prc
Planning Research Corporation

PRC Engineering
Suite 600
33 East Wacker Drive
Chicago, IL 60601
(312) 938-0300
TWX 910-221-4055
Cable PRCENVIRON

DRAFT PROTOCOL

FOR GROUNDWATER INSPECTIONS

AT HAZARDOUS WASTE TREATMENT,

STORAGE AND DISPOSAL FACILITIES

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Waste Programs Enforcement
Washington, D.C. 20460

Work Assignment No.	: 192
EPA Region	: Headquarters
Site No.	: N/A
Date Prepared	: May 2, 1985
Contract No.	: 68-01-7037
PRC No.	: 15-1922-36 through 15-1922-53
Prepared By	: PRC Environmental Management, Inc.
Telephone No.	: (312) 938-0300

Approved:

Thomas D. Brisbin
Deputy Program Manager

Robert J. Van Osten
Chief of Administration

TABLE OF CONTENTS

Table of Contents Continued

Table of Contents Continued

Table of Contents Continued

LIST OF APPENDICES

FIGURES

TABLES

1.0 INTRODUCTION

1.1 Statement of Objectives

This document presents a protocol for the activities of the Hazardous Waste Ground Water Task Force. The Task Force will assess 58 commercial sites for compliance with RCRA ground-water monitoring regulations.

The Task Force is made up of a U.S. EPA Headquarters Core Team, U.S. EPA Regional Office Task Force Coordinators, personnel from the State environmental agencies in whose states the sites are located, and personnel from the U.S. EPA National Enforcement Investigations Center (NEIC).

The sites were selected primarily because they have land-based RCRA treatment, storage, or disposal (TSD) facilities and are now receiving or are expected to receive large quantities of hazardous waste from Superfund (CERCLA) sites clean-up activities. These sites are located in U.S. EPA Regions II through X, with no sites in Region I. The evaluation of sites is expected to continue through 1987.

The basic ground-water monitoring requirements for RCRA land-based TSD facilities set forth in 40 CFR, Parts 264 and 265, Subpart F, were originally promulgated in 1980. EPA has recognized the need to verify and assure compliance with these rules by the regulated community. Compliance through adequate self monitoring, is necessary to determine whether or not these facilities are posing an immediate threat to human health and the environment. Wastes from CERCLA clean-up activities are being disposed of at some of these facilities. Ground-water monitoring will assist U.S. EPA in determining whether these facilities are adequately protected to prevent ground-water contamination which may necessitate later removal of wastes at a significant added cost.

The objectives of the Task Force are:

- To evaluate commercial land disposal facilities for:

- Compliance with the regulations in 40 CFR, Part 265, Subpart F, "Interim Status Standards for Owners...," and potential compliance with the rules set forth in Part 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities"

- Levels of contamination in the ground-water

- Compliance with ground-water aspects of the Superfund off-site policy. (The final draft of this policy is presently being completed by EPA and will be incorporated into this protocol).

o To establish a rigorous nationally consistent method of ground-water evaluation.

o To implement a nationally consistent program of action in the form of permit conditions, orders, and penalties related to compliance with the RCRA ground-water monitoring regulations.

The effort will include review of existing documents, field inspections and sampling. Decisions will be reached by consensus between teams of experts from the EPA Headquarters, EPA Regions, and State agencies.

1.2 Scope of Work

Initially, the Task Force will evaluate one facility in each of U.S. EPA Regions II through X. (There are no commercial land disposal facilities in Region I). The 58 sites commercially handle hazardous wastes or their residues in land-based facilities subject to RCRA Regulations, 40 CFR Parts 264 and 265, Subpart F. The initial evaluations will be performed at sites chosen by balancing a number of considerations:

o Ongoing or near-term planned State, Regional, or NEIC evaluations.

o Volume and variety of waste.

- Receipt of large quantities of wastes from Superfund sites clean-up.

- Location and number of sites among the nine Regions.

- Variety of seasonal weather conditions.

The evaluation of the first 28 facilities will be completed during 1985 and 1986. As of April 1985, the initial nine sites have been identified with the balance to be subsequently designated. The evaluation of all 58 facilities may take several years.

In order to coordinate the activities of the Task Force, EPA has developed a phased work plan which will be used to evaluate each site.

- Phase I. Planning and Protocol Development
- Phase II. Data Procurement
- Phase III. Data Analysis
- Phase IV. Site Visit
- Phase V. Technical Report
- Phase VI. Follow Up

1.3 Task Force

The joint Hazardous Waste Ground Water Task Force is made up of personnel from EPA Headquarters, EPA Regional offices, state environmental agencies, and NEIC. The Headquarters Core Team will initially be composed of three investigators, each with hydrogeologic background and field experience. Current assignments are:

- Group 1 Regions II, III, V - Randy Breeden
- Group 2 Regions IV, VII, IX - Don Shosky
- Group 3 Regions VI, VIII, X - Roy Murphy

After initial site evaluations in Region II, IX, and VI, the team will be

expanded to six hydrogeologists. The three additional Core Team members will be assigned one each to activities in Groups 1 to 3.

The technical coordinator for the Core Team will also review the findings on most facilities, providing consistent hydrogeologic review and an independent opinion on technical matters.

1.4 Facility Inspection Protocol

This protocol will be used to aid in achieving consistent and thorough facility evaluations. The areas covered by this protocol are:

- Data Procurement
- Facility Inspection Planning
- Development of Field Investigation Plan
- Facility Inspection
- Development of a Sampling Plan
- Health and Safety
- Field Quality Assurance
- Compliance Evaluation
- Follow Up Activities

The protocol is presented in the following sections, corresponding to the topics listed above. Within each section, step-by-step items or procedures are listed. Since many of these steps involve choosing between alternatives, a discussion of the approaches, considerations, or options available follows the list of steps.

2.0 DATA PROCUREMENT

For each site, available hydrogeologic and operating information will be reviewed as the first step in performing compliance assessments. This process involves identifying all information sources, other than the site operator or owner, obtaining pertinent documentation from those sources, and determining what information is missing but necessary for performing the compliance assessment. Efforts should then be focused on obtaining the missing information from the site's existing files or through sampling/inspection activities at the site.

2.1 Training and Prerequisites

Team members must use a prescribed set of procedures for obtaining and handling site-specific information and documents (I/D). Such procedures should aid in providing efficient retrieval of site-specific I/D, and will providing defensible I/D evidence for potential litigation.

2.1.1 NEIC Evidentiary Workshop

The U.S. EPA's National Enforcement Investigations Center (NEIC) has established a document control system for handling evidence obtained in the course of enforcement/compliance site inspections. Prior to initiating any data procurement activities, the Task Force Core Team members and their contractors should attend NEIC's evidentiary workshop, or its equivalent, to become familiar with document control procedures. The workshop should cover at least the following topics: overview of procedures used by inspectors when collecting field data and establishing a document file for a site, and document handling procedures for I/D cataloging, storage, accessibility, retrieval, routing, and disposal. The procedures should be modified, as appropriate, and be used by the Task Force Core Team members and their contractors in all data procurement efforts.

2.1.2 Confidential Business Information (CBI) Clearance

Certain site-specific documents may be classified as general confidential business information (CBI) or as CBI specifically related to provisions in the Toxic Substances Control Act (TSCA). CBI and TSCA CBI each require special clearance and safeguards to preclude their inappropriate release to the general public. Accordingly, prior to reviewing or obtaining CBI, the Core Team members and their contractors will obtain clearance through NEIC to handle CBI and TSCA CBI documents.

2.2 Document Control System

The purpose of a document control system is to provide organization and accountability for the I/D compiled under this program. This system will describe the handling, routing and storage procedures which will be used for I/D gathered for each targeted site and includes an I/D-unique numbering system, a document inventory procedure, and a central filing system.

A document control officer (DCO) would control the handling and routing of I/D, and would insure proper storage in files. CBI would be maintained in locked files.

In addition to providing organization and limited access to the I/D, the document control system will facilitate I/D retrievability. This will be achieved by assigning a unique, 13-digit, document number for each document obtained under this program. This document identification number will reflect the following: Task Force project identifier, unique commercial site identification number (assigned by the Task Force), data procurement contractor, I/D category and subcategory, and a serial number. Figure 2-1 provides a graphical description of this numbering assignment scheme.

Example Document Identification Number:

T 0 0 1 - P 0 1 - 2 0 2 - 0 0 5

T - Task Force Project Identifier

001 - Site Identification Number (1-999)

P - Data Procurement Contractor Identifier (P = PRC Engineering)

01 - Source Identifier

01 = U.S. EPA HQ
02 = U.S. EPA RCRA Program Enforcement
03 = U.S. EPA ESD
04 = U.S. EPA Compliance/Permit
05 = NEIC
06 = USGS
07 = USDA
08 = State EPA
09 = U.S. EPA

2 - Document Category Identifier

1 = Part B Application
2 = Part A Application
3 = Compliance/Enforcement
4 = Hydrogeological Reports
5 = Correspondence
6 = Technical Reports and Plans
7 = Maps, Drawings and Photos
8 = TSCA CBI
9 = Task Force Reports and Plans

02 - Document Subcategory

00 = No subcategory
01 = Application/revisions
02 = Comments/Review/Request

005 - Document Serial Number, 1-999, to make each overall document number unique

Figure 2-1. DOCUMENT IDENTIFICATION NUMBERING SYSTEM

2.3 Identification of Information Sources

The data procurement contractor, as instructed by the Core Team member(s), will initially obtain all available pertinent I/D for each site from sources other than the site. The following agencies have been identified as sources of I/D that are relevant to the objectives of the Task Force, as discussed in Section 1. Listed opposite each source agency are the typical I/D types likely to be available from that source.

- o U.S. EPA Headquarters Personnel
- o U.S. EPA Regional RCRA Permit Personnel
- o U.S. EPA CERCLA Personnel
- o State Programs Personnel

- RCRA Part A and Part B Applications
- Application Revisions
- Engineering Reports
- Hydrogeologic Reports
- Groundwater Monitoring/ Assessment Plan
- Site Standard Operating Procedures
- Waste Analysis Plan
- Waste Inventory/Manifest/ Analysis
- Closure/Post Closure Plan
- Permits (air, water, etc.)
- Manifests/Receiving Orders
- Inspection Reports
- Documented Complaints and Problems

- o U.S. EPA Regional RCRA Compliance Personnel
- o Regional Counsel

- Inspection Reports
- Notices of Deficiencies (NODs)
- Records of Decisions (RODs)
- Litigation Actions
- Documented Complaints and Problems

o U.S. and State Geological Surveys	- Geologic and Hydrologic Reports - Water Monitoring Data - Topographic Maps and Aerial Photographs - Well Inventory/Water Use
o U.S. Department of Agriculture	- Soil Maps - Soil Types, Physical Characteristics, and Depths - Aerial Photographs - Climatic Data
o U.S. Corps of Engineers (COE)	- Floodplain Maps - Aerial Photographs - Land Plats
o U.S. National Enforcement Investigations Center (NEIC)	- Site Financial Assessment Reports - Analytical Data
o Technical Analysis Branch (TAB), NEIC	- Aerial Photographs
o National Cartographic Information Center (NCIC) o Environmental Photographic Interpretation Center (EPIC) o Environmental Monitoring Systems Laboratory (EMSL)	- Sophisticated Imagery Interpretation and Special Maps
o U.S. Environmental Services Division (ESD)	- Analytical Data

2.4 Procurement of Information

The federal and state agencies previously listed, as well as others, will be visited to obtain available information which is pertinent to the Task Force's objectives. In order to insure consistency in the types of I/D collected for the target sites a checklist of pertinent I/D has been prepared and will be used on all data procurement efforts under this program. It is projected that the data procurement effort for each site will take approximately six weeks to accomplish. The following sections discuss these data procurement activities in more detail.

2.4.1 Identify Information Needs

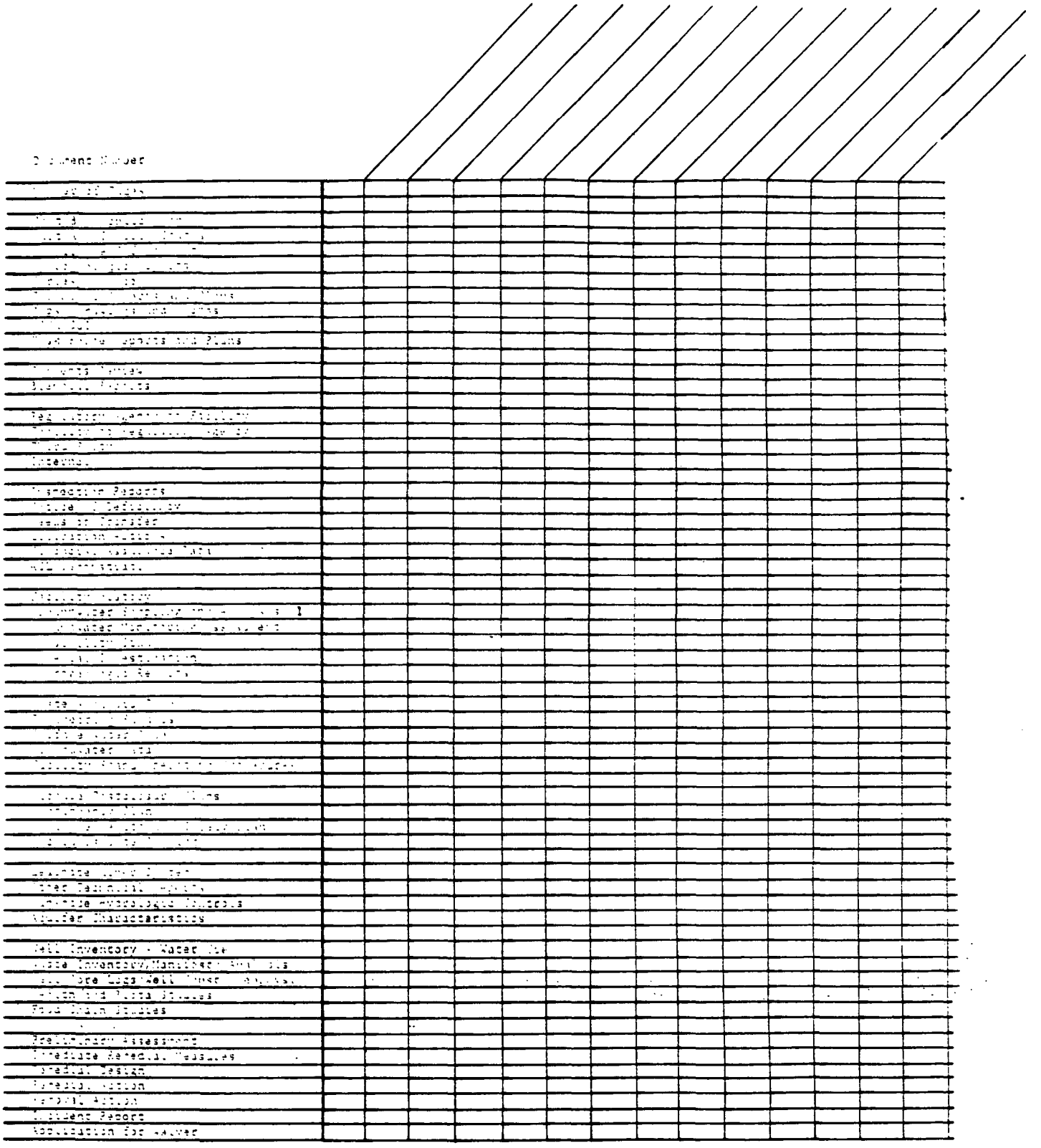
The Task Force Core Team members, working with the data procurement contractor, have developed a comprehensive checklist of I/D necessary for performing the nationwide assessment of sites. This checklist was used to develop the Document/Subject Cross-Reference Chart, shown in Figure 2-2, which will facilitate indexing and retrieving specific I/D.

A unique 13-digit number will be assigned for each site-specific I/D collected. Each I/D's number will be recorded on a diagonal line at the top of a column and the subjects in that I/D will be checked off in the appropriate column below. By reviewing the subject index, one would be able to locate the I/D dealing with a particular subject. Alternately, by focusing on a specific document, one could determine if a particular subject is discussed therein.

2.4.2 Determine Availability of Information

The data procurement contractor will make preliminary telephone calls to the previously listed agency sources, excepting the federal EPA (e.g., state regulatory agencies, USGS, USDA, USCOE, etc.) to determine what I/D are available from non-EPA sources, their quantities, and, if reasonable, whether or not these can be transmitted directly to the contractor. If the non-EPA source contact states that its policies prohibit transmittal of

Figure 2-2. Document/Subject Cross-Reference Chart



desired I/D or that it is not feasible to do so, the contractor will ask the contact whether the I/D can be reproduced at the source agency or taken to a commercial reproduction service. If neither is possible, the contractor will either purchase the I/D (e.g., reports, maps, etc.) or record pertinent information regarding the nature of the I/D and their location.

Prior to initiating data procurement activities at federal and state EPA offices, the contractor will telephone the EPA Regional Team Leader (RTL) and request the names and telephone numbers of Regional and State EPA compliance and permit personnel that have files on the target site. The contractor will then contact these Regional and State personnel, and determine what I/D on the cross-reference chart (Figure 2-2) are available, in which files they are located, and their approximate quantities.

2.4.3 Identify Additional Information Sources

During the telephone conversation with each source agency contact, the contractor will identify on the cross-reference chart the I/D which are apparently available from that source and will note which I/D are still missing. After determining the location and quantity of the available I/D, the contractor will ask the source contact for other possible sources for the missing I/D.

This method of tele-networking would be continued until either all the I/Ds are located and identified as obtainable or until no further sources are identified. In the latter case, if all I/Ds have not yet been located or are unavailable, the contractor may decide to: contact the following public agencies and private companies to obtain the missing I/D; attempt to obtain the missing I/D through EPA's issuance of a 3007 letter to the site (see Appendix C); or collect the I/D at the site during the Task Force's site inspection.

o	County or Regional Planning Agencies	- Plans, concerns, and past problems at site
o	Other County Offices	
	* Health Department	- Problems, complaints, analytical data
	* Planning and Zoning	- Land use restrictions
	* Assessor	- Plat maps, landowners
	* Clerk	- Deeds of Transfer, Liens
o	City Offices	
	* Chamber of Commerce	- Information on local industries including number of employees, principal products, and site addresses
	* Engineer	- Foundation and inspection reports - Survey benchmark locations
	* Fire Department	- History of fires and/or explosions at site
	* Law Enforcement	- Complaints and violations of local ordinances
o	Building Contractors	- Local soils - Geology - Shallow water levels
o	Soil Exploration and Foundation Contractors/Water Well Drillers	- Local soils - Geology - Hydrology - Water levels
o	U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)	- Industrial processes - Hazards - Protective equipment needs
o	National Oceanic and Atmospheric Administration (NOAA)	- Climatic data

2.4.4 Request Categorization of Information Prior to Visiting the Information Locations or Transmittal to Contractor

In order to facilitate the procurement of relevant data for a specific site from the various federal and state EPA sources, the contractor will request the agency contact to separate the available I/D, as necessary, into unclassified and CBI categories. Separation of the I/D into these two categories facilitates its subsequent handling, routing and storage by the contractor.

As discussed in Section 2.4.2, all I/D sources also will be requested by the contractor to identify and/or separate their site I/D into I/D that can be sent directly to the contractor (e.g., reports, maps, aerial photographs) and I/D that require on-site procurement, due to their nature and/or quantities. Unless purchased by the contractor, all I/D sent by the source will be reproduced either at the contractor's office or at a commercial site, and the originals returned usually within one week of their receipt.

For I/D requiring on-site procurement, the contractor will request the source to further identify and/or separate them into I/D that may be released into the contractor's custody for duplication and I/D that may not be released by the source.

By having the I/D categorized into the above-mentioned categories prior to the on-site visit, the contractor can schedule and perform data procurement activities more efficiently.

2.4.5 Schedule Visit

The contractor will schedule data procurement activities at U.S. EPA Regional sources with a Core Team member and RTL so that the on-site data procurement visit coincides with EPA's site assessment kick-off meeting. The scheduled data for this meeting should correspond to the Task Force's Work Schedule Plan for this program.

At the site assessment kick-off meeting, attended by usually one Core Team

member, Regional EPA permit and compliance/enforcement personnel and the contractor, the following subjects will be identified and discussed. I/D locations, data gathering logistics, location and handling procedures for CBI, DCO for TSCA CBI, existence of aerial photo workups, and the necessity for issuing a 3007 letter to get I/D from the site owner or operator.

2.4.6 Conduct Visit

After the site kick-off meeting, Regional EPA personnel (usually the RTL) will assist the contractor in collecting the desired site I/D by either accompanying the contractor or making preliminary telephone calls to facilitate access to appropriate state and federal sources.

The contractor will normally review the following files at state and federal EPA sources: Regional Office (RO) permit, enforcement/compliance, and CERCLA files (if any); Headquarters enforcement/compliance files (as necessary); RO state implementation files; ESD files, and State files. During the review of EPA's files, the contractor will tag individual I/D corresponding to the items listed on the cross-reference chart. Depending on the nature and quantity of I/D that are tagged by the contractor, as well as the source agency's internal I/D handling policies, either the contractor or EPA source personnel will extract the tagged items, have them reproduced/duplicated, and return them to their original locations in the respective files. All CBI and TSCA CBI will be sent directly either to the Task Force DCO at EPA Headquarters or to the contractor's DCO.

The contractor will normally schedule visits to non-EPA agency sources after completing data procurement activities at EPA sources, and will utilize similar procedures for obtaining copies of I/D.

2.5 Inventory of Site-Specific Information

The relevant I/D obtained for each site to be evaluated will be arranged into nine major categories, as shown in Figure 2-3.

The contractor will complete a separate cross-reference chart for each major

category to identify the subjects contained in each category's I/D.

Arrangement of the I/D in this manner will not require separation of individual documents, and will permit a reviewer to focus on a major area of interest, a specific subject or an individual I/D.

1. Part B Application

   1.1 Application/Revisions
   1.2 Comments/Review/Request

2. Part A Application/Interim Status

   2.1 Application/Revisions
   2.2 Comments/Review/Request

3. Compliance/Enforcement

   3.1 Inspection Report
   3.2 Requests, Notices, Orders, Permits from Responsible Agency Official to Site
   3.3 Response, Reports, Applications from Site to Responsible Agency Official

4. Hydrogeological Reports

5. Correspondence

   5.1 Regulatory Agency to Site
   5.2 Site to Regulatory Agency
   5.3 Third Party Regulatory
   5.4 Internal

6. Technical Reports and Plans

   6.1 Engineering Reports
   6.2 Soil/Water Resource
   6.3 General Technical

7. Maps, Drawings and Photos

8. Confidential Information

   8.1 CBI
   8.2 TSCA CBI

9. Task Force Reports and Plans

   9.1 Technical Reports
   9.2 Data Analysis Report
   9.3 Site Management Plan

Figure 2-3. DOCUMENT ORGANIZATION CATEGORIES

2.6 Determination of Missing Information

2.6.1 List of Information Missing from Initial Data Gathering Effort

After performing the inventory of site-specific I/D, the completed cross-reference charts will be reviewed to determine which subjects are not contained in the I/D collected during the initial procurement activities. The contractor will then summarize these I/D deficiencies, which must be subsequently obtained at the site.

2.6.2 Site Environmental Coordinator

After compiling a list of missing I/D, the data procurement contractor will telephone the EPA RTL to indicate the need for obtaining the missing I/D at the site and to discuss a tentative schedule for visiting the site. The contractor should be certified as having undergone appropriate health and safety training prior to the site visit.

The RTL will coordinate the site visit with the Core Team members, Regional Office inspection team members, the sampling and data procurement contractors, and the site's environmental coordinator. The RTL will determine whether the site has a document copier and, if so, whether the owner or operator will permit its use by EPA's contractor. In addition, the RTL will attempt to ascertain from the site environmental coordinator the quantity of I/D to be collected.

2.7 Development of Document Package

After all available site-specific I/D have been gathered, the individual I/D will be numbered and placed into the previously described categories. Separate I/D packages will be prepared for CBI and TSCA CBI.

2.7.1 Assign Document Control Number

The data procurement contractor will utilize the numbering system described in Figure 2-2 for coding the various types of site-specific I/D obtained

under this program. CBI and TSCA CBI will grouped under Category 8, Confidential Information.

2.7.2 Document Package Format

In order to provide consistency and facilitate document review/retrieval by the Task Force members and program participants, the contractor will describe the contents of each I/D package in the following manner:

- Table of Contents,
- Document Inventory,
- Major Document Categories.

The above three items will be included in each volume of a document package and will contain, for each I/D, the document number, the volume it is located in, and (except for CBI and TSCA CBI) the title or a brief description of the document. Confidential information will only be described by its document number and general category: CBI or TSCA CBI. One copy of each site-specific document package will be forwarded to the following participants: State EPA (or its counterpart), NEIC, EPA Regional Office, and Core Team DCO. CBI and TSCA CBI packages will be forwarded only to the Core Team DCO.

2.8 Communication Plan

In order to avoid inconsistent and contradictory statements to the general public or site community, the data procurement contractor should direct all questions to the appropriate Regional EPA communications staff (press or community relations) through the RTL. This staff willestions to the appropriate Regional EPA communications staff (press or community relations) through the RTL. This staff will coordinate their activities and responses with the Task Force Communications Coordinator at EPA Headquarters and the RTL.

3.0 FACILITY INSPECTION PLANNING

3.1 Scope of Meeting

Upon completion of the data procurement task, a Document Package will be issued to a combined evaluation team. The Facility Assessment Program reaches Phase III on the work plan, Data Analysis. The combined evaluation team is composed of representatives from the Core Team, Regional EPA Team, State Team and NEIC Team. NEIC will only participate in the evaluation of the first facility in each of the nine Regions. After an indepth evaluation of the document by the team members, a meeting will be held to discuss and reach consensus on the major findings. The NEIC or Region is responsible to schedule the meeting and prepare agenda for the meeting. The agenda should include:

- Discussions on the findings from each member's evaluation of the information provided in the document package.
- Resolution of any disagreements on technical findings.
- Establish technical objectives for the Field Investigation Plan.
- Establish specific objectives regarding sampling.
- Assemble a list of technical questions needed to be resolved.
- Outline the Field Investigation Plan.
- Identify members of the combined Field Investigation Team and team leader.
- Establish preliminary site visit schedule.

3.2 Definition of Technical Objectives

The purpose of the meeting is to discuss and evaluate the findings from the review of each Document Package with emphasis on the following areas:

- Compliance with 40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities", and 40 CFR 265, Subpart F, "Interim Status Standards",
- The nature of any contaminants in the ground-water,
- Inadequate ground-water monitoring system design and/or operation,
- Validity and completeness of the existing data, and
- Characterization of existing or potential geological problems in proximity to the site which could contribute to the endangerment of the ground-water.

The evaluations will be used to develop the field data requirements to be addressed by the Facility Inspection Plan.

3.2.1 Areas of Concern For Each Facility

After considering the areas mentioned in the previous section on a facility specific basis, each site will be characterized and the technical objectives for field investigation outlined.

Due to the extensive experience of NEIC in site investigations, they will prepare a facility inspection plan for the first facility in each Region. The Region will then prepare a subsequent plan. This approach will provide a method of standardizing all facility inspection plans and promoting a nationally consistent investigation.

A facility specific inspection plan will focus on (but not be limited to) the following major areas:

- o Organization and coordination of the combined field inspection team.
- o Procedures for evaluation of owner/operator sampling techniques.
- o Development of sampling plan.
- o Evaluation of self-monitoring data.
- o Examination of on-site records.
- o Review and evaluation of the ground-water monitoring system.
- o Schedule and logistics.

3.2.2 Outline Sampling Objectives

Based upon the findings from the review of the documents, the degree of compliance with the previously established technical objectives can be established and the sampling objectives for each facility can be outlined. A detailed discussion of the sampling plan is provided in Section 5.0. To ensure that the sampling activity yields complete and admissible results, contractors assigned responsibility for the sampling will receive direct supervision by EPA.

Sampling activity should focus on :

- o Completing any areas with missing or incomplete data.

- o Confirming or eliminating any possibility of ground-water contamination.

- o Discovering the reliability of the facility self-monitoring data.

