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MCRD PARRIS ISLAND
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SITE 53 PRELIMINARY ASSESSMENT/SITE INSPECTION AND SOLID WASTE MANAGEMENT UNIT 53 ASSESSMENT REPORT AND CONFIRMATION SAMPLING WORK PLAN WITH TRANSMITTAL LETTER MCRD PARRIS ISLAND SC
8/22/2001
TETRA TECH NUS

ID224

Site 53 PA/SI and SWMU 53 Assessment Report and Confirmation Sampling Work Plan

Marine Corps Recruit Depot

Parris Island, South Carolina

U.S. EPA Identification Number: SC6 170 022 762

Southern Division
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 150

August 2001

TETRA TECH NUS, INC.
661 Andersen Drive ▪ Pittsburgh, Pennsylvania 15220-2745
(412) 921-7090 ▪ FAX (412) 921-4040 ▪ www.tetratech.com

PITT-08-1-026

August 22, 2001

Project Number: N3920

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: Mr. Arthur Sanford (ES322)
2155 Eagle Drive - 29406
North Charleston, South Carolina 29406

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order No. 0150

Subject: Final Site 53 PA/SI and SWMU 53 Assessment Report and Confirmation Sampling Work Plan
MCRD Parris Island, South Carolina

Dear Mr. Sanford:

Please find two copies of the subject plan for your use. This final work plan incorporates comments from the MCRD Parris Island Partnering Team. As discussed, one up gradient temporary monitoring well was added to allow groundwater flow directions at the site to be determined in the field. Copies have been distributed as indicated below.

If you have any questions or require additional information, please call me at (412) 921-8375.

Sincerely,

David D. Brayack
Task Order Manager

DDB/db
Enclosure

Cc: Mr. T. Dillon, NOAA (Electronic Copy - EC)
Ms. D. Duncan, USFWS (EC)
Mr. D. Ewing, CH2MHILL (EC)
Mr. D. Hargrove, SCDHEC (EC)
Mr. T. Harrington, MCRD PI (Paper Copy (5) -PC, EC)
Mr. D. Keefer, Parallax (EC)
Mr. M. Perry/File, TtNUS (PC)
Mr. R. Pope, USEPA (PC, EC)
Mr. J. Stamps, SCDHEC (PC, EC)
Ms. P. Wendt, SCDNR (EC)
Ms. D. Wroblewski, TtNUS (w/o attachment)

REVISION 0
AUGUST 2001

SITE 53 PA/SI and SWMU 53 ASSESSMENT REPORT AND CONFIRMATION WORK PLAN

MARINE CORPS RECRUIT DEPOT PARRIS ISLAND, SOUTH CAROLINA

U.S. EPA IDENTIFICATION NUMBER
SC6 170 022 762

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:
Tetra Tech NUS, Inc.
661 Anderson Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 150

AUGUST 2001

PREPARED UNDER THE SUPERVISION OF:

DAVID D. BRAYACK
TASK ORDER MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

APPROVED BY:

DEBBIE WROBLEWSKI
PROGRAM MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

CERTIFICATION PAGE

REGISTERED SOUTH CAROLINA PROFESSIONAL GEOLOGIST CERTIFICATION

By affixing my seal to this report, I certify that the geologic data and interpretations stated in this *Site 53 PA/SI and SWMU 53 Assessment Report and Confirmation Sampling Work Plan, MRCD Parris Island, South Carolina,* are true and accurate to the best of my knowledge. I further certify that I am registered to practice geology in the State of South Carolina and that it is within my professional expertise to verify the correctness of this information.

Keith W. Henn, P.G.
Registration Number 2242

8/22/01
Date

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ACRONYMS

ASTM	American Society of Testing and Materials
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
CTO	Contract Task Order
DPT	Direct-Push Technology
DQO	Data Quality Objective
EISOPQAM	Environmental Investigations Standard Operating Procedures Quality Assurance Manual
FOL	Field Operations Leader
FSP	Field Sampling Plan
I.D.	Inside Diameter
IDW	Investigation-Derived Waste
IR	Installation Restoration
LQAP	Laboratory Quality Assurance Plan
MCRD	Marine Corps Recruit Depot
msl	Mean Sea Level
NAVFAC	Naval Facilities Engineering Command
NEESA	Naval Energy and Environmental Support Activity
PA	Preliminary Assessment
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PID	Photoionization Detector
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QAM	Quality Assurance Manager
QAP	Quality Assurance Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act
SCDHEC	South Carolina Department of Health and Environmental Control
SI	Site Inspection
SOPs	Standard Operating Procedures
SOUTHDIV	Southern Division
SSO	Site Safety Officer

SVOCs	Semivolatile Organic Compounds
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCL	Target Compound List
TOM	Task Order Manager
TtNUS	Tetra Tech NUS, Inc.
U.S. EPA	United States Environmental Protection Agency
U.S.	United States
VOCs	Volatile Organic Compounds

FOREWORD

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act of 1986 (SARA) establish a program for the cleanup of hazardous waste disposal and spill sites nationwide. This program contains provisions for the cleanup of contamination from past hazardous waste operations and past hazardous material spills and is the framework for Installation Restoration (IR) programs at numerous Navy and Marine Corps installations. The Resource Conservation and Recovery Act (RCRA), as amended, also establishes a cleanup program that provides for current and future hazardous waste management practices, as well as cleanup of past disposal sites at permitted or interim status Navy/Marine Corps installations.

Because of the past hazardous waste activities conducted at the Marine Corps Recruit Depot (MCRD) Parris Island, South Carolina, the MCRD meets criteria for conducting IR activities under the CERCLA regulatory framework. The MCRD also meets the criteria for conducting IR activities under RCRA because, in the late 1980s, the MCRD applied for a RCRA permit. Under RCRA, this action required the MCRD to conduct corrective action for the release of hazardous waste or hazardous constituents from solid waste management units. An interim RCRA facility assessment was conducted in 1990 as part of this requirement. Since this time, the MCRD has withdrawn its application for a RCRA permit.

Because of the circumstances surrounding the MCRD's IR program history, discussions have been held among representatives from the United States Marine Corps, U.S. Navy, South Carolina Department of Health and Environmental Control, and the U.S. Environmental Protection Agency, Region 4 to determine the appropriate regulatory framework for conducting IR activities at the MCRD. From these discussions, it has been decided that this site-specific work plan will encompass both CERCLA and RCRA requirements and will be dually titled as such.

RESPONSES TO US EPA AND SCDHEC COMMENTS ON THE DRAFT PA/SI WORK PLAN FOR SITE/SWMU 53 MCRD PARRIS ISLAND, SC

US EPA GENERAL COMMENTS:

1. **Comment:** An additional groundwater sampling location north of the dump area is needed to determine upgradient conditions and to allow for definition of a potentiometric surface. It is requested that a method more definitive than visual surveying, such as geophysics, be used to define disturbed areas potentially reflecting subsurface disposal. See specific comments.

   Response: The site is located on a relatively small sand island that has very limited upgradient areas. In general, rainfall recharge creates a poorly defined groundwater divide. This poorly defined area encompasses a large portion of the island; therefore, the typical assumption of an upgradient well would not be effective in this area. Furthermore background groundwater conditions have been previously defined for the facility. As discussed during the February 2001 partnering team meeting, a metal detector will be used to investigate the potential for buried metal around the location of the drums at the site.

2. **Comment:** The development and presentation of Data Quality Objectives (DQOs) and the project Quality Assurance Plan (QAP) is inadequate to meet EPA requirements. While the planned data acquisition would seem to correspond to the more evident data needs, the lack of specific DQO problem statements/decision needs makes this difficult to evaluate. Moreover, the quantity and quality of data proposed has not been substantiated. The specific QAP requirements also should reflect the established DQOs.

   Response: The Navy has prepared a DQO cross walk table for the Site 53 Work Plan (attached) that is similar to the table prepared for the Site 45 Work Plan.

US EPA SPECIFIC COMMENTS:

3. **Comment: Section 1.2, 1st sentence:** Sentence states that the work plan was developed using the data quality objective process. However, the DQO process is not reflected in the referenced Work Plan sections.

   Response: The Navy has prepared a DQO Checklist for Site 53 WP (attached) that is similar to the table prepared for the Site 45 Work Plan.

4. **Comment: Section 2.1, 2nd paragraph, 4th sentence:** This sentence states that additional material may be buried at the site. This concern is not addressed by the proposed work. It is requested that an EM-31 geophysical investigation be done to determine if buried waste is present.

   Response: As discussed during the February 2001 Partnering Team Meeting, buried materials present on the western side of the site consist primarily of construction debris. The site is being investigated primarily due to the presence of drums and asphalt. A magnetic survey will be performed to determine if more metal drums are present in the facility of the existing drums.

5. **Comment: Section 2.1, 2nd paragraph, last sentence:** It is unclear that the proposed visual survey will identify all disturbed areas. Relying on visual surveys and aerial photographs alone is not adequate, particularly if subsurface disposal took place over 50 years ago.

   Response: As discussed during the February 2001 Partnering Team meeting, the initial investigation at the site will focus the asphalt pile and the partially buried drums. A magnetometer will be used to investigate the potential for additional buried drums.

6. **Comment: Section 3.2:** Based on the size of the site and the wide variety of material exposed at the surface, the proposed number of soil samples is inadequate to fully determine the presence or absence of hazardous wastes or their impact on the site media. At a minimum, 6 surface soil and 6 subsurface soil samples should be collected. Additionally, at least 1 background surface soil and subsurface soil should be collected.

   Response: As discussed during the February 2001 Partnering Team meeting, six surface soil samples and 3 subsurface soil samples will be collected in the area of the drums and the asphalt pile. The locations will be biased toward areas where contamination is anticipated. Also, based on the results of the magnetometer survey, additional subsurface soil samples may be collected. Background data from investigation of MCRD Parris Island Sites will be used for comparison.

7. **Comment:** **Section 3.2:** Since the location and extent of the site is not well established, the following steps are needed in the investigation prior to locating and collecting groundwater samples: 1) a geophysical investigation to define the limits of waste; 2) UXO screening for all subsurface penetrations; 3) locating wells in closer proximity to the waste; and, 4) an upgradient groundwater sample should be collected.

   Response: Based on the site walk in February 2001, the majority of the waste materials at the site are common construction type debris used to form a level upland storage/staging area. This area was historically used as an asphalt plant. With the possible exception of the asphalt pile and the drums at the site, these materials are unlikely to represent significant risk to human health or the environment. As a result, the environmental investigation at Site 53 will focus on the asphalt pile and the drums. Ordnance, other than potentially small fire arms where not used in this area, and therefore UXO screening is not normally performed at MCRD Parris Island investigations.

   As discussed during the February 2001 MCRD Parris Island Partnering Team meeting, two temporary monitoring wells will be moved closer to the asphalt pile and drums. Note that these wells will also be located hydraulically down gradient of the general fill area, and can be used to identify potential contamination migrating from the general fill area. As mentioned in Response to General Comment 1, background groundwater concentrations have been previously defined for MCRD Parris Island.

8. **Comment:** Section 3.2.1, 1st paragraph: PCB and pesticide analysis must be included in the requirements for soil samples. These compounds were known to be used and disposed at MCRD, they are persistent in the environment, and have relatively low mobility. The Work Plan is not clear if these compounds are being included or excluded from the planned analyses.

   Response: PCB and pesticide soil analyses are planned for Site 53, see the footnotes in Table 5-1. The clarify the analyte list in Section 3.0, the first paragraph of Section 3.2.1 will be changed as follows: "The soil samples will be analyzed for Target Compound List (TCL) organics that include volatile organic compounds (VOCs), semi-volatile organics (SVOCs), -polychlorinated biphenyls (PCBs) and pesticides, and Target Analyte List ...".

9. **Comment:** **Figure 3-1**: Once the full extent of the waste is determined, downgradient wells should be moved closer to the waste and an upgradient well should be added.

Response: As discussed during the February 2001 Partnering Team meeting, the investigation will focus on the drums and the asphalt pile at the site. Two temporary monitoring wells will be placed just down gradient (south) of these areas.

10. **Comment:** **Section 5.2:** On what basis will the subsurface soil sample interval be selected? In the absence of elevated PID readings or other visual indications of contamination, it is recommended that subsurface soil samples be collected directly above the water table.

Response: Agreed. The text will be modified as follows: "...submitted for chemical testing. In the absence of elevated PID readings or other visual indications of contamination, the subsurface soil samples be collected directly above the water table."

11. **Comment:** **Section 6:** This section, including the referenced information, does not meet EPA Quality Assurance Plan (QAP) requirements. A review of the Master QAP indicates that appropriate generic/sitewide content (e.g., audit and corrective action processes) is included, however, there remains significant project-specific content that is not presented in the project Work Plan.

Response: The Navy has prepared a DQO cross walk table for the Site 53 Work Plan (attached) that is similar to the table for the Site 45 Work Plan.

12. **Comment:** **Section 8, 1st paragraph:** No "DQO statements" were made.

Response: See comment 11. The first sentence of the chapter will be changed to: "The purpose of this section is to specify frequency of QA/QC samples, bottleware requirements, sample custody and shipment procedures. This section will also cross reference procedures for laboratory QC checks, project record keeping, data management, performance and system audits, corrective actions and training and quality planning."

SCDHEC COMMENTS:

1. **Comment:** **General:** Under the RCRA program, this document would essentially be a combination a SWMU Assessment Report and a Confirmation Sampling Work Plan. Please entitle this document as such.

   Response: Agreed. The Work Plan title will be changed to: "Site 53 PA/SI and SWMU 53 Assessment Report and Confirmation Sampling Work Plan".

2. **Comment:** Section 2.1: This section should describe the approximate size of the area in question. Additionally, the approximate dates of operation of the asphalt should be described, if know.

   Response: The extent of the disturbed area at Site 53 is approximately 2.5 acres. Visually, this disturbed area is primarily soil and construction type fill materials. Approximately 8 feet below and to the south of the disturbed area are several corroded metal drums that are on the surface and/or are partially buried. These drums are located in an area approximately 20 feet by 20 feet. Also, at the site is a pile of dumped asphalt. This pile is approximately 20 foot by 20 foot and 6 foot high. The drum area and the asphalt pile are the two areas of concern at Site 53. The operational period of the asphalt plant is uncertain, but will be further investigated.

3. **Comment:** Section 2.3: 1st Sentence, Typographical Error. Please remove the redundant "area of".

   Response: Agreed, the redundant "area of" will be removed.

4. **Comment:** Section 3.2: The department is in agreement with EPA specific comment #4. Three soil samples will not be adequate to determine if a release has occurred at this site. Additional soil samples will be necessary.

   Response: As discussed during the February 2001 Partnering Team meeting, six surface soil samples and 3 subsurface soil samples will be collected in the area of the drums and the asphalt pile. Also, based on the results of the magnetometer survey, additional subsurface soil samples may be collected.

