Kozol's
Copy

QUALITY ASSURANCE PROJECT PLAN
OPERATION AND MAINTENANCE
FOR LANDFILL COMPONENT
STOUGHTON CITY LANDFILL
STOUGHTON, WISCONSIN

Prepared for:

U.S. Environmental Protection Agency
Emergency and Remedial Response Branch
Region V
77 West Jackson Boulevard
Chicago, Illinois 60604

This document was prepared in accordance with U.S. EPA Contract No. 68-W8-0089, WESTON Region V Alternative Remedial Contracting Strategy (ARCS).

Work Assignment No. 54-5NT2

Document Control No. 4500-54-AMRN

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS/ABBREVIATIONS

AMSL	Above Mean Sea Level
AOC	Administrative Order by Consent
APO	Administrative Project Officer
ARARS	applicable or relevant and appropriate requirements
ASTM	American Society of Testing and Materials
ATV	all-terrain vehicle
CCS	Contracts Compliance Screening
CDO	Central District Office
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
CLP	Contract Laboratory Program
COC	Chain-of-Custody
CRDL	Contract Required Detection Limits
CRL	Central Regional Laboratory
CRQL	Contract Required Quantitation Limits
DCDFM	Dichlorodifluoromethane
DMI	distance measuring instrument
DNAPL	dense nonaqueous phase liquids
DQO	data quality objective
EMSL	Environmental Monitoring Systems Laboratory
FID	flame ionization detector
FSM	Field Sample Manager
FSP	field sampling plan
HQ	Headquarters
IATA	International Air Transport Association
LSSS	Laboratory Scientific Support Section (Region V)
M&E	Metcalf and Eddy, Inc.
MCL	maximum contaminant level
MS/MSD	matrix spike/matrix spike duplicate
NBS	National Bureau of Standards
NEIC	National Enforcement Investigations Center
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
OERR	Office of Emergency and Remedial Response
OSC	on-scene coordinator
PAHs	polynuclear aromatic hydrocarbons
PAL	Preventive Action Limit
PE	performance evaluation
PID	photoionization detector
ppb	parts per billion
PRPs	Potential Responsible Parties
QA	quality assurance
QAM	quality assurance manager

LIST OF ACRONYMS/ABBREVIATIONS (Continued)

QAO	quality assurance officer
QAPP	quality assurance project plan
QAS	Quality Assurance Section
QC	quality control
R.E.H.S	Registered Environmental Health Specialist
RA	Remedial Action
RAS	routine analytical services
RD	Remedial Design
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
RPM	Remedial Project Manager
RQAM	Regional Quality Assurance Manager
RSCC	Regional Sample Control Center
SARA	Superfund Amendments and Reauthorization Act
SAS	special analytical services
SCL	Stoughton City Landfill
SHSC	Site Health and Safety Coordinator
SM	site manager
SMC	sample management coordinator
SMO	sample management office
SNL	Special Notice Letters
SOP	standard operating procedure
SOW	Statement of Work
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCFM	Trichlorofluoromethane
TCL	Target Compound List
TDS	Total Dissolved Solids
TES	Technical Enforcement Support
THF	Tetrahydrofuran
TIC	tentatively identified compound
TKN	Total Kjeldahl Nitrogen
TOC	total organic carbon
TPO	Technical Project Officers
TR	Traffic Report
TSS	Total Suspended Solids
U.S. EPA	United States Environmental Protection Agency
USCS	Unified Soil Classification System
USGS	United States Geological Survey
VOA	volatile organic analysis
VOC	volatile organic compound
WDNR	Wisconsin Department of Natural Resources
WESTON	Roy F. Weston, Inc.

SECTION 1

INTRODUCTION

This document is part of the remedial design for the landfill component for the Stoughton City Landfill (SCL) site in Stoughton, Wisconsin. The United States Environmental Protection Agency (U.S. EPA) requires that all environmental monitoring and measurement efforts mandated or supported by U.S. EPA participate in a centrally-managed quality assurance (QA) program. Any party generating data under this program has the responsibility to implement minimum procedures to ensure that the precision, accuracy, completeness, and representativeness of its data are known and documented. To ensure the responsibility is met uniformly, each party must prepare a written Quality Assurance Project Plan (QAPP) covering each project it is to perform.

This QAPP presents the organization, objectives, functional objectives, and specific QA and Quality Control (QC) activities for environmental monitoring associated with the Operation and Maintenance (O&M) for the landfill component of the SCL site. This QAPP also describes the specific protocols that will be followed for sampling, sample handling and storage, chain of custody, and laboratory and field analysis. The Field Sampling Plan (FSP) is provided in Appendix A. The FSP presents sample network design and rationale, field investigation protocols, and field QC procedures.

All QA/QC procedures will be in accordance with applicable technical standards, U.S. EPA requirements, government regulations and guidelines, and specific project goals and requirements. This QAPP was prepared by Roy F. Weston, Inc. (WESTON®) in accordance with all U.S. EPA QAPP guidance documents; in particular, the following documents:

- *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans* (QAMS-005/80)
- *Region V Content Requirements for QAPPs* (U.S. EPA, 1989)
- *Region V Model QAPP* (U.S. EPA, 1991).

SECTION 2
PROJECT DESCRIPTION

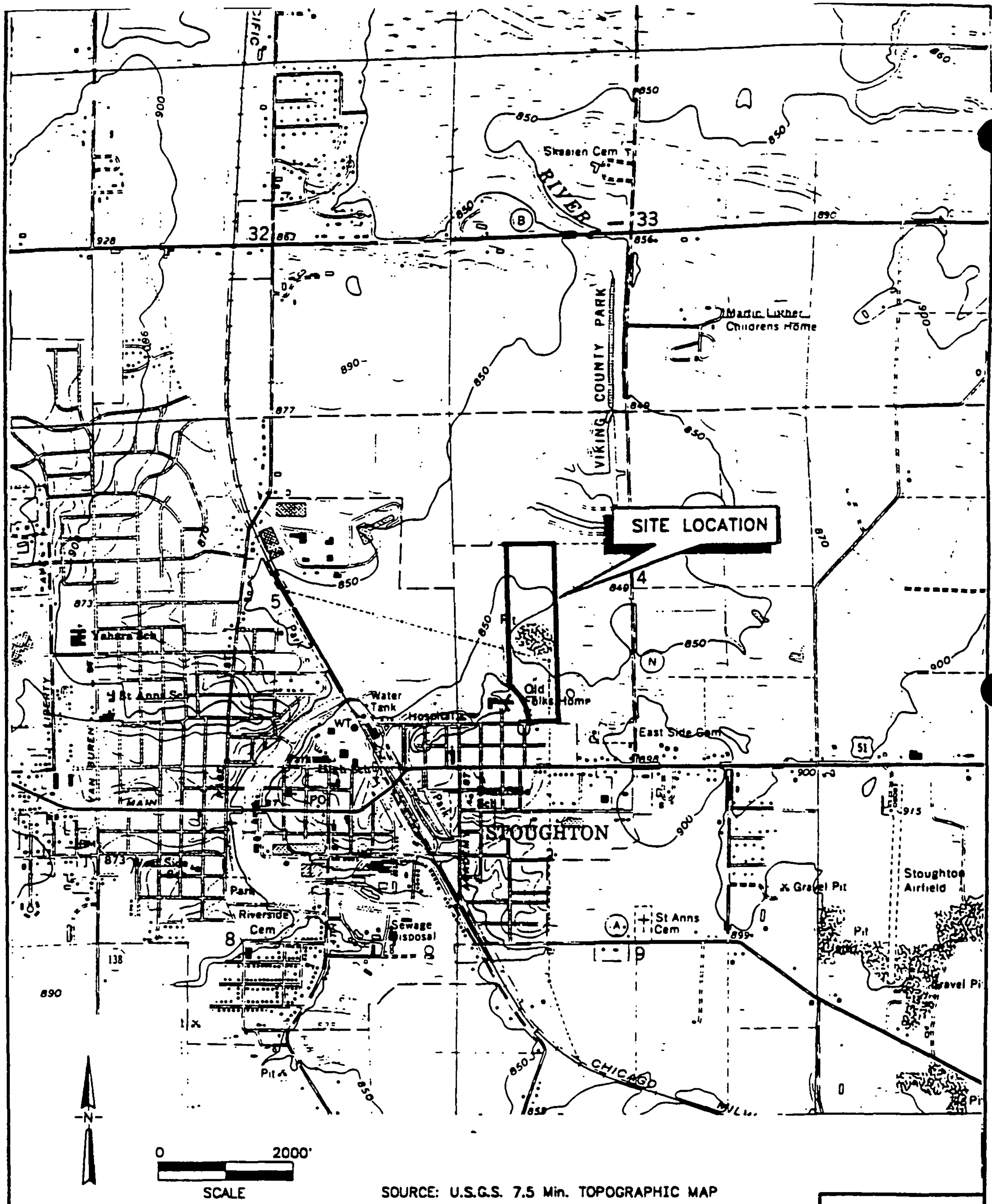
This section presents site background, summary of previous investigations, project objectives and scope, overview of sampling and analysis program, anticipated uses of the results, and project schedule.

2.1 SITE LOCATION/BACKGROUND INFORMATION

2.1.1 Site Location and History

The SCL site is located in the northeast portion of the City of Stoughton, approximately 13 miles southeast of Madison, in Dane County, Wisconsin (Figure 2-1). The property containing the site encompasses approximately 27 acres and occupies portions of the west half of the southwest quarter and the southwest quarter of the northwest quarter of Section 4, Township 5 North, Range 11 East. A wetland area, located along the southeast portion of the present property boundary, was the initial area of waste disposal. Wetlands are also located in the north portion of the site, and west of the site along the Yahara River. The Yahara River is located west of the site and is within approximately 400 feet of the site at its closest distance. Existing site conditions are depicted in Figure 2-2.

The landfill operated from 1952 until it was officially closed in 1982. Between 1952 and 1969, the site was operated as an uncontrolled dump site. During this time, refuse was usually burned or covered by dirt. The site began operation as a state-licensed landfill in 1969. In 1977, the Wisconsin Department of Natural Resources (WDNR) required that the site be closed according to state regulations. Closure activities included construction of a trash transfer station, placement of cover material borrowed from agricultural areas, application of topsoil, and



SOURCE: U.S.G.S. 7.5 Min. TOPOGRAPHIC MAP
STOUGHTON QUADRANGLE

FIGURE 2-1

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 054-5NT2
DOCUMENT CONTROL No. 4500-54-AMRN

SITE LOCATION MAP

STOUGHTON LANDFILL SITE
Stoughton, Wisconsin

INSERT FIGURE 2-2
SITE CONDITIONS

seeding. Closure work was performed according to WDNR regulations from 1978 to 1982. Only brick, rubble, and similar construction materials were accepted at the site during this period.

Common municipal waste and solid and liquid industrial wastes were disposed of at the site during its years of operation. Industrial sludge containing acetone, tetrahydrofuran, toluene, xylene, and other organic substances were disposed of at the site from 1954 until 1962. During this period, the liquid wastes were commonly poured over garbage and burned. It was also reported that some liquid wastes were poured down boreholes in the west-central portion of the landfill. (These boreholes had been drilled as part of field testing of drilling equipment.)

The site was placed on the National Priorities List (NPL) in June 1986. In March 1988, the two Potentially Responsible Parties (PRPs), Uniroyal Plastics, Inc., and the City of Stoughton, entered into an Administrative Order on Consent (AOC) with U.S. EPA and WDNR. This AOC required the completion of a remedial investigation and feasibility study (RI/FS). A Record of Decision (ROD) was signed for the site in September 1991. The ROD presents the site background and the selected remedial action for the site.

2.1.2 Summary of Key Groundwater Monitoring Activities

The RI/FS was performed by ENSR Consulting and Engineering, Westmont, Illinois. RI field activities began at the site in March 1989 and the majority of the RI was completed by September 1991. The RI activities and results are described in the *Final Remedial Investigation Report*, dated 17 January 1991. Six shallow and deep monitoring well clusters (MW-1 through MW-6), were installed and sampled during the RI phase. The monitoring well locations are shown in Figure 2-2. Tetrahydrofuran (THF) was detected above the Wisconsin enforcement standard in groundwater samples in monitoring wells on the western side of the landfill. Dichlorodifluoromethane (DCDFM) and trichlorofluoromethene (TCFM) were detected below the enforcement standards; however, DCDFM was detected close to the preventive action limit. Therefore, the presence of DCDFM and TCFM also required further investigation. The FS is presented in the *Final Feasibility Study Report*, dated 20 June 1991.

Prior to issuance of the ROD, U.S. EPA requested that additional field work be performed by the PRPs for the purpose of further addressing the groundwater contaminants. This work was subsequently tasked by U.S. EPA to the Technical Enforcement Support (TES) X contractor because the PRPs refused to perform the work. Metcalf & Eddy, Inc. (M&E) was the primary TES X contractor to U.S. EPA. Jacobs Engineering Group Inc. (Jacobs), subcontractor to M&E with the TES X contract, performed the actual work. Based on the RI results, Jacobs conducted additional sampling on the west side of the landfill. Jacobs drilled four exploratory borings and installed eight monitoring wells (MW-3B, MW-7S, MW-7I, MW-8B, MW-9S, MW-9I, and MW-9B). The monitoring well locations are shown in Figure 2-2. Monitoring wells MW-3B, MW-7B, MW-8B, and MW-9B were installed in bedrock. Jacobs identified THF, DCDFM, and TCFM as the chemicals of concern in groundwater, and conducted two rounds of groundwater sampling. Tables 2-1 and 2-2 summarize the groundwater sampling results reported by Jacobs.

WESTON under the ARCS contract, was tasked by U.S. EPA to perform the Remedial Design/Remedial Action (RD/RA) at the site.

Based on a review of the groundwater data, WESTON determined that additional predesign groundwater investigation was needed. WESTON conducted the additional predesign data collection activities during May 1994 to March 1995 according to the Remedial Design Work Plan Revision (WESTON, April 1994). WESTON presented the results in the *Remedial Design*

Table 2-1

Round 1 Groundwater Sampling Results
(Conducted by Jacobs, October 1993)
Stoughton City Landfill
Stoughton, Wisconsin
(All Concentrations in μg/L)

Location	Screen Interval (ft.)	Tetrahydrofuran	Dichlorodifluoromethane	Trichlorofluoromethane
MW-1S	5 - 15	ND	ND	ND
MW-1D	69 - 79	ND	ND	ND
MW-2S	5 - 15	ND	ND	ND
MW-2D	24 - 34	ND	ND	ND
MW-3S	7 - 17	ND	ND	ND
MS-3D	61 - 71	417	ND	ND
MW-3B	82 - 92	ND	ND	ND
MW-4S	5 - 15	ND	ND	ND
MW-4D	63 - 73	ND	ND	ND
MW-5S	5 - 15	ND	18	ND
MW-5D	65 - 75	ND	ND	3 J
MW-6S	4 - 14	ND	ND	ND
MW-6D	46 - 56	ND	ND	ND
MW-7S	6 - 12	ND	ND	ND
MW-7I	46 - 56	ND	ND	ND
MW-7B	71 - 81	ND	ND	ND
MW-8B	71 - 81	ND	ND	ND
MW-9S	18 - 28	42	357	2 J
MW-9I	34 - 44	94	315	24
MW-9B	71 - 81	ND	ND	7 J
Enforcement Standard (E.S.)		50	1,000	3,490
Preventive Action Limit (PAL)		10	200	698

10, 13, 14, 15, EW-1

J - Estimated.
Detection Limit - 10 μg/L.
ND - Nondetect.

Only tetrahydrafuran, didichlorodifluoromethane, and trichlorofluoromethane results are summarized here.

Table 2-2

Round 2 Groundwater Sampling Results
(Conducted by Jacobs, February - March 1994)
Stoughton City Landfill
Stoughton, Wisconsin
(All Concentrations in μg/L)

Location	Screen Interval (ft.)	Tetrahydrofuran	Dichlorodifluoromethane	Trichlorofluoromethane
MW-1S	5 - 15	ND	ND	ND
MW-1D	69 - 79	ND	ND	ND
MW-2S	5 - 15	ND	ND	ND
MW-2D	24 - 34	ND	ND	ND
MW-3S	7 - 17	9 J	ND	ND
MS-3D	61 - 17	300	ND	ND
MW-3B	82 - 92	ND	ND	ND
MW-4S	5 - 15	2 J	ND	ND
MW-4D	63 - 73	ND	ND	ND
MW-5S	5 - 15	ND	23	0.6 J
MW-5D	65 - 75	3 J	5 J	2 J
MW-6S	4 - 14	ND	ND	ND
MW-6D	46 - 56	ND	ND	ND
MW-7S	6 - 12	4 J	ND	ND
MW-7I	46 - 56	ND	ND	ND
MW-7B	71 - 81	ND	ND	ND
MW-8B	71 - 81	ND	ND	ND
MW-9S	18 - 28	150	450	ND
MW-9I	34 - 44	91	290	17
MW-9B	71 - 81	NA	NA	NA
Enforcement Standard (E.S.)		50	1,000	3,490
Preventive Action Limit (PAL)		10	200	698

J - Estimated value.
ND - Nondetect.
NA - Not analyzed.

Detection limit for tetrahydrofuran = 20 μg/L.
Detection limit for dichlorodifluoromethane, trichlorofluoromethane = 10 μg/L.
Only tetrahydrafuran, didichlorodifluoromethane, and trichlorofluoromethane results are summarized here.

Data Collection Report (WESTON, June 1995). The following are the conclusions of the predesign groundwater investigation:

- The inorganic groundwater quality west of the site is in the same range as background inorganic groundwater quality east of the site. Iron, lead, and manganese in groundwater are mostly associated with suspended solids.

- Three distinct stratigraphic units exist at the site: landfill materials, glacial deposits, and carbonate bedrock. The thickness of landfill waste and fill material varies from 10 to 15 feet below ground surface (bgs). The glacial deposits are relatively permeable coarse-grained soils composed primarily of outwash sand and gravel, and silty and sandy loam deposits. The thickness of these units range from a few feet to over 70 feet bgs. Bedrock was encountered in deep borings between 70 to 80 feet bgs.

- Shallow groundwater below the landfill flows radially. Regional groundwater generally flows toward the northwest across the study area and has an upward vertical flow gradient component towards the Yahara River. The average horizontal and vertical groundwater velocities are estimated to be 1.2 feet per day (ft/day) and 0.3 ft/day, respectively.

- The chemicals of concern in groundwater are THF and DCDFM. Table 2-3 presents the results of groundwater monitoring conducted during the predesign investigation. Figures 2-3 and 2-4 present the areal extent of THF and DCDFM contamination in groundwater.

2.1.3 Summary of Key Landfill Gas Monitoring Activities

During the RI, a soil gas survey was conducted at the site. The results of the soil gas survey indicated the presence of low-level chlorinated organics, fluorocarbon compounds, petroleum derivative compounds, and other volatile organic compounds (VOCs). During the predesign activities, WESTOn installed three landfill gas monitoring probes along the southern perimeter of the site to monitor the potential migration of landfill gas through the subsurface geology.

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin

Analyte	Field Sample Numbers SL2-									
	MW1S-01		MW1D-01		MW2S-01		MW2S-01FB		MW2D-01MSD	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Special VOCs (μg/L)										
Dichlorodifluoromethane	4 UJ	–	4 UJ	–	4 UJ	–	4 UJ	–	4 UJ	–
Tetrahydrofuran	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Trichlorofluoromethane	4 U	–	4 U	–	4 U	–	4 U	–	4 U	–
RAS VOCs (μg/L)										
Vinyl Chloride	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Methylene Chloride	10 U	–	10 U	–	6 J	–	10 U	–	4 J	–
Acetone	10 U	–	10 U	–	10 U	–	10 BJU	–	10 U	–
1,2-Dichloroethene (Total)	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Trichloroethene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Benzene	10 U	–	10 U	–	4 J	–	10 U	–	10 U	–
Toluene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Ethylbenzene	10 U	–	10 U	–	290 D	–	10 U	–	10 U	–
Metals (μg/L)										
Aluminum	2050	43.8 B	34.8 B	33.1 B	47.7 B	24.9 U	24.9 U	24.9 U	24.9 U	25.5 B
Antimony	46.2 U	46.2 U	46.2 U	75.1	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW1S-01		MW1D-01		MW2S-01		MW2S-01FB		MW2D-01MSD	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (μg/L) (Cont.)										
Arsenic	22.5	15.5 J	2.1 BJ	2.0 U	2.0 U	7.8 BJ	2.0 U	2.0 U	6.5 BJ	6.0 BJ
Barium	259	245	74.1 B	73.3 B	288	273	0.78 BJ	0.79 BJ	97.9 B	96.7 B
Beryllium	0.80 BJ	0.80 BJ	0.37 BJ	0.51 BJ	0.80 BJ	0.73 BJ	0.35 BJ	0.20 U	0.79 BJ	0.79 BJ
Cadmium	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
Calcium	143000	136000	82000	82900	164000	172000	366 B	221 BJ	86200	84700
Chromium	68.7	3.4 U	3.4 U	3.4 U	3.6 B	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U
Cobalt	5.6 B	6.1 B	3.2 U	3.2 U	4.7 BJ	4.4 BJ	3.2 U	3.2 U	3.2 U	5.6 BJ
Copper	31.5 J	18.2 BJ	11.5 BJ	8.5 BJ	20.2 BJ	11.6 BJ	6.0 BJ	3.3 BJ	12.4 BJ	12.7 BJ
Iron	8170	3030	696 J	352 J	18800	20400	87.8 B	420	1800 J	2200
Lead	2.0 BJ	1.0 BJ	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U
Magnesium	68400	64300	47800	48700	64500	67000	176 BJ	58.5 BJ	50800	51500
Manganese	1010	984	15.9	15.0	1960	2090	2.0 BJ	1.7 BJ	84.1	83.6
Mercury	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Nickel	51.0	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U
Potassium	6770	8500	1950 U	1950 U	13200	14900	1950 U	1950 U	2520 B	1950 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW1S-01		MW1D-01		MW2S-01		MW2S-01FB		MW2D-01MSD	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (μg/L) (Cont.)										
Selenium	5.0 J	2.0 U	2.3 BJ	2.0 U	2.0 U	2.6 BJ	2.0 U	2.0 U	2.0 U	2.1 BJ
Silver	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
Sodium	8580	8710	207000	210000	21300	21900	167 BJ	185 BJ	10600	11300
Thallium	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U
Vanadium	25.8 BJ	19.9 BJ	12.2 BJ	13.8 BJ	22.1 BJ	21.0 BJ	3.1 U	3.1 U	14.4 BJ	11.6 BJ
Zinc	31.6	32.6 J	21.2 J	7.6 BJ	19.0 BJ	7.6 BJ	16.4 B	12.2 B	7.3 BJ	18.7 BJ
Cyanide	–	–	–	–	–	–	–	–	–	–

