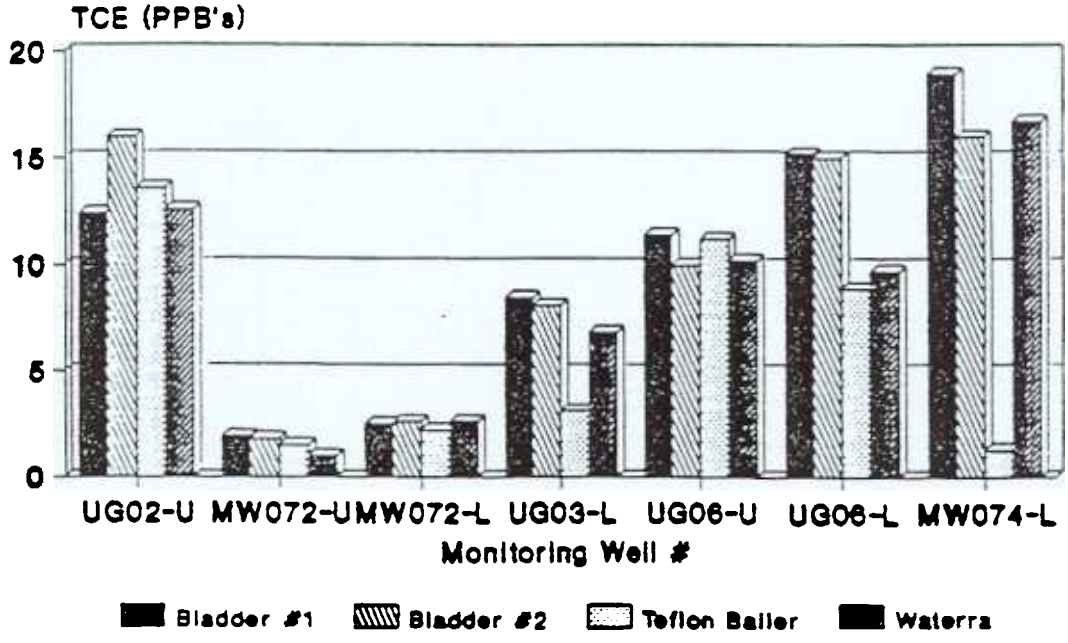
Duplicate Data Collected By CEH, Inc



Teflon Bailer VS Standard Waterra Pump

Waterra - Bladder Pump Comparison

ORNL Duplicate Study (Arizona, USA)



Bladder Pump VS Standard & H/C Waterra

Well# MW-9

	Teflon Bailer	Waterra
1,2-Dichloroethyene	1100	1100
1,1,1-Trichloroethane	420	420
Trichloroethene	11000	11000
Tetrachloroethene	2100	2000

Well# MW-10

1,2-Dichloroethyene	3100	3000
1,1,1-Trichloroethane	990	960
Trichloroethene	18000	17000
Tetrachloroethene	3700	3300

The minor differences between the sample pairs were not considered significant and the company was permitted to use the pump as the sampling device on the project. It should also be mentioned that CEH, Inc. did not use the recommended technique for collecting volatile samples from the Waterra Inertial pump.

The Oakridge National Labs Study

A second study in 1990 was carried out by Oak Ridge National Labs of Oak Ridge, TN. This study compared samples collected with Teflon bailers, Teflon and stainless steel bladder pumps and the Standard Waterra Inertial pump. Seven monitoring wells were sampled, twice with the bladder pump and once each with the Waterra and bailer. Trichloroethylene (TCE) was detected in all of the wells at very low levels. The results, reported below, are in ppbs.

Well#	Bladder #1	Bladder #2	Bailer	Waterra
UG02-U	12.4	16.0	13.6	12.6
MW072-U	1.9	1.8	1.5	1.0
MW072-L	2.5	2.6	2.2	2.6
UG03-L	8.5	8.1	3.1	6.8
UG06-U	11.4	10.0	11.2	10.2

Leaching

Eliminating possible sources of contamination of groundwater samples has resulted in the evaluation of most of the materials used in pump and well construction as possible sources. The main source of contamination of samples by sampling equipment is from the use of flexible PVC tubing or bottles. Flexible PVC tubing contains a high percentage of plasticizers, usually a phthalate ester. These compounds rapidly leach into samples and can appear in subsequent analysis.

The potential of virgin polyethylene contaminating sample water by leaching has been evaluated (Devlin, J.F. 1986) This material did not substantially contaminate organic free deionized water, Polyethylene is considered to be leach free as it does not contain any plasticizers. However polyethylene was found to be difficult to decontaminate and should consequently not be used in non-dedicated pumping systems in order to avoid cross contamination.

Unpublished Work

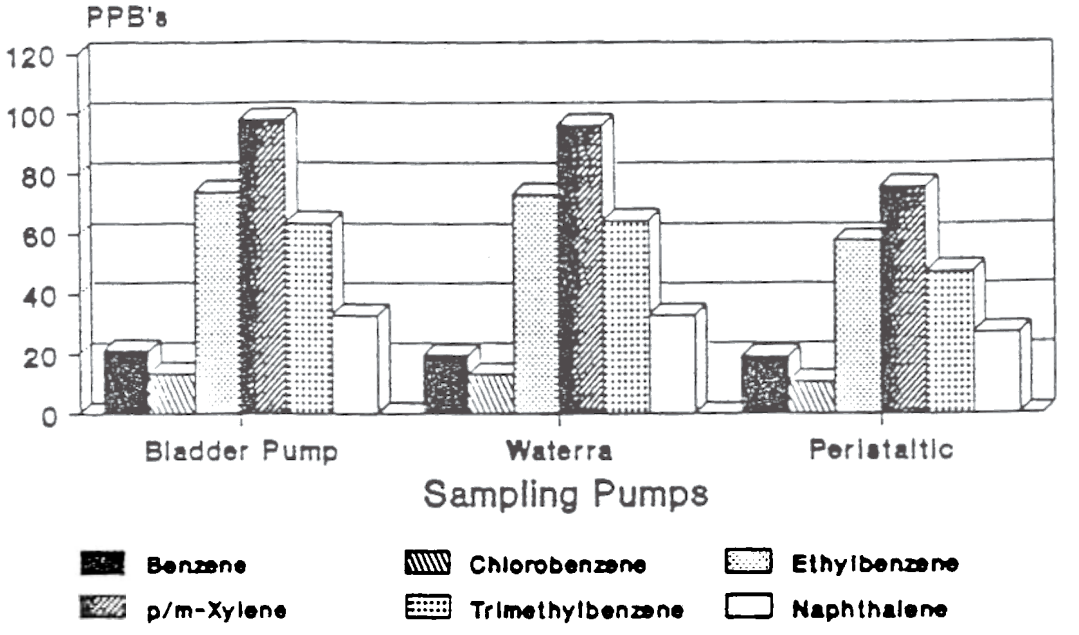
Several unpublished field studies have been completed that compare the performance of the Waterra Inertial pump to other sampling devices. These studies have evaluated the relative performance of the various sampling devices for VOC sampling.

The New Jersey Study

The first study was completed by CEH, Inc. of Portsmouth, NH in 1990. The New Jersey Department of Environment (DEP) requested that CEH, Inc. collect duplicate sample sets from two wells with Teflon bailers and Standard Waterra Inertial pumps (Delrin D-25 valve and polyethylene tubing). The state regulators requested this study in order to support manufacturers claims that the Inertial pump is suitable for use as a sampling device. These duplicate sets were submitted to the same laboratory for analysis. The results, given below, are reported in ppbs.

Field Volatile Recovery (Degassing)

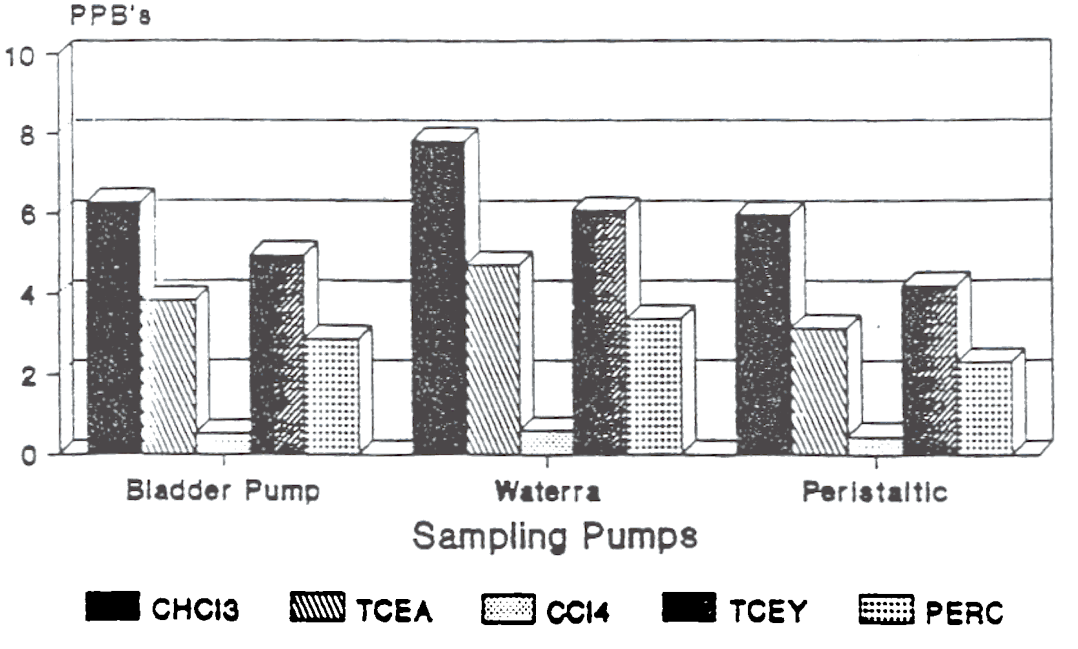
Bladder Pump / Waterra / Peristaltic



After Barker & Dickhout, 1988

Lab Volatile Recovery (Degassing)

Bladder Pump / Waterra / Peristaltic



After Barker & Dickhout, 1988

Sample Bias due to Volatilization Loss

The Barker & Dickhout Study, 1988

Volatilization loss is recognized as the most significant cause of negative sample bias in subsequent concentration determinations. Laboratory evaluations of sampling bias due to volatilization (Barcelona et al., 1984, Schalla et al., 1988) have predicted little to no variation of volatile halocarbons in samples collected with different sampling devices. The samples used in these studies contained low concentrations of volatile organics, less than 100 ppb and the lifts required for sampling were shallow, usually less than 20 feet.

Gas-charged groundwater is more likely to produce conditions conducive to significant volatile losses even with low levels of VOCs present. Barker and Dickhout (1988) evaluated the performance of various sampling systems for sampling gas-charged groundwater. The relative recoveries of volatile aromatic hydrocarbons with a peristaltic pump, a positive displacement bladder pump and an inertial lift "Waterra pump" were compared when sampling methane gas-charged groundwater.

The suction lift peristaltic pump produced 9 to 13 percent negative bias relative to other methods. The inertial lift pump and positive displacement bladder pump produced similar results.

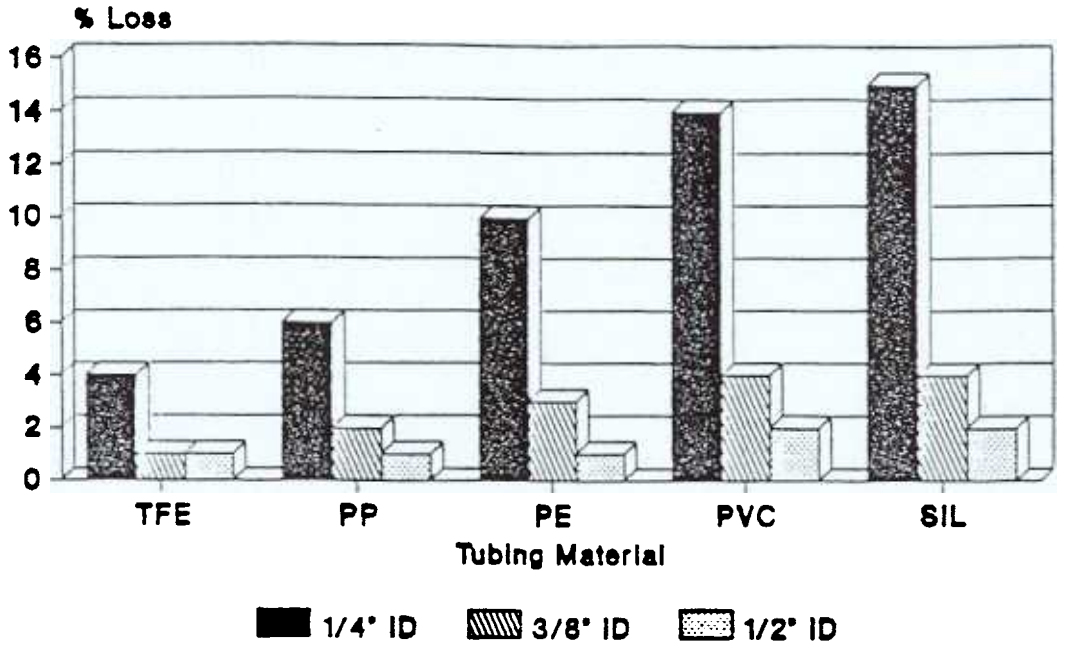
The performance of these sampling systems was further evaluated in an artificial well. Samples were drawn from a port near the bottom of the artificial well, as a control, and from the sampling devices simultaneously.

The inertial lift pump consistently produced the highest concentrations of volatile halocarbons, the bladder pump concentrations were 13 to 20 percent lower and the peristaltic pump concentrations were 23 to 33 percent lower.

This experiment was repeated with the Waterra pump with non-degassing water from the artificial well. Under these conditions the Waterra pump suffered virtually on loss of volatile organics. Barcelona et al. (1984) also reported that the bladder pump and bailer produced no serious bias (<2 percent) under non-degassing conditions when sampling trihalomethanes.

Sorption Losses and Polymer Material

Percentage Loss



after Barcelona et al (1984)

Percentage Loss

Tube ID\Type	TFE	PP	PE	PVC	SIL	Residence Time
1/4"	4%	6%	10%	14%	15%	4.5 minutes
3/8"	1%	2%	3%	4%	4%	12.0 minutes
1/2"	1%	1%	1%	2%	2%	19.5 minutes

The two main parameters that determine sorbative loss with a given organic and polymer are the surface area of contact and the duration of the contact.

The residence time of the sample in the tubing in the above example is a function of the tubing ID. Since the larger diameter tubes have a larger storage volume and the flow rate is fixed to 100 mL/minute the sample requires more time to move through the tube. Initially one may think that this would result in greater sorbative loss however increasing the diameter of the tube significantly increases the volume of fluid within the tube relative to the surface area of the tubing available for sorption to take place. This reduces the impact that sorption can have on a sample.

This comparison is a worst case example because of the extended contact time between the solution and the tubing material. In a typical 100' installation using 1/2" ID tubing, flows are commonly 1 gpm. This flow rate results in a contact time between the sample and the tubing of 1 minute. Never the less, the percentage loss predicted by the model illustrates even in a worst case situation that the loss due to sorption is insignificant.

There is no question that polymer tubing materials sorb organics. What is questioned is the belief that the use of Teflon, instead of less expensive materials, results in a measurable improvement in sample quality. Most studies now conclude (Devlin, J.F., 1986, Schalla et al., 1988 and Thomey et al., 1991) that this is not the case. Field conditions and the method of sample collection are far more significant in their ability to bias sample analysis.

A commonly referenced paper concerning the effect of tubing materials on sample quality is "Sample Tubing Effect on Groundwater Samples" by M.J. Barcelona et al. In this study samples are drawn from sealed lengths of 0.25 inch ID tubing. Five different tubing materials were studied, Teflon (TFE), polypropylene (PP), polyethylene (PE), Tygon (flexible vinyl PVC) and silicon rubber (SIL). The first two samples were collected after 5 minutes of exposure and the balance at 10 minute intervals.

There are two problems with the procedure used by Barcelona et al. First, rarely is sample water in contact with the sampling device, including bailers, for any time period near these durations. Secondly the use of 0.25 inch ID tubing maximizes the surface to volume ratio, producing an example that overstates the significance of sorption. Conventional monitoring well pumps never use tube of this size and bailers are certainly never constructed with 0.25 inch ID pipe.

Nevertheless, the data produced in this study illustrates two important facts. The first is that with relatively short durations of exposure, 5 to 10 minutes, the performance differences between Teflon, polypropylene and polyethylene are insignificant. Secondly, desorption, the release of sorbed organics is irrelevant as none of the tubing materials released any significant portion of the organic compound they sorbed.

The insignificance of sorption is further illustrated in table 4 from "Sampling Tubing Effects on Groundwater Samples", reproduced below. The sample residence time has been added to this table. This table compares the performance of the various tubing materials studied in a hypothetical model. The sorbative loss is calculated as a result of passing a 40 ppb mixture of chloroform, trichloromethylene, tetrachloroethane and tetrachloroethylene through a 15 meter length of tubing at a rate of 100 mL/minute. Three different tubing IDs are evaluated.

equipment which is difficult to transport and offers the potential of cross contamination if the equipment is not dedicated.

Waterra's goal was to produce a narrow diameter monitoring well pump that would bridge the gap between the existing methods. The task was to develop an affordable well purging and sampling device that was efficient, reliable and suitable for dedication. The result was the Inertial Pump.

	Advantages	Disadvantages
Inertial Pump		
	- inexpensive - simple design - easy operation - suitable for sampling - good purge rate - suitable for dedication	- pump efficiency decreases in larger diameter wells - automated equipment is heavy

Groundwater Sampling & Pump Materials

A common concern in groundwater monitoring is the possible negative effect that polymer materials may have on sample chemistry. Numerous papers have been published discussing "Sorption effects".