TABLE RTC

RESPONSE TO COMMENTS QAPP CHECKLIST
SITE 53 - PA/SI WORK PLAN
MCRD PARIS ISLAND, SOUTH CAROLINA
PAGE 1 OF 5

	ELEMENT	DQO STEP (QA/R-5 A.3)	COMMENTS	REFERENCE(S)/COMMENT EXPLANATION
A1.	**Title and Approval Sheet**			
	Title		P	Site 53 RI/RFI Work Plan Title Page
	Organization's name		P	Site 53 RI/RFI Work Plan Title Page
	Dated signature of project manager		P	Site 53 RI/RFI Work Plan Title Page
	Dated signature of quality assurance officer		NA	Project Manager documents QA process
	Other signatures, as needed		P	Site 53 RI/RFI Work Plan Title Page
A2.	**Table of Contents**		P	Site 53 RI/RFI Work Plan Title Page
A3.	**Distribution List**		P	Site 53 RI/RFI Work Plan Transmittal Letter
A4.	**Project/Task Organization**	1		
	Identifies key individuals, with their responsibilities (data-users, decision-makers, project QA manager, subcontractors, etc.)		P	Site 53 RI/RFI Work Plan Sec. 7.2
	Organization chart shows lines of authority and reporting responsibilities.		P	Site 53 RI/RFI Work Plan Figure 7-1
A5.	**Problem Definition/Background**	1 & 2		
	Clearly states problem or decision to be reached		P	Site 53 RI/RFI Work Plan Section 2.3 (As Revised)
	Provides historical and background information		P	Site 53 RI/RFI Work Plan Section 2.0
A6.	**Project/Task Description**	1, 2, 3 & 6		
	Lists measurements to be made		P	Site 53 RI/RFI Work Plan Tables 3-1 & 5-1
	Cites applicable technical, regulatory or program-specific quality standards, criteria or objectives		P	Site 53 RI/RFI Work Plan Section 5.2
	Notes special personnel or equipment requirements		P	Master Work Plan Vol. I Section 3
	Provides work schedule		NA	SMP with regular partnering team updates
	Notes required project and QA records/reports		P	Master QAP Section 7.0, Master Work Plan Vol. II
A7.	**Quality Objectives and Criteria for Measurement Data**	4, 5 & 6		
	States project objectives and limits, both quantitatively and qualitatively		P	Site 53 RI/RFI Work Plan Sections 1.1, 3.1, and 3.2
	States and characterizes measurement quality objectives as to applicable action levels or criteria		P	Master QAP Section 3.2
	States appropriate temporal and spatial boundaries		P	Site 53 RI/RFI Work Plan Section 5.2
	States "scale of decision making"		P	Site 53 RI/RFI Work Plan Section 3.0

TABLE RTC

RESPONSE TO COMMENTS QAPP CHECKLIST
SITE 53 - PA/SI WORK PLAN
MCRD PARIS ISLAND, SOUTH CAROLINA
PAGE 2 OF 5

	ELEMENT	DQO STEP (QA/R-5 A.3)	COMMENTS	REFERENCE(S)/COMMENT EXPLANATION
A8.	**Special Training Requirements/Certification Listed**			
	States how provided, documented, and assured		P	Master Work Plan Vol. II HASP Section 8.1
A9.	**Documentation and Records**	3 & 7		
	Lists information and records to be included in the data report (e.g. raw data, field logs, results of QC checks, problems encountered)		P	Master QAP Chapter 8.0
	States requested lab turnaround time		P	Site 53 RI/RFI Work Plan Section 3.2 (As revised
	Gives retention time and location for records and reports		P	Master QAP Chapter 7.0 (Stored at Pittsburgh office seven years after end of contract)
B1.	**Sampling Process Design (Experimental Design) States the following:**	5 & 7		
	Type and number of samples required		P	Site 53 RI/RFI Work Plan Tables 5-1
	Sampling design and rationale		P	Site 53 RI/RFI Work Plan Chapter 3.0
	Sampling locations and frequency		P	Site 53 RI/RFI Work Plan Figures 3-1
	Sample matrices		P	Site 53 RI/RFI Work Plan Tables 5-1
	Classification of each measurement parameter as either critical or needed for information only		NA	All sampling at Site 53 critical
	Appropriate validation study information, for nonstandard situations		NA	No nonstandard situations expected
B2.	**Sampling Method Requirements**	3 & 7		
	Identifies sample collection procedures and methods		P	TtNUS SOPs SA-1.1 and SA-1.3
	Lists equipment needs		P	Site 53 RI/RFI Work Plan Sections 4.0
	Identifies support facilities		NA	Subcontractors to be decided upon
	Identifies individuals responsible for corrective action		P	Master QAP Section 2.0
	Describes process for preparation and decontamination of sampling equipment		P	TtNUS SOP SA-7.1
	Describes selection and preparation of sample containers and sample volumes		P	Site 53 RI/RFI Work Plan Table 8-2
	Describes preservation methods and maximum holding times		P	Site 53 RI/RFI Work Plan Table 8-2
B3.	**Sample Handling and Custody Requirements**			
	Notes sample handling requirements		P	Site 53 RI/RFI Work Plan Section 8.4
	Notes chain-of-custody procedures, if required		P	Site 53 RI/RFI Work Plan Section 8.4

TABLE RTC

RESPONSE TO COMMENTS QAPP CHECKLIST
SITE 53 - PA/SI WORK PLAN
MCRD PARIS ISLAND, SOUTH CAROLINA
PAGE 3 OF 5

	ELEMENT	DQO STEP (QA/R-5 A.3)	COMMENTS	REFERENCE(S)/COMMENT EXPLANATION
B4.	**Analytical Methods Requirements**	3 & 7		
	Identifies analytical methods to be followed (with all options) and required equipment		P	Site 53 RI/RFI Work Plan Table 8-2
	Provides validation information for nonstandard methods		NA	No nonstandard method necessary
	Identifies individuals responsible for corrective action		P	Master QAP Section 2.3
	Specifies needed laboratory turnaround time		P	Site 53 RI/RFI Work Plan Table 8-2
B5.	**Quality Control Requirements**	3		
	Identifies QC procedures and frequency for each sampling, analysis, or measurement technique, as well as associated acceptance criteria and corrective action		P	Site 53 RI/RFI WP Table 8-1, Master QAP Sections 3.2 and 3.3
	References procedures used to calculate QC statistics including precision and bias/accuracy		P	Master QAP Section 3.2
B6.	**Instrument/Equipment Testing, Inspection, and Maintenance Requirements**	3		
	Identifies acceptance testing of sampling and measurement systems		P	Master QAP Section 6.6
	Describes equipment preventive and corrective maintenance		P	Master QAP Section 6.6
	Notes availibility and location of spare parts		NA	Not applicable. Critical spare parts not an issue
B7.	**Instrument Calibration and Frequency**	3		
	Identifies equipment needing calibration and frequency for such calibration		P	Master QAP Section 6.6, Master FSP Section 2.5
	Notes required calibration standards and/or equipment		P	Master QAP Section 6.6, Master FSP Section 2.5
	Cites calibration records and manner traceable to equipment		P	Master QAP Section 6.6, Master FSP Section 2.5
B8.	**Inspection/Acceptance Reqirements for Supplies and Consumables**			
	States acceptance criteria for supplies and consumables		NA	To be determined during field sampling
	Notes responsible individuals		P	Site 53 RI/RFI Work Plan Section 7.2

TABLE RTC

RESPONSE TO COMMENTS QAPP CHECKLIST
SITE 53 - PA/SI WORK PLAN
MCRD PARIS ISLAND, SOUTH CAROLINA
PAGE 4 OF 5

	ELEMENT	DQO STEP (QA/R-5 A.3)	COMMENTS	REFERENCE(S)/COMMENT EXPLANATION
B9.	**Data Acquisition Requirements for Nondirect Measurements**	1 & 7		
	Identifies type of data needed from nonmeasurement sources (e.g., computer data bases and literature files), along with acceptance criteria for their use		NA	None
	Describes any limitations of such data		NA	None
	Documents rationale for original collection of data and its relevance to this project		P	Site 53 has not been previously investigated.
B10.	**Data Management**	3 & 7		
	Describes standard record-keeping and data storage and retrieval systems		P	Master QAP Section 8.4, TtNUS SOP CT-05 Section 5.0 (To be provided)
	Checklists or standard forms attached to QAPP		P	TtNUS SOP CT-05 Attachment A
	Describes data handling equipment and procedures used to process, compile, and analyze data (e.g., required computer hardware and software		P	Master QAP Section 8.4, TtNUS SOP CT-05 Section 3.0 (To be provided)
	Describes process for assuring that applicable Office of Information Resource Management requirements are satisfied		P	Master QAP Section 8.4, TtNUS SOP CT-05 Section 3.0 (To be provided)
C1.	**Assessments and Response Actions**	7		
	Lists required number, frequency and type of assessments, with approximate dates and names of reponsible personnel (assessments include, but are not limited to, peer reviews, management system reviews, technical system audits, performance evaluations, and audits of data quality.		P	Master QAP Section 9.0
	Identifies individuals responsible for corrective action		P	Master QAP Section 10.0
C2.	**Reports to Management** Identifies frequency and distribution reports for:			
	Project status		NA	Partnering team meeting minutes
	Results of performance evaluations and audits		P	Master QAP Section 9.0
	Results of periodic data quality assessments		P	Master QAP Section 9.0
	Any significant QA problems		P	Master QAP Section 8.2
	Preparers and recipients of reports		P	Master QAP Section 9.0

TABLE RTC

RESPONSE TO COMMENTS QAPP CHECKLIST
SITE 53 - PA/SI WORK PLAN
MCRD PARIS ISLAND, SOUTH CAROLINA
PAGE 5 OF 5

	ELEMENT	DQO STEP (QA/R-5 A.3)	COMMENTS	REFERENCE(S)/COMMENT EXPLANATION
D1.	**Data Review, Validation, and Verification**	7		
	States criteria for accepting, rejecting, or qualifying data		P	Master QAP Sections 3.0 and 8.0, TtNUS SOP CT-03
	Includes project-specific calculations or algorithms		P	Master QAP Section 3.0, TtNUS SOP CT-03
D2.	**Validation and Verification Methods**	3		
	Describes process for data validation and verification		P	Master QAP Section 8.2, TtNUS SOP CT-03
	Identifies issue resolution procedure and responsible individuals		P	Master QAP Section 9.0
	Identifies methods for conveying these results to data users		P	Master QAP Section 9.0, TtNUS SOP CT-05 Sections 5.8 and 5.9
D3.	**Reconciliation with User Requirements**	7		
	Describes process for reconciling project results with DQOs and reporting limitations on use of data		P	Site 53 RI/RFI Work Plan Section 10.0

DQO Steps:
1 - State the Problem
2 - Identify the Decision
3 - Identify Inputs to the Decision
4 - Define the Study Boundaries
5 - Develop a Decision Rule
6 - Specify Limits on Decision Error
7 - Optimize the Design

Abbreviations:
WP - Work Plan
QAP - Quality Assurance Plan
HASP - Health and Safety Plan
SOP - Standard Operating Procedure

Comments:
P - Present and Acceptable
I - Incomplete
NP - Not Present
NA - Not Applicable

1.0 INTRODUCTION

This work plan has been prepared by Tetra Tech NUS, Inc. (TtNUS) for the Southern Division (SOUTHDIV) Naval Facilities Engineering Command (NAVFAC) under the Navy Comprehensive Long-Term Environmental Action Navy (CLEAN) Program, Contract Number N62467-94-D-0888, Contract Task Order (CTO) 0150. This work plan outlines the requirements and describes the procedures for performing a preliminary assessment (PA)/site inspection (SI) with limited sampling at a site/solid waste management unit (SWMU) discovered in 2000. This site/SMWU has been identified as Site/SMWU 53 - Horse Island Debris Area. The site is characterized by the visual presence of surface debris, including corroded drums. For ease of reading and clarity, this site/SWMU will be referred to as Site 53.

MCRD Parris Island is located along the southern coast of South Carolina, approximately 1 mile south of the city of Port Royal and 3 miles south of the city of Beaufort within Beaufort County. MCRD Parris Island covers approximately 8,047 acres, consisting of dry land, salt marshes, saltwater creeks, and ponds, as shown in Figure 1-1. MCRD Parris Island is the reception and recruit training facility for the Marine Corps for enlisted men from states east of the Mississippi River and enlisted women nationwide.

1.1 SCOPE AND OBJECTIVE

The objectives of this investigation are to determine whether hazardous wastes were disposed in the area, and, if so, to determine whether these wastes have impacted the adjacent soil and groundwater. Currently, there is very little information available for the site. Historic aerial photographs show disturbed soils in the area in 1945. Debris, including asphalt and corroded drums, is present in the area.

The scope of the investigation will include researching historic information, including conducting employee interviews and reviewing records and photographs, and collecting a limited number of environmental samples to determine the presence of environmentally significant contamination. Based on the results of the investigation, a recommendation will be made for either more investigation (i.e., remedial investigation, RCRA facility investigation, etc.) or no action/no further action.

1.2 DATA QUALITY OBJECTIVES

This work plan was developed using the data quality objective (DQO) process. The DQO process is a focused, iterative process for developing a data collection strategy designed to support decision making. The goal of the process is to conduct investigations in an efficient and effective manner without unnecessary precision or redundancy of data. The process consists of seven steps, ordered in a

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QUADRANGLE LOCATION

0 4000 8000
SCALE IN FEET

SOURCE: USGS QUADRANGLE MAP PARRIS ISLAND, S.C. 1979

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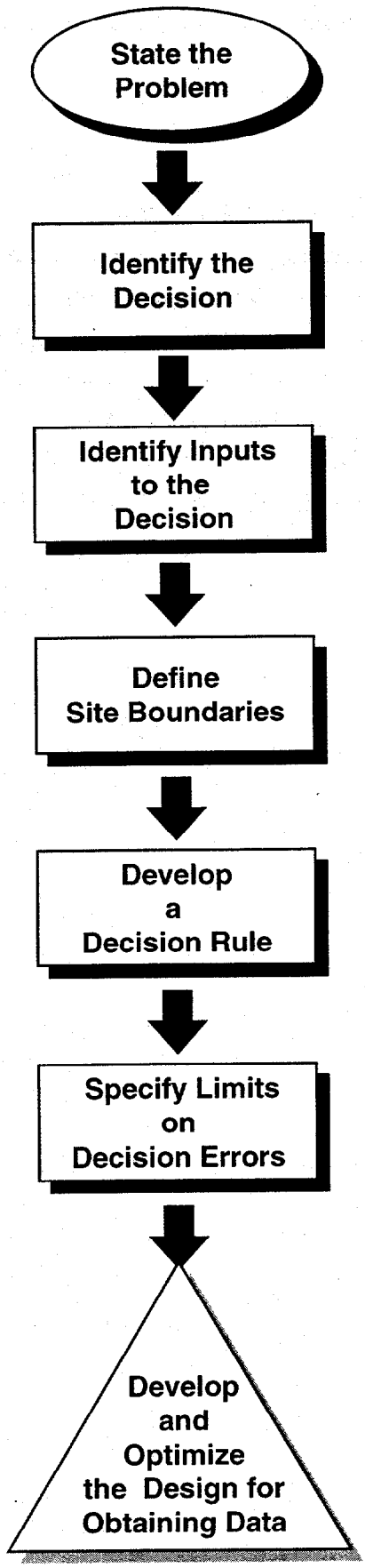
downward decision flow. A flow diagram with descriptions of each step is provided in Figure 1-2. The DQO Process is further explained in Volume I, Section 1.2.2, of the Master Work Plan for MCRD Parris Island (B&R Environmental, 1998).

1.3 PLANNING DOCUMENT ORGANIZATION

This work plan is intended to be used in conjunction with the Master Work Plan for MCRD Parris Island (Volumes I through III) and references the Master Work Plan where appropriate. This work plan includes the site-specific information to be used for sampling, and the Master Field Sampling Plan (FSP) and the Master Quality Assurance Plan (QAP) provide general information that is applicable to all sites on MCRD Parris Island. Sections 1.0 through 3.0 of this site-specific work plan identify the project scope and objectives, summarize background information and existing data, and present the conceptual model and proposed sampling. Sections 4.0 and 5.0 present the site-specific FSP and Sections 6.0 through 8.0 describe the quality assurance and quality control (QA/QC) measures for ensuring that usable data are obtained.

FIGURE 1-2
DATA QUALITY OBJECTIVES PROCESS



- Review of historical and background information (Section 2.0).
- Statement of problem for data collection (Section 2.0).
- Preliminary assessment of existing data (Section 2.0).

- Statement of the action-based decision to resolve problem (Section 3.0).

- Identification of measurable variables and action levels to support decisions (Section 3.0).

- Definition of sampling population and of spatial and temporal boundaries and limitations (Section 2.0).

- Single statement synthesizing previous steps and summarizing how data will be used to make a decision (Master Work Plan, Volume III).
- An "if...then" statement defining values for deciding among alternative actions (Master Work Plan, Volume III).

- Definition of acceptable limits of decision error and potential consequences of incorrect decisions (Decision Document; Master Work Plan, Volume III).

- Development of alternative sampling designs and selection of most effective design for sampling and analysis (Section 3.2).

2.0 SITE BACKGROUND

2.1 SITE DESCRIPTION AND HISTORY

Site/SWMU (Site) 53 - Horse Island Debris Area is located in the east-central portion of Horse Island, as shown on Figure 1-1. Based on topography and location, Ribbon Creek is the nearest water body and would be the likely receptor for groundwater from this site (Figure 2-1).

Information on historic waste disposal is not currently available. The only evidence of the site is the visual presence of surface debris, including asphalt and corroded 55-gallon drums. An asphalt plant was reportedly located in this general area. Based on the presence of a steep bank adjacent to the observed surface debris, additional material may be buried at this site. A metal detector survey will be conducted at the suspected edge of fill to confirm the limits of waste. This bank is approximately 3 to 6 feet in height. The extent of the debris area is uncertain but will be delineated during the PA/SI based on a field survey of disturbed areas and or aerial photographs.

The extent of the disturbed area at Site 53 is approximately 2.5 acres. Visually, this disturbed area is primarily soil and construction type fill materials. Approximately 8 feet below and to the south of the disturbed area are several corroded metal drums that are on the surface and/or are partially buried. These drums are located in an area approximately 20 feet by 20 feet. Also, at the site is a pile of dumped asphalt. The pile is approximately 20 foot by 20 foot and 6 foot high. The drum area and the asphalt pile are the two areas of concern at Site 53. The operational period of the asphalt plant is uncertain, but will be further investigated.