Samples collected during the field activities will be split with the regional ESD laboratory (when involved) and the CLP laboratory for analyses. An offer will also be made to split samples with the owner or operator's laboratory and the State laboratory. Point of evaluation samples will be prepared by U.S. EPA, ORD, Cincinatti. The contractor will manage the sample packaging and distribution. VIAR has been contracted to coordinate the sampling activities with the sample bottle depository (IChem), sampling contractor and CLP laboratory. VIAR will also arrange with ORD and NEIC for laboratory audits where analysis of quality control samples do not provide acceptable results. The coordination of analytical services is discussed in further detail in Section 4.0.

3.3 Preliminary Organization and Coordination

After a consensus is reached on the sampling objectives, a preliminary schedule of activities will be developed at the conclusion of the meeting.

3.3.1 Tentative Schedule of Facility Visits

The schedule of visits will be established initially by coordinating the workloads of the Core Team, the Region, NEIC, the State, the sampling contractor, and the laboratories. Of prime importance to scheduling is the level of responsibility of each group for the planning and execution of each inspection. The Core Team and the Regional Team will expend significantly more time than will other participants and, therefore, may need to have greater input to the scheduling process.

3.3.2 Tentative Inspection Team Selection

Based upon the objectives outlined for each facility, and the tentative schedule of site visits, an inspection team should be selected to include individuals whose areas of expertise correspond to the sampling needs, thereby providing a high level of accuracy and reliability in the results.

3.3.3 Outline of Field Investigation Plan

Prior to the conclusion of the initial consensus meeting, an outline of the Field Investigation Plan will be developed to identify specific items to be included in the plan. This will provide guidance in preparing the Facility Management Plan and will insure that all the findings and objectives are addressed in the plan. The outline will also include the following information:

- Tentative combined field investigation team
- Tentative field investigation schedule

4.0 FIELD INVESTIGATION PLAN

4.1 Organization and Coordination

4.1.1 Introduction

To ensure that the field investigation is both comprehensive and efficient, each of the teams involved will have clearly defined roles. The coordination of team functions must be planned carefully in order to provide an optimum degree of overlapping effort and to avoid redundancy.

4.1.2 EPA Core Team

The Core Team functions to:

1) Ensure consistency and uniformity during the facility evaluation,
2) Identify and evaluate problems encountered in the field and provide guidance,
3) Assist in the development of the project, and
4) Provide assistance in coordinating the various teams to assure smooth functioning of the effort.

4.1.3 Regional EPA Team

The Regional EPA Team will organize individual facility assessments in accordance with the standard operating procedures included in this protocol. Makeup of the Regional team is at the discretion of the team leader and Regional management but should include in most cases, field inspectors, permit writers, enforcement staff, Regional counsel, sampling and analytical personnel (usually ESD), and a communication expert. Designated Team Leaders for the nine regions are:

Region II - Rich Walka
Region III - Bruce Smith
Region IV - George Harlow

Region V - Joe Boyle
Region VI - William Rhea
Region VII - Mike Sanderson
Region VIII - Mike Gansecki
Region IX - Phil Bobel
Region X - Ken Feigner

The Regional Team will establish contacts with the states. Facility investigations will be scheduled by the Regional Team Leader. Due to their extensive experience, the first on-site coordinator in the Region will be provided by NEIC; however, for all subsequent inspections, the Region will provide the on-site coordinator. Similarly, NEIC will draft the first facility evaluation in each Region and the Region will draft all subsequent evaluations. The Regional team will be responsible for overseeing the State implementation of most of the decisions reached.

4.1.4 State Team

The Region will discuss with the State Team their level of involvement in the inspection process. Generally, it is anticipated that the State Team will participate as an equal partner in the Task Force.

4.1.5 NEIC Team

The NEIC's role is to:

1) Establish the procedures which will be followed during subsequent site investigations and evaluations by providing a single team for the first evaluation in each Region,

2) Assist the Core Team in developing the inspection protocol and standard operating procedures,

3) Provide a structure for the program based upon their extensive investigative experience, and

4) Provide an independent source of expertise to the program.

4.1.6 Contractor Team

The role of the Contractor Team is discussed in Section 2.0.

4.2 Development of Facility Inspection Plan

The facility inspection has two primary objectives; 1) to expand and/or verify background information, and 2) to assess the potential for groundwater contamination, through visual inspection, and where necessary, sampling and analysis.

A facility-specific inspection plan should be developed to address the scope, schedule, and level of effort involved in conducting an inspection to achieve the aforementioned objectives. The elements that should be included in the facility inspection are listed below.

1) Prepare Facility Inspection Plan - The Core Team should determine inspection and sampling objectives upon completing the evaluation of the Document Package, and develop a detailed inspection plan (the elements of such a plan are discussed in Sections 5, 6, 7, and 8 of this protocol). The Core Team should also assign various team members to be responsible for certain aspects of the onsite interview and activities, and should identify and assemble all required documentation for the facility inspection. The plan should also identify the responsible personnel at the facility who will be interviewed. A draft inspection plan should be transmitted to members of the inspection team for review and comments. The Core Team is responsible for incorporating appropriate changes into the final inspection plan.

2) Notification Letter - The Core Team should issue an official "Notice of Inspection" letter to responsible personnel at the facility. If a scheduling conflict arises, the facility

should be requested to adjust their sampling schedule, if possible, to accommodate the inspection.

3) Distribute Inspection Plan - The final inspection plan should be distributed to all team members (including communications specialist), the sampling contractor, and an appropriate contact at VIAR or the CLP lab. This should be done at least three weeks in advance of the anticipated sampling date.

4) Verify Contractor Readiness - The sampling contractor and the CLP laboratory (through VIAR) should notify the Core Team as soon as they are ready to begin field activities. If logistical or other problems arise within the three-week lead period, the sampling contractor should notify the Core Team as soon as practicable to resolve such problems.

5) Conduct the Inspection - The onsite inspection should be conducted by beginning with an initial briefing (see Section 5.0), followed by the designated inspection/sampling activities, and concluding with an exit briefing. A daily meeting should be held for the entire inspection team at the close of each day's activities to review progress and resolve any field problems. The inspection/sampling activities may include interviews with facility environmental, sampling, or process personnel, observation of facility operations and sampling techniques, review and copying of facility documents, and sampling at onsite monitoring wells or other appropriate locations (see Sections 5.8). All documents (e.g. field logbooks) generated during this inspection should be entered into the Task Force document control system.

6) Data Review - Site inspection and analytical data should be reviewed by all team members for validity, quality, and relevance to the regulatory requirements for ground-water monitoring.

7) Compliance Evaluation - Team members should meet to complete the data review and determine the facility's compliance status with the appropriate regulations. If needed, appropriate action(s) should be identified; these, together with recommendations for their implementation, should be summarized in a technical Field Investigation Report. This effort should conclude with the development of a Facility Management Plan to ensure that recommended actions are implemented effectively.

4.3 Communications Plan

The Task Force Communications Coordinator will meet with the Regional Team Leader and with the community relations staff to develop a facility specific communications plan. Although it is the policy of EPA to make information about EPA and its work freely available, this policy does not extend to confidential information and evidence relating to the possible violation of Federal environmental laws. Since much of the information obtained during the site investigations will be "sensitive", the team members should refer all inquiries to the designated Communications Coordinator.

4.4 Coordination With CLP Laboratories

VIAR has been selected to coordinate the activities related to sampling and analysis including hardware selection, sample distribution, QA/QC and laboratory selection (from the Contract Laboratory Program). VIAR will coordinate the efforts of these groups:

- Versar - Provide sampling equipment and sampling technicians.
- IChem - Provide sample bottles.
- Life Systems - Provide laboratory quality assurance support.
- EPA ORD, Cincinnati, Ohio - Provide point of evaluation samples (blanks and spikes) to monitor performance of analytical laboratories samples.

- o EPA EMSL/LV (Environmental Monitoring Systems Laboratory/ Las Vegas) - QA/QC, protocol evaluation, and standards
- o Contract Laboratories (from CLP) - Laboratory to perform sample analysis.

Figure 4-1, depicts the information flow among the participating groups;

1) IChem will supply the sample containers to Versar.

2) At the direction of VIAR, Versar will transport the necessary equipment and sample containers to the facility. Versar will ship the samples to the CLP laboratory for analysis.

3) CLP will analyze the samples and distribute sample results to the Core Team, Life Systems, VIAR, and EMSL/LV.

4) ORD will supply blanks and control samples.

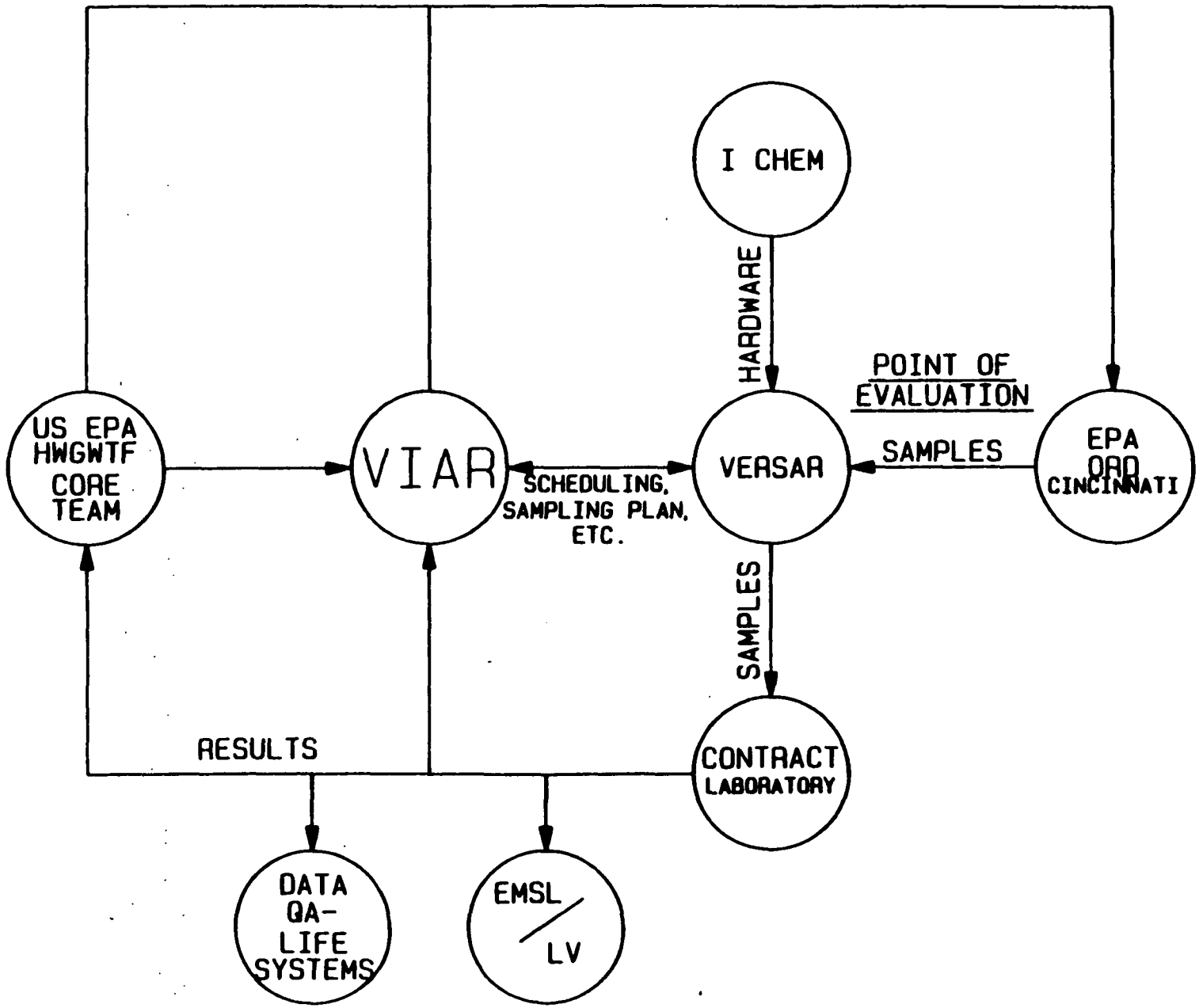
4.5 Site Visit Schedule

A site visit schedule will be established by considering the work load distribution of the Task Force members. Both the preparatory work and the site visit require a significant time expenditure by the Core Team and by the Regional Team. Therefore, to ensure that there is adequate time in which to do the necessary planning, the number of simultaneous visits within a Region should be minimized.

4.6 Field Investigation Report Format

The inspectors will use an established Field Investigation Report format to promote consistency and accuracy, during the site investigation. The report prepared by NEIC for the first facility in each Region will serve as a general format to be followed by subsequent field investigation teams.

FIGURE 4.1 - OVERVIEW OF SAMPLING



4.7 CBI Status

4.7.1 Introduction

Pursuant to Title 40 CFR, Part 2, Subpart B, Sections 2.201-2.309 [40 FR 36902, September 1, 1976, as amended in 43 FR 39997, September 8, 1978], a facility can designate information "confidential." A facility may also designate a "business confidentiality" claim for all or part of their information pursuant to 40 CFR 2.203(b). Any information received with a request of confidentiality should be handled as "confidential."

Provisions of the Toxic Substances Control Act (TSCA) allow a company to make a claim of confidentiality for any or all information collected by EPA during an inspection if the material meets all of the following criteria:

1) The company has taken measures to protect the confidentiality of the information, and it intends to continue to take such measures.

2) The information is not, and has not been, reasonably obtainable without the company's consent, by non-company personnel (other than government bodies) by use of legitimate means (other than discovery based on a showing of special need in a judicial or quasi-judicial proceeding).

3) The information is not publicly available elsewhere.

4) Disclosure of the information would cause substantial harm to the company's competitive position.

Once confidentiality is claimed, there are stringent procedures that must be followed. Only persons who have been granted special clearance may have access to the material in the files.

4.7.2 Handling TSCA CBI

1) Documents must be supervised directly by a Document Control Officer (DCO) who has been TSCA CBI authorized. Documents must be returned to the DCO each day unless the user has approved TSCA document storage facilities.

2) TSCA CBI can be discussed only with authorized persons.

3) Information must be safeguarded when in use by keeping it under constant surveillance by covering it or placing material face down when unauthorized persons enter the area. It must be returned to approved storage containers when not in use.

4) TSCA CBI may not be reproduced. Copies must be obtained from the DCO.

5) TSCA CBI cannot be destroyed except upon approval by and under the supervision of the DCO.

6) TSCA CBI cannot be discussed over the telephone without prior written approval.

7) If TSCA CBI must be sent to another authorized individual, the transmittal is accomplished through the respective Document Control Officers.

The penalties for violating the required procedures are severe. A violation is the failure to comply with any provision in the TSCA Confidential Business Information Security Manual, whether or not such failure leads to actual unauthorized disclosure of TSCA Confidential Business Information. Violators of these procedures may be removed from the authorized access list and be subject to disciplinary action with penalties up to and including dismissal. Willful unauthorized disclosure of TSCA Confidential Business Information may subject the discloser to a fine of not more than $5,000 or

imprisonment for not more than 1 year, or both.

It is essential that personnel be familiar with and abide by these requirements. TSCA confidential files are subject to inspections by personnel from the EPA Security and Inspection Division, as well as personnel from the Office of the Inspector General.

EPA publications provide in-depth discussions on TSCA CBI handling procedures.

4.8 Problem Resolution

It is anticipated that discussions among members of the investigation team will sometimes fail to reach a consensus. In such situations, the following guidelines will apply:

1) Technical Questions - Failure to reach consensus on a technical question will usually be due to insufficient reliable information, a legitimate scientific knowledge gap or interpretation of available data. In the case of insufficient information, the Task Force should develop plans for gathering the necessary additional information from the owner or operator, or through additional inspections or contractor action, etc.

   If the problem stems from a lack of scientific knowledge, there are several alternatives:

   a) The Core Team should identify the need to the Headquarters Program Evaluation Team for incorporation into the research program, and

   b) The lead agency (Region or State) must make interim decisions based on a preponderance of evidence pending a technical resolution.

If the problem stems from different interpretation of the available data, the Core Team should submit the problem to the Technical Advisory Panel for review and recommendations.

2) Regulation or Policy Interpretations - The regulations and policies are often non-specific in terms of performance; therefore, disagreements may arise in interpreting their specific application. Where consensus cannot be reached, the Task Force Chairman is responsible for obtaining official interpretation in writing from the lead Headquarters office (i.e., OSW, OWPE, or OERR).

3) Procedural Disagreements - Disagreements may also arise on how to proceed based on the conclusions reached (e.g., action on a permit application vs. the use of an enforcement order to deal with non-compliance). Questions such as this may not be addressed in regulations and policies issued to date. They may simply represent alternative acceptable approaches with differing advantages. In this circumstance, the responsible agency (State or Region) should make an interim decision. Other team members, if they feel strongly, may raise the issue to higher management for possible discussion at that level.

4.9 Safety

Protecting the health and safety of the investigative team is a major concern in hazardous waste site investigations. Section 111 (c) of CERCLA and the National Contingency Plan (40 CFR 300.71) require all hazardous waste site work to be conducted by personnel who are adequately trained in safety procedures. Therefore all field staff will have completed field safety training. This is discussed further in Section 7.0.

4.10 Quality Assurance /Quality Control (QA/QC)

Decisions concerning the control and management of hazardous substances documented in the field investigation or the need for legal actions are based on analytical data. Because such decisions can be no better than the data on which they are based, the quality of the data must be ensured. A comprehensive and well-documented QA program is essential to obtaining precise and accurate data that are scientifically and legally defensible. The concepts outlined in the QA program must be considered when determining the sites for sampling, the frequency of sampling, the number of samples to be collected, the procedures involved in the collection, preservation, and transport of samples, the calibration and maintenance of instruments, and the processing, verification, and reporting of the data.

The objectives of sampling quality assurance are: 1) to ensure that the procedures used will not detract from the quality of results, and 2) to ensure that all activities, findings, and results follow an approved plan and are documented. These objectives dictate that much of the sampling quality assurance effort be made before the field work begins. Preparations should include:

- written protocols for all activities;
- training all field team members regarding equipment operation, sampling procedures, and proper documentation procedures;
- ensuring that all containers and equipment have been properly cleaned and are appropriate for analytes of interest; and
- ensuring coordination with the laboratory

A distinction should be made between field quality control and laboratory quality control. Any laboratory analyzing samples from hazardous waste sites will have an associated quality control program (in the case of the Contractor Laboratory Program, this program is standard). However, the laboratory's program only provides adequate quality control for the analytical function and cannot be used to ensure the quality of the entire sampling

and analysis process. Consequently, the sampling plan should provide for adequate field quality control.

In addition to provisions for quality control, sampling quality assurance should specify a system of quality assurance procedures,checks, audits, and corrective actions specific to the site activities. Field quality control will be discussed in greater detail in Section 8.0, "Field Quality Assurance."

5.0 FACILITY INSPECTION

The facility inspection activities should be carried out in a methodical, well-thought-out fashion. While many inspections may be routine, the possibility of adversarial postures by facility personnel and subsequent litigation requires that the following items be a part of the facility inspection protocol:

- Facility entry should be scheduled for normal working hours, unless overriding circumstances dictate. Entry should commence by proper presentation of authorizing credentials, and will be announced in advance by a notification letter.

- Inspectors should complete a visitor register if requested but should not sign a waiver of liability.

- Inspectors should follow established Agency rules of conduct, including procedures when entry is denied.

- Begin the inspection with an initial briefing that states the purpose, objectives, and authority of the inspection.

- Interview knowledgeable personnel about specific facility details before making site observations (e.g., site operations, monitoring system and sampling details, etc.).

- Review appropriate records concerning compliance with groundwater monitoring regulations.

- Conduct a visual inspection of the facility to verify conditions reported in background information and facility records, and to evaluate facility sampling practices.

- At the close of the inspection, conduct a debriefing meeting with facility personnel.

- o Complete the appropriate inspection checklists during the site visit.

- o Each member of the inspection team should maintain a field log book to record observations throughout the inspection. The log book should contain factual information only.

5.1 Notification Letter

The Core Team will alert the facility prior to the inspection with a Notification Letter that describes the intent and scope of the inspection.

The time when the facility is to be inspected should coincide with the facility's routine quarterly ground-water sampling program. Before the Notification Letter is issued, Regional Team personnel will telephone the facility to establish the time when the next round of ground-water samples will be taken. Core Team personnel will then contact Headquarters, State, and contractor team members to determine if the date for the inspection is satisfactory. If so, the notification letter can be issued. If the initial date presents a conflict for some of the team members, the Regional Team leader should determine an acceptable alternate date. The Notification Letter should then include a request for the facility to adjust the date of their quarterly sampling (preferably not more than one week earlier or later) to accommodate the inspection team's schedule. It is the Regional Team's responsibility to work out scheduling conflicts and notify all participants of the final inspection schedule.

Approximately one week prior to the inspection date, the Regional Team leader should telephone the facility to reaffirm the date and time of the inspection. During this conversation, the Team leader should supply the names of EPA Regional and State personnel as well as those of the contractor's that will be included in the site visit. The Regional Team leader can also reiterate the general mechanisms of the inspection procedure including:

1) the areas he would like to view during the site visit,
2) the facility personnel he would like to interview, and
3) the documents he will need to review.

Specific questions about the inspection procedure or matters of compliance should not be discussed at this time.

5.2 Facility Entry

The appropriate time of entry should be determined by the inspection team leader. All inspections should be conducted at reasonable times or during normal working hours. Inspections which cannot be completed before the normal close of business for the facility will be continued on the next business day unless the time required for completion is so short that the management does not object to working past normal closing time. If the facility runs continuously or the management normally departs before operations stop, the inspection may continue at the owners discretion. However, the inspection should be completed in a timely manner.

The plant premises should be entered through the entrance designated by the facility in its response to an inspection notification letter.

If there is only a guard present at the entrance, the inspection team leader should present his/her credentials and suggest the guard call his superior or the responsible official. The team leader should then document the entry in his/her logbook and note the date, time and name of the facility personnel encountered.

The inspection team should be aware that consent to the inspection may be withdrawn at any time. However, any segment of the inspection completed before withdrawal of consent remains valid. Withdrawal of consent is equivalent to a refused entry. Therefore, a warrant may be secured to complete the inspection (see Section 5.3 Procedures).

Consent to enter the site is not required for an inspection to observe and report things in plain view (i.e., that a member of the public could be in a position to observe). This includes observations made while on private property in areas not closed to the public (e.g., matters observed while the inspector presents credentials). However, if the inspector does not have a warrant, it may limit the inspector's access to any portion of the facility. All inspections must be conducted in light of the Barlow's decision. An understanding of the implications of this decision on inspection activities is crucial for their proper evaluation (See Section 5.3, Procedures).

5.3 Facility Entry Procedures

- Present Credentials

Upon arrival at a company or facility, an inspector should introduce himself/herself as an EPA inspector and present the proper EPA credentials to the owner, operator or agent in charge whether or not identification is requested. He/she should allow the person to whom the credentials are presented the opportunity to closely scrutinize, but not photocopy the credentials since they indicate that the holder is a lawful representative of the Administrator of the Environmental Protection Agency and authorize performance under RCRA and under all other applicable statutes.

- Liability Form

Under the authority of federal law, inspectors shall not sign any liability form or release of liability (waiver) when entering a facility.

- Visitor Register

If the facility provides a blank sign-in sheet, log or visitors register, it is acceptable to sign it.

- Demeanor

EPA inspectors are required to perform their duties in a professional and responsible manner and to refrain from any use of official position for private gain. They are also required to collect and report the facts of an investigation completely, accurately, and objectively. The inspectors must conduct themselves at all times in accordance with the regulations prescribed in the EPA handbook, "Responsibilities And Conduct For EPA Employees." The following paragraphs review some topics in the handbook especially applicable to work conducted by the HWGW Task Force.

Employees shall avoid conflicts of interest through outside employment or other private interests. A conflict of interest may exist whenever an EPA employee or contractor has a personal or private interest in a matter which is related to his official duties and responsibilities. It is important to avoid even the appearance of a conflict of interest because the appearance of a conflict damages the integrity of the Agency and its employees in the eyes of the public. All employees must, therefore, avoid situations which are, or give the appearance of, conflicts of interest when dealing with others in or outside the government.

Good public relations and common sense dictate that employees dress appropriately and with proper safety equipment for the activity in which engaged. When in the laboratory, field, or facility, employees should consult their supervisor and the NEIC Safety Manual relative to proper attire and safety requirements. Chapter 7 describes the appropriate health and safety measures to be followed while conducting an inspection for the HWGW Task Force.

It is important that cooperation be obtained and good working relations established when working with the public. This can best be accomplished by using diplomacy, tact, and persuasion. Employees should not speak of any person, other regulatory agency, or facility in a derogatory manner and should use discretion when asked to give a professional opinion on specific products or projects. All information acquired during an employee's duties is for official use only.

An employee is forbidden to solicit or accept any gift, gratuity, entertainment, favor, or any other thing of monetary value from any person, corporation, or group which has a contractual or financial relationship with EPA, which has interests that may be substantially affected by such employee's official actions, or which conducts operations regulated by EPA. Responsibility for individual actions rests with the employee where circumstances make it inappropriate to decline a nominally valued gratuity, such as lunch in a company cafeteria where no payment mechanism is provided.

- Facility Entry Denial

If an inspector is refused entry into a facility for the purposes of an inspection under Section 3007 of RCRA, certain procedural steps must be carefully followed. These steps are as follows:

1) Present proper identification to the facility representative authorized to consent to an inspection. Consent must be given at the time of the inspection.

2) Thoroughly document the event, noting time, date, and facility personnel encountered.

3) If entry is denied, ask the reason for denial.

4) If the problem is beyond the inspector's authority, suggest that the official contact an attorney to obtain legal advice on his/her responsiblity under Section 3007 of RCRA.

5) <u>Under no circumstances discuss potential penalties or do anything which may be construed as threatening.</u>

6) If entry is denied a second time, exit from the premises and document any observations made pertaining to the denial, particularly any suspicions of violations being covered up.

7) Report all aspects of denial of entry to the Enforcement Division for appropriate action to be taken including help in obtaining a search warrant (see Appendix B).

8) An Enforcement Division attorney will assist the inspector in the preparation of the documents necessary to obtain a search warrant and will arrange for a meeting with the inspector and a U.S. Attorney. The inspector will bring a copy of the appropriate draft warrant and affidavits to the meeting.

9) The Enforcement Division attorney will inform the appropriate Headquarters Enforcement attorney of any refusals to enter and send a copy of all papers filed to Headquarters.

10) The attorney will then secure the warrant and forward it to the inspector, and/or the U.S. Marshall.

It is the policy of EPA to obtain a warrant when all other efforts to gain lawful entry have been exhausted. This policy, of course, does not apply to pre-inspection warrants, which may be obtained under circumstances described later in this chapter.

In Marshall v. Barlow's, Inc., 436 U.S. 307 (1978), the Supreme Court addressed the need for an administrative warrant when an Occupational Health and Safety Administration inspector sought entry into a work place where consent for the inspection was not voluntarily given by the owner. The Court concluded that an administrative warrant was required to conduct such regulatory inspections unless the industry is one with a history of extensive regulation, such as liquor or firearms.

As a matter of policy, the Agency will apply the requirements of Barlow's to all RCRA inspections. According to Barlow's, a warrant may be obtained where there is a specific reason to think that a violation has been committed (i.e., where there is probable cause, such as an employee's complaint or a competitor's tip). A warrant may also be issued if the Agency can show that the establishment to be inspected has been selected pursuant to a

neutral inspection scheme.

Conducting an inspection under a search warrant will differ from conducting a normal inspection. The following procedures should be complied with in these situations:

1) Use of a Warrant to Gain Entry

   a. If there is a high probability that entry will be refused even with a warrant or where there are threats of violence, the inspector should be accompanied by a U.S. Marshall.

   b. The inspector should never attempt to make any forceful entry of the establishment.

   c. If entry is refused to an inspector holding a warrant but not accompanied by a U.S. Marshall, the inspector should leave the establishment and inform the Enforcement Division Attorney.

2) Conducting the Inspection

   a. The inspection must be conducted strictly in accordance with the warrant. If the warrant restricts the inspection to certain areas of the premises or to certain records, those restrictions must be adhered to.

   b. If sampling is authorized, all procedures must be carefully followed including presentation of receipts for all samples taken. The facility should also be informed of its right to retain a portion of the samples obtained by the inspector.

   c. If records or property are authorized to be taken, the inspector must provide receipts and maintain an inventory of all items removed from the premises.

Inspectors should consult NEIC's procedures for further guidance (see Appendix B).