All polymer materials, Teflon included, will sorb certain organic chemicals from a water sample. The rate at which sorption occurs is dependant upon several parameters. The most important parameters are the type of organic chemicals present in the sample and the type of polymer material that these chemicals are in contact with.

The typical sorption study procedure consists of sealing a piece of tubing in a container with an organic solution of a known concentration. Alternatively the organic solution may be sealed in a section of tubing. Samples are drawn from containers at various time intervals and the concentration of the organics are measured. Any loss in the concentration is deemed to be a result of tubing sorption.

In general, blended chemical species tend to sorb faster than singular species and more rigid (crystalline) polymers tend to sorb at a slower rate than more flexible tubes.

Sampling Devices for Narrow Diameter Monitoring Wells

Prior to the availability of the Waterra Inertial Pump several methods were used for developing, purging and sampling narrow diameter monitoring wells. These methods are characterized by the types of equipment involved, either simple devices or complex devices.

The most common and simple method of purging and sampling monitoring wells is bailing. Less commonly used and more complex, are air lift devices and bladder & piston (positive displacement) pumps. The advantages and disadvantages of these types of equipment are listed here.

	Advantages	Disadvantages
Bailer	- simple design - easy to operate - can be dedicated - inexpensive - portable	- inefficient (<1 gpm) - prone to contamination during use - cross contamination possible if not dedicated
Air Lift Pump	- high purge rate - inexpensive - can be dedicated	- poor portability, requires compressed gas cylinder or compressor - continued operating cost due to consumption of nitrogen - not suited to wells less than 1/3 submersed - air - water mixing, not suitable for sampling
Bladder Pump & Piston Pump	- good purge rate - good sampling system	- poor portability, requires compressor and controller - expensive to dedicated because of high unit cost - continued operating cost due to reagent used in cleaning & rinse blank analysis if not dedicated

This selection of equipment left the groundwater geologist with a choice between inexpensive, inefficient equipment that may produce samples of dubious quality or expensive

GROUNDWATER MONITORING WITH THE WATERRA INERTIAL PUMP

by John Newall

Abstract

The Waterra Inertial Pump has been available for use in narrow diameter monitoring wells for several years. This device offers many advantages over other types of sampling equipment. Since this pump operates via a principle not used by any other type of device and is commonly constructed of materials not widely used in field sampling some questions exist regarding its suitability.

A review of published literature concerning the effect of different polymer materials clearly shows that the materials used do not have a measurable impact on sample quality. Additionally, published equipment tests as well as recent field testing of the Inertial pump has shown it to be an excellent performer in narrow diameter monitoring wells for sampling volatile organics.

Introduction

Narrow diameter monitoring wells (2 inch) have been used in Canada for many years now. This type of well offers many advantages over the traditional 4" or 6" well. Narrow diameter wells are less expensive to install, materials costs as well as the volume of cuttings produced are reduced. In addition, the purge volumes in 2" monitoring wells are significantly less than in larger wells. This can produce significant savings in labour and operating costs especially if the purge water must be containerized. Narrow diameter monitoring wells do create some problems as they limit the types of equipment suitable for use in these wells.

Waterra Pumps Limited has developed a line of pumps designed specifically for use in narrow diameter monitoring wells. This paper outlines the advantages of the Waterra Inertial pump and discusses some of the concerns regarding groundwater sampling devices.

Performance

A Performance Range For Virtually Any Well

Waterra has four pumping ranges to ensure that virtually any well from small diameter piezometers to large diameter, deep rock wells can be sampled efficiently. The four ranges are: Micro Flow, Low Flow, Standard Flow and High Flow. All four systems work by the same inertial principle and differ only in dimensions.

Flow Rates

Flow rates vary from well to well based on depth, well diameter, well recovery and pumping system selected. Flows as little as 0.3 gpm are sustainable with the Micro Flow system and up to 4.0 gpm with the High Flow system.

Lift Capability

Waterra has flow systems that operate to depths well beyond 100 feet and under certain conditions to depths approaching 230 feet. Waterra's automated pumps make sampling deep wells as easy as shallow wells and allow the sampler the freedom to perform other tasks while the pump does the work.

Range of Well Diameters

Wells as small as 0.5" I.D. and wells up to 6" I.D. are easily sampled with Waterra's pumping line giving the inertial pumping system greater range than any other pump on the market.

Ease of Use

The inherently simple design of Waterra pumps makes them completely intuitive in operation and require no manuals or training to operate at maximum efficiency. The simplicity of the system means little can break down, wear-out or frustrate the user. In the field simplicity means efficiency!

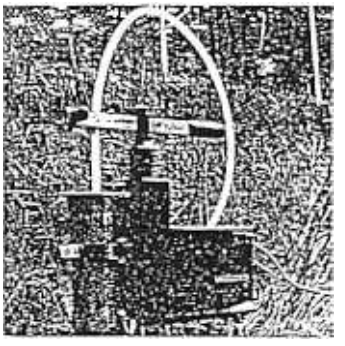
Versatility

The Waterra system saves time and additional expenses by utilizing the same pump to perform well development, purging and sampling tasks.

Well Development

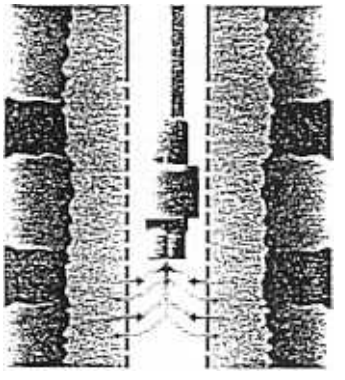
Well development is one of the most critical areas of groundwater monitoring practices. Typical objectives include: Removal of residual drilling fluids, increased well yields, removal of fine sediment from the filter pack and reduced sample turbidity.

Automation



A Waterra Hydrolift II pump purging a 90 foot deep well at 1.7 g.p.m. at a landfill in New York State.
(Photo courtesy of SPI Inc.)

Well Development



Waterra pumps develop wells through a combination of mechanical surging and high volume pumping. The surging action can be enhanced with the addition of Waterra surge blocks. The capability of handling heavy, abrasive sediment loads further increases the efficiency of Waterra pumps during well development.

Price List

(US Dollars) Oct. 1, 1994

SYSTEM	PRODUCT	MATERIAL	DESCRIPTION	PRODUCT NO.	PRICE
Standard Flow	**Footvalves**	Delrin™	Standard Flow 25mm (1") O.D.	D-25	$17.50
		Delrin™	Standard Flow 16mm (0.625") O.D.	D-16	18.50
		Stainless Steel	Standard Flow 19mm (0.75") O.D.	SS-19	40.00
		Stainless Steel	Standard Flow 16mm (0.625") O.D.	SS-16	30.00
	Tubing		Standard Flow 0.625"O.D - 0.500" I.D.		
		HDPE	100 ft. coil	0.625" HDPE-100	30.00
		HDPE	200 ft. coil	0.625" HDPE-200	60.00
		HDPE	500 ft. coil	0.625" HDPE-500	150.00
		Teflon™	Minimum Order - 25 ft.	0.625" FEP	4.80/ft
	Accessories		Well Development Surge Block Ring		
		Delrin™	Standard Flow (1.875" O.D. x 1.500" Long	SBD-25	8.00
High Flow	**Footvalves**	Delrin™	High Flow 32mm (1.25") O.D.	D-32	28.00
		Stainless Steel	High Flow 32mm (1.25") O.D.	SS-32	50.00
	Tubing		High Flow 1.000"O.D - 0.875" I.D.		
		HDPE	100 ft. coil	1.0" HDPE-100	60.00
		HDPE	200 ft. coil	1.0" HDPE-200	120.00
		HDPE	300 ft. coil	1.0" HDPE-300	180.00
	Accessories		Well Development Surge Block Ring		
		Delrin™	High Flow (1.875" O.D. x 1.500" Long	SBD-32	
Low Flow	**Footvalves**	Delrin™	Low Flow 13mm (0.500") O.D.	D-13	18.50
		Stainless Steel	Low Flow 13mm (0.500") O.D.	SS-13	30.00
	Tubing		Low Flow 0.500"O.D - 0.375" I.D.		
		HDPE	100 ft. coil	0.500" HDPE-100	20.00
		Teflon™	Minimum Order - 25 ft.	0.500" FEP	CALL
Micro Flow	**Footvalves**	Stainless Steel	Micro Flow 10mm (0.375") O.D.	SS-10	
	Tubing		Micro Flow 0.375"O.D - 0.250" I.D.		
		HDPE	100 ft. coil	0.375" HDPE-100	15.00
		Teflon™	Minimum Order - 25 ft.	0.375" FEP	CALL
Drive Mechanisms			Waterra Lever Pump	WLP-100	280.00
			Waterra Hydrolift II	WHLP-II	~~1899.00~~
			Waterra Hydrolift II	RENTAL	CALL $1995.00
Accessories			Disposable In-Line High Turbidity Filter	FHT-700	13.95
		HDPE	VOC Sampling Kit - 0.250" O.D. - 0.170"I.D. x 8 ft. long (10/pk)	Sampling Kit	5.00/pk
		Delrin™	Plastic Valve Wrench	WVW-1	5.00
		Nylon™/Steel	Tube Cutter	WTC-1	15.00

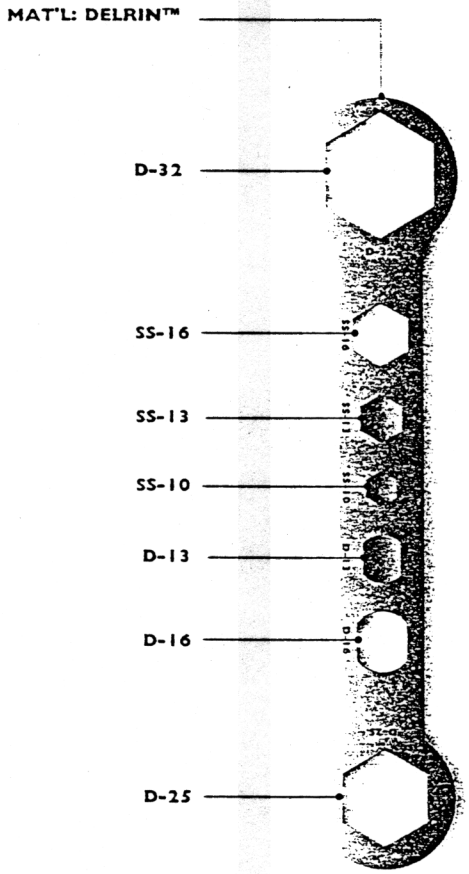
waterra

Waterra USA, Inc. 184 Ballard Road, Unit 1, Gansevoort, New York 12831. Voice: 518.587.5215. Fax: 518.587.5538
Waterra USA, Inc. 7283 Augusta Drive, Boulder, Colorado 80301. Voice: 303.530.7255. Fax: 530.530.7233

Valve Wrench
Tube Cutter

Waterra Valve Wrench

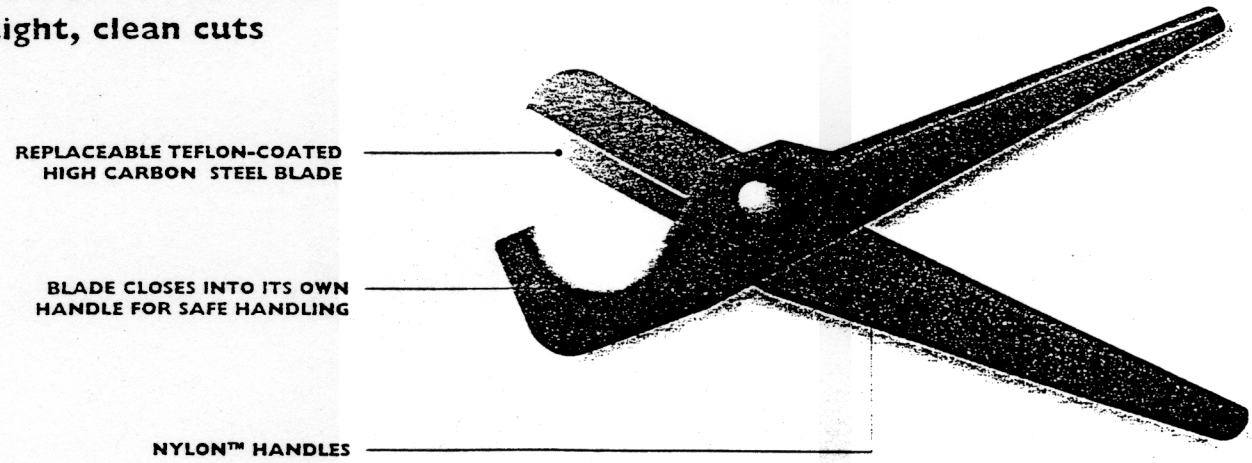
- Ensures that valves are securely attached to the tubing
- Eliminates lost valves down the well
- Designed exclusively for use with Waterra Footvalve system



(Shown 1:2 Scale)

Waterra Tube Cutter

- Faster & safer than a utility knife
- Easy to use
- Rotating/rocking motion produces straight, clean cuts



(Shown 1:2 Scale)

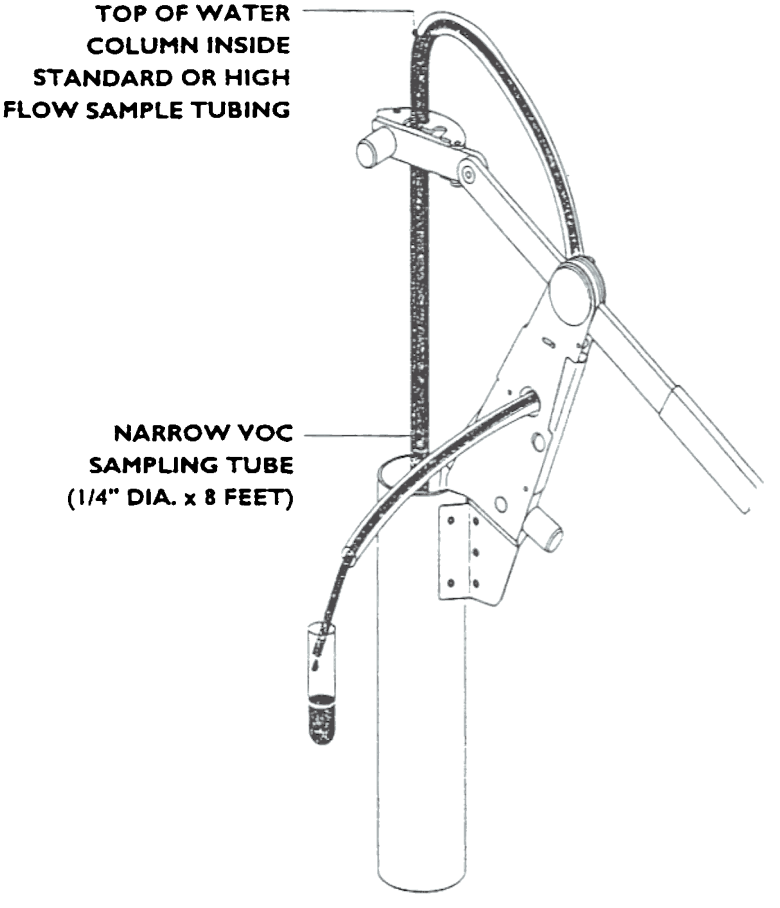
waterra

VOC Sampling Kit

How it Works

The method we suggest for collecting volatile samples is very simple and all that is required is 8 feet of narrow diameter VOC tubing.
After purging the well, approximately 7 feet of the VOC tubing is inserted inside the sampling tube leaving about one foot protruding out the end of the riser. Once the VOC tube has been inserted into the sample tube, the pump can be operated again. After a few moments of pumping, water will flow from both tubes and will continue as long as the pump is actuated. When pumping is stopped the sample tubing will cease to produce water, however the VOC tube will continue to flow operating as a siphon, drawing water down the level standing in the tubing. This siphon action can easily be used to collect small samples for volatile analysis as the flow from the narrow tube is steady, laminar and easily directed into a glass vial.
It is also worth noting that the siphon action is not generated by suction but is a result of gravity flow, therefore there is no loss of volatiles as is commonly associated with suction pumps. In addition, the sample is drawn from below the surface of the water level in the tubing, ensuring that it has not been aerated.
These VOC tubing accessories should be dedicated to the monitoring well where they are used in order to avoid decontamination procedures and cross contamination.

Waterra VOC Sampling Kits contain 10 pieces of 8 foot long x 1/4" dia. VOC sampling tube.