2.2 SITE HYDROGEOLOGY

A summary of the site hydrogeology for MCRD Parris Island is provided in this section. The site hydrogeology is based on investigations that have been conducted at other sites within MCRD Parris Island.

2.2.1 Surficial Aquifer

The surficial or water-table aquifer is unconsolidated and restricted to the shallow, Pleistocene to Holocene age, fine-grained, sedimentary deposits of the Pamplico and Waccamaw Formations (Hughes et al., 1989). Based upon previous investigations at MCRD Parris Island, the upper 20 feet of sediment consists of very fine, yellow-brown sand with traces of clay and silt and thin (approximately 6 inches thick), discontinuous layers of greenish-gray silty clay. The surficial aquifer is estimated to be 20 feet thick in the area. An estimated transmissivity of 1,300 square feet per day with a storage coefficient of 0.20 has been

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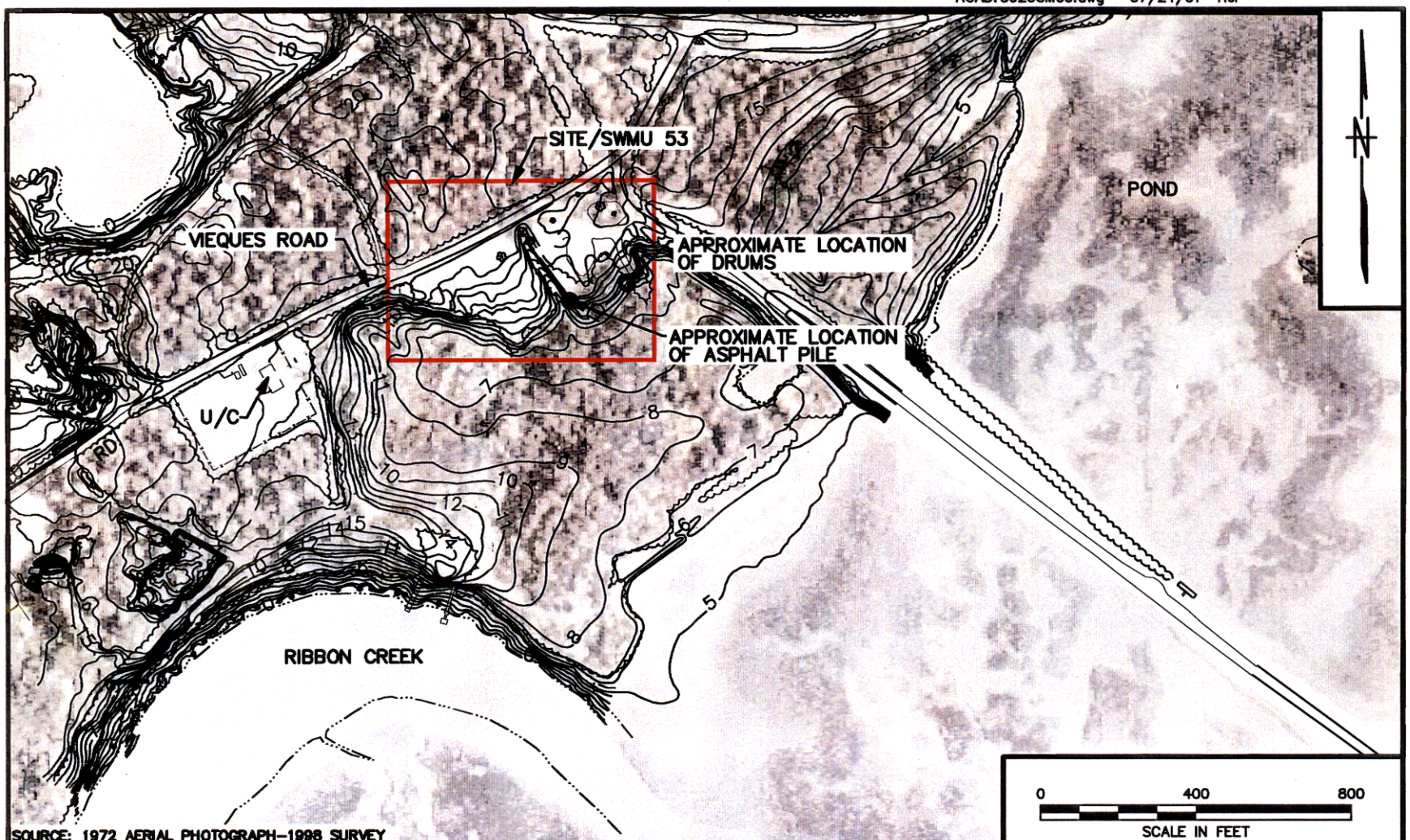

SOURCE: 1972 AERIAL PHOTOGRAPH–1998 SURVEY

DRAWN BY HJP	DATE 7/24/01	SITE/SWMU 53 HORSE ISLAND DEBRIS AREA MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	CONTRACT NO. 3920
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reported for sands within the shallow deposits (Hassen, 1985). Water-table depths range from 0 to 10 feet, and seasonal changes can be as great as 6.5 feet (NEESA, 1986).

2.2.2 Confining Layer

The surficial aquifer is underlain by the unconsolidated, Miocene age, Hawthorn Formation (Hughes et al., 1989). The Hawthorn Formation consists of a sand and clay zone that hydraulically functions as a confining unit and separates the unconfined surficial aquifer from the underlying, artesian Floridan Aquifer. The elevation at the top of the Hawthorn Formation, where present, is reported to be within the range of 30 to 60 feet below mean sea level (msl) at Parris Island. The thickness of the Hawthorn Formation is anticipated to be between 20 to 40 feet (NEESA, 1986). Hughes, et al. (1989) calculated the leakage through the Hawthorn Formation to be 0.0002 cubic feet per day for every foot of head difference (using an average formation thickness of 30 feet and vertical hydraulic conductivity of 0.006 feet per day).

2.2.3 Floridan Aquifer

The principal source of groundwater used for consumption in the Beaufort County, South Carolina area is the Floridan Aquifer (Smith, 1987). This artesian limestone aquifer system is contained within the Santee Limestone Formation, has a total thickness of approximately 1,000 feet, and is divided into the Upper Unit and the Lower Unit (NEESA, 1986). The Floridan Aquifer is described in more detail in the Master Work Plan.

2.3 STATEMENT OF PROBLEM

Surface debris has been observed in the area of Site 53. This debris appears to be primarily construction type materials that were used to form a level, but slightly elevated equipment lay down area. Based on visual evidence along the edge of the fill, the materials used to construct the lay down area consist of primarily soil, and broken concrete and asphalt. As such, this area would not normally be considered under a CERCLA/RCRA investigation.

However, several corroded and partially buried drums were noted in the low area adjacent to the equipment lay down area and a pile of waste asphalt is also present. Historically, an asphalt plant was present in this area and the type of materials observed in the drums and the pile appear to be asphalt related. However the origin of these materials cannot be confirmed visually.

Specific potential concerns at this site are as follows:

1. Buried drums may be present at the site near the observed surface drums. The contents of the drums and the nature of the asphalt pile are uncertain.

2. The drum contents and/or asphalt pile may represent a threat to human health from ingestion of the wastes or impacted soils.

3. The wastes may become soluble and impact groundwater. There are no nearby users of groundwater. However, groundwater is expected to flow toward the marsh to the southeast and therefore represent a potential threat to ecological receptors.

3.0 INVESTIGATION SCOPING

3.1 INVESTIGATION SUMMARY AND RATIONALE

Table 3-1 presents a summary of the rationale and summary of the proposed investigation. Preliminary sample locations are presented on Figure 3-1. All data will be collected in accordance with the Master FSP, the Master QAP (B&R Environmental, 1998), and the U.S. Environmental Protection Agency (U.S. EPA) Region 4 Environmental Investigations Standard Operating Procedures Quality Assurance Manual (EISOPQAM) (U.S. EPA, 1996).

3.2 ANALYTICAL PARAMETER RATIONALE

This section provides the rationale for the proposed analytical program to be conducted on the samples collected from Site 53. Six surface and three subsurface soil samples and two groundwater samples are proposed. The two groundwater samples will be located hydraulically downgradient of the site. Based on the results of a planned magnetometer survey, two additional subsurface soil samples may be collected.

The approximate sample locations are shown on Figure 3-1. Accurate survey data is not yet available for this area. Therefore, the sample locations will be selected in the field based on the actual location of the drum and asphalt pile areas. Four surface soil samples, two subsurface soil samples, and one groundwater sample will be collected in the area of the drums. The surface and subsurface soil samples will be taken at a maximum distance of 2 to 5 feet from the drums and will be distributed to provide uniform coverage in this area. The groundwater sample will be collected approximately 30 feet south of the drum area.

Two surface, one subsurface soil samples, and one groundwater sample will be collected in the area of the asphalt pile. The soil samples will be taken at a maximum distance of 2 to 5 feet from the asphalt pile be distributed to provide uniform coverage in this area. The groundwater sample will be collected approximately 30 feet south of the asphalt pile area.

3.2.1 TCL and TAL Parameters

The soil samples will be collected in or near the suspected waste disposal area and will be biased toward locations with evidence of contamination [e.g., staining, odors, or elevated photoionization detector (PID) readings]. The soil samples will be analyzed for Target Compound List organics including volatile organic compounds (VOCs) semi-volatile organic compounds (SVOCs) polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenols (PCBs), and pesticides (hereafter TCL), Target Analyte List (TAL)

TABLE 3-1

INVESTIGATION RATIONALE
SITE 53 HORSE ISLAND DEBRIS AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA

Site/SWMU	Identified/Suspected Contaminants	Preliminary Assessment	Data Gaps/Needs	Resolution Of Data Gaps/Needs
Site 53 - Horse Island Debris Area	At Site 53, surface debris of unknown source and history was observed.	Soils and groundwater have not been characterized.	• Determine whether contamination is present at the site and, if present, whether a significant release of contamination has occurred.	• Analyze one groundwater sample for TCL organics plus additional Appendix IX VOCs, SVOCs, pesticides, and herbicides and TAL metals/cyanide and tin. • Analyze one groundwater sample for TCL organics and TAL metals/cyanide. • Collect six surface and three subsurface soil samples in the debris area, biased toward evidence of contamination, and analyze for TCL organics and TAL metals/cyanide and tin.

Evidence of contamination is based on elevated PID readings, soil discoloration, and non native soil types.

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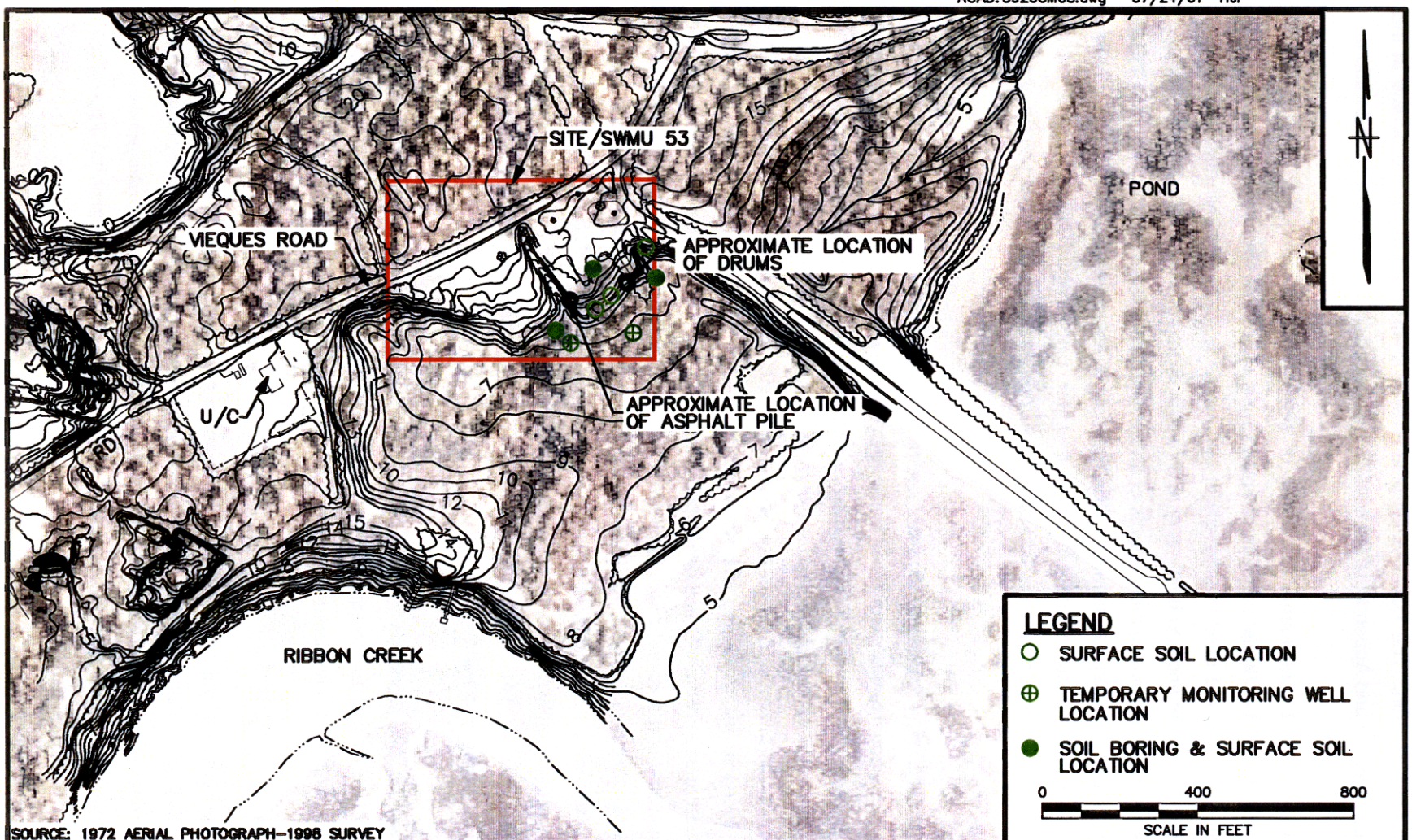

SOURCE: 1972 AERIAL PHOTOGRAPH–1998 SURVEY

DRAWN BY HJP DATE 7/24/01	DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMMAND	SITE/SWMU 53 HORSE ISLAND SAMPLE LOCATION MAP MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	CONTRACT NO. 3920
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Inorganics (hereafter TAL), plus tin. The TCL/TAL list plus tin was determined to be appropriate at this site as opposed to Appendix VIII and Appendix IX list constituents based on the following considerations:

Under RCRA, the Appendix VIII constituents list is one of several factors commonly used to identify hazardous wastes. The Appendix VIII list consists of known toxic chemicals and constituents that vary from being commonly available and used extensively in commerce [e.g., bis(2-ethylhexyl) phthalate in plastics and lead in paints and batteries] to being very rare (nicotine) and/or chemically unstable (calcium chromate). For sites that are not manufacturing plants of known products, however, the Appendix VIII list usually defaults to the Appendix IX list constituents. The Appendix IX list represents the chemicals of the Appendix VIII list that can be measured and are stable in water. However, the Appendix IX list still includes many chemicals that are very rare outside of specific manufacturing plants or unique chemical products.

Since MRCD Parris Island is not a manufacturing plant and only common commercial products were used at the base, the hazardous constituents considered under the Appendix VIII and Appendix IX lists are not directly applicable. Rather, some of these chemicals are potentially present because they were either directly used at the base such as non-chlorinated solvents (e.g., toluene) or they may be present as an impurity in other commercial products such as polynuclear aromatic hydrocarbons (PAHs) (semivolatile organics commonly found in fuels). During the development of the CERCLA regulations, U.S. EPA reviewed the list of hazardous constituents and developed a separate list of constituents (the TCL/TAL list) that are commonly available and at elevated concentrations represent a significant threat to human health and/or the environment. Chemicals on the Appendix IX list that are not present on the TCL/TAL list are uncommon and are only rarely found outside specific industries or unique products. In addition, when these compounds are present, they are usually associated with the more common chemicals found on the TCL/TAL list. Therefore, the TCL/TAL list plus tin is considered viable to adequately characterize potential environmental concerns associated with this site.

Two groundwater samples are proposed for Site 53. These samples will be collected hydraulically downgradient of the site. Based on the planned proximity of these sample locations to the site, the groundwater samples should also represent the upper bound of hazardous chemicals potentially migrating from this site.