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW3S-01		MW3D-01		MW3B-01		MW4S-01		MW4D-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Special VOCs (μg/L)										
Dichlorodifluoromethane	4 U	–	4 U	–	4 U	–	4 U	–	4 U	–
Tetrahydrofuran	4 U	–	230 J	–	4 U	–	4 U	–	4 U	–
Trichlorofluoromethane	4 U	–	4 U	–	4 U	–	4 U	–	4 U	–
RAS VOCs (μg/L)										
Vinyl Chloride	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Methylene Chloride	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Acetone	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
1,2-Dichloroethene (Total)	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Trichloroethene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Benzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Toluene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Ethylbenzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Metals (μg/L)										
Aluminum	534	372	249	9.0 U	24.8 B	9.5 B	106 BJ	9.0 U	9.0 U	9.0 U
Antimony	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW3S-01		MW3D-01		MW3B-01		MW4S-01		MW4D-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (μg/L) (Cont.)										
Arsenic	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	9.6 B	9.8 B
Barium	101 B	94.7 B	99.6 B	88.5 B	35.8 B	33.9 B	57.6 B	54.9 B	74.8 B	65.8 B
Beryllium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Calcium	104000 J	93000 J	110000 J	108000 J	95600 J	90600 J	66000	63300	148000	127000
Chromium	7.8 B	5.3 B	1.3 B	1.0 U	2.3 B	1.9 B	3.2 BJ	2.6 B	1.0 U	1.0 U
Cobalt	1.3 B	1.0 U	1.4 B	1.0 U	1.0 U	1.0 U	1.3 BJ	1.0 U	1.2 BJ	1.0 U
Copper	4.6 B	2.0 U	2.9 B	2.0 U	2.0 U	2.0 U	2.7 BJ	2.0 B	2.0 U	2.0 U
Iron	1040	140	7550	460	7.0 U	7.0 U	287 J	7.0 U	5860 J	3500
Lead	2.0 U	3.7	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Magnesium	54400 J	48300 J	76700 J	74600 J	51900 J	49200 J	31800	30600	92600	83600
Manganese	80.8 J	1.8 BJ	135 J	101 J	1.0 BJ	1.0 UJ	34.5 J	1.0 BJ	61.4	50.4
Mercury	0.21	0.20 U	0.20 U	0.24	0.22	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	3.0 B	1.9 B	5.1 B	2.1 B	1.0 U	1.0 U	1.6 BJ	1.0 U	2.5 BJ	1.0 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW3S-01		MW3D-01		MW3B-01		MW4S-01		MW4D-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (µg/L) (Cont.)										
Potassium	1190 BEJ	1060 BEJ	1690 BEJ	1600 BEJ	1020 BEJ	957 BEJ	694 BEJ	682 BEJ	2360 BEJ	2120 BEJ
Selenium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Silver	1.0 U	1.1 B	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sodium	16200 J	16300 J	12300 J	12400 J	7030 J	6640 J	4600 BEJ	5050 EJ	27500 EJ	25000 EJ
Thallium	6.0 U	6.0 B	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U
Vanadium	2.5 B	1.1 B	1.0 U	1.0 U	1.0 U	1.0 U	1.2 B	1.0 U	1.0 U	1.0 U
Zinc	37.9	11.5 B	14.8 B	10.5 B	58.5	33.2	17.8 BJ	34.0	17.0 BJ	10 BJ
Cyanide	–	–	–	–	–	–	–	–	–	–

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW5S-01		MW5D-01		MW6S-01		MW6D-01		MW6D-01DP	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Special VOCs (µg/L)										
Dichlorodifluoromethane	8	–	7	–	4 UJ	–	4 U	–	4 U	–
Tetrahydrofuran	4 U	–	4 U	–	10 U	–	4 U	–	4 U	–
Trichlorofluoromethane	4 U	–	4 U	–	4 U	–	4 U	–	4 U	–
RAS VOCs (µg/L)										
Vinyl Chloride	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Methylene Chloride	10 U	–	10 U	–	9 J	–	10 U	–	10 U	–
Acetone	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
1,2-Dichloroethene (Total)	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Trichloroethene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Benzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Toluene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Ethylbenzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Metals (µg/L)										
Aluminum	499	9.0 U	83.0 BJ	9.0 U	5450	31.7 B	9.0 U	9.0 U	32.6 BJ	9.0 U
Antimony	4.0 U	4.0 U	4.0 U	4.0 U	61.7	46.2 U	4.0 U	4.0 U	4.0 U	4.0 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW5S-01		MW5D-01		MW6S-01		MW6D-01		MW6D-01DP	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (μg/L) (Cont.)										
Arsenic	6.0 U	6.0 U	6.0 U	6.0 U	3.8 BJ	2.0 U	6.0 U	6.0 U	6.0 U	6.0 U
Barium	77.8 B	71.2 B	46.6 B	45.4 B	87.2 B	47.4 B	32.7 B	30.2 B	31.0 B	30.8 B
Beryllium	1.0 U	1.0 U	1.0 U	1.0 U	1.1 BJ	0.51 BJ	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	1.0 U	1.0 U	1.0 U	1.0 U	3.7 U	3.7 U	1.0 U	1.0 U	1.0 U	1.0 U
Calcium	76900	70800	105000	100000	147000	94400	79500	72300	73600	76000
Chromium	3.8 BJ	2.1 B	2.3 BJ	1.0 U	18.5	3.4 U	2.2 BJ	1.7 B	2.3 BJ	1.6 B
Cobalt	2.1 BJ	1.1 BJ	1.0 U	1.0 U	9.3 BJ	3.2 U	1.0 U	1.0 U	1.0 BJ	1.0 U
Copper	6.9 BJ	2.3 B	2.9 BJ	14.2 B	76.6	13.7 BJ	2.0 U	2.0 U	2.0 U	2.0 U
Iron	1030 J	7.0 U	6110 J	95.6 BJ	9880	81.4 BJ	846	7.0 U	1150 J	7.0 U
Lead	2.0 U	2.0 U	2.0 U	2.0 U	3.8 J	0.80 U	2.0 U	2.0 U	2.0 U	2.0 U
Magnesium	38800	34800	62600	62900	75700	48600	49900	46500	48300	47700
Manganese	128	1.0 U	62.2	24.1	503	6.8 BJ	9.2 BJ	5.6 BJ	12.0 BJ	5.0 BJ
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.10 U	0.10 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	12.5 BJ	6.2 BJ	2.5 BJ	3.0 BJ	15.5 U	15.5 U	1.3 BJ	1.0 U	1.6 BJ	1.0 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW5S-01		MW5D-01		MW6S-01		MW6D-01		MW6D-01DP	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (μg/L) (Cont.)										
Potassium	791 BEJ	671 BEJ	2050 BEJ	2350 BEJ	3290 B	3020 B	1320 BEJ	1230 BEJ	1310 BEJ	1260 BEJ
Selenium	5.0 U	5.0 U	5.0 U	5.0 U	3.1 BJ	2.1 BJ	5.0 U	5.0 U	5.0 U	5.0 U
Silver	1.0 U	1.0 U	1.0 U	1.0 U	3.7 U	3.7 U	1.0 U	1.0 U	1.0 U	1.0 U
Sodium	13900 EJ	16600 EJ	13900 EJ	15200 EJ	5960	5730	4850 BEJ	4530 BEJ	4710 BEJ	4660 BEJ
Thallium	6.0 U	6.0 U	6.0 U	6.0 U	3.1 U	3.1 U	6.0 U	6.0 U	6.0 U	6.0 U
Vanadium	2.2 B	1.0 U	1.0 U	1.0 U	32.2 BJ	14.0 BJ	1.0 U	1.0 U	1.0 U	1.0 U
Zinc	16.0 BJ	4.7 BJ	15.7 BJ	10.9 BJ	45.8 J	7.3 BJ	5.6 BJ	6.0 BJ	4.0 BJ	4.8 BJ
Cyanide	–	–	–	–	–	–	–	–	–	–

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW6D-01FB		MW7S-01		MW7B-01		MW7I-01		MW8B-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Special VOCs (μg/L)										
Dichlorodifluoromethane	4 U	–	4 U	–	4 U	–	4 U	–	4 U	–
Tetrahydrofuran	4 U	–	4 U	–	4 U	–	4 U	–	4 U	–
Trichlorofluoromethane	4 U	–	4 U	–	4 U	–	4 U	–	4 U	–
RAS VOCs (μg/L)										
Vinyl Chloride	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Methylene Chloride	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Acetone	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
1,2-Dichloroethene (Total)	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Trichloroethene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Benzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Toluene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Ethylbenzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Metals (μg/L)										
Aluminum	10.4 BJ	9.0 U	896	24.6 B	18.7 B	9.0 U	9.0 U	16.4 B	12.5 B	9.0 U
Antimony	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW6D-01FB		MW7S-01		MW7B-01		MW7I-01		MW8B-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (µg/L) (Cont.)										
Arsenic	6.0 U	6.0 U	8.1 B	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U
Barium	1.0 U	1.0 U	93.3 B	74.6 B	38.2 B	38.9 B	26.1 B	24.2 B	38.2 B	34.9 B
Beryllium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Calcium	471 B	150 BJ	148000 J	104000 J	92200 J	93600 J	83700 J	77600 J	91000 J	80500 J
Chromium	37.0	1.0 U	6.3 B	1.0 U	5.9 B	1.8 B	1.0 U	1.0 U	8.7 B	3.5 B
Cobalt	2.9 B	1.1 B	4.1 B	2.6 B	1.1 B	1.0 U	1.0 U	1.0 U	1.1 B	1.0 U
Copper	15.0 B	2.0 U	18.3 B	3.0 B	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Iron	582	25.1 BJ	2480	7.0 U	75.4 B	7.0 U	7.0 U	7.0 U	35.5 B	7.0 U
Lead	2.0 U	2.0 U	2.4 B	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2..6 B	2.0 U
Magnesium	181 B	15.6 BJ	81200 J	56800 J	49800 J	50500 J	46100 J	42700 J	47400 J	43300 J
Manganese	9.4 B	2.2 B	1520 J	1260 J	6.1 BJ	1.7 BJ	19.1 J	16.7 J	3.3 BJ	1.2 BJ
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	96.3	5.8 B	15.7 B	9.5 B	6.3 B	6.6 B	1.0 U	1.0 U	5.8 B	1.0 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW6D-01FB		MW7S-01		MW7B-01		MW7I-01		MW8B-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (μg/L) (Cont.)										
Potassium	42.1 BEJ	32.3 BEJ	1480 BEJ	1150 BEJ	1050 BEJ	1070 BEJ	756 BEJ	697 BEJ	10400 EJ	12800 EJ
Selenium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Silver	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sodium	142 BEJ	134 BEJ	10600 J	8800 J	9120 J	9370 J	2830 BJ	2590 B	10700 J	10900 J
Thallium	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U
Vanadium	1.0 U	1.0 U	5.7 B	1.0 B	1.0 U	1.0 U	1.0 B	1.0 U	1.0 U	1.2 B
Zinc	13.2 B	6.3 BJ	40.7	32.5	30.1	53.7	20.5	23.1	2.4 B	2.6 B
Cyanide	--	--	--	--	--	--	--	--	--	--

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW9S-01		MW9I-01		MW9I-01DP		MW10S-01		MW10D-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Special VOCs (µg/L)										
Dichlorodifluoromethane	280	–	290	–	260	–	4 UJ	–	4 UJ	–
Tetrahydrofuran	54	–	55 EJ	–	40 U	–	10 U	–	10 U	–
Trichlorofluoromethane	4	–	4 UJ	–	40 U	–	4 U	–	4 U	–
RAS VOCs (µg/L)										
Vinyl Chloride	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Methylene Chloride	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Acetone	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
1,2-Dichloroethene (Total)	10 U	–	5 J	–	5 J	–	10 U	–	10 U	–
Trichloroethene	5 J	–	10 U	–	10 U	–	10 U	–	10 U	–
Benzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Toluene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Ethylbenzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Metals (µg/L)										
Aluminum	256	9.8 B	16.2 B	9.0 U	20.7 B	15.1 B	8100	29.8 B	188 B	24.9 U
Antimony	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	46.2 U	46.2 U	46.2 U	46.2 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW9S-01		MW9I-01		MW9I-01DP		MW10S-01		MW10D-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (μg/L) (Cont.)										
Arsenic	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	10.2 J	5.6 BJ	2.0 U	2.0 U
Barium	33.5 B	32.0 B	30.8 B	13.8 B	28.7 B	28.8 B	106 B	52.6 B	38.5 B	35.9 B
Beryllium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.2 BJ	0.65 BJ	0.80 BJ	0.80 BJ
Cadmium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.7 U	3.7 U	3.7 U	3.7 U
Calcium	66500 J	63000 J	79400 J	36000 J	74000 J	74700 J	132000	77300	89800	87400
Chromium	2.0 B	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	91.3	3.4 U	3.4 U	3.4 U
Cobalt	5.0 B	4.6 B	2.2 B	1.4 B	2.4 B	2.7 B	8.2 B	3.2 U	3.2 U	3.2 U
Copper	3.5 B	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	41.6 J	16.4 BJ	16.0 BJ	14.6 BJ
Iron	329	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	10800	46.6 BJ	293 J	259 J
Lead	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.7 J	0.80 U	0.80 U	0.80 U
Magnesium	43200 J	41400 J	50200 J	22500 J	46700 J	47300 J	78000	48100	47000	45900
Manganese	519 J	495 J	342 J	156 J	320 J	322 J	392	92.5	17.5	5.7 BJ
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.21	0.10 U	0.10 U	0.10 U
Nickel	18.2 B	15.7 B	3.3 B	1.0 U	2.8 B	2.8 B	53.6	15.5 U	15.5 U	15.5 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW9S-01		MW9I-01		MW9I-01DP		MW10S-01		MW10D-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (µg/L)										
Potassium	1260 BEJ	1380 BEJ	1040 BEJ	398 BEJ	936 BEJ	942 BEJ	4040 B	1950 U	2180 B	1950 U
Selenium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Silver	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.7 U	3.7 U	3.7 U	3.7 U
Sodium	19300 J	19200 J	10800 J	4510 BJ	10000 J	10100 J	11700	11700	10800	10900
Thallium	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	3.1 U	3.1 U	3.1 U	3.1 U
Vanadium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	40.9 B	11.9 BJ	14.7 BJ	14.5 BJ
Zinc	15.8 B	28.5	4.7 B	2.4 B	2.7 B	5.8 B	43.6 J	16.1 BJ	18.4 BJ	15.3 BJ
Cyanide	–	–	–	–	–	–	–	–	–	–

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW10I-01		MW11S-01		MW11D-01		MW11I-01		MW12S-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Special VOCs (µg/L)										
Dichlorodifluoromethane	160 DJ	–	4 UJ	–	4 UJ	–	4 UJ	–	4 UJ	–
Tetrahydrofuran	39	–	10 U	–	10 U	–	10 U	–	10 U	–
Trichlorofluoromethane	4 U	–	4 U	–	4 U	–	4 U	–	4 U	–
RAS VOCs (µg/L)										
Vinyl Chloride	8 J	–	10 U	–	10 U	–	10 U	–	10 U	–
Methylene Chloride	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Acetone	10 U	–	10 U	–	10 U	–	10 U	–	28	–
1,2-Dichloroethene (Total)	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Trichloroethene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Benzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Toluene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Ethylbenzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Metals (µg/L)										
Aluminum	5420	42.6 B	895	24.9 U	1420	24.9 U	178 B	27.1 B	70.2 B	74.5 B
Antimony	75.7	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW10I-01		MW11S-01		MW11D-01		MW11I-01		MW12S-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (µg/L) (Cont.)										
Arsenic	5.0 BJ	2.6 BJ	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.5 B	6.0 B
Barium	85.9 B	55.0 B	27.2 B	19.7 B	41.1 B	19.7 B	26.3 B	28.0 B	155 B	154 B
Beryllium	1.2 BJ	0.51 BJ	0.63 BJ	0.62 BJ	0.62 BJ	0.47 BJ	0.62 BJ	0.63 BJ	0.48 BJ	0.48 BJ
Cadmium	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
Calcium	187000	107000	85100	76100	93100	69400	85500	86500	121000	119000
Chromium	42.2	3.4 U	18.4	3.4 U	9.7 B	3.4 U	4.9 B	3.4 U	3.4 U	3.4 U
Cobalt	10.1 B	6.7 B	3.2 U	3.2 U	3.4 B	3.2 U	3.2 B	3.2 U	10.3 BJ	13.2 BJ
Copper	37.0 J	12.8 BJ	15.5 BJ	11.1 BJ	20.3 BJ	11.4 BJ	13.3 BJ	14.7 BJ	13.6 BJ	11.8 BJ
Iron	9400	86.1 BJ	1480	63.1 BJ	2070	235	402	61.7 BJ	1690	1350
Lead	3.2 J	0.80 U	0.80 U	0.80 U	3.2	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U
Magnesium	101000	58400	46800	42300	53800	40900	45800	46200	60600	60000
Manganese	553	60.6	74.6	42.2	174	25.5	30.0	20.9	2820	2810
Mercury	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Nickel	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW10I-01		MW11S-01		MW11D-01		MW11I-01		MW12S-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (μg/L) (Cont.)										
Potassium	4590 B	3400 B	1950 U	1960 B	1950 U	1950 U	1950 U	1950 U	1950 U	1950 U
Selenium	2.0 U	2.0 U	2.8 BJ	2.0 U	2.6 BJ	3.1 BJ	2.9 BJ	2.9 BJ	5.1 J	3.2 BJ
Silver	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
Sodium	14600	14600	4150 B	3920 B	11800	11500	4740 B	5000 B	79000	78300
Thallium	3.1 U	3.1 U	7.1 B	3.3 B	5.8 B	3.2 B	7.2 B	4.4 B	3.1 U	3.1 U
Vanadium	37.2 B	15.3 BJ	14.2 B	9.3 B	15.8 B	9.8 B	14.4 B	11.0 B	16.0 BJ	16.0 BJ
Zinc	34.6 J	9.1 BJ	18.5 B*J	12.3 B*J	26.1 *J	14.2 B*J	11.1 B*J	21.5 *J	18.7 B*J	32.9 *J
Cyanide	–	–	–	–	–	–	–	–	–	–

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW12S-01FB		MW12D-01MSD		MW12I-01		MW12I-01DP		MW13S-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Special VOCs (μg/L)										
Dichlorodifluoromethane	4 UJ	–	4 UJ	–	4 UJ	–	4 UJ	–	4 UJ	–
Tetrahydrofuran	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Trichlorofluoromethane	4 U	–	4 U	–	4 U	–	4 U	–	4 U	–
RAS VOCs (μg/L)										
Vinyl Chloride	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Methylene Chloride	3 J	–	10 U	–	10 U	–	10 U	–	10 U	–
Acetone	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
1,2-Dichloroethene (Total)	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Trichloroethene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Benzene	41	–	10 U	–	10 U	–	10 U	–	10 U	–
Toluene	5 J	–	10 U	–	10 U	–	10 U	–	10 U	–
Ethylbenzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Metals (μg/L)										
Aluminum	43.2 BJ	61.5 BJ	144 B	61.2 BJ	206	24.9 U	108 B	32.5 B	19500	24.9 U
Antimony	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	64.2	46.2 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW12S-01FB		MW12D-01MSD		MW12I-01		MW12I-01DP		MW13S-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (μg/L) (Cont.)										
Arsenic	2.0 U	2.0 U	2.0 U	2.0 U	5.2 B	4.3 B	6.0 B	4.5 B	9.0 B	2.0 U
Barium	1.0 BJ	2.4 BJ	38.6 B	36.1 B	98.0 B	97.7 B	94.9 B	96.3 B	165 B	41.6 B
Beryllium	0.20 U	0.20 U	0.49 BJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	2.5 B	0.62 BJ
Cadmium	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
Calcium	624 B	287 BJ	87600	81000	60800	60800	59900	59900	367000	60900
Chromium	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U	153	3.4 U
Cobalt	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	22.1 B	3.2 U
Copper	5.5 BJ	6.7 BJ	13.3 BJ	11.7 BJ	9.6 BJ	8.1 BJ	12.9 BJ	10.8 BJ	95.1	15.9 B
Iron	78.1 B*J	177 *J	278	202 *J	576	249	502	321	33700	333
Lead	0.80 U	1.2 BJ	1.4 BJ	1.4 BJ	0.80 U	1.0 BJ	0.95 BJ	1.7 BJ	16.3	0.80 U
Magnesium	316 BJ	181 BJ	46500	43600	41700	41300	40800	40700	203000	37200
Manganese	2.6 BJ	3.6 BJ	72.4	55.3	86.1	78.5	87.7	75.6	1210	22.9
Mercury	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Nickel	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	95.7	15.5 U

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-									
	MW12S-01FB		MW12D-01MSD		MW12I-01		MW12I-01DP		MW13S-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Metals (μg/L) (Cont.)										
Potassium	1950 U	1950 U	1950 U	1950 U	1950 U	1950 U	1950 U	1950 U	6490	1950 U
Selenium	2.3 BJ	2.0 U	4.4 BJ	2.0 U	3.1 BJ	2.0 U	2.9 BJ	3.5 BJ	3.6 BJ	2.7 BJ
Silver	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
Sodium	383 BJ	298 BJ	5590	5280	4960 B	4770 B	5140	4730 B	7150	5510
Thallium	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U
Vanadium	3.1 U	3.1 U	13.2 BJ	12.5 BJ	9.3 BJ	10.4 BJ	10.7 BJ	10.8 BJ	93.2	10.7 B
Zinc	51.9 J	19.0 BJ	44.0 *J	31.0 J	53.1 *J	14.2 B*J	22.0 *J	34.7 *J	91.8 *J	15.6 B*J
Cyanide	–	–	–	–		--	–	–	–	–