5.4 Initial Briefing with Owner/Operator of the Facility

During the initial briefing with the owner/operator of the facility the inspector should state the purpose of the inspection and the authority under which the inspection is being conducted. If requested, the inspector should furnish a copy of the Act and appropriate regulations to the facility representative.

5.4.1 Scope of Inspection

The inspector should outline the objectives of the inspection and the order in which various aspects of the facilities operations will be examined. If duties regarding sampling and laboratory analysis have been delegated to key personnel, the inspector can suggest a schedule for meeting with those responsible persons if a meeting has not been established already. A well-planned schedule can eliminate wasted time in waiting for records to be gathered, key facility personnel to become available, and intermittent facility operations to be started. During a compliance inspection, it would be beneficial to have a facility representative accompany the inspection team to describe to them the plant and its principal operating characteristics and to answer their questions.

The plant manager and facility officials should also be informed of their right to request and receive immediately duplicates of any samples collected for laboratory analysis during the inspection, and copies of analysis results later (if an enforcement case is not pending or being pursued). By establishing an atmosphere of cooperation between the inspection team and facility officials, inspectors will be able to accomplish inspection activities more easily.

5.4.2 Document and Data Requests

Most information on ground-water monitoring system details, ground-water assessment programs and monitoring waiver demonstrations will be submitted and available for review at the regional EPA offices and/or at the state offices and will probably be included as part of the document package for the facility. The documents available should be reviewed prior to the site visit. There will be instances when such information will not be available for review until the site inspection. In this case, the inspector will have to request to review the applicable ground-water documents at the facility. After a review of the documents at the facility, the inspector should request copies of pertinent documents. The copies can then be brought back with the inspector for a more detailed review.

5.5 Interviews

Much time can be saved by interviewing the appropriate knowledgeable facility personnel. Before beginning a visual inspection of the facility, Owners/Operators, Facility Engineers, and sampling and laboratory personnel should be interviewed.

5.5.1 Owner/Operators/Facility Engineers

The owner/operator and facility engineer can provide information that will give the inspector a general understanding of the operation of the facility. This knowledge is necessary to aid in the determination of substances present at the facility. It is not necessary that an inspector has an in-depth understanding of all the intricacies of the onsite processes; however, a sufficient understanding will provide the inspector with confidence to conduct the inspection.

The questions on the checklist (Appendix C) should also be directed toward the facility engineer, or toward the owner or operator, if the facility is smaller.

5.5.2 Sampling Personnel

The sampling personnel will be able to answer specific questions on the checklist regarding sample collection. For example, questions pertaining to how ground-water wells are purged prior to sampling, sampling equipment and procedures, and sample preservation and shipment, chain-of-custody procedures can be asked of sampling personnel.

5.5.3 Laboratory Manager

The laboratory manager will, of course, be the focal point for questions concerning analytical procedures and the types of parameters measured. The laboratory manager should also be aware of proper chain-of-custody procedures and laboratory QA/QC requirements. If the analyses are carried out by an outside laboratory, the inspection team will determine, on a case-by-case basis, if an additional inspection of the outside lab is necessary.

5.6 Records Review

A facility may have implemented one of three types of ground-water monitoring systems:

1) A groundwater detection monitoring system as described in 40 CFR 265.90(a)(b).

2) An alternate ground-water monitoring system as described in 40 CFR 265.90(d)

3) A ground-water quality assessment plan as described in 40 CFR 265.93(d).

The following sections define the procedures to be followed in conducting the comprehensive ground-water investigations for each type of system. See the checklist (Section 5.10 and Appendix C) for details of protocol elements.

5.6.1 Detection Monitoring System

If a detection monitoring system was implemented, inspect the files for, and evaluate the adequacy of:

- Analytical Records - All facilities should have appropriate analyses on file. The record should include the following information:
  - Parameters
  - Frequency
  - Replicates as appropriate
  - Timeliness

  If any of the National Interim Primary Drinking Water Standards results obtained during the first year exceed the respective MCL's, the results should be highlighted in the quarterly report submitted to the Regional Administrator.

- Ground Water Elevations - These should be determined before samples are removed each time a well is sampled.

- Sampling and Analysis Plan

- Well Construction Data (not required by regulations). If it is not available, interview appropriate facility personnel who may have knowledge of installation.

- Ground Water Quality Assessment Outline.

- Evidence of semi-annual statistical comparison of ground water data. Where comparisons indicate no significant change, perform independent comparison using facility data (note if alternative statistical procedure was used).

- Evidence of implementation of a ground water quality assessment plan if the semi-annual statistical comparison indicates a significant change in ground water has occurred.

5.6.2 Alternate Ground-water Monitoring System

If an alternate ground-water monitoring system was implemented, inspect files for:

- An alternate ground-water monitoring system plan (see checklist for specifics regarding certification, dates of submission and implementation, plan basics and objectives).

- The report (which should have been submitted as soon as technically feasible after implementation of the plan) to the appropriate regulatory agency with the results of the assessment.

- Evidence of continued quarterly monitoring, including analyses and evaluations.

- Correspondence documenting submission of annual assessment report to appropriate regulatory agency.

5.7 Visual Inspection

Following the initial briefing or opening conference with facility management or operating personnel, and interviews with sampling and laboratory personnel, a visual inspection must be conducted. When touring the facility, appropriate facility safety requirements must be strictly adhered to. It may be useful to have the plant engineer conduct the tour along with the facility's sampling personnel. The laboratory manager will only be required for the inspection of his laboratory. The plant engineer will be able to describe the facility's processes as the tour continues. The sampling personnel will direct the inspector to the sampling points and demonstrate

the sampling techniques practiced by the facility.

5.7.1 Geomorphic Features

An important aspect of the site investigation is to ensure that all potential sources of discharge of hazardous waste to the ground-water are addressed in the program. It is necessary for the inspector to locate the sources described in the monitoring or assessment program and determine if any source has been omitted. In the event that any waste management areas have been left out, the inspector must note the location, size and type of area in his/her inspection log book.

The occurrence of significant topographic or surficial features, if any, should be noted in the inspector's log book. These features may indicate areas of ground-water recharge or discharge.

5.7.2 Surface Water and Seeps

During the inspection, attention should be paid to any surface water bodies or streams on or adjacent to the site. Since ground-water may be discharged to these surface water bodies, there is a possibility that contaminants in the ground-water may also be present in the surface water. Signs of contamination may be:

- an oily sheen on the surface of the water;
- discoloration on the banks from precipitation of contaminants;
- dead or distressed vegetation along the banks; and,
- unusual foaming or odors.

The distances of surface water bodies, streams and wetlands should be noted in the inspector's log book.

5.7.3 On-Site Wells

While it may not be possible to observe all well construction details, there are several items that can be checked. These include the construction

materials, the location and number of the monitoring wells, the total depths and the ground-water elevations. During the inspection, the locations and numbers of monitoring wells should be checked to ensure that all wells are located and in agreement with the monitoring program locations. See Section 6.3 for a detailed discussion of monitoring well inspection.

5.8 Sampling Procedures Evaluation

During the sampling inspection, the following sampling procedures practiced by the facility should be evaluated (see Checklist, Appendix C):

1) How are wells purged prior to sampling and how are samples obtained?

2) Are all wells sampled with the same equipment? If so, what provisions are used to clean the equipment after sampling to prevent cross-contamination between wells?

3) Are all organic constituents to be sampled?

4) Are samples collected with equipment to minimize absorption and volatilization?

5) Have standard preservation procedures been followed?

6) Are samples refrigerated?

7) Are sample holding period requirements adhered to?

8) Are suitable containers used?

9) Are provisions made to keep samples chilled during shipment?

5.9 Laboratory Inspection

During the laboratory inspection the following analytical procedures should be evaluated (see Checklist, Appendix C):

1) How are samples preserved and what are the holding times?

2) Are approved analyses used as standard operating procedure?

3) Are analytical instruments routinely calibrated and in good state of repair?

4) Is there an adequate QA/QC program for all analyses?

5) Are calibration records and other recordkeeping logs kept at the laboratory?

6) Is the glassware cleaned and baked according to proper laboratory procedure?

5.10 Facility Owner/Operator Debriefing Meeting

A debriefing meeting or closing conference should be held with facility management or operating personnel at the end of the inspection. The inspection team's main function is to observe and evaluate compliance, but it is noted that overall compliance will be determined by the Task Force Core Team upon final review of the report and other pertinent findings. Statements on compliance status, legal effects, or enforcement consequences should not be discussed with facility management or its operating personnel.

At this meeting, inspectors may request additional data, questions may be asked or answered, requested permit changes and process modifications are noted and necessary receipts are given. The inspectors should make a final review of checklists and field notes before the conclusion of the visit. Field notes taken during the visit should not be turned over to the company

officials. However, the inspectors are free to let the company know that they may request a copy of the inspection report, and that it may be made available in accordance with the restriction of the Freedom of Information Act and 40 CFR Part 2.

Written receipts are given for samples and documents taken from the facility. A declaration of Confidential Business Information (see Section 4.7) shall include a list of items declared confidential by an authorized facility official, and procedures should be explained if the company desires to make any subsequent declaration.

5.11 Analysis of Results

Results of the inspection should be discussed during the debriefing meeting. Discussion may include observed deviations from prescribed or recommended procedure. Facility officials should be informed of any leaks, spills, or other problems that require immediate attention. However, the inspector's discussion should be limited to specific findings of the visit. Certain precautions are essential.

The inspector must:

1) Remember that his/her function is to observe and evaluate compliance while on compliance inspections. The overall compliance or non-compliance status of the facility will be determined by the Core Team upon review of the inspection report. Statements regarding compliance status and any legal effects or enforcement consequence should not be discussed with the permittee or facility operating personnel.

2) Realize that it is an unacceptable practice to recommend a particular consultant or consulting firm even if asked to do so. However, it is not unethical to suggest that the permittee, operator, or agent contact a professional society for advice concerning this matter.

3) Make no attempt to substitute his/her own judgement for that of plant operating personnel regarding details of operation.

5.12 Checklists

At all inspected facilities, a checklist must be completed and submitted as part of the inspection report. A checklist for comprehensive ground water inspections at RCRA facilities was developed by NEIC and will be used as part of this protocol. The checklist is designed to evaluate compliance with subpart F of the interim status standards at 40 CFR Part 265, Subpart F: Groundwater Monitoring. An example checkist is shown as Appendix C.

6.0 SAMPLING PLAN

The protocol for developing the sampling plan is addressed below in four areas: pre-survey activities, equipment staging, monitoring well inspection, and sampling. In each area, the salient requirements of the protocol are presented as specific items or steps. These are followed by a discussion of some of the considerations or options associated with each item in the protocol.

6.1 Review Document Package and Field Investigation Plan

Compilation of the sampling plan should begin with a review of the facility data collected by the HWGW Task Force (the 'document package') and the Field Inspection Plan developed after the first consensus meeting. The document package and the Facility Inspection Plan should be reviewed to:

(1) determine the physical characteristics and layout of the wells comprising the monitoring system.
(2) determine the nature of the hydrogeologic regime into which the monitoring system has been installed.
(3) determine the types of samples that need to be taken during the inspection (e.g., ground-water, leachate, soil, surface water)
(4) determine the analytes of interest for each type of sample.
(5) determine the equipment and sample containers needed for sampling.
(6) determine schedule requirements (e.g., to obtain quality control samples from the CLP lab; obtain bottles from the Sample Bottle Repository), level of effort estimates, and safety considerations.

6.1.1 Monitoring System Evaluation

The parties responsible for preparing the sampling plan should review the facility description information, analytical data, and background geologic data in the document package. The objective of this review is to evaluate

the characteristics of the monitoring system in place at the facility and the implications this would have on the sampling approach. It is assumed that sampling activities initially will focus on those monitoring wells routinely used by the facility as part of their ground-water monitoring system, consistent with the sampling objectives developed in Section 3.2.

For the purposes of the Task Force's evaluations, the wells to be sampled and inspected must be part of a monitoring system that is designed and installed in accordance with the applicable RCRA regulations:

- "Owners or operators of surface impoundments, landfills, or land treatment facilities which are used to manage hazardous waste must have implemented a ground-water monitoring program capable of determining the facility's impact on the quality of ground-water in the uppermost aquifer underlying the facility." (40 CFR 265.90)

- "A ground-water monitoring system must have been installed capable of yielding samples for analysis and consisting of:

  (a) Monitoring wells (at least one) installed hydraulically upgradient from the limit of the waste management area. Upgradient wells must yield ground-water samples which are representative of background ground-water quality and not affected by the facility; and

  (b) Monitoring wells (at least three) installed hydraulically downgradient at the limit of the waste management area. They must be located and constructed such that they will immediately detect any significant amounts of hazardous waste or hazardous waste constituents that migrate from the waste management area to the uppermost aquifer. All monitoring wells must be cased in a manner that maintains the integrity of the borehole. The casing must be screened or perforated and gravel packed where necessary

to enable sample collection at depths where appropriate flow zones exist. The annular space above the gravel pack must be sealed with a suitable material (e.g., cement grout or bentonite slurry) to prevent contamination of samples and ground water." (40 CFR 265.91)

An evaluation of the adequacy of the wells in each monitoring system requires definition of the hydrogeological characteristics of the site. Important characteristics include:

- Depths to, and thicknesses of aquitards and aquifers of interest.
- Ground-water elevations.
- Textural properties of aquifers and aquitards.
- Hydraulic conductivities, pressure gradients, and flow rates within the system.

Site-specific hydrogeological information which may supply much of the data needed to determine these characteristics may be obtained from RCRA Part B Permit applications and from ground-water monitoring and assessment plans. Useful information to be obtained should include:

- Monitoring well boring logs
- Monitoring well construction details
- Facility site map showing well locations
- Survey data on well elevations

Regional geologic details should also be reviewed, if available, to enable verification or refinement of site-specific data. Regional geologic conditions may also relate to the potential pollution problem at hand and may

affect some of the considerations of the sampling approach as well.

The natural erosional or depositional history of a site can often be deduced from land forms. When present, common geomorphic features, such as flood plains, stream terraces, glacial moraines, dunes, sinkholes, drainage divides, and valley profiles, should be identified. Topography and drainage observations from site maps may aid in evaluating surface runoff, infiltration, and ground-water flow possibilities. Topography around the site governs surface water flow and suggests the probable direction of ground-water flow. Drainage patterns may indicate bedrock control, through joints or structures, which could influence ground-water flow.

Springs and seeps represent ground-water discharge and are generally a result of the water table intersecting the land surface or of leakage from an artesian aquifer. Such features should be located on a site map.

Surface water bodies, such as streams and impoundments, may be contributing to or receiving ground-water flow. Their importance in this regard must be evaluated. Streams, rivers, and/or impoundments near the site should be located and described in terms of physical dimensions, source waters, and topographic relation to the facility. Water-level records for the identified surface water bodies should be obtained and used together with ground-water elevation data to predict the direction of ground water flow and pollutant movement.

These data should be reduced and interpreted by a qualified hydrogeologist and compared with monitoring system characteristics to determine if the requirements of 40 CFR 265 are fulfilled. To the extent possible, construction information about any well identified as part of the monitoring system should be used. These data should include:

- Location of the well
- Well depth ("as built" and present)
- Casing dimensions and material

- Screen dimensions and material
- Sealing material and methods in borehole above gravel pack
- Gravel pack interval and materials, if applicable
- Static water level and data measured

Extensive evaluation procedures are presented in the "Ground Water Technical Enforcement Guidance Document - Draft: March 21, 1985" (U.S. EPA, Office of Solid Waste and Emergency Response). Evaluation of a well as not fulfilling the regulatory requirements should exclude it from consideration as a monitoring point and may indicate the need to use alternate (existing) wells or install new wells at appropriate location(s).

6.1.2 Analytical Evaluation

Determination of the nature and types of samples that need to be taken during the inspection should be made primarily on the basis of previous sampling activities conducted at the facility. The protocol followed by the HWGW Task Force should attempt to utilize, rather than duplicate, existing site information; therefore, the analyses that are specified in the sampling plan should include those routinely made by the facility for compliance purposes. These analytical parameters may be determined from previous reports of analytical data and from permit applications. Previous groundwater analyses and applications generally provide information concerning potential and actual ground water contaminants. In addition, knowledge of the behavior of particular contaminants in ground water will be necessary to evaluate the adequacy of the monitoring system and to determine personal protective equipment requirements during sampling operations. Previous inspection reports should also be reviewed to determine a facility's compliance history, problems which may be associated with certain contaminants, and any details which may require special attention. In reviewing this information an effort should be made to determine the integrity (from both security and physical standpoints) of wells in the monitoring system.

6.2 Development of Preliminary Sampling Approach

A preliminary sampling approach should be developed to:

(1) select sampling locations (this may or may not correspond to existing wells at the site, depending on their evaluation).
(2) specify the manpower requirements of sampling activities.
(3) identify equipment needs.
(4) identify safety and logistical considerations.
(5) determine the scheduling requirements needed to perform the sampling activities.

Information conveyed in the document package for the facility and the field investigation plan (Section 4.2) will be the primary resources for development of the preliminary sampling approach.

6.2.1 Selection of Sampling Locations

The determination of sampling site locations should be done first, because this will have bearing on the equipment needs and logistical considerations of the sampling activities. The prime candidates for sampling are the monitoring wells specified as part of the compliance monitoring system; however, these wells must be evaluated as to their adequacy in terms of the regulatory requirements (discussed in Section 6.1.1). Monitoring wells that do not fulfill these requirements should not be used as sampling locations; alternate (existing) wells may have to be used, or new wells may have to be installed.

Surface water (e.g., streams, lagoons) and soil sampling locations may be selected if samples from these locations would verify or augment well samples. Surface water samples should, in general, be selected from areas of known or suspected ground-water discharge downgradient of the facility. Soil samples may be useful in determining contamination from leachate or disposal activity, and in delineating possible areas of contamination.

The sampling approach should designate all proposed sampling locations on a map of the site and should designate the type of sample (e.g. soil, groundwater) and analytical parameters associated with each location.

6.2.2 Manpower Allocations

The sampling approach should identify the name or classification (e.g., environmental engineer, hydrogeologist) of the personnel required for the inspection, and the responsibilities of each member of the team. In general, this will follow the organization set up by the Field Investigation Plan (Section 4.1) but should also include designation of the team leader and person(s) responsible for carrying out specific sampling activities.

6.2.3 Equipment Designation

The sampling approach should describe the equipment needed to carry out the sampling inspection. This equipment can be categorized in three general areas: sampling equipment, containers and preservatives, and expendable items. Selection of the actual sampling equipment to be used is discussed in the sections to follow.

Specification of the number and type of containers needed at each sampling location depends on the type of sample to be taken and the analytical parameters of interest. This information is most easily prepared in a table format, using a reference such as "Methods for Chemical Analysis of Water and Waste" (U.S. EPA, 1983) to determine the specific container types (glass, plastic) and volumes (pint, liter, etc.) needed for each parameter. The table should have a list of the preservatives required by each of the analytical parameters, and should present totals for the various types of containers needed. The totals must also include the quality assurance samples required by the laboratory, such as field blanks and trip blanks. Quality assurance samples are discussed in Section 8.0.

The equipment list should also include a list of expendable items that will be needed to conduct the sampling. These items include, but are not limited to: solvents and distilled water for washing sampling equipment in the field (unless one-time disposable equipment is being used); plastic sheeting and paper products for maintaining a clean work area and cleaning/drying equipment; sample packing boxes and material; ice (wet; solid carbon dioxide or 'dry ice' is restricted for transportation) for refrigerating samples; and filters for filtering dissolved metals samples in the field.

6.2.4 Safety Considerations

The sampling approach should detail the specific safety concerns identified from available site information, and describe the appropriate precautions or response to be taken. This issue is discussed further in Section 7.0.

6.2.5 Logistical Considerations

The sampling approach should lay out a schedule for all activities associated with the sampling investigation, with particular attention to items or events that may be of a significant duration and thereby delay the sampling schedule. This includes specifying and scheduling equipment preparation (ordering expendable items, obtaining sample containers, etc.), equipment staging and calibration (if necessary), and transportation of equipment to the site and samples to the analytical laboratory. The sampling plan should also detail the logistics of obtaining quality assurance samples; specifically, these samples include trip blanks, which should be obtained from the CLP laboratory selected by EPA, and performance evaluation samples, which will be obtained from EPA-ORD in Cincinnati.

6.2.6 Notification of Sample Management Office and CLP Laboratory

The sampling approach should include the name(s) and telephone number of contacts at the EPA Sample Management Office (SMO) or the responsible contractor such as VIAR and at the CLP laboratory to be used for sample analysis. These contacts should be made in advance of field activities and should report the dates of sampling, the anticipated number and types of

samples, the kinds of analyses required, and the anticipated method and time of shipment. The appropriate analysis request forms and other documentation, if applicable, should be requested at the time of contact.

6.3 Equipment Staging

Preparation and assembly of the required equipment and materials for site sampling should proceed as follows:

(1) Equipment should be assembled using a checklist based on the requirements of the preliminary sampling approach.
(2) All equipment should be checked for proper calibration, assembly, and operation.
(3) All sampling equipment that will potentially contact sample material should be cleaned with a detergent wash, solvent rinse, and distilled water rinse.
(4) Openings in sampling equipment and small sampling implements should be wrapped in clean aluminum foil for transport.

Sampling equipment and associated material should be assembled in a clean laboratory area for preparation and check-out. This is facilitated by using an equipment checklist that can be developed during preparation of the sampling approach. This list should be prepared in cooperation with all personnel involved in the study. Items should be checked and rechecked against the list prior to departure so nothing will be forgotten. The list should include:

- Portable analytical equipment (e.g., pH meter, conductivity meter)
- Sample preservatives
- Analytical reagents and cleaning solvents
- Glassware

- Appropriate sampling gear (e.g., Kemmerer samplers, Teflon bailers, corers, submersible pumps, etc.)
- Sample containers
- Shipping and sample storage containers (ice chests)
- Photographic equipment
- Water-level sounding apparatus (mechanical, electrical, or acoustic)
- Notebooks, sample tags, field data sheets, custody sheets
- Protective clothing, breathing apparatus, first aid equipment, etc.

The above list is only an example and should be amended to include equipment or supplies that address the specific sampling requirements associated with the facility to be inspected.

Mechanical and electrical equipment that will be used for sampling should be checked to make sure it is in working order before entering the field. Sampling equipment, including all pumps, bailers, and other implements that will enter a well or contact sample material, should be cleaned with non-phosphate soap and hot water, rinsed (hexane or acetone for priority pollutant or organic samples; dilute nitric acid for metals), and finally rinsed several times with distilled, deionized water. The open ends of sampling equipment (e.g., pump inlets/outlets) should be covered with clean aluminum foil until used. Smaller implements (e.g., coring tubes) should be entirely wrapped in foil.

The preparation and cleaning of sample containers is discussed in Section 8.0.

6.4 Monitoring Well Inspection

Onsite sampling activities should commence with an inspection of the monitoring wells selected for sampling. This inspection should proceed as follows:

(1) Perform a safety survey prior to opening each well.
(2) Open the well carefully, while observing for possible pressure in the casing or the presence of toxic or noxious gas.
(3) Measure and record the well parameters (casing diameter, total depth, static water elevation).
(4) Determine the volume of water to be purged from the well prior to sampling.
(5) Determine whether there are different liquid phases or stratified contaminants in the well so that sampling strategies may be adjusted.

6.4.1 Perform Safety Survey

Ordinarily, monitoring wells are constructed in such a way that the ambient pressure is equalized with the pressure inside the casing; ground water in a well also does not usually evolve toxic or noxious gases that would present a safety hazard. However, the potential to encounter both of these situations exists for wells which may be encountered by the HWGW Task Force, and the initial approach to a well should incorporate a safety survey.

Typically, the survey should include an inspection of the closed well to determine if overpressure in the casing may be present. This would likely be found in a deep well constructed of solid, unvented casing with a threaded cap or plug. If such a condition is encountered, the sampling personnel should open the well slowly, after donning eye protection. The escaping gas at the well head should be sampled with an organic vapor analyzer (OVA or HNU) to determine the need for respiratory protection. Sampling personnel should also be equipped with portable equipment (e.g., Drager sampler) to analyze for other gases such as hydrogen cyanide, hydrogen chloride, etc.

6.4.2 Opening The Well

Each monitoring well should be unlocked and opened at the time of sampling; premature opening of the well (except for evacuation of standing water in wells drilled into an aquifer of low transmissivity) may invite questions concerning the security of the well and the resultant validity of sample data. Depending on the installation methods, materials at hand, and other factors, the monitoring wells that will be encountered by the HWGW Task Force may have several different kinds of closure configuration. Where facility personnel will accompany Task Force members to each well, access should not be a problem; however, the sampling equipment should include various implements such as pipe wrenches (for steel casing), strap wrenches (for plastic), and rubber mallets to assist in opening corroded or tight well closures.

6.4.3 Measure Physical Parameters of the Well

Several measurements of the physical parameters of each well must be made before sampling can commence. The reasons for this are twofold. The measurements are needed to calculate the volume of standing water in the well casing, which in turn will determine the volume of water that must be purged from the well prior to sampling. An additional reason for measuring well parameters (e.g., total depth) is as a check for casing integrity and for siltation of the well screen. Corrosion can cause collapse and/or leaking of the well casing. This could lead to erroneous or misleading water level measurements. Corrosion and silting can clog well screens causing a sluggish response or no response to water level change. In wells used for water sampling, this can be tested by removing a known volume of water from the well and monitoring the water level response as the well recharges.

The inner diameter (I.D.) of the well casing should be determined and recorded. Then, the static water level and depth of the well should be determined with a chalked (blue carpenter's chalk) steel tape; an electric or acoustic sounder may also be used for the water-level measurement. The steel tape should be lowered into the water slowly to prevent splashing.

Whatever tool is selected should at least be wiped with a clean paper towel and rinsed/washed with distilled water prior to and after use. The time of the depth to water reading, point of reference, and depth to water level should be recorded. Determination of the number of linear feet of standing water should be made by subtracting the distance from the top of the casing to the static water level from the total depth of the well. It is important to determine the static water level before purging the well so that a point of reference is obtained for observing the recharge of the well (especially in low-permeability aquifers).

6.4.4 Equipment Options and Preferences

Several tools are available to perform the above measurements; the choice of tools generally depends on availability and the familiarity of the sampling personnel with each device. The advantage of a steel tape over the electric sounder or acoustic measuring devices is the ability to measure the depth to water more accurately -- to within 0.01 foot. The disadvantage of the steel tape compared to the electric tape or acoustic sounder is that if the depth to water is unknown, it may be necessary to lower the tape into the well several times before obtaining a reliable reading; water on the casing wall may also wet the tape above the true water level, resulting in measurement errors. Where a series of measurements are needed in quick succession, such as in pumping tests, electric tapes have the advantage of not having to be removed from the well for each reading.

6.4.5 Determine Well Purging Volume

The volume of standing water that should be removed from the casing prior to sampling should be determined from the chart presented in Figure 6-1.