In order to comply with both federal and state requirements and to avoid multiple mobilizations, both groundwater samples will be analyzed for TCL volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs) and TAL metals/cyanide. At the request of the state, one of the groundwater samples will be analyzed for the additional Appendix IX VOCs, SVOCs, pesticides, and herbicides.

The requested laboratory turn around time will be 30 days from sample receipt at the laboratory.

Details regarding these analytical lists (i.e., constituents of the list and contract required quantitation limits) are provided in Appendix A.

4.0 FIELD OPERATIONS

This section outlines the project-specific field investigation activities and procedures to be performed at Site/SWMU 53. This section is to be used in conjunction with the Master FSP, Volume II of the Master Work Plan for MCRD, Parris Island (B&R Environmental, 1998) and references the Master FSP where appropriate.

Field operation activities to be performed at MCRD Parris Island for this investigation include mobilization of equipment, site restoration, soil boring installation, temporary monitoring well installation, site surveying, equipment decontamination, and waste handling. These activities are discussed in the following sections. Procedures for performing soil, sediment, and groundwater sampling are discussed in Section 5.0.

All field activities will be performed as described in the Master FSP and as per current TtNUS standard operating procedures (SOPs), except where noted. A state-certified driller will be used to install the soil borings and monitoring wells.

4.1 MOBILIZATION/DEMOBILIZATION

Mobilization activities will be performed in accordance with the procedures outlined in the Master FSP.

A metal detector survey will be conducted in the area around the drums to determine if additional buried drums are present. The survey will be conducted in an area of approximately 60 feet by 100 feet.

4.2 SITE RESTORATION

If investigation activities (e.g., monitoring well installation) disturb or alter the landscape, vegetation, or other features of the site, the site may require restoration to pre-investigation conditions. Portions the site will be regraded if investigation activities alter the natural contour of the site. Additionally, all equipment used during the investigation and all investigation-derived waste (IDW) will be removed from the site.

4.3 DRILLING METHODS FOR SOIL SAMPLES

Either direct-push technology (DPT) or hollow-stem auger drilling techniques will be used to install the soil borings and collect soil samples. For either method, continuous soil sampling will be conducted to the water table. Drilling and sampling methods for groundwater samples are presented in Section 4.4. Drilling activities are further described in the following sections.

4.3.1 Direct-Push Technology (DPT) with Soil Sampling

Hollow stem auger or DPT (e.g., Geoprobe® and Hydropunch®) may be used to obtain soil samples and groundwater samples during this field effort. All subcontracted operations will be overseen by TtNUS.

Most DPT equipment is mounted in cargo vans or on the bed of a pickup truck and includes an hydraulic-powered probe for driving and removal of hardened steel sample rods. Many DPT rigs are equipped with an additional air percussion option for penetrating dense material and an electric hammer for drilling through asphalt and concrete. A wide variety of sample rods are utilized by the DPT system for soil, soil-gas, and groundwater sampling.

Should DPT be used, soil samples will be collected continuously until the terminus of the boring. The soils will be scanned and the lithologies characterized. At each location, subsurface soils will be selected for chemical testing with a bias toward evidence of contamination (e.g., staining and elevated PID readings). Remaining soil cuttings will be disposed as described in Section 4.7.

A boring log will be maintained as described in the Master FSP for each soil boring. Field screening and head-space analysis results and a lithologic description of each split-spoon sample will be recorded on the boring log. At a minimum, the information outlined in the Master FSP will be recorded on the boring log for each boring.

4.3.2 Hollow-Stem Auger Soil Boring Drilling with Split-Spoon Soil Sampling

If hollow-stem auger sampling is to be used, split-spoon samples will be collected continuously from the ground surface to the termination depth of the borings, in accordance with American Society of Testing and Materials (ASTM) Method D 1586-84. The use of drilling fluids is prohibited during soil boring drilling.

The split-spoon samplers will have a minimum inside diameter (I.D.) of 2 inches and a length of 2 feet. Each split-spoon sample will be field screened with a PID upon collection and head-space field analysis will be conducted. The soils will be scanned and the lithologies characterized. In each boring, soils will be selected for chemical testing with a bias toward evidence of contamination (e.g., staining and elevated PID readings). Remaining soil cuttings will be disposed as described in Section 4.7.

A boring log will be maintained as described in the Master FSP for each soil boring. Field screening and head-space analysis results and a lithologic description of each split-spoon sample will be recorded on the boring log. At a minimum, the information outlined in the Master FSP will be recorded on the boring log for each boring.

4.4 MONITORING WELL INSTALLATION AND SAMPLING

Prior to the construction of any monitoring well, a formal request will be submitted to the South Carolina Department of Health and Environmental Control (SCDHEC) for approval. The submittal of this work plan is intended to meet the requirements for a formal request. This Work Plan contains the following information relevant to this request:

- Proposed location(s) on a scaled map or plate
- Proposed construction detail
- Intended purpose of the monitoring well(s)

The state also requires a formal submission detailing the activity performed during the installation of the permanent monitoring well(s). Since permanent monitoring wells are not being installed, a monitoring well record form or other form provided and/or approved by the state will not be completed and submitted.

Three temporary monitoring wells will be installed. The two southern (downgradient) wells will be sampled. A third temporary well will be installed to the north near the area of the suspected groundwater divide. The third temporary well will not be sampled. Water level measurements will be conducted during well installation and approximate water table elevations will be determined in the field using an autoleveler.

4.4.1 Temporary Monitoring Wells Using DPT

If DPT is selected for temporary well construction, 1-to 4-foot-long stainless-steel screens will be driven to sample depth through the hole opened during the DPT drilling. At a depth of approximately 1 to 2 feet below the water table, a groundwater sample will be collected through the screen using a peristaltic pump or variable-speed submersible pump. The pump rate will be adjusted to approximate low-flow conditions. The pH, temperature, turbidity, and specific conductivity will be measured for the purged water. The temporary wells will be purged prior to sampling until a minimum of three and a maximum of 10 well volumes have been removed and these readings have become stabilized. After all sampling has been completed at the well, the borings will be pressure grouted as the rods are being withdrawn. This technique is discussed in greater detail in SOP GH-1.3, Soil and Rock Drilling Methods, dated June 1999.

4.4.2 Temporary Monitoring Wells Using Hollow-Stem Auger Drilling

If hollow-stem auger drilling is selected, then the augers will be used to advance the boring to a depth of approximately 5 feet below the water table. A PVC screen and well casing will be set in the boring. The augers will then be raised above the well screen and the formation will be allowed to collapse around the

screen. Well screens will be 5 feet long. There is sufficient history from existing wells at other sites within MCRD Parris Island to conclude that these shallow surficial wells will be screened in fine-grained material (silt and fine sand); therefore, the anticipated slot size for the shallow well screens is determined to be 0.010 inch. No filter pack is proposed.

A groundwater sample will be collected through the screen using a peristaltic pump or variable-speed submersible pump. The pump rate will be adjusted to approximate low-flow conditions. The pH, temperature, turbidity, and specific conductivity will be measured for the purged water. The temporary wells will be purged prior to sampling until a minimum of three and a maximum of 10 well volumes have been removed and these readings have become stabilized. After all sampling has been completed at the well, the borings will be pressure grouted as the rods are being withdrawn. This technique is discussed in greater detail in SOP GH-1.3, Soil and Rock Drilling Methods, dated June 1999.

4.5 SURFACE SOIL SAMPLING

Three of the six surface soils will coincide with soil boring locations. In these locations, the soil samples will be collected from the DPT macro-cores or split spoon samples in the soil boring. Three of the six surface soil samples will not coincide with soil borings. These three samples will be collected from directly from the ground surface using a disposable PVC sample trowel.

4.6 SURVEYING

All proposed temporary groundwater monitoring well locations, surface soil, subsurface soil, and sediment sample locations will be surveyed. A third-order survey will be conducted by a professional surveyor licensed in the state of South Carolina according to the requirements described in Section 2.9 of the Master FSP of the Master Work Plan, Volume II (B&R Environmental, 1998).

4.7 DECONTAMINATION

Decontamination of major equipment, including all downhole equipment and sampling equipment, will be in accordance with Section 2.10 of the Master FSP and SOP SA-7.1, Decontamination of Field Equipment and Waste Handling. An area for the decontamination pad for major equipment and a source of potable water for steam washing will be arranged by the field operations leader (FOL) through MCRD personnel.

4.8 WASTE HANDLING

All solid and liquid wastes generated as a result of this investigation will be handled in accordance with the procedures described in Section 2.11 of the Master FSP and SOP SA-7.1, "Decontamination of Field Equipment and Waste Handling, dated March 1998, with the following exceptions:

Drill rig or DPT vehicle decontamination and well development fluids will be containerized in 55-gallon drums and inventoried at the base's 90-day accumulation area. Pending the results of analytical testing, these decontamination fluids will be discharged to the Depot's wastewater treatment plant.

Personal protection equipment will be placed in a suitable trash receptacle at the Depot.

The cuttings will be containerized in 55-gallon drums and inventoried at the MCRD Parris Island 90-day accumulation area for additional testing prior to disposal off site.

5.0 ENVIRONMENTAL SAMPLING

This section outlines the environmental sampling program for Site/SWMU (Site) 53.

5.1 SUMMARY OF ENVIRONMENTAL SAMPLING

The following sections describe the sampling efforts to be conducted at Site 53. Table 5-1 summarizes the sampling program for the field investigation. Proposed sampling locations are presented in Figure 3-1 and the final locations are contingent upon drum and asphalt pile locations, metal detector results, utility location, and clearance with MCRD personnel. The rationale for any deviation of these sampling locations will be documented in the PA/SI report.

5.2 SAMPLING PROCEDURES

Three soils borings will be installed to collect subsurface soil samples in the waste area. The three soil boring locations will be biased toward the areas of visible waste. In each boring, soil samples will be collected continuously from the ground surface to the water table and used for waste identification, lithology, and field screening (PID). One subsurface soil sample per boring will be submitted for chemical testing. In the absence of elevated PID readings or other visual indications of contamination, the subsurface soils will be collected directly above the water table. Surface soil samples will be collected in soil areas near waste at the location of the three soil borings. The soil samples will be collected in accordance with the methodologies described in the Master FSP and SOP Number SA-1.3, Soil Sampling, dated June 1999.

Two temporary monitoring wells will be installed as shown in Figure 3-1. The monitoring wells will be sampled during this investigation in accordance with the U.S. EPA Region 4 EISOPQAM and SOP SA-1.1, Section 5.7, Low Flow Purge and Sampling, dated June 1999.

5.3 SAMPLE HANDLING

Sample handling procedures are discussed in this section.

5.3.1 Sample Containers, Preservation, Holding Times, and Analyses

Sample handling includes proper selection of sample containers, preservation, allowable holding times, and analyses. The Master QAP (B&R Environmental, 1998) summarizes the sample handling requirements for this investigation.

TABLE 5-1

SUMMARY OF ENVIRONMENTAL SAMPLING
SITE/SWMU 53
MCRD PARRIS ISLAND, SOUTH CAROLINA

Sample Location	Sample Designation	Sample Depth (Feet below ground surface)	TCL Organics	Sample: Additional Appendix IX organics	Analysis: TAL metals/ cyanide plus tin
SURFACE SOIL					
PAI-53-SS-01-01	PAI-53-SS-01	0-1	•		•
PAI-53-SS-02-01	PAI-53-SS-02	0-1	•		•
PAI-53-SS-03-01	PAI-53-SS-03	0-1	•		•
PAI-53-SS-04-01	PAI-53-SS-04	0-1	•		•
PAI-53-SS-05-01	PAI-53-SS-05	0-1	•		•
PAI-53-SS-06-01	PAI-53-SS-06	0-1	•		•
SUBSURFACE SOIL					
PAI-53-SB-01-XX	PAI-53-SB-01	TBD	•		•
PAI-53-SB-02-XX	PAI-53-SB-02	TBD	•		•
PAI-53-SB-03-XX	PAI-53-SB-03	TBD	•		•
PAI-53-SB-04-XX*	PAI-53-SB-04	TBD	•		•
PAI-53-SB-05-XX*	PAI-53-SB-05	TBD	•		•
GROUNDWATER					
PAI-53-TW-01-01	PAI-53-TW-01	Surfacial	•		•
PAI-53-TW-02-01	PAI-53-TW-02	Surfacial	•	•	•

TCL Organics consist of VOCs, SVOCs, PCBs, and pesticides.
Additional Appendix IX constituents consist of VOCs, SVOCs, pesticides, and herbicides not included within the TCL organic list.
XX - Bottom of sample interval.
TBD - to be determined.
* - Soil boring and samples are to be collected in the event the magnetic survey detects evidence of additional drums.

5.3.2 Sample Nomenclature

Each sample will be assigned a unique codified sample identification number. The sample nomenclature format described in the Master FSP and B&R Environmental SOP Number CT-04, Sample Nomenclature, dated March 1996, will be used for this investigation. The unique label system established for this sampling event is as follows:

1		2		3		4
AAA-NN	-	AA	-	NNN	-	NN
Site Location and Site Number		Media		Sample Number		Sample Depth/ Round

1	PAI - Parris Island 53 - Site/SWMU 53	2	SB - Subsurface Soil SS - Surface Soil TW – Temporary Monitoring Well
3	An ascending sequential number of samples collected	4	Bottom of sample interval (soils) or sample round (groundwater).

5.3.3 Sample Documentation, Packaging, and Shipping

Matrix-specific sample logsheets will be maintained for each sample collected. In addition, sample collection information will be recorded in field notebooks and the site logbook. Further description of sample documentation is provided in the Master FSP and SOP Number SA-6.3, Field Documentation, dated January 2000.

Samples will be packaged and shipped according to the procedures outlined in Master FSP and SOP Number SA-6.1, Non-Radiological Sample Handling, dated March 2000.

5.3.4 Sample Custody

Sample custody will be maintained and documented at all times. Custody begins at the time of collection and ends at the time of disposal by the laboratory. The procedures for custody described in the Master FSP and SOP Number SA-6.1 will be implemented for this investigation.

6.0 QUALITY ASSURANCE PLAN

A general discussion of the quality assurance process is provided in the Master Work Plan (B&R Environmental, 1998). Site-specific data quality objectives are provided in Section 3.0 of this document, and the laboratory DQOs are discussed in Section 8.0 of this document.

7.0 PROJECT MANAGEMENT ORGANIZATION

TtNUS will be responsible for management, implementation, and inspection of the field investigation. TtNUS will coordinate activities with program personnel and MCRD Navy personnel when appropriate.

7.1 PROJECT ORGANIZATION

An organizational chart of the site-specific project personnel for this investigation is provided in Figure 7-1.

7.2 PROJECT PERSONNEL RESPONSIBILITIES

A description of responsibilities of individual project team members is provided below.