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-											
	MW13D-01		MW13D-01DP		MW13I-01		EW01-01		PTWB-01	PWTB-02	PWTB-03	PWTB-04
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered				
Special VOCs (μg/L)												
Dichlorodifluoromethane	4 UJ	–	4 UJ	–	4 UJ	–	980 DJ	–	4 U	4 U	4 UJ	4 UJ
Tetrahydrofuran	10 U	–	10 U	–	10 U	–	380 EJ	–	4 U	4 U	10 U	10 U
Trichlorofluoromethane	4 U	–	4 U	–	4 U	–	8 J	–	4 U	4 U	4 U	4 U
RAS VOCs (μg/L)												
Vinyl Chloride	10 U	–	10 U	–	10 U	–	10 U	–	10 U	10 U	10 U	10 U
Methylene Chloride	10 U	–	10 U	–	10 U	–	10 U	–	10 U	10 U	10 U	10 U
Acetone	10 U	–	10 U	–	10 U	–	10 BJU	–	10 U	10 U	10 BJU	10 U
1,2-Dichloroethene (Total)	10 U	–	10 U	–	10 U	–	18	–	10 U	10 U	10 U	10 U
Trichloroethene	10 U	–	10 U	–	10 U	–	3 J	–	10 U	10 U	10 U	10 U
Benzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	10 U	10 U	10 U
Toluene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	10 U	10 U	10 U
Ethylbenzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	10 U	10 U	10 U
Metals (μg/L)												
Aluminum	3930	24.9 U	3200	40.9 B	24.9 U	24.9 U	175 B	24.9 U	–	–	–	–
Antimony	57.4 B	46.2 U	46.2 U	46.2 U	54.8 B	46.2 U	59.2 B	46.2 U	–	--	–	–

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-											
	MW13D-01		MW13D-01DP		MW13I-01		EW01-01		PTWB-01	PWTB-02	PWTB-03	PWTB-04
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered				
Metals (μg/L) (Cont.)												
Arsenic	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.4 BJ	2.0 U	–	–	–	–
Barium	59.8 B	24.3 B	57.4 B	24.2 B	44.2 B	43.2 B	32.5 B	30.1 B	–	–	–	–
Beryllium	1.1 BJ	0.32 BJ	1.1 BJ	0.32 BJ	0.47 BJ	0.47 BJ	0.79 BJ	0.51 BJ	–	–	–	–
Cadmium	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	–	–	–	–
Calcium	124000	66300	123000	65000	62100	60100	90400	84600	–	–	–	–
Chromium	15.0	3.4 U	12.3	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U	–	–	–	–
Cobalt	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	–	–	–	–
Copper	29.1	11.6 BJ	26.8	9.0 BJ	13.4 BJ	11.4 BJ	16.7 BJ	10.9 BJ	–	–	–	–
Iron	6260	385 *J	5880	116 J	168	123 J	334 J	211 J	–	–	–	–
Lead	6.6	0.80 U	6.4	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U	–	–	–	–
Magnesium	65500	35500	65000	35200	43100	41400	51100	48800	–	–	–	–
Manganese	453	36.0	440	35.3	28.4	27.5	121	105	–	–	–	–
Mercury	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	–	–	–	–
Nickel	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	–	–	–	–
Potassium	1950 U	1950 U	1950 U	1950 U	1980 B	1950 U	3920 B	2190 B	–	–	–	–

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Analyte	Field Sample Numbers SL2-											
	MW13D-01		MW13D-01DP		MW13I-01		EW01-01		PTWB-01	PWTB-02	PWTB-03	PWTB-04
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered				
Metals (µg/L) (Cont.)												
Selenium	2.2 BJ	5.0 BJ	3.9 BJ	4.9 BJ	2.7 BJ	4.1 BJ	2.0 U	2.0 U	–	–	–	–
Silver	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	–	–	–	–
Sodium	9860	9230	9790	8840	4280 B	4140 B	14200	14700	–	–	–	–
Thallium	3.1 U	3.4 BJ	3.1 U	3.1 U	3.1 U	4.6 BJ	3.1 U	3.1 U	–	–	–	–
Vanadium	21.9 B	10.3 B	20.9 B	10.5 BJ	9.6 B	11.2 B	16.8 BJ	14.4 BJ	–	–	–	–
Zinc	42.2 *J	30.7 J	39.3 *J	17.2 B*J	18.0 B*J	36.4 *J	15.3 BJ	9.1 BJ	–	–	–	–
Cyanide	–	–	–	–	–	–	–	–	–	–	–	–

Table 2-3

Monitoring Well Sampling Results
Predesign Phase II Investigation
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

Organic Data Qualifiers:

U - Indicates that the compound was analyzed for, but not detected. The sample quantitation limit corrected for dilution and percent moisture is reported.
J - Indicates an estimated value. This flag is used either when estimating a concentration for a tentatively identified compound or when the data indicates the presence of a compound,, but the result is less than the sample quantitation limit, but greater than zero. This flag is also used to indicate a reported result having an associated QC problem.
B - Indicates the analyte is detected in the associated blank as well as the sample.
E - Indicates compounds whose concentrations exceed the calibration range of the instrument.
D - Indicates an identified compound in an analysis has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses.
– - Not analyzed.

Inorganic Data Qualifiers:

U - Indicates the material was analyzed, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J - Indicates the associated value is an estimated quantity.
B - Indicates that the reported value is less than the Contract Required Detection Limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
* - Indicates the duplicate analysis is not within control limits.
– - Not analyzed.

INSERT FIGURE 2-3
AREAL EXTENT OF THF CONTAMINATION IN THE GROUNDWATER

FIGURE 2-4
AREAL EXTENT OF DCDFM CONTAMINTION IN THE GROUNDWATER

WESTON conducted monthly monitoring using a combustible gas indicator (CGI) and a photoioniztion detector (PID). Based on this monitoring, no landfill gas or chemical constituents were detected in the landfill gas monitoring probes.

During the predesign activities, WESTON also conducted a pilot-scale gas extraction test at the site to evaluate the feasibility of installing an active gas extraction system. The ROD indicated that a passive gas venting system should be installed, but at the request of the WDNR and upon the approval of the U.S. EPA, WESTON conducted a pilot test. Based on the pilot test and air sample results, it appears that an active gas extraction system would not be cost effective for the SCL site. An active extraction system would require a flare system to thermally destroy the methane and other low-level chemical constituents in the extracted airstream. Based on the air sampling results, the methane concentration would not be sufficient to consistently maintain combustion, and an alternate fuel source would be required. This alternate fuel source, such as natural gas, would be needed to keep the flare burning at the required temperature to ensure total destruction of the methane and chemical constituents. In addition, because of the shallow nature of the waste, extraction wells would need to be closely spaced to achieve the necessary extraction rate without drawing air in from above the final cover system.

From this data, WESTOn concluded that a passive landfill gas vent system would be the most efficient and cost-effective method of landfill gas control. The horizontal collection trenches will adequately vent any landfill gas generated from the waste layer. In addition, the constituents in the landfill gas vents will be well below any regulatory action levels for air emissions.

2.1.4 Landfill Remedial Action

The landfill remedial action as identified in the ROD includes:

- Site security measures including the placement of a fence around the entire site perimeter.
- Land use restrictions to present the installation of public or private water supply wells within 1,200 feet of the property boundary and to prevent residential development of the site.
- Excavation, relocation, and consolidation of wastes in contact with groundwater.
- Placement of a solid waste disposal cap (NR 504 cap) over the existing fill area and consolidated wastes.
- Long-term groundwater monitoring to confirm the effectiveness of the other components of the selected remedial action.

2.2 PROJECT OBJECTIVES AND SCOPE

The objective of the QAPP is to establish standard procedures so that the integrity, accuracy, precision, completeness, and representativeness of the samples and field activities are maintained and the required objectives of the O&M are achieved.

The objectives of the groundwater monitoring are:

- Establish a baseline for site groundwater quality immediately after the placement of the landfill cap.

- Monitor the movement of the THF and DCDFM plumes to evaluate natural attenuation and the effect of the landfill cap on the THF and DCDFM plumes.
- Reevaluate the site groundwater quality five years after the placement of the landfill cap and compare it against the initial baseline. Repeat this reevaluation every five years until the THF and DCDFM concentrations fall below the cleanup standards.

The landfill gas monitoring has the following objectives:

- Monitor the concentration of the landfill gases as a percentage of the lower explosive limit (LEL) for the landfill gases at the site boundary.
- Provide data to estimate air emissions from the passive gas vents.

2.3 SAMPLE NETWORK DESIGN AND RATIONALE

The sample network design and rationale for sample locations is described in detail in Section 3 of the FSP (Appendix A). Table 2-4 provides an overview of sampling and analysis program.

2.4 PARAMETERS TO BE TESTED AND FREQUENCY

Sample matrices, analytical parameters, and frequency of sample collection are presented in Table 2-5. The FSP includes additional discussion on the rationale for parameters to be tested and frequency.

Table 2-4

Overview of Annual O&M Sampling and Analysis Program
Stoughton City Landfill
Stoughton, Wisconsin

O&M Task	Intended Data Use	Sample Matrix	Sampling Procedure	Analysis Required	Analytical Method
Baseline Groundwater Monitoring (repeat every five years until the THF and DCDFM concentrations fall below the PALs).	- Establish a baseline for the site groundwater quality immediately after the placement of the landfill cap. - Reevaluate the site groundwater quality five years after the placement of the landfill cap and compare it against the initial baseline.	Groundwater	Grab	Tetrahydrofuron (THF)	SAS Method (EPA Method 502.2 and 524.2 - see Appendix B).
				Dichlorodifluoromethene (DCDFM)	SAS Method (EPA Methods 502.2 and 524.2 - see Appendix B).
				Trichlorofluoromethane (TCFM)	SAS Method (EPA Methods 502.2 and 524.2 - see Appendix B).
				CLP RAS TCL Volatiles	CLP RAS Method
				CLP RAS TAL Metals (Filtered)	CLP RAS Method
				CLP RAS TAL Metals (Unfiltered)	CLP RAS Method
Routine Groundwater Monitoring (semi-annually).	- Monitor the movement of the THF and DCDFM plumes.	Groundwater	Grab	THF	SAS Method (EPA Methods 502.2 and 524.2 - see Appendix B).
				DCDFM	SAS Method (EPA Methods 502.2 and 524.2 - see Appendix B).
Landfill Off Gas Monitoring (5 vents annually)	- Verify that the air emissions from the passive gas vents do not exceed the regulatory levels.	Air	Grab (SUMMA® Canister)	EPA Method T014 Standard List of Volatile Organic Compounds (VOCs)	EPA Method T014

Table 2-5

Summary of Annual O&M Sampling and Analysis Program
Stoughton City Landfill
Stoughton, Wisconsin

				Investigative			Field Duplicate			Field Blank			MS/MSD [5]			
O&M Task	Sample Matrix	Field Parameters	Laboratory Parameters[4]	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	Matrix Total
Baseline Groundwater Monitoring[1]	Groundwater	Water Level, pH, Conductivity, Temperature, Turbidity, Dissolved Oxygen	Tetrahydrofuran (THF)	40	1	40	4	1	4	4	1	4	2	1	2	48
			Dichlorodifluoromethane (DCDFM)	40	1	40	4	1	4	4	1	4	2	1	2	48
			Trichlorofluoromethane (TCFM)	40	1	40	4	1	4	4	1	4	2	1	2	48
			CLP RAS TCL Volatiles	40	1	40	4	1	4	4	1	4	2	1	2	48
			CLP RAS TAL Metals (Filtered)	40	1	40	4	1	4	4	1	4	2	1	2	48
			CLP RAS TAL Metals (Unfiltered)	40	1	40	4	1	4	4	1	4	2	1	2	48
Routine Groundwater Monitoring[2]	Groundwater	Water Level, pH, Conductivity, Temperature, Turbidity, Dissolved Oxygen	THF	28	2	56	3	2	6	3	2	6	2	2	2	68
			DCDFM	28	2	56	3	2	6	3	2	6	2	2	2	68

Table 2-5

Summary of Annual O&M Sampling and Analysis Program
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

O&M Task	Sample Matrix	Field Parameters	Laboratory Parameters[4]	Investigative			Field Duplicate			Field Blank			MS/MSD[5]			Matrix Total
				No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Passive Gas Vent Monitoring[3]	Air	Flow, Percent LEL, Percent Oxygen	EPA Method T014 Standard List of VOCs	5	1	5	NA	NA	NA	NA	NA	NA	1	1	1	5

[1] Baseline groundwater monitoring will be conducted immediately after the placement of the landfill cap and then repeated every five years until the THF and DCDFM concentrations fall below the PALs.
[2] Routine groundwater monitoring will be conducted twice every year. However, if the baseline groundwater monitoring is conducted that year, only one round of routine groundwater monitoring will be needed.
[3] Four annual sampling events are expected to complete the sampling of 21 passive gas vents. This will involve sampling 5 gas vents each year for 3 years and 6 gas vents the fourth year.
[4] All parameters that are not designated as CLP RAS analyses will be analyzed according to SAS methodologies presented in Appendix B.
[5] MS/MSDs are not additional samples, but are instead investigative samples on which MS/MSD analyses are performed. MS/MSDs are for organic samples only. Duplicate/spike analyses are performed for inorganic samples.
[6] The matrix total does not include trip blank samples and MS/MSD samples. One trip blank will be shipped with every shipment container containing aqueous VOA samples.

2.5 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are qualitative and quantitative statements that specify the quality of the data required to support decisions made during RI/FS activities and are based on the end uses of the data to be collected. As such, different data uses may require different levels of data quality. The following five analytical levels address various data uses and the QA/QC effort and methods required to achieve the desired level of quality:

- Screening (DQO Level I): Provides the lowest data quality but the most rapid results. It is often used for health and safety monitoring at the site, for preliminary comparison to appropriate or relevant and appropriate requirements (ARARs), for initial site characterization to locate areas for subsequent and more accurate analyses, and for engineering screening of alternatives (bench-scale tests). These types of data include those generated on site through the use of pH, conductivity, temperature and other real-time monitoring equipment at the site.

- Field Analyses (DQO Level II): Provides rapid results and better quality than Level I. This level may include mobile lab generated data, depending on the level of quality control exercised.

- Engineering (DQO Level III): Provides an intermediate level of data quality and is used for site characterization. Engineering analyses may include mobile lab generated data and some analytical lab methods (i.e., laboratory data with quick turnaround used for screening but without full quality control documentation).

- Confirmational (DQO Level IV): Provides the highest level of data quality and is used for purposes of risk assessment, evaluation of remedial alternatives, and potential responsible party (PRP) determination. These analyses require full Contract Laboratory Program (CLP) analytical and data validation procedures in accordance with U.S. EPA-recognized protocol (includes CLP routine analytical services [RAS]).

- Non-Standard (DQO Level V): Refers to analyses conducted by non-standard protocols; for example, when exacting detection limits or analysis of an unusual chemical compound is required. These analyses often require method development or adaptation. The level of quality control is usually similar to DQO Level IV data (includes CLP and non-CLP special analytical services [SAS]).

For O&M activities, DQO Analytical Level I will apply to readings generated during health and safety monitoring, water level measurements, and measurement of physical parameters by field instruments (e.g., pH, temperature, conductivity, and turbidity).

DQO Level IV will apply to all analytical data generated from RAS analyses. DQO Level V will apply to all analytical data generated from SAS analyses.

The DQOs for all associated data collection activities, data types, data uses, and other data quality control factors are summarized in Table 2-6.

2.6 PROJECT SCHEDULE

The O&M project schedule is dependent upon the completion of the RD/RA activities. The estimated project schedule is as follows:

- Immediately after the placement of the landfill cap, perform baseline groundwater monitoring. Repeat this groundwater monitoring every five years until the THF and DCDFM concentrations fall below the cleanup levels.
- Perform routine groundwater monitoring semi-annually.
- Perform landfill gas flow measurements and landfill gas sampling annually.
- Submit reports to U.S. EPA within one month of receipt of analytical data after each sampling event.

Table 2-6
O&M Data Quality Objectives Summary
Stoughton City Landfill
Stoughton, Wisconsin

Data Quality Objective	Data Collection Activity	Data Type	Data Use	Analytical Level
Establish a baseline for the site groundwater quality immediately after the placement of the landfill cap. Reevaluate the site groundwater quality five years after the placement of the landfill cap.	Field parameter evaluation	pH, conductivity, temperature, dissolved oxygen, turbidity	SP, EA	I
	Water level measurements	Hydraulic head	SP, EA	I
	Collect and analyze groundwater samples	THF, DCDFM, TCFM	SC	V
		CLP RAS volatiles and metals	SC	IV
Monitor the movement of the THF and DCDFM plumes	Field parameter evaluation	pH, conductivity, temperature, dissolved oxygen, turbidity	SP, EA	I
	Water level measurements	Hydraulic head	SC	I
	Collect and analyze groundwater samples	THF, DCDFM	EA	V
Landfill off-gas monitoring	Landfill gas flow from passive gas vents	Flow	EA	II
	Field parameter evaluation	Percent lower explosive limit, percent oxygen, temperature, barometric pressure	SP, EA	I
	Collect and analyze landfill gas samples	EPA Method TO-14 Standard VOC list	SC, EA	V

<u>Notes and Abbreviations:</u>

<u>Data Use Symbols</u>
SC - Site Characterization
SP - Sampling Protocol
EA - Engineering Assessment

<u>Analytical Levels</u>

I - Qualitative screening with field equipment
II - Field analysis with sophisticated equipment
III - Engineering analysis without full QC documentation
IV - Analysis by routine methods (RAS)
V - Analysis by special methods (SAS)

The entire O&M monitoring will be reassessed according to the criteria discussed in Section 2 of the FSP.

SECTION 3

PROJECT ORGANIZATION AND RESPONSIBILITY

U.S. EPA will select a Contractor for environmental monitoring during the O&M phase of the remedial action. The Contractor will provide project management of the monitoring activities.

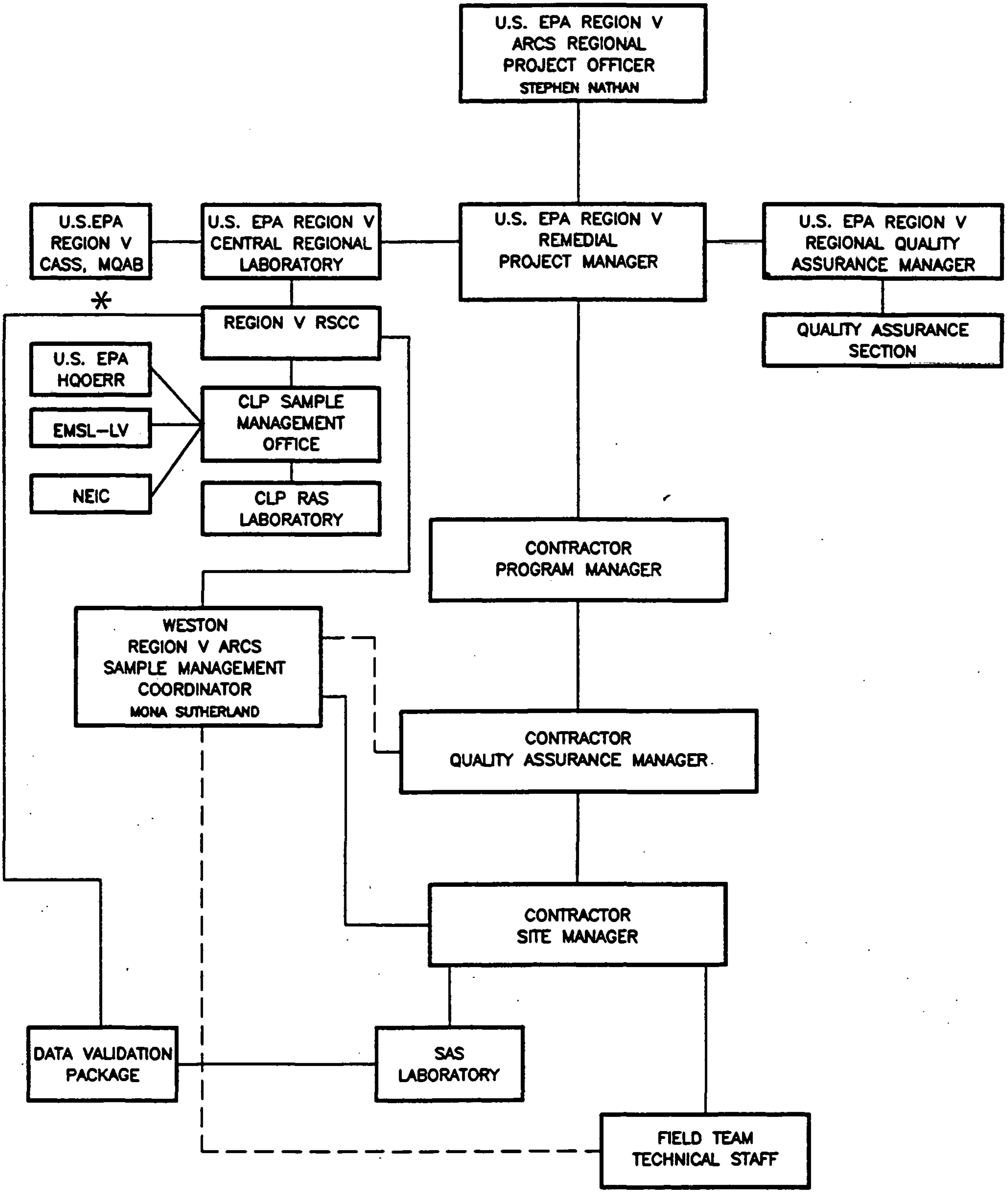
This section presents overall project organization and responsibilities, lines of communication, responsibilities for specific quality assurance tasks, and responsibilities for field and laboratory operations.

Key personnel responsibilities in four specific areas (project management, quality assurance, field operations, and laboratory operations) are discussed in the following subsections. Figure 3-1 presents the project organization chart.

3.1 PROJECT MANAGEMENT

This project is a U.S. EPA Region V-lead project, and the Remedial Project Manager (RPM) has the overall responsibility for all phases of the RD/RA.

Operational responsibilities involving execution and direct management of the technical and administrative aspects of this project have been assigned as follows:



* Contractor selected SAS Laboratory will forward the data package for initial validation.

TAD-05/31/96-13:19-± \CAD93\600\62893

FIGURE 3-1

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 54-5NT2
DOCUMENT CONTROL No. 4500-54-AMRN

PROJECT ORGANIZATION CHART

STOUGHTON CITY LANDFILL
Stoughton, Wisconsin

3.1.1 U.S. EPA Remedial Project Manager

The U.S. EPA RPM has the overall responsibility for all phases of the RD/RA. The RPM and the U.S. EPA QA Officer provide final review/approval of the QAPP.

3.1.2 Contractor Program Manager

The Contractor Program Manager has overall responsibility for ensuring that the project meets U.S. EPA objectives and the Contractor's quality standards. He is also responsible for ensuring that all work is executed in accordance with the U.S. EPA's technical directives. The Program Manager is responsible for assigning and monitoring the functions and responsibilities of the Contractor Site Manager.

3.1.3 Contractor Quality Assurance Manager

The Contractor Quality Assurance (CQA) Manager has the responsibility to implement and administer the CQA Program. The CQA Manager will remain independent of direct job involvement and day-to-day operations, and has direct access to corporate executive staff as necessary to resolve any QA dispute. Other duties include:

- Exercise overall responsibility for all audits.
- Determine projects and activities to be audited; establish audit schedules.
- Notify the audited entity of the nonconformances and the need for corrective actions.
- Approve the disposition of nonconformances.