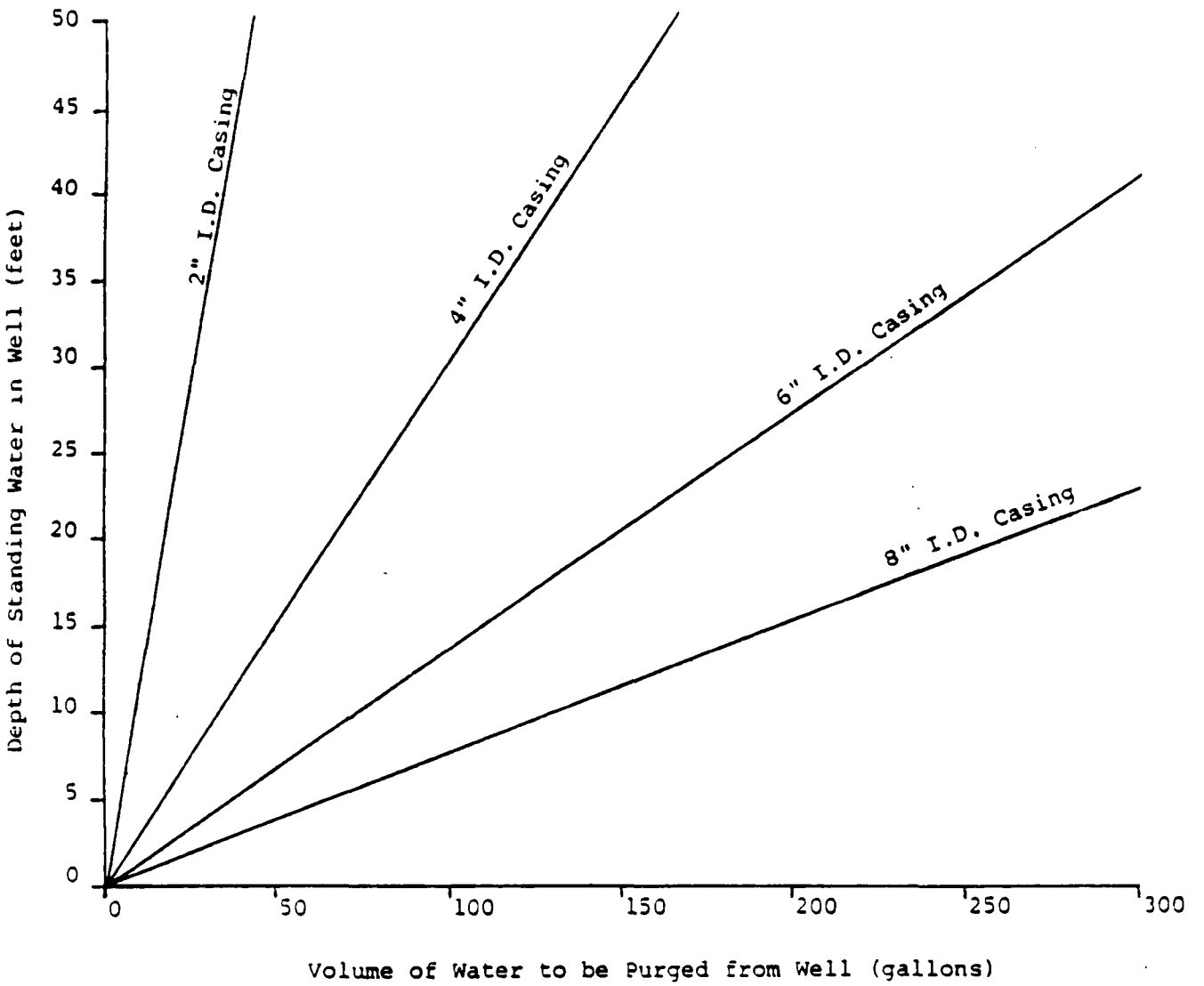


Figure 6-1: Determination of Volume of Standing Water in Well

This chart is based on the formula:

$V = r^2h(0.163)$, where:

V = standing water volume in gallons

r = inside radius of well casing in inches

h = linear feet of standing water in the casing

0.163 = conversion factor (includes conversion of inches to feet, cubic feet to gallons, and pi)

The effects of pumping a well for a period of time to insure collection of a "representative" sample have been documented effectively. In most cases, the water stored in the well casing is of a different chemical quality than that contained in the aquifer to be sampled. Solutes may be adsorbed or desorbed from the casing material, oxidation may occur, and biological activity is possible. Therefore, the stagnant water within the well bore must be purged (see Section 6.4). This will enable ground-water which is representative of the aquifer to enter the well.

6.4.6 Determine Liquid Phases in the Well

During development of the preliminary sampling approach, it will become apparent whether or not the ground water to be sampled might include constituents of different densities and solubilities. It is to be expected that any of the following conditions could be encountered:

1) Immiscible fluids - insoluble compounds may either rest on the ground-water surface or descend to a confining layer beneath the aquifer depending on density differentials.

2) Dense solutions and contaminant stratification - some soluble contaminants tend to form discrete stratification sequences with narrow adjacent zones of dispersion. Ground water flow velocities are typically very low and do not create sufficient turbulence to uniformly blend the solutions.

To sample the constituents of interest properly , sampling personnel should attempt to determine if an immiscible layer is present at the top or bottom of the well. This may be done by sending down a steel tape coated on one side with a paste that is color-sensitive to organic liquids and on the other with a water-sensitive paste. The approximate thickness of different liquid phases in the well can be read directly from the tape.

6.5 Well Evacuation

Each monitoring well to be sampled should be purged of stagnant water in the well casing, as mentioned above. This should be done by the following procedure:

(1) Determine how the well should be evacuated, depending on its recharge characteristics.
(2) Select the appropriate equipment to purge the well.
(3) Record the appropriate measurements and field observations prior to and during the well evacuation.
(4) Purge the well and dispose of the extracted water properly.

6.5.1 Select Pumping Equipment

The method used to purge a well is partly dependent upon the size (I.D.) of the well to be sampled, depth to water, volume of water in the well, and well accessibility. The other important factor is the recharge characteristics of the well as discussed below. The types of equipment available for well evacuation include hand-operated or motor-driven suction pumps, peristaltic pumps, compressed-gas (air lift) pumps, submersible pumps, and bailers made of various materials such as stainless steel, copper, Teflon, and PVC. In general, well purging should be done with equipment that will allow large volumes of water to be removed but that will not contaminate the remaining water in the well. These considerations are discussed thoroughly in references such as "Manual For Ground Water Quality Sampling Procedures" (U.S. EPA, 1981). Table 6-1 presents a compilation of applicable well-purging equipment.

TABLE 6-1: PURGING EQUIPMENT SELECTION

Diameter Casing	Bailer	Peristaltic Pump	Vacuum Pump	Airlite	Diaphragm "Trash" Pump	Submersible Diaphragm Pump	Submersible Electric Pump
2-INCH							
Water level <25 ft	X	X	X	X	X	X	
Water level >25 ft	X			X		X	
4-INCH							
Water level <25 ft	X	X	X	X	X	X	X
Water level >25 ft	X			X		X	X
6-INCH							
Water level <25 ft				X	X		X
Water level >25 ft				X			X
8-INCH							
Water level <25 ft				X	X		X
Water level >25 ft				X			X

Source: Region II S.O.P. for Well Sampling, 1984

Special care must be taken to prevent cross-contamination between sampling points. The well purging and sampling devices must be cleaned thoroughly to ensure that contaminants from one well are not carried to another.

The purging equipment should be decontaminated with a water wash, acetone rinse, and a distilled water rinse. Heavily contaminated purging equipment should be cleaned with a hot water detergent wash followed by the rinsing procedure. Clean gloves should be worn by the sampling personnel. In addition, a clean plastic sheet should be placed adjacent to or around the well in order to prevent surface soils from coming in contact with the purging equipment and support ropes which in turn could introduce contaminants to the well. The effects of cross-contamination also can be minimized by sampling the least contaminated well first and progressing to the more contaminated ones, if such information is known.

6.5.2 Purging Procedures

If the recovery rate of the well is sufficient, the well should be completely evacuated at least five times (which is the volume determined from Figure 6-1) and allowed to recover prior to sample withdrawal. The amount of water removed can be determined by collecting it in a container of known volume during the purging operation. Complete evacuation may be not possible from wells installed in high yield aquifers. In these cases, several factors must be considered in determining adequacy of evacuation procedures. These include the type of equipment used, (bailers or pumps); the discharge rate; and the intake position in the well (above screen or within screen). Intake position will affect flow patterns in the well and influence the determination of volumes to be evacuated to insure sampling of fresh formation water.

Sampling personnel should record the following information:

1) Type of evacuation equipment and types of materials of which it is constructed, including delivery lines or lines used to lower equipment into the well.

2) Whether wells are completely evacuated, and, if so, the number of times they were evacuated.

3) Intake depth in wells not completely evacuated.

4) Volumes evacuated from all wells.

5) Methods used to determine volumes evacuated.

6) Procedures for collection, management and disposal of evacuated water.

7) Whether or not individual wells have dedicated evacuation equipment.

8) Decontamination and cleaning procedures for equipment used in more than one well.

9) Physical properties of evacuated water
   - o Color
   - o Odor
   - o Turbidity
   - o Presence of oil or grease

A second approach to well purging is based upon the stabilization of temperature, pH, Eh, and conductance. Once successive measurements of these indicator parameters agree within $\pm$ 10 percent over three consecutive purged volumes, uniform sampling conditions can be presumed to exist. The stabilization of pH is the most important indicator. This method is appropriate for both ground-water monitoring wells and water supply wells. It is recommended that this method be applied to large water supply wells where the well casing water volume can not be determined. The water from residential wells should be monitored and pumped to waste for ten to twenty minutes before the sample is collected.

6.5.3 Disposal of Purged Water

The water removed from a hazardous waste site monitoring well may contain hazardous chemicals. Therefore, the purged water may need to be containerized (drummed) and should not be discharged directly on the ground at the well site. Determination of the nature of the purged water should be based upon the site background review, the location of the well in relation to the site, and screening of the purged water with a HNU, OVA, or conductance meter. If these parameters suggest that the water may not need special handling, the purged water should be disposed on site in the facility's wastewater treatment system or leachate management system. The disposal of purged water also should be considered as part of the site safety plan. (Section 4.7).

6.5.4 Procedures for Slow-Recharging Wells

There are currently several different approaches to purging and sampling wells that recharge slowly. These approaches include (1) evacuating the well to dryness and allowing it to fully recharge before sampling; (2) allowing the well to recharge after complete evacuation while taking several small incremental samples during recharge, and (3) evacuating the well until the water level reaches the top of the well screen, then withdrawing samples such that no additional drawdown occurs. At present, there is very little reliable data on which to choose one sampling method over another in "tight" formations. The preponderant approach seems to be complete evacuation followed by collection of samples as soon as sufficient recharge has occurred.

6.6 Parameter-Specific Procedures

Depending on the type of analysis planned for each of the samples obtained at a facility, there will be different requirements for sampling containerization, and sample handling. These requirements are covered briefly below.

6.6.1 Priority Pollutant Sampling Requirements

Special sampling and sample handling procedures must be instituted when priority pollutant and/or trace contaminant samples are being collected. These procedures are:

(1) All sampling equipment which comes into contact with the water in the well must be cleaned in accordance with the procedures described in Section 8.0.

(2) Sampling personnel must wear a clean pair of disposable gloves each time a new station is sampled.

(3) If possible, background samples and possibly contaminated samples should be collected by different sampling teams. If this is not possible, background samples should be collected first and containerized separately.

(4) If possible, one member of the sampling team should take all field notes, etc. while the other member does all of the sampling.

(5) Surface water samples should be collected before sediment samples at the same location.

(6) Sufficient sample material should be obtained so that all of the priority pollutant parameters can be analyzed. For water samples, this requires the collection of the following sample aliquots at each sampling location:

Parameters	Sample Volume	Containers
Volatile Organics	40 ml in duplicate	40 ml vials, Teflon septa
Acid Extractables Base/Neutral Extractables Pesticides/PCBs	1 gallon in duplicate	Glass
Metals	1 liter	Plastic
Cyanide	1 liter	Glass or plastic
Phenolics	1 liter	Glass only
Oil & Grease	1 liter	Glass only
TOC and Ammonia	1 liter	Glass or plastic
Sulfide	1 liter	Glass or plastic
Fluoride	1 liter	Glass or plastic

Soil and sediment samples to be tested for priority pollutants should be collected as duplicate 1-kg samples (approximately one pint) in glass jars with Teflon-lined lids. All samples should be field-preserved and refrigerated for shipment, according to the requirements described in Section 8.0.

6.6.2 EP Toxicity Sampling Requirements

According to the method requirements given in EPA SW-846 (U.S. EPA, 1984), the analyses performed for the EP extraction procedure require the collection of at least 500 ml of sample. Therefore, a 1-liter sample of groundwater or surface water, or a 1-kg sample of soil should be collected to ensure that there is adequate sample material. These samples are not to be preserved or refrigerated (unless it is known that refrigeration will not affect the integrity of the sample).

6.6.3 BTU Sample Requirements

The sampling requirements for material to be analyzed for BTU value are not specified in the usual water-quality or solid waste method references;

however, standard methods have been developed for this type of analysis as it relates to fuels and other materials. Perhaps the most applicable methods for BTU analysis are those formulated by the American Society of Testing and Materials (ASTM). The applicable test methods are D2015 (Standard Test Method for Gross Calorific Value of Solid Fuel by the Adiabatic Bomb Calorimeter) and D3286 (Standard Test Method for Gross Calorific Value of Solid Fuel by the Isothermal-Jacket Bomb Calorimeter). Both methods require preparation of several small (1 gram) samples, but these samples must be representative of the waste or contaminated material. Representative sampling methods are discussed in ASTM D2234 (Standard Methods for Collection of a Gross Sample of Coal) and in EPA SW-846 (as they apply to waste materials. For the purposes of the HWGW Task Force, collection of a 1-kg sample according to either method should be sufficient.

6.7 Well Sampling

Well sampling activities should concentrate on obtaining representative samples of ground water that are properly preserved and handled according to the requirements of the analytical methods that will be used. Attention should also be given to appropriate documentation of all activities. The procedures to be used are as follows:

(1) Select the right equipment, depending on the construction and depth of the well, field conditions, and the analytes of interest.
(2) Obtain samples from the well, avoiding undue aeration or turbulence.
(3) Transfer sample material to the appropriate containers and preserve samples according to standard methods.
(4) Measure in-situ parameters (pH, dissolved oxygen, specific conductivity, and temperature) at the time of sampling.
(5) Clean all sampling equipment before using at the next site.
(6) Document all sampling activities, including sample numbers.

6.7.1 Select Sampling Equipment

There are currently several different kinds of sampling equipment available to obtain ground-water samples. The more common types are described in Table 6-2; since the selection of a certain kind of sampling device depends on many factors (e.g. depth and diameter of the well, parameters to be analyzed, accessibility of power sources), the choice of equipment should be made on a site-specific basis by consensus of the Task Force.

Table 6-2: General Types of Monitoring Well Sampling Equipment With Discussion of Advantages and Disadvantages

Type Of Equipment	Advantages	Disadvantages
Bailer	Can be constructed in a wide variety of diameters	Time consuming sampling, sometimes impractical to evacuate casing properly before taking actual samples
	Can be constructed from a wide variety of materials	Transfer of water to sample bottle may result in aeration
	No external power source required	
	Extremely portable	
	Low surface area to volume ratio, resulting in a very small amount of outgassing of volatile organics while sample is contained in bailer	
	Easy to clean	
	Readily available	
	Inexpensive	
Suction Lift Pump	Relatively portable	Sampling is limited to situations where water levels are within about 20 ft. from ground surface
	Readily available	
	Inexpensive	
		Vacuum effect can cause the water to lose some dissolved gas and volatile organics
		In some cases, not constructed with materials compatible with sampling certain constiuents

Table 6-2 Continued

Type Of Equipment	Advantages	Disadvantages
Gas Lift Samplers	Relatively portable	Generally not considered appropriate method for acquisition of water samples for detailed chemical studies owing to degassing
	Readily available	
	Inexpensive	
	Very suitable for well development	Regardless of the gas utilized changes in CO_2 concentrations make this method unsuitable for sampling for pH sensitive parameters.
		Aeration of water remaining in well frequently make method unsuitable for well evacuation
		If air is used, oxygenation is impossible to avoid unless elaborate precautions are taken (only a very small amount of oxygen is required to cause a water sample to attain saturation with respect to oxygen)
Submer-sible Pumps	Wide range in diameters	Conventional units are unable to pump sediment-laden water without incurring damage to the pump
	Various materials are available	
	Fairly portable	Relatively expensive
	Depending upon size of pump and pumping depths, relatively large pumping rates are possible	
	Positive displacement minimizes loss of volatiles during pumping	
	Readily available	

Table 6-2 Continued

Type Of Equipment	Advantages	Disadvantages
Gas-operated Squeeze Pump	Can be constructed in diameters as small as one inch Can be constructed from a wide variety of materials Relatively portable Fair range in pumping rates are possible Driving gas does not contact water sample, eliminating possible contamination or gas stripping Positive displacement minimizes loss of volatiles	Gas source required Large gas volumes and long cycles are necessary for deep operation Pumping rates are not as great as with suction or jet pumps Commercial units are relatively expensive - pumps cost around $300.00, while central gas unit costs about $15.00
Gas Driven Piston Pump	Isolates the sample from the operating gas Requires no electrical power source Operates continuously and reliably over extended periods of time Uses compressed gas economically Can be operated at pumping heads in excess of 500m Positive displacement minimizes loss of volatiles	Relatively expensive; in excess of $3000 for the continuously operating unit Particulate material may damage or inactivate pump unless the suction line is filtered Low pumping rates

6.7.2 Sample Collection Procedures

The major consideration for sample withdrawal procedures is insuring that samples are not altered or contaminated during the process. Sampling equipment must be constructed of materials compatible with actual or potential contaminants. These materials must neither leach nor absorb constituents of interest. Sampling equipment must be dedicated to individual wells or be capable of being fully disassembled and cleaned between wells. Lines used to lower equipment into the well and discharge piping must also be constructed of materials compatible with possible contaminants. Samples should be collected a soon as possible after purging the well.

It is expected that, in general, submersible pumps will be used for purging and well development purposes only, and that samples will be collected using bailers, peristaltic pumps, or in-place plumbing. This will minimize the possibility of contaminating the sample with material leaching from the discharge tube/hose of the pump and/or from inadequate cleaning of the internal pump parts or the inside of the pump discharge tubing. Therefore, the procedure included here applies to Teflon or stainless-steel bailers. Sampling should proceed as follows:

1) Select new or cleaned Teflon bailer.

2) Attach bailer to a line for lowering. (Use either non-synthetic rope or stainless steel wire.) The line should be of more than sufficient length to allow for water level drawdown while sampling.

3) Lower bailer slowly until it contacts water surface.

4) Allow bailer to sink and fill with a minimum of surface disturbance.

5) Slowly raise bailer to surface. Do not allow bailer line to contact ground. Place bailer line on protective liner.

6) Tip the bailer to allow slow discharge from top to flow gently down the side of the sample bottle with minimum entry turbulence.

7) Repeat as needed to acquire sufficient sample volume.

Reasonable care should be taken in transferring water from the bailer to sample containers so that the sample is not aerated. This is especially important for volatiles, but also is a concern for metal samples to avoid oxidation.

After each sample has been collected, it should be preserved in accordance with the requirements given in "Methods for Chemical Analysis of Water and Wastes" (U.S. EPA, 1983). Samples for organics analysis should not have preservative added. All sample bottles should be labeled properly (see Section 8.0) and placed in an appropriate carrying container maintained at $4^{o}C$ throughout the sampling and transportation period. Upon completion of sampling, bailers should be placed in plastic bags for transportation to the laboratory. Each well must be securely capped. Sampling equipment should be decontaminated by cleaning with detergent, rinsing with distilled water, and rinsing with methylene chloride, acetone, or hexane. It is recommended to use a separate bailer for each well to avoid cross-contamination. If this is not possible, field decontamination should be performed prior to each use. A new support line should be used for each well sample and decontaminated or disposed in an acceptable manner after each use.

6.7.3 In-Situ Measurements

At the time each well is sampled, four in-situ parameters should be measured: temperature, pH, dissolved oxygen, and specific conductance. A separate sample can be withdrawn from the well into a beaker for these measurements; alternatively, direct-reading instruments may be used if the probe and cable assembly is long enough to reach to the depth of the well screen. If direct-reading instruments are used in the well casing, the probes and cable should be cleaned before use in the same manner as the other sampling equipment. All instruments should be calibrated (with reference solutions or internal standards) prior to making the reading; calibration information should be recorded along with the other sampling data in the field notebook.

6.8 Sampling Ground-water Seeps (Surface Water)

6.8.1 Location Selection

Sampling locations for ground-water seepage should be selected on the basis of their probability for showing contaminants migrating from a site. Prior to any sampling, surface water drainage at and around the site should be characterized using all available background information, including topographic maps and aerial photography.

In general, sampling locations may include rivers, brooks, or streams running through or adjacent to a site. These would include bodies of water receiving ground-water discharge and/or leachate from a site. In areas where the ground surface slopes steeply away from buried wastes, ground-water seepage or leachate may emerge from the ground, forming a damp or wet area or a small stream. Samples taken from such streams may have to be treated as medium or high concentration samples, depending upon a field evaluation. Exposed soil should be examined for areas of discoloration. Areas of excessive dead vegetation are also good indicators of leachate emergence.

The number of sampling locations selected is dependent on a variety of factors including the size of a site, the accessibility and magnitude of the discharge, and the availability of analytical support. Sampling should be performed at a minimum of two locations.

6.8.2 Sampling Techniques and Equipment

Ground-water seepage sampling at hazardous waste sites involves a number of different problems and concerns. The major criteria used in determining how and where to sample surface leachate streams include obtaining a representative sample, safety of the personnel involved in sampling, and using a simple method which is applicable at various sites. Due to the nature of hazardous waste sites, no one sampling method can be assured to be reliable for obtaining a representative sample at each site. Therefore, the judgment and discretion of the project leader is required to determine the most suitable

sampling locations and techniques.

Due to the unknown chemical and toxic nature of surface leachate streams, it should be required that all sampling at these locations be performed by a minimum of two persons using at least Level B protection (SCBA, chemical protection suit, boots and gloves).

Two types of sampling techniques are generally recognized for leachate streams, grab sampling and composite sampling.Grab samples are taken over a short period of time (e.g., less than 15 minutes) and are used to characterize the seep at a given time. Weather conditions and flow volume of the leachate seep should be recorded at the time of sampling. Composite samples are a combination of individual samples taken over a prolonged period of time at the same sampling point. This technique is generally not used in sampling surface leachate streams; however, a modification of this method may be used at sites with numerous leachate outbreaks. This modification involves combining samples taken at different leachate locations. This provides a location composite as opposed to a time composite and may provide useful data on the average concentration of contaminants or the presence or absence of hazardous substances in the area.

The best method for manual sample collection is to use the actual sample container which will be used to transport the sample to the laboratory. This eliminates the possibility of contaminating the sample with an intermediate collection container. The actual sample container must always be used for collecting oil and grease and bacterial samples.

A separate collection container can be used to collect the sample, from which the sample can be redistributed to other containers. If this is done, the container used to collect the sample must be cleaned properly and must be made of a material that meets the requirements of the parameter(s) being investigated. Separate containers should be used at each sample site to avoid cross contamination between sampling sites.

Sample bottles should be labeled prior to actual sampling with at least the following information: sample ID number, date, site name or case number, sample location and analysis to be performed by the laboratory (see Section 8.5.3). All labeling should be done with a waterproof marker to prevent label information from being washed off during and after sampling.

If the ground-water seep cannot be physically reached by the sampling personnel, an intermediate collection container may be used. The sample is then collected by lowering a properly cleaned Teflon, plastic, glass or stainless steel collection vessel (type of collection vessel used depends on the parameter being investigated) into the material to be sampled. Samples should be collected manually by tipping the collection container into the seep or stream so the mouth of the container faces upstream. The container should be rinsed out via this procedure at least twice before the sample is collected (except if preservatives are present in the sampling container or for certain analyses such as oil and grease and bacteria).

Care should be taken to avoid collecting leaves, stones, and other debris into the sample container. The sample bottle should be filled with about 10% ullage (empty space) remaining for shipping purposes. In some instances, a wide-mouth quart jar will have to be used to collect the sample. This sample should then be transferred to the appropriate sample bottles for analysis. The quart jar used for sampling should be disposed on-site.

If the leachate stream flow is low, a shovel may be used to dig a small hole at the sampling point. The hole is allowed to fill with leachate and sufficient volume is then obtained from the hole. The shovel should be decontaminated before use at another sample location. Decontamination of all sampling equipment and sample containers should follow the procedures outlined in Section 8.3.3.

After the samples have been collected, the samples should be preserved as necessary and placed on ice ($4^{o}C$) for transport to the laboratory.

6.9 Soil Sampling

6.9.1 Location Selection

Areas selected for soil sampling should be located strategically in order to collect a representative fraction of the soils with the minimum number of samples and effort. A surface inspection of the subject area should be made to locate pertinent features (e.g., rock outcrops, drainage patterns, surface runoff, ponds, lakes, wet areas, seeps, springs, permanent structures, fill areas, erosional areas, depositional areas, etc.) and to evaluate the relationship between these features and potential sources of pollution. The locations of sediment depositional areas are good indicators of surface runoff direction. If direction of surface runoff or drainage is difficult to detect, observation of new deposition or sediment movement following a rain may prove helpful in establishing this direction. The spreading or fanning out of the sediment body will indicate direction of flow.

In most instances, the HWGW Task Force's investigation of a site will be similar to a reconnaissance or screening type study. Sampling of soil in these instances will generally be confined to surface soils or shallow coring using hand equipment such as shovels, post hole diggers, or hand augers. For screening purposes, surface soil/sediment sampling should be conducted in depositional areas on the periphery of the study area, primarily in the downstream or downgradient portion of the area of interest; however, an upgradient sample is often valuable as a control. Sampling at depositional areas tends to bias the sampling toward high concentrations; this is a valuable screening tool but should not be construed as representative of the area conditions.

6.9.2 Sampling Techniques and Equipment

Sampling of undisturbed soils may be done by both hand or power equipment. Hand equipment such as spoons, scoops, shovels, hand augers, and small diameter push tubes are available and may be used for sampling at shallow depths. However, hand equipment is limited even at shallow depths when the soils are difficult to penetrate. Power equipment such as augers may be

used for sampling at shallow depths when hand coring equipment cannot be utilized.

Shelby tubes or thin wall push tubes can be used with both power and hand equipment to sample undisturbed soils. Stainless steel construction is recommended for most types of sampling. Soils can be extruded from the tubes for logging and selective sampling or sealed and sent directly to the laboratory in the tubes.

Surface soil samples should be collected with a spoon or scoop. Grass, leaves, or other debris should be scraped away prior to sampling. Shallow depth samples may be collected by digging a hole with a shovel or post hole digger, then removing all the loose soil and collecting a sample at the desired depth using a sampling spoon. For deeper sampling using hand equipment, a larger diameter auger is used until the desired depth is reached. A small diameter auger or Shelby tube is then used to collect the sample. The sample is extruded, the portions that are disturbed and/or contaminated are discarded, and the remainder is placed in an aluminum or stainless steel pan for mixing. These procedures shall be repeated until the desired amount/number of samples are collected. If an undisturbed sample is required, the Shelby tube and sample may be shipped intact to the laboratory for analyses.

The split spoon sampler may be used for sampling at greater depths. Because of its weight, the split spoon sampler is generally used with power equipment. A hollow stem auger is used to advance the hole to the desired depth. The split spoon is added to the correct length of drill rod and forced into the undisturbed soil by means of a 140-pound weight or hammer. The split spoon is retrieved from the hole and opened to reveal the sample. The top two or three inches of the sample normally will be disturbed and should be discarded. The undisturbed portion should be placed in an aluminum or stainless steel pan by means of a clean stainless steel spoon or spatula. The procedure is repeated until the desired amount for the sample is collected. The sample should then be mixed thoroughly and split into the appropriate sample containers.

6.10 Lagoon Sampling

Surface impoundments used for the storage or evaporation of hazardous wastes vary greatly in size. It is difficult to collect representative samples from large impoundments without incurring considerable expense and assuming excessive risk. Any samples desired beyond about 10 feet from the bank will require the use of a boat or crane, and therefore generally will not be feasible to collect.

Lakes, ponds, and impoundments have a much greater tendency to stratify than rivers and streams; the relative lack of mixing requires that more samples be obtained. The number of water sampling sites on a lake, pond, or impoundment will vary with the size and shape of the basin. In ponds and small impoundments, a single vertical composite at the deepest point may be sufficient. In naturally-formed ponds, the deepest point is usually near the center; in impoundments, the deepest point is usually near the dam.

In larger impoundments, several vertical subsamples should be composited to form a single sample. These samples are often taken along a transect or grid. Again, the number of vertical subsamples and the depths at which subsamples are taken are usually at the discretion of the sampling crew. In some cases, it may be of interest to form separate composites of deep and shallow zones, but normally a composite would be taken, consisting of several vertical subsamples collected at various depths.

To sample, the surface area of the impoundment is divided into an imaginary grid. The number of grid sections is determined by the desired number of samples to be collected which, when combined should give a representative sample of the lagoon contents. Three samples are collected from each grid, if possible: one sample at or near the surface, one sample at mid-depth and one sample at the bottom.

Many different kinds of sampling devices have been developed to obtain samples from a surface impoundment. The sampling team, in consensus with the project leader, should select the equipment which best suits the needs of a particular sampling situation. Applicable equipment includes:

- Pond Sampler

  The pond sampler consists of an adjustable clamp attached to the end of a two or three piece telescoping aluminum tube that serves as the handle. This device can be used to collect samples as far as 10 feet from the bank. Note that the sampling methods listed in Appendix 1 of 40 CFR 261 for liquid wastes in impoundments require only this type of device for representative samples.