The responsibilities of the task order manager (TOM) are provided in the Master Work Plan. The FOL will be responsible for coordinating all site personnel and field activities. The FOL will

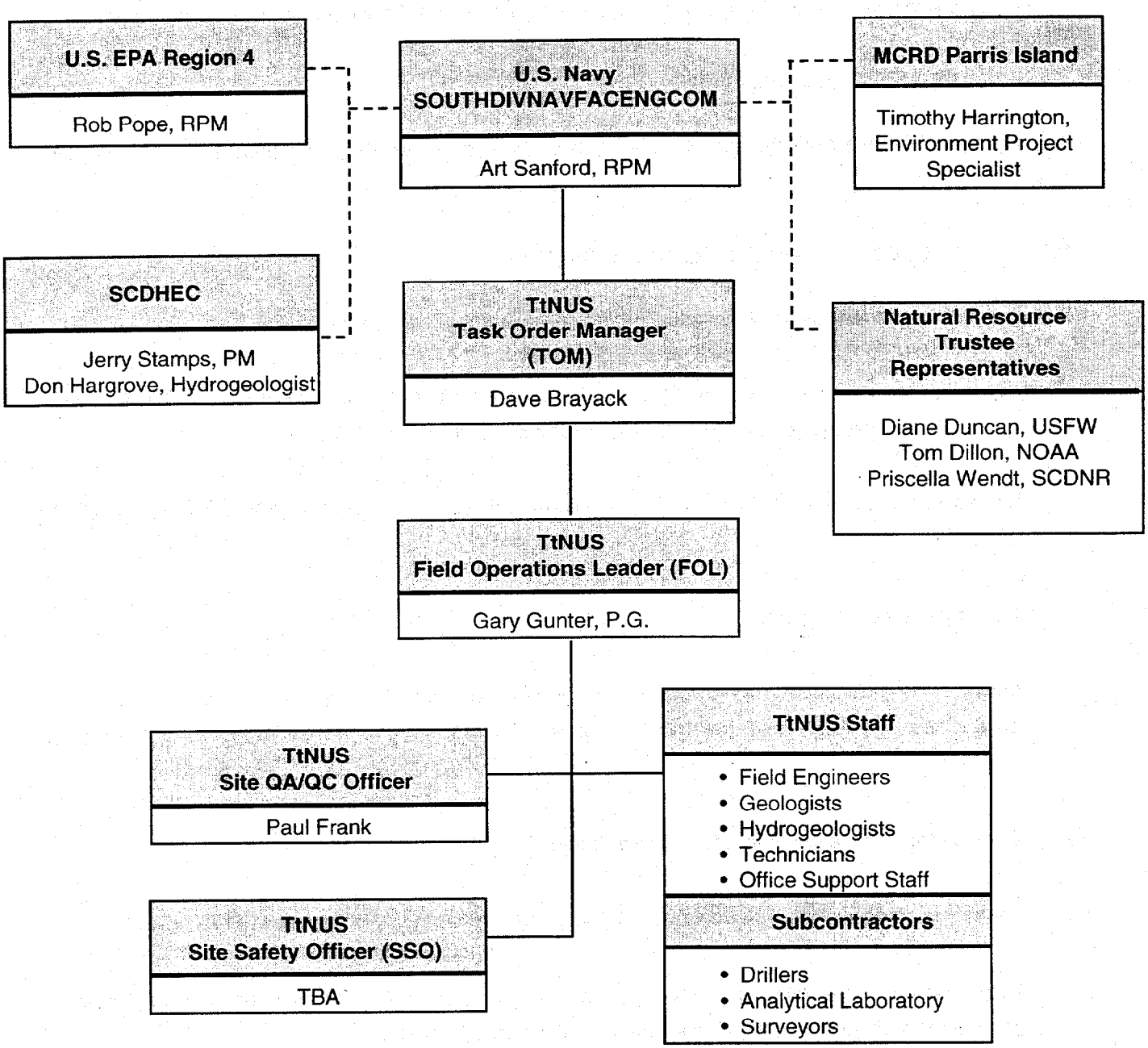
- Act as liaison among the TOM, field team members, site safety officer (SSO), and site QA/QC officer.
- Supervise all subcontractors.
- Oversee the mobilization and demobilization of all equipment, personnel, and subcontractors and ensure the availability and maintenance of all field sampling and monitoring equipment and materials.
- Oversee the completion of all site documentation.
- Assume custody of all samples and ensure the proper handling and shipment of all samples.
- Resolve all logistical, weather, personnel, and equipment problems that may arise and initiate field change requests after consultation with the TOM, when necessary.

The site QA/QC officer will be responsible for ensuring all site activities are performed according to the QA/QC guidelines outlined in the Master QAP. The site QA/QC officer will

- Act as liaison among the TtNUS quality assurance manager (QAM), laboratory, and site personnel.

FIGURE 7-1

**PROJECT PERSONNEL ORGANIZATION
MCRD PARRIS ISLAND, SOUTH CAROLINA**



NOAA: National Oceanic and Atmospheric Administration
PM: Project Manager
RPM: Remedial Project Manager
SCNDR: South Carolina Department of Natural Resources
TBA: To Be Assigned
USFW: U.S. Fish and Wildlife Service

- Ensure that field duplicates and quality control blanks are collected at the proper frequency and volume.

- Ensure that all measuring and testing equipment is calibrated, used, and maintained in accordance with applicable procedures.

- Manage bottleware procurement and oversee field preservation and filtration activities.

The SSO will advise the FOL on issues of site health and safety. The duties of the SSO are described in the Master Health and Safety Plan (HASP) of the Master Work Plan, Volume II (B&R Environmental, 1998).

8.0 DATA QUALITY REQUIREMENTS

The purpose of this section is to specify frequency of QA/QC samples, bottleware requirements, sample custody and shipment procedures. This section will also cross reference procedures for laboratory QC checks, project record keeping, data management, performance and system audits, corrective actions and training and quality planning.

8.1 LABORATORY ANALYSES

Section 5.0 of the Master QAP (B&R Environmental, 1998) describes the laboratory and methodology requirements for the sample analyses for this investigation. Section 5.5 of the Master QAP (B&R Environmental, 1998) describes the data reporting requirements for this investigation. Section 5.6 of the Master QAP (B&R Environmental, 1998) describes the criteria for laboratory selection. The laboratory selected to perform work at this site must be South Carolina state certified.

8.2 EXTERNAL (FIELD) QC SAMPLES

Section 3.3 of the Master QAP (B&R Environmental, 1998) contains a general description of field quality control measures.

8.2.1 Field QC Sample Types and Frequencies

Table 8-1 summarizes the frequency and type of field QA/QC samples to be collected for this investigation.

TABLE 8-1

FREQUENCY OF FIELD QC SAMPLES
MCRD PARRIS ISLAND, SOUTH CAROLINA

Type Of Sample	Organics	Inorganics
Field Duplicate/ Split Samples	1/10 samples/per medium	1/10 samples/per medium
Source Water Blank	1/source/sampling event	1/source/sampling event
Trip Blank (VOCs only)	1/cooler containing VOCs samples	NA
Equipment Rinsate Blank	1/day/per matrix	1/day/per matrix
Field Blank	As needed; depends on site conditions	As needed; depends on site conditions

Detailed descriptions of QC sample types are provided in Sections 3.3.1 through 3.3.5 of the Master QAP of the Master Work Plan, Volume II (B&R Environmental, 1998).

8.2.2 Matrix Spike/Duplicate Sample Aliquots

Laboratory duplicate and matrix spike samples will be analyzed as described in Section 3.4 of the Master QAP of the Master WP, Volume II (B&R Environmental, 1998). The field sampling team will provide the appropriate additional sample volume, as prescribed by the laboratory requirements. The additional sample aliquots required for analysis of matrix spike/duplicates will be collected with a frequency of 1 per 20 samples per matrix.

8.3 BOTTLEWARE REQUIREMENTS

The bottleware, preservation requirements, and holding times for the analyses proposed for this investigation are provided in Table 8-2. Pre-preserved, certified clean bottleware will be supplied by the laboratory subcontractor.

8.4 SAMPLE CUSTODY AND SHIPMENT

Sample custody procedures are designed to provide proper documentation of sample acquisition and integrity. Sample custody and shipment procedures for this investigation are described in Section 4.0 of the Master QAP of the Master Work Plan, Volume II (B&R Environmental, 1998).

8.5 INTERNAL (LABORATORY) QC CHECKS

Descriptions of the internal (laboratory) QC check types are provided in Section 6.0 of the Master QAP of the Master Work Plan, Volume II (B&R Environmental, 1998).

8.5.1 Laboratory Duplicate, Spike, and Method Blank Analyses

Table 8-3 summarizes the frequency and type of laboratory QC checks to be performed for this investigation.

TABLE 8-2

SUMMARY OF BOTTLEWARE, PRESERVATION, AND HOLDING TIMES
SITE 53 - HORSE ISLAND DEBRIS AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 1 OF 2

Analysis	Analytical Method	Sample Volume[1]	Bottleware	Preservation[2]	Holding Time[3]
AQUEOUS (GROUNDWATER)					
TCL VOCs and Additional Appendix IX VOC constituents	SW-846 8260B	2 x 40 mL	Glass; Teflon-lined septum cap	HCl to pH<2; Cool to 4°C; zero headspace	14 days to analysis
TCL SVOCs and Additional Appendix IX SVOC constituents.	SW-846 8270C	1 L	Amber Glass	Cool to 4°C	7 days to extraction; 40 days to analysis
TCL PCBs/Pesticides and Additional Appendix IX pesticides and herbicides.	SW-846 8081A/8082/ 8151A/8141A	4 L	Amber Glass	Cool to 4°C	7 days to extraction; 40 days to analysis
Total TAL Metals and Tin	SW-846 6010B/ 7000A Series	1 L	HDPE	HNO_3 to pH<2	6 months to analysis, except Hg (28 days)
Cyanide	SW-846 9010B	1 L	HDPE	NaOH>ph12 Cool to 4°C	14 days to analysis

TABLE 8-2

SUMMARY OF BOTTLEWARE, PRESERVATION, AND HOLDING TIMES
SITE 53 - HORSE ISLAND DEBRIS AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 2 OF 2

Analysis	Analytical Method	Sample Volume[1]	Bottleware	Preservation[2]	Holding Time[3]
SOLID (SURFACE & SUBSURFACE SOIL & SEDIMENT)					
TCL VOCs	SW-846 5035/8260B	5 x 5 g	EnCore™ Samplers	Cool to 4°C; At lab, samples to be preserved by adding to 5 ml reagent water and then freezing at -10°C	Extract within 48 hours; 14 days to analysis
TCL SVOCs	SW-846 8270C	8 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Total TAL Metals, cyanide	SW-846 6010B/7000A Series 9012A	8 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	6 months, except Hg (28 days), cyanide 14 days.
TCL Pesticides	SW-846 8081A	4 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
TCL PCBs	SW-846 8082	4 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Tin	SW-846 6010B 7000A Series	1 L	HDPE	HNO_3 to pH <2	6 months to analysis

1 Sample volume may vary based on the laboratory.
2 HCl - Hydrochloric acid; HNO_3 - Nitric acid; NaOH - Sodium hydroxide; H_2SO_4 - Sulfuric acid.
3 Holding times are measured from the date of sample collection.
4 NA - Not applicable.

HDPE = High Density Polyethylene

TABLE 8-3

**FREQUENCY OF LABORATORY QC CHECKS
MCRD PARRIS ISLAND, SOUTH CAROLINA**

Type Of Sample	Organics	Inorganics
Laboratory Duplicate	NA	1/20 samples/per medium
Matrix Spike	1/20 samples/per medium	1/20 samples/per medium
Matrix Spike Duplicate	1/20 samples/medium	NA
Surrogate Spike	Each sample for chromatographic analyses	NA
Method Blank	Based on method requirements with a minimum of 1/batch of 20 samples	Based on method requirements with a minimum of 1/batch of 20 samples

8.5.2 Other Laboratory QC Checks

Calibration and preventive maintenance of laboratory instruments are described in Section 6.6 of the Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998). Handling and storage of samples, use of qualified technicians, and independent confirmation of data computations and deliverables are described in the Laboratory Quality Assurance Plan (LQAP).

8.6 PROJECT RECORDS

Record keeping and evidentiary file concerns are described in Section 7.0 of the Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998). All protocols described therein will be strictly observed.

8.7 DATA REDUCTION, VALIDATION, AND REPORTING

The data generated from this investigation will be validated in accordance with the U.S. EPA National Functional Guidelines for Organic and Inorganic Data Review. The corresponding requirements, as discussed in Section 8.0 of the Master QAP, Volume II (B&R Environmental, 1998), for data assessment, electronic deliverables, and data interpretation and reporting will be followed.

Data validation will consist of either a data review or a full data validation. The full data validation will be performed on a minimum of 10 percent of the data packages received from a laboratory and all analytes will be covered by at least one full data validation. A data review will be performed on the remaining data packages for the purposes of identifying false positive and negative results.

8.8 PERFORMANCE AND SYSTEM AUDITS

The protocol for conducting audits, as outlined in Section 9.0 of the Master QAP, Volume II (B&R Environmental, 1998), will be followed.

8.9 CORRECTIVE ACTIONS

In the event there are discrepancies in field activities from the established procedures and/or requirements or modifications to the proposed work plan, the procedures established in Section 10.0 of the Master QAP, Volume II (B&R Environmental, 1998) for documenting nonconformances will be implemented and, if appropriate, a Field Task Modification Request Form will be completed.

8.10 TRAINING AND QUALITY PLANNING

Training requirements and pro-active management practices are provided in Section 11.0 of the Master QAP the Master Work Plan, Volume II (B&R Environmental, 1998).

REFERENCES

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APPENDIX A

TCL, TAL, AND APPENDIX IX CONSTITUENTS

United States Environmental Protection Agency
Office of Solid Waste and Emergency Response
Publication 9240.0-08-FSD
January 2000

EPA

Multi-Media, Multi-Concentration, Organic Analytical Service for Superfund (OLM04.2)

Office of Emergency and Remedial Response
Analytical Operations/Data Quality Center (5204G)
Quick Reference Fact Sheet

Under the legislative authority granted to the U.S. Environmental Protection Agency (EPA) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), EPA develops standardized analytical methods for the measurement of various pollutants in environmental samples from known or suspected hazardous waste sites. Among the pollutants that are of concern to the EPA at such sites, are a series of volatile, semivolatile, and pesticide/Aroclor (pesticide/PCB) compounds that are analyzed using gas chromatography coupled with mass spectrometry (GC/MS) and gas chromatography with an electron capture detector (GC/ECD). The Analytical Operations/Data Quality Center (AOC) of the Office of Emergency and Remedial Response (OERR) offers an analytical service that provides data from the analysis of water and soil/sediment samples for organic compounds for use in the Superfund decision-making process. Through a series of standardized procedures and a strict chain-of-custody, the organic analytical service produces data of known and documented quality. This service is available through the Superfund Contract Laboratory Program (CLP).

DESCRIPTION OF SERVICES

The new organic analytical service is available as of September 1999. It provides a technical and contractual frame work for laboratories to apply EPA/CLP analytical methods for the isolation, detection, and quantitative measurement of 48 volatile, 65 semivolatile, and 28 pesticide/Aroclor (pesticide/PCB) target compounds in water and soil/sediment environmental samples. The CLP provides the methods to be used and the specific technical, reporting, and contractual requirements, including quality assurance (QA), quality control (QC), and standard operating procedures (SOPs), by which EPA evaluates the data. This service uses GC/MS and GC/ECD methods to analyze the target compounds. Three data delivery turnarounds are available to CLP customers: 7, 14, and 21-day turnaround after laboratory receipt of the last sample in the set. In addition, there are 48 (for volatiles) and 72-hour [for semivolatiles and pesticides/Aroclors (pesticides/PCBs)] preliminary data submission options available. New options under this service include a closed system purge-and-trap method for low level volatile soil analysis and methanol preservation for medium level volatile soil analysis. In addition, users may request modifications to the specified methodologies that may include, but are not limited to, additional compounds and modified quantitation limits.

DATA USES

This analytical service provides data which EPA uses for a variety of purposes, such as determining the nature and extent of contamination at a hazardous waste site, assessing priorities for response based on risks to human health and the environment, determining appropriate cleanup actions, and determining when remedial actions are complete. The data may be used in all stages in the investigation of a hazardous waste site including site inspections, Hazard Ranking System scoring, remedial investigations/feasibility studies, remedial design, treatability studies, and removal actions. In addition, this service provides data that will be available for use in Superfund enforcement/litigation activities.