- Review and approve QA plans and procedures.

3.1.4 Contractor Site Manager

The Contractor Site Manager is responsible for implementing the project, and to meet the project objectives and requirements. The Contractor Site Manager's primary function is to ensure that the technical, financial, and scheduling objectives are achieved successfully. The Contractor Site Manager will coordinate with the Contractor Program Manager and CQA Manager, and will provide the major point of contact and control for matters concerning the project. His other responsibilities include:

- Coordination and management of project personnel.
- Project scheduling.
- Coordination and review of required deliverables.
- General QA of field activities.
- Representing the project team at meetings and public hearings.

3.2 QUALITY ASSURANCE

All aspects of the RA at the site are subject to review by the CQA Manager prior to obtaining approval of the U.S. EPA RPM. Primary responsibility for all quality control activities at the site is the responsibility of the Contractor Site Manager. The specific quality assurance tasks and responsibilities are summarized below.

3.2.1 Final Review/Approval of the O&M QAPP

The U.S. EPA Region V Environmental Sciences Division (specifically, the Quality Assurance Section [QAS] and the Central Regional Laboratory [CRL]) shall review the O&M QAPP. It shall provide recommendations for approval to the U.S. EPA Region V Regional Quality Assurance Manager. In addition, the U.S. EPA Region V RPM shall review and approve the QAPP.

3.2.2 Validation of RAS/SAS Analytical Data

All analytical data will be forwarded to the Monitoring and Quality Assurance Branch (MQAB), Contract Analytical Services Section (CASS) for verification. In addition, Contractor's data reviewers will conduct a systematic review of the data for compliance with established QC criteria.

3.2.3 Performance and Systems Audits

Field Audits

- External field audits of the RA monitoring activities are the co-responsibility of the U.S. EPA Region V CASS, MQAB.

- Internal field audits are the primary responsibility of the Contractor QA Manager and the Contractor Site Manager, and may be conducted at their discretion.

Laboratory Audits

CLP RAS Laboratories

Audits of the CLP RAS laboratories are the responsibility of the following:

- U.S. EPA Headquarters (HQ) Office of Emergency and Remedial Response (OERR) (Analytical Operations Branch).

- U.S. EPA Environmental Monitoring Systems Laboratory - Las Vegas (EMSL-LV).

- National Enforcement Investigations Center (NEIC) Evidence Audit Team.

- U.S. EPA Regional Technical Project Officers.

SAS Laboratories

The Contractor will be responsible for procurement of laboratories for Special Analytical Services (SAS). Technical audits of the SAS laboratories are the responsibility of the Contractor. The U.S. EPA Region V CRL may choose to accompany the Contractor on these audits. These audits may include review of available laboratory analytical procedures, analysis of performance evaluation samples and, if necessary, system audits at the laboratory.

3.2.4 Scheduling of Laboratory Analyses

All CLP RAS analyses are scheduled by the U.S. EPA Region V Regional Sample Control Coordinator (RSCC). The Contractor's Sample Management Coordinator will coordinate all site sampling requirements and schedules with the RSCC. All SAS analyses will be scheduled by the Contractor's Sample Management Coordinator.

3.2.5 Preparation of Special Analytical Services Requests

WESTON has prepared the SAS requests with assistance from the U.S. EPA Region V RSCC. These SAS requests are included in Appendix B. Additional SAS request preparation is the responsibility of the Contractor with assistance from the U.S. EPA Region V RSCC. The review and approval of SAS requests are the responsibility of the U.S. EPA Region V CASS, MQAB and the U.S. EPA QAS.

3.2.6 Final Assessment of Quality Assurance Objectives

The Contractor's QA Manager and Site Manager will jointly assess the validated data to determine whether the QA objectives have been met.

3.2.7 Internal Quality Assurance Review and Approval of Reports, Standard Operating Procedures, and Field Activities

Responsibilities for internal quality assurance review/approval of reports, SOPs and field activities are as follows:

- The Contractor QA Manager and Site Manager are responsible for reviewing all necessary reports and procedures that can affect the data quality for planned site activities.
- The Contractor QA Manager or Site Manager are responsible for auditing the implementation of the QA program (as outlined in the QAPP) to ensure conformance with the Contractor's and the U.S. EPA's project requirements.
- The Contractor Field Team Leader (FTL) shall report the status of the field QA program to the Contractor QA Manager or Site Manager on a regular basis during field activities.
- The Contractor QA Manager and Site Manager shall provide QA technical assistance to the field and project staff during the QA plan's development and field implementation.

3.2.8 Evidence Audits of Field Records

Internal evidence audits of field records shall be the responsibility of the Contractor Site Manager and/or Contractor QA Manager.

External evidence audits of field records are the responsibility of the U.S. EPA Region V CASS, MQAB.

3.3 FIELD OPERATIONS

The Contractor field team shall operate under the direction of the Contractor Site Manager. The field team's activities include sample collection, field measurements, sample packaging, sample shipment, and sample chain-of-custody preparation. Within the field team, there will be a minimum of three specific roles:

- FTL—Responsible for the management of the field team and the supervision of all field activities in the absence of the Contractor Site Manager.

- Site Health and Safety Coordinator (SHSC)—Responsible for the implementation of the Health and Safety Plan (HASP). Will perform health and safety monitoring and ensure compliance with all health and safety requirements for the site.

- Field Sample Manager (FSM)—Manages the custody of all samples from the time they are collected to when they are shipped. Responsible for ensuring that all sample management and documentation procedures are implemented correctly.

For health and safety and QA reasons, a minimum of two field personnel will be present at all times during sampling activities. Depending on the schedule for the field sampling activity, the Contractor Site Manager will evaluate the need for additional personnel. When necessary, the FTL may also perform in the capacity of the SHSC. To the extent practicable, the FSM will not be given any additional responsibilities other than field samples. All personnel will be given the title of field sampler in order to encourage full utilization of all personnel at all times. The field samplers will collect samples and decontaminate equipment. In the absence of the Contractor Site Manager, the FTL will provide QA of field activities.

3.4 LABORATORYOPERATIONS

All RAS laboratory analyses for samples collected as part of the RA activities, with the exception of field parameters (e.g., pH, temperature), shall be performed by U.S. EPA CLP RAS laboratories. For the RAS analyses, the Contractor Sample Management Coordinator (SMC) is responsible for initiating and scheduling the request for analytical services with the U.S. EPA Region V RSCC. The U.S. EPA CLP Sample Management Office (SMO) schedules samples for CLP RAS laboratories prior to sample collection based upon information received from the U.S. EPA Region V RSCC. The Contractor SMC will coordinate with the Contractor Site Manager and FTL in executing all laboratory arrangements. The Contractor will be responsible for procurement of laboratories for all SAS analyses.

SECTION 4

QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for field sampling, chain of custody, laboratory analysis, and reporting that will provide results which are legally defensible in a court of law. Specific procedures for sampling, chain of custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal quality control, audits, preventive maintenance of field equipment, and corrective action are described in other sections of this QAPP. The purpose of this section is to address the specific objectives for accuracy, precision, completeness, representativeness, and comparability of reported data from all analytical laboratories. QA objectives for field measurements are also discussed in this section.

4.1 LEVEL OF QUALITY CONTROL EFFORT

Field blank, trip blank, duplicate, and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling program. Field and trip blanks consisting of Ultra Pure (HPLC Grade) water will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field sampling program. Field blank samples are analyzed to check for procedures at the site that may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage. Duplicate samples are analyzed to check for sampling and analytical reproducibility. Matrix spikes provide information about the effect of the sample matrix on the digestion and measurement methodology. All matrix spikes are performed in duplicate and are hereinafter referred to as matrix spike/matrix spike duplicate (MS/MSD) samples.

The general level of the QC effort to groundwater samples will be one field duplicate and one field blank for every 10 or fewer investigative samples (i.e., a 10 percent frequency). However, field blanks will only be collected for water samples and will consist of Ultra Pure (HPLC Grade) water. No field blanks will be collected for air samples. One volatile organic analysis (VOA) trip blank, consisting of Ultra Pure (HPLC Grade) water, will be included along with each shipment of aqueous VOA samples.

MS/MSD and spike/duplicate samples are investigative samples on which additional analyses are performed. One MS/MSD will be collected/designated for every 20 or fewer investigative samples per sample matrix (i.e., air and groundwater). Aqueous MS/MSD samples must be collected at triple the volume for VOCs. Aqueous spike/duplicate samples require double the normal volume for total metals. The specific level of field QC for samples collected as part of the O&M sampling is summarized by sample matrix and parameter in Table 2-4. Sampling procedures are specified in the FSP (Appendix A).

The analysis for Target Compound List (TCL) volatiles, and Target Analyte List (TAL) metals will be in accordance with RAS protocols (Analytical Level IV). The analysis for other parameters will be according to specified SAS protocol (Analytical Level V). If the U.S. EPA Region V CRL chooses to analyze samples, the analytical protocols will be in accordance with the CRL Standard Operating Procedure (SOP).

The level of laboratory QC effort for RAS analysis provided by the CLP is specified in the current statements of work (SOWs), SOW-OLM03.1 for organic and SOW-ILM03.0 for inorganic analyses or most recent revision. Tables 4-1 and 4-2 present the quantitation levels for TCL parameters and TAL parameters, respectively. The specified level of QC for the SAS analyses is specified in each individual SAS request.

Table 4-1

U.S. EPA Contract Laboratory Program Low/Medium Concentration Organic Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)[1]

	Volatiles	CAS Number	Water (μg/L)
1.	Chloromethane	74-87-3	10
2.	Bromomethane	74-83-9	10
3.	Vinyl Chloride	75-01-4	10
4.	Chloroethane	75-00-3	10
5.	Methylene Chloride	75-09-2	10
6.	Acetone	67-64-1	10
7.	Carbon Disulfide	75-15-0	10
8.	1,1-Dichloroethene	75-35-4	10
9.	1,1-Dichloroethane	75-34-3	10
10.	1,2-Dichloroethene (total)	540-59-0	10
11.	Chloroform	67-66-3	10
12.	1,2-Dichloroethane	107-06-2	10
13.	2-Butanone	78-93-3	10
14.	1,1,1-Trichloroethane	71-55-6	10
15.	Carbon Tetrachloride	56-23-5	10
16.	Bromodichloromethane	75-27-4	10
17.	1,2-Dichloropropane	78-87-5	10
18.	cis-1,3-Dichloropropene	10061-01-5	10
19.	Trichloroethene	79-01-6	10
20.	Dibromochloromethane	124-48-1	10
21.	1,1,2-Trichlorethane	79-00-5	10
22.	Benzene	71-43-2	10
23.	trans-1,3-Dichloropropene	10061-02-6	10
24.	Bromoform	75-25-2	10
25.	4-Methyl-2-pentanone	108-10-1	10
26.	2-Hexanone	591-78-6	10
27.	Tetrachloroethene	127-18-4	10
28.	Toluene	108-88-3	10
29.	1,1,2,2-Tetrachloroethane	79-34-5	10
30.	Chlorobenzene	108-90-7	10
31.	Ethylbenzene	100-41-4	10
32.	Styrene	100-42-5	10
33.	Xylenes (total)	1330-20-7	10

---

[1] This listing is from SOW OLM03.1.

Table 4-2

U.S. EPA Contract Laboratory Program Low/Medium Concentration Inorganic Target Analyte List (TAL)[1]

Analyte	Contract Required Quantitation Limit[2,3] (μg/L)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5,000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3
Magnesium	5,000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5,000
Selenium	5
Silver	10
Sodium	5,000
Thallium	10
Vanadium	50
Zinc	20

---

[1] Listing from SOW ILM03.0.

[2] Subject to the restrictions specified in the first page of Part G, Section IV of Exhibit D (Alternate Methods - Catastrophic Failure) any analytical method specified in SOW Exhibit D may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Limit (CRDL) requirements. Higher detection limits may only be used in the following circumstance:
If the sample concentration exceeds five times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the Contract Required Detection Limit. This is illustrated in the example below:

For lead:
Method in use - ICP — Sample concentration - 220
Instrument Detection Limit (IDL) - 40 — Contract Required Detection Limit (CRDL) - 3

The value of 220 may be reported even though instrument detection limit is greater than CRDL. The instrument or method detection limit must be documented as described in Exhibit E.

[3] The CRDLs are the instrument detection limits obtained in pure water that must be using the procedure in Exhibit E. The detection limits for samples may be considerably higher depending on the sample matrix.

4.2 ACCURACY,PRECISION, AND SENSITIVITY OF ANALYSIS

The fundamental QA objective with respect to accuracy, precision, and sensitivity of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols. The accuracy and precision requirements for CLP RAS are specified in the current SOW-OLM01.8 for organics and SOW-ILM02.1 for inorganics or the most recent revision. The sensitivities required for CLP RAS analyses will be the Contract Required Quantitation Limits (CRQL) for organic and inorganic compounds, presented in Tables 4-1 and 4-2, respectively. The accuracy, precision, and sensitivity requirements for SAS from the CLP are specified in each individual SAS request.

The QC limits should be met completely without any outliers. If an out-of-control result occurs and the QC coordinator of the laboratory does not believe it necessary to rerun the sample, the result will be flagged and a memorandum written regarding the utility of the data.

The calibration procedures, range of measurement, and measurement procedures for equipment to be used for field measurements for pH, conductivity, temperature, dissolved oxygen, turbidity and headspace organic vapor are provided in the SOPs in Appendix C.

4.3 COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. It is expected that the laboratories will provide data meeting QC acceptance criteria for 95 percent or more of all samples tested using the RAS and SAS. Following the completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\text{Completeness (\%)} = \frac{\text{Number of valid data}}{\text{Number of samples collected for each parameter analyzed}} \times 100$$

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter which is dependent upon the proper design of the sampling program and proper laboratory protocol. The sampling network was designed to provide data representative of conditions at the site. During development of this network, consideration was given to the prior investigation results, physical setting, and RA objectives. The rationale of the sampling network is discussed in detail in the FSP (Appendix A). Representativeness will be satisfied by ensuring that the FSP is followed, proper sampling techniques are used, proper analytical procedures are followed, and holding times of the samples are not exceeded in the laboratory. Representativeness will be assessed by the analysis of field duplicate samples.

Comparability expresses the confidence with which one data set can be compared with another. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data, as documented in the QAPP, are expected to provide comparable data.

SECTION 5

SAMPLING PROCEDURES

Sampling procedures are specified in the FSP, which is presented as Appendix A.

SECTION 6
SAMPLE CUSTODY

This section describes the sample custody procedures to be followed in the field and the laboratory. It is U.S. EPA Region policy to follow U.S. EPA Region V sample custody, or chain-of-custody protocols as described in *NEIC Policies and Procedures*, (U.S. EPA, 1985). This custody is in three parts: sample collection, laboratory analysis, and final evidence files. Final evidence files, including all originals of laboratory reports and purge files, are maintained under document control in a secure area.

A sample or evidence file is under your custody if it is:

- In your possession.
- In your view, after being in your possession.
- In your possession and you place it in a secured location.
- In a designated secure area.

6.1 FIELD CHAIN-OF-CUSTODY PROCEDURES

The Contractor should utilize the U.S. EPA field sample custody procedures as required by the U.S. EPA Region V CASS, MQAB and outlined in the U.S. EPA Region V Sample Handling Manual and recent revisions. These procedures are outlined in the FSP (Appendix A) and summarized in Subsection 6.1.4.

The sample packaging and shipping procedures summarized below will ensure that samples arrive at the laboratory with the chain-of-custody intact. The protocol for specific sample numbering using case numbers and traffic report numbers (if applicable) and other sample designations are included in the FSP (Appendix A).

6.1.1 Field Procedures

Field procedures are as follows:

(a) The field sampler is personally responsible for the care and custody of the samples until they are transferred to the Field Sample Manager or properly dispatched. As few people as possible should handle the samples.

(b) All bottles will be tagged with sample numbers and locations. The appropriate CRL or SAS number and sticker will be affixed to each bottle.

(c) Sample tags are to be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample tag because the ballpoint pen would not function in freezing weather.

(d) The Contractor Site Manager (or his designee) will review all field activities to determine whether proper custody procedures were followed during the field work. The designee will notify the Contractor SMC and Site Manager of a breach or irregularity in chain-of-custody procedures.

6.1.2 Field Logbooks/Documentation

Field logbooks will provide the means of recording data collecting activities performed at the site. As such, entries will be described in as much detail as possible so that persons going to the site could re-construct a particular situation without relying on memory.

Field logbooks will be bound, consecutively numbered, field survey books or notebooks. Logbooks will be assigned to the field team, but will be stored in a secure area when not in use. The logbooks will be identified by the project-specific document number.

The title page of each logbook will contain the following:

- Person to whom the logbook is assigned.
- Logbook number.
- Project name.
- Project start date.
- Anticipated project end date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, the level of personal protection being used, and the signature of the person making the entry will be entered. The names of visitors to the site, field sampling or investigative team personnel, and the purpose of their visit will also be recorded in the field logbook.

Measurements taken and samples collected will be recorded. All entries will be made in ink (weather permitting), and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark and the initials of the person making the correction placed next to the strike mark. Whenever a sample is collected or a measurement is made, a detailed description of the location of the station (including compass and approximate distance measurements) will be recorded. The number of photographs taken of the station, if any, will also be noted. All equipment used to take measurements will be identified, along with the date of calibration.

Samples will be collected following the sampling procedures described in the FSP (Appendix A). The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume, and number of containers. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description. The sample identification system is described in Section 6 of the FSP.

6.1.3 Transfer of Custody and Shipment Procedures

Transfer of custody and shipment procedures are as follows:

(a) Samples are accompanied by a properly completed chain-of-custody (COC) form. The sample numbers and locations will be listed on the COC. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage area.

(b) Samples will be packaged for shipment and dispatched to the appropriate laboratory for analysis. A separate signed COC form will be enclosed in each sample shipment container. Shipping containers will be locked and secured with strapping tape and U.S. EPA custody seals for shipment to the laboratory. A custody seal will be attached to the front right and back left of the shipment container. The custody seals will be covered with clear plastic tape. The shipment container will be strapped shut with strapping tape in at least two locations.

(c) Whenever samples are split with a source or government agency, a separate sample receipt will be prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the source or agency will request the representative's signature acknowledging sample receipt. If the representative is unavailable or refuses, this will be noted in the "received by" space.

(d) All shipments will be accompanied by the COC form identifying the contents. The bottom two forms will be retained by the sampler for return to the sampling office, while the top two copies will accompany the shipment.

(e) If the samples are sent by common carrier, a bill of lading will be used. Receipts of bills of lading will be retained as part of the permanent documentation. If sent by mail, the package will be registered with return receipt requested. Commercial carriers will not be required to sign off on the custody form as long as the custody forms are sealed inside the sample shipment container and the custody seals remain intact.

6.1.4 Summary of Field Chain-of-Custody Procedures

A site field team will consist mainly of the following individuals:

- The FTL.
- The SHSC.
- The FSM.

There will be a minimum of two people in each field team. All members will be considered to be field samplers and may be involved in the actual sample collection. Depending on the magnitude of the field operations, the Contractor Site Manager will evaluate the need for additional personnel. When necessary, the FTL will also perform in the capacity of the SHSC. To the extent practicable, the FSM will not be given any additional responsibilities other than sometimes performing as a field sampler. If more than two people are in the field team, there may be personnel who are designated as only field samplers.

The FTL will have overall responsibility for ensuring the completion of all field activities in accordance with the QAPP and FSP. The FTL is the overall coordinator of sampling activities at the site and is the communication link between field team members and the Contractor Site Manager. The FTL will assign specific field duties to the team members based on input from the Contractor Site Manager.

The Contractor SMC will give all required sample documentation to the FSM prior to leaving for the site. The FSM will be responsible for preparing (and reviewing for accuracy and completeness) all sample paperwork such as combination chain-of-custody/traffic report forms (COC/TR), SAS/packing list (COC/SAS) forms, sample tags, and any other paperwork required for sample documentation. The FSM will also prepare all sample shipment information such as airbills. If the FSM does not participate in sampling activities at a site, the FSM will have one or more of the field samplers sign the sample tags. If the FSM requests assistance from other members of the field team in completing sample paperwork, the FSM will be responsible for reviewing and ensuring the accuracy and completeness of this paperwork before he/she encloses it in the sample shipment container. All members of the field team may be involved in the actual sample packaging and shipment. The FSM is responsible for tracking all sample paperwork from the time of receipt until the completed paperwork is given to the Contractor SMC.

The FTL is responsible for maintaining the site field logbook. The site field logbook will contain notes made by the FTL on site activities, including the tracking of the samples from the time of sample collection to the delivery of the samples to the shipping carrier. The names and function of all field team members will be listed in the logbook. During the course of sample collection activities, the FTL will document the times and dates of all sampling activities (e.g., who collected the sample, when and where the sample was collected, who delivered the sample to FSM, when the sample coolers were delivered to the shipping carrier, etc.) If the FSM was part of the sampling team this will be specifically noted. The FTL will note the names of the actual samplers for each station location along with the time, date, station location identifier and sample identifiers, etc.

The collected samples will be transported to the FSM by a member or members of the field team. If the sample locations are far apart, multiple samples may be collected prior to delivering them to the FSM. The FTL will ensure that any preservation requirements (e.g., keeping the samples cool) are implemented prior to the time that the samples are delivered to the FSM. To the extent practicable, the FSM will be in view of the sampling crew.

Upon receipt of the samples, the FSM will be responsible for ensuring that custody is transferred. The FSM will require the field team member delivering the samples to sign and date the COC/TR, COC/SAS or the stand-alone COC form associated with the samples as relinquisher of the samples in the "relinquished by" area. The FSM will then sign the forms as the recipient. The signed forms will be the same forms that will accompany the samples to the laboratory. Prior to enclosing the forms in the shipment container, the FSM will sign the various COC forms to indicate he or she is relinquishing custody to the shipment carrier. If the forms are sealed in the shipment container with COC seals on the outside of the container, the shipment carrier will not sign the forms as the recipient. The FSM will be responsible for completing the remainder of all forms except as noted previously. In all instances, the FTL will sign each form in the area for "sampler" since he or she will be present during all sampling activities.

The FSM will sign sample tags if he or she participates in sampling activities. Otherwise, the FSM will have members of the sampling team sign the tags when they deliver samples.

The team member delivering the samples will also provide the FSM with the individual time of collection for each sample. All sample documentation shipped with the sample to the laboratory (i.e., COC/TR, COC/SAS, etc.) will become part of the evidence file for the samples. The site field logbook will be maintained in the site file or in the custody of the FTL.