Waterra Lever Pump and Glass Vial not included in VOC Sampling Kit

- **Produces the best VOC recoveries**
- **Pulseless, Laminar Flow**
- **Eliminates cascading & sample aeration**
- **Installs in seconds**
- **Works with both Standard & High Flow systems**

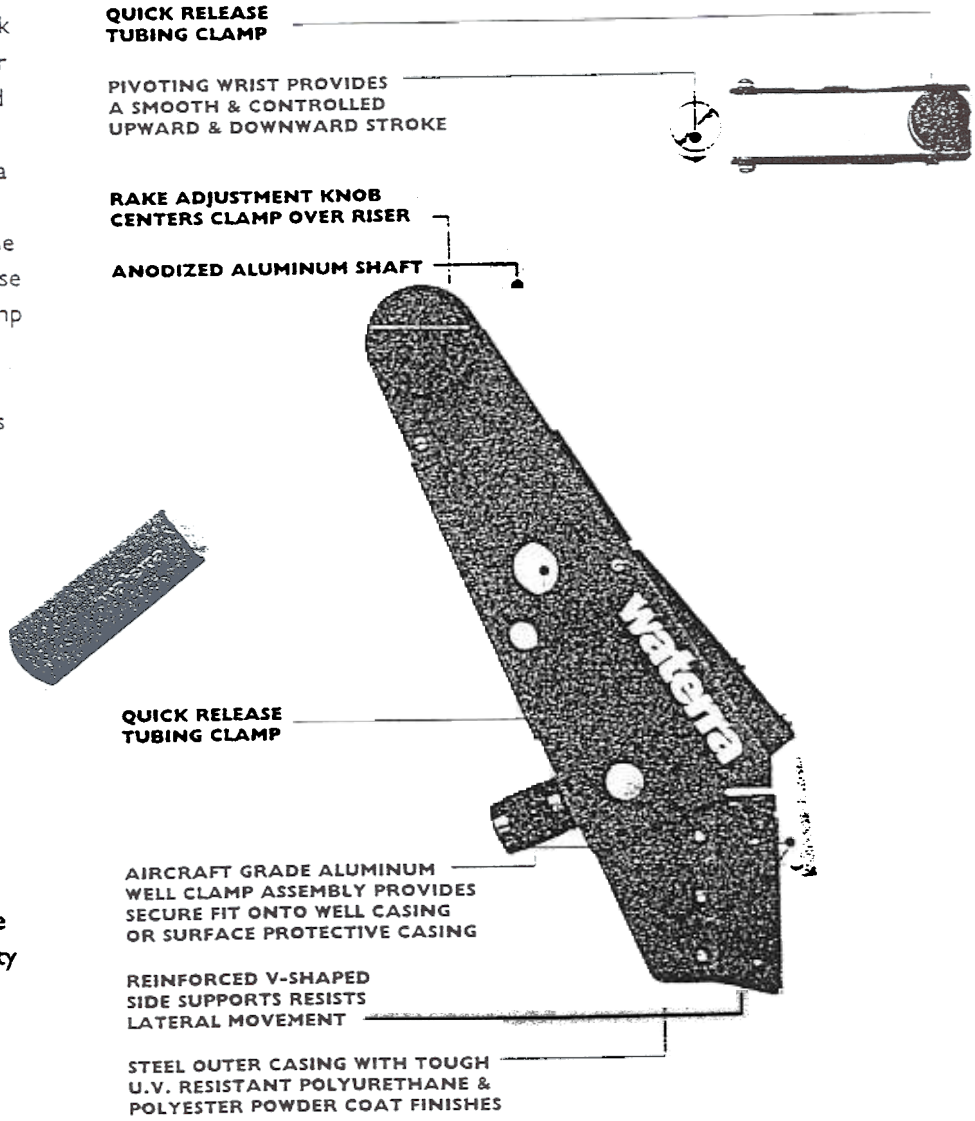
waterra

Lever Pump

Portable Mechanical Advantage

The Lever Pump was designed to minimize the tedious task of manually pumping water by maximizing the mechanical advantage. The lever is a convenient tool which allows for quick sampling of wells without the need for external power sources. It is intended for use in conditions where the wells are 30' - 100' when using the Waterra Standard System or 60' maximum when using the High Flow System. The design utilizes easy to use quick release clamps for head clamp, discharge clamp and well clamp connections. The injection molded Delrin™ Rake Adjustment Knob Assembly simplifies the centering of the head clamp/tube over the riser simply by sliding the shaft into the desired position and tightening the knob. The reinforced, V-shaped side supports eliminates unwanted lateral movements, while the pivoting wrist at the head clamp provides a smooth and controlled upward and downward stroke for maximum mechanical advantage.

Lightweight, corrosion resistant materials, finishes and a maintenance free design ensures years of reliability and portability.



Specifications

Weight — **8 Lbs.**
Dimensions — **17"H x 2.5"W x 24"L**
Power Source — **Manual**

- **Lightweight (8lbs)**
- **Portable**
- **Rugged Field Construction**
- **Ideal for Wells less than 100' deep**

waterra

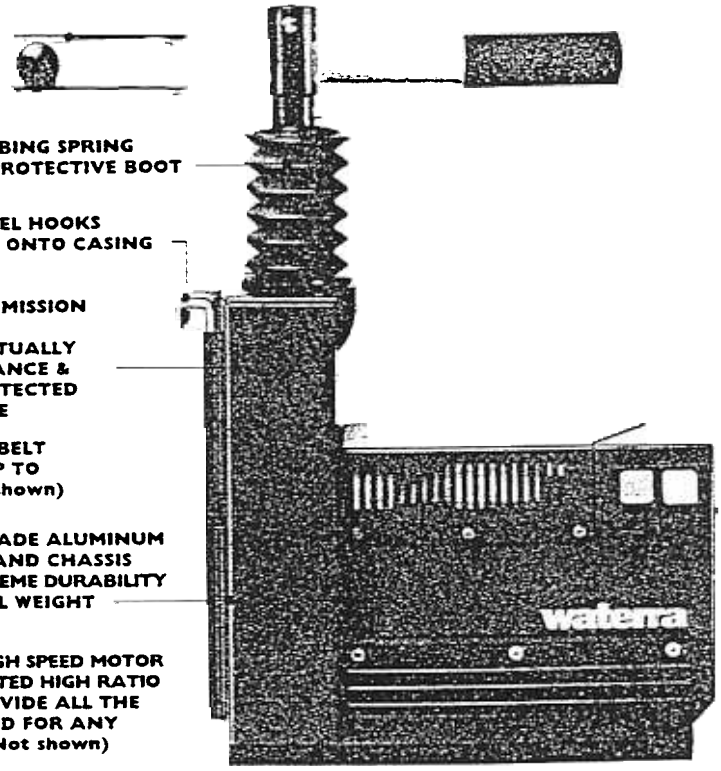
HydroLift II

High Performance Automation

Every component in the Hydrolift II was designed to keep weight to an absolute minimum. Use of aluminum extrusions, a high performance motor and high ratio gearing have produced an extremely powerful, compact and portable actuator.

All components have been designed to handle the rigors of field work. The Hydrolift II structure was designed around high strength aircraft grade Aluminum extrusions and a 0.375" thick Aluminum chassis, that serves as a platform and a protective shell for the power transmission components.

Corrosion resistant materials and a virtually maintenance free design ensures years of reliable service.



SIMPLE CONTROLS: LARGE PUSH BUTTON ON/OFF SWITCHES AND TACTILE ROTARY SPEED KNOB ALLOWS PRECISE ADJUSTMENT OF STROKE RATE

QUICK RELEASE TUBING DISCHARGE CLAMP LOCATED ON OTHER SIDE OF UNIT (Not shown)

Specifications

Weight	35 Lbs.
Dimensions	14"H x 8"W x 24"L
Horsepower	3/4
Gearing	35:1
RPM (Maximum)	200
Power Source	1000 Watt Generator

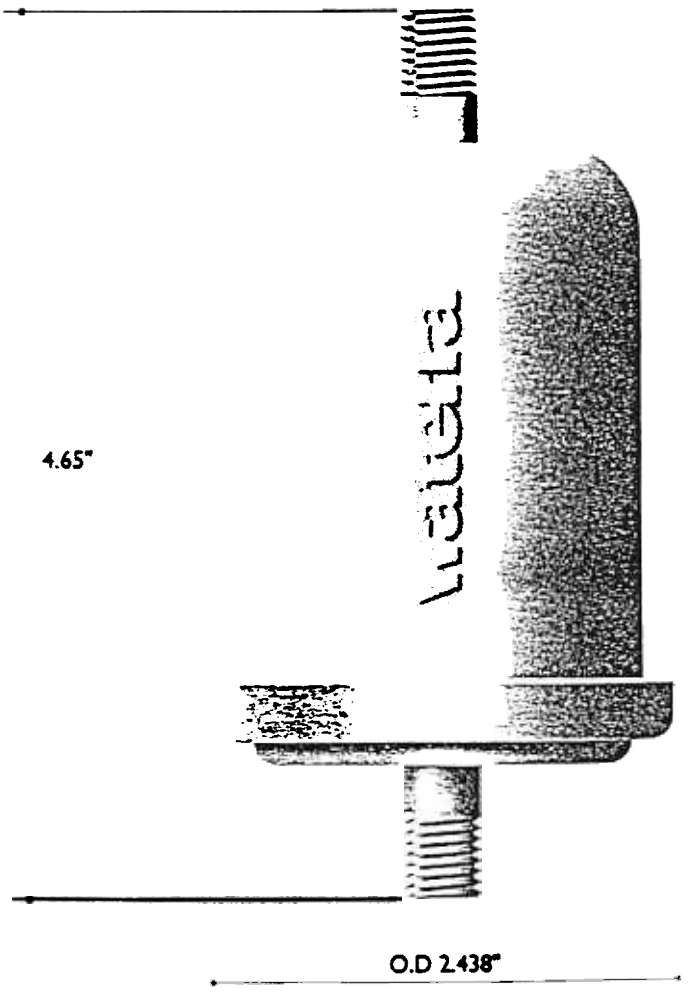
- **Lightweight (35lbs)**
- **Power: 0-3.75 GPM / 200 feet + depth**
- **Rugged Field Construction**

waterra

High Turbidity In-Line Filter

Filter

The Waterra High Turbidity In-Line Filter is a capsule style filter which is designed to quickly attach to the discharge end of either the Standard or High Flow pumping systems. Once installed the user oscillates the pump to produce a flow through the filter. The filter's specially designed 0.45 micron, pleated membrane has a highly efficient 700 cm^2 surface area which is suitable for the turbid conditions found in most wells. The Waterra Filter is far more efficient than traditional barrel or sheet style filters and requires no decontamination.



(Shown actual size)

Specifications

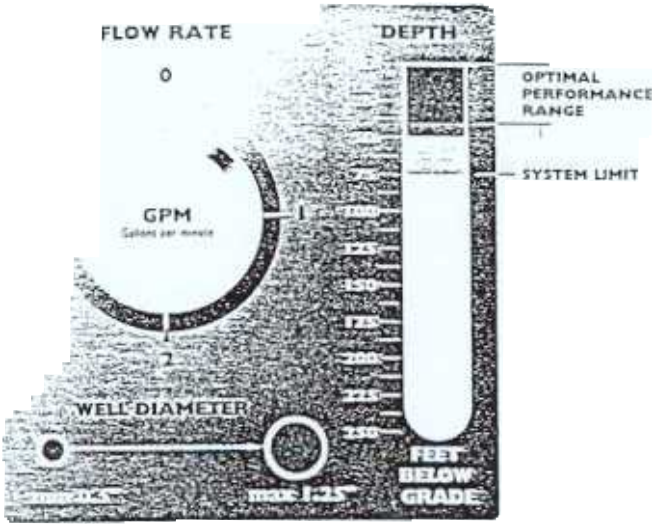
Filter size ——— **0.45 Micron**
Surface Area —— **700 cm^2**
Filter Media ——— **Acrylic co-polymer**
Body Material —— **HDPE**

- **EPA approved method**
- **Filters large volume, turbid samples quickly**
- **Disposable - No Decontamination**
- **Installs In-Line* in seconds**

* Requires Filter Adapter to Function with High Flow System

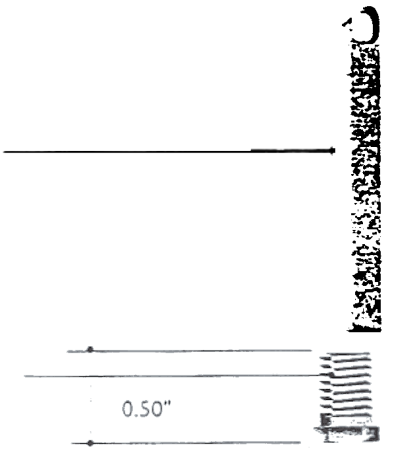
waterra

Micro Flow System



Performance Chart

O.D. 0.375"
I.D. 0.25"



USES

- Micro wells
- Sampling damaged wells
- Custom installations
- For use with Direct Push Technology
- Hand operation

Ø 0.375"

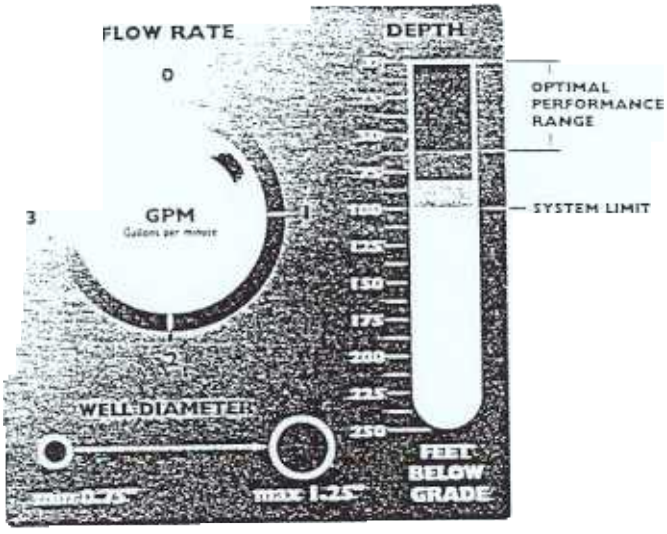
(Shown actual size)

Optional Equipment (Shown 1:2 Scale)

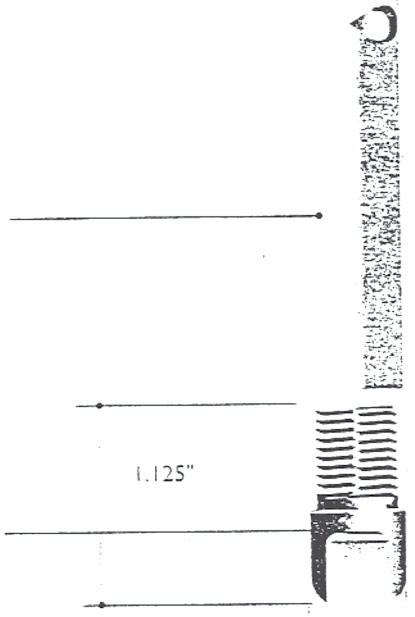
Teflon Tubing

O.D. Ø 0.375"
Length Cut to length
Material 'Teflon' FEP

Low Flow System



Performance Chart



(Shown actual size)

USES

- Sampling piezometers
- Sampling damaged wells
- Custom installations
- Hand operation

Optional Equipment (Shown 1:2 Scale)

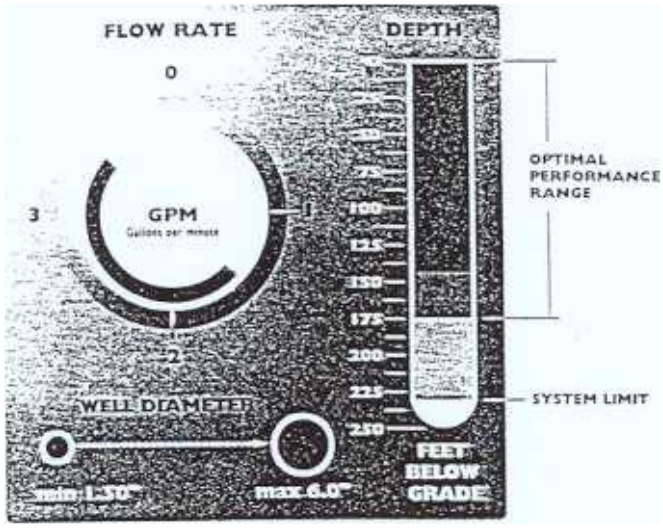
SS-13

O.D. Ø 0.50"
Length 0.50"
Material Stainless Steel

Teflon Tubing

O.D. Ø 0.50"
Length Cut to length
Material "Teflon" FEP

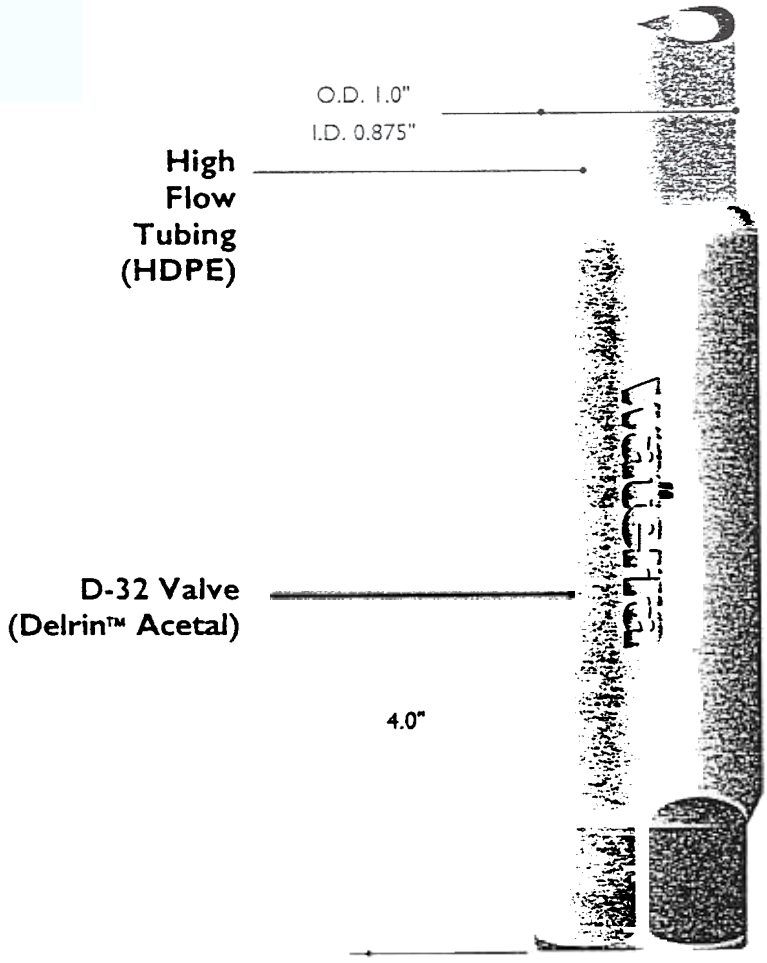
High Flow System



Performance Chart

High Flow System

The High Flow System was developed for those situations where lifts and flow rates required exceed those supplied by the Waterra Standard System. The High Flow System is particularly effective for well development and wells with large purge volumes. The increased weight of the High Flow System makes manual operation difficult beyond 60 feet and use of the Waterra Hydrolift II or Power Pump is strongly recommended.