TARGET COMPOUNDS

The compounds for which this service is applicable and the corresponding quantitation limits are listed in **Table 1**. For water samples, the lowest quantitation limits reportable are 10 ppb for the volatile compounds, 10 ppb for the semivolatile compounds, and 0.05 ppb for the pesticide/Aroclor (pesticide/PCB) compounds. For soil samples, the lowest quantitation limits reportable are 10 ppb for the volatile compounds, 330 ppb for the semivolatile compounds, and 1.7 ppb for the pesticide/

Table 1. Target Compound List and Contract Required Quantitation Limits (CRQLs) For OLM04.2*

		Quantitation Limits Water (µg/L)	Low Soil (µg/Kg)
VOLATILES			
1.	Dichlorodifluoromethane	10	10
2.	Chloromethane	10	10
3.	Vinyl Chloride	10	10
4.	Bromomethane	10	10
5.	Chloroethane	10	10
6.	Trichlorofluoromethane	10	10
7.	1,1-Dichloroethene	10	10
8.	1,1,2-Trichloro-1,2,2-trifluoroethane	10	10
9.	Acetone	10	10
10.	Carbon Disulfide	10	10
11.	Methyl Acetate	10	10
12.	Methylene Chloride	10	10
13.	trans-1,2-Dichloroethene	10	10
14.	Methyl tert-Butyl Ether	10	10
15.	1,1-Dichloroethane	10	10
16.	cis-1,2-Dichloroethene	10	10
17.	2-Butanone	10	10
18.	Chloroform	10	10
19.	1,1,1-Trichloroethane	10	10
20.	Cyclohexane	10	10
21.	Carbon Tetrachloride	10	10
22.	Benzene	10	10
23.	1,2-Dichloroethane	10	10
24.	Trichloroethene	10	10
25.	Methylcyclohexane	10	10
26.	1,2-Dichloropropane	10	10
27.	Bromodichloromethane	10	10
28.	cis-1,3-Dichloropropene	10	10
29.	4-Methyl-2-pentanone	10	10
30.	Toluene	10	10
31.	trans-1,3-Dichloropropene	10	10
32.	1,1,2-Trichloroethane	10	10
33.	Tetrachloroethene	10	10
34.	2-Hexanone	10	10
35.	Dibromochloromethane	10	10
36.	1,2-Dibromoethane	10	10
37.	Chlorobenzene	10	10
38.	Ethylbenzene	10	10
39.	Xylenes (Total)	10	10
40.	Styrene	10	10
41.	Bromoform	10	10
42.	Isopropylbenzene	10	10
43.	1,1,2,2-Tetrachloroethane	10	10
44.	1,3-Dichlorobenzene	10	10
45.	1,4-Dichlorobenzene	10	10
46.	1,2-Dichlorobenzene	10	10
47.	1,2-Dibromo-3-chloropropane	10	10
48.	1,2,4-Triclorobenzene	10	10

		Quantitation Limits Water (µg/L)	Low Soil (µg/Kg)
SEMIVOLATILES			
49.	Benzaldehyde	10	330
50.	Phenol	10	330
51.	bis-(2-Chloroethyl)ether	10	330
52.	2-Chlorophenol	10	330
53.	2-Methylphenol	10	330
54.	2,2'-oxybis (1-Chloropropane)	10	330
55.	Acetophenone	10	330
56.	4-Methylphenol	10	330
57.	N-Nitroso-di-n-propylamine	10	330
58.	Hexachloroethane	10	330
59.	Nitrobenzene	10	330
60.	Isophorone	10	330
61.	2-Nitrophenol	10	330
62.	2,4-Dimethylphenol	10	330
63.	bis-(2-Chloroethoxy) methane	10	330
64.	2,4-Dichlorophenol	10	330
65.	Naphthalene	10	330
66.	4-Chloroaniline	10	330
67.	Hexachlorobutadiene	10	330
68.	Caprolactam	10	330
69.	4-Chloro-3-methylphenol	10	330
70.	2-Methylnaphthalene	10	330
71.	Hexachlorocyclopentadiene	10	330
72.	2,4,6-Trichlorophenol	10	330
73.	2,4,5-Trichlorophenol	25	830
74.	1,1'-Biphenyl	10	330
75.	2-Chloronaphthalene	10	330
76.	2-Nitroaniline	25	830
77.	Dimethylphthalate	10	330
78.	2,6-Dinitrotoluene	10	330
79.	Acenaphthylene	10	330
80.	3-Nitroaniline	25	830
81.	Acenaphthene	10	330
82.	2,4-Dinitrophenol	25	830
83.	4-Nitrophenol	25	830
84.	Dibenzofuran	10	330
85.	2,4-Dinitrotoluene	10	330
86.	Diethylphthalate	10	330
87.	Fluorene	10	330
88.	4-Chlorophenyl-phenylether	10	330
89.	4-Nitroaniline	25	830
90.	4,6-Dinitro-2-methylphenol	25	830
91.	N-Nitrosodiphenylamine	10	330
92.	4-Bromophenyl-phenylether	10	330
93.	Hexachlorobenzene	10	330
94.	Atrazine	10	330
95.	Pentachlorophenol	25	830
96.	Phenanthrene	10	330
97.	Anthracene	10	330

		Quantitation Limits Water (µg/L)	Low Soil (µg/Kg)
98.	Carbazole	10	330
99.	Di-n-butylphthalate	10	330
100.	Fluoranthene	10	330
101.	Pyrene	10	330
102.	Butylbenzylphthalate	10	330
103.	3,3'-Dichlorobenzidine	10	330
104.	Benzo(a)anthracene	10	330
105.	Chrysene	10	330
106.	bis-(2-Ethylhexyl)phthalate	10	330
107.	Di-n-octylphthalate	10	330
108.	Benzo(b)fluoranthene	10	330
109.	Benzo(k)fluoranthene	10	330
110.	Benzo(a)pyrene	10	330
111.	Indeno(1,2,3-cd)pyrene	10	330
112.	Dibenz(a,h)anthracene	10	330
113.	Benzo(g,h,i)perylene	10	330
PESTICIDES/AROCLORS (PESTICIDES/PCBs)		**Water (µg/L)**	**Soil (µg/Kg)**
114.	alpha-BHC	0.05	1.7
115.	beta-BHC	0.05	1.7
116.	delta-BHC	0.05	1.7
117.	gamma-BHC (Lindane)	0.05	1.7
118.	Heptachlor	0.05	1.7
119.	Aldrin	0.05	1.7
120.	Heptachlor epoxide	0.05	1.7
121.	Endosulfan I	0.05	1.7
122.	Dieldrin	0.10	3.3
123.	4,4'-DDE	0.10	3.3
124.	Endrin	0.10	3.3
125.	Endosulfan II	0.10	3.3
126.	4,4'-DDD	0.10	3.3
127.	Endosulfan sulfate	0.10	3.3
128.	4,4'-DDT	0.10	3.3
129.	Methoxychlor	0.50	17
130.	Endrin ketone	0.10	3.3
131.	Endrin aldehyde	0.10	3.3
132.	alpha-Chlordane	0.05	1.7
133.	gamma-Chlordane	0.05	1.7
134.	Toxaphene	5.0	170
135.	Aroclor-1016	1.0	33
136.	Aroclor-1221	2.0	67
137.	Aroclor-1232	1.0	33
138.	Aroclor-1242	1.0	33
139.	Aroclor-1248	1.0	33
140.	Aroclor-1254	1.0	33
141.	Aroclor-1260	1.0	33

* For volatiles, quantitation limits for medium soils are approximately 120 times the quantitation limits for low soils. For semivolatile medium soils, quantitation limits are approximately 30 times the quantitation limits for low soils.

Aroclor (pesticide/PCB) compounds. Specific sample quantitation limits will be highly matrix dependent. Compounds identified with concentrations below the quantitation limit will be reported as estimated concentration values.

The list of target compounds for this service was originally derived from the EPA Priority Pollutant List of 129 compounds. In the years since inception of the CLP, compounds have been added to and removed from the Target Compound List (TCL), based on advances in analytical methods, evaluation of method performance data, and the needs of the Superfund program.

For drinking water and groundwater type samples, use of the low concentration organic analytical service is recommended.

METHODS AND INSTRUMENTATION

For semivolatile and pesticide/Aroclor (pesticide/PCB) water samples, a 1-L aliquot is extracted with methylene chloride using a continuous liquid-liquid extractor or separatory funnel [for pesticides/Aroclors (pesticides/PCBs) only]. For low level semivolatile soil and pesticide/Aroclor (pesticides/PCBs) soil samples, a 30-g soil/sediment sample is extracted with methylene chloride/acetone using sonication, automated soxhlet, or pressurized fluid extraction techniques. For medium level semivolatile soil samples, a 1-g aliquot is extracted with methylene chloride using the techniques mentioned above for low level soil samples. For both water and soil samples, the extract is concentrated, subjected to fraction-specific cleanup procedures, and analyzed by GC/MS for semivolatiles or GC/ECD for pesticides/Aroclors (pesticides/PCBs).

For volatile water samples, 5 mL of water is added to a purge and trap device and purged with an inert gas at room temperature. For volatile low level soil samples, a 5-g aliquot of soil is added to a purge and trap device with 5 mL of reagent water then purged with an inert gas at 40°C; or a 5-g aliquot (pre-weighed in the field) is purged from a closed-system purge and trap device at 40°C. For volatile medium level soil samples, a measured amount is collected/extracted with methanol and an aliquot of the methanol extract is added to reagent water and purged at room temperature. For both water and soil samples, the volatiles purged from the sample are trapped on a solid sorbent. They are subsequently desorbed by rapidly heating the sorbent and then introduced into a GC/MS system. **Table 2** summarizes the methods and instruments used in this analytical service.

DATA DELIVERABLES

Data deliverables for this service include hardcopy data reporting forms and supporting raw data. In addition to the hardcopy deliverable, contract laboratories must also submit the same data electronically. The laboratory must submit data to EPA within 7, 14, or 21-days [or preliminary data within 48 hours (for volatiles)] or 72 hours [for semivolatiles and pesticides/Aroclors (pesticides/PCBs)] after laboratory receipt of the last sample in the set. EPA then processes the data through an automated Data Assessment Tool (DAT). DAT is a complete CLP data assessment package. DAT incorporates Contract Compliance Screening (CCS) and Computer-Aided Data Review and Evaluation (CADRE) review to provide EPA Regions with PC-compatible reports, spreadsheets, and electronic files within 24 to 48 hours from the receipt of the data for data validation. This automated tool facilitates the transfer of analytical data into Regional databases. In addition to the Regional electronic reports, the CLP laboratories are provided with a data assessment report that documents the instances of noncompliance. The laboratory has 10 days to reconcile defective data and resubmit the data to EPA. EPA then reviews the data for noncompliance and sends a final data assessment report to the CLP laboratory and the Region.

QUALITY ASSURANCE

The quality assurance (QA) process consists of management review and oversight at the planning, implementation, and completion stages of the environmental data collection activity. This process ensures that the data provided are of the quality required.

During the implementation of the data collection effort, QA activities ensure that the quality control (QC) system is functioning effectively and that the deficiencies uncovered by the QC system are corrected. After environmental data are collected, QA activities focus on assessing the quality of data to determine its suitability to support enforcement or remedial decisions.

Each contract laboratory prepares a quality assurance plan (QAP) with the objective of providing sound analytical chemical measurements. The QAP must specify the policies, organization, objectives, and functional guidelines, as well as the QA and QC activities designed to achieve the data quality requirements for this analytical service.

QUALITY CONTROL

The QC process includes those activities required during analytical data collection to produce data of known and documented quality. The analytical data acquired from QC procedures are used to estimate and evaluate the analytical results and to determine the necessity for, or the effect of, corrective action procedures. The QC procedures required for this analytical service are shown in **Table 3.**

Table 2. Methods and Instruments

Fraction	Water	Soil
Volatiles	Purge-and-trap followed by GC/MS analysis	Purge-and-trap or closed-system purge-and-trap followed by GC/MS analysis
Semivolatiles	Continuous liquid-liquid extraction followed by GC/MS analysis	Sonication, automated soxhlet, or pressurized fluid extraction followed by GC/MS analysis
Pesticides/Aroclors (Pesticides/PCBs)	Continuous liquid-liquid or separatory funnel extraction followed by dual column GC/ECD analysis	Sonication, automated soxhlet or pressurized fluid extraction followed by dual column GC/ECD analysis

Table 3. Quality Control

QC Operation	Frequency
System Monitoring Compounds (volatiles)	Added to each sample, standard, and blank
Surrogates [for semivolatiles and pesticides/Aroclors (pesticides/PCBs)]	Added to each sample, standard, and blank
Method Blanks (volatiles)	Analyzed at least every 12 hours for each matrix and level
Method Blanks [semivolatiles and pesticides/Aroclors (pesticides/PCBs)]	Prepared with each group of 20 samples or less of same matrix and level, or each time samples are extracted by the same procedure
Instrument Blank (volatiles)	Analyzed after a sample which contains compounds at concentrations greater than the calibration range
Instrument Blank [pesticides/Aroclors (pesticides/PCBs)]	Every 12 hours on each GC column used for analysis
Storage Blanks (volatiles)	Prepared and stored with each set of samples
GC/MS mass calibration and ion abundance patterns (volatiles and semivolatiles)	Every 12 hours for each instrument used for analysis
GC Resolution Check [pesticides/Aroclors (pesticides/PCBs)]	Prior to initial calibration, on each instrument used for analysis
Initial Calibration	Upon initial set up of each instrument, and each time continuing calibration fails to meet the acceptance criteria
Continuing Calibration	Every 12 hours for each instrument used for analysis
Internal Standards (volatiles and semivolatiles)	Added to each sample, standard, and blank
Matrix Spike and Matrix Spike Duplicate	Once every 20 or fewer samples of same fraction, matrix, and level in an SDG

PERFORMANCE MONITORING ACTIVITIES

Laboratory performance monitoring activities are provided primarily by AOC and the Regions to ensure that contract laboratories are producing data of the appropriate quality. EPA performs on-site laboratory audits, data package audits, GC/MS and/or GC/ECD tape audits, and evaluates laboratory performance through the use of blind performance evaluation samples.

For more information, or for suggestions to improve this analytical service, please contact:

Terry Smith
Organic Program Manager
USEPA/AOC
Ariel Rios Building (5204G)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-603-8849
FAX: 703-603-9112

United States Environmental Protection Agency
Office of Solid Waste and Emergency Response
Publication 9240.0-09-FSD
February 2000

EPA

Multi-Media, Multi-Concentration, Inorganic Analytical Service for Superfund (ILM04.1)*

Office of Emergency and Remedial Response
Analytical Operations/Data Quality Center (5204G)
Quick Reference Fact Sheet

Under the legislative authority granted to the U.S. Environmental Protection Agency (EPA) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), EPA develops standardized analytical methods for the measurement of various pollutants in environmental samples from known or suspected hazardous waste sites. Among the pollutants that are of concern to EPA at such sites are a series of inorganic analytes and cyanide that are analyzed using inductively coupled plasma (ICP), atomic absorption (AA), and colorimetric techniques. The Analytical Operations/Data Quality Center (AOC) of the Office of Emergency and Remedial Response (OERR) offers an analytical service that provides data from the analysis of water and soil/sediment samples for inorganic analytes for use in the Superfund decision-making process. Through a series of standardized procedures and a strict chain-of-custody, the inorganic analytical service produces data of known and documented quality. This service is available through the Superfund Contract Laboratory Program (CLP).

DESCRIPTION OF SERVICES

The inorganic analytical service provides a technical and contractual framework for laboratories to utilize EPA/CLP analytical methods. These methods are used in the preparation, detection, and quantitative measurement of cyanide and 23 inorganic target analytes in both water and soil/sediment environmental samples. The CLP provides the methods to be used and the specific technical, reporting, and contractual requirements, including quality assurance, quality control, and standard operating procedures, by which EPA evaluates the data. This service uses ICP, AA, and colorimetric methods to analyze the inorganic target analytes and cyanide. Three data delivery turnarounds are available to CLP customers: 7, 14, and 21-day turnaround after receipt of the last sample in the set. In addition, a 72-hour preliminary data submission option also is available for all turnaround times.

DATA USES

This analytical service provides data that EPA uses for a variety of purposes. Examples include determining the nature and extent of contamination at a hazardous waste site, assessing priorities for response based on risks to human health and the environment, determining appropriate cleanup actions, and determining when remedial actions are complete. The data may be used in all stages in the investigation of a hazardous waste site including site inspections, Hazard Ranking System scoring, remedial investigations/feasibility studies, remedial design, treatability studies, and removal actions. In addition, this service provides data that are available for use in Superfund enforcement/litigation activities.

TARGET ANALYTES

The analytes and detection limits for which this service is applicable are listed in **Table 1**. The list of target analytes for this service was originally derived from the EPA Priority Pollutant List of 129 compounds. In the years since the inception of the CLP, analytes have been added to and deleted from the Target Analyte List, based on advances in analytical methods, evaluation of method performance data, and the needs of the Superfund program. Specific detection limits are highly matrix dependent.

* ILM04.1 is an interim inorganic analytical service. Further changes are expected to be released under ILM05.0 for competition during calendar year 2000.

Table 1.
Target Analyte List and Contract Required Detection Limits (CRDLs) (ILM04.1)

Abbreviation	Analyte	CRDL[1] (μ/L)
Al	Aluminum	200
Sb	Antimony	60
As	Arsenic	10
Ba	Barium	200
Be	Beryllium	5
Cd	Cadmium	5
Ca	Calcium	5000
Cr	Chromium	10
Co	Cobalt	50
Cu	Copper	25
Fe	Iron	100
Pb	Lead	3
Mg	Magnesium	5000
Mn	Manganese	15
Hg	Mercury	0.2
Ni	Nickel	40
K	Potassium	5000
Se	Selenium	5
Ag	Silver	10
Na	Sodium	5000
Tl	Thallium	10
V	Vanadium	50
Zn	Zinc	20
Cn	Cyanide	10

Sample concentration exceeding five times the detection limit of the instrument or method in use may be reported even though the instrument or method detection limit is greater than the CRDL. This is illustrated in the following example:

For lead:
Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample Concentration = 220
CRDL = 3

[1]The CRDL is the instrument detection limit obtained in pure water.

METHODS AND INSTRUMENTATION

When storing samples, the use of a cooler temperature indicator bottle and the cooler temperature must be reported on Form DC-1 and in the Sample Delivery Group (SDG) Narrative. When applying AA methods, the Contractor may analyze the sample at a dilution so long as the raw concentration or absorbence of the diluted sample falls within the upper half of the calibration range. For ICP, an undiluted analysis of the sample is required.