- Rod and Clamp

  This device consists of six foot sections of aluminum rod which can be taped together to a desired length. A chain clamp is secured on one end and holds the sample container. This device is best used to obtain surface samples although subsurface samples can be obtained by manipulating the rods and clamp location.

- Sub-Surface Grab Sampler

  This device consists of a long aluminum tube with two adjustable stainless steel clamps which hold a sample bottle. A rod attached to the tube removes and replaces the sample bottle cap while the bottle is submerged. Samples are obtained by placing a capped bottle in clamps, submerging the sampler in liquid and turning the handle of the rod to remove and replace cap.

- Thief Sampler

  The thief sampler is applicable for obtaining bottom samples. The thief is designed so that a sample can be obtained within 13 mm of the bottom of the impoundment. There are two basic types of thief. One type is lowered into the impoundment with the valves open to permit the contents to flush through it. When the thief strikes the bottom of the impoundment, the valves close, trapping a bottom sample. The other type has a projecting stem on the valve rod which opens the valves when the stem strikes the bottom of the impoundment.

The sample enters through the bottom valve and air is released simultaneously through the top. The valves snap shut when the thief is withdrawn.

- Weighted Bottle Sampler

This sampler consists of a bottle, usually glass, a weight or sinker, a bottle stopper, and a line that is used to open the bottle and lower and raise the sampler. The weighted bottle sampler can be used to sample liquids in a pond, lake or impoundment. It cannot, however, be used to collect liquids that are incompatible or react chemically with the weight sinker and line.

Although there are a few variations of this sampler, the sampling procedure is the same. The sampler is lowered to the proper depth. The stopper is then pulled out with a sharp jerk of the chain or twine attached to the stopper. The bottle is allowed to fill completely, as evidenced by the cessation of air bubbles. When full, the sampler is raised.

7.0 HEALTH AND SAFETY

7.1 Potential Hazards

During the facility inspection, the Hazardous Waste Ground-water Task Force (HWGWTF) may encounter a number of potential hazards. These hazards may be present as contaminants in the physical environment; in the soil, surface water, or as gases or vapors in the ambient air. Other hazards may include the effects of temperature, presence of machinery or heavy equipment, and associated noise levels. It is important to anticipate as many unsafe or potentially hazardous conditions or practices as possible through adequate planning and training.

Establishment of rules or procedures, and assignment of responsibilities is paramount in reducing the potential risks involved during monitoring activities at these sites. It also allows for prompt corrective actions in the event of a dangerous occurrence or accident. It must be emphasized that individuals should maintain a high level of safety consciousness at all times through use of personal common sense, good judgment, and adequate technical training. The following discussion represents potential hazards that may be encountered during sampling assignments at the monitoring sites. This list is not meant to be all-inclusive but does provide a general compilation of the potential hazards involved.

7.1.1 Toxic Substances

Among the potential hazards that may be encountered at the monitoring site are toxic or poisonous substances. The Federal Hazardous Substances Labeling Act broadly defines "toxic" as any substance, other than a radioactive substance, having the capacity to produce personal injury or illness to man through ingestion, inhalation, or absorption through the body surface. The Toxic Substances Control Act currently maintains a Master File containing over 2000 toxic substances subject to regulation.

7.1.2 Explosive Materials

Explosive gases are often formed through biodegradation processes of underlying material. These gases may concentrate to dangerous levels in low areas or in sheltered areas not subject to wind dispersal and mixing. Any spark or flame, thermal or mechanical shock may cause detonation of highly reactive material, or may cause an explosive decomposition or reaction. Gas analysis meter readings to determine the explosive limit are normally taken at suspect locations. Readings greater than 20% of the Lower Explosive Limit (LEL) generally warrant a survey of the entire area, obtaining ground, waist, and head level readings. The sampling team should evacuate the area immediately at any LEL reading approaching or greater than 50% and contact the fire department. Any sampling equipment used at the site should be spark-free equipment.

7.1.3 Corrosive Materials

Corrosive materials may be present at the monitoring site in the form of solids, liquids, or gases. This material, when in contact with living tissue, will cause destruction of tissue by chemical reaction. These same materials may damage clothing as well as protective garments worn by the individual. Acids, bases, peroxides, and other strong oxiders which may be present in waste materials or environmental samples exhibit varying degrees of corrosivity.

7.1.4 Flammable Materials

Flammable materials are substances having a flash point above -6.7°C (20°F) and below 26.7°C (80°F) (below 37.8°C (100°F) for liquids). Flammable vapors in ambient air may explode or ignite if the vapor density of the substance becomes high enough. Vapors may include gasoline, and other petroleum based products, solvents, and other hydrocarbons, methane and natural gases, carbon monoxide, and hydrogen sulfide. Confined areas lacking natural ventilation should be considered oxygen-deficient and possibly contaminated by hazardous gases and vapors until proven safe by air monitoring.

7.1.5 Heat Or Cold Stress

Frequently overlooked as a potential hazard is the effect of heat or cold on the individual during sampling activities. Protective clothing worn during even warm weather sampling can cause accelerated fatigue, dizziness, and water loss. During cold weather, additional undergarments should be worn to retain body heat. Each individual should adequately plan their activities bearing in mind the physical conditions of the site as well as their own personal limitations.

7.1.6 Oxygen-Deficient Atmosphere

Oxygen-deficient environments will generally be associated with confined spaces or areas lacking adequate ventilation. Oxygen levels should be measured under these circumstances to ensure that the concentrations present are at least 19.5%. In situations where levels are below 19.5% oxygen, forced ventilation into the confined area may be necessary to purge the area of stagnant anaerobic gases and replenish acceptable oxygen concentrations.

7.1.7 Cancer-Causing Agents

There are numerous substances or agents which may be found in environmental samples or onsite waste materials that are carcinogenic, or capable of producing cancer. Additionally, other substances may be present that are mutagenic or teratogenic. These substances, even present in very low concentrations, are a subject of concern. Exposure to these agents or substances is reduced significantly by donning appropriate field gear.

7.1.8 Irritants

Irritants are substances which are not corrosive and in the immediate, prolonged, or repeated exposure with living tissue, will induce a local inflammatory response. Irritants apply to both skin and eyes.

7.1.9 Excessive Noise

High noise levels may be present at the monitoring site from heavy equipment and machinery operations. High noise levels could permanently impair normal hearing unless proper protective headwear is worn. Monitoring personnel should not venture into high noise level environments without proper protection.

7.1.10 Biologically Active Materials

Certain materials or biohazardous agents could be present in some instances that are capable of producing illness or disease through an infectous process or by production of toxins upon exposure. These etiologic agents are generally not persistent at high levels in the soil/water environment; however, monitoring sites located in areas containing sanitary wastes must be presumed as having these agents present. Therefore appropriate steps should be taken in these instances to limit exposure.

7.1.11 Radioactive Materials

Unlike other hazards, radiation does not require direct contact to cause any harm. Mere proximity to a strong radioactive source may cause physiological damage. With the increasing use of radioisotopes in medicine, research, and diagnostic equipment, comes a greater probability in encountering this hazard.

Natural or background radiation is typically up to 0.2 milli-Roentgens/hour (mR/hr). Monitoring sites at which a radiation hazard is suspected should be initially surveyed using a scintillation counter to verify radiation levels. Levels up to 10 mR/hr can be tolerated if the period of exposure is limited to the time to conduct sampling only. At levels higher than 10 mR/hr, the site should be evacuated and a health physicist contacted.

7.1.12 Accidents Resulting in Physical Harm

Other hazards that may be encountered during monitoring activities may

include machinery, heavy equipment operations,and other traffic near or on the site. Presence of wreckage or litter may tear or snag protective clothing. Common sense, alertness, and adherence to all company safety rules and regulations is mandatory.

7.2 Routes of Exposure

The routes of exposure include:

- o Inhalation - breathing contaminated air
- o Dermal exposure - skin contact with contaminated material
- o Dermal absorption - skin contact and absorption of contaminated material
- o Ingestion - eating or drinking of contaminated material

7.2.1 Inhalation

The most frequent source of general occupational poisoning and a common route of exposure during monitoring situations is inhalation of hazardous materials via the respiratory system. It should be emphasized that even by breathing relatively low concentrations of noxious gases, fumes, particulates, and aerosols, toxic dosages can be inhaled in short periods of time.

Depending on the absorption characteristics of the substance within the lungs and the physiological response, the impact may be so sudden and traumatic that the worker maybe rendered totally incapacitated and unable to provide for his or her own safety. Some individuals may exhibit extreme sensitivity to certain contaminants and elicit anaphylactic shock. Treatment in this extreme situation must be immediate.

7.2.2 Dermal Exposure

Direct dermal irritation or sensitization represents another exposure route that may occur. Caustics and acids represent the most common contact skin irritants. Severe chemical burns may increase one's susceptibility to

secondary infections. Field personnel should also be aware of sunburn hazards resulting from excessive exposure to UV radiation.

Some chemicals, upon skin contact exposure, may bring about sensitization. Subsequent exposure to the same chemical may then cause contact dermatitis (skin rashes). Increased vascular permeability from allergic responses may result in localized edema, which in some cases may impair breathing, swallowing, or vision.

7.2.3 Dermal Absorption

The skin barrier, normally effective in protecting underlying tissues from foreign substances, can be penetrated by absorption processes or through open cuts or wounds. Some materials not normally able to penetrate the skin may be carried by organic solvents. Organic solvents gain entrance into the body by removing the protective lipids and sweat that covers the skin and then entering through hair follicles and sebaceous glands.

7.2.4 Ingestion

Poisoning through gastrointestinal absorption of ingested material is a far less common form of exposure than that of inhalation or dermal contact. However, exposure by this route can occur through ignorance or lack of awareness of transmission processes. Workers may inadvertently contaminate temporary drinking water supplies, food, or cigarettes by not first washing thoroughly. Strict adherence to rules prohibiting eating, drinking or smoking at any location onsite and offsite only after decontamination should be followed.

7.3 Exposure Prevention Protocol

The health and safety protocol developed for the HWGW Task Force centers on exposure prevention, which is accomplished through two objectives: 1) pre-survey identification of hazards, medical surveillance, training, and equipment selection, and 2) onsite supervision of safety practices, precau-

tionary testing,and equipment usage. The items in the protocol, which are discussed below, include the following steps:

Pre-Survey Activities

1) Project team leader designates one or more persons to administer this protocol and to act as field safety supervisor.

2) Potential hazards associated with the site are identified from background information and site data. Descriptions of possible hazards, along with recommendations for their minimization, are compiled and distributed to all team members.

3) Applicable team personnel undergo medical surveillance testing. Testing is followed up annually (see Section 7.3.1).

4) Applicable team members are issued appropriate respiratory protection equipment. Team members are trained in its use and maintenance. Masks are fit-tested (see section 7.3.2).

5) A site health and safety plan is completed, which specifically describes the known or suspected hazards onsite; the identity of all safety supervisors who will be onsite; the locations, phone numbers, and contacts of local emergency services (hospital, fire department, etc.); and the protective clothing, equipment, and testing instruments that will be needed onsite (see Section 7.3.3).

Onsite Activities

1) Field safety supervisor designates "safe" area onsite and tests atmospheric conditions to verify level of protection needs prior to personnel entry to a suspect area (see Section 7.4). If conditions warrant, field safety supervisor assigns appropriate level of protection requirements (see Section 7.5).
2) Field safety supervisor maintains visual or radio contact with

sampling personnel, who are assigned as a (minimum) two-man team.

3) Field safety supervisor designates decontamination area and ensures compliance with decontamination procedures following sampling activities (see Section 7.7).

7.3.1 Medical Surveillance Program

To ensure the health and well-being of all personnel involved in groundwater monitoring at hazardous waste sites, a program of medical surveillance should be followed. The program should consist of three main components:

1) Comprehensive health examination

2) Annual check-ups

3) Tracking and evaluation

Individuals directly involved in monitoring activities should have a complete comprehensive health examination on file. This is important not only in verifying one's physical and mental fitness, but also in establishing control background levels upon which subsequent test results maybe compared. It is highly desirable that persons in the monitoring program be free of any residual effects of previous hazardous materials exposure.

Examinations should then be repeated annually in the same manner as long as the individual is involved with the monitoring tasks at these sites. If the sites monitored are known to contain higher than normal background radiation (70.2 mR/hr), then the annual check-ups should include dosimetry (whole body counts).

Tracking and evaluation of medical files should be an assigned responsibility to the project safety officer. Files should be reviewed and updated as needed. Any test results extending beyond normal limits should initiate a corrective action that minimally requires a retest of the given parameter. If comparable results are obtained, then appropriate health officials should

be contacted to evaluate these results to determine if exposure has occurred.

7.3.2 Respiratory Protection Program

The protection program centers on the selection, use, and limitations of respiratory equipment and chemical protective clothing. In addition, the incorporation of an organized program in training may be the most important element in exposure prevention. The protection program should require an understanding and working knowledge of the following:

1) OSHA requirements
2) General requirements governing equipment
3) Fit testing procedures
4) Field testing procedures
5) Care and inspection of equipment
6) Record keeping
7) Training program

o OSHA Requirements

The respiratory protection program should be designed to fulfill the requirements of the Occupational Safety and Health Administrations (OSHA) respiratory protection standard 1910-134. OSHA regulations call for the establishment of authority and assignment of responsibilities and requirements involving respiratory protection. Procedures shall be developed in the selection of protection equipment based on the level of hazard present at the site.

o General Requirements Governing Equipment

General requirements include the assignment and issuance of respiratory devices and chemical protective clothing by a Safety Officer. Only individuals who have completed training in the use of the equipment and are medically and physically capable of wearing the gear safely will be allowed to don the equipment. Figure 7.1 presents an example user certification form.

On _____, _____, _____

has received hands-on training in the care, use, and limitations of the following respiratory protection device(s).

_____ SCBA

_____ Fullface Air Purifying Respirator

_____ Half-face Air Purifying Respirator

_____ Other

_____ has also been instructed and trained in the proper fit-test methods for the above marked respiratory device(s).

On _____, _____, _____

has satisfactorily passed the irritant smoke test for the following respiratory protection device(s).

Manufacturer	Type of Device	Unit No.	User	Instructor

At this examination on _____, _____, no contra-indictions to the use of the above form(s) of respiratory devices have been identified.

(Physician's Signature)_____

Figure 7.1 User Training, Medical Clearance

o Fit Testing Procedures

Procedures describing fit testing should be detailed to assure the adequacy of the seal between the face and the facepiece. Failure to pass a fit test indicates an inadequate seal. Those not passing a fit test will be prohibited from entering the site until the situation can be corrected. Use of jellies or creams to achieve a seal will not be allowed. The fit testing should employ the following tests:

- Qualitative Fit Tests
- Irritant Smoke Test
- Odorous Vapor Test

o Field Testing Procedures

A positive and negative pressure sealing test will be performed in the field every time a respirator is donned.

o Care and Inspection of Equipment

Not only is the proper care and inspection of protective equipment necessary in exposure prevention but this equipment is expensive. Proper handling, cleaning, and storing of the gear will promote its longevity. Protective equipment care should include protocols for:

- Maintenance
- Cleaning at site
- Disassembly
- Washing and disinfection
- Inspecting during cleaning
- Storage

Inspection guidelines should be established for the frequency and routines to be followed for all protective equipment. Inspections should include all components or assemblies comprising the protective gear. Minor defects may be repaired or adjusted while major defects should be brought to the atten-

tion of the field supervisor and safety officer. Defective devices should be visibly marked or tagged as such with instructions not to use.

o Record Keeping

All protective equipment records and documents will be maintained by the Safety Officer. Inspection and maintenance forms filled out by monitoring personnel will be promptly returned to the Safety Officer. An example of a maintenance log form is shown in Figure 7.2. The log also serves as a respirator assignment sheet and fit test verification.

o Training Program

Training in the selection, use, and limitations of respiratory equipment and chemical protective clothing are the most important elements in exposure prevention. Specifically, training should include:

- Concepts of proper fitting
- Limitations
- Donning and doffing procedures
- Clothing/gear inspection
- Maintenance and testing of respiratory devices and equipment
- Nature and scope of hazards involved at site
- Corrective actions to be taken in the event that clothing or respiratory devices fail or become impaired
- Contents of this protection program

7.3.3 Field Safety Practices Enforcement

Enforcement of safety practices in the field is established by:

- o Defining a chain of command
- o Assignment of duties and responsibilities
- o Adherence to a formalized health and safety plan for each site

INITIAL FIT – TEST/ISSUE/MAINTENANCE LOG

UNIT TYPE _____ UNIT NUMBER _____

ISSUED TO _____ OF _____ ON _____

INITIALLY FIT TESTED ON _____ USING _____

UNIT TYPE _____ UNIT NUMBER _____

ISSUED TO _____ OF _____ ON _____

INITIALLY FIT TESTED ON _____ USING _____

UNIT TYPE _____ UNIT NUMBER _____

ISSUED TO _____ OF _____ ON _____

INITIALLY FIT TESTED ON _____ USING _____

MAINTENANCE

DATE	TYPE OF REPAIRS OR MAINTENANCE	PERFORMED BY	PARTS USED	LEAK TESTED

INSERVICE DATE _____ REMOVED FROM SERVICE _____

RETURN TO SAFETY OFFICER

Figure 7.2 Unit Issue Maintenance Log

The establishment of a series of positions in an order of authority will promote better vertical communication that is critically important in maintaining a high level of safety during field work. The assignment of specific duties and responsibilities ensures that all safety considerations are employed. Recommended responsibilities for the monitoring personnel should include the following:

- Safety Officer Responsibilities
  - Hazard assessment to determine the type and concentration of air contamination
  - Respirator selection
  - Workers training in the proper use of respirators
  - Respirator fitting
  - Maintenance and cleaning procedures
  - Purchasing procedures and inventory control, including maintaining spare component parts for respirators
  - Medical surveillance of employees using respiratory protection devices
  - Documentation: recordkeeping
- Field Supervisor Responsibilities
  - Review scope of hazard and respiratory protection requirements with Safety Officer before start of job
  - Review scope of hazard and respiratory protection requirements with crew before start of job

- Monitoring of workplace

- Conduct respirator fit-tests

- Ensure that those individuals in their charge are complying with rules governing the use of respiratory protective devices

o Employee Responsibilities

- Comply with all safety procedures and regulations governing the use of respiratory protective devices

- Ensure that the respiratory device used fits properly

- Maintain, inspect, and clean respiratory devices according to manufacturers' direction and this program

- Inform supervisor of actual or potentially hazardous conditions

A formalized health and safety plan developed for each site visit documents the level of safety to be employed. Recommended contents of a health and safety plan for site visits are presented as Appendix D.

7.4 Determination of Approach Level of Protection

When field activities are conducted where atmospheric contamination or any other type of hazard is known or suspected to exist, personal protective equipment must be worn. Prior to the start of any field activities, the field supervisor must designate a level of protection for that job. This designation will inform the field crew what hazards may be expected in the field and what personal protective equipment must be worn. The field supervisor must use direct reading instruments (when available), such as the ENMET tritector, the Foxboro organic vapor analyzer, the HNU total organic analyzer, or color detection tubes whenever hazardous atmospheric contaminants are known or likely to be present. This information will help desig-

nate the level of respiratory protection required.

7.4.1 Historical Data As An Indicator

All pertinent information sources should be consulted prior to the investigation to gain preliminary data. These include site history from state or local files, on processes and operations, waste handling activities, material data sheets identifying contaminants and concentrations. Reference sources should be consulted to identify contaminant properties and classifications. These include Department of Transportation (DOT) identification number and Chemical Abstracts Service Registry Numbers (CAS) information, the NIOSH Registry of Toxic Effects of Chemical Substances (RTECS), or other available data sources.

7.4.2 Pre-Entry Surveillance Criteria

Direct reading instruments such as the Foxboro organic vapor analyzer, HNU total organic gas analyzer, and the ENMET tritector must be used to provide a complete characterization of the airborne contaminants prior to conducting field activities. The work area should be scanned while wearing the highest level of protective equipment. A lower level of protection may be designated based on the results of the initial scan.

All field crew members must be assigned to work in pairs. In addition, two-way radios should be used to maintain contact with a person in a "safe" area who is equipped with the suitable respiratory and skin protection. This person is on standby to assist the two-man field team in the case of an accident.

The field supervisor must be aware of the possibility of physical stress to the field crew due to extremes of temperature. Of special concern is the possibility of heat stress due to working in a hot environment while wearing personal protective equipment.

A "clean" area should be established where the field activities can be controlled. Workers leaving the contaminated area must go through a decon-

tamination process where the clothing, tools and safety equipment are cleaned. This will prevent the migration of hazardous materials from potentially contaminated areas.

7.4.3 Monitoring During Work Performance

If monitoring activities are prolonged, the air monitoring should be performed periodically throughout the day to verify the adequacy of the safety equipment chosen.

7.5 Levels of Safety Protection

The following discussion outlines five levels of protection, some of the equipment required for each level of protection, and the rationale for choosing each level. When there is insufficient information on the type of hazardous contaminants or their concentrations, the field supervisor will assign Level B personal protective equipment until the pollutant concentrations and health effects are known. A complete equipment listing for each level of protection is presented in Attachment 1.

Levels A and B represent the highest levels of protection, though level A carries a higher degree of skin and eye protection. Both require full respiratory protection using a positive-pressure (pressure demand) self contained breathing apparatus (SCBA) that is MSHA/NIOSH approved. Both require chemical resistant gloves and boots, and two-way radios.

Levels C and D represent lower levels of protection and are used when the type of airborne contaminant is known and incorporate use of air purifying respirators (MSHA/NIOSH approved). Level D assumes unlikely skin and eye exposure. Periodic air monitoring should be performed to detect increased contaminant levels, in which case upgrading to level B may be necessary.

Level E represents minimal protection and is designed for use when only skin and eye protection is needed and airborne contamination is unlikely.

7.6 Emergency Procedures

At sites where the possibility of contamination or the severity of the hazard warrants, emergency procedures should be prepared. Emergency first aid equipment and medical personnel, or someone who knows how to provide emergency first aid, should always be present and readily available at the work site. The phone numbers of the local emergency services and the nearest hospital should also be readily available (e.g., in the site health and safety plan prepared beforehand).

When wearing a SCBA respirator in an atmosphere that is immediately dangerous to life or health, at least one additional person must be present with a similar respirator to aid in case of an emergency. Visual or verbal contact from a safe area must be maintained at all times.

If a field worker knows or suspects that they have been contaminated with a hazardous substance, they must immediately inform the field supervisor. All injuries must also be immediately reported to the field supervisor. An exposure report form is presented as Figure 7.3.

EXPOSURE REPORT

NAME_____ DATE_____

Job Site Location_____

Time Of Exposure_____ Supervisor_____

Substance(s) Exposed To_____

_____

Was Substance In: Air_____ Water_____ Soil_____ Other_____

Protective Equipment Used_____

_____

Cause of Exposure_____

_____

Area of Body Exposed_____

Action Taken To Decontaminate_____

_____

_____

_____

List Changes To Prevent Exposure_____

_____

_____

cc: Employee _____ _____
Supervisor Supervisor Date
Safety Officer
Physician

Figure 7.3 Exposure Report Form

7.7 Personnel Decontamination and Equipment Disposal

Following sampling, appropriate measures should be undertaken to decontaminate samples, equipment, and protective clothing. For each two-man sampling team, the "clean" man is required to organize and set up the decontamination area. Everything leaving the monitoring area should be presumed as potentially contaminated, unless the level of hazard is shown to be within safe levels.

The extent of personnel decontamination required at the site is dependent on the following factors:

- Type of contaminant
- Amount of contaminant present
- Level of protection used
- Degree or duration of contact
- Location of contaminant
- Reason for leaving site

In general, the procedures involved in decontamination employ steps in washing with special detergent solutions, rinsing with copious amounts of water, or if the specific contaminant is known, then rinsing with a specialized solution known to inactivate, alter, neutralize, or increase its solubility. For explicit doffing and decontamination procedures, the reader should refer to Appendix G of the Interim Standard Operating Safety Guidelines (U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, 1982). This document provides stepwise procedures for decontamination for the various levels of hazard protection. The sequence of decontamination and disposal for the five levels of hazard is listed in Appendix D of this protocol.

8.0 FIELD QUALITY ASSURANCE

8.1 Preparation For Field Activities

8.1.1 Personnel Training and Qualifications

The selection of qualified personnel and their participation in training activities is essential for the proper performance of inspection and sampling procedures under the HWGW Task Force program. Inspectors and sampling personnel should be selected on the basis of their qualifications (education and experience) that most nearly match the responsibilities assigned to them under this program.

Personnel assigned onsite duties should have hands-on training to achieve competence in safety and field activities. Preparation for onsite investigations must include detailed briefings, particularly for less experienced personnel. The requirement for planning and carefully-thought-out field sequences must be stressed.

Personnel training should, at a minimum, comprise the following areas:

- Inspection Personnel

  1) Field Safety Techniques
     - Responsibilities
     - Safe and Restricted Zones
     - Site Observations and Surveillance

  2) Hazardous Materials
     - Health Hazards
     - Fire Hazards
     - Storage and Transportation (including DOT requirements)
     - Deposition

3) Personal Protective Equipment

- Respirators and Self-Contained Breathing Apparatuses
- Protection Clothing - Tyvek suits

4) Inspection Procedures

- Credentials
- Liability
- Entry Denial
- CBI Handling and Data Review
- Logbook Documentation
- Photographic Documentation
- Exit Briefing

o Sampling Personnel

1), 2), 3) above, plus:

4) Sampling Requirements

- Procedures (site selection, sampling, field testing)
- Equipment (selection, maintenance, operation)
- Field QA Requirements (QC samples, handling, custody, etc.)
- Documentation

Training needs should be identified by the Core Team. They should also assume the responsibility of ensuring that the training is implemented and that personnel certification is attained in the appropriate areas. A record of the type and duration of training for each individual should be kept as part of the ongoing program of QA activities. The need for refresher courses or re-certification can be evaluated from the training records.

8.1.2 Pre-Inspection Strategy Meeting

The Phase III consensus meeting will include sampling (contractor) personnel, the Core Team and Regional Team leaders. At this meeting, several aspects of the proposed inspection that have a bearing on QA requirements

will be defined. These areas include:

- o probable existence and nature of groundwater contamination;
- o details of monitoring system design;
- o useful activities to be conducted during the inspection.

Decisions reached on these topics will determine the numbers and types of samples to be taken, the analytical parameters of interest, the general types of equipment needed, and the responsibilities of sampling and inspection personnel. These details will be passed on to all parties involved in the inspection, preferably at a pre-inspection strategy meeting following the Phase III consensus meeting. The purpose of such a meeting would be to review and discuss the QA requirements in conjunction with the other inspection details, to reach a consensus on QA issues that are dependent on site-specific characteristics, and to review site background information as it applies to preparation of the facility inspection plan.

8.1.3 Staging

Assembly of the equipment, instruments, and supplies needed for sampling at a particular site should be accomplished in an orderly, controlled fashion. Equipment staging should be initiated by selecting appropriate items from a comprehensive checklist (see Section 6.2).

All sampling equipment utilized to collect samples during the inspection should be numbered so that this equipment can be traced through field records. A log book should be established for this equipment, so that all cleaning, maintenance, and repair procedures can be traced to the person performing such procedures and specific repairs made. All equipment used to collect groundwater samples shall be cleaned and repaired, if necessary, before being stored at the conclusion of field studies. In addition, all portable instruments and sampling equipment should be tested and calibrated in the laboratory before being issued for field studies. The cleaning procedures conducted in the field for re-used sampling equipment and all field repairs shall be thoroughly documented in field records.

8.2 Field Operations

8.2.1 Chain of Command

The organizational control should be diagrammed and described so that the chain of command is fully illustrated prior to the initiation of field activities for each facility inspection plan. This organizational diagram should illustrate the relationship between the Task Force and all parties involved in quality assurance (e.g., NEIC SCC, SMO, etc.).

8.2.2 Inspectors Responsibilities

The responsibilities for each member of the combined inspection team should be determined and outlined in the Field Investigation Plan. At the end of the first consensus meeting, the participants can provide recommendations and guidance for the assignment of various responsibilities to the members of the combined inspection team.

8.2.3 Sampling Personnel Responsibilities

The responsibilities of the sampling personnel in support of the quality assurance aspect of the program are:

- to ensure that all sampling procedures are carried out in accordance with the sampling plan;
- to ensure that samples are collected, containerized, labeled, and handled in accordance with the analytical and program requirements;
- to ensure that all required quality control samples are prepared and submitted for analysis;
- to document all equipment cleaning, instrument calibration, on-site measurements, and sample handling procedures in a standardized, reproducible format.