USES

- **Deep well sampling**
- **Large diameter wells**
- **Well development**
- **High flow rates**
- **Sediment laden wells**

Optional Equipment (Shown 1:2 Scale)

SS-32 Valve

O.D. Ø 1.25"
Length 3.5"
Material Stainless Steel

Well Development Surge Block SBD-32

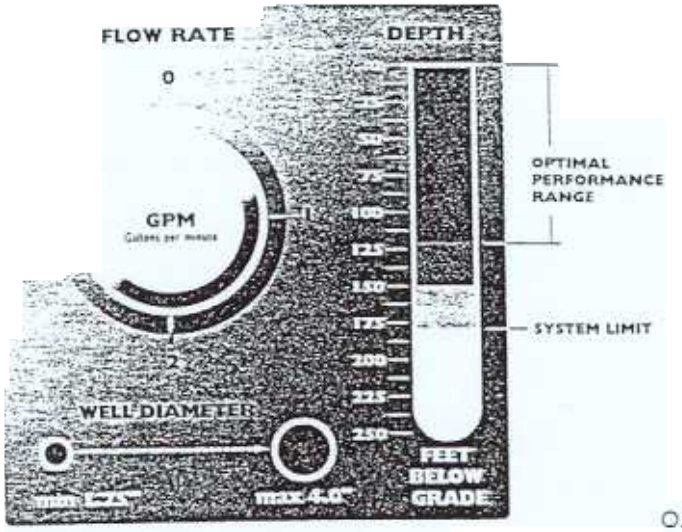
(Shown with D-32 Valve)

O.D. Ø 1.875"
Length 1.5"
Material Delrin™ Acetal

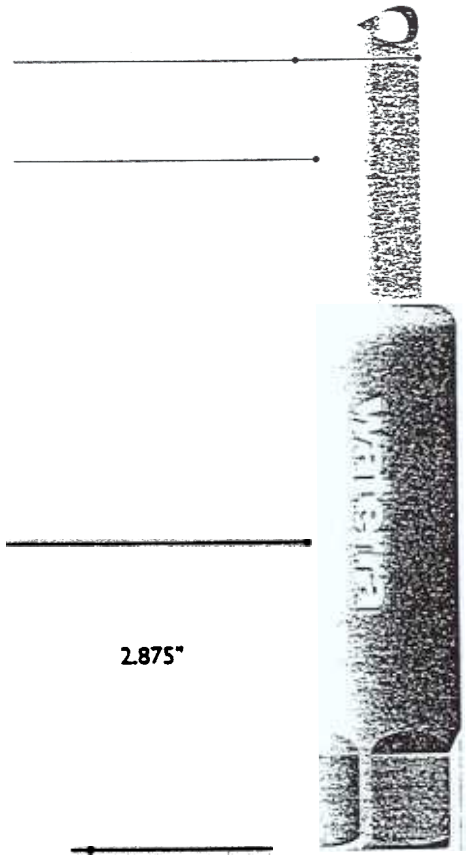
Ø1.25"

(Shown actual size)

Standard Flow System



Performance Chart



(Shown actual size)

USES

- Our most popular system
- Best Cost/Performance Ratio
- Well development
- Hand or Automatic operation

Optional Equipment (Shown 1:2 Scale)

D-16 Valve

O.D. Ø 0.625"
Length 1.2"
Material Delrin™ Acetal

SS-19 Valve

O.D. Ø 0.750"
Length 3.0"
Material Stainless steel

SS-16 Valve

O.D. Ø 0.625"
Length 1.0"
Material Stainless steel

Well Development Surge Block SBD-25

(Shown with D-25 Valve)

O.D. Ø 1.875"
Length 1.5"
Material Delrin™ Acetal

Teflon Tubing

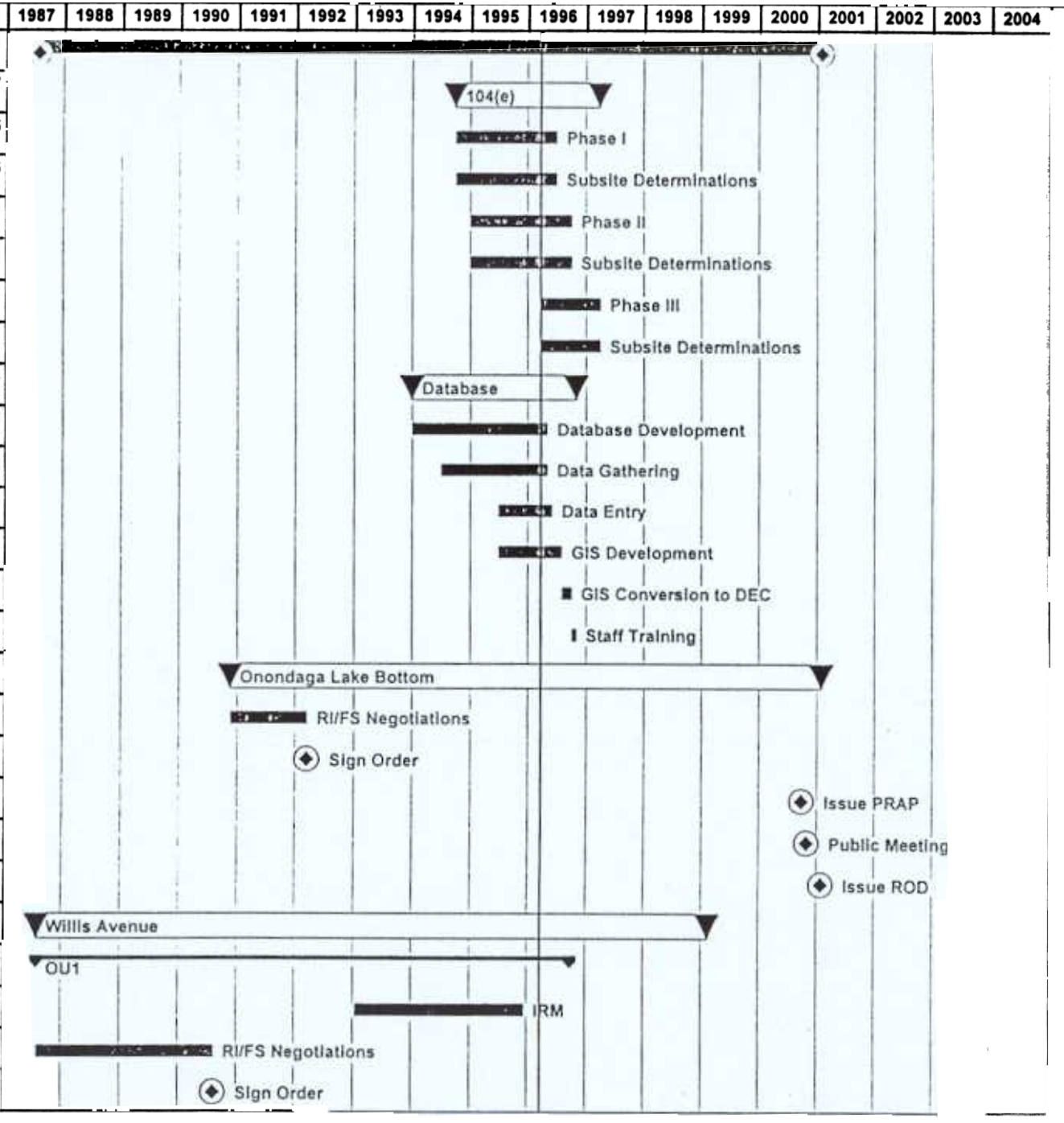
O.D. Ø 0.625"
Length Cut to length
Material Teflon™ FEP

APPENDIX D

ONONDAGA LAKE PROJECT SCHEDULES

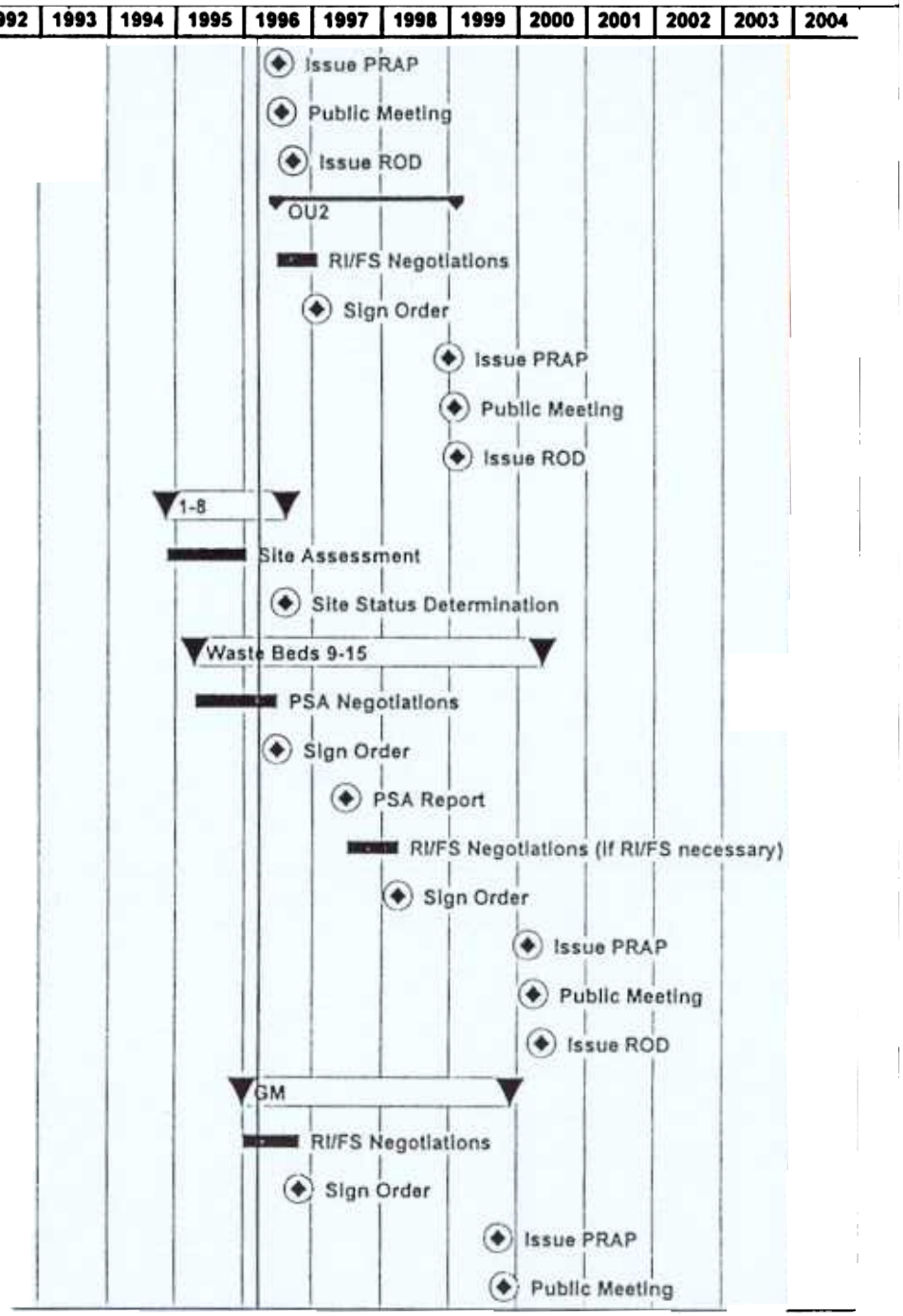
Updated 3/18/96

Task Name	Start	Finish
Onondaga Lake NPL Site	8/3/87	2/2/01
104(e)	9/30/94	4/1/97
Phase I	9/30/94	7/1/96
Subsite Determinations	9/30/94	7/1/96
Phase II	12/30/94	10/1/96
Subsite Determinations	12/30/94	10/1/96
Phase III	4/1/96	4/1/97
Subsite Determinations	4/1/96	4/1/97
Database	1/3/94	11/1/96
Database Development	1/3/94	5/1/96
Data Gathering	6/30/94	5/1/96
Data Entry	6/30/95	5/31/96
GIS Development	6/30/95	7/31/96
GIS Conversion to DEC	8/1/96	9/30/96
Staff Training	10/2/96	11/1/96
Onondaga Lake Bottom [RI/FS]	11/21/90	2/2/01
RI/FS Negotiations	11/21/90	3/16/92
RI/FS Start	3/16/92	3/16/92
PRAP Release	10/2/00	10/2/00
Public Meeting	11/2/00	11/2/00
RI/FS End	2/2/01	2/2/01
Willis Avenue [RI/FS]	8/3/87	2/15/99
OU1	8/3/87	10/1/96
IRM	1/15/93	12/15/95
RI/FS Negotiations	8/3/87	8/10/90
RI/FS Start	8/10/90	8/10/90



ONONDAGA LAKE PROJECT SCHEDULES
Updated 3/18/96

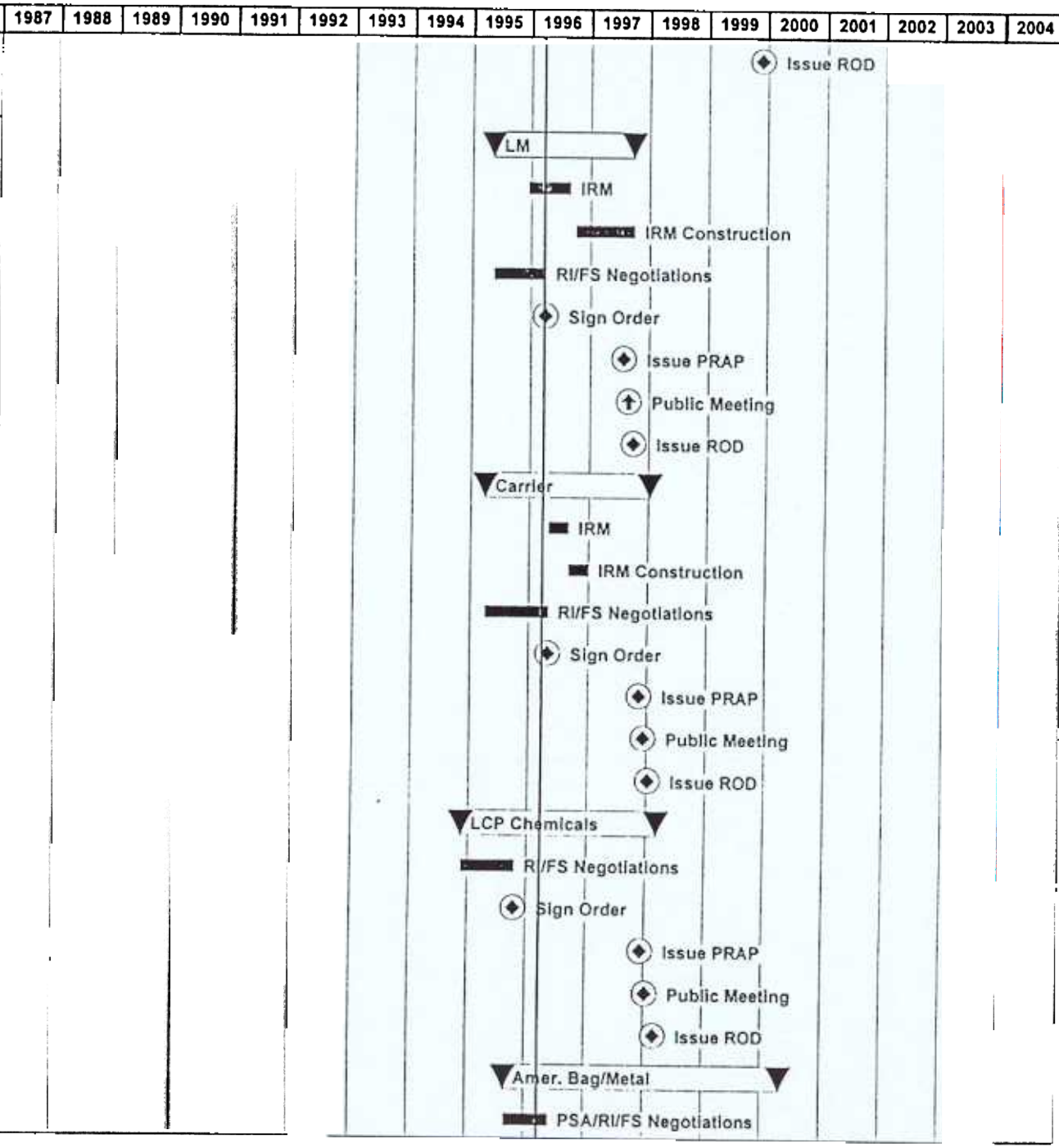
Task Name	Start	Finish
PRAP Release	7/15/96	7/15/96
Public Meeting	8/1/96	8/1/96
RI/FS End	10/1/96	10/1/96
	7/1/96	2/15/99
RI/FS Negotiations	7/1/96	2/1/97
RI/FS Start	2/1/97	2/1/97
PRAP Release	1/1/99	1/1/99
Public Meeting	2/1/99	2/1/99
	2/15/99	2/15/99
Waste Beds 1-8	11/14/94	8/15/96
Site Assessment	11/14/94	1/15/96
Site Status Determination	8/15/96	8/15/96
Waste Beds 9-15 [PSA/RI/FS]	4/17/95	5/15/00
PSA Negotiations	4/17/95	7/1/96
PSA Start	7/1/96	7/1/96
PSA End	7/1/97	7/1/97
RI/FS Negotiations (if necessary)	7/1/97	4/1/98
RI/FS Start	4/1/98	4/1/98
PRAP Release	3/1/00	3/1/00
Public Meeting	3/31/00	3/31/00
RI/FS End	5/15/00	5/15/00
General Motors Corp. [RI/FS]	1/1/96	12/2/99
RI/FS Negotiations	1/1/96	11/1/96
RI/FS Start	11/1/96	11/1/96
PRAP Release	10/1/99	10/1/99
Public Meeting	11/2/99	11/2/99