If an insufficient sample amount (less than 90% of the required amount) is received to perform the analyses, the Contractor must contact the Sample Management Office (SMO) to report the problem. The same is required for multi-phase samples (e.g., two-phase liquid sample and oily sludge/sandy soil sample).

Table 2 summarizes the methods and instruments used in this analytical service.

DATA DELIVERABLES

Data deliverables for this service include both hardcopy/ electronic data reporting forms and supporting raw data. The laboratory must submit data to EPA within 7, 14, 21-days, or preliminary data must be submitted within 72 hours after laboratory receipt of each sample in the set. EPA then processes the data through an automated Data Assessment Tool (DAT). DAT is a complete CLP data assessment package. DAT incorporates Contract Compliance Screening (CCS) and Computer-Aided Data Review and Evaluation (CADRE) to provide EPA Regions with PC-compatible reports, spreadsheets, and electronic files. These files can be provided to the Regions within 24 to 48 hours from the receipt of the data and can be used as a tool during the data validation process at the Region. This automated tool facilitates the transfer of analytical data into Regional databases. In addition to the Regional electronic reports, the CLP laboratories are provided with a data assessment report that documents the instances of noncompliance. The laboratory has 4 days to reconcile defective data and resubmit the data to EPA. EPA then reviews the data for noncompliance and sends a final data assessment report to the CLP laboratory and the Region.

QUALITY ASSURANCE

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Table 2. Methods and Instruments

Analyte	Instrument	Method
Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Ni, K, Se, Ag, Na, Tl, V, Zn	Inductively Coupled Plasma (ICP)	Acid digestion followed by ICP analysis
As, Pb, Tl, Se	Graphite Furnace Atomic Absorption (GFAA)	Acid digestion followed by GFAA analysis
Ca, Mg, Na, K	Flame Atomic Absorption (FAA)	Acid digestion followed by FAA analysis
Hg	Cold Vapor Atomic Absorption (CVAA)	Acid and permanganate oxidation followed by CVAA analysis
CN	Manual and Semi-automated Colorimetric	Distillation followed by colorimetric analysis

Table 3. Quality Control

QC Operation	Frequency
Instrument Calibration	Daily or each time instrument is set up
Initial Calibration Verification	Following each instrument calibration
Initial Calibration Blank	Following each instrument calibration
Continuing Calibration Verification	Every 10 analytical samples or every 2 hours during a run and at the beginning and end of each run
Continuing Calibration Blank	Every 10 analytical samples or every 2 hours during a run and at the beginning and end of each run
Interference Check Sample	Every 20 analytical samples and at the beginning and end of each run
CRDL Standard for ICP	Every 20 analytical samples and at the beginning and end of each run
CRDL Standard for AA	At the beginning of each AA analytical run
Serial Dilution for ICP	For each matrix type and concentration level for each SDG
Preparation Blank	For each sample preparation, analysis, and matrix per batch of prepared samples
Laboratory Control Sample	For each sample preparation and analysis procedure for each batch
Matrix Spike Sample Analysis	For each matrix type, concentration level, and method for each SDG
Duplicate Sample Analysis	For each matrix type, concentration level, and method for each SDG
Post Digestion Spike	Each time matrix spike recovery is outside QC limits
Analytical Spike	For each analytical sample analyzed by furnace AA
Method of Standard Addition	When the analytical spike recovery is outside QC limits
Instrument Detection Limit Determination	Quarterly
Interelement Corrections	Annually for ICP instruments only
Linear Range Analysis	Quarterly for ICP instruments only

During the data collection effort, QA activities ensure that the quality control (QC) system is functioning effectively and that the deficiencies uncovered by the QC system are corrected. After environmental data are collected, QA activities focus on assessing the quality of data to determine its suitability to support enforcement or remedial decisions. Each contract laboratory prepares a quality assurance plan (QAP) with the objective of providing sound analytical chemical measurements. The QAP must specify the policies, organization, objectives, functional guidelines, and QA/ QC activities designed to achieve the data quality requirements for this analytical service.

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PERFORMANCE MONITORING ACTIVITIES

Laboratory performance monitoring activities are provided primarily by AOC and the Regions to ensure that contract laboratories are producing data of the appropriate quality. EPA performs on-site laboratory audits, data package audits, and evaluates laboratory performance through the use of blind performance evaluation samples.

For more information, or for suggestions to improve this analytical service, please contact:

Tanya Mitchell
Inorganic Program Manager
EPA/AOC
Ariel Rios Building (5204G)
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
703-603-8872
FAX: 703-603-9112

Fremont
Jefferson
Madison
Oneida
Power
Teton

MONTANA

Beaverhead
Broadwater
Cascade
Deer Lodge
Flathead
Gallatin
Granite
Jefferson
Lake
Lewis and Clark
Madison
Meagher
Missoula
Park
Powell
Sanders
Silver Bow
Stillwater
Sweet Grass
Teton
Wheatland

NEVADA

All

NEW MEXICO

Bernalillo
Catron
Grant
Hidalgo
Los Alamos
Rio Arriba
Sandoval
Sante Fe
Sierra
Socorro
Taos
Torrance
Valencia

UTAH

Beaver
Box Elder
Cache
Carbon
Davis
Duchesne
Emery
Garfield
Iron
Juab
Millard
Morgan
Piute
Rich
Salt Lake
Sanpete
Sevier
Summit
Tooele
Utah
Wasatch
Washington
Wayne
Weber

WASHINGTON

Chelan
Clallam
Clark
Cowlitz
Douglas
Ferry
Grant
Grays Harbor
Jefferson
King
Kitsap
Kittitas
Lewis
Mason
Okanogan
Pacific
Pierce
San Juan Islands
Skagit
Skamania
Snohomish
Thurston
Wahkiakum
Whatcom
Yakima

WYOMING

Fremont
Lincoln
Park
Sublette
Teton
Uinta
Yellowstone National Park

[46 FR 57285, Nov. 23, 1981; 47 FR 953, Jan. 8, 1982]

APPENDICES VII—VIII TO PART 264
[RESERVED]

APPENDIX IX TO PART 264—GROUND-WATER MONITORING LIST[1]

GROUND-WATER MONITORING LIST[1]

Common name[2]	CAS RN[3]	Chemical abstracts service index name[4]	Suggested methods[5]	PQL (µg/L)[6]
Acenaphthene	83-32-9	Acenaphthylene, 1,2-dihydro-	8100	200
			8270	10
Acenaphthylene	208-96-8	Acenaphthylene	8100	200
			8270	10
Acetone	67-64-1	2-Propanone	8240	100
Acetophenone	98-86-2	Ethanone, 1-phenyl-	8270	10
Acetonitrile; Methyl cyanide	75-05-8	Acetonitrile	8015	100
2-Acetylaminofluorene; 2-AAF	53-96-3	Acetamide, N-9H-fluoren-2-yl-	8270	10
Acrolein	107-02-8	2-Propenal	8030	5
			8240	5
Acrylonitrile	107-13-1	2-Propenenitrile	8030	5
			8240	5
Aldrin	309-00-2	1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro- 1,4,4a,5,8,8a-hexahydro- (1α,4α, 4aβ, 5α,8α,8aβ)-	8080	0.05
			8270	10
Allyl chloride	107-05-1	1-Propene, 3-chloro-	8010	5
			8240	100
4-Aminobiphenyl	92-67-1	[1,1'-Biphenyl]- 4-amine	8270	10
Aniline	62-53-3	Benzenamine	8270	10
Anthracene	120-12-7	Anthracene	8100	200
			8270	10
Antimony	(Total)	Antimony	6010	300
			7040	2,000
			7041	30
Aramite	140-57-8	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester.	8270	10

GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
Arsenic	(Total)	Arsenic	6010	500
			7060	10
			7061	20
Barium	(Total)	Barium	6010	20
			7080	1,000
Benzene	71–43–2	Benzene	8020	2
			8240	5
Benzo(a)anthracene; Benzanthracene.	56–55–3	Benz[a]anthracene	8100	200
			8270	10
Benzo(b)fluoranthene	205–99–2	Benz[e]acephenanthrylene	8100	200
			8270	10
Benzo(k)fluoranthene	207–08–9	Benzo[k]fluoranthene	8100	200
			8270	10
Benzo(ghi)perylene	191–24–2	Benzo[ghi]perylene	8100	200
			8270	10
Benzo(a)pyrene	50–32–8	Benzo[a]pyrene	8100	200
			8270	10
Benzyl alcohol	100–51–6	Benzenemethanol	8270	20
Beryllium	(Total)	Beryllium	6010	3
			7090	50
			7091	2
alpha-BHC	319–84–6	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α, 2α,3β, 4α,5β,6β)-	8080	0.05
			8250	10
beta-BHC	319–85–7	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2β, 3α,4β, 5α,6β)-	8080	0.05
			8250	40
delta-BHC	319–86–8	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2α, 3α, 4β,5α,6β)-	8080	0.1
			8250	30
gamma-BHC; Lindane	58–89–9	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α, 2α, 3β, 4α,5α,6β)-	8080	0.05
			8250	10
Bis(2-chloroethoxy)methane	111–91–1	Ethane, 1,1'-[methylenebis (oxy)]bis [2-chloro-	8270	10
Bis(2-chloroethyl)ether	111–44–4	Ethane, 1,1'-oxybis(2-chloro-	8270	10
Bis(2-chloro-1-methylethyl) ether; 2,2'-Dichlorodiisopropyl ether.	108–60–1	Propane, 2,2'-oxybis(1-chloro-	8010	100
			8270	10
Bis(2-ethylhexyl) phthalate	117–81–7	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl)ester	8060	20
			8270	10
Bromodichloromethane	75–27–4	Methane, bromodichloro-	8010	1
			8240	5
Bromoform; Tribromomethane	75–25–2	Methane, tribromo-	8010	2
			8240	5
4-Bromophenyl phenyl ether	101–55–3	Benzene, 1-bromo-4-phenoxy-	8270	10
Butyl benzyl phthalate; Benzyl butyl phthalate	85–68–7	1,2-Benzenedicarboxylic acid, butyl phenylmethyl ester.	8060	5
			8270	10
Cadmium	(Total)	Cadmium	6010	40
			7130	50
			7131	1
Carbon disulfide	75–15–0	Carbon disulfide	8240	5
Carbon tetrachloride	56–23–5	Methane, tetrachloro-	8010	1
			8240	5
Chlordane	57–74–9	4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a- hexahydro-.	8080	0.1
			8250	10
p-Chloroaniline	106–47–8	Benzenamine, 4-chloro-	8270	20
Chlorobenzene	108–90–7	Benzene, chloro-	8010	2
			8020	2
			8240	5
Chlorobenzilate	510–15–6	Benzeneacetic acid, 4-chloro-α-(4-chlorophenyl)-α-hydroxy-, ethyl ester.	8270	10
p-Chloro-m-cresol	59–50–7	Phenol, 4-chloro-3-methyl-	8040	5
			8270	20
Chloroethane; Ethyl chloride	75–00–3	Ethane, chloro-	8010	5
			8240	10
Chloroform	67–66–3	Methane, trichloro-	8010	0.5
			8240	5
2-Chloronaphthalene	91–58–7	Naphthalene, 2-chloro-	8120	10
			8270	10
2-Chlorophenol	95–57–8	Phenol, 2-chloro-	8040	5

GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
			8270	10
4-Chlorophenyl phenyl ether	7005-72-3	Benzene, 1-chloro-4-phenoxy-	8270	10
Chloroprene	126-99-8	1,3-Butadiene, 2-chloro-	8010	50
			8240	5
Chromium	(Total)	Chromium	6010	70
			7190	500
			7191	10
Chrysene	218-01-9	Chrysene	8100	200
			8270	10
Cobalt	(Total)	Cobalt	6010	70
			7200	500
			7201	10
Copper	(Total)	Copper	6010	60
			7210	200
m-Cresol	108-39-4	Phenol, 3-methyl-	8270	10
o-Cresol	95-48-7	Phenol, 2-methyl-	8270	10
p-Cresol	106-44-5	Phenol, 4-methyl-	8270	10
Cyanide	57-12-5	Cyanide	9010	40
2,4-D; 2,4-Dichlorophenoxyacetic acid.	94-75-7	Acetic acid, (2,4-dichlorophenoxy)-	8150	10
4,4'-DDD	72-54-8	Benzene 1,1'-(2,2-dichloroethylidene) bis[4-chloro-	8080	0.1
			8270	10
4,4'-DDE	72-55-9	Benzene, 1,1'-(dichloroethenylidene) bis[4-chloro-	8080	0.05
			8270	10
4,4'-DDT	50-29-3	Benzene, 1,1'-(2,2,2-trichloroethylidene) bis[4-chloro-	8080	0.1
			8270	10
Diallate	2303-16-4	Carbamothioic acid, bis(1-methylethyl)- , S- (2,3-dichloro-2-propenyl) ester.	8270	10
Dibenz[a,h]anthracene	53-70-3	Dibenz[a,h]anthracene	8100	200
			8270	10
Dibenzofuran	132-64-9	Dibenzofuran	8270	10
Dibromochloromethane; Chlorodibromomethane	124-48-1	Methane, dibromochloro-	8010	1
			8240	5
1,2-Dibromo-3-chloropropane; DBCP.	96-12-8	Propane, 1,2-dibromo-3-chloro-	8010	100
			8240	5
			8270	10
1,2-Dibromoethane; Ethylene dibromide.	106-93-4	Ethane, 1,2-dibromo-	8010	10
			8240	5
Di-n-butyl phthalate	84-74-2	1,2-Benzenedicarboxylic acid, dibutyl ester	8060	5
			8270	10
o-Dichlorobenzene	95-50-1	Benzene, 1,2-dichloro-	8010	2
			8020	5
			8120	10
			8270	10
m-Dichlorobenzene	541-73-1	Benzene, 1,3-dichloro-	8010	5
			8020	5
			8120	10
			8270	10
p-Dichlorobenzene	106-46-7	Benzene, 1,4-dichloro-	8010	2
			8020	5
			8120	15
			8270	10
3,3'-Dichlorobenzidine	91-94-1	[1,1'-Biphenyl]- 4,4'- diamine, 3,3'-dichloro-	8270	20
trans-1,4-Dichloro-2-butene	110-57-6	2-Butene, 1,4-dichloro-, (E)-	8240	5
Dichlorodifluoromethane	75-71-8	Methane, dichlorodifluoro-	8010	10
			8240	5
1,1-Dichloroethane	75-34-3	Ethane, 1,1-dichloro-	8010	1
			8240	5
1,2-Dichloroethane; Ethylene dichloride.	107-06-2	Ethane, 1,2-dichloro-	8010	0.5
			8240	5 ...
1,1-Dichloroethylene; Vinylidene chloride.	75-35-4	Ethene, 1,1-dichloro-	8010	1
			8240	5
trans-1,2-Dichloroethylene	156-60-5	Ethene, 1,2-dichloro-, (E)-	8010	1
			8240	5
2,4-Dichlorophenol	120-83-2	Phenol, 2,4-dichloro-	8040	5
			8270	10
2,6-Dichlorophenol	87-65-0	Phenol, 2,6-dichloro-	8270	10
1,2-Dichloropropane	78-87-5	Propane, 1,2-dichloro-	8010	0.5
			8240	5 ...

GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
cis-1,3-Dichloropropene	10061-01-5	1-Propene, 1,3-dichloro-, (Z)-	8010 8240	20 5
trans-1,3-Dichloropropene	10061-02-6	1-Propene, 1,3-dichloro-, (E)-	8010 8240	5 5
Dieldrin	60-57-1	2,7:3,6-Dimethanonaphth [2,3-b]oxirene, 3,4,5,6,9,9-hexachloro- 1a,2,2a,3,6,6a,7,7a- octahydro-, (1aα,2β, 2aα, 3β,6β,6aα,7β,7aα)-	8080 8270	0.05 10
Diethyl phthalate	84-66-2	1,2-Benzenedicarboxylic acid, diethyl ester	8060 8270	5 10
O,O-Diethyl O-2-pyrazinyl phosphorothioate; Thionazin	297-97-2	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester	8270	10
Dimethoate	60-51-5	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester.	8270	10
p-(Dimethylamino)azobenzene	60-11-7	Benzenamine, N,N-dimethyl-4-(phenylazo)-	8270	10
7,12-Dimethylbenz[a]anthracene	57-97-6	Benz[a]anthracene, 7,12-dimethyl-	8270	10
3,3'-Dimethylbenzidine	119-93-7	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl-	8270	10
alpha, alpha-Dimethylphenethylamine.	122-09-8	Benzeneethanamine, α,α-dimethyl-	8270	10
2,4-Dimethylphenol	105-67-9	Phenol, 2,4-dimethyl-	8040 8270	5 10
Dimethyl phthalate	131-11-3	1,2-Benzenedicarboxylic acid, dimethyl ester	8060 8270	5 10
m-Dinitrobenzene	99-65-0	Benzene, 1,3-dinitro-	8270	10
4,6-Dinitro-o-cresol	534-52-1	Phenol, 2-methyl-4,6-dinitro-	8040 8270	150 50
2,4-Dinitrophenol	51-28-5	Phenol, 2,4-dinitro-	8040 8270	150 50
2,4-Dinitrotoluene	121-14-2	Benzene, 1-methyl-2,4-dinitro-	8090 8270	0.2 10
2,6-Dinitrotoluene	606-20-2	Benzene, 2-methyl-1,3-dinitro-	8090 8270	0.1 10
Dinoseb; DNBP; 2-sec-Butyl-4,6-dinitrophenol	88-85-7	Phenol, 2-(1-methylpropyl)-4,6-dinitro-	8150 8270	1 10
Di-n-octyl phthalate	117-84-0	1,2-Benzenedicarboxylic acid, dioctyl ester	8060 8270	30 10
1,4-Dioxane	123-91-1	1,4-Dioxane	8015	150
Diphenylamine	122-39-4	Benzenamine, N-phenyl-	8270	10
Disulfoton	298-04-4	Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl]ester	8140 8270	2 10
Endosulfan I	959-98-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3α,5aβ,6α,9α,9aβ)-.	8080 8250	0.1 10
Endosulfan II	33213-65-9	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro- 1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3α,5aα, 6β,9β, 9aα)-	8080	0.05
Endosulfan sulfate	1031-07-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro- 1,5,5a,6,9,9a-hexahydro-, 3,3-dioxide.	8080 8270	0.5 10
Endrin	72-20-8	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro- 1a,2,2a,3,6,6a,7,7a- octahydro-, (1aα, 2β,2aβ, 3α,6α, 6aβ,7β, 7aα)-	8080 8250	0.1 10
Endrin aldehyde	7421-93-4	1,2,4-Methenocyclopenta[cd]pentalene- 5-carboxaldehyde, 2,2a,3,3,4,7-hexachlorodecahydro-, (1α,2β, 2aβ,4β, 4aβ,5β,6aβ,6bβ,7R*)-	8080 8270	0.2 10
Ethylbenzene	100-41-4	Benzene, ethyl-	8020 8240	2 5
Ethyl methacrylate	97-63-2	2-Propenoic acid, 2-methyl-, ethyl ester	8015 8240 8270	10 5 10
Ethyl methanesulfonate	62-50-0	Methanesulfonic acid, ethyl ester	8270	10
Famphur	52-85-7	Phosphorothioic acid, O-[4-[(dimethylamino)sulfonyl]phenyl]-O,O-dimethyl ester.	8270	10
Fluoranthene	206-44-0	Fluoranthene	8100 8270	200 10
Fluorene	86-73-7	9H-Fluorene	8100 8270	200 10
Heptachlor	76-44-8	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-	8080 8270	0.05 10

GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
Heptachlor epoxide	1024–57–3	2,5-Methano-2H-indeno(1,2-b)oxirene, 2,3,4,5,6,7,7-heptachloro-1a,1b,5,5a,6,6a,-hexahydro-, (1aα,1bβ,2α,5α,5aβ,6β,6aα)	8080	1
			8270	10
Hexachlorobenzene	118–74–1	Benzene, hexachloro-	8120	0.5
			8270	10
Hexachlorobutadiene	87–68–3	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	8120	5
			8270	10
Hexachlorocyclopentadiene	77–47–4	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	8120	5
			8270	10
Hexachloroethane	67–72–1	Ethane, hexachloro-	8120	0.5
			8270	10
Hexachlorophene	70–30–4	Phenol, 2,2'-methylenebis(3,4,6-trichloro-	8270	10
Hexachloropropene	1888–71–7	1–Propene, 1,1,2,3,3,3-hexachloro-	8270	10
2-Hexanone	591–78–6	2-Hexanone	8240	50
Indeno(1,2,3-cd)pyrene	193–39–5	Indeno(1,2,3-cd)pyrene	8100	200
			8270	10
Isobutyl alcohol	78–83–1	1-Propanol, 2-methyl-	8015	50
Isodrin	465–73–6	1,4,5,8-Dimethanonaphthalene,1,2,3,4,10,10-hexachloro- 1,4,4a,5,8,8a hexahydro-(1α, 4α, 4aβ, 5β, 8β,8aβ)-.	8270	10
Isophorone	78–59–1	2-Cyclohexen-1-one, 3,5,5-trimethyl-	8090	60
			8270	10
Isosafrole	120–58–1	1,3-Benzodioxole, 5-(1-propenyl)-	8270	10
Kepone	143–50–0	1,3,4-Metheno-2H-cyclobuta- [cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6- decachlorooctahydro-	8270	10
Lead	(Total)	Lead	6010	40
			7420	1,000
			7421	10
Mercury	(Total)	Mercury	7470	2
Methacrylonitrile	126–98–7	2-Propenenitrile, 2-methyl-	8015	5
			8240	5
Methapyrilene	91–80–5	1,2,Ethanediamine, N,N-dimethyl-N'-2- pyridinyl- N'-(2-thienylmethyl)-.	8270	10
Methoxychlor	72–43–5	Benzene, 1,1'-(2,2,2,trichloroethylidene)bis(4-methoxy-.	8080	2
			8270	10
Methyl bromide; Bromomethane	74–83–9	Methane, bromo-	8010	20
			8240	10
Methyl chloride; Chloromethane	74–87–3	Methane, chloro-	8010	1
			8240	10
3-Methylcholanthrene	56–49–5	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-	8270	10
Methylene bromide; Dibromomethane.	74–95–3	Methane, dibromo-	8010	15
			8240	5
Methylene chloride; Dichloromethane.	75–09–2	Methane, dichloro-	8010	5
			8240	5
Methyl ethyl ketone; MEK	78–93–3	2-Butanone	8015	10
			8240	100
Methyl iodide; Iodomethane	74–88–4	Methane, iodo-	8010	40
			8240	5
Methyl methacrylate	80–62–6	2-Propenoic acid, 2-methyl-, methyl ester	8015	2
			8240	5
Methyl methanesulfonate	66–27–3	Methanesulfonic acid, methyl ester	8270	10
2-Methylnaphthalene	91–57–6	Naphthalene, 2-methyl-	8270	10
Methyl parathion; Parathion methyl.	298–00–0	Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester.	8140	0.5
			8270	10
4-Methyl-2-pentanone; Methyl isobutyl ketone.	108–10–1	2-Pentanone, 4-methyl-	8015	5
			8240	50
Naphthalene	91–20–3	Naphthalene	8100	200
			8270	10
1,4-Naphthoquinone	130–15–4	1,4-Naphthalenedione	8270	10
1-Naphthylamine	134–32–7	1-Naphthalenamine	8270	10
2-Naphthylamine	91–59–8	2-Naphthalenamine	8270	10
Nickel	(Total)	Nickel	6010	50
			7520	400
o-Nitroaniline	88–74–4	Benzenamine, 2-nitro-	8270	50
m-Nitroaniline	99–09–2	Benzenamine, 3-nitro-	8270	50
p-Nitroaniline	100–01–6	Benzenamine, 4-nitro-	8270	50
Nitrobenzene	98–95–3	Benzene, nitro-	8090	40
			8270	10
o-Nitrophenol	88–75–5	Phenol, 2-nitro-	8040	5
			8270	10

GROUND-WATER MONITORING LIST [1]—*Continued*

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
p-Nitrophenol	100-02-7	Phenol, 4-nitro-	8040	10
			8270	50
4-Nitroquinoline 1-oxide	56-57-5	Quinoline, 4-nitro-, 1-oxide	8270	10
N-Nitrosodi-n-butylamine	924-16-3	1-Butanamine, N-butyl-N-nitroso-	8270	10
N-Nitrosodiethylamine	55-18-5	Ethanamine, N-ethyl-N-nitroso-	8270	10
N-Nitrosodimethylamine	62-75-9	Methanamine, N-methyl-N-nitroso-	8270	10
N-Nitrosodiphenylamine	86-30-6	Benzenamine, N-nitroso-N-phenyl-	8270	10
N-Nitrosodipropylamine; Di-n-propylnitrosamine.	621-64-7	1-Propanamine, N-nitroso-N-propyl-	8270	10
N-Nitrosomethylethylamine	10595-95-6	Ethanamine, N-methyl-N-nitroso-	8270	10
N-Nitrosomorpholine	59-89-2	Morpholine, 4-nitroso-	8270	10
N-Nitrosopiperidine	100-75-4	Piperidine, 1-nitroso-	8270	10
N-Nitrosopyrrolidine	930-55-2	Pyrrolidine, 1-nitroso-	8270	10
5-Nitro-o-toluidine	99-55-8	Benzenamine, 2-methyl-5-nitro-	8270	10
Parathion	56-38-2	Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyl) ester	8270	10
Polychlorinated biphenyls; PCBs	See Note 7	1,1'-Biphenyl, chloro derivatives	8080	50
			8250	100
Polychlorinated dibenzo-p-dioxins; PCDDs.	See Note 8	Dibenzo[b,e][1,4]dioxin, chloro derivatives	8280	0.01
Polychlorinated dibenzofurans; PCDFs.	See Note 9	Dibenzofuran, chloro derivatives	8280	0.01
Pentachlorobenzene	608-93-5	Benzene, pentachloro-	8270	10
Pentachloroethane	76-01-7	Ethane, pentachloro-	8240	5
			8270	10
Pentachloronitrobenzene	82-68-8	Benzene, pentachloronitro-	8270	10
Pentachlorophenol	87-86-5	Phenol, pentachloro-	8040	5
			8270	50
Phenacetin	62-44-2	Acetamide, N-(4-ethoxyphenyl)	8270	10
Phenanthrene	85-01-8	Phenanthrene	8100	200
			8270	10
Phenol	108-95-2	Phenol	8040	1
			8270	10
p-Phenylenediamine	106-50-3	1,4-Benzenediamine	8270	10
Phorate	298-02-2	Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester	8140	2
			8270	10
2-Picoline	109-06-8	Pyridine, 2-methyl-	8240	5
			8270	10
Pronamide	23950-58-5	Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-	8270	10
Propionitrile; Ethyl cyanide	107-12-0	Propanenitrile	8015	60
			8240	5
Pyrene	129-00-0	Pyrene	8100	200
			8270	10
Pyridine	110-86-1	Pyridine	8240	5
			8270	10
Safrole	94-59-7	1,3-Benzodioxole, 5-(2-propenyl)-	8270	10
Selenium	(Total)	Selenium	6010	750
			7740	20
			7741	20
Silver	(Total)	Silver	6010	70
			7760	100
Silvex; 2,4,5-TP	93-72-1	Propanoic acid, 2-(2,4,5-trichlorophenoxy)-	8150	2
Styrene	100-42-5	Benzene, ethenyl-	8020	1
			8240	5
Sulfide	18496-25-8	Sulfide	9030	10,000
2,4,5-T; 2,4,5-Trichlorophenoxyacetic acid.	93-76-5	Acetic acid, (2,4,5- trichlorophenoxy)-	8150	2
2,3,7,8-TCDD; 2,3,7,8-Tetrachlorodibenzo-p- dioxin	1746-01-6	Dibenzo[b,e][1,4]dioxin, 2,3,7,8-tetrachloro-	8280	0.005
1,2,4,5-Tetrachlorobenzene	95-94-3	Benzene, 1,2,4,5-tetrachloro-	8270	10
1,1,1,2-Tetrachloroethane	630-20-6	Ethane, 1,1,1,2-tetrachloro-	8010	5
			8240	5
1,1,2,2-Tetrachloroethane	79-34-5	Ethane, 1,1,2,2-tetrachloro-	8010	0.5
			8240	5
Tetrachloroethylene; Perchloroethylene; Tetrachloroethene.	127-18-4	Ethene, tetrachloro-	8010	0.5
			8240	5
2,3,4,6-Tetrachlorophenol	58-90-2	Phenol, 2,3,4,6-tetrachloro-	8270	10
Tetraethyl dithiopyrophosphate; Sulfotepp.	3689-24-5	Thiodiphosphonic acid ($[(HO)_2P(S)]_2O$), tetraethyl ester	8270	10

GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
Thallium	(Total)	Thallium	6010	400
			7840	1,000
			7841	10
Tin	(Total)	Tin	7870	8,000
Toluene	108-88-3	Benzene, methyl-	8020	2
			8240	5
o-Toluidine	95-53-4	Benzenamine, 2-methyl-	8270	10
Toxaphene	8001-35-2	Toxaphene	8080	2
			8250	10
1,2,4-Trichlorobenzene	120-82-1	Benzene, 1,2,4-trichloro-	8270	10
1,1,1-Trichloroethane; Methylchloroform.	71-55-6	Ethane, 1,1,1-trichloro-	8240	5
1,1,2-Trichloroethane	79-00-5	Ethane, 1,1,2-trichloro-	8010	0.2
			8240	5
Trichloroethylene; Trichloroethene.	79-01-6	Ethene, trichloro-	8010	1
			8240	5
Trichlorofluoromethane	75-69-4	Methane, trichlorofluoro-	8010	10
			8240	5
2,4,5-Trichlorophenol	95-95-4	Phenol, 2,4,5-trichloro-	8270	10
2,4,6-Trichlorophenol	88-06-2	Phenol, 2,4,6-trichloro-	8040	5
			8270	10
1,2,3-Trichloropropane	96-18-4	Propane, 1,2,3-trichloro-	8010	10
			8240	5
O,O,O-Triethyl phosphorothioate	126-68-1	Phosphorothioic acid, O,O,O-triethyl ester	8270	10
sym-Trinitrobenzene	99-35-4	Benzene, 1,3,5-trinitro-	8270	10
Vanadium	(Total)	Vanadium	6010	80
			7910	2,000
			7911	40
Vinyl acetate	108-05-4	Acetic acid, ethenyl ester	8240	5
Vinyl chloride	75-01-4	Ethene, chloro-	8010	2
			8240	10
Xylene (total)	1330-20-7	Benzene, dimethyl-	8020	5
			8240	5
Zinc	(Total)	Zinc	6010	20
			7950	50

[1] The regulatory requirements pertain only to the list of substances; the right hand columns (Methods and PQL) are given for informational purposes only. See also footnotes 5 and 6.

[2] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

[3] Chemical Abstracts Service registry number. Where "Total" is entered, all species in the ground water that contain this element are included.

[4] CAS index names are those used in the 9th Cumulative Index.

[5] Suggested methods refer to analytical procedure numbers used in the EPA publication, SW-846, "Test Methods for Evaluating Solid Waste", Third Edition. Analytical details can be found in SW-846 and in documentation on file at the Agency. The packed column gas chromatography methods 8010, 8020, 8030, 8040, 8060, 8080, 8090, 8110, 8120, 8140, 8150, 8240, and 8250 were promulgated methods through Update IIB of SW-846 and, as of Update III, the Agency has replaced these methods with "capillary column GC methods", as the suggested methods.

[6] Practical Quantitation Limits (PQLs) are the lowest concentrations of analytes in ground waters that can be reliably determined within specified limits of precision and accuracy by the indicated methods under routine laboratory operating conditions. The PQLs listed are generally stated to one significant figure. CAUTION: The PQL values in many cases are based only on a general estimate for the method and not on a determination for individual compounds; PQLs are not a part of the regulation.

[7] Polychlorinated biphenyls (CAS RN 1336-36-3); this category contains congener chemicals, including constituents of Aroclor-1016 (CAS RN 12674-11-2), Aroclor-1221 (CAS RN 11104-28-2), Aroclor-1232 (CAS RN 11141-16-5), Aroclor-1242 (CAS RN 53469-21-9), Aroclor-1248 (CAS RN 12672-29-6), Aroclor-1254 (CAS RN 11097-69-1), and Aroclor-1260 (CAS RN 11096-82-5). The PQL shown is an average value for PCB congeners.

[8] This category contains congener chemicals, including tetrachlorodibenzo-p-dioxins (see also 2,3,7,8-TCDD), pentachlorodibenzo-p-dioxins, and hexachlorodibenzo-p-dioxins. The PQL shown is an average value for PCDD congeners.

[9] This category contains congener chemicals, including tetrachlorodibenzofurans, pentachlorodibenzofurans, and hexachlorodibenzofurans. The PQL shown is an average value for PCDF congeners.

[52 FR 25947, July 9, 1987, as amended at 62 FR 32462, June 13, 1997]