The FSM assumes custody of the samples once he or she has signed the COC form(s). If the FSM must leave the "staging area" (where sample preparation for shipment and documentation completion is performed), the samples will either be locked inside of the sampling team's vehicle/trailer, or will be secured in a cooler with custody seals. The custody seals will be inspected by the FSM upon return to the staging area to ensure they are intact. These practices will be followed whenever necessary to maintain custody of the samples in the field and will be logged into the site field logbook.

6.2 LABORATORYCHAIN-OF-CUSTODYPROCEDURES

The chain-of-custody procedures for the CLP are described in the SOWs for RAS; these same procedures apply to SASs. These custody procedures, along with the holding time requirements for CLP samples, are described in the appropriate SOW documents. Prior to procuring the SAS laboratories, the Contractor must ensure that the SAS laboratories will follow the approved chain-of-custody procedures.

If the U.S. EPA Region V CRL chooses to analyze samples, chain-of-custody procedures for the CRL are described in the CRL's SOP.

6.3 FINAL EVIDENCE FILES CUSTODY PROCEDURES

The Contractor is the custodian of the evidence file and maintains the contents of the evidence files for the site field activities. The Contractor maintains all relevant records, reports, correspondence, logs, field notebooks, pictures, subcontractor reports, and the U.S. EPA CASS, MQAB data reviews in a secured, limited access area and under custody of the Contractor Site Manager.

SECTION 7

CALIBRATION PROCEDURES AND FREQUENCY

This section describes procedures for maintaining the accuracy of all the instruments and measuring equipment which are used for conducting field tests and laboratory analyses. For any activity that influences data quality, all instruments and equipment should be calibrated prior to each day's use or on a scheduled periodic basis.

7.1 FIELD INSTRUMENTS/EQUIPMENT

Instrument and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that the accuracy and reproducibility of results are consistent with the manufacturer's specifications. The field instruments should be calibrated and maintained by trained personnel.

Equipment to be used during the field sampling will be examined to certify that it is in operating condition. This includes checking the manufacturer's operating manual and the instructions for each instrument to ensure that all maintenance requirements are being observed. Field notes from previous sampling trips will be reviewed so that any prior equipment problem is not overlooked and all necessary repairs to equipment have been made.

Calibration of field instruments is governed by the specific SOP for the applicable field analysis method, and such procedures take precedence over the following general discussion. Calibration of field instruments will be performed at the intervals specified by the manufacturer or more frequently as conditions dictate. In the event that an internally calibrated field instrument fails to meet calibration/checkout procedures, it will be returned to the manufacturer for service.

Field instruments to be used during the investigation include:

- pH meter.
- Thermometer.
- Specific conductivity meter.
- Dissolved oxygen meter.
- Water level indicator/electronic sounding device.
- Turbidimeter.
- Flame Ionization Detector (FID).
- PID
- CGI/Oxygen Meter.

The calibration/checkout of all field instruments will be performed prior to use each day. The calibration/checkout and maintenance programs for each instrument will be according to the manufacturer's specifications. Appendix C includes some generic SOPs.

All calibration performed in the field will be documented in the site field logbook. A master calibration/maintenance record will be maintained by the Contractor FTL for each measuring instrument and will include at least the following information:

- Name of device or instrument calibrated.
- Device/instrument serial and/or identification (I.D.) number.

- Frequency of calibration.
- Results of calibration.
- Name of person performing the calibration.
- Identification of the calibration media (e.g., pH buffer solutions).

Tape measures used to locate sampling stations and to determine depths in boreholes or wells will be examined visually prior to each day of use to check for damage. Damaged tape measures will not be used.

7.2 LABORATORYINSTRUMENTS

7.2.1 Calibration Procedures and Frequency for RAS Analyses

The CLP RAS calibration procedure and frequencies are specified in the CLP organic and inorganic SOWs.

7.2.2 Calibration Procedure and Frequency for SAS Analyses

The groundwater SAS calibration procedures and frequency are specified in the SAS request. The calibration procedures and frequency for air analyses will be in accordance with EPA Method TO-14.

7.2.3 U.S. EPA Region V CRL Calibration Procedures and Frequency

The CRL calibration procedures and frequency are specified in the CRL organic and inorganic SOWs.

SECTION 8

ANALYTICALPROCEDURES

This section describes the analytical procedures for all analysis that will be conducted during the RA. Table 2-4 identifies the field and laboratory parameters for soil and groundwater for each RA task.

8.1 LABORATORYANALYTICALSERVICES

8.1.1. Routine Analytical Services Laboratory Procedure

All samples for CLP TCL volatiles will be analyzed according to analytical procedures set forth in U.S. EPA CLP RAS SOW OLM03.1 or the most recent revision. All samples for CLP TAL metals will be analyzed according to the analytical procedures set forth in U.S. EPA CLP RAS SOW ILM03.0 or the most recent revision. If the U.S. EPA Region V CRL chooses to analyze samples, the analyses will be in accordance with the analytical procedures set forth in the CRL SOP.

8.1.2 Special Analytical Services Laboratory Procedure

Table 2-3 identifies the laboratory parameters (for air and groundwater samples) which require SAS analyses. The analytical procedures to be used for performing the SAS groundwater analyses are described in the SAS requests in Appendix B of this QAPP. The analytical procedure for analyzing VOCs in landfill gas would be EPA Method TO-14. This method is referenced in *Compendium of Methods for the Determination of Toxic Organic Compounds in Air, EPA 600/4-84-041, EPA Method TO-14*. The Contractor is responsible for procuring the SAS laboratories.

8.2 FIELD SCREENING ANALYTICALPROTOCOLS

The procedures for field measurement of pH, specific conductivity, temperature, dissolved oxygen, and turbidity are described in the SOPs in Appendix C.

SECTION 9

INTERNAL QUALITY CONTROL CHECKS

This section describes the internal quality control checks for field sample collection, field measurements, and laboratory analyses.

9.1 FIELD SAMPLE COLLECTION

The assessment of QC for field sampling will be made through the collection of field blank and field duplicate samples, in accordance with the applicable procedures and frequency described in Table 2-4 of this QAPP and Section 5 of the FSP.

9.2 FIELD MEASUREMENT

QC procedures for pH, conductivity, dissolved oxygen, turbidity, and temperature, as well as manual and electronic measurement of water levels, are limited to checking the reproducibility of the measurement by obtaining multiple readings on a single sample or standard and/or by calibrating the instruments (when appropriate).

9.3 LABORATORYANALYSIS

9.3.1 RAS Internal Quality Control Checks

The CLP QC program is structured to provide consistent results of known and documented quality. Internal quality control procedures for RAS from the CLP are specified in the SOWs for organics and inorganics, or in the method description of SOPs. These specifications include the types of QC checks required (method blanks, reagent/preparation blanks, MS/MSDs, calibration standards, internal standards, surrogate standards, the frequency of each audit, the specific calibration check standards, laboratory duplicate/replicate analysis), compounds and concentrations to be used, and the quality control acceptance criteria for these audits. If the U.S. EPA Region V CRL chooses to analyze samples, internal quality control check procedures will be followed in accordance with the CRL SOP.

9.3.2 SAS Internal Quality Control Checks

Quality control checks for groundwater SAS are identified in the SAS requests in Appendix B. Quality control for air SAS are identified in EPA Method TO-14.

SECTION 10

DATA REDUCTION, VALIDATION, AND REPORTING

This section identifies responsibilities and procedures for data reduction, validation and reporting for field measurements, sample collection and laboratory services.

10.1 FIELD MEASUREMENTS AND SAMPLE COLLECTION

Raw data from field measurements and sample collection activities will be appropriately recorded in the site field logbook. If the data are to be used in the project reports, they will be reduced or summarized, and the method of reduction will be documented in the report.

10.2 LABORATORYSERVICES

10.2.1 Data Reduction

All samples collected at the site will be sent to the CLP. Data reduction, evaluation, and reporting for samples analyzed by the CLP according to the RAS protocol will be performed in accordance with specifications outlined in the CLP RAS SOW OLM03.1 for organics and SOW ILM03.0 for inorganics, or the most recent revision. Data resulting from groundwater SAS analyses will be reduced, evaluated, and reported as described above, unless special procedures are given in the actual SAS request presented in Appendix B. If the U.S. EPA Region V CRL chooses to analyze samples, data reduction will be performed by the CRL according to specifications outlined in the CRL SOP.

10.2.2 Data Validation

Following data evaluation and reduction, the data will be sent to the U.S. EPA Region V LSSS of the CRL for data validation. Validation will be accomplished by comparing the contents of the data packages and QA/QC results to the requirements contained in RAS methods and SAS methods. Raw data such as GC/MS Total Ion Current (TIC) chromatograms, GC chromatograms, and mass spectra, ICAP and FAA data reports, and data station printouts will be examined to ensure that reported results are accurate. The U.S. EPA Region V LSSS will be responsible for this.

The U.S. EPA Region V validation protocols for the CLP, RAS, and SAS data are based on the following guidelines:

- *Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses* - U.S. EPA, February 1994.
- *Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses* - U.S. EPA, February 1994.

Data validation may also be based on Region V Standard Operating Procedure for Validation of CLP Inorganic Data dated September 1993. The Contractor will review the validated data and use it accordingly.

10.2.3 Data Reporting

The RAS and SAS analytical laboratories will prepare and submit full analytical and QC reports to U.S. EPA Region V in compliance with the requirements of the CLP. They will include the following (as applicable):

1. Narrative including statement of samples received, description of any deviations from RAS or SAS standard procedures, explanation of qualifications regarding data quality, and any other significant problems encountered during analysis.
2. Up to 20 extractable organic compounds not included in the RAS analytes, tentatively identified and quantified against the nearest internal standard.
3. An organic QA/QC report including Forms I to X, surrogate spike results for each sample, matrix spike and matrix spike duplicate results, method blank results, and initial and continuing calibration checks.
4. An inorganic QA/QC report including Forms I to XIII spike and duplicate results, method blank results, and initial and continuing calibration checks.
5. Field and laboratory chain-of-custody documentation pertaining to each sample delivery group analyzed.

SECTION 11

PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY

Performance and system audits of both field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the FSP and the QAPP. The audits of field and laboratory activities include two separate, independent parts: internal and external audits.

Quality assurance system audits are conducted at least once during activities that may affect the integrity of the sampling program. The objectives of the QA systems audits are:

- To verify that a system of quality control measures, procedures, reviews, and approvals is established for all activities that generate and process environmentally-related data.
- To verify that a system for project documentation (records, chain-of-custody forms, analytical tags, logbooks, worksheets, etc.) is established.
- To verify documentation of the required quality control reviews, approvals, and activity records (logbooks, worksheets, etc.).
- To identify nonconformance with the established system of quality control measures, procedures, reviews, approvals, and documentation.
- To recommend corrective actions for identified nonconformance.
- To verify implementation of corrective action.
- To provide written reports of audits.

11.1 FIELD AUDITS

Internal audits of field activities at the site will be the responsibility of the Contractor Technical Operations Manager and/or Site Manager. In the absence of both persons, the QA of field activities will be conducted by the designated FTL. Field audits will cover the following:

- Organization and responsibilities—determine whether the quality assurance organization is operational.
- Collection of samples—to ensure that written procedures are available and being followed.
- Chain-of-Custody program—to ensure that the appropriate steps have been followed in the traceability of sample origin.
- Implementation of the operational procedures—to ensure that the appropriate QC checks are being made in the field and records are maintained of these checks.
- Equipment—to determine whether the specified equipment is available, calibrated, and in proper working order.
- Training—to ensure that sampling crews are adequately trained.
- Records—to ensure that recordkeeping procedures are operational and that field notebooks, log sheets, bench sheets, and tracking forms are properly prepared and maintained.

These audits will occur at the outset of the project to verify that all established procedures are followed. Follow-up audits will be conducted to ensure correction of any deficiencies that were previously identified and to verify that QA procedures are maintained throughout the project.

In addition, constant surveillance of field sampling and testing activities shall be performed by qualified technical personnel, as approved by the Contractor Site Manager. The Contractor Site Manager may conduct audits of site work procedures on an unscheduled basis.

External field audits are the responsibility of by the U.S. EPA Region V CASS, MQAB. Audits may be scheduled or unscheduled.

11.2 LABORATORYAUDITS

The CLP RAS laboratories are audited on a regular basis by the U.S. EPA. The U.S. EPA EMSL-LV conducts the system audits of the CLP laboratories on an annual basis, and conducts performance audits on a quarterly basis. Audits of the SAS laboratories are the responsibility of the contractor; however, the U.S. EPA Region V RSCC may choose to accompany the contractor on these audits.

Audits include the examination of laboratory documentation for sample receiving, sample log-in, sample storage, chain-of-custody procedure, sample preparation and analysis, instrument operating records, etc. The performance audits consist of sending performance evaluation (PE) samples to laboratories for ongoing assessment of laboratory precision and accuracy. The analytical results of the analysis of PE samples were evaluated by U.S. EPA to ensure that the laboratory maintains good performance. The analytical results of the PE sample for a SAS laboratory will be evaluated by the contractor.

SECTION 12

PREVENTATIVEMAINTENANCE PROCEDURES

This section describes the specific preventive maintenance procedures to be followed for field equipment and laboratory instruments.

12.1 FIELD EQUIPMENT/INSTRUMENTS

The field equipment for this project includes thermometers, pH meter, conductivity meter, turbidimeter, and dissolved oxygen meter. Specific preventative maintenance procedures for this equipment are discussed in the SOPs in Appendix C, and will be conducted in accordance with manufacturer's specifications.

Field instruments will be checked and calibrated daily before use. Calibration checks will be documented in the site field logbook. The FTL will be responsible for implementing and documenting these procedures in the logbook.

Preventative maintenance will normally be conducted by the equipment supplier. Additional maintenance of equipment will be performed at the site, if necessary, by the field sampling personnel on an as-needed or an as-recommended basis. In addition, critical spare parts, such as tape, pH probes, and batteries, will be kept on site to reduce downtime. Backup instruments and equipment will be available on site if deemed necessary, or will be within one-day's shipment to avoid delays in the field schedule.

12.2 LABORATORYINSTRUMENTS

All laboratories participating in the CLP are required under the CLP RAS SOW OLM03.1 for organics and SOW ILM03.0 for inorganics (or the most current version) to have SOPs for preventative maintenance for each measurement system and required support activity. Preventative maintenance procedures for laboratories performing SAS analyses are the same as those described above for RAS. All maintenance activities must be documented in logbooks to provide a history of maintenance records. If the U.S. EPA Region V CRL chooses to analyze samples, laboratory instruments will be maintained according to CRL SOP.

SECTION 13

SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY,COMPLETENESS

This section describes the specific routine procedures to be followed to assess data precision, accuracy and completeness for field measurements and laboratory results.

13.1 FIELD MEASUREMENTS

Field data will be checked for compliance with the established QC criteria that are specified in the QAPP and FSP. Data from field measurements of pH, specific conductance, temperature, dissolved oxygen, turbidity, groundwater levels, and CGI/Oxygen levels will be assessed by thorough review of QC data (i.e., calibrations, standards, blanks, replicates), documentation in site field logbooks, and reports from system audits.

Accuracy of field measurements will be assessed using daily instrument calibration, calibration check, and analysis of blanks. Precision will be assessed on the basis of reproducibility by multiple readings of a single sample.

All data will be reviewed for completeness by the Field Team Leader or his/her designee. Data completeness will be calculated using the following equation.

$$\text{Completeness} = \frac{\text{Valid Data Obtained}}{\text{Total Data Planned}} \times 100 \qquad \text{Eq. 13-1}$$

13.2 LABORATORYDATA

Laboratory results will be assessed for compliance with required precision, accuracy, completeness, and sensitivity as discussed in the following subsections.

13.2.1 Precision

The degree of agreement between the numerical values of a set of duplicate samples performed in an identical fashion constitutes the precision of the measurement. Precision of laboratory analysis will be assessed by comparing the analytical results between MS/MSD samples for organic analysis and laboratory duplicate analyses for inorganic analysis. Precision will be reported as a relative percent difference and will be calculated for each pair of duplicate analysis using the following equation.

$$\% \text{RPD} = \frac{S-D}{(S+D)/2} \times 100 \qquad \text{Eq. 13-2}$$

Where:

% RPD = Relative percent difference.

S = First sample value (MS for organics and initial sample result for inorganics).

D = Second sample value (MSD for organics and method duplicate for inorganics).

13.2.2 Accuracy

Accuracy is the measure of a result to the accepted (or true) value. Accuracy of laboratory results will be assessed for compliance with the QC criteria that are described in Section 4 of the QAPP, using the analytical results of QA samples like the method blanks, reagent/preparation blank, MS/MSD samples, field blanks, and bottle blanks.

Analytical accuracy is expressed as the percent recovery of an analyte that has been added to the sample or standard matrix (i.e., blank) at a known concentration before analysis. The percent recovery of matrix spike samples will be calculated using the following equation:

$$\%R = \frac{SSR - SR}{SA} \times 100 \qquad \text{Eq. 13-3}$$

Where:

%R = Percent recovery

SSR = The total analyte concentration determined experimentally from the spiked sample (spiked sample recovery).

SR = The sample result (SR) determined by separate analysis of the unspiked sample. SR is zero if the SR is qualified U.

SA = Amount of the spike added.

3.2.3 Completeness

The data completeness of laboratory analyses results will be assessed for compliance with the amount of data required for decisionmaking. Data completeness will be calculated using Equation 13.1.

13.2.4 Sensitivity

The achievement of method detection limits depends on instrument sensitivity and matrix effects. Therefore, it is important to monitor the instrument sensitivity to ensure the data quality through constant instrument performance. The instrument sensitivity will be monitored through the analysis of method blank, calibration check sample, laboratory control samples, etc.

SECTION 14

CORRECTIVE ACTIONS

Corrective actions may be required for two classes of problems: analytical and equipment problems and noncompliance problems. Analytical and equipment problems may occur during sampling and sample handling, sample preparation, laboratory instrument analysis, and data review.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem is responsible for notifying the Contractor Site Manager or his designee if the problem occurs in the field, or the U.S. EPA Region V RSCC if the problem occurs in the laboratory. Information on these problems will be promptly communicated to the U.S. EPA RPM, the Contractor Site Manager and/or QA Manager. Implementation of corrective actions will be confirmed in writing through the same channels.

Any nonconformance with the established quality control procedures in the QAPP or FSP will be identified and corrected in accordance with the QAPP. The QA Manager or his designee will issue a nonconformance report for each nonconformance condition.

Corrective actions will be implemented and documented in the site field logbook. No staff member will initiate corrective action without prior communication of findings through the proper channels. Corrective actions will be defined by the auditor and implemented to the satisfaction of the QA Manager. If corrective actions are insufficient, work may be stopped by a stop-work order issued by the U.S. EPA RPM, the Contractor Site Manager, or the Contractor QA Manager.

14.1 SAMPLE COLLECTION/FIELD MEASUREMENTS

Technical staff and field personnel will be responsible for reporting all suspected technical or QA nonconformance or suspected deficiencies of any activity or issued document by reporting the situation to the FTL or his/her designee. The FTL will be responsible for assessing the suspected problem, consulting with the Contractor Site Manager on the problem and anticipated change, and implementing the change. If it is determined that the situation warrants a reportable nonconformance requiring corrective action, then a nonconformance report will be initiated by the Contractor Site Manager.

The Contractor Site Manager will be responsible for informing the Contractor QA Manager, and the U.S. EPA RPM of the problem. The Contractor Site Manager will be responsible for ensuring that corrective action for the nonconformance is initiated by:

- Evaluating all reported nonconformance.
- Controlling additional work on nonconforming items.
- Determining disposition or action to be taken.
- Maintaining a log of nonconformance.
- Reviewing nonconformance reports and corrective actions to be taken.
- Ensuring nonconformance reports are included in the final site documentation in project files.

If appropriate, the Contractor Site Manager will ensure that no additional work that is dependent on the nonconforming activity is performed until the corrective actions are completed.

Corrective action for field measurements may include:

- Repeating the measurement to check the error.
- Checking all proper adjustments for ambient conditions such as temperature.
- Checking the batteries.
- Checking the calibration.
- Re-calibration.
- Replacing the instrument or measurement device.
- Stopping work (if necessary).

All changes will be evaluated based on the potential to impact the quality of the data. The Contractor Site Manger has ultimate responsibility for all site activities. In this role, the Site Manager at times is required to adjust the site programs to accommodate site-specific needs. When it becomes necessary to modify a program, the FTL notifies the Contractor Site Manager of the anticipated change and implements the necessary changes. The Contractor Site Manager or his designee must approve all changes verbally and/or in writing prior to field implementation by the FTL. The Contractor QA Manager, and the U.S. EPA RPM will be notified when any field changes are made.

All problems and corrective actions will be documented in the site field logbook by the FTL. No field team member will initiate corrective action without prior communication of findings through the proper channels. The action taken during the period of deviation will be evaluated in order to determine the significance of any departure from established program practices and action taken. If corrective actions are insufficient, work may be stopped by the FTL following instructions from the Contractor Site Manager, Contractor QA Manager, or the U.S. EPA RPM.

14.2 LABORATORYANALYSES

CLP RAS issues are dealt with by the U.S. EPA data reviewer, who contacts the CLP laboratory directly. The Contractor will handle all SAS issues. The SMO Contracts Compliance Screening (CCS) group performs automated CCS (screening) of the RAS data, which the laboratory must respond to within 10 days. The RAS re-analyses are authorized by the U.S. EPA CLP Administrative Project Officer (APO). The U.S. EPA Regional Technical Project Officers (TPO) handle laboratory problems with CLP laboratories in their Region.

14.2.1 Laboratory Corrective Actions - CLP RAS

For the CLP RASs, corrective action is implemented at several different levels. The laboratories participating in the CLP are required to have a written SOP specifying corrective action to be taken when an analytical error is discovered or the analytical system is determined to be out of control. The SOP requires documentation of the corrective action and notification by the analyst about the errors and corrective procedures.

The SMO also may request corrective action for any contractual nonconformance identified by audits or data validation. The CRL may request corrective action by the laboratories for any nonconformances identified in the data validation process through the SMO or, for minor problems, the lab may be contacted directly. Corrective action may include:

- Re-analyzing the samples, if holding time criteria permits.
- Resampling and analyzing.
- Evaluating and amending sampling procedures.

- Evaluating and amending analytical procedures.
- Accepting the data and acknowledging the level of uncertainty.

If resampling is deemed necessary due to laboratory problems, the U.S. EPA RPM must identify the necessary approach including cost recovery from the CLP for the additional sampling effort. The Contractor QA Manager must be notified in writing of all decisions.

14.2.2 Laboratory Corrective Actions - SAS

For SAS requests, corrective action will be implemented as specified in the SAS request and in accordance with the procedures described in the previous paragraph (Subsection 14.2.1). The Contractor is responsible for ensuring that the SAS laboratories implement corrective action procedures in accordance with approved procedures.