ONONDAGA LAKE PROJECT SCHEDULES

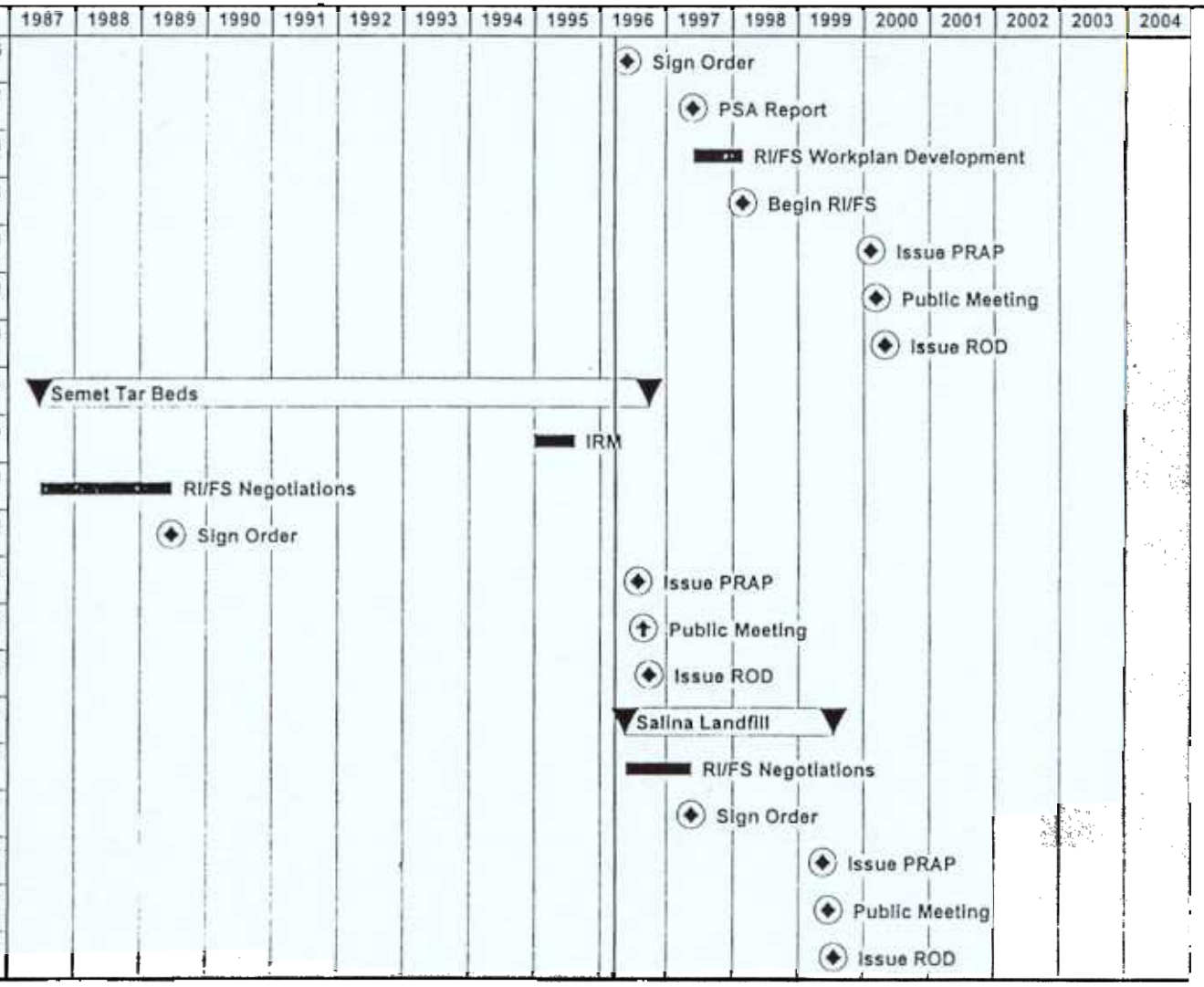
Updated 3/18/96

Task Name	Start	Finish
RI/FS End	12/2/99	12/2/99
Lockheed Martin [RI/FS]	**5/15/95**	**10/1/97**
IRM Design	12/13/95	8/30/96
IRM Construction	10/1/96	10/1/97
RI/FS Negotiations	5/15/95	4/1/96
RI/FS Start	4/1/96	4/1/96
PRAP Release	8/1/97	8/1/97
Public Meeting	9/1/97	9/1/97
RI/FS End	10/1/97	10/1/97
Carrier Carlyle [RI/FS]	**4/3/95**	**1/15/98**
IRM Design	4/30/96	8/30/96
IRM Construction	8/30/96	12/31/96
RI/FS Negotiations	4/3/95	4/30/96
RI/FS Start	4/30/96	4/30/96
PRAP Release	11/17/97	11/17/97
Public Meeting	12/15/97	12/15/97
RI/FS End	1/15/98	1/15/98
LCP Chemicals [RI/FS]	**11/21/94**	**3/11/98**
RI/FS Negotiations	11/21/94	10/20/95
RI/FS Start	10/20/95	10/20/95
PRAP Release	12/15/97	12/15/97
Public Meeting	1/15/98	1/15/98
RI/FS End	3/11/98	3/11/98
American Bag & Metal [PSA/RI/FS]	**9/1/95**	**5/1/00**
PSA Negotiations	9/1/95	5/31/96



ONONDAGA LAKE PROJECT SCHEDULES
Updated 3/18/96

Task Name	Start	Finish
PSA Start	5/31/96	5/31/96
PSA End	6/2/97	6/2/97
RI/FS Negotiations	6/2/97	2/27/98
RI/FS Start	3/2/98	3/2/98
PRAP Release	2/15/00	2/15/00
Public Meeting	3/15/00	3/15/00
RI/FS End	5/1/00	5/1/00
Semet Tar Beds [RI/FS]	6/26/87	10/1/96
IRM	12/27/94	8/15/95
RI/FS Negotiations	6/26/87	6/26/89
RI/FS Start	6/26/89	6/26/89
PRAP Release	8/1/96	8/1/96
Public Meeting	8/30/96	8/30/96
RI/FS End	10/1/96	10/1/96
Salina Town Landfill [RI/FS]	5/21/96	7/21/99
RI/FS Negotiations	5/21/96	5/21/97
RI/FS Start	5/21/97	5/21/97
PRAP Release	5/21/99	5/21/99
Public Meeting	6/22/99	6/22/99
RI/FS End	7/21/99	7/21/99



APPENDIX E

ONONDAGA LAKE
NATIONAL PRIORITIES LIST SITE

COORDINATION PLAN

Prepared by the New York State Department of Environmental Conservation
Bureau of Central Remedial Action

SEPTEMBER 1995

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INTRODUCTION

Over the past ten years, Onondaga Lake and its environs have been the focus of numerous environmental remediation and restoration efforts:

On December 14, 1994, EPA listed the lake on the National Priorities List which identifies the lake as one of the country's worst inactive hazardous waste sites.

In 1990, Federal legislation was enacted which formed the Onondaga Lake Management Conference (OLMC) and charged the OLMC with developing and implementing a Management Plan for the lake's restoration. In early 1994, the OLMC issued the Management Plan and is pursuing implementation thereof.

Pursuant to a Consent Decree with NYSDEC, the county is currently preparing a Draft Environmental Impact Statement which will evaluate various alternatives to address the wastewater discharges from the Syracuse Metropolitan Wastewater Treatment Plant and Combined Sewer Overflows.

On June 27, 1989, New York State filed a complaint against Allied Signal for its contribution of contamination into the environment of Onondaga Lake and associated

Natural Resource Damages. As a result of the complaint, Allied Signal signed a consent decree with the State and is currently conducting an investigation of the nature and extent of its contamination within the Onondaga Lake system.

The Allied Waste Beds, located along the southwestern shore of the lake, are the subject of a closure feasibility study.

There are also a number of inactive hazardous waste sites around the lake which are in various stages of site remediation pursuant to corresponding consent orders with the respective responsible parties.

The Department's goal is to see Onondaga Lake's environs restored to a level that allows the public to use it as a viable natural resource. Achieving this goal will revitalize the Lake's potential for recreational and economic opportunities such as swimming, boating, and fishing.

In order to ensure that the various restoration projects proceed on a consistent, efficient track, and that remedial decisions consider the lake in a comprehensive manner, enhanced intraDepartmental coordination is warranted. The proposed Onondaga Lake Coordination Plan describes how this will be achieved. The Coordination Plan is divided into three major sections: (1) **Engineering/Management** , (2) **Enforcement**, and (3) **Communications**.

SECTION 1

ENGINEERING/MANAGEMENT ACTIVITIES

The Onondaga Lake NPL site encompasses inactive hazardous waste sites and hazardous substance sites which have impacted or threaten the Onondaga lake system. Some of the state listed inactive hazardous waste sites which meet the NPL site criteria have remedial programs already underway. These projects are proceeding on their respective schedules with engineering and technical staff already in place. However, the NPL listing and the State's role as regulatory oversite lead creates some additional responsibilities and needs. The process of identifying all problem areas and related responsible parties and tying them together within the NPL site's remedial program framework led to the formation of a unit within the Division of Hazardous Waste Remediation that is responsible for:

Overall coordination of the NYSDEC environmental restoration efforts for Onondaga Lake, and

Regulatory oversight and management of the Onondaga Lake National Priority List Site.

Overall coordination of the NYSDEC environmental restoration efforts for the lake is a

very broad responsibility which encompasses a number of key tasks. Management of the NPL site is also quite significant due to the project's size, complexity, and relationship to other ongoing restoration efforts. Following are descriptions of the key tasks related to these two major work components.

Overall Coordination of NYSDEC Restoration Efforts

Project Tracking

As mentioned earlier, the Onondaga Lake restoration effort is comprised of a number of separate but related projects which are currently being managed under a variety of different NYSDEC programs such as Solid Waste, Water, Fish&Wildlife, and Hazardous Waste Remediation. These projects typically involve coordination with and support provided by the New York State Department of Health. **Attachment 1 provides a listing of the various projects involved.** This attachment also provides project descriptions, status, schedules of near term milestones, and the names of the respective DHWR contacts and project managers. In order for DHWR to track the progress of each project, each respective project manager reports either to a designated program contact or directly to the DHWR contact. In the former instance, the program contact will in turn report directly to the DHWR contact. The DHWR contact is a staff engineer within the Special Projects Section of the Bureau of Central Remedial Action. Reporting is done at least once per month and should be more frequent if significant events are anticipated or if problems are encountered. Routine reporting should be in the form of a memorandum or a mark-up of the previous month's report in order to streamline the process.

Progress Reporting

Project update information received by DHWR is routinely folded into two tracking reports: a monthly and a quarterly. The monthly report focuses on significant items including information on each of the various tasks identified in the Cooperative Agreement grant from EPA which are related to DHWR's Onondaga Lake NPL site management responsibilities (discussed later in the Coordination Plan). The monthly report is distributed to the program contacts and DHWR management.

The Quarterly Report is more comprehensive than the monthly report. Each separate project is discussed and all progress and status issues are visited. The quarterly report may also serve as a good resource for providing the public with regular updates on progress. The Quarterly Report is distributed to the program contacts and executive staff. Each project manager and program contact should read this document in order to flag any issues which may need follow-up or clarification.

Project Issue Identification and Follow-up

As information is received from the various project managers and program contacts, DHWR staff, primarily the Special Projects Section, must determine if any particular issues require input or review from other NYSDEC programs (apart from routine intraDepartmental coordination). If so, DHWR will follow-up with the respective project manager and will assist as needed with getting any other program's contact person or services on line in an expeditious fashion. For example, a proposed clean-up goal for a given site contaminant being addressed under the Spills program may require consultation with Hazardous Waste Remediation or Water

to ensure that consistency is achieved and to ensure that any potential precedents are fully considered within the context of the entire Onondaga Lake basin.

In order for DHWR to be able to identify these types of issues and provide assistance in a timely fashion, two chief ingredients are required. First, the routine reporting and identification of issues described above must be done in a thorough and cooperative fashion ; ie, the respective project managers should determine if issues are arising on their respective projects which they believe warrant special consideration and this should be clearly communicated to the DHWR contact. Second, the DHWR contact must learn enough about each project to be able to determine any points of "overlap" between respective programs and/or projects. In order for the DHWR contact to be effective, it is primarily contingent upon the various project managers to ensure that the DHWR contact has all current information on their respective projects. This means that for projects which are complex and/or which have a long history, the respective project manager or program contact should pull together key documents from the files like issue papers and commissioner briefings so that the DHWR contact can become familiar with the project quickly and efficiently. This also includes providing the DHWR contact with copies of correspondence and providing the opportunity for attendance at key meetings.

Problem Resolution

As problems arise related to a particular project, DHWR will determine if it can assist with their resolution via the communications/organization structure which has been developed for this process. In other words, the Bureau of Central Remedial Action within DHWR will be

able to raise issues with and seek assistance from any number of NYSDEC programs in an expedited fashion. DHWR will also be able to raise issues and seek assistance from the various program Directors. **Detailed organization charts and information are discussed within and provided as attachments to the "Communications" section of the Coordination Plan.**

In addition to the intraDepartmental network discussed above, DHWR has direct access to broad and specialized technical expertise outside the Department which may be able to provide assistance towards lake restoration. For example, to the extent that a given problem may impact the NPL site remedial program, TAMS Consultants, Inc. is available to provide engineering/technical assistance. Also, via the DEC conference representative, it may be possible to obtain assistance from the Onondaga Lake Management Conference.

NPL Site Management and Regulatory Oversight

Onondaga Lake was named to the NPL in December 1994. Typically, the US Environmental Protection Agency manages the remedial program for any given NPL site. In this case, however, NYSDEC is serving as regulatory lead for the project with EPA acting in an oversight and consultative role. NYSDEC lead status is well justified by the many ongoing State lead remedial projects, not the least of which is the Remedial Investigation/Feasibility Study of the lake being conducted pursuant to a Consent Decree.

A key aspect of this is to build upon as much past and ongoing hazardous waste

remediation work as possible so as to avoid duplicating work. At the same time however, it is clear that the NPL listing brings with it the need to expedite remedial work for certain sites and to determine if additional areas of concern exist. These additional areas may include sites which would not ordinarily be handled under the DEC remedial program such as hazardous substance sites.

The NPL site is not yet fully defined since not all of the areas of concern or responsible parties are known at this time. The formal process to obtain such information is underway and will be discussed in greater detail later in the document. For now, the site is defined as the lake, and any areas which release or threaten to release hazardous substances to the lake or its tributaries. Based upon ongoing remedial activities at State listed inactive hazardous waste sites around the lake, some of the sites which are contributing contamination to the lake system are already known.

The fundamental approach to remediation of Onondaga Lake is comprised of two components: source mitigation and residuals clean-up. For certain contaminants, like mercury, source mitigation to the extent feasible is prerequisite to effectively cleaning up the existing and continuing sediment and water column mercury load. Therefore, NYSDEC will seek to implement measures which will mitigate ongoing pollutant source conditions even as we are in the process of determining how best to clean-up historic, persistent lake pollutants. This process will include consultation with the Department of Health, and the public as appropriate. Within the hazardous waste remediation program, such actions are termed "interim remedial measures" (IRM's). The EPA remedial program has similar actions one of which is termed "Non Time

Critical Removal Action".

The State's NPL site management role, as described above, is largely funded by federal monies awarded to NYSDEC via a Cooperative Agreement grant pursuant to provisions of CERCLA. Many of the key tasks associated with the NPL site's remedial program are identified in the grant and are tracked by NYSDEC and EPA. **A summary of the grant funded tasks is included as Attachment 2**. An important aspect of the funding agreement is the understanding that the majority of the estimated project costs will be recoverable from the Responsible Parties. This aspect is a key component to all hazardous waste remediation consent orders, both Federal and State.

Following are the major management/engineering tasks associated with the NPL site

Coordination Plan

This task is primarily for development of the Coordination Plan This task is within the scope of the EPA grant and substantially completed. Per the grant agreement, EPA approval of this deliverable is required.

Subsite Management

The State will provide oversight of the remedial investigations and feasibility studies (RI/FSs) at the subsites within the Onondaga Lake NPL site, to ensure that the work complies

with the respective subsite consent decrees, CERCLA, the NCP and federal and state laws and regulations. The Bureau of Central Remedial Action (BCRA) is primarily responsible for this task. In order to accomplish this, BCRA will be managing the majority of the individual subsite Onondaga Lake related remedial programs. For those sites which will not be managed by BCRA, the respective project managers will work closely with the BCRA contact to ensure that the respective project's remedial program is consistent with the other Lake related sites. This means, for example, that the BCRA contact will be provided the opportunity to attend key meetings, review major project deliverables, and be provided regular project schedule updates.

Due to the number and diversity of subsites involved, this task will likely consume the greatest amount of engineering/technical resources. In addition, any one of these subsites will likely require consultation with other programs within NYSDEC, such as Fish &Wildlife, Water, and Solid Waste. BCRA will also need to consult with EPA on a regular basis to ensure that a respective project's program is consistent with CERCLA and the NCP. Given the link between a number of the subsites and ongoing litigation, the Attorney General's office technical contact will be routinely apprised of subsite activities. The New York State Department of Health contact will also work closely with the engineering team to facilitate adequate data gathering related to determining routes of exposure to humans and related site risks.