8.2.4 Quality Assurance/Quality Control Samples

The field sampling activities should be supported by preparing and submitting several sets of quality control samples. These include blanks, spikes and duplicates.

o Blanks

These samples should include trip blanks and field blanks. Trip blanks are used to determine if contamination is introduced from the sample containers. These should be prepared by the sampling contractor selected for the individual site to be inspected. They are prepared by using distilled deionized water of known high purity, and are sent with the other sample bottles to the field. One set of trip blanks for each analytical parameter group (e.g., organics, metals, volatiles) should be prepared and submitted for each day the sampling takes place.

Field blanks are used to determine if contamination is introduced by the sample collection activities or sampling environment. They are prepared by bringing a quantity of distilled deionized water to the field and using this water to prepare appropriate sample aliquots for each parameter. This is also the responsibility of the sampling contractor and should be done for each day the sampling takes place.

Blanks should be submitted in the same manner as the other field samples, with no distinguishing labeling or markings. For the HWGW Task Force, it is anticipated that blanks will be prepared and handled by the sampling contractor.

o Spikes

Spikes are samples to which a known amount of a compound has been added and are used to appraise the accuracy and precision of analyses performed by the laboratory. The standard analytical methods recommended for use in this program specify a certain amount of spiked samples to be included during analysis of field samples (e.g., one spiked sample for every ten field

samples). Note that spiked samples will generally be prepared by the analytical laboratory selected under the Contract Laboratory Program (CLP).

o Duplicates

Duplicate samples are another method of checking on the precision of a laboratory's analytical methods. Duplicate samples should be taken at least once for every analytical parameter to be tested at a particular facility. At each sampling location where volatile organics are to be sampled, duplicate samples must be taken.

8.3 Equipment

8.3.1 Routine Maintenance/Calibration

All field equipment that is to be used for obtaining field measurements must be calibrated prior to entering the field and at periodic intervals during use. Calibration records must be maintained to demonstrate the precision and accuracy of field measurements made with a particular instrument.

Calibration records will include:

- a unique identification number assigned to the device (e.g., factory serial number);
- the source and traceability of the standard(s) used for calibration;
- the name of the person performing the calibration, the date and notation as to whether it was a routine check or one required by malfunction .

Equipment calibration should be further supported by routine maintenance, as required by the individual types of equipment in use (e.g., changing batteries in portable meters, lubrication of moving parts of a sampling device with non-contaminating materials). Maintenance of auxiliary equipment, such

as portable generators, will also aid the sampling effort.

Maintenance records should be kept similar to calibration records and should document the type of work done (routine checks, emergency repairs, etc.), the person performing the work, and the identity of the equipment.

8.3.2 Decontamination

Decontamination of field equipment may be done onsite or offsite, depending on the availability of equipment that may be dedicated to one sampling location. Use of equipment at more than one location implies on site decontamination to avoid carrying possible contaminants from one location to the next.

Onsite decontamination may be performed at each sampling location or at a designated area at the facility. Depending on the size of the facility, location of sampling points, etc., one of these approaches may be more efficient than the other. The procedures, however, should always include a thorough washing of all equipment with hot water and detergent, followed by successive rinses with deionized water and appropriate solvents (hexane, acetone, methylene chloride, etc.). The waste solvents should be collected in a container for proper disposal.

Offsite decontamination may be carried out in a similar manner, except that the equipment should be transported from the sampling location in doubled polyethylene bags.

Decontamination procedures for smaller sampling equipment (e.g., soil scoops, containers) are not necessary if this material is disposed of after use. Discarded sampling implements should be properly disposed of onsite or packaged for appropriate offsite disposal.

8.4 Documentation

8.4.1 Field Forms and Personal Logs

Appropriate field sheets must be completed at the time of sample collection. These would include RCRA Compliance Inspection checklists and applicable Regional Field Sample Record forms.

In addition to sample tags and field sheets, a bound field notebook should be maintained by each member of the sampling team to provide a daily record of significant events. All entries must be signed and dated. All notebooks and logbooks should be kept for the permanent record. In a legal proceeding, notes, if referred to, are subject to cross-examination and admissible as evidence.

Accountable documents include items such as logbooks, field data record, correspondence, sample tags, graphs, chain-of-custody records, bench cards, analytical records and photos. Each document should bear a serialized number and be listed, with the number, in a project document inventory assembled at the project's completion.

All field logbooks, field data records, field laboratory logbooks, sample tags and chain-of-custody records should be numbered and assigned to the Core Team leader for appropriate distribution and accountability. The logbook of the team leader will document the transfer of other logbooks to individuals who have been designated to perform specific tasks on the project. All pertinent information should be recorded in these logbooks from the time each individual is assigned to the project until the project is completed. Logbook entries should be dated, legible, and contain accurate and inclusive documentation of an individual's project activities. The logbook must contain only facts and observations. Language should be objective, factual, and free of personal feelings or other terminology which might prove inappropriate. Entries made by individuals other than the person to whom the logbook was assigned are dated and signed by the individual making the entry.

Where appropriate, serialized Field Data Records (FDRs) in the form of individual sheets or bound logbooks are maintained for each project. the project leader numbers the FDRs with the appropriate project code. All onsite measurements and field observations are recorded in the FDRs with all pertinent information necessary to explain and reconstruct sampling operations. Each page of an FDR is dated and signed by all individuals making entries on the page. All project logbooks and FDRs are to be turned over to the project leader and placed in the central document file when a project has been concluded.

Assignment of all serialized sample tags to field personnel should also be recorded in the project leader's logbook. At no time are any sample tags to be discarded. Immediately upon discovery, tags that are lost, voided or damaged, or transferred on split samples, are noted in the appropriate FDR or logbook.

Other documentation of field activities, such as records of sample numbers and chain of custody, is covered in Section 8.5.

8.4.2 Photographs

Photographs are important in documenting the cause and effect relationship of hazardous materials migrating offsite, especially in the areas of environmental damage and potential exposure. Whenever samples are collected, photographs should be taken to verify the written description in the field logbook. In all cases where a photograph is taken, the following information must be written in the logbook:

1) time, date, location, and, if appropriate, weather conditions;

2) complete description or identification of the subject in the photograph and reason why the photograph was taken;

3) the sequential number of the photograph and file roll number;

4) name of person taking photograph.

When the photographs are developed, the information recorded in the field logbook should be transposed onto the back of the photographs. Photographs and negatives are part of the project files and must be accounted for under document control procedures.

8.5 Sample Handling

8.5.1 Containers

In general, the sample containers to be used for collecting groundwater, surface water, and soil samples at hazardous waste facilities are specified by the analytical methodology to be used (see "Methods for Chemical Analysis of Water and Wastes", U.S. EPA, 1983).

Water samples for organics analyses are collected in glass bottles equipped with teflon-lined screw caps. These water samples are to be preserved by cooling with ice to 4°C. Use of analytical contract laboratories requires that duplicate samples be collected for volatiles. Samples for volatiles are collected in 40 ml glass vials equipped with teflon-backed silicon septum screw caps. Bottles and septa are washed with detergent, rinsed with organics free water and dried 1 hour at 105°C.

Samples for extractables are collected in 1-gallon or four 1-liter glass bottles with teflon-lined caps. New bottles and liners are rinsed with methylene chloride and dried by vacuum or other safe means until no solvent remains. Previously used bottles are washed with detergent, rinsed with organics free water, dried and solvent-rinsed as above.

Water samples for metals analysis are collected in 1-liter high-density polyethylene bottles with solid polyethylene or polyethylene-lined caps. Bakelite caps are to be avoided. The bottles are cleaned with dilute nitric acid and washed well with distilled or deionized water. The samples are preserved with nitric acid to below pH 2. Nitric acid concentration must not exceed 0.15% if the sample is to be shipped via air cargo.

Water samples for ammonia and TOC analyses are collected in 500 ml polyethylene bottles. The samples are preserved with sulfuric acid to below pH 2. The samples are then stored at 4°C. Water samples for pH and flouride analysis are collected in 500 ml polyethylene bottles. Water samples for cyanide analysis are collected in 1-liter bottles and preserved with sodium hydroxide to pH greater than 12. Water samples from sulfide analysis are collected in 1-liter polyethylene bottles. Two ml of 0.04% zinc acetate is added as well as NaOH to pH 9. These samples should all be stored at 4°C.

Soil and sediment samples are collected in wide mouth glass jars equipped with teflon-lined screw caps. Samples are preserved by cooling with ice or refrigeration at 4°C. Bottles are cleaned with detergent, rinsed with tap water and organics-free water.

In addition to analytical programs, the Contractor Laboratory Program provides several supplementary services. These activities have developed as a natural adjunct to the program's analytical services. One of these services is the Sample Bottle Repository Program. Since the HWGW Task Force is using the CLP for sample analysis, sample containers will be obtained through the repository.

Under the Sample Bottle Repository operation, nine types of sample containers are available to CLP clients. Bottles provided through this program are precleaned and QC-tested according to prescribed procedures to ensure that no contamination exists that might affect sample data results.

Clean, empty bottles and closures are shipped to users in protective cardboard cartons. (Note that sample coolers and sample preserving agents are <u>not</u> supplied through the Repository program.)

The following chart (Table 8-1) lists the types of bottles provided through this program, the case sizes in which bottles are shipped, and the type(s) of samples appropriate for collection in each bottle type. Each bottle type is cleaned and QC tested by procedures directly related to the specific analyses that may be performed on samples collected in the bottle. These containers match those required by the sampling activities anticipated for the Task Force site visits.

Table 8-1: CONTAINERS AVAILABLE FROM THE SAMPLE BOTTLE REPOSITORY PROGRAM

Container Type	Description	No. Per Case	Expected Sample Type*
1	80 ounce amber glass bottle with teflon-lined black phenolic cap	6	Extractable Organics Low Concentration Water Samples
2	40-ml glass via with teflon-backed silicon septum cap	72	Volatile Organics Low & Medium Concentration Water Samples
3	1-liter high-density polyethylene bottle with poly cap	42	Metals, Cyanide Low Concentration Water Samples
4	120-ml wide-mouth glass	72	Volatile Organics Low & Medium Concentration Soil Samples
5	16-oz wide-mouth glass jar with teflon-lined black phenolic cap	48	Metals, Cyanide Medium Concentration Water Samples
6	8-oz wide-mouth glass jar with teflon-lined black phenolic cap	96	Extractable Organics Low & Medium Concentration Soil Samples -and- Dioxin Soil Samples -and- Organics & Inorganics High Concentration Liquid & Solid Samples
7	4-oz wide-mouth glass jar with teflon-lined black phenolic cap	120	Extractable Organics Low & Medium Concentration Soil Samples -and- Metals, Cyanide Low & Medium Concentration Soil Samples -and- Dioxin Soil Samples -and- Organic & Inorganic High Concentration Liquid & Solid Samples
8	1-liter amber glass bottle with teflon-lined black phenolic cap	30	Extractable Organics Low Concentration Water Samples
9	32-oz wide-mouth glass jar with teflon-lined black phenolic cap	36	Extractable Organics Medium Concentration Water Samples

* This column specifies the only type(s) of samples that should be collected in each container.

The sampling contractor will contact the EPA Sample Management Office (SMO) initially to become authorized to order from the Repository and to obtain a supply of Delivery Order forms. Thereafter, the contractor will order bottles directly from the Repository. Since the Repository can respond only to orders submitted by a SMO-designated representative, the SMO will be notified of any change in contractor representative designations. Orders will be placed following the guidance in "Users Guide to the CLP Program" (U.S. EPA, 1984).

8.5.2 Chain-of-Custody

All sample shipments will be accompanied by a Chain-of-Custody Record identifying its contents. The original record will accompany the shipment, and a copy will be retained by the Sampling Contractor. Chain-of-custody requirements have been extensively described in numerous documents (e.g., "Enforcement Considerations for Evaluations of Uncontrolled Hazardous Waste Disposal Sites by Contractors", U.S. EPA; NEIC, 1980). In general, as few people as possible should handle the samples; until shipped or transferred, custody will be the responsibility of the sampling contractor.

Whenever samples are split with a facility, it is noted in the remarks section of the custody form. The note indicates with whom the samples are being split and is signed by both the sampler and recipient. If the split is refused, this will be noted and signed by both parties. The person relinquishing the samples to the facility should request the signature of a representative of the appropriate party, acknowledging receipt of the samples. If a representative is unavailable or refuses to sign, this is noted in the "Remarks" space. When appropriate, as in the case where the representative is unavailable, the custody record should contain a statement that the samples were delivered to the designated location at the designated time.

Serialized Chain-of-Custody Records should be assigned and accounted for in a manner similar to that for the sample tags, as described below. When samples are transferred from a field sampler or courier to laboratory

personnel, the analyst, after signing, retains the original custody record and files it in a safe place. A copy of the custody record should be returned to the sampler.

8.5.3 Labeling and Packaging

All samples collected for the Task Force should be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. Sample labels should have a pre-assigned, unique number that is indelible; the label should also be waterproof. Preferably, a two-part label should be used so that the sample identification number can be affixed to the sample bottle and can also be entered in a field logbook at the time of collection, along with pertinent remarks. The label to be attached to the bottle should list only the sample number; the label for the notebook should include this number as well as:

- project code number
- station location and number
- date and time
- sample type (composite or grab)
- signature of sampler
- preservative indication (yes or no; type)
- analyses required
- additional remarks

Samples should be packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate custody record accompanying each shipment (e.g., one for each field laboratory, one for samples driven to laboratory). Shipping containers should be padlocked or sealed for shipment to the laboratory. Only metal or plastic ice chests should be utilized as the outside shipping container for routine environmental samples. This strong outside shipping container must be able to withstand a 4-foot drop on solid concrete in the position most likely to cause damage. The drainage hole at the bottom of each ice chest should be permanently plugged to prevent any possibility of leakage through the hole. Each ice chest must be clearly marked with arrows indicating the proper upright

position of the container, a label indicating "THIS END UP" on the top, a label stating "ENVIRONMENTAL SAMPLES" on the lid, and a sticker containing the originator's name and address.

All field personnel should be cognizant of DOT criteria for classifying samples as hazardous material. When there is reasonable doubt as to whether or not a particular sample is subject to DOT regulations, the shipper should consult with the SMO or his/her supervisor prior to shipping the sample.

Each ice chest offered for shipment should be securely taped shut. This should be accomplished by wrapping reinforced tape at least one complete overlapping wrap around the ice chest near each end, where the hinges are located.

Sample containers should be packaged in the following manner:

- Glass Containers

1) The container's screw-type lid should be tightened securely before it is placed in the shipping container. Glass stoppers must be held securely in place with wire or nylon reinforced tape.

2) The containers should be separated in the shipping container by cushioning (e.g. styrofoam) or absorbent material (e.g. vermiculite to prevent breakage due to contact with other glass containers or solid objects.

3) The small glass vials for organic samples should be placed inside a larger plastic container to minimize breakage and to contain any leakage.

- Plastic Containers

1) The cap should be tightened securely before it is placed in the shipping container.

2) Although the plastic containers do not need cushioning material between them, they do need to be protected from punctures from sharp objects.

All sample containers and wet ice should be packed inside a sturdy plastic bag, placed inside the shipping container as an inner pack. The plastic bag will be tightly closed with wire, nylon reinforced tape or other positive means after all of the sample containers and ice have been added to prevent any leakage of material from the bag.

8.5.4 Transportation

Samples processed through the CLP must be packaged for shipment in compliance with current U.S. Department of Transportation (DOT) and commercial carrier regulations. All required government and commercial carrier shipping papers must be filled out and shipment classifications made according to current DOT regulations. In general, sample classification procedures and shipping requirements are designed for samples containing less than 10 ppm of any single organic pollutant and less than 100 ppm of any single inorganic pollutant, although the samples may well exceed these concentrations. Investigative team leaders must exercise judgment, such that if samples are suspected of containing substantially higher concentrations, they be treated as Hazardous Samples. Questions concerning sample packaging may also be directed to the SMO.

Sample Traffic Reports, Chain-of-Custody Records, and any other shipping/sample documentation accompanying the shipment should be enclosed in a waterproof plastic bag and taped to the underside of the cooler lid. In general, preservatives added to routine environmental samples will not affect the classification of the samples for shipping purposes. However, preservatives in pure or concentrated form should not be shipped via commercial means.

Samples for organics analysis must be shipped "Priority One/Overnight." If shipment requires more than a 24-hour period, sample holding times can be exceeded compromising the integrity of the sample analyses.

Samples for inorganics analysis should be held until sampling at the facility is complete and shipped "Standard Air" for two-day delivery. Three days is the anticipated maximum period for collection of facility samples.

The SMO should be notified immediately after sample shipment, and should be provided with the following information:

- sampling contractor's name
- project number
- exact number(s) and type(s) of samples shipped
- the name of the facility and location from where the samples are being shipped
- the laboratory that the samples were shipped to
- carrier, airbill number(s), method of shipment (e.g., priority, two-day)
- shipment date and time
- irregularities or anticipated problems, such as special handling needs, hazardous samples, etc.

Sample shipments made after 5:00 P.M. EST should be called in to the SMO at the start of business the next day (8:00 A.M. EST). The SMO must be notified by 3:00 P.M. EST Friday concerning information on sample shipments going out Friday intended for Saturday delivery/pickup. CLP laboratories remain open to receive or pick-up Saturday shipments only upon advance notification by the SMO and only when shipment airbill numbers have been provided to the SMO by the sampler.

9.0 COMPLIANCE EVALUATION

9.1 Introduction

Upon completion of the review of the document package, site inspection notes, and sample analyses, the Team Leader (NEIC or Region) will draft a facility compliance evaluation report. The on-site coordinator will collect all completed checklists, forms and pertinent documents from members of the combined inspection team. The findings developed from the final debriefing meeting at the end of the facility inspection should be incorporated in the report which will focus on the following:

1) Observations and findings from the data review and the on-site inspection,

2) Conclusions covering regulatory compliance of the facility's ground-water monitoring program, and probable nature and level of groundwater contamination, and

3) Recommendations on technical activities necessary to achieve compliance or determine the nature and extent of contamination.

9.2 Scope of Meeting

Within one week after the issuance of the draft report, the Regional Team Leader should coordinate a second meeting of all team leaders and managers from each organizational unit involved. The purpose of the meeting is to review the facility evaluation report, reach a consensus on appropriate changes and to develop appropriate action strategies for attaining compliance with RCRA regulations and with the Superfund off-site policy.

If certain technical problems cannot be resolved at the meeting, the Regional Team Leader should compile a list of these technical problems and submit to the Technical Advisory Panel for review and guidance.

9.3 Technical Objectives

9.3.1 Status of Facility RCRA Compliance

The Facility Evaluation Report should combine the results of the site visit with the background information from the Document Package to create a complete profile of the facility's current or potential impact on the areal ground water. This profile should allow the Task Force to reach a consensus on the degree that the prescribed technical objectives have been met, with respect to the status of the facility's compliance with ground-water regulations and requirements.

9.3.2 Identification of Appropriate Action

In order to decide appropriate action for a facility, the investigation team members must agree on the ground-water monitoring compliance status of the facility. The EPA publication, "Ground Water Technical Enforcement Guidance Document" (Draft, March 21, 1985) provides detailed technical guidance in evaluating ground-water monitoring systems at commercial land disposal facilities. The document discusses the following issues:

- Characterization of Site Hydrogeology,
- Placement of Detection Monitoring Wells,
- Monitoring Well Design and Construction,
- Sampling and Analysis,
- Data Quality,
- Methods for Presenting Detection and Assessment Monitoring Data
- Statistical Analysis of Detection Monitoring Data, and
- Assessment Monitoring.

Based on a detailed site-specific evaluation by the team, the probable sources of contamination, if any, can be identified and the degree of contamination can be approximated. The investigation team can then identify the appropriate action(s) that will be required to bring the facility into compliance. Chapter 5 of the EPA publication, "Compliance Order Guidance" (Draft, March 21, 1985), provides detailed guidance on how to identify and

design appropriate technical actions and how to incorporate these actions into an enforcement strategy that will correct present violations while advancing a facility toward permitting.

9.3.3 Schedule For Action

A preliminary implementation schedule should also be developed to be reviewed by the Facilities' Management and be incorporated into the Facility Management Plan. Limiting factors such as weather, personnel availability, scheduling conflicts, and equipment availability should be considered to insure the schedule is workable.

9.4 Recommendations

In finalizing the facility evaluation report, the participants of the consensus meeting should agree on the appropriate actions and develop a preliminary enforcement strategy to bring the facility into compliance. Areas where the appropriate action may be focused on includes:

- o Modification of the ground-water monitoring system
- o Sample collection and handling procedures
- o Leachate collection system
- o Waste treatment and disposal unit design
- o Data QA/QC including chain-of-custody procedures
- o Waste analysis and waste management plans

These recommendations will be incorporated into a comprehensive Facility Management Plan (Chapter 10) to be prepared by the Region.

9.5 Technical Report

A draft report should be completed and distributed by the Region (or NEIC in the case of the first report for each Region) to members of the combined inspection team for review and comments, two weeks after the completion of the field inspection.

All involved groups will review the draft and the technical staff will meet to comment and iron out disagreements. NEIC or the Region will revise the report accordingly and issue a second draft to the respective team leaders.

The Core Team, through the Director, will submit any additional technical problems to the Technical Advisory Panel for review and advice.

The Regional Team Leader will schedule a consensus meeting of team leaders and managers from each organization unit involved to resolve any remaining disagreements and to discuss problems that developed in conducting the evaluation. This meeting will be kept to a small group to facilitate discussion and agreement. NEIC or the Region will finalize the report in accordance with decisions made at the meeting.

10.0 FOLLOW UP

10.1 Development of a Facility Management Plan

Based on the findings and recommendations in the finalized technical report, Regional EPA staff will prepare a draft Facility Management Plan. This Plan should describe the methods and procedures the Region will utilize to gain facility compliance with rules, regulations, orders, etc., and/or resolve facility problems identified in the technical report. Moreover, the Plan should identify the likely participating agencies, as well as their respective responsibilities and the anticipated administrative/enforcement actions to be initiated by each agency. The following is a summary of the major elements and areas of concern that should be addressed in the draft plan:

- Overview of the facility's history of operations and compliance status (from the technical report);

- Definition of specific short and long-term objectives to be achieved by the facility;

- Outline of available mechanisms for achieving compliance (from the technical report), such as issuing administrative orders and/or penalties, issuing new/modifying existing permit conditions, etc. (EPA's draft report, "Compliance Order Guidance," March 21, 1985, provides a framework for developing administrative/enforcement actions against non-complying interim status facilities. Appendix C in this protocol describes the various administrative/enforcement orders available under CERCLA and RCRA.);

- Identification of the likely mechanism(s) to be used for gaining facility compliance or problem resolution;

- Identification of upcoming facility-related deadlines, such as issuance/reauthorization of permits, enforcement action

deadlines, etc.;

- Identification of likely participating agencies;

- Establishment of roles, responsibilities and actions to be initiated by each agency; and

- Establishment of liaison/coordinating mechanism(s) and outline of procedures for coordinating actions from state and local agencies.

The Region will provide a draft copy of the Facility Management Plan to each participating agency for review and comment. One copy of the draft Plan will also be provided to the Office of Waste Programs Enforcement (OWPE), whose role is to ensure overall consistency in enforcement-related actions.

The RTL will schedule and conduct a meeting with team leaders and managers from the various participating agencies to: 1) discuss the Plan and resolve any problems, 2) conclude what actions should ensue, 3) develop a schedule for initiating the identified actions, and 4) assign responsibilities for implementing those actions and monitoring their progress.

10.2 Implementation of Facility Management Plans

Based on the results of the consensus meeting on the Facility Management Plan, the identified responsible agency (Regional Office or State) will implement appropriate action(s) -- orders (see Appendix C), modified/new permit conditions, etc. -- according to the plan's schedule and through normal operating channels.

The Core Team will assist the responsible agency in initiating the selected corrective action by arranging for the OWPE and OSW to resolve any issues of interpretation and to provide any assistance that is desired in writing any orders or permits.

The schedule of corrective action will include a timetable for meeting each

objective in the plan. Each schedule will be facility-specific and should reflect the following issues:

- o magnitude of the problem, as this may dictate the expediency of the solution, and

- o local factors, such as weather and availability of equipment and personnel.

The timetable will contain milestones by which progress towards compliance may be assessed.

Actions to be initiated at facilities whose treatment, storage or disposal operations pose an actual or imminent threat to human health or the environment should be expedited to eliminate or minimize any resulting damage(s). Where such a threat is determined by the responsible agency (Region, State, local) to be imminent, the Region will initiate action by the Emergency Response Team (ERT). The ERT will determine whether and to what degree additional immediate action may need to be initiated by the appropriate responsible agency. At facilities where the responsible agency determines that an actual or imminent threat does not exist, the schedule of actions outlined in the Plan will apply.

10.3 Monitoring the Progress of Initiated Actions

The Core Team will conduct a weekly review with the RTL on the progress of all actions taken at each facility. The Core Team will then issue their progress report to the Director of the Task Force. The Director will then issue, through his office, bi-weekly progress reports to the Senior Management Steering Committee and will brief the Committee on the progress at specific facilities where deemed appropriate.

10.4 Identification of Implementation Problems

When a facility does not achieve the milestones identified in the action, the responsible agency will also teleconference/meet with the Core Team and

RTL during the weekly facility review. The responsible agency will discuss what additional measures need to be initiated and what type and degree of support, if any, may be required from the EPA Regional office or Headquarters. After concurring on the appropriate additional action (enforcement order, penalty, fine), which reflects the facility's degree of culpability and noncompliance, the appropriate agency will initiate that action.

Problems dealing with the administrative aspects of the program will be handled by the Operations Assessment Group.

The Core Team representative will communicate to the Operations Assessment Group at Headquarters, problems with guidance, policies, regulations, availability of technology, organization, skills, and any other identifiable problem areas that may impact the program.

10.5 Final Report

A final report will be compiled by the Core Team at the conclusion of activity which will summarize all of the activities of the Hazardous Waste Groundwater Task Force.

APPENDIX A

FIELD INVESTIGATION REPORT FORMAT

Field Investigation Report*

GROUNDWATER MONITORING SYSTEM (Section to be completed before site visit)

Resource Documents:

Summary:

* Field Investigation Protocol developed by U.S. EPA Region X

A. Identification of Hazardous Waste and Regulated Units

A. Identification of Hazardous Waste and Regulated Units

1) What HW are being land treated at this facility?
2) What groundwater regulated process units are utilized at this facility?
3) How long have these HW been put into units?
4) What volume of HW and other liquids have been put into the regulated unit.
5) What is the chemical character of the materials being placed in the regulated unit?
6) If tests have been run, is a copy of the results available?
7) How long have these waste been deposited in the unit?
8) Are any closed fill areas at nor near the regulated units?
9) Are there ponds or lagoons within the regulated unit?
10) If yes, are the metered?
11) Are there any groundwater chemical analyses available?

Comments:

B. Regional Hydrogeological Information

1) Has a geologic/hydrologic study been done by a qualified professional?
2) Is a regional map of the site available?
3) Is a local map of the site available?
4) Are there any significant topographic features?
5) Has the geology of the site been mapped?
6) Is the geologic map available?
7) What type of formation underlies the region?
8) Is formation consolidated, unconsolidated, fractured?
9) Is formation heterogeneous enough to cause a possible differentiation in pollutant flow?
10) Are any streams, rivers, lakes or wetlands near the facility? Distance? Direction?
11) Is there more than one aquifer beneath the site? Are they hydraulically connected?

Comments:

C. Site Specific Hydrogeological Information?

1) Is there a site specific geohydrologic map available?
   What is the date of issue?
   Are any recent (post map date) changes evident?
2) Are local discharging wells noted? Distance? Direction?
3) Does pumping of surrounding wells change or reverse the direction of the hydraulic gradient?
4) Are potentiometric maps available?
   Is groundwater flow direction noted?
   Are the contours logical based on other maps?
   Is the facility along with the HW units plotted (Scale)?
   Are any seeps, springs, etc., shown near the facility?
   Are monitoring wells plotted?
   Is site potentiometric surface plotted?
   Is the indicated potentiometric surface compatible with regional hydrology?
      Are site flow lines indicated?
      What are the contour intervals?
      Are static water elevations shown?
5) Does the facility affect the groundwater surface?