If the U.S. EPA Region V CRL chooses to analyze samples, corrective actions by the CRL will be implemented according to CRL SOP.

SECTION 15

QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Contractor QA Manager and/or Site Manager (or designee) will audit the implementation of this QAPP. These reviews will include an assessment of data quality, and the results of systems and/or performance audits as appropriate. These reviews are done to ensure that problems, if any, identified during sampling and/or analysis are investigated, and corrective actions are properly taken. The preparation of a Quality Assurance Report is not anticipated, except as necessitated by problems arising during the execution of project activities. Any QA reports prepared by the Contractor for the site will be submitted to the U.S. EPA RPM.

The technical memorandum describing the monitoring activities will contain QA sections that summarize data quality information collected during the project.

SECTION 16

REFERENCES

Cline, D.R., *"Geology and Groundwater Resources of Dane County, Wisconsin."* GSA Water Supply Paper 1979-U.

Jacobs Engineering, *"Revised Technical Work Plan Addendum,"* 10 May 1993.

Mickelson, D.M. and M.C. McCartney, *Map Showing Glacial Geologist of Dane County, Wisconsin University of Wisconsin - Extension Geological and Natural History Survey.*

U.S. Environmental Protection Agency (U.S. EPA). 1994a. *Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses.* EPA Data Review Work Group. February 1994.

U.S. Environmental Protection Agency (U.S. EPA). 1994b. *Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses.* EPA Data Review Work Group, February 1994.

U.S. Environmental Protection Agency (U.S. EPA). 1989a. *Content Requirements for Quality Assurance Project Plan.* Prepared by Cheng-Wen Tsai. Revised January 1989.

U.S. Environmental Protection Agency (U.S. EPA). 1991. *Model Quality Assurance Project Plan.* Office of Superfund, Region V. May 1991.

U.S. Environmental Protection Agency (U.S. EPA). *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans.* QAMS-005/80.

U.S. Environmental Protection Agency (U.S. EPA). *Record of Decision - "Selected Remedial Action for the Stoughton City Landfill Site, Stoughton, Wisconsin," 1991.*

ENSR Consulting and Engineering, *Final Remedial Investigation Report for Stoughton City Landfill, Stoughton, Wisconsin*, January 17, 1991.

Roy F. Weston, Inc., *Remedial Design Work Plan for Stoughton City Landfill, Stoughton, Wisconsin*, December 1992.

Roy F. Weston, Inc., *Remedial Design Data Collection Report for Stoughton City Landfill, Stoughton, Wisconsin*, June 1995.

APPENDIX A

FIELD SAMPLING PLAN

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

LIST OF TABLES

SECTION 1
INTRODUCTION

This Field Sampling Plan (FSP) describes the field sampling protocols to be followed as part of the operation and maintenance (O&M) for the landfill remediation component at the Stoughton City Landfill (SCL) site in Stoughton, Wisconsin.

Specifically, the FSP addresses the following:

- Sampling plan rationale.
- Field sampling procedures.
- Numbers, locations, and types of samples.
- Quality Assurance/Quality Control (QA/QC) of field sampling.
- Sample numbering system.
- Sample containers and preservation.
- Sample packaging and shipment.
- Chain-of-custody procedures.
- Documentation.
- Sampling team organization.
- Management of investigation-derived wastes.
- Sample container procurements.

During the O&M, additional field sampling may be necessary. If the additional field sampling is not covered in this FSP, an addendum to the FSP should be made at the appropriate time, and approval should be obtained by the United States Environmental Protectin Agency (U.S. EPA) before initiating the field work.

SECTION 2

SAMPLE NETWORK DESIGN AND RATIONALE

This section presents the rationale for sampling frequency and analysis during the O&M phase of the remedial action. The sampling activities include groundwater monitoring and landfill gas monitoring. Table 2-1 summarizes the sampling and analysis program.

2.1 GROUNDWATER MONITORING

The Record of Decision (ROD) identified the Wisconsin Preventive Action Limits (PALs) as the applicable groundwater quality standards for the site. The Remedial Design (RD) Data Collection Report (WESTON, 1995) delineated the groundwater plume at the site. The report concluded that there are two plumes moving in the northwest direction away from the landfill towards the Yahara River (Figures 2-3 and 2-4 of the QAPP). These plumes appear to be disconnected. The chemicals exceeding the PALs for groundwater are tetrahydrofuran (THF) and dichlorodifluoromethane (DCDFM). The PAL for THF is 10 micrograms per liter (μg/l) and for DCDFM is 200 μg/l. Both of the plumes exceed the PALs for both THF and DCDFM.

The groundwater monitoring has the following objectives:

- Establish a baseline for site groundwater quality immediately after the placement of the landfill cap.

- Monitor the movement of the THF and DCDFM plumes semiannually to evaluate natural attenuation and the effect of the landfill cap on the THF and DCDFM plumes.

Table 2-1

Summary of Annual O&M Sampling and Analysis Program
Stoughton City Landfill
Stoughton, Wisconsin

O&M Task	Sample Matrix	Field Parameters	Laboratory Parameters[4]	Investigative			Field Duplicate			Field Blank			MS/MSD[5]			Matrix Total
				No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Baseline Groundwater Monitoring[1]	Groundwater	Water Level, pH, Conductivity, Temperature, Turbidity, Dissolved Oxygen	Tetrahydrofuran (THF)	40	1	40	4	1	4	4	1	4	2	1	2	48
			Dichlorodifluoromethane (DCDFM)	40	1	40	4	1	4	4	1	4	2	1	2	48
			Trichlorofluoromethane (TCFM)	40	1	40	4	1	4	4	1	4	2	1	2	48
			CLP RAS TCL Volatiles	40	1	40	4	1	4	4	1	4	2	1	2	48
			CLP RAS TAL Metals (Filtered)	40	1	40	4	1	4	4	1	4	2	1	2	48
			CLP RAS TAL Metals (Unfiltered)	40	1	40	4	1	4	4	1	4	2	1	2	48
Routine Groundwater Monitoring[2]	Groundwater	Water Level, pH, Conductivity, Temperature, Turbidity, Dissolved Oxygen	THF	28	2	56	3	2	6	3	2	6	2	2	2	68
			DCDFM	28	2	56	3	2	6	3	2	6	2	2	2	68

Table 2-1

Summary of Annual O&M Sampling and Analysis Program
Stoughton City Landfill
Stoughton, Wisconsin
(Continued)

O&M Task	Sample Matrix	Field Parameters	Laboratory Parameters[4]	Investigative			Field Duplicate			Field Blank			MS/MSD [5]			Matrix Total
				No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Passive Gas Vent Monitoring[3]	Air	Flow, Percent LEL, Percent Oxygen	EPA Method T014 Standard List of VOCs	5	1	5	NA	NA	NA	NA	NA	NA	1	1	1	5

[1] Baseline groundwater monitoring will be conducted immediately after the placement of the landfill cap and then repeated every five years until the THF and DCDFM concentrations fall below the PALs.

[2] Routine groundwater monitoring will be conducted twice every year. However, if the baseline groundwater monitoring is conducted that year, only one round of routine groundwater monitoring will be needed.

[3] Four annual sampling events are expected to complete the sampling of 21 passive gas vents. This will involve sampling 5 gas vents each year for 3 years and 6 gas vents the fourth year.

[4] All parameters that are not designated as CLP RAS analyses will be analyzed according to SAS methodologies presented in Appendix D.

[5] MS/MSDs are not additional samples, but are instead investigative samples on which MS/MSD analyses are performed. MS/MSDs are for organic samples only. Duplicate/spike analyses are performed for inorganic samples.

[6] The matrix total does not include trip blank samples and MS/MSD samples. One trip blank will be shipped with every shipment container containing aqueous VOA samples.

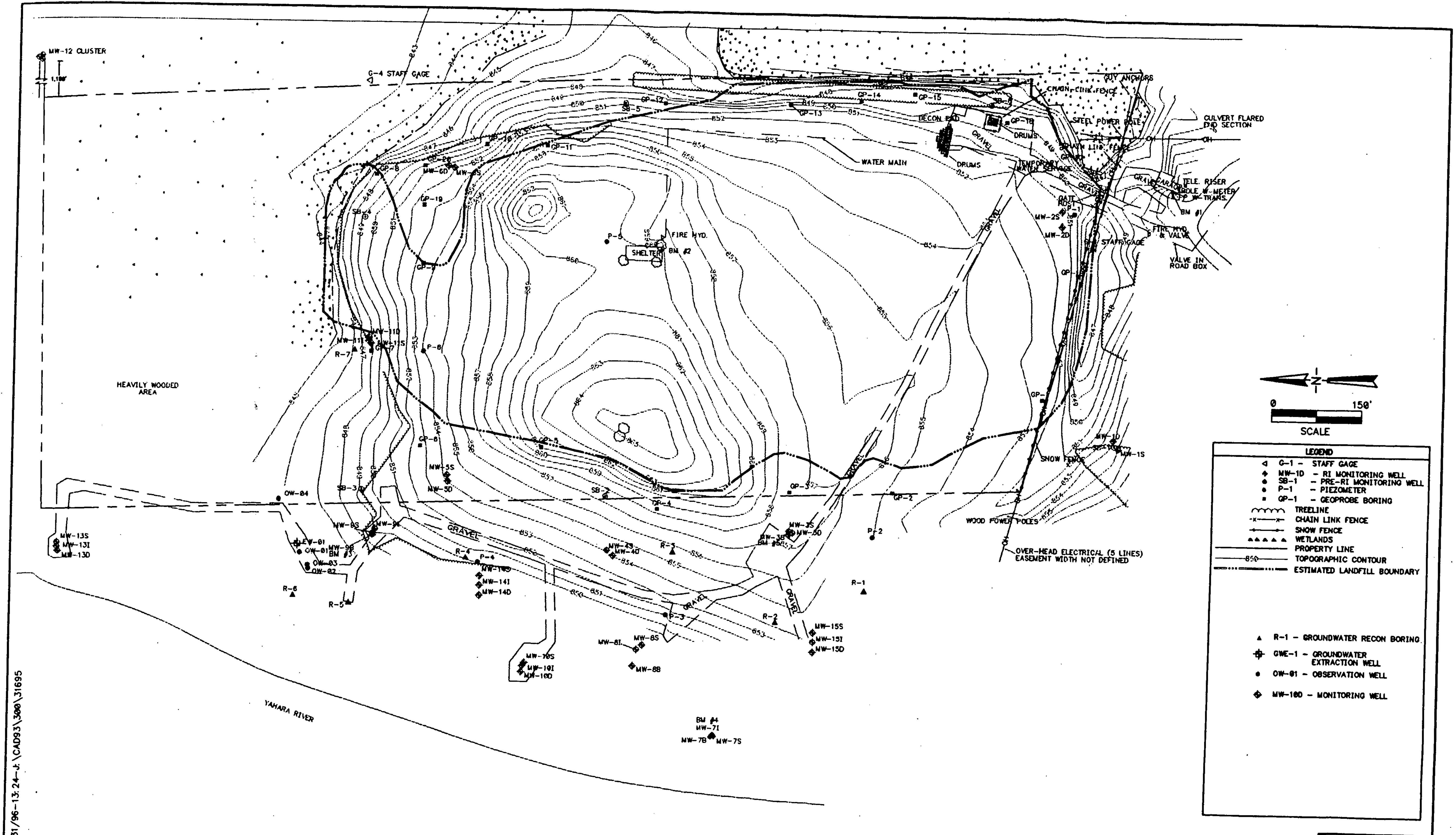
- Reevaluate the site groundwater quality five years after the placement of the landfill cap and compare it against the initial baseline. Repeat this reevaluation every five years until the THF and DCDFM concentrations fall below the PALs.

The entire monitoring program will be reassessed biannually. Specific adjustments to the program that may be necessary include:

- Analyte list - Do analytes need to be added or deleted?
- Sampling frequencies - Is semi-annual sampling adequate or excessive?
- Monitoring well network - Is the monitoring well network adequate? Does any well need to be replaced? Should additional wells be installed? Can some of the monitoring wells be deleted from the sampling program?
- Sampling Program - Do the analytical data indicate that the THF and DCDFM concentrations are decreasing? Should the monitoring program continue?

Baseline Groundwater Monitoring

The baseline groundwater monitoring will be conducted immediately after the placement of the landfill cap. A network of groundwater monitoring wells exist at the site (Figure 2-1). The network includes 41 monitoring wells. All the monitoring wells will be used for the baseline groundwater monitoring. For the baseline, the groundwater samples will be analyzed for routine analytical services (RAS) Target Compound List (TCL) volatiles, Target Analyte List (TAL) metals, THF, DCDFM, and trichlorofluoromethane (TCFM). TCFM is included in the analysis because it was detected during the remedial investigation (RI) sampling effort. TCL semivolatiles, TCL pesticides/polychlorinated biphenlys (PCBs), and cyanide are not included in the list of analysis because these parameters were not detected in groundwater in previous investigations. The baseline groundwater monitoring



NOTE: MONITORING WELLS 8S, 8I, 14S, 14I, 14D, 15S, 15I AND 15D HAVE NOT BEEN INSTALLED AT THE TIME OF INTERMEDIATE DESIGN SUBMITTAL. THESE WELLS ARE PROPOSED TO BE INSTALLED IN SUMMER 1996.

FIGURE 2-1

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 054-5NT2
DOCUMENT CONTROL No. 4500-54-AMRN

SITE CONDITIONS

STOUGHTON CITY LANDFILL
Stoughton, Wisconsin

TAD-05/31/96-13:24-J:\CAD93\300\31695

will be repeated every five years until the THF and DCDFM concentrations fall below the PALs.

Routine Groundwater Monitoring

The routine groundwater monitoring will be conducted semi-annually. The objective of the routine groundwater monitoring is to monitor the movement of THF and DCDFM plumes. Therefore, only THF and DCDFM analysis will be performed. The monitoring wells located on the western edge of the landfill (28 monitoring wells) will be used for the routine groundwater monitoring. These include monitoring wells 3S, 3D, 3B, 4S, 4D, 5S, 5D, 7S, 7I, 7B, 8S, 8I, 8B, 9S, 9I, 10S, 10I, 10B, 13S, 13I, 13B, 14S, 14I, 14B, 15S, 15I, 15B, and EW-01. MW-9B is not included because it was damaged during previous sampling efforts.

2.2 LANDFILL GAS MONITORING

The landfill gas monitoring has the following objectives:

- Monitor the concentration of the landfill gases as a percentage of the lower explosive limit (LEL) for the landfill gases at the site boundary.
- Verify that the air emissions from the passive gas vents do not exceed the regulatory levels found in the applicable provisions of the National Emission Standards for Hazardous Air Pollutants (NESHAP), and Chapter NR 445, Wisconsin Administrative Code (WAC).

During the predesign activities, WESTON used a combustible gas indicator (CGI) to periodically monitor the concentration of the landfill gases as a percentage of the LEL for the landfill gases at the monitoring probes outside the site boundary. The percent LEL readings at these locations during the predesign monitoring were zero. During the remedial action (RA), a series of landfill gas monitoring probes will be installed outside the waste boundary. These probes will be monitored once every three months to verify that the LEL is below 25 percent.

Landfill gas sampling from the passive gas vents will focus on the NR 445 criterion because NR 445 levels are lower than the NESHAP levels. Design estimates indicate that the amount of gas generated by the landfill is small (approximately 6 cubic feet per minute). Given the age of the landfill (it stopped receiving municipal waste in 1978) and that prior to cap construction infiltration from the rainfall and runoff would have percolated readily through landfill refuse, it is likely much of the decomposition of waste has already occurred and the landfill may be approaching the end of its landfill gas generation capability. Based on the data collected during the predesign activities and engineering estimates, WESTON expects that the gas emissions from the passive gas vents will be below the NR 445 de minimis levels. Therefore, hazardous air containment technology will not be required and long-term monitoring of offgas from the passive gas vents may not be necessary. During the RA, 21 passive gas vents will be installed on the landfill cap. Landfill gas flow will be measured from each of these vents annually. Gas samples will also be collected annually. It is estimated that five vents will be sufficient to collect representative gas samples from the landfill. Therefore, during the first sampling event, 5 out of 21 vents will be sampled. During the second sampling event, 5 out of the remaining 16 vents will be sampled. During the third sampling event, 5 out of the remaining 11 vents will be sampled, and the remaining 6 vents will be sampled during the fourth event. The samples will be analyzed for volatile organic compounds (VOCs) included in EPA Method TO-14. The VOCs included in this method encompass VOCs typically found in landfill gases. The National Ambient Air Quality Standard for particulate matter (PM) will not be monitored. PM is not a concern because the landfill gas will not be flared and the physical processes occurring within the landfill will not generate particulate matter. At the end of each sampling event, the data will be used to determine if the landfill gas emissions exceed the NR 445 de minimis levels. Based on the results, the monitoring requirements will be reevaluated to determine whether further monitoring or gas treatment is required or sampling can be discontinued.

SECTION 3

FIELD INVESTIGATION PROTOCOLS

The following sections detail the procedures that will be followed during the O&M field sampling activities. All sample container preservation and volume requirements are outlined in Table 7-1.

3.1 WATER LEVEL MEASUREMENT

Prior to the sampling of monitoring wells, water level measurements will be collected. The water level data will be used in determining the approximate direction of groundwater flow, and will provide information on lateral and vertical hydraulic gradients. All readings within a single round shall be collected within two hours of each other in order to obtain accurate information on aquifer conditions. The following protocols will be used during water level measurement:

- The water level probe and cable will be decontaminated prior to each use with a distilled water rinse.
- Depth to water will be measured with an electrical sounding device (accuracy ±0.01 feet). The reference point for this measurement will be the top of the well riser pipe. Measurements will be converted into elevations (i.e., mean sea level), using established survey information.
- The depth to water and the time will be recorded in a field notebook.

3.2 GROUNDWATER MONITORING WELL SAMPLING PROCEDURES

Monitoring wells will be sampled using a bladder pump (or a submersible pump) utilizing a very slow flow rate (0.2 to 2 liters per minute [L/min]). Sampling equipment and all downhole equipment will be decontaminated pursuant to the protocols outlined in Table 3-1. Each sample will be collected using the following methodology:

- Upon removing the protective cap to the monitoring well riser, the head space will be monitored with a Flame Ionization Detector (FID) or a Photoionization Detector (PID). The purpose of this analysis is for health and safety monitoring, not for characterization. The measured values will be recorded in the field notebook.

- The depth to the water level in the well and the total depth of the well will be measured with an electrical sounding device (accuracy ±0.01 feet). The depth to water and the time of measurement will be recorded. The reference point for these depths will be the top of the well riser pipe.

- The volume of standing water in the well will be calculated. Volume of water in a 2-inch-diameter well (gallons) = length (feet) x 0.16 (gallons/foot). For a 4-inch diameter well (gallons) = length (feet) x 0.65 (gallons/foot). For a 6-inch diameter well (gallons) = length (feet) x 1.47 (gallons/foot).

- A bladder pump or a submersible pump that has been decontaminated prior to use will be used for purging and sampling utilizing a very slow flow rate (0.2 to 2 L/min). Tubing will be thick and of minimal length to exclude atmospheric gases.

- Well purging will be conducted at low flow rates (1.0 to 4.0 L/min) with the pump intake just above or within the screened interval. Field measurements of pH, temperature, conductivity, dissolved oxygen and turbidity will be made over time. Stabilization of these well purging parameters (±0.25 units for pH, ±0.5°C for temperature, ±10 percent for conductivity, ±0.1 mg/L for dissolved oxygen, and ±1 units for turbidity) indicate equilibrated conditions. Well purging will continue until the turbidity has decreased to 5

Table 3-1

Standard Decontamination Protocol for Sampling Equipment
Stoughton City Landfill
Stoughton, Wisconsin

Step	Procedure
1	Scrub equipment thoroughly with soft-bristle brushes in a phosphate-free, low-sudsing detergent solution.
2	Rinse equipment with tap water by submerging and/or spraying. (See note below.)
3	Rinse equipment with reagent-grade distilled/deionized water until dripping and allow to air dry for 1 to 2 minutes.
4	Rinse equipment a second time with deionized water by spraying until dripping.
5	Place equipment on polypropylene or aluminum foil and allow to air-dry for 5 to 10 minutes.
6	Wrap equipment in polypropylene or aluminum foil for handling and/or storage until next use.

Note: The decontamination liquids will be managed as described in Section 9. If sampling equipment was used to collect oily or adhesive types of contaminated media, or the presence of organic compound residue is suspected, a rinse via spraying with isopropanol will be included after Step 2.

nephelometric turbidity units (NTU) or less, or until five purge volumes have been removed.

- In the event that the monitoring well pumps dry before three volumes have been removed, the well will be allowed to recharge for 15 minutes and then be pumped dry again before sampling. All purge water will be containerized and managed in accordance with Section 9 protocols.

- Samples will be collected directly from the pump after the well purging has been completed. The groundwater samples will be collected in decreasing order of sensitivity of volatilizing organic contaminants: TCFM, DCDFM, THF followed by VOCs and total metals.

- Sample bottles will be filled at an angle in order to limit splashing and bubbling. VOA sample bottles will be preserved with hydrochloric acid (HCl) prior to the addition of the sample. The VOA sample bottles will be filled such that no air space is present in the bottle after it is capped. If bubbles appear after the bottle is capped, additional sample (water) will be added and the bottle resealed. If the sample has to be discarded and a new sample collected, a new, preserved VOA container will be used to collect the sample. If bubbles persist, an unpreserved VOA sample will be collected. (The Field Sample Manager will note the absence of the preservative on the sample paperwork and in the field logbook.)

- For collecting filtered and unfiltered metal samples, two samples will be collected at each monitoring well sample locations. One sample will be field filtered via a sterilized disposable 0.45 micron filter. Both the filtered and unfiltered sample will be submitted for analysis. Sample preservation will occur following field filtration within 30 minutes of sample collection unless the filtration process is lengthy due to the presence of suspended solids.

3.3 LANDFILL GAS FLOW RATE MEASUREMENTS

During the annual sampling event, flow rates will be measured at each of the 21 passive gas vents. Caution should be used near the vents because of potential explosion and breathing hazards. The landfill gas flow rates will be measured using the following procedure:

- Record weather conditions in the field logbook including temperature, rainfall, barometric pressure, cloud cover/sunshine, wind speed and direction.
- Remove the threaded fittings from the passive gas vents and place the inlet to the anemometer in the threaded hole. Record the flow rate in the field logbook.