This task encompasses field oversight of PRP lead activities; development and review of deliverables such as workplans, RI reports, and FS reports; field reconnaissance related to preliminary site investigations; preparing and issuing Proposed Remedial Action Plans and

Records of Decision; and conducting or managing remedial work for sites which do not have Responsible Parties identified or available to conduct needed work. For each subsite, the Project Manager will develop a project schedule consistent with any related provisions from the governing consent order which will project the accomplishment of key milestones such as RI Start, RI report submission, RI approval, FS start , etc..through ROD issuance. Once RODs are issued, schedules addressing design and construction will be developed. **All subsite schedules available to date are provided in Attachment 3 to the Coordination Plan.**

Comprehensive Remedial Investigation/Feasibility Study

The DEC is responsible for the development of a comprehensive RI/FS of the NPL site. A major portion of this task is comprised of a comprehensive Risk Assessment. In this case, EPA will allow ongoing and future PRP lead risk assessment work to proceed provided that the resultant data and conclusions are reviewed by qualified staff or a qualified independent contractor working for NYSDEC. This approach takes advantage of ongoing work and avoids duplication of effort and associated delays. Ultimately, all of the individual subsite risk assessments and any additional risk assessment work to fill data gaps will be integrated into one comprehensive Risk Assessment. This will ensure that NPL site risks are adequately characterized.

Another part of the comprehensive RI/FS will be a compilation of the various subsite RI's, supplemented by any additional data gathered to fill any apparent data gaps. This comprehensive RI/FS report will weave in the comprehensive risk assessment and describe

selected remedies for the various subsites. The final deliverable associated with this task will be the final ROD for the NPL site, which will summarize all of the various subsite RODs and assert that all of the various selected remedies, when taken as a whole, adequately mitigate threats to human health and the environment posed by the site. NYSDEC has already procured its consultant which will be responsible for the bulk of the comprehensive RI/FS work. The consultant is TAMS Consultants, Inc. headquartered in Bloomfield, NJ. The TAMS Scope of Services includes:

- Comprehensive Risk Assessment
- Development of an analytical database and GIS system
- Data Validation
- Review of 104(e) (Request for Information) Responses
- Financial Assessment of PRPs (as needed)
- Comprehensive RI Report
- Field Sampling and related analytical services
- Assistance with Citizen Participation Activities

Comprehensive Database

The DEC is responsible for the development of an analytical database to provide a comprehensive view of the NPL site contamination. This database will be comprised largely of analytical data associated with the various subsites gleaned from the respective sites' RI reports. This database will be important to the risk assessment, will assist in completing the comprehensive RI (determining if data gaps exist), and may assist the Natural Resources

Damages claim.

TAMS has been tasked with developing the format for the database and will likely also assist with data entry and coding. In order to arrive at a database that will be of the most use to the varied remedial needs of the Department, BCRA will seek input from a variety of involved NYSDEC programs as the format of the database is being developed. For example, the Division of Fish & Wildlife has certain biota data already available. It would be advantageous if the database design could readily accommodate entry of this data while satisfying other remedial program needs.

Citizen Participation Plan

Development and implementation of a site-wide Citizen Participation (CP) Plan is a standard task for any hazardous waste remediation project, whether it be State or Federal lead. However, the size and complexity of this site requires that the CP Plan provide for information sharing and regular updates on restoration activities that extend beyond subsite hazardous waste remedial program activities. The CP program will be the means to show the public how some of the other Department's Onondaga Lake restoration efforts are progressing and how the work fits together.

SECTION 2

ENFORCEMENT

The following discusses the legal strategy that DEC will employ with respect to issues of liability for contaminants released or disposed of at the NPL site and the responsibility for remedial action where those contaminants impact or threaten to impact the Lake system.

Applicable Authorities:

Federal Law: DEC's authority to administer the Onondaga Lake NPL hazardous substances site under federal law is generally derived from the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 USC Section 9601 et seq.. As discussed under the Engineering/Management Section, DEC and EPA have already begun the process of identifying areas of concern by gathering pertinent information on facilities suspected of polluting the Lake system. For this purpose, DEC will specifically take its enforcement authority from CERCLA Section 104(d), providing that the President may enter into a cooperative agreement with a State that authorizes the State to carry out any or all actions authorized in CERCLA Section 104[1], in accordance with the criteria and priorities established in

[1] CERCLA Section 104(a) authorizes the President to remove and provide for remedial action relating to hazardous substance releases or the threat thereof, or take any other response measure, consistent with the National Contingency Plan (40 CFR Part 300 et seq.). 42 U.S.C.

CERCLA Section 105(a)(8).[2]

Hazardous Substances Under CERCLA: Many different potential contaminants can interact with environmental media to constitute a hazardous substance site. CERCLA defines a hazardous substance broadly, invoking various provisions of the federal Clean Water Act, Solid Waste Disposal Act, Toxic Substances Control Act, Clean Air Act and the list of "elements, compounds, mixtures solutions and substances which, when released into the environment may present a substantial danger to the public health or welfare or the environment ." provided for in CERCLA §102(a). This definition is more broad in scope than the definition of hazardous waste provided for in New York State legislation (see below) that authorizes DEC to conduct remedial programs for inactive hazardous waste disposal sites.

New York State Law: Of course, DEC also draws upon State law to address the pollution of the Onondaga Lake system, deriving legislative enforcement authority from the Environmental Conservation Law (ECL), particularly Article 27, Title 13 of the ECL: the Inactive Hazardous Waste Disposal Sites law. Hazardous wastes are defined in ECL §27-1301, which refers to a series of regulations listing New York's hazardous wastes by name. 6 NYCRR §371.4. In the alternative, even if not on the list, hazardous wastes can be identified under the

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Section 9604(a).

[2] CERCLA Section 105(a)(8) provides that the President shall revise the National Contingency Plan for the Removal of Oil and Hazardous Substances (NCP, 40 CFR Part 300, et seq.) to establish procedures and standards for responding to releases of hazardous substances, pollutants and contaminants, including criteria for determining priorities among releases or threatened releases for the purpose of taking remedial actions and removal actions.

same regulations if they exhibit the characteristics of ignitability, corrosivity, reactivity or toxicity. 6 NYCRR §371.3. Other applicable State regulations include 6 NYCRR Part 375, which sets forth the State's guidelines and criteria for implementing the Inactive Hazardous Waste Disposal Site Remedial Programs.

Under the State's inactive hazardous waste disposal site remedial program, if DEC determines that hazardous wastes have been disposed of at a site, the site can be placed on the New York Inactive Hazardous Waste Disposal Site Registry (Registry). Sites listed on the Registry are prioritized pursuant to statutorily defined classes (see ECL §27-1304(4)(b)) and pursued for remediation: (i) either through administrative or civil enforcement actions brought to require a responsible party to commit to a remedial program pursuant to ECL Article 27, Title 13, or (ii) through the State Superfund process whereby the State remediates the site and seeks to recover costs from the responsible party.

The Cooperative Agreement With EPA: As noted above, DEC and EPA entered into the Cooperative Agreement, dated September 30, 1993, which designates the DEC as the lead agency for "enforcement-related activities for the Onondaga Lake site", with the ultimate goal of remediating Onondaga Lake. The Cooperative Agreement originally authorized DEC to expend up to $2,734,249.00 for the support of the project; that grant can be amended periodically to provide for continuing technical and enforcement support for the program. In order to maintain federal funding under CERCLA, DEC's remedial program strategy and the implementation of its enforcement program must be consistent with the National Oil and

Hazardous Substances Contingency Plan (NCP, 40 CFR Part 300). The purpose of the regulations in the NCP is to provide the organizational structure and procedures for preparing for and responding to releases of hazardous substances, pollutants and contaminants which may present an imminent and substantial danger to public health, welfare or the environment. Among other things, it provides procedures for:

(i) undertaking remedial measures under the Clean Water Act,

(ii) response actions under CERCLA, and

(iii) involving State governments in the initiation, development, selection and implementation of response actions.

DEC's Objectives and Enforcement Strategy

DEC's Division of Environmental Enforcement, in cooperation with the Division of Hazardous Waste Remediation, other Divisions within the Department, the Departments of Law and Health, and EPA, will screen facilities within the Onondaga Lake system to determine whether they are the source of releases or threatened releases of hazardous substances to the Lake system. This screening will also review whether such releases or threatened releases require a remedial response (i.e., performance of a remedial investigation and feasibility study, "RI/FS").

The Department's primary enforcement effort under the authorities mentioned above will be to enter into Consent Orders with the party(s) responsible for creating and/or maintaining hazardous substance contamination that threatens the Lake system. Such orders will be

developed from model DEC and EPA enforcement orders designed to require that the responsible party(s) conduct a RI/FS to characterize the nature and extent of hazardous substance contamination at the property.

In the event that a responsible party will not enter into a Consent Order with DEC , or if a responsible party is financially incapable of participating in a remedial program or cannot be found, DEC and EPA will review the property in question to determine whether a RI/FS should be performed by the State under the federal Superfund program. The State would seek to accomplish the same goals in a RI/FS under the Superfund program as a responsible party would be obligated to achieve under a Consent Order. However, a responsible party who does not participate in the remedial program will still be liable for hazardous substance contamination. DEC will pursue such party to recover the costs of responding to the contamination and associated administrative and legal expenses.

In addition, there are likely to be cases where sources of contamination that may threaten the Lake system cannot be linked to a particular responsible party. If this creates a gap in the information needed to produce the State's comprehensive RI/FS for the Lake system, DEC will perform the RI/FS for the property in question to characterize the nature and extent of contamination, identify its relationship to the Lake and analyze appropriate remedial alternatives.

DEC's enforcement strategy for this effort is intended to reflect DEC's and EPA's technical strategy for investigation and analysis of contaminants effecting the Lake system -

including sources of potential contamination upland of the Lake itself - and the evaluation of various alternative remedial programs, ultimately resulting in the aforementioned comprehensive RI/FS. This will necessarily take into account an ongoing RI/FS for the bed of the Lake and upland areas associated with hazardous substances disposed of or released at the AlliedSignal Corporation plant area in Solvay, New York, being performed by AlliedSignal Corporation pursuant to a consent decree executed with the State in March, 1992. This strategy will also take into account other ongoing RI/FS consent orders that currently affect the Lake system.

Furthermore, DEC's enforcement efforts, and the development of the comprehensive RI/FS will be developed with a cognizance of the Consent Judgment filed with the U.S. District Court (Northern District of New York) in the civil action brought against the Onondaga County Department of Drainage and Sanitation and Onondaga County by the Atlantic States Legal Foundation, later joined by DEC as co-plaintiffs That action was brought on the grounds of alleged violations of the Clean Water Act due to discharges of sewage to Onondaga Lake from the metropolitan sewage treatment plant. The Consent Judgment, entered into in January, 1989, provides that the County will bring the sewage treatment plant discharges into compliance through an upgrading project. The Consent Judgment also requires the County to submit a Municipal Compliance Plan, selecting engineering alternatives to upgrade and/or divert the sewage discharge, and treat and/or divert combined sewer overflows. Upon approval of the MCP by DEC, the implementation schedule in the Municipal Compliance Plan will become an enforceable part of the Consent Judgment. Thus, DEC must keep track of the County's efforts to comply with the Consent Judgment to consider all influences on the NPL site remedial program.

DEC's Relationship To The Onondaga Lake Management Conference, EPA and Other Agencies.

As noted above, the Department has been designated lead agency for enforcement actions regarding the NPL site, by virtue of the Cooperative Agreement. Other entities, such as EPA and the Onondaga Lake Management Conference (OLMC), have jurisdiction over and/or are concerned with examining and developing solutions for impacts to the Lake environment In order for DEC to carry out its appropriate enforcement role under State and federal law, its Division of Environmental Enforcement and Hazardous Waste Remediation will interface with and coordinate with these entities.

The Onondaga Lake Management Conference.

The Onondaga Lake Management Conference (OLMC) was formed under the auspices of the Great Lakes Critical Programs Act (GLCPA, Pub. L. No. 101-596, §401, 104 Stat. 3010 (1990)) "for the restoration, conservation and management of Onondaga Lake." The OLMC is comprised of representatives from effected levels of government and the public: the Governor of the State of New York, The Attorney General of the State of New York, the Onondaga County Executive, the Mayor of the City of Syracuse, the US Army Corps of Engineers, and the EPA. The OLMC is operated by an appointed Director who also acts as the liaison between the OLMC and a Citizens Action Committee, providing public input to the project.

Like the Department's Onondaga Lake NPL site enforcement program, the OLMC also

operates under a Cooperative Agreement with EPA, which in this case articulates the OLMC's mission to "develop a plan that identifies corrective action and compliance schedules for cleanup of Onondaga Lake, and coordinates implementation of the plan by members of the conference and others.

The Department's and the OLMC's respective missions are related; more due to common subject matter and some common goals than as a result of statute or policy. Moreover, DEC's responsibilities and goals are enforcement-related; the OLMC's responsibilities and goals are focused on developing a public plan for resource conservation, management and corrective actions. Thus, both DEC and OLMC incorporate into their view of the Onondaga Lake universe a significant remedial/restoration component: DEC's will be realized largely through a NPL site-wide RI/FS and MCP addressing conventional water pollution; OLMC's will be represented by its resource management plan.[3] Where appropriate, the Department will coordinate with the OLMC and incorporate useful, integral aspects of the latter's analytical efforts.

What most distinguishes the Department from the OLMC is reflected by their respective enabling authorities. DEC's enforcement authority under such laws as CERCLA and the Clean Water Act means that it has jurisdiction to compel a remedial action or complete it on its own.

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[3] As of this writing, the OLMC Management Plan has been issued and approved by the EPA. The Governor has concurred with the Plan in part, to the extent that the Plan will not interfere with the engineering of a response to the remediation of the lake's various pollution issues as addressed by other actions, such as the resolution of CERCLA litigation against Allied-Signal, a Clean Water Act action against the Onondaga County "Metro" Sewage Treatment Plant, and the NPL site remedial program.

Whereas the OLMC does not possess such enforcement authority, its charter brings together the various federal, State and local community interests to plan for the Lake's return to a healthy environment and a public resource.

The United States Environmental Protection Agency.

Under the Cooperative Agreement, EPA has agreed that DEC will act as the lead agency for the NPL site, as noted above. In the terms of the NCP, EPA will serve in the role as "support agency" for DEC's lead. In this capacity, EPA will provide DEC with direct oversight to ensure that the enforcement program is consistent with federal laws and regulations (primarily CERCLA and the NCP):

Presently, EPA's support role includes being available to impose a unilateral enforcement order pursuant to CERCLA §106. EPA may issue a §106 unilateral order: (i) "when the President determines that there may be an imminent and substantial danger to the public health or welfare or the environment because of an actual or threatened release of a hazardous substance from a facility" or (ii) "after notice to the affected State, take other action under this section including, but not limited to, issuing such orders as may be necessary to protect public health and welfare and the environment." In the event that a responsible party capable of participating in a remedial program is unwilling to cooperate by entering into a Consent Order to achieve remedial goals for the Onondaga Lake system, EPA, upon DEC's notification, will consider issuing a §106 unilateral order to resolve the matter.

Selection of Sites For Remediation/Restoration

DEC's NPL site enforcement program is intended to address the sources of contamination of Onondaga Lake along with the in-Lake impacts. Whereas Onondaga Lake (including the Lake sediments and Lake waters) has been made the subject of several analytical studies, the discrete releases and threatened releases of contaminants from properties and/or facilities upland of the Lake shore and along its tributaries require further identification. Once identified, these locations will be the subject of intense analyses to determine their impact or potential impact on the Lake system. DEC will identify those releases and threatened releases that should be included as components of the overall NPL remedial program. The result of the process will be the inclusion of the properties or facilities in production of the comprehensive RI/FS, as components of the NPL site.

In order to identify releases or potential releases of hazardous substances, DEC will deliver demands for documentary disclosures to targeted industrial facility operators within the Lake system. These demands will be made pursuant to CERCLA §104(e) and the ECL; the information submitted to DEC will support a determination as to whether the facility will be included in the NPL site and made subject to the enforcement program contemplated by DEC and EPA.

Prior to the nomination of Onondaga Lake to the NPL, a few facilities had negotiated consent orders with DEC, under the enforcement program provided for in the ECL, and they are

committed to conduct components of a remedial program. An example is the AlliedSignal Corporation (AlliedSignal), which is conducting a RI/FS of the Lake pursuant to a Consent Decree executed with DEC with the approval of the U.S. District Court (Northern District) in March 1992. The RI/FS will include investigations of Lake sediment contaminants, as well as the upland extent of pollution stemming from disposal or release of AlliedSignal's industrial wastes from its facility. Allied also has consent orders related to two other upland sites, under which Allied is performing RI/FSs.

The Department will seek to place as many properties and facilities as possible under enforcement programs designed to produce RI/FSs, through the process of consent order negotiations conducted with EPA's cooperation and support. In the event that such negotiations prove fruitless, EPA can exercise the authority provided in CERLCA §106, whereby EPA issues a unilateral order directing a potentially responsible party to remediate hazardous substance contamination. In either event, the result will be an iterative RI/FS resulting in a comprehensive RI/FS for the NPL site.

SECTION 3

COMMUNICATIONS

Communications is a key ingredient for the success of the Onondaga Lake NPL site remedial program. Although the previous two sections of the Coordination Plan touch upon this item, it is important enough to warrant a dedicated section. There are three chief types of communications networks involved : (1) Intra Departmental, (2) Inter Agency, and (3) with the public. Following are discussions of each of these including specifics as to how they will be addressed.

Intra Departmental

Execution of DHWR's engineering and technical tasks, as described in Section 1 of the Coordination Plan, will require routine consultation with staff in other programs within NYSDEC such as Fish & Wildlife, Water and Solid Waste. The program expertise and specific project knowledge provided will be valuable to the BCRA project manager in tracking project progress and ensuring that project remedial programs are appropriate, consistent and do not conflict with each other. **Attachment 4 provides the organization/management structure for the Onondaga Lake restoration work**. The bottom row shows the key programs and personnel assigned to provide support to the BCRA contacts (**DHWR Task Leaders, see Attachment 5**). The DHWR Task Leaders report to the SPS Section Chief within BCRA who is the chief contact

for the various programs and personnel identified in the third row from the bottom of Attachment 4. The SPS Section Chief reports directly to the BCRA Director who in turn is the bridge to Division and Department management. This organizational structure is a good model of the typical communications links appropriate and necessary for this Project. However, the flow of information is not constrained by this structure.

The typical means of keeping everyone apprised of issues and progress is through the Monthly and Quarterly Reports The Monthly Report focuses on significant items including information on each of the various tasks related to management of the NPL site. The Quarterly Report is more comprehensive, discussing each separate project and visiting all progress and status issues. However, as any issues arise or key meetings are being considered for a project or issue, the appropriate DHWR contact should be notified so that good intra departmental coordination is assured.

Inter Agency

Oversight and management of lake restoration activities will also require regular communication with other regulatory agencies. **Attachment 4 also shows** the key organizational linkages to the New York State Department of Health, the Attorney General's Office, and the Environmental Protection Agency. For each of these there are assigned project level technical contacts who will routinely communicate with the DHWR Task leaders. There are also management level technical counterparts for NYSDOH and USEPA.

Public

It is essential that the public understand the goals, methods and progress of the Department's lake restoration activities. This will be achieved through the implementation of a site-wide Citizen Participation (CP) Plan currently being developed. The CP Plan will be consistent with CERCLA, the National Contingency Plan, and DEC guidance. The CP Plan will include routine informational bulletins, public meetings, public availability sessions, and public repositories for project related documents.

SECTION 4

SUMMARY

The coordination plan for the Onondaga Lake Restoration Project is an examination of the project goal and the means by which the goal will be accomplished. The size and complexity of this site warrants specialized management and communications approaches. Rather than short-cutting Department processes, this will overlay an additional structure to enhance communications and cooperation.

The fundamental approach to remediation and restoration of Onondaga Lake is comprised of two components; source mitigation and residuals clean-up. The Coordination Plan encompasses all the NYSDEC's environmental initiatives directly related to Onondaga Lake. This includes both Lake restoration efforts and oversight and management of the Onondaga Lake National Priority List Site.

A coordination team has been selected with members representing each of the major program areas involved in Onondaga Lake restoration efforts. This coordination team will be the core troubleshooting group. They will act as a hub for transmitting information and concerns from the different program areas into the contact points and vice-versa. Communication of the

Department's goals and accomplishments to the public will be achieved through the use of the Citizen Participation Plan.

In summary, the goal is to restore the Onondaga Lake environs so as to serve the public as a viable natural resource. Attainment of this goal will revitalize the Lake's vast potential for recreational and economic opportunities.

List of Attachments

Attachment 1

Descriptions of the various projects comprising the Onondaga Lake restoration effort. Referenced on page 4.

Attachment 2

A summary of grant funded tasks. Referenced on page 9.

Attachment 3

Subsite schedules. Referenced on page 11

Attachment 4

Organization/management structure outline. Referenced on pages 25 and 26.

Attachment 5

A listing of DHWR Task Leaders and their responsibilities. Referenced on page 25.

ATTACHMENT 1

ONONDAGA LAKE RESTORATION PROJECTS

AlliedSignal Related Projects

Onondaga Lake Bottom Mercury Sediments

The RI/FS workplan for this project calls for the development of mercury and calcite models to simulate past, present and future conditions of the Lake under various remedial actions; a sampling program of water and sediments in the lake to determine the variety of substances in the Lake and the extent and distribution of Allied-related substances; a fish sampling program; an ecological effects study; and a risk assessment. It is anticipated that the draft RI report will be submitted in 1996 and that the remedial investigation will be completed in 1997.

Project Manager: Tim Larson, SPS-DHWR

Willis Avenue Site

This is the site of a former chlorine and chlorobenzene production facility located at the corner of Willis Avenue and State Fair Boulevard near the shore of Onondaga Lake. Also included are portions of the Allied Main Plant grounds, including the former benzene production facility and "hot spots" of chlorobenzene contamination along former supply and waste water lines. An IRM pilot study pump & treat system to intercept the flow of a free product layer of chlorinated benzenes very close to the lake shore has been implemented and a final pump & treat system is in the design phase. It is anticipated that the RI/FS will be completed in 1996.

Project Manager: Kevin Kelly, Region 7

A second Operable Unit (OU2) is being considered for the site in order to determine the nature and extent of mercury contamination. As part of this OU, we would akso evaluate on-site and off-site buried utilities and other subsurface structures relative to their roles as pathways for contaminant migration. Due to the link to the ongoing Lake Bottom RI/FS, this OU would likely be managed by the Special Projects Section in Central Office.

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dispensing of paint solvents utilized 5 gallon drums staged diked concret pad The UST
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and es will commence an and that the sit will be listed as NY Inactive Hazardous

Waste Site in 1995

Project Manager: Alyse Peterson, SPS-DHWR

Carrier/Carlyle

Carlyle Compressor Division is a 50-acre site located on Chrysler Drive in the Town of Dewitt. It was utilized as a manufacturing facility for reciprocating compressors from the early 1970's until January 1991, when the plant shut down. An Environmental Site Assessment in 1989 began a series of groundwater investigations to determine the extent of contamination on this site. These investigations completed by the owner, Carrier Corporation, and others have determined that groundwater in the southwest corner of the manufacturing building is contaminated with VOCs. The site is a Class 3 NYS Inactive Hazardous Waste Site. It is anticipated that the site RI/FS will commence in 1996 and will include an IRM component.

Project Manager: Alyse Peterson, SPS-DHWR

American Bag & Metal

This site is located adjacent to Onondaga Creek , by the Spencer Street bridge. American Bag & Metal Company (ABM) is a scrap metal business which also recovers insulated cable, and has operated at this location since 1965. DOT sampling of soils in its right-of-way adjacent to the ABM property showed the presence of PCBs. Subsequent investigation confirmed the presence of PCBs at levels above 50ppm. The site is currently on the New York Registry as a Class 2a Inactive Hazardous Waste Site. It is anticipated that the site RI/FS will commence in 1996.

Project Manager: Rick Mustico, SPS-DHWR

ATTACHMENT 2
GRANT FUNDED TASKS

Coordination Plan Development

This task entails development of the Action and Coordination Plans for the Onondaga Lake restoration effort. This task also includes general project management The deliverables for this task have been submitted to EPA.

Subsite Management

This task encompasses field oversight of PRP lead activities, field reconnaissance related to preliminary site investigations, preparing and issuing Proposed Remedial Action Plans and Records of Decision, and conducting or managing remedial work for sites which do not have Responsible Parties identified or available to conduct needed work

Comprehensive RI/FS

This task encompasses a comprehensive Risk Assessment for the NPL site, a summary Compilation Report of the various subsite RIs and the final ROD for the NPL site. TAMS Consultants, Inc. has been procured to perform the bulk of the comprehensive RI/FS work.

Analytical Database (GIS)

This task involves development of an analytical database and corresponding geographical information system which will provide a comprehensive view of the NPL site contamination.

Citizen Participation (CP) Plan

This task involves the development and implementation of a site-wide CP Plan. The CP Plan will be the means to show the public how all of the Department's Onondaga Lake restoration efforts are progressing and how the work fits together

Coordination and Tracking of Onondaga Lake Remediation

This task entails monitoring of the activities associated with the various aspects of the project to insure that subsite enforcement agreements are followed and that the remedial measures are consistent with the site-wide remediation, CERCLA and NCP. This task also includes distribution of a Tracking Report.

Coordination of Onondaga Lake Management Conference Activities

NYSDEC will work with the Management Conference to ensure that all pertinent information is shared so that respective actions towards the common goal of lake restoration are complementary.

Development of a Comprehensive Enforcement Program for the NPL Site

This task involves development of a comprehensive enforcement program to ensure that all appropriate enforcement activities are undertaken to obtain commitments from responsible parties, to carry out the necessary remedial investigations/feasibility studies, implement the required remedial action and pay all past and future response costs.