Comments:

D. Monitoring Well Locations

1) Are logs of all wells and borings available from either onsite or offsite?
2) Are the monitoring wells completed in the same stratum as nearby water supply wells? If no, please explain. Are any types of geophysical logs available? Were any discrete formation samples taken? How were these samples taken?
3) Are any physical tests of aquifer materials available?
4) Have the elevations of the wells been surveyed to sufficient accuracy to determine gradient?
5) Is there sufficient distance between wells to establish a gradient on the potentiometric surface?
6) Do the regulated units create a groundwater mound?
7) Is the upgradient well(s) placed in a position to represent a background condition.
8) Does intermittent flow to the disposal site affect the groundwater mound?
9) Do the downgradient wells monitor the mounding at the water surface?
10) Are the groundwater monitoring wells placed in a position such they can immediately detect any groundwater contamination from the regulated unit?
11) Does the master map clearly show the monitoring wells and their assigned identification numbers?

Comments:

E. Well Completion

1) Are the wells constructed of nonreactive materials?
   Casings? Screens? Gravel pack materials?
   Have any glues or solvents been used?
2) Have the wells been sealed to prevent downward migration of contaminants? Bentonite? Cement? Other? How?
3) Will these contact the water being sampled?
4) Are the wells capped and locked to prevent vandalism?
   If no, what security measures taken?
5) Are the wells protected against vehicular damage?
6) Are the wells completed in the first water bearing zone?
7) Is this the regional aquifer?
8) Is this a perched aquifer or zone?
9) Are the wells screened in water bearing materials?
   What type of screen was used?
   Size of openings?
10) Does the screen extend above the water surface so as to detect "floating" contaminants or account for fluctuating water levels?
11) Are the wells gravel or sand packed around the screen?
   What materials were used in the pack?
   What was the source of those materials?
12) Are the wells screened at the correct level?
13) What was the method of drilling? Auger? Mud Rotary? Air Rotary? Reverse Rotary? Cable Tool? Jetting? Other?
14) Was the equipment cleaned prior to drilling? How?
15) Were any additives, including non-formation water, used during or after drilling?
16) What precautions were taken to prevent cross-contamination during drilling?
17) Have the wells been developed? By what method? Was any non-formation fluid used for jetting or surging?

Comments:

F. Sampling and Analysis Plan

1) Does the plan specify the procedures to be used to collect the required samples?
2) Does the plan specify the data and methods for in field collection?
3) How soon after well completion was the first sample taken?
4) How is the plan deficient?

Comments:

G. Well Summary Table

Please complete the following summary of pertinent well information. Four wells are the minimum considered adequate, if more than four wells, use additional sheets.

		Upgradient		Downgradient	
Well	Number	Well_____	Well_____	Well_____	Well_____
1)	Total depth				
2)	Casing diameter				
3)	Length of casing				
4)	Screen length				
5)	Screen slot size				
6)	Screened interval	From To	From To	From To	From To
7)	Gravel Pack interval	From To	From To	From To	From To
8)	Ground Elevation				
9)	Height of Casing Above Ground				
10)	Elevation of measuring point				
11)	Depth to Water				
12)	Elevation of water				
13)	Source of Data				

Driller's Name_____

Geologist/Engineer_____

Comments:

H. Map of facility

Approx. Scale_____

. Monitor Well

* Water Supply Well

SAMPLING TECHNIQUE (Section to be completed during site visit)

Resource Documents:

Summary:

A. Well Purging

1) Well correctly identified?
2) Depth to water measured?
3) Depth to bottom measured or available from records?
4) Sounding equipment cleaned after use?
5) From where in the well is the water drawn?
   Is this depth consistently maintained?
6) Volume to remove calculated?
7) How do you determine that formation water is being sampled?
   Number of well casing evacuated?
   Stabilization of pH, eh, spec. cond. or temp.?
8) What method is used to purge the wells?
   If commercially available, what make and model number?
9) Why was this method selected?
   Has this procedure been maintained throughout the sampling program?
   If not, what other methods have been used?
10) What period of time usuals elapses between purging and sampling?
11) Water collected and stored if hazardous?
   How is this water disposed of?
12) Were the samples turbid? Which?
   What precautions are taken to avoid cross contamination?
   Individual pumps or bailers?
   Is the same cable/rope used in all wells?
   Is the cable/rope cleaned? wrapped?

Comments:

B. Sampling Equipment

1) What type of equipment is used?

2) Is it commercially available? Make? Model No.?

3) Sampling equipment clean?

4) Sampling equipment kept clean during use?

5) Sampling equipment appropriate for contaminants?

6) Sampling equipment properly cleaned in field if needed?

Comments:

C. Sampling Procedures

1) Does the same person/contractor/laboratory always take the samples?
2) With what materials does the sample come in contact?
3) For VOA's, what is done to prevent sample aeration?
4) Are sample containers appropriate for analytes? (See Appendix A)
5) Are preservatives used?
   Are they added in lab.? field?
6) How are containers handled prior to taking sample?
   Are they washed, with what?
7) Are field blanks used?
   If yes, is the water source regularly tested?
8) Have the methods used been consistent since the program started?
   If no, what changes have been instituted?
9) Have laboratories been changed since analysis begun? Which?
10) Provide a list of methods that are being used by the lab. for analysis along with the detection limits for each parameter.
11) Are samples refrigerated after collection?
12) What is the average holding time before samples are analyzed?
13) Are time sensitive parameters measured in the field or in the lab?

Comments:

D. Field Measurements

1) pH - Meter warmed up?
Calibrated with proper buffers (4 and 7,or 7 and 10)?
Corrected for temperature?
Measurements repeated until within 0.1 pH unit?

2) Conductivity - Calibrated with 0.01 N KCl standard?

3) Temperature - Measured as soon as sample taken?

Comments:

E. Sample Containers

1) Documentation of proper cleaning?

2) Correct containers (see Appendix A)?

Comments:

F. Field QA/QC

1) Field QA/QC samples prepared?
   - Duplicates
   - Samples preservative blank
   - Spikes
   - Transport/transfer blanks
2) Bottles prerinsed with sample water (except pesticides/herbicides)?
3) Correct preservatives used (see Appendix A)?
4) Sample holding times not exceeded (see Appendix A)?

Comments:

G. Sample Labels

1) Integrity?
2) Required information?
   - Unique sample number
   - Name of collector
   - Date and time of collection
   - Place of collection
3) Optional information?
   - Sample type
   - Preservative used
   - Analyses required
   - Field information

Comments:

H. Sample Seals

1) Integrity?

2) Required information?

Unique sample number (same as label)

Name of collector

Date and time of sampling

Comments:

I. Field Log Book

1) Bound?

2) Entries?

Purpose of sampling

Unique sample number

Date and time of collection

Names of all persons present

Location of sample point (description and/or sketch)

Description of sampling methodology

Number and volume of sample taken

Suspected composition of sample

Name and address of field contact

Sample distribution and transportation

Field observations

Field measurements

Signature of sampler

Comments:

J. Chain of Custody Record

1) Required information?
   - Sample number
   - Signature of sampler
   - Date and time of collection
   - Place and address of collection
   - Type of sample
2) Number and type of containers
3) Signature of custodian
4) Inclusive dates of possession
5) Signature of receiver
6) Description of shipping container

Comments:

K. Sample Analysis Request

1) Field Information?
   - Name and phone number of collector
   - Date and time of collection
   - Collector's sample number
   - Field information
   - Analysis requested
   - Special handling or storage
2) Laboratory information?
   - Name of person receiving sample
   - Date of sample receipt
   - Analysis required

Comments:

L. Sample Shipping

1) Samples packed to prevent breakage?
2) Chain of custody record enclosed?
3) Sample analysis request enclosed?
4) Shipping container sealed?

Comments:

M. Sample Receipt

1) Condition of samples checked?
   - Containers intact
   - Preservative present
   - Seal intact
2) Sample information checked?
3) Chain of custody record present?
4) Sample and seal information match chain of custody record?
5) Chain of custody record signed?
6) Request for analysis present?
7) Receipt of sample entered in laboratory log book?
8) Laboratory sample number assigned?

9) Sample stored in secure area:

Comments:

N. Lab QA/QC

1) Lab quality assurance plan available?

2) Documentation of EPA acceptable methods?

3) Instrument calibration records available?

4) Copies of QA/QC control charts available?

5) Method accuracy and precision calculated and reported?

Comments:

DATA ANALYSIS

Resource Documents:

Summary:

A. Duplicate Sample Data

Data Source:

Summary:

B. Other Data (Other than split Sample)

Data Source:

Summary:

GROUNDWATER MONITORING DATA STATISTICAL ANALYSIS

"t" STATISTICS

EPA ID NO. _____ SAMPLE DATE _____

FACILITY _____ BACKGROUND WELL(S) _____

		n	mean	variance	tc	t*
W	pH					
E	Sp. Cond.					
L	TOC					
L	TOX					
W	pH					
E	Sp. Cond.					
L	TOC					
L	TOX					
W	pH					
E	Sp. Cond.					
L	TOC					
L	TOX					
W	pH					
E	Sp. Cond.					
L	TOC					
L	TOX					

PARAMETERS USED AS INDICATORS OF GROUND-WATER CONTAMINATION

Upgradient Well

Well # _____

PARAMETER (UNIT)	REPS	pH (pH UNITS)	SPECIFIC CONDUCTANCE (umhos/cm)	TOC (mg/l)	TOX (ug/l)
Quarter 1	1				
Sample Date _____	2				
Water Elev. _____	3				
	4				
Quarter 2	1				
Sample Date _____	2				
Water Elev. _____	3				
	4				
Quarter 3	1				
Sample Date _____	2				
Water Elev. _____	3				
	4				
Quarter 4	1				
Sample Date _____	2				
Water Elev. _____	3				
	4				
Background Mean					
Background Variance					

GROUNDWATER MONITORING DATA STATISTICAL ANALYSIS

COMPOSITE RESULTS OF STUDENT'S t-TEST

EPA ID NO. _____ SAMPLE DATE _____

FACILITY _____ BACKGROUND WELL(S) _____

	Significant Change	No Significant Change
pH		
Specific Conductance		
TOC		
TOX		

Monitoring:

Upgradient well(s) _____
Downgradient well(s) _____

SAMPLE VOLUMES, CONTAINERS, PRESERVATIVES, AND HOLDING TIMES FOR SELECTED CHEMICAL PARAMETERS

DRINKING WATER QUALITY PARAMETERS

Metals (dissolved)

As, Ba, Cd, Cr, Pb, Se, Ag
- 200 ml
- Plastic or glass
- *Filter on site
- Add HNO_3 to pH less than 2
- 6-month holding period

Hg
- 100 ml
- Plastic or glass
- *Filter on site
- Add HNO_3 to pH less than 2
- 28-day holding period

Anions

Cl
- 50 ml
- Plastic or glass
- No preservative
- 28-day holding period

F
- 300 ml
- Plastic
- No preservative
- 28-day holding period

NO_3
- 100 ml
- Plastic or glass
- Cold (4 C)
- Add HNO_3 to pH less than 2
- Analyze within 28 days

Organochlorine Pesticides and Herbicides

Endrin, Lindane, Methoxychlor, Toxaphene
- 500 ml
- Glass with teflon lined cap
- Cold (4 C) only, if extracted within 48 hours
- Cold (4 C) and adjust pH to 6 to 8 with NaOH or H_2SO_4 if extracted after 48 hours
- All samples extracted within 14 days

2,4-D; 2,4,5-TP
- 500 ml
- Glass with teflon cap
- Cold (4 C)
- All samples extracted within 7 days

GROUNDWATER QUALITY PARAMETERS

Metals

Fe, Mn, Na
- 200 ml
- Plastic or glass
- *Filter on site
- Add HNO3 to pH less than 2
- 6-month holding period

Anions

Cl
- 50 ml
- Plastic or glass
- No preservative
- 28-day holding period

SO4
- 50 ml
- Plastic or glass
- Cold (4 C)
- 28-day holding period

Organics

Phenols
- 500 ml
- Glass
- Cold (4 C)
- H3PO4 to pH less than 4
- 1.0 gm CuSO4 per liter
- 28-day holding period

GROUNDWATER CONTAMINATION PARAMETERS

pH
- 25 ml
- Plastic
- No preservative
- Determine on site
- 6-hour holding period

Specific Conductance
- 100 ml
- Plastic
- Cold (4 C)
- 28-day holding period

Total Organic Carbon (TOC)
- 25 ml
- Plastic or glass
- Cold (4 C)
- H_2SO_4 or HCl to pH less than 2
- 28-day holding period

Total Organic Halogen (TOX,
- 250 ml
- Glass with teflon septum or liner
- No headspace
- Cold (4 ' C)
- 24-hour holding period

Semi-volatile Organics
- 1 liter
- Glass, no prerinse
- Refrigerate at 4 C
  - If residual chlorine present and sample will not be extracted within 48 hours, add 35 mg sodium thiosulfate per ppm free chlorine/liter of sample. Adjust pH to 7-10 with NaOH or H_2SO_4. Record volume of acid or base used.
- All samples extracted within 7 days
- * All samples analyzed witnin ~~30~~ 40 days

Volatile Organics
- 720 ml
- Septum vials
- No sample agitation or entrained air
- Analyze within 7 days
- No preservatives
- No prerinse
  - If known to be chlorinated, prior to shipment of containers add 1 ug/40 ml sodium thiosulfate to emoty sample containers
- Hold at 4 C

* see Fed Reg. Fri, Oct 26, 1984; Part VIII; 40 CFR Part 136; p. 28

APPENDIX B

NEIC PROCEDURES FOR CONDUCTING AN INSPECTION UNDER A WARRANT

NEIC'S PROCEDURES FOR CONDUCTING AN INSPECTION UNDER A WARRANT

In the event that entry is denied or consent withdrawn, the Enforcement Division must be contacted. Normally an Enforcement Attorney will take the necessary actions to secure three separate documents and submit them to the judge or magristrate in order to obtain a warrant, viz:

1. Application for a Warrant

   a. Statement of statutory and regulatory authority for the warrant.

   b. Identification of the site or establishment desired to be inspected (and if possible the owner and/or operator of the site).

   c. Summary of the factual background for the warrant as stated in the affidavit.

2. Affidavit

   a. The affidavit should contain consecutively numbered paragraphs which provide detailed descriptions of the facts which support the issuance of a warrant.

   b. The factual description should recite or incorporate the specific probable cause or neutral administrative scheme which led to the particular establishment's selection for inspection.

   c. The affidavit must be signed by a person with personal knowledge of all the facts contained therein (in refused entry proceedings, this person would most likely be the inspector denied entry).

d. An affidavit is a sworn statement which, therefore, must be either notarized or personally sworn before the magistrate.

3. Draft Warrant

The contents of the warrant varies based on the type of warrant sought (discussed below). The warrant should be submitted in such a form that the judge or magistrate merely has to sign it to make it valid.

a. Civil specific probable cause warrant - based on some specific reason to believe that the requirements of the statute or regulations are being violated. A civil warrant could be sought only where it can be accurately stated in the affidavit that the purpose of the inspection is to find and remedy the statutory violation through noncriminal proceedings.

Therefore, this warrant will be used when the inspection is being made in response to the discovery of a potential or actual violation from another source, i.e., a citizen's complaint or through the report screening process. If possible, such a warrant should be obtained rather than a neutral administrative inspection scheme warrant (discussed below).

b. Civil probable cause based on neutral administrative inspection scheme, i.e., showing that "reasonable legislative or administrative standards for conducting an ... inspection are satisfied with respect to a particular establishment." Marshall v. Barlow's Inc., _____ U.S. _____, 98 S. Ct. 1816 (1978). A warrant based on a neutral administrative process can be issued only if the facility for which the warrant is sought was selected for inspection through this neutral process. Therefore,

this type of warrant may be used for regularly scheduled inspections, e.g., annual inspections, post closure inspections, etc.

c. Criminal warrant - obtained when the purpose of inspection is to gather evidence for a criminal prosecution in accordance with Rule 41 of the Federal Rules of Criminal Procedures. This type of warrant requires a specific showing of probable cause to believe that evidence of a crime will be discovered. It should be noted that, oridinarily, evidence of a criminal violation discovered under a civil probable cause warrant will be admissible in court (see Section IV, Exhibit 1, p. 2). Therefore, this type of warrant will be used only where the Agency is reasonably certain that criminal violations have occurred.

4. Securing a Warrant

The following procedures should be followed in securing a warrant:

a. When an inspector is refused entry, the inspector should leave the premises immediately.

b. The inspector should then immediately contact the designated Regional Enforcement Attorney to inform him/her of the situation. The inspector should at this time report any exigent conditions; i.e., dumping, etc.

c. The Enforcement Attorney will assist the inspector in the preparation of the necessary documents.

d. The Enforcement Attorney will arrange for a meeting with the inspector and a U.S. Attorney. The inspector will bring a copy of the appropriate draft warrant and affidavits.

e. The Enforcement Attorney should inform the appropriate Headquarters Enforcement Attorney of any refusals to enter and send a copy of all papers filed to headquarters.

f. The attorney will then secure the warrant and forward it to the inspector; and/or the U.S. Marshall.

5. Inspections with a Warrant Should Comply with the Following:

a. Use of a Warrant to Gain Entry

i. If there is a high probability that entry will be refused even with a warrant or where there are threats of violence, the inspector should be accompanied by a U.S. Marshall.

ii. The inspector should never himself/herself attempt to make any forceful entry of the establishment.

iii. If entry is refused to an inspector holding a warrant but not accompanied by a U.S. Marshall, the inspector should leave the establishment and inform the Enforcement Attorney.

b. Conducting The Inspection

i. The inspection must be conducted strictly in accordance with the warrant. If the warrant restricts the inspection to certain areas of the premises or to certain records, those restrictions must be adhered to.

ii. If sampling is authorized, all procedures must be carefully followed including presentation of receipts for all samples taken. The facility should also be informed of its right to retain a portion of the samples obtained by the inspector.

iii. If records or property are authorized to be taken, the inspector must provide receipts and maintain an inventory of all items removed from the premises.

6. Procedures to be Followed Upon Completion of the Inspection

i. Whoever executed the warrant must sign the Return-of-Service form indicating on whom the warrant was served and the date of service.

ii. The executed warrant must be submitted to the U.S. Attorney for formal return to the issuing magistrate or judge.

iii. An inventory of any items which were taken from the premises must be submitted to the court, and the inspector must be present to certify that the inventory is accurate and complete.

INSPECTIONS

The purpose of the site inspection is to obtain information, data, and in some cases samples, to assess the problem and to develop the project plan for a field investigation. If samples are collected, established sampling methods and Chain-of-Custody procedures must be followed. The data from the samples may be used in enforcement actions.

The investigation must be thorough. Do not attempt to rush through the inspection. The inspection is complete only when the objectives are met and the inspector is satisfied that all data and information have been collected to assess the situation. A careful review of the field notes is required before leaving the area to ensure that the objectives have been met.

Before the inspection is completed, the inspector should prepare a sketch of the site, in the logbook if possible, locating fixed reference points and locations of disposal and storage. If samples are collected, the sample locations should be marked on the sketch. Inventory of visible drums should be made where possible and also located on the sketch. The contents of the drums will probably be different than the contents specified on the labels; nevertheless, the labels may provide useful information.

In addition to the drum inventory, the inspector should check for sewers, drains, spills or liquid disposal and evaluate the runoff potential. The potential for fires, explosions, and other imminent hazards should also be evaluated. If the situation requires an emergency response, the Oil and Hazardous Materials Coordinator in the Regional Office should be contacted immediately. Observations of soils and exposed subsurface materials should be made. However, care should be taken not to handle materials which may be contaminated.

APPENDIX C

FACILITY INSPECTION CHECKLIST

CHECKLIST
FOR
COMPREHENSIVE GROUND WATER
INSPECTIONS
AT
RCRA FACILITIES

FACILITY NAME _____
EPA I.D. # _____
FACILITY ADDRESS _____
_____
_____

FACILITY CONTACT/TITLE _____
_____

INSPECTORS NAME _____
DATE _____
TYPE OF FACILITY: (Check one or more)
SURFACE IMPOUNDMENT _____
LANDFILL _____
LAND TREATMENT _____

GENERAL COMMENTS/OBSERVATIONS

Y or N

ALTERNATE GROUND WATER MONITORING SYSTEM

____ 1. Was plan submitted to RA or SD by 11/19/81?

____ 2. Was plan certified by qualified geologist or geotechnical engineer?

____ 3. Does plan specify:

- number, location and depth of wells. (Evaluate using items 4 and 5, p. 2).

____ - sampling and analytical methods for those hazardous waste or hazardous waste constituents in the facility? (Evaluate using item 2, p. 3).

____ - evaluation procedures including previously gathered groundwater quality information?

- schedule for implementation?

____ 4. Was the plan implemented by 11/19/81?

____ 5. Did the plan define:

- rate and extent of migration of hazardous waste or hazardous waste constituents?

____ - concentrations of constituents?

____ 6. Was a report, based on the results of the implemented plan, submitted to the RA or SD in a timely manner (as soon as technically feasible)?

____ 7. Has the owner/operator continued to monitor quarterly?

____ 8. Are records of the analyses and evaluations resulting from implementation of this plan kept at the site?

____ 9. Is there evidence that the required annual assessment report including calculated or measured rate of migration has been submitted to the RA or SD?

Y or N

DETECTION MONITORING PROGRAM SYSTEM

____ 1. Do records indicate that all wells consistently yield samples of ground water for analysis (look for "DRY" or other similar notations)?

____ 2. Is there at least one well indicated as being located hydraulically upgradient of the waste management area?

3. Are there at least three wells indicated as being located hydraulically downgradient of the waste management area? (Note: In the case of extremely small units, one or more of these wells may have been waived. If so documentation should be provided. Is it? Who granted the waiver?

4. What was the basis for locating the wells:

   - Only topographic considerations
   - Geotechnical consultant/borings
   - Other (Specify)

5. Are there any records regarding well construction on file?

   If no records are available on construction, can the owner/operator or anyone else supply any or all of the following information based on recollection? If any of this information is available, please describe in a report to be attached to this inspection details of the following:

   - How were wells bored?
   - What considerations were given to screening, packing and selecting appropriate aquifer flow zones for monitoring?
     - First water
     - Geotechnical consultants recommendation (what was basis for this recommendation).
     - Other (Specify)
   - Describe procedures and specifications for sealing the annular space above the screened interval.
   - How were wells developed?
   - Who drilled wells (name or company if available)?
     - Water well driller.
     - Ground water monitoring specialist.
     - Other (Specify)
   - What is type and size of casing?
   - What type, size and length of screen?
   - Was bottom of well capped?

- What method is used to determine water level elevations in wells?

  Electric water marker _____
  Steel tape _____
  Air line _____
  Other (explain) _____
  _____

- How were ground elevations at wells determined?

Y or N

SAMPLING AND ANALYSIS

_____ 1. Is there a ground water sampling and analysis plan at the facility?

_____ 2. Does this plan include adequate procedures and techniques for:

- Sample collection

  - How are wells purged and samples obtained?

    Air lift pump _____
    Submersible pump _____
    Positive displacement pump _____
    Centrifugal pump _____
    Peristaltic or other suction lift pump _____
    Bailer _____

  - Are all wells sampled with the same equipment and procedures? (Y/N) _____ If not, explain _____
    _____
    _____
    _____

  - Are provisions included to clean equipment after sampling to prevent cross-contamination between wells? (Y/N) _____

  - Are organic constituents to be sampled? (Y/N) ____
    If yes:

    Are samples collected with equipment to minimize absorption and volatilization? (Y/N) _____
    Describe equipment_____
    _____
    _____
    _____

- Sample preservation and shipment.

  - Have standard sample preservation procedures been followed (filtration and preservation where appropriate)? (Y/N) _____

  - Are samples refrigerated? (Y/N) _____

  - Are sample holding period requirements adhered to? (Y/N) _____

  - Are suitable container types used? (Y/N) _____
    Indicate type of containers used _____
    _____
    _____
    _____

  - Are provisions made to ship samples under cold conditions (ice packs, etc.)? (Y/N) _____

- Analytical procedures.

  - Reference Table 2-3, p. 61 & 62, SW-963, Revised March 1983, Groundwater Monitoring Guidance for Owners and Operators of Interim Systems Facilities. The procedures should be appropriate for drinking water or similar samples.

- Chain-of-custody control.

_____ 3. Has the owner/operator completed the first years quarterly analysis for the parameters found at 265.92 (b) (1), (2) & (3)?

_____ 4. Were all parameters included each quarter for all wells?

- Check below and note any deficiencies.

(b) (1)	(b) (2)	(b) (3)
__ Arsenic	__ Chloride	__ pH
__ Barium	__ Iron	__ Spec. Cond.
__ Cadmium	__ Manganese	__ TOC
__ Chromium	__ Phenols	__ TOX
__ Fluoride	__ Sodium	
__ Lead	__ Sulfate	
__ Mercury		
__ Nitrate (as N)		
__ Selenium		
__ Silver		
__ Endrin		
__ Lindane		
__ Methoxychlor		

(This column continued on next page)

___ Toxaphene
___ 2,4-D
___ 2,4,5-TP Silvex
___ Radium
___ Gross Alpha
___ Gross Beta
___ Turbidity
___ Coliform

___ 5. Who does analyis?

___ 6. Has this responsibility changed during sampling history?

___ 7. Were four replicate measurements for the (b) (3) parameters taken at the upgradient well (s)?

___ 8. Is there documentation that the wells were in place by 11/19/81?

- If not when were they installed? _____

___ 9. Was the 1st quarterly sampling done by February 19, 1982?

___ 10. Was the last quarterly sampling done by November 19, 1982?

___ 11. On what date did the first semi-annual monitoring occur? _____ This date should not be later than May 19, 1983.
(Note: After first year monitoring is completed the (b) (1) parameters are dropped and the (b) (2) are sampled yearly.)

___ 12. Were four replicates taken or made for each well in the system?

___ 13. Were groundwater elevations determined at each well before sampling?

EVALUATION

___ 1. Is there an outline of a groundwater quality assessment program at the facility?

___ 2. Does it describe a more comprehensive program than that specified at 265.91 and .92?

3. Does it appear to adequately describe a program capable of determining:

   - Whether hazardous waste or hazardous waste constituents have entered groundwater?

   - The rate and extent of migration of hazardous waste or hazardous waste constituents in groundwater?

   - The concentrations of hazardous waste or hazardous waste constituents in groundwater?

4. After obtaining the first (and/or subsequent) semi-annual values and concentrations for (b) (3) parameters (replicated and meaned for each well) did the owner/operator do the comparisons using the Students t-test at the 0.01 level of significance?

5. If the upgradient comparison indicated a significant change in one of the (b) (3) parameters, did the owner/operator submit notice in required annual report, if appropriate?

6. If comparison of downgradient wells indicates significant change in (b) (3) parameters, did owner/operator immediately resample to verify?

7. If the verification was positive, did owner/operator provide written notice to RA/SD within 7 days?

GROUND WATER QUALITY ASSESSMENT PROGRAM

8. Within 15 days of this notification, did the owner/operator submit an assessment plan, based on his outline, which specifies:

   - Number, location and depth of wells?

   - Sampling and analytical methods for those hazardous waste or hazardous waste constituents in the facility?

   - Evaluation procedures, including previously gathered ground water quality information?

   - Schedule for implementation?

9. If an assessment plan was implemented, was the rate and extent (both areal and vertical) of migration as well as the concentrations determined in a timely manner?

10. Were these determinations reported within 15 days to the RA or SD?

11. If the determination was that hazardous waste or hazardous waste constituents had/have entered the groundwater, has the owner/operator continued to make the determinations referenced in No. 9 above on a quarterly basis?

12. Is there evidence or documentation that the groundwater elevations have been evaluated annually to assess gradient relationship of the wells?

RECORD KEEPING AND REPORTING

FOR FACILITIES IN DETECTION MONITORING:

1. Does owner/operator have records of 1st year quarterly analyses of 265.92 (b) (1) (2) & (3) parameters?

2. Does owner/operator have records of annual analyses of (b) (2) parameters and semi-annual analyses of (b) (3)?

3. Does owner/operator have records of the groundwater elevation measurements required at 265.92 (e)?

4. Is there documentation of the following reporting requirements?

   - Timely submissions (within 15 days of analysis) of the analysis of the parameters at 265.92 (b) (1) with concentrations above the MCL highlighted?

   - By March 1, concentrations or values for the parameters at 265.92 (b) (3) for each well, with the statistical comparisons required at 265.93 (b). This report should note situations where changes in upgradient have occurred.