3.4 LANDFILL GAS SAMPLING PROCEDURES

During the annual sampling event, gas samples will be collected from 5 passive gas vents. Caution should be used near the vents because of potential explosion and breathing hazards. The gas sampling will be performed using SUMMA passivated 6-liter stainless steel canisters utilizing a teflon line and a flow control system. The laboratory should transport each canister certified as clean and evacuated to an absolute pressure of 0.05 millimeters of mercury (mm Hg). The interior surfaces of the canister must be treated with a pure chrome-nickel oxide layer. This provides for greater stability for VOCs stored in the canisters. The sample flow controller is used to maintain a constant flow rate from full vacuum to 25 psig. The laboratory should preset the flow controllers to 200 mL/min to equal collection of a 6-liter sample in about 30 minutes. The gas samples will be collected using the following procedures:

- At least three days prior to sample collection, place an airtight stainless steel monitoring well cap on each passive gas vent to allow landfill gas to equilibrate in the vent. Seal the cap threads with teflon tape.
- Purge the vent immediately before sample collection. Connect a vacuum pump to the vent using teflon tubing. Each seal cap has a 1/4-inch Swagelok fitting that is used to connect to the vent. Use a combustible gas indicator/oxygen (CGI/O_2) meter to monitor the percent lower explosive limit (LEL) and the percent oxygen (O_2) in the landfill gas being purged from the vent. Collect percent LEL and percent O_2 measurements continuously every

1 to 2 minutes to determine whether a representative sample of landfill gas is being obtained (i.e., stability is reached). The landfill gas being purged from the vent is determined to be stable after two consecutive readings within 10 percent of each other. Begin sample collection after stability is reached.

- Attach the flow controller to the canister. Connect the canister and the flow controller to the vent using teflon tubing and fitting. The 1/4-inch Swagelok fitting in the seal cap is used to connect the vent to the canister and flow controller. The connecting line between the sample outlet and the vent should be as short as possible to minimize the contained sample volume.
- Open canister valve and record start time and canister pressure. Periodically check and record canister pressure and sampler operation during the 30 minute sampling event.
- When the canister is near ambient pressure, record canister pressure and elapsed time; then close the canister inlet valve.
- Disconnect canister from the flow controller, and cap the canister with the Swagelok end cap.

3.5 DECONTAMINATION REQUIREMENTS

All sampling equipment will be decontaminated before being used to collect a sample. The decontamination protocol for sampling equipment is presented in Table 3-1. The management of water generated during decontamination will be in accordance with the requirements outlined in Section 9. All decontamination wastewater will be containerized.

SECTION 4

FIELD QUALITY CONTROL SAMPLES

The O&M sampling effort will include the following types of field quality control (QC) samples:

- Field duplicates.
- Matrix spikes/matrix spike duplicates.
- Field blanks.
- Trip blanks.

Section 4 of the QAPP explains the purpose of each type of QC sample. Sample containers and handling and shipment procedures used for QC samples are identical to those used for the investigative samples. Each field QC sample will be documented on a chain-of-custody (COC) form.

Table 2-1 shows the specific level of QC effort for field activities, respectively. The following subsections detail the collection procedures for each QC sample type.

4.1 FIELD DUPLICATE SAMPLES

Field duplicate samples will be collected at selected locations during soil and water sampling at a 1 per 10 sample frequency using procedures identical to those for the investigative samples. Duplicate samples will be analyzed for the same parameters as the investigative samples. Duplicate samples will be collected by alternatively filling two sets of sample bottles from the same sample unit (e.g., pump, split spoon, scoop, etc.). The volatile organic analysis (VOA) fraction for each duplicate sample will be collected immediately after the VOA fraction for the investigative sample, in order to minimize the possibility of loss of VOCs during sample collection.

4.2 MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLES

Matrix spike/matrix spike duplicate samples (MS/MSDs), will be collected on a one per 20 sample (or less) basis for air and water. MS/MSD samples are investigative samples on which MS/MSD analyses are performed. MS/MSD analyses only apply to organic samples. For inorganic samples spike/duplicate analyses are performed. Extra sample volume is required for aqueous MS/MSD and spike/duplicate analyses. For aqueous MS/MSD analyses, triple the normal volume is required for volatile organics. Double volume is required for spike/duplicate analyses for the inorganic aliquot (total metals). Field blank, trip blanks and field duplicate samples will not be utilized as MS/MSD and spike/duplicate samples. All MS/MSD and spike/duplicate samples will be identified as such on all sample paperwork.

4.3 FIELD BLANKS

Field blank samples will be collected during water sampling events. One field blank will be collected for every 10 or fewer investigative aqueous samples collected during the field sampling activities. For water samples, field blanks will be obtained by pouring ultra pure water (HPLC-grade water) over and through a decontaminated or disposable sampling device such as a bailer, and collecting the water in the required sample containers. Each field blank will be analyzed for the same parameters as the investigative samples in accordance with the same analytical methodologies. When collecting a field blank, the volatile Special Analytical Service (SAS) parameters THF, DCDFM, and TCFM will be collected first, followed by Routine Analytical Service (RAS) VOCs and total metals. All field blanks will be identified as such on all sample documentation.

4.4 TRIP BLANKS

One trip blank sample will be enclosed in each sample shipment container in which aqueous VOA samples are included. Trip blanks will consist of two 40-milliliter (ml) glass vials. All sample handling, packaging and preservation requirements for the trip blanks will be identical to the investigative VOA sample aliquot. The 40-ml vials for each trip blank will be filled under laboratory-type conditions as soon as is practicable (give the sample holding time) prior to the beginning of a field sampling event. Preparation of the trip blank will entail the pouring of ultra pure water (HPLC-grade water) into the 40-ml vial (leaving no airspace) and carefully securing the caps to ensure the absence of air bubbles. The sealed bottles will be subsequently placed in a sample container and accompany field personnel to the sample site. All trip blanks will be shipped to the laboratories in containers with other VOA samples. The trip blank will be documented and identified as such on all sample documentation.

SECTION 5

SAMPLE NUMBERING SYSTEM

All samples for analysis, including QC samples, will be given a unique sample number. A listing of sample numbers cross-referenced to COC and shipment documents, will be maintained in the site field logbook.

The Contractor will assign each sample two identification numbers: a project sample number and a Contract Laboratory Program (CLP) sample number. The project sample number highlights the sample matrix and location, and will be used for documentation purposes in field logbooks, as well as for presentation of the analytical data in Contractor memoranda and reports. The CLP sample number is utilized by the U.S. EPA to track samples through the CLP system.

5.1 PROJECT SAMPLE NUMBERING SYSTEM

The project sample numbers will be comprised of the three components described below:

- Project identifier. A three-character designation will be used to identify where (the site) and when (O&M sampling round) the sample is collected. For first round of O&M sampling, it will be SC1. SC stands for Stoughton City Landfill, and the number (1,2,3...) will change depending on the sampling round.
- Sample type and location. This shall consist of the following components:
    - A sample type code. For the proposed field sampling, it will be MW for monitoring well groundwater, GV for landfill gas vent, and TB for trip blank samples.

  - The code above will be combined with a two-digit location code (e.g., MW02 for sample from monitoring well MW02 location). In the case of field blanks and trip blanks , it will be a two-digit sequential sampling order code (e.g., FB01 for first field blank).

- Sequence and Quality Control Type Identifier. This shall consist of the following components:

  - A two-digit sequence number that tracks the number of samples collected from a specific location. Sequence 01 refers to the first sample interval, and sequence 02 refers to the second sample interval. Sample depths will not be a part of the sample code; rather, depth information will be recorded in the site field logbook and presented with the analytical results. There is no need for this sequence number for field and trip blanks.

  - If the sample is a field duplicate sample, the above will be combined with DP. If the sample is a matrix spike/matrix spike duplicate sample, the above will be combined with MS/MSD.

It should be noted that field duplicate samples will be submitted without reference to the laboratory (i.e., the laboratory will not be informed that the sample is duplicate).

Some examples of the project sampling number system and their respective definitions are as follows:

- SL1-MW10I-01DP: Stoughton City Landfill site, O&M Round 1 sampling; monitoring well sample, monitoring well location 10I; field duplicate of first sample at this location.

- SL2-MWFB02: Stoughton City Landfill site, O&M Round 2 sampling; second monitoring well field blank sample.

- SL1-GV02-01MSD: Stoughton City Landfill site, O&M Round 1 sampling; landfill gas vent sample, location 2; first sample at this location; matrix spike/matrix spike duplicate sample.

5.2 THE CONTRACT LABORATORY PROGRAM SAMPLE NUMBERING SYSTEM

The CLP sample numbers are unique numbers generated by the CLP that are assigned to each RAS organic and inorganic sample. The CLP sample numbers are printed at the Sample Management Office (SMO) on adhesive labels and distributed to the U.S. EPA Region V Regional Sample Control Center (RSCC). The RSCC will provide label sets to the Contractor Sample Management Coordinator (SMC), who will give the organic and inorganic labels to the Field Sample Manager (FSM) prior to the commencement of field work. The FSM will assign the unique CLP sample numbers to each organic and inorganic sample.

The CLP sample numbers enable the SMO to track RAS and RAS plus SAS samples through their system. The labels are placed on the outside of the sample containers, and the number is utilized on all documentation (traffic report [TR], COC form, sample tag, etc.). The CLP sample numbers will be correlated to the Contractor project sample number thereby identifying where the sample was collected. Organic aliquots of RAS samples will have a CLP sample number that begins with the fifth letter of the alphabet (E for Region V) followed by other letters and numbers (e.g., EG 006, EJK 17, etc.). The corresponding inorganic aliquot of the RAS samples will have a CLP sample number that begins with the consonant "M" for metals followed by the fifth letter of the alphabet (E for Region V), followed by additional letters and/or numbers (e.g., MEE 001, MEG 27, etc.).

For SAS samples, follow the CRL sample numbering system.

5.3 CRL SAMPLE NUMBERING SYSTEM

If the U.S. EPA Region V CRL chooses to analyze the samples, each sample aliquot submitted to the CRL will be assigned a CRL sample number in lieu of the CLP sample number. The CRL sample number contains the following elements:

- 97—Indicates fiscal year (October 1 through September 30).
- Two characters indicating the Contractor code (e.g, ZG is the contractor code for WESTON;).
- 01—Indicates number of sites the Contractor has sampled during the fiscal year. Each site is assigned a number is consecutive order (01, 02 - 99).
- S—Indicates sample type (S=sample, D=duplicate, R=blank).
- 01—Indicates sample number (01, 02 - 99).

An example CRL sample number is as follows: 97ZG01S02—Sample number two of the first site collected by WESTON in fiscal year 1997.

SECTION 6
SAMPLE DOCUMENTATION AND TRACKING

6.1 FIELD RECORDS

Field observations and other information pertinent to the collection of samples will be recorded in the field. All entries will be made in a bound logbook. All field documentation will be in accordance with procedures outlined in Subsection 6.1.2 of the QAPP. Logbooks will be identified by unique sequential numbers. The data to be recorded for each sample will include date, time (military time reference), sample number, sample location, sample appearance, and name of the person(s) collecting the sample. In addition, general information will be recorded in the logbook daily, including personnel present at the site, level of protection being worn, and weather. Direct instrument readings obtained from health and safety monitoring of the breathing zone during sampling activities will also be recorded in the logbook. Photographs will also be taken and logged to document sampling activities.

6.2 FIELD CHAIN-OF-CUSTODY PROCEDURES

Field COC procedures are presented in Subsection 6.1 of the QAPP, with a detailed summary in Subsection 6.1.4. Details on the completion of field sample COC documentation are discussed in Subsection 6.3 of the FSP.

6.3 SAMPLE DOCUMENTATION FORMS

Sample documentation forms required by the U.S. EPA are numbered. Copies of the multiple copy fo[illegible]s must accompany samples to the laboratory. Upon return from the field, the FSM must [illegible]e the other copies to the SMC, who will forward them to the RSCC and/or SMO, e[illegible]ring that the appropriate paperwork is attached.

Required pape[illegible]rk for laboratory samples includes COC forms, TR forms, SAS packing lists, sample ta[illegible]nd COC seals. All sample documentation forms will be completed by the Contracto[illegible]sonnel (mainly the assigned FSM) in accordance with the requirements outlined in th[illegible]S. *EPA Region V Sample Handling Manual* (March 1989) or the most recent revisio[illegible]date. The U.S. EPA is currently utilizing a combined COC/TR form for RAS analyses[illegible] a stand-alone COC form for shipping samples to the U.S. EPA Region V CRL. An [illegible]packing list COC is used for SAS analyses. The U.S. EPA Region V RSCC is resp[illegible]le for providing the Contractor with updates on changes in the sample documentatio[illegible]ms/requirements. The Contractor SMC will train all field personnel on any new docu[illegible]ation requirements prior to their commencing field sampling activities.

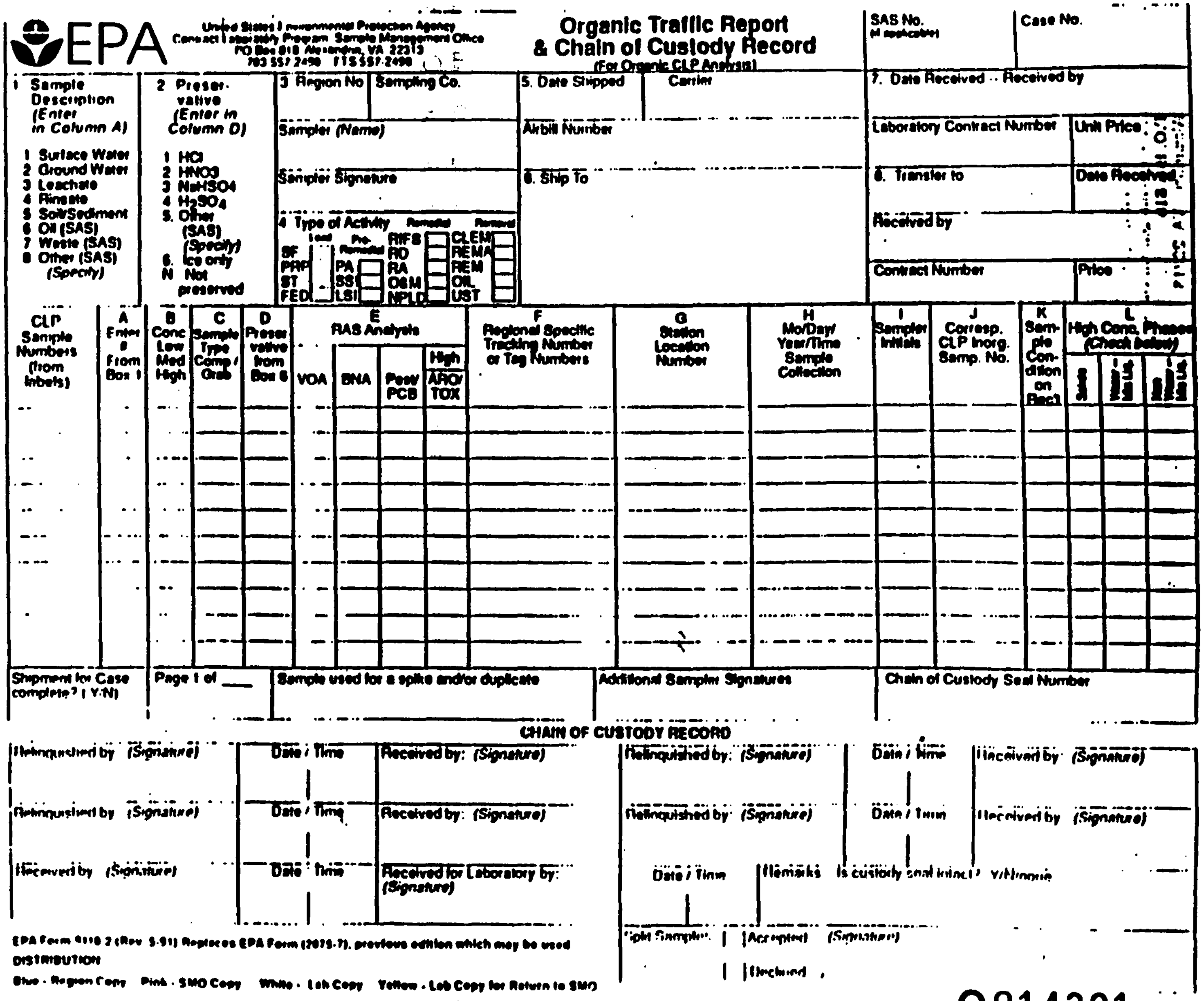
The critical asp[illegible] of the documentation protocol for shipping samples to the laboratories are summarized[illegible]ow:

Chain-of-Custod[illegible]raffic Report Form

Combination CO[illegible]R forms are utilized for samples sent to the laboratories for RAS analyses. A stand-[illegible]ne COC form is used for CRL and an SAS packing list COC for SAS analyses. In ord[illegible]to maintain sample custody in accordance with the U.S. EPA requirements, the following aspects of sample documentation protocol must be implemented and adhered to:

- Each sample shipment container must have at least one COC/TR form or stand-alone COC form, or SAS packing list COC enclosed.
- Each sample in a shipment container must be identified/documented on the accompanying form.
- All information associated with the samples must be included on the form.
- If sample custody is transferred from field samplers to the FSM, the field sampler must sign the COC record as the relinquisher of the samples and include the date and time of the transfer. The FSM must then sign as the recipient of the samples.
- The COC seal numbers on seals assigned to a particular cooler must be documented on the COC form(s) in that cooler in the section provided.
- The carrier service person does not have to sign the COC form if the custody seals remain intact. The airbill number must be written on the COC form in the section provided.
- The site name (Stoughton City Landfill) will be printed on the COC form.
- Field personnel must carefully transcribe RAS CLP sample numbers from the printed sample labels onto the COC/TR form in the space provided. The CRL sample numbers must be transcribed onto the stand-alone COC form and SAS numbers onto the SAS packing list COC form. The labels should be affixed to the appropriate sample containers.

Figures 6-1 and 6-2 present examples of organic and inorganic COC/TR forms. Appendix D contains the U.S. EPA document that outlines the requirements for completing the multi-sample COC/TR forms and an example of completed forms. Figure 6-3 presents an example of a stand-alone COC form. This form will continue to be used when shipping samples to



United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 818 Alexandria, VA 22313
703 557 2490 FTS 557-2490

Organic Traffic Report & Chain of Custody Record

(For Organic CLP Analysis)

SAS No. (if applicable)

Case No.

1 Sample Description (Enter in Column A)
1 Surface Water
2 Ground Water
3 Leachate
4 Rinsate
5 Soil/Sediment
6 Oil (SAS)
7 Waste (SAS)
8 Other (SAS) (Specify)

2 Preservative (Enter in Column D)
1 HCl
2 HNO3
3 NaHSO4
4 H_2SO_4
5. Other (SAS) (Specify)
6. Ice only
N Not preserved

3 Region No

Sampling Co.

Sampler (Name)

Sampler Signature

4 Type of Activity

Lead	Pre-Remedial	Remedial	Removal
SF	PA ☐	RIFS ☐	CLEM ☐
PRP	SSI ☐	RD ☐	REMA ☐
ST	LSI ☐	RA ☐	REM ☐
FED		O&M ☐	OIL ☐
		NPLD ☐	UST ☐

5. Date Shipped

Carrier

Airbill Number

6. Ship To

7. Date Received

Received by

Laboratory Contract Number

Unit Price

8. Transfer to

Date Received

Received by

Contract Number

Price

CLP Sample Numbers (from labels)	A Enter # From Box 1	B Conc Low Med High	C Sample Type Comp/Grab	D Preservative from Box 6	E RAS Analysis				F Regional Specific Tracking Number or Tag Numbers	G Station Location Number	H Mo/Day/Year/Time Sample Collection	I Sampler Initials	J Corresp. CLP Inorg. Samp. No.	K Sample Condition on Rec'd	L High Conc. Phases (Check below)		
					VOA	BNA	Pest/PCB	High ARO/TOX									

Shipment for Case complete? (Y/N)

Page 1 of ___

Sample used for a spike and/or duplicate

Additional Sampler Signatures

Chain of Custody Seal Number

CHAIN OF CUSTODY RECORD

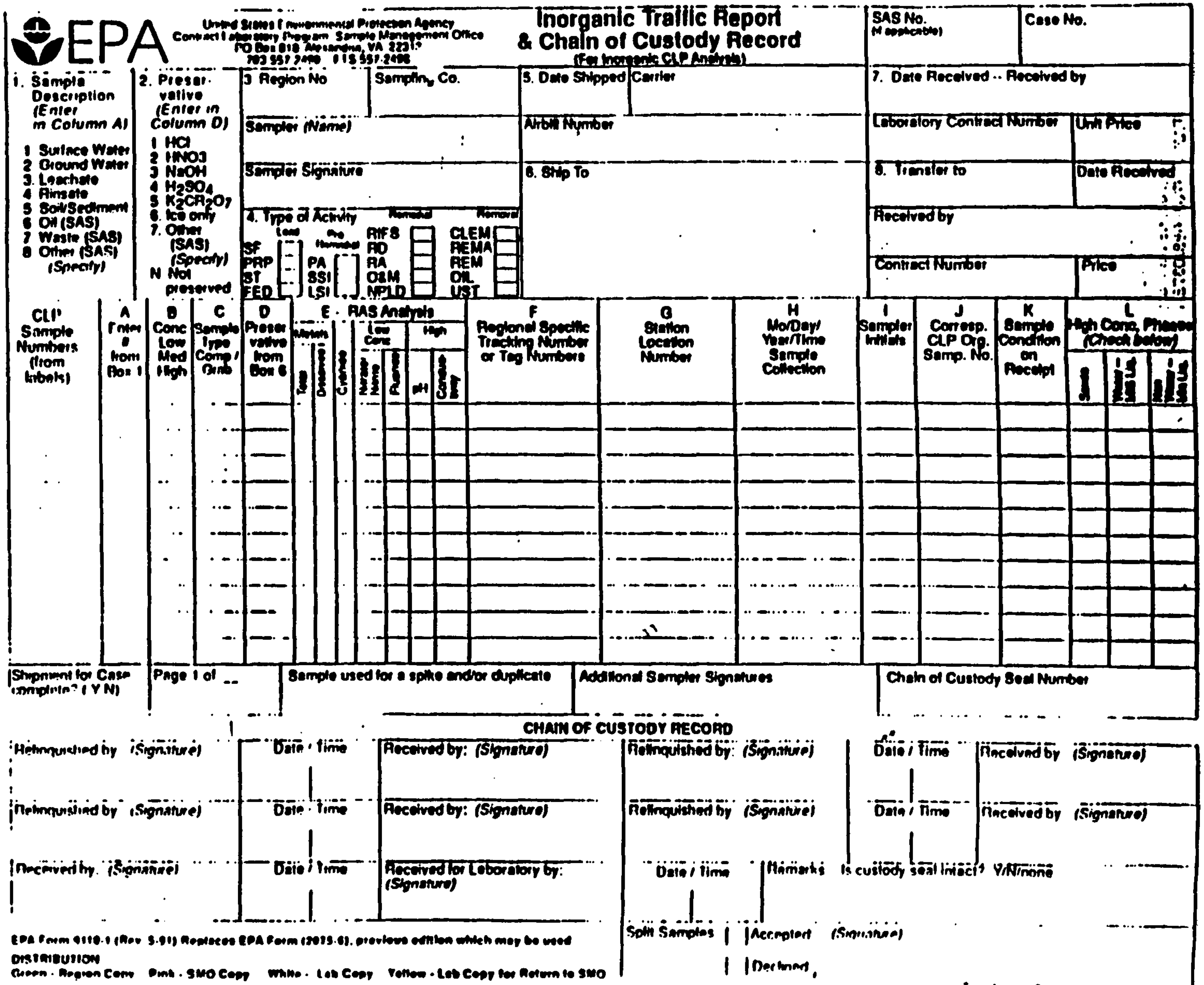
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Received by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks Is custody seal intact? Y/N/none	

Split Samples ☐ Accepted (Signature)
☐ Declined

EPA Form 9110-2 (Rev. 5-91) Replaces EPA Form (2075-7), previous edition which may be used
DISTRIBUTION
Blue - Region Copy Pink - SMO Copy White - Lab Copy Yellow - Lab Copy for Return to SMO

FIGURE 6-1

ORGANIC TRAFFIC REPORT & CHAIN OF CUSTODY RECORD



EPA United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 818 Alexandria, VA 22313
703 557 2490 FTS 557-2490

Inorganic Traffic Report & Chain of Custody Record
(For Inorganic CLP Analysis)

SAS No. (if applicable)

Case No.

1. Sample Description *(Enter in Column A)*
- 1 Surface Water
- 2 Ground Water
- 3. Leachate
- 4 Rinsate
- 5 Soil/Sediment
- 6 Oil (SAS)
- 7 Waste (SAS)
- 8 Other (SAS) *(Specify)*

2. Preservative *(Enter in Column D)*
- 1 HCl
- 2 HNO3
- 3 NaOH
- 4 H_2SO_4
- 5 $K_2CR_2O_7$
- 6. Ice only
- 7. Other (SAS) *(Specify)*
- N Not preserved

3 Region No

Sampling Co.

Sampler *(Name)*

Sampler Signature

4. Type of Activity

Lead		Pre-Remedial		Remedial		Removal	
SF	☐			RIFS	☐	CLEM	☐
PRP	☐	PA	☐	RD	☐	REMA	☐
ST	☐	SSI	☐	RA	☐	REM	☐
FED	☐	LSI	☐	O&M	☐	OIL	☐
				NPLD	☐	UST	☐

5. Date Shipped

Carrier

Airbill Number

6. Ship To

7. Date Received -- Received by

Laboratory Contract Number

Unit Price

8. Transfer to

Date Received

Received by

Contract Number

Price

CLP Sample Numbers (from labels)	A Enter # from Box 1	B Conc Low Med High	C Sample Type Comp / Grab	D Preservative from Box 6	E - RAS Analysis							F Regional Specific Tracking Number or Tag Numbers	G Station Location Number	H Mo/Day/ Year/Time Sample Collection	I Sampler Initials	J Corresp. CLP Org. Samp. No.	K Sample Condition on Receipt	L High Conc. Phases (Check below)		
					Metals			Low Conc		High										
					Total	Dissolved	Cyanide	Nitrate/ Nitrite	Fluoride	pH	Conductivity							Solids		

Shipment for Case complete? (Y N)

Page 1 of __

Sample used for a spike and/or duplicate

Additional Sampler Signatures

Chain of Custody Seal Number

CHAIN OF CUSTODY RECORD

Relinquished by *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by *(Signature)*
Relinquished by *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by *(Signature)*	Date / Time	Received by *(Signature)*
Received by *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks Is custody seal intact? Y/N/none	

Split Samples ☐ Accepted *(Signature)*
☐ Declined

EPA Form 9110-1 (Rev 5-91) Replaces EPA Form (2075-6), previous edition which may be used

DISTRIBUTION
Green - Region Copy Pink - SMO Copy White - Lab Copy Yellow - Lab Copy for Return to SMO

FIGURE 6-2

INORGANIC TRAFFIC REPORT-&CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

REGION 5
230 South Dearborn Street
Chicago, Illinois 60604

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME

SAMPLERS: *(Signature)*

STA. NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS								REMARKS

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	

Distribution: White — Accompanies Shipment; Pink — Coordinator Field Files; Yellow — Laboratory File

FIGURE 6—
STAND-ALONE CHAIN OF CUSTODY FORM

the U.S. EPA Region V CRL. Figure 6-4 presents an example of a SAS packing list COC. Figure 6-5 presents an example of a sample tag.

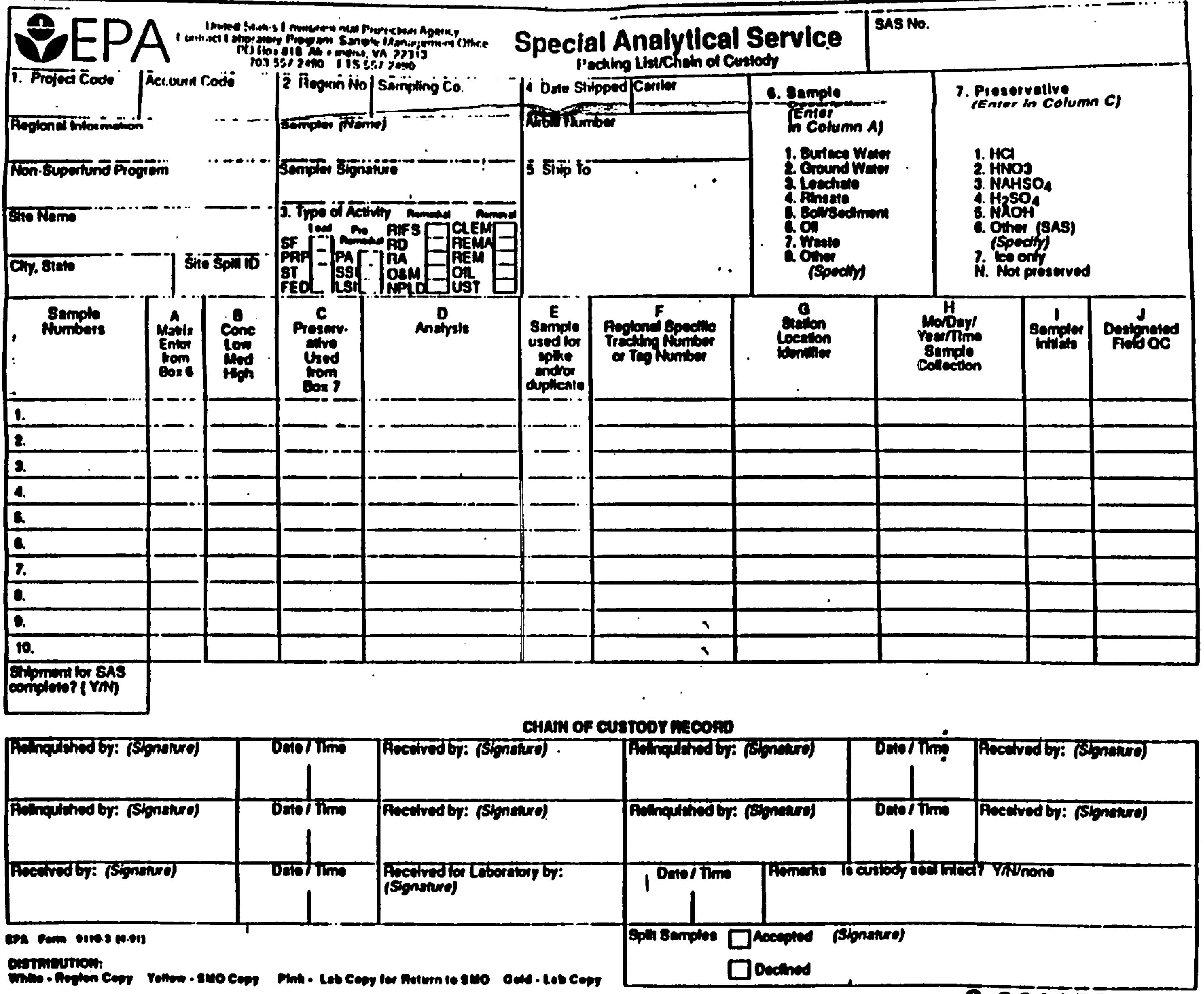
Chain-of-Custody Seals

- Two seals per shipping container are used to secure the lid and provide evidence that samples have not been tampered with.
- The COC seals must be covered with clear tape to avoid accidental damage during shipment.
- The COC seal numbers must be documented on the COC/TR, stand-alone COC forms or SAS packing list COC as herein described.
- All sample shipment containers require COC seals.

Sample Tags

- Each sample container must have a Sample Tag affixed to it with string or tape.
- Stand-alone COC or COC/TR form numbers are recorded in the "Remarks" section of the tag.
- Sample Tag numbers are recorded on the stand-alone COC form, the COC/TR form, or the SAS packing list form.

All paperwork accompanying the samples being shipped to the CLP laboratory will be sealed in a plastic bag that is taped to the inside of the cooler lid. Copies will be made of all sample documentation and retained for in-house files.



EPA United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 818 Alexandria, VA 22313
703 557 2490 FTS 557 2490

Special Analytical Service

Packing List/Chain of Custody

SAS No.

1. Project Code
Account Code
2. Region No
Sampling Co.
4. Date Shipped
Carrier
Regional Information
Sampler (Name)
Airbill Number
Non-Superfund Program
Sampler Signature
5. Ship To
Site Name
3. Type of Activity

Lead		Pre Remedial		Remedial		Removal	
SF	☐			RIFS	☐	CLEM	☐
PRP	☐	PA	☐	RD	☐	REMA	☐
ST	☐	SSI	☐	RA	☐	REM	☐
FED	☐	LSI	☐	O&M	☐	OIL	☐
				NPLD	☐	UST	☐

City, State
Site Spill ID

6. Sample Description (Enter in Column A)
1. Surface Water
2. Ground Water
3. Leachate
4. Rinsate
5. Soil/Sediment
6. Oil
7. Waste
8. Other (Specify)

7. Preservative (Enter in Column C)
1. HCl
2. HNO3
3. NAHSO$_4$
4. H$_2$SO$_4$
5. NAOH
6. Other (SAS) (Specify)
7. Ice only
N. Not preserved

Sample Numbers	A Matrix Enter from Box 6	B Conc Low Med High	C Preservative Used from Box 7	D Analysis	E Sample used for spike and/or duplicate	F Regional Specific Tracking Number or Tag Number	G Station Location Identifier	H Mo/Day/Year/Time Sample Collection	I Sampler Initials	J Designated Field QC
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										

Shipment for SAS complete? (Y/N)

CHAIN OF CUSTODY RECORD

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Received by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks Is custody seal intact? Y/N/none	

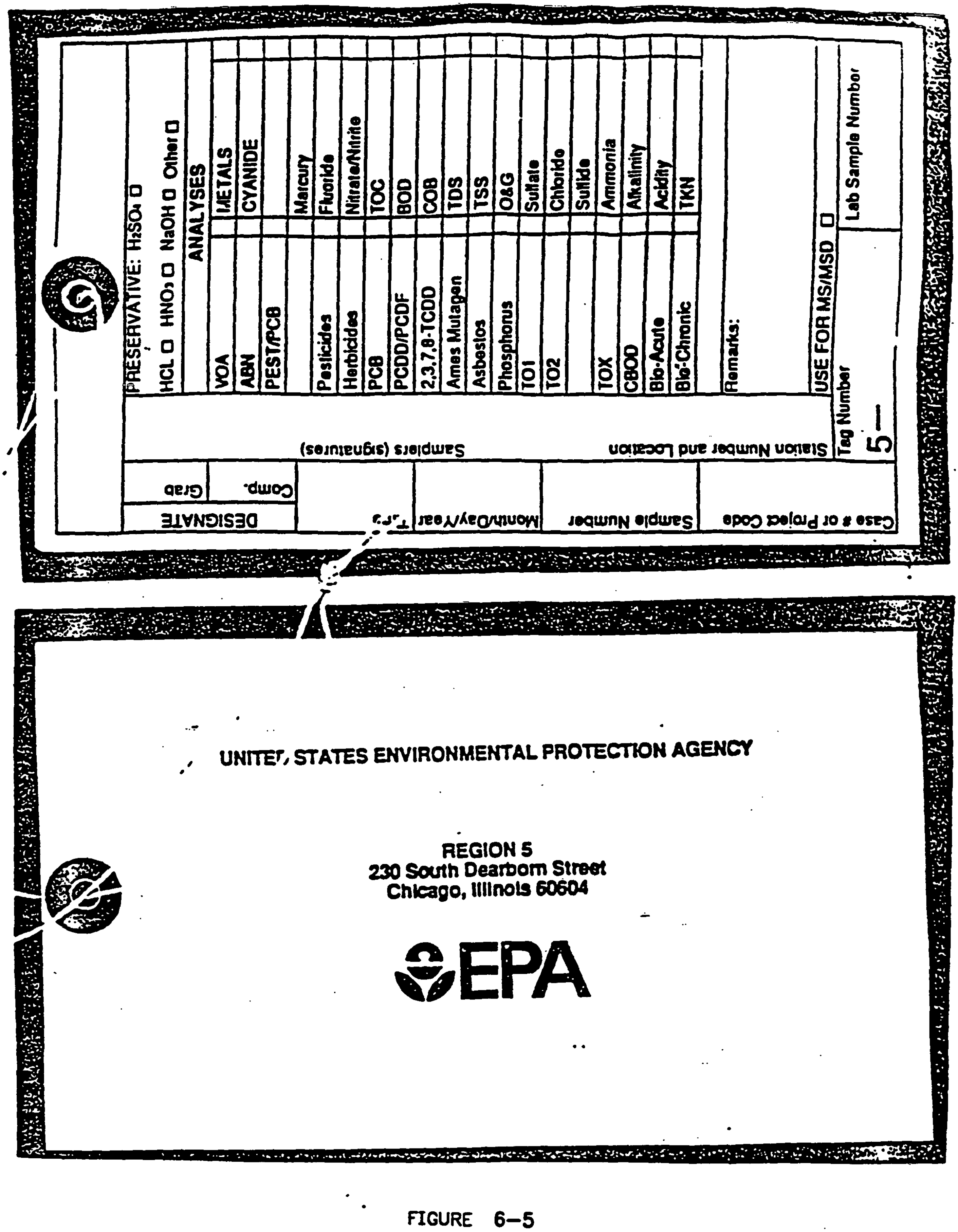
Split Samples ☐ Accepted *(Signature)*
☐ Declined

EPA Form 9110-3 (4-91)

DISTRIBUTION:
White - Region Copy Yellow - SMO Copy Pink - Lab Copy for Return to SMO Gold - Lab Copy

FIGURE 6–

SPECIAL ANALYTICAL SERVICES PACKING LIST & CHAIN-OF-CUSTODY FORMS



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5
230 South Dearborn Street
Chicago, Illinois 60604

EPA

Case # or Project Code

Sample Number

Month/Day/Year

Time

DESIGNATE: Comp. ☐ Grab ☐

Station Number and Location

Samplers (signatures)

PRESERVATIVE: H_2SO_4 ☐

HCL ☐ HNO_3 ☐ NaOH ☐ Other ☐

ANALYSES

VOA		METALS	
ABN		CYANIDE	
PEST/PCB			
		Marcury	
Pesticides		Fluoride	
Herbicides		Nitrate/Nitrite	
PCB		TOC	
PCDD/PCDF		BOD	
2,3,7,8-TCDD		COB	
Ames Mutagen		TDS	
Asbestos		TSS	
Phosphorus		O&G	
TO1		Sulfate	
TO2		Chloride	
		Sulfide	
TOX		Ammonia	
CBOD		Alkalinity	
Bio-Acute		Acidity	
Bio-Chronic		TKN	

Remarks:

USE FOR MS/MSD ☐

Tag Number
5—

Lab Sample Number

FIGURE 6–5
SAMPLE TAG

All sample handling procedures and paperwork will be performed and completed according to guidance set forth in the *U.S. EPA, Region V CRL Sample Handling Manual*, (U.S. EPA, 1989) (or the most recent version) and the *U.S. EPA User's Guide to the Contract Laboratory Program*, December (U.S. EPA, 1988).

SECTION 7

SAMPLE HANDLING

7.1 SAMPLE CONTAINERS AND SAMPLE PRESERVATION

All samples collected for analysis will be containerized, preserved, packaged and shipped in accordance with *U.S. EPA Region V CRL Sample Handling Manual*, (U.S. EPA, 1989), *U.S. EPA User's Guide to the Contract Laboratory Program* (U.S. EPA, 1988), *The U.S. Department of Transportation (DOT) Regulations,* and *Dangerous Goods Regulations* (International Air Transport Association [IATA], 1995). The RAS organic Statement of Work (SOW) covers samples with organic compound concentrations up to 20 parts per million (ppm), which are considered low level, and samples with organic compound concentrations between 20 ppm and 15 percent, which are considered medium level. The RAS inorganic SOW considers samples low level if they contain less than 10 ppm of any of the priority pollutants and medium level if the priority pollutant concentration levels are between 10 ppm and 15 percent. Based on these definitions and on existing site conditions, all groundwater and air samples from the SCL site are expected to be low level. Table 7-1 lists the required sample containers, sample volumes, sample preservation requirements, and holding times associated with all parameters and media applicable to the O&M monitoring sampling.

7.2 SAMPLE PACKAGING AND SHIPMENT

All samples shipped from the site must be shipped in accordance with DOT regulations and must comply with *Dangerous Goods Regulations* (IATA, 1995) if shipped by air transportation.

Table 7-1

Sample Container, Volume, and Preservation Requirements
Stoughton City Landfill
Stoughton, Wisconsin

Matrix Type	Analysis	Sample Concentration Level	No. of Bottles	Type of Bottles	Preservatives	Technical Holding Time***
Water (RAS)	Volatiles	Low	2	40-ml glass vials	Cool, 4 degrees C 4 drops 1:1 HCL to pH<2	14 days
	Metals	Low	1	1-L Polyethylene bottle	HNO3 to a pH<2	6 months (28 days for mercury)
Water (SAS)	Tetrahydrofuran (THF), Dichlorodifluoromethane (DCDFM), and Trichlorofluoromethane (TCFM)	Low	2	40-mL glass vials	Cool, 4 degrees C	14 days
Air	EPA Method TO-14 list for VOCs	Low	1	SUMMA Cannister	—	—

*** All holding times are from the date of sample collection.

Note:
- Aqueous MS/MSD sample analysis will require triple the normal volume for volatile organics. Spike/duplicate sample analysis will require double the normal volume.
- Trip blanks will be collected in two 40-ml glass vials. One VOA trip blank will accompany each aqueous VOA shipment container.
- All medium-level samples will be sealed in paint cans or other appropriate containers for shipment in accordance with DOT/IATA regulations. Based on previous investigations, only low concentration levels are expected.

Following sampling, the exterior of all sample bottles will be initially decontaminated near the sampling location by wiping with a moist cloth. The filled sample containers will not be sprayed with water during decontamination because this water could contact the sample if the container was not tightly sealed. In preparation for shipment to the CLP laboratory, all samples will be packaged in accordance with the following general procedures:

- Check to make sure container cap is securely tightened. Seal with tape. Mark liquid levels of water samples if bottles are partially full.
- Make sure the CLP sample labels and sample tags are securely attached to the sample containers. Place each container in a zip-lock baggie.
- Low concentration samples will be placed in a shipment container lined with a large polyethylene bag. Enough vermiculite or equivalent absorbent material will be packed around the samples to minimize the possibility of sample container breakage. The temperature will be maintained at 4° C with cold packs or ice, sealed in plastic bags as appropriate to the sample. The remaining space in the container will be filled with additional packing material and the large bag sealed.
- If a sample is deemed medium concentration or a dangerous good, it will be packaged in accordance with the IATA *Dangerous Goods Regulations*, based on the classification of the samples.
- Place COC/TR forms, TR forms, and, if appropriate, SAS packing lists, in a zip-lock bag and tape to inside of shipment container lid.
- Close shipment container and seal it shut with strapping tape. If shipment container has a drain port, seal it shut with tape. Place custody seals across seam between the container lid and base so that custody seal would be broken if shipment container was opened. Cover custody seals with clear tape.
- Affix airbill with shipper's and recipient's names and addresses to the top of the shipment container. Affix a second mailing label with the same information to the top of the container in case the airbill becomes detached

from the container during shipment. Place "This End Up" labels and other appropriate labels on front and sides of container.

- Organic samples will be shipped on the day of collection or within 24 hours of collection, and inorganic samples will be shipped within 48 hours of collection. All samples will be shipped via Federal Express overnight delivery unless prohibited under IATA regulations.

The Contractor Field Team Leader (FTL) must contact the Contractor SMC to confirm sample shipment dates for both RAS and SAS analyses. The SMC is required to inform the RSCC of the schedule for RAS and SAS analyses at least one week in advance. The FTL will notify the SMO of any last-minute changes in sampling schedule that will affect the sample shipment schedule. Upon shipment of samples to the CLP, the FTL will call the SMO (before 5:00 p.m. Central Standard Time [CST] on the day of the shipment or by 9:00 a.m. the following morning). The SMO must be notified by 2:00 p.m. CST Friday for shipments to the CLP for Saturday delivery/pick-up. The SMO must be provided with the following information for RAS and CRL analysis:

- Name of site.
- Case and/or CRL number.
- Name of laboratory(ies).
- Date of shipment.
- Carrier and airbill number.
- Number and matrices of samples shipped.
- Information regarding changes or delays pertaining to the activity.
- Whether all shipments pertaining to the sample case are complete.

In instances where the FTL does not have easy access to a telephone, the FTL will provide the above-mentioned information to the SMC. The SMC will convey all site sample shipment information to the SMO.

SECTION 8

SAMPLING TEAM ORGANIZATION

The sampling team organization is presented in Subsection 3.3 of the QAPP.

SECTION 9

MANAGEMENT OF INVESTIGATION-DERIVED WASTES

For purposes of this FSP, investigation-derived wastes (IDWs) are defined as any by-products of the SCL site field investigative activities that are suspected or known to be contaminated with hazardous substances. The performance of O&M field activities will produce waste products such as development and purge groundwater, decontamination wastewater, and expendable personnel protective equipment. A portable or temporary decontamination pad will be set up on-site for decontamination of heavy equipment. Wastewater will be pumped from the decontamination pad, collected, and containerized. Wastewater and purge water from the developing and sampling of groundwater monitoring wells will be stored in DOT-approved drums. Depending on