ATTACHMENT 3

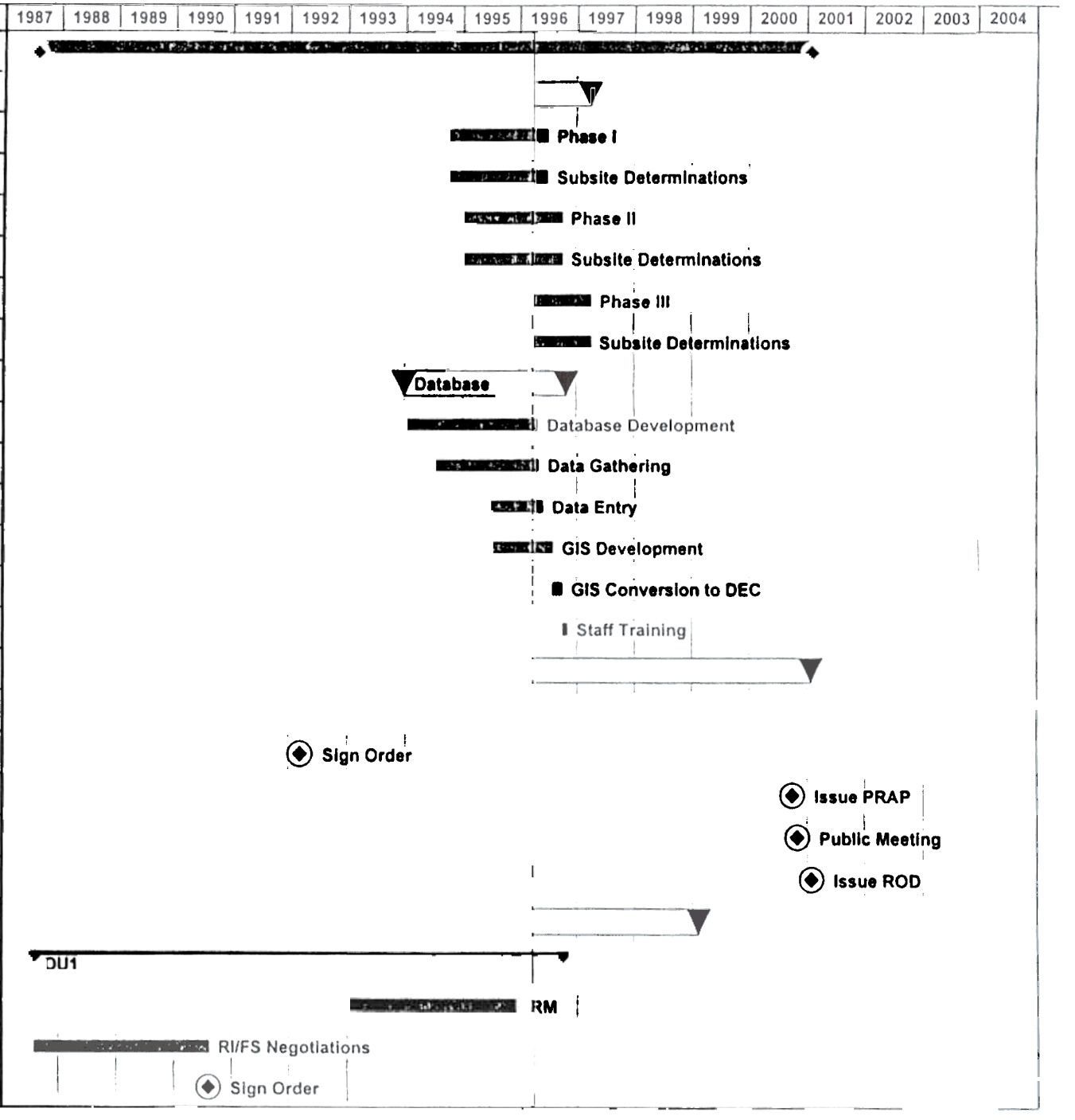
SUBSITE SCHEDULES

{This attachment includes all subsite project schedules.}

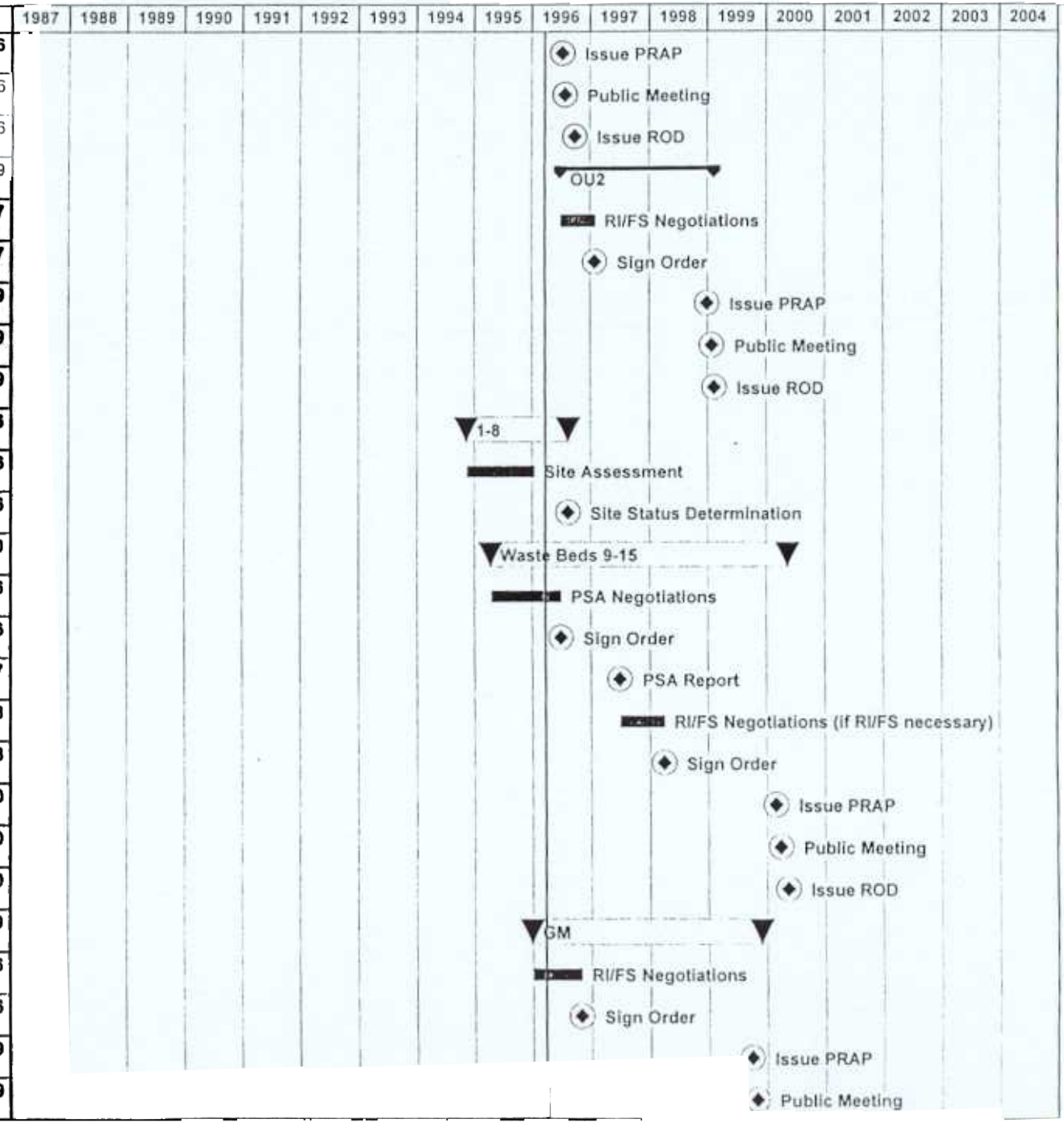
ONONDAGA LAKE P. CT SCHEDULES

Updated 3/18/96

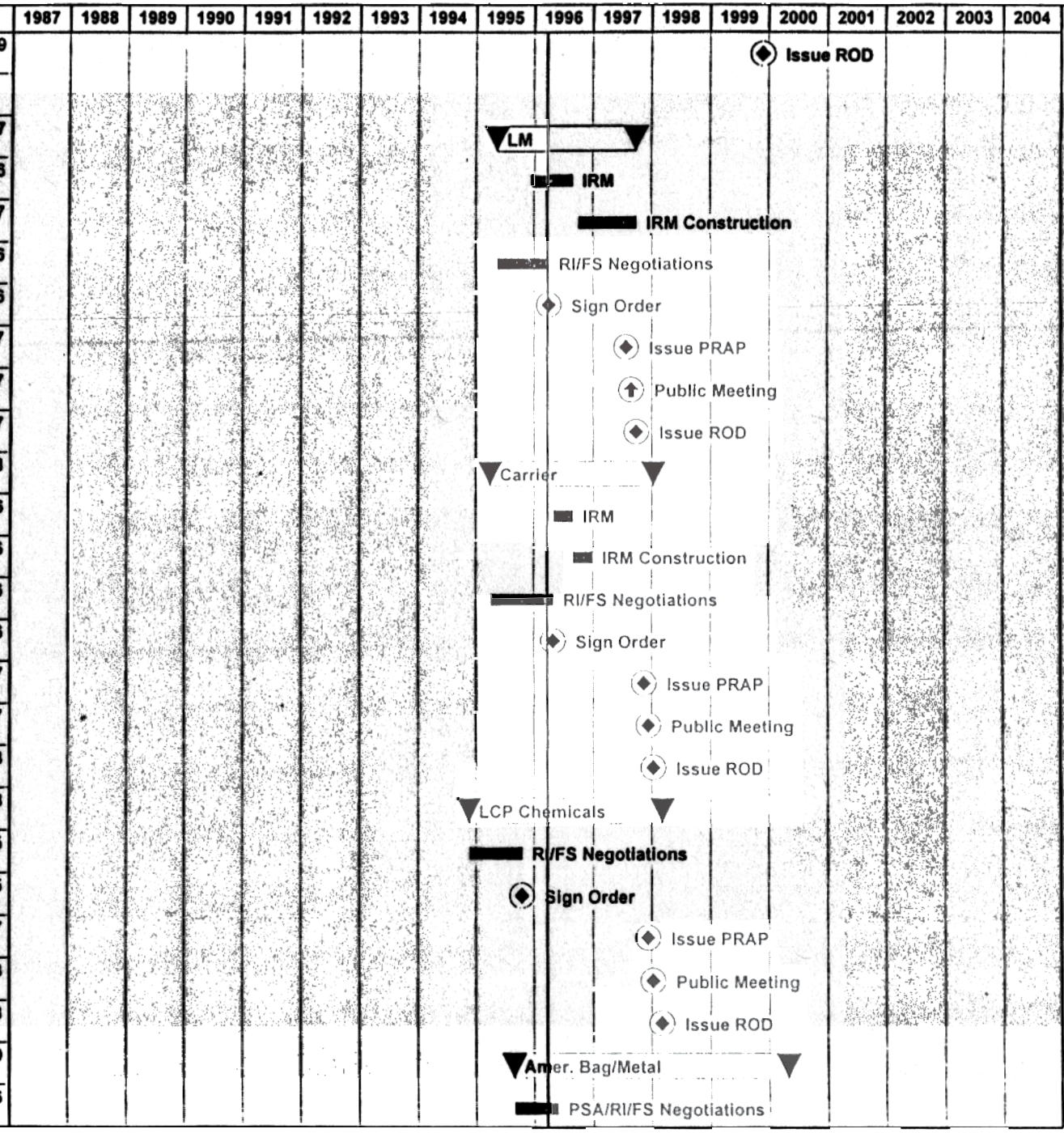
ID	Task	Start	Finish
	Onondaga Lake NPL Site	8/3/87	2/2/01
2	104(e)	9/30/94	4/1/97
3	Phase I	9/30/94	7/1/96
4	Subsite Determinations	9/30/94	7/1/96
5	Phase II	12/30/94	10/1/96
6	Subsite Determinations	12/30/94	10/1/96
7	Phase III	4/1/96	4/1/97
8	Subsite Determinations	4/1/96	4/1/97
9	Database	1/3/94	11/1/96
10	Database Development	1/3/94	5/1/96
11	Data Gathering	6/30/94	5/1/96
12	Data Entry	6/30/95	5/31/96
13	GIS Development	6/30/95	7/31/96
14	GIS Conversion to DEC	8/1/96	9/30/96
15	Staff Training	10/2/96	11/1/96
16	Onondaga Lake Bottom [RI/FS]	11/21/90	2/2/01
17	RI/FS Negotiations	11/21/90	3/16/92
18	RI/FS Start	3/16/92	3/16/92
19	PRAP Release	10/2/00	10/2/00
20	Public Meeting	11/2/00	11/2/00
21	RI/FS End	2/2/01	2/2/01
22	Willis Avenue [RI/FS]	8/3/87	2/15/99
23	OU1	8/3/87	10/1/96
24	IRM	1/15/93	12/15/95
25	RI/FS Negotiations	8/3/87	8/10/90
26	RI/FS Start	8/10/90	8/10/90



ID	Task Name	Start	Finish
27	PRAP Release	7/15/96	7/15/96
28	Public Meeting	8/1/96	8/1/96
29	RI/FS End	10/1/96	10/1/96
30	OU2	7/1/96	2/15/99
31	RI/FS Negotiations	7/1/96	2/1/97
32	RI/FS Start	2/1/97	2/1/97
33	PRAP Release	1/1/99	1/1/99
34	Public Meeting	2/1/99	2/1/99
35	RI/FS End	2/15/99	2/15/99
36	Waste Beds 1-8	11/14/94	8/15/96
37	Site Assessment	11/14/94	1/15/96
38	Site Status Determination	8/15/96	8/15/96
39	Waste Beds 9-15 [PSA/RI/FS]	4/17/95	5/15/00
40	PSA Negotiations	4/17/95	7/1/96
41	PSA Start	7/1/96	7/1/96
42	PSA End	7/1/97	7/1/97
43	RI/FS Negotiations (if necessary)	7/1/97	4/1/98
44	RI/FS Start	4/1/98	4/1/98
45	PRAP Release	3/1/00	3/1/00
46	Public Meeting	3/31/00	3/31/00
47	RI/FS End	5/15/00	5/15/00
48	General Motors Corp. [RI/FS]	1/1/96	12/2/99
49	RI/FS Negotiations	1/1/96	11/1/96
50	RI/FS Start	11/1/96	11/1/96
51	PRAP Release	10/1/99	10/1/99
52	Public Meeting	11/2/99	11/2/99

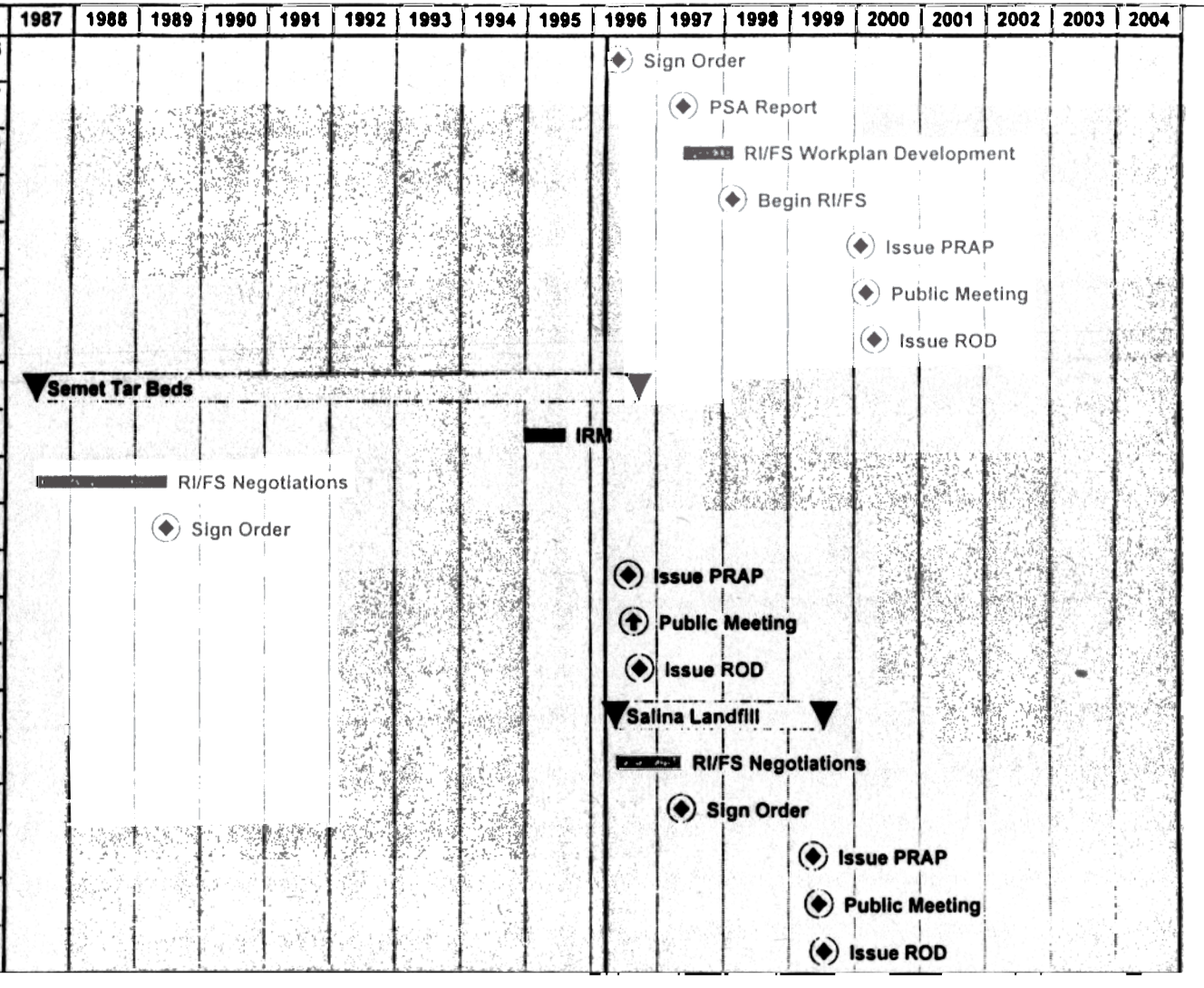


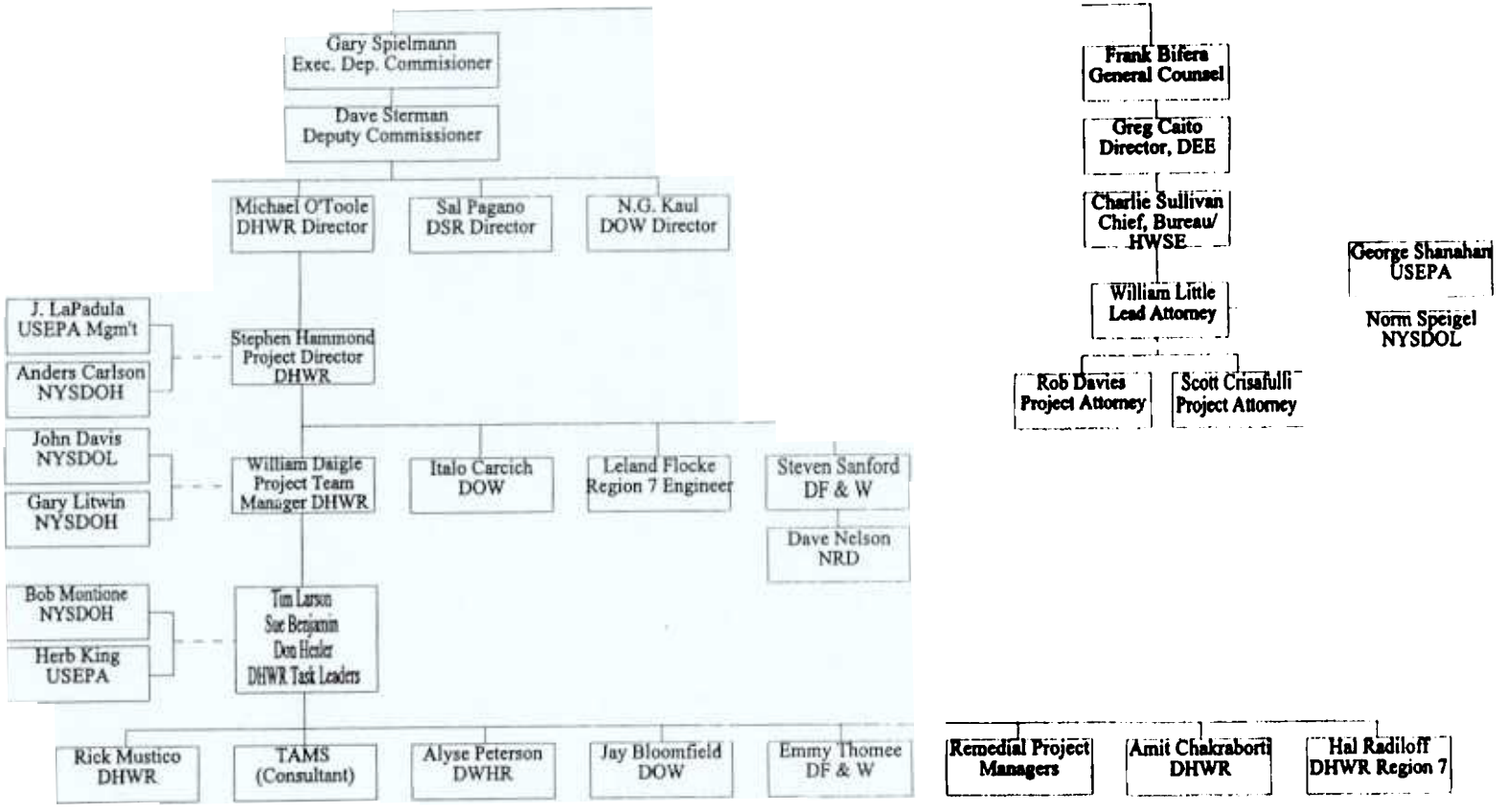
ID	Task Name	Start	Finish
	RI/FS End	12/2/99	12/2/99
54			
55	Lockheed Martin [RI/FS]	5/15/95	10/1/97
56	IRM Design	12/13/95	8/30/96
57	IRM Construction	10/1/96	10/1/97
58	RI/FS Negotiations	5/15/95	4/1/96
59	RI/FS Start	4/1/96	4/1/96
60	PRAP Release	8/1/97	8/1/97
61	Public Meeting	9/1/97	9/1/97
62	RI/FS End	10/1/97	10/1/97
63	Carrier Carlyle [RI/FS]	4/3/95	1/15/98
64	IRM Design	4/30/96	8/30/96
65	IRM Construction	8/30/96	12/31/96
66	RI/FS Negotiations	4/3/95	4/30/96
67	RI/FS Start	4/30/96	4/30/96
68	PRAP Release	11/17/97	11/17/97
69	Public Meeting	12/15/97	12/15/97
70	RI/FS End	1/15/98	1/15/98
71	LCP Chemicals [RI/FS]	11/21/94	3/11/98
72	RI/FS Negotiations	11/21/94	10/20/95
73	RI/FS Start	10/20/95	10/20/95
74	PRAP Release	12/15/97	12/15/97
75	Public Meeting	1/15/98	1/15/98
76	RI/FS End	3/11/98	3/11/98
77	American Bag & Metal [PSA/RI/FS]	9/1/95	5/1/00
78	PSA Negotiations	9/1/95	5/31/96



ONONDAGA LAKE PROJECT SCHEDULES
Updated 3/18/96

ID	Task Name	Start	Finish
	PSA Start	5/31/96	5/31/96
80	PSA End	6/2/97	6/2/97
81	RI/FS Negotiations	6/2/97	2/27/98
82	RI/FS Start	3/2/98	3/2/98
83	PRAP Release	2/15/00	2/15/00
84	Public Meeting	3/15/00	3/15/00
85	RI/FS End	5/1/00	5/1/00
86	Semet Tar Beds [RI/FS]	6/26/87	10/1/96
87	IRM	12/27/94	8/15/95
88	RI/FS Negotiations	6/26/87	6/26/89
89	RI/FS Start	6/26/89	6/26/89
90	PRAP Release	8/1/96	8/1/96
91	Public Meeting	8/30/96	8/30/96
92	RI/FS End	10/1/96	10/1/96
93	Salina Town Landfill [RI/FS]	5/21/96	7/21/99
94	RI/FS Negotiations	5/21/96	5/21/97
95	RI/FS Start	5/21/97	5/21/97
96	PRAP Release	5/21/99	5/21/99
97	Public Meeting	6/22/99	6/22/99
98	RI/FS End	7/21/99	7/21/99




Gary Spielmann
Exec. Dep. Commisioner
Dave Sterman
Deputy Commissioner
Michael O'Toole
DHWR Director
Sal Pagano
DSR Director
N.G. Kaul
DOW Director
J. LaPadula
USEPA Mgm't
Anders Carlson
NYSDOH
Stephen Hammond
Project Director
DHWR
John Davis
NYSDOL
Gary Litwin
NYSDOH
William Daigle
Project Team
Manager DHWR
Italo Carcich
DOW
Leland Flocke
Region 7 Engineer
Steven Sanford
DF & W
Dave Nelson
NRD
Bob Montione
NYSDOH
Herb King
USEPA
Tim Larson
Sue Benjamin
Don Hesler
DHWR Task Leaders
Rick Mustico
DHWR
TAMS
(Consultant)
Alyse Peterson
DWHR
Jay Bloomfield
DOW
Emmy Thomee
DF & W
Frank Bifera
General Counsel
Greg Caito
Director, DEE
Charlie Sullivan
Chief, Bureau/
HWSE
William Little
Lead Attorney
Rob Davies
Project Attorney
Scott Crisafulli
Project Attorney
George Shanahan
USEPA
Norm Speigel
NYSDOL
Remedial Project
Managers
Amit Chakraborti
DHWR
Hal Radiloff
DHWR Region 7

ATTACHMENT 5

DHWR TASK LEADERS AND SUBSITE MANAGERS

Susan Benjamin
Task Leader: Project Tracking
Subsite Coordination
EPA Grant Management
Comprehensive RI/FS
Database Development
Citizen Participation (CP) Plan

Subsite Manager: Allied Waste Beds 1-8
Ley Creek Dredgings RD/RA
GM Fisher Guide

Tim Larson
Task Leader: Comprehensive Risk Assessment
Subsite Manager: Allied Lake Bottom Sediments

Don Hesler
Task Leader: 104e Process - Technical
Subsite Manager: Allied Waste Beds 9-15
Willis Avenue

Alyse Peterson
Subsite Manager: Lockheed Martin - Court Street 5/5A
Carrier - Carlyle

Rick Mustico
Subsite Manager: Allied Bridge Street Site (LCP)
American Bag & Metal
Lockheed Martin - Electronics Park

Hal Radiloff
Subsite Coordinator for Regional Lead Subsites

Amit Chakraborti
Task Leader: Quality Assurance/Quality Control