   - By March 1, groundwater elevation evaluations and responses when required.

RECORD KEEPING AND REPORTING

FOR FACILITIES IMPLEMENTING ALTERNATE GROUNDWATER MONITORING PROGRAMS OR ASSESSMENT PLANS:

1. Has the owner/operator kept records of the analyses and evaluations specified in the plans?

2. Has the owner/operator, by March 1 of each year submitted the required report to the RA or SD which, at a minimum includes the calculated or measured rate of migration of hazardous waste or constituents in the groundwater during the reporting period?

FIELD INSPECTION OF SYSTEM

1. Are the wells located where they appear on any drawings or documents at the facility (Part A for example)?

2. Do all the wells appear to be of the same construction and/or as indicated in facility records?

3. Are they capped or otherwise protected to prevent vandalism or accidental introduction of contaminants?

4. Does there appear to be an adequate number of wells to monitor the facility?

5. Does the upgradient well appear to be unaffected by the facility (consider spills as well as proper gradient relationship)?

APPENDIX D

HEALTH AND SAFETY PLAN FOR SITE VISITS

SAFETY AND HEALTH PLAN FOR SITE VISITS

SITE: _____ PROJECT NO: _____

Location: _____ Region: _____

Primary Contact: _____ Phone No.: _____

Plan Prepared By: _____ Date: _____

Objective(s): _____

_____

Proposed Date of Investigation: _____

Background Review is: Complete: _____ Preliminary: _____

State has additional site data.

Overall Hazard is: High: _____ Moderate: _____

Low: _____ Unknown: _____

FACILITY DESCRIPTION: _____

_____

_____

Principal Operations: _____

_____

Unusual Features (containers, buildings, dikes, power lines, terrain, etc.):

_____

_____

_____

_____

History (worker or non-worker injury, complaints from public, previous agency action): _____

_____

_____

_____

_____

_____

REVIEW AND APPROVALS

Project Manager: _____ Date: _____

Health Safety Manager: _____ Date: _____

HAZARDOUS/TOXIC MATERIAL

Known or suspected materials, contaminated media, storage container, etc.
Circle which wastes are present and estimate the amount of waste by category.

SLUDGE	OIL	SOLVENT	CHEMICALS	SOLIDS	OTHER
Amount	Amount	Amount	Amount	Amount	Amount
Unit of Measure	Unit of Measure	Unit of Measure	Unit of Measure	Unit of Measure	Unit of Measure
Paint Pigments	Oily Wastes	Halogenated Solvents	Acids	Flyash	Laboratory Pharmaceut
Metals Sludges	Other (Specify):	Non-halogenated Solvents	Pickling Liquors	Asbestos	Hospital
POTW		Other (Specify):	Caustics	Milling/Mine Tailings	Radioactive
Aluminum			Pesticides	Ferrous smelt-	Municipal
Other (Specify)			Dyes/inks	Non-ferrous	Other (Specify):
			Cyanide	Other (Specify):	
			Phenols		
			Halogens		
			PCB		
			Metals		
			Other (Specify):		

List known substances on the site

1. Substance	2. Form			3. Toxicity				Amount*	Unit
	Solid	Liquid	Vapor	High	Med.	Low	None		

WASTE TYPES: Liquid _____ Solid _____ Sludge _____ Gas _____

CHARACTERISTICS: Corrosive _____ Flammable _____ Radioactive _____

Toxic _____ Volatile _____ Reactive _____ Inert _____

HAZARD ASSESSMENT

Describe hazards taking into account toxic and pharmacologic effects, reactivity, stability, flammability, operational concerns, sampling, decontamination, etc.

MONITORING PROCEDURES

Perimeter Establishment: Map/Sketch Attached _____ Site Secured? _____

Perimeter Identified _____ Zones of Contamination Identified _____

_____

_____

Personal Protection

Level of Protection Required: A _____ B _____ C _____ D _____ E_____ F_____

Modifications: _____

_____

_____

Level A should be selected when the highest level of respiratory, skin, eye, and mucuous membrane protection is needed. The personal protection equipment required at Level A includes:

- Positive-pressure (pressure demand), self contained breathing apparatus (MSHA/NIOSH approved).
- Fully-encapsulating chemical resistant suit (OSHA response suit).
- Gloves, inner, chemical resistant.
- Boots, chemical resistant, steel toe and shank (depending on suit boot construction, worn over or under suit boot).
- Underwear, cotton, long-john type. (Optional)
- Socks, cotton.
- Coveralls, cotton (undersuits). (Optional)
- Hard hat (under suit). (Optional)
- Nonsparking tools.
- Explosion-proof lantern.
- Two-way radio communications (intrinsically safe).
- Personal radiation detectors.

Level B protection should be selected when the highest level of respiratory protection is needed, but a lesser level of skin and eye protection. Level B protection is the minimum level recommended on initial site entries until hazards have been further identified and defined by monitoring, sampling, and other reliable methods of analysis, and personnel equipment corresponding with those findings utilized. The personal protection equipment required at Level B includes:

- SCBA unit.
- Chemical resistant clothing (Neoprene splash suits or Saranex coveralls).
- Gloves, outer, chemical resistant.
- Gloves, inner, chemical resistant.
- Boots, outer, chemical resistant, steel toe and shank.
- Boots, outer, chemical resistant. (Optional)
- Two-way radio.
- Hard hat. (Optional)

Level C protection should be selected when the type of airborne contaminant is known, its concentration measured, criteria for using air purifying respirators met, and when skin and eye exposure is likely. Periodic air monitoring must be performed. The personal protection equipment required at Level C includes:

- Full-face, air-purifying respirator (MSHA/NIOSH approved).
- Chemical resistant clothing (splash suit, Saranex, Tyvek).
- Gloves, outer, chemical resistant.
- Boots, chemical resistant, steel toe and shank.
- Boots, outer, chemical resistant. (Optional)
- Cloth coveralls (inside chemical resistant clothing). (Optional)
- Two-way radio.
- Hard hat. (Optional)

Level D protection should be selected when skin and eye exposure is unlikely, but when the type of airborne contaminant is known, concentration measured, and criteria for using half-face respirators met. Periodic air monitoring must be performed. Level D personal equipment requirements include:

- Half-face air purifying respirator (MSHA/NIOSH approved).
- Single-use respirator (MSHA/NIOSH approved). (Optional)
- Hard hat. (Optional)
- Boots, steel toe and shank. (Optional)

Level E protection is designed for use when only skin and eye protection is needed and airborne contamination is unlikely. Personal equipment requirements for Level E include:

- Hard hat (face shield).
- Goggles or safety glasses.
- Gloves, chemical resistant. (Optional)
- Work gloves.
- Coveralls, long sleeve.
- Ear protection. (Optional)
- Dust respirator. (Optional)

Level F is primarily a work uniform. It should not be assigned at any site where respirator or skin hazards exist.

Surveillance equipment and materials needed to monitor the site for identity and concentration of contamination: _____

_____

_____

_____

_____

Medical surveillance procedures for evidence of personnel exposure: _____

_____

_____

_____

_____

DECONTAMINATION AND DISPOSAL

_____ Level A - Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, tape removal, boot cover removal, outer glove removal, suit/safety hat removal, SCBA backpack removal, inner glove wash, inner glove removal, inner clothing removal, field wash, redress.

_____ Level B - Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, tape removal, boot cover removal, outer glove removal, suit/safety boot wash, suit/SCBA/boot/glove rinse (tank change), safety boot removal (splash suit removal) SCBA backpack removal, inner glove wash, inner glove rinse, facepiece removal, inner glove removal, inner clothing removal, field wash, redress.

_____ Level C - Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, tape removal, boot cover removal, outer glove removal, suit/safety boot wash, suit/safety boot rinse (Canister or Mask Change), safety boot removal, splash suit removal, inner glove wash, inner glove rinse, facepiece removal, inner glove removal, inner clothing removal, field wash redress.

_____ Level D - Segregated equipment drop, boot and glove wash, boot and glove rinse.

_____ Level E - No formal decontamination required.

Decontamination Modification (personnel surfaces, materials, instruments, equipment, etc.): _____

_____

_____

_____

Disposal Procedures (contaminated equipment, supplies, disposable washwater):

_____

_____

_____

_____

EMERGENCY PROCEDURES

Overt Personnel Exposure:

Skin Contact: _____

_____

Inhalation: _____

_____

Ingestion: _____

_____

Potential or Actual Fire or Explosion:

Call Fire Department: Phone: _____

Call Police: Phone: _____

Personnel Injury:

Call Ambulance/Hospital: Phone: _____

Call Versar Office: Phone: 703-750-3000

EMERGENCY RESOURCES

Ambulance _____

Hospital Emergency Room _____

Poison Control Center _____

Police _____

Fire Department _____

Airport _____

Explosive Ordinance Disposal Unit _____

EPA Contact _____

State Contact _____

Site Water Supply _____

Site Telephone _____

Site Radio _____

Site Other _____

EMERGENCY CONTACTS

_____

_____

_____

_____

_____

_____

_____

EMERGENCY ROUTES

HOSPITAL: _____

OTHER: _____

PERSONNEL POTENTIALLY EXPOSED TO HAZARDOUS MATERIALS

Personnel authorized to enter HWS	Assignment	TLD Badge No.
1.		
2.		
3.		

APPENDIX E

ADMINISTRATIVE ENFORCEMENT ORDERS

EXAMPLE PHASED ORDER

Pursuant to Section(s) _____ of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 69__, it is ordered that _____ shall comply with the following requirements:

1. Within __ calendar days of the effective date of this ORDER, respondent shall develop and submit for EPA approval a plan for conducting a hydrogeologic investigation of the site. The plan should be designed to provide the following information:

   a. A description of the regional geologic and hydrogeologic characteristics in the vicinity, including:

      1) local stratigraphy (soil and unconsolidated sediment cover, bedrock, structural features, and formation origins)

      2) regional hydrogeologic flow patterns

      3) areas of recharge and discharge

   b. An analysis of any topographic or geomorphic features that might influence the ground water flow system (Note that stereoscopic analysis of aerial photographs should aid in this analysis).

   c. A classification and description of the hydrogeologic properties of all the hydrogeologic units found at the site (i.e., the aquifers and any intervening saturated and unsaturated units), including:

      1) hydraulic conductivity, porosity

      2) texture, uniformity, lithology

      3) an interpretation of hydraulic interconnections between saturated zones

   d. Using a topographic map as a base, isopach and structural contour maps and at least two geologic cross sections showing the extent (depth, thickness, lateral extent) of all hydrogeologic units within the facility property, identifying:

      1) sand and gravel deposits in unconsolidated deposits

      2) zones of significant fracturing or channeling in consolidated deposits

      3) zones of higher permeability or lower permeability that might direct or restrict the flow of contaminants

      4) perched aquifers

5) the uppermost aquifer (defined as the first saturated zone that may have a potential for migration of contaminants)

e. A description of water level or fluid pressure monitoring including:

1) water level contour maps and vertical gradient sections

2) well or piezometer hydrographs

3) an interpretation of the flow system, including the vertical and horizontal components of flow

4) an interpretation of any change in hydraulic gradients

f. A desciption of manmade influences that may affect the hydrogeology of the site, identifying:

1) local water-supply and production wells with an approximate schedule of pumping

2) manmade hydraulic structures (pipelines, french drains, ditches)

The plan should include a description of the field methods and other information sources proposed for the study and a summary of which data will be collected by each method. The proposed methods should include, but are not limited to:

a. A program of soil borings, as required to adequately describe the subsurface geology of the site. The program should provide for the presence of a qualified geologist or geotechnical engineer to log and describe the materials encountered during the boring. The program should also describe the methods proposed to stabilize selected holes until monitoring wells are installed.

b. A sufficient number of piezometers to characterize ground-water depth and gradient (both horizontal and vertical) over the entire area of the site.

c. The use of slug and/or pump tests as appropriate to determine hydraulic conductivities

The plan shall contain a schedule for conducting the proposed hydrogeologgic assessment and shall be submitted to:

Deputy Director, Air and Waste Management Division
Environmental Protection Agency
444 RCRA Way
Anytown, USA 00001

2. Within 15 calendar days of the effective date of this ORDER, respondent shall develop and submit to EPA a list of proposed indicator parameters capable of detecting leakage of hazardous waste or hazardous constituents into ground

water. The parameters should be representative of constituents at least as mobile as the most mobile constituents that could reasonably be derived from the facility's waste, and should be chosen after considering:

a. the types, quantities, and concentrations of constituents in wastes managed at the facility;

b. the mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the waste management area;

c. the detectability of the indicator parameters, waste constituents or reaction products in ground water;

d. the concentration or value and the natural variation (known or suspected) of the proposed monitoring parameter in background ground water.

The list should include the basis for selecting each proposed indicator parameter, including any analyses or calculations performed. The basis for selection must include chemical analysis of the facility's waste and/or leachate as appropriate.

The list should also include parameters to characterize the site-specific chemistry of ground water at the site, including but not limited to the major anions and cations that make up the bulk of dissolved solids in water (i.e., Cl^-, Fe, Mn, Na^+, SO_4, Ca^+, Mg^+, K^+ NO^{-3}, $PO_4^{\equiv}$, silicate, ammonium).

3. Within __ calendar days of written approval by EPA, the respondent shall promptly implement the hydrogeologic assessment plan according to the terms and schedules contained therein.

4. Within __ calendar days after completion of the hydrogeologic investigation, the respondent will submit to EPA a full report that provides the information described in paragraph 1.

5. Also within __ days after the completion of the hydrogeologic investigation, the respondent will submit to EPA a plan for the design and installation of a monitoring well network that will meet the following requirements:

   a. The upgradient wells must be capable of yielding samples that are representative of background water quality in the uppermost aquifer and are not affected by the facility. The number and location of the wells must be sufficient to: 1) characterize the spatial variability of background water; and 2) meet the needs of the statistical test proposed pursuant to paragraph __.

   b. The downgradient wells must be capable of immediately detecting any statistically significant amounts of hazardous waste or hazardous constituents that migrate from the facilty into ground water.

   c. The monitoring system should be designed to operate for a period of no less than thirty years.

The plan should include the following elements:

a. A description and map of proposed well locations, including a survey of each well's surface reference point and the elevation of its top of casing.

b. Size and depth of wells;

c. Desciption of well-intake design, including screen slot size and length filter pack materials and method of filter-pack emplacement.

d. Type of proposed well casing and screen materials. The choice of well materials should be made in light of the parameters to be monitored for and the nature of the leachate that could potentially migrate from the facility. The well materials should: 1) minimize the potential of adsorption and desorption of constituents from the samples; and 2) maintain their integrity for the expected life of the system (at least thirty years).

e. Methods used to seal the well from the surface and prevent downward migration of contaminants through the well annulus.

f. Description of the methods or procedures used to develop the wells.

When developing this plan, the Respondent shall refer to the Technical Enforcement Guidance Document (EPA, _____ 1985) to determine the methods and materials that are acceptable to the Agency.

6. Also within ___ days after the completion of the hydrogeologic assessment, the Respondent shall sumbit a sampling and analysis plan capable of yielding representative samples for a comparison of up- and downgradient wells. The plan should include the following elements:

a. Well evacuation procedures including volume to be evacuated prior to sampling and handling procedures for purged well water

b. Sample withdrawal techniques. Sampling equipment and materials (tubing, rope, pumps, etc.) shall be selected to yield representative samples in light of parameters to be monitored for. The sampling protocol will include field measurement of pH, conductivity, and temperature for each sample.

c. Sample handling and preservation techniques including provision for field-filtration of samples as appropriate.

d. Procedures for decontaminating sampling equipment between sampling event.

e. Procedures for measuring ground-water elevations at each sampling event

f. Chain of custody procedures to be used for all phases of sample managem-

g. Laboratory analytical techniques, including EPA-approved analytical methods and quality assurance, quality control procedures.

h. Procedures for performing a comparison of upgradient and downgradient ground water to determine whether contamination has occurred. The procedures should include:

1) A proposed method (statistical or otherwise) to compare upgradient and downdradient well water that provides a reasonable balance between the probability of falsely identifying and failing to identify contamination.

2) An accelerated sampling schedule to establish data for the comparison. In no instance shall sampling exceed __ months.

3) A proposed method for data organization and presentation.

When developing the sample and analysis plan and data presentation format, the Respondent should propose methods deemed acceptable in the Technical Enforcement Guidance Document (EPA, April 1985).

7. By no later than __ days after EPA approval of the well network plan, Respondent shall complete the installation of the well network.

8. By no later than __ days after the installation of the monitoring network, Respondent shall implement the sample and analysis plan, perform the comparison and submit the results to EPA for review.

9. If there is a statistically significant difference between upgradient and downgradient well water, the Respondent will develop a ground-water assessment plan capable of determining the following:

a. The extent of migration of hazardous constituents into ground water

b. The concentration of each Appendix VIII constituent throughout the plume or the maximum concentration of each Appendix VIII in the plume.

c. Background concentrations for all Appendix VIII constituents detected in ground water.

d. Waste/leachate characteristics including specific gravity, viscosity, solubility in water, and octanol-water partition coefficient.

e. Soil properties including cation exchange capacity, organic content, and temperature.

The plan should describe the methods proposed to accomplish the above objectives including indirect and direct techniques. The sampling and analysis plan developed pursuant to paragraph 6 should be revised to meet

the new objectives of this monitoring phase. The plan should include an expeditious schedule for the implementation of the above assessment, and should be submitted to EPA no later than 15 days after the confirmation leakage.

10. Within __ calendar days of EPA approval of the assessment plan, the Resp will begin to execute the plan according to the terms and schedules cont therein. Within __ days of the completion of the assessment, the Respor will submit the results to the Agency, including all raw data collected, calculations performed, and an interpretation of the findings.

11. Based on the results of the study, the Respondent will fulfill his/her informational obligations pursuant to §270.14(c)(7) or (8) and submit the results to EPA no later than ___ months after the completion of the ground-water assessment described in paragraph nine.

12. All plans, reports, and schedules required by the terms of this ORDER are, upon approval by EPA, incorporated into this ORDER. Any noncompliance wi such approved studies, reports, or schedules shall be termed noncompliance with this ORDER.

13. In the event of Agency disapproval (in whole or in part) of any plan requ by this ORDER, EPA shall specify any deficiencies in writing. The Responde shall modify the plan to correct the deficiencies within __ days from rec of disapproval by EPA. The modified plan shall be submitted to EPA in writing for review.

Should the Respondent take exception to all or part of EPA's disapproval, Respondent shall submit to EPA a written statement of the grounds for the exception. Representatives of EPA and the Respondent may confer in perso or by telephone in an attempt to resolve any disagreement. If agreement is reached, the resolution shall be reduced to writing and signed by representatives of each party. In the event that resolution is not reached within 15 days, the Respondent shall modify the plan as required by EPA.

14. In the event that EPA believes the respondent has failed to:

    a. Comply with the milestones contained in paragraphs 3, 7, 8, or 10;

    b. Provide the plans and information described in paragraphs 1, 2, 4, 5, 6, 8, 9, 10, or 11;

EPA will notify the respondent of the failure and shall provide the respondent fifteen days in which to remedy the failure. If the respondent does not remedy the failure within fifteen days, (s)he shall pay stipulate penalties from the date of the violation as follows:

    a. $500.00 per day for failure to comply with a milestone listed above;

    b. $100.00 per day for failure to provide a plan or information listed abo

15. Notwithstanding compliance with the terms of this ORDER, Respondent may be required to take further actions as necessary, including additional ground-water monitoring and/or assessment, to come into compliance with RCRA, or other applicable state of Federal law.

CERCLA 106

Abatement Action

Sec. 106(a) In addition to any other action taken by a State or local government, when the President determines that there may be an imminent and substantial endangerment to the public health or welfare or the environment because of an actual or threatened release of a hazardous substance from a facility, he may require the Attorney General of the United States to secure such relief as may be necessary to abate such danger or threat, and the district court of the United States in the district in which the threat occurs shall have jurisdiction to grant such relief as the public interest and the equities of the case may require. The President may also, 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.

(b) Any person who willfully violates, or fails or refuses to comply with, any order of the President under subsection (a) may, in an action brought in the appropriate United States district court to enforce such order, be fined not more than $5,000 for each day in which such violation occurs or such failure to comply continues.

(c) Within one hundred and eighty days after enactment of this Act, the Administrator of the Environmental Protection Agency shall, after consultation with the Attorney General, establish and publish guidelines for using the imminent hazard, enforcement, and emergency response authorities of this section and other existing statutes administered by the Administrator of the Environmental Protection Agency to effectuate the responsibilities and powers created by this Act. Such guidelines shall to the extent practicable be consistent with the national hazardous substance response plan, and shall include, at the minimum, the assignment of responsibility for coordinating response actions with the issuance of administrative orders, enforcement of standards and permits, the gathering of information, and other imminent hazard and emergency powers authorized by (1) sections 311(c)(2), 308, 309, and 504(a) of the Federal Water Pollution Control Act, (2) section 3007, 3008, 3013, and 7003 of the Solid Waste Disposal Act, (3) sections 1445 and 1431 of the Safe Drinking

Water Act, (4) sections 113 and 114, and 303 of the Clean Air Act, and (5) section 7 of the Toxic Substances Control Act.

RCRA 3007

Inspections

Sec. 3007. (a) ACCESS ENTRY.--For purposes of developing or assisting in the development of any regulation or enforcing the provisions of this title, any person who generates, stores, treats, transports, disposes of, or otherwise handles or has handled hazardous wastes shall, upon request of any officer, employee or representative of the Environmental Protection Agency, duly designated by the Administrator, or upon request of any duly designated officer, employee or representative of a State having an authorized hazardous waste program, furnish information relating to such wastes and permit such person at all reasonable times to have access to, and to copy all records relating to such wastes. For the purposes of developing or assisting in the development of any regulation or enforcing the provisions of this title, such officers, employees or representatives are authorized --

"(1) to enter at reasonable times any establishment or other place where hazardous wastes are or have been generated, stored, treated, disposed of, or transported from;

"(2) to inspect and obtain samples from any person of any such wastes and samples of any containers or labeling for such wastes. Each such inspection shall be commenced and completed with reasonable promptness. If the officer, employee or representative obtains any samples, prior to leaving the premises, he shall give to the owner, operator, or agent in charge a receipt describing the sample obtained and if requested a portion of each such sample equal in volume or weight to the portion retained. If any analysis is made of such samples, a copy of the results of such analysis shall be furnished promptly to the owner, operator, or agent in charge.

"(b) Availability To Public (1) Any records, reports, or information obtained from any person under this section shall be available to the pub-

lic, except that upon a showing satisfactory to the Administrator (or the State, as the case may be) by any person that records, reports, or information, or particular part thereof, to which the Administrator (or the State, as the case may be) or any officer, employee or representative thereof has access under this section if made public, would divulge information entitled to protection under section 1905 of title 18 of the United States Code, such information or particular portion thereof shall be considered confidential in accordance with the purposes of that section, except that such record, report, document, or information may be disclosed to other officers, employees, or authorized representatives of the United States concerned with carrying out this Act, or when relevant in any proceeding under this Act.

"(2) Any person not subject to the provisions of section 1905 of title 18 of the United States Code who knowingly and willfully divulges or discloses any information entitled to protection under this subsection shall, upon conviction, be subject to a fine of not more than $5,000 or to imprisonment not to exceed one year, or both.

"(3) In submitting data under this Act, a person required to provide such data may --

"(A) designate the data which such person believes is entitled to protection under this subsection, and

"(B) submit such designated data separately from other data submitted under this Act.

A designation under this paragraph shall be made in writing and in such manner as the Administrator may prescribe.

"(4) Notwithstanding any limitation contained in this section or any other provision of law, all information reported to, or otherwise obtained by, the Administrator (or any representative of the Administrator) under this Act shall be made available, upon written request of any duly authorized committee of the Congress to such committee (including records, reports, or information obtained by representatives of the Environmental Protection Agency).

RCRA 3008(a)

Federal Enforcement

"Sec. 3008 (a) Compliance Orders.-- (1) Except as provided in paragraph (2), whenever on the basis of any information the Administrator determines that any person is in violation of any requirement of this subtitle, the Administrator may issue an order requiring compliance immediately or within a specified time period or the Administrator may commence a civil action in the United States district court in the district in which the violation occurred for appropriate relief, including a temporary or permanent injunction.

"(2) In the case of a violation of any requirement of this subtitle where such violation occurs in a State which is authorized to carry out a hazardous waste program under section 3006, the Administrator shall give notice to the State in which such violation has occurred prior to issuing an order or commencing a civil action under this section.

"(3) If such violator fails to take corrective action within the time specified in the order, he shall be liable for a civil penalty of not more than $25,000 for each day of continued noncompliance and the Administrator may suspend or revoke any permit issued to the violator (whether issued by the Administrator or the State).

RCRA 3013

Monitoring, Analysis, and Testing

"Sec 3013(a) Authority of Administrator.-- If the Administrator determines, upon receipt of any information, that --

"(1) the presence of any hazardous waste at a facility or site at which hazardous waste is, or has been, stored, treated, or disposed of, or

"(2) the release of any such waste from such facility or site may present a substantial hazard to human health or the environment, he may issue an order requiring the owner or operator of such facility or site to conduct such monitoring, testing, analysis, and reporting with respect

to such facility or site as the Administrator deems reasonable to ascertain the nature and extent of such hazard.

"(b) Previous Owners and Operators -- In the case of any facility or site not in operation at the time a determination is made under subsection (a) with respect to the facility or site, if the Administrator finds that the owner of such facility or site could not reasonably be expected to have actual knowledge of the presence of hazardous waste at such facility or site and of its potential for release, he may issue an order requiring the most recent previous owner or operator of such facility or site who could reasonably be expected to have such actual knowledge to carry out the actions referred to in subsection (a).

"(c) Proposal -- An order under subsection (a) or (b) shall require the person to whom such order is issued to submit to the Administrator within 30 days from the issuance of such order a proposal for carrying out the required monitoring, testing, analysis, and reporting. The Administrator may, after providing such person with an opportunity to confer with the Administrator respecting such proposal, require such person to carry out such monitoring, testing, analysis, and reporting in accordance with such proposal, and such modifications in such proposal as the Administrator deems reasonable to ascertain the nature and extent of the hazard.

"(d) Monitoring, Etc., Carried Out By Administrator. -- (1) If the Administrator determines that no owner or operator referred to in subsection (a) or (b) is able to conduct monitoring, testing, analysis, or reporting satisfactory to the Administrator, If the Administrator deems any such action carried out by an owner or operation to be unsatisfactory, or if the Administrator cannot initially determine that there is an owner or operator referred to in subsection (a) or (b) who is able to conduct such monitoring, testing, analysis, or reporting, he may --

"(A) conduct monitoring, testing, or analysis (or any combination thereof) which he deems reasonable to ascertain the nature and extent of the hazard associated with the site concerned, or

"(B) authorize a State or local authority or other person to carry out any such action,and require, by order, the owner or operator referred to in subsection (a) or (b) to reimburse the Administrator or other authority or person for the costs of such activity.

"(2) No order may be issued under this subsection requiring

reimbursement of the costs of any action carried out by the Administrator which confirms the results of an order issued under subsection (a) or (b).

"(3)For purposes of carrying out this subsection, the Administrator or any authority or other person authorized under paragraph (1) may exercise the authorities set forth in section 3007.

"(e) Enforcement.-- The Administrator may commence a civil action against any person who fails or refuses to comply with any order issued under this section. Such action shall be brought in the United States district court in which the defendant is located, resides, or is doing business. Such court shall have jurisdiction to require compliance with such order and to assess a civil penalty of not to exceed $5,000 for each day during which such failure or refusal occurs.

RCRA 7003

Imminent Hazard

"Sec. 7003(a) Authority of Administrator

Notwithstanding any other provision of this Act, upon receipt of evidence that the handling, storage, treatment, transportation or disposal of any solid waste or hazardous waste may present an imminent and substantial endangerment to health or the environment, the Administrator may bring suit on behalf of the United States in the appropriate district court to immediately restrain any person contributing to such handling, storage, treatment, transportation or disposal to stop such handling, storage, treatment, transportation, or disposal or to take such other action as may be necessary. The Administrator shall provide notice to the affected State of any such suit. The Administrator may also, 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 the environment.

"(b) Violations -- Any person who willfully violates, or fails or refuses to comply with, any order of the Administrator under subsection (a) may, in an action brought in the appropriate United States district court to

enforce such order, be fined not more than $5,000 for each day in which such violation occurs or such failure to comply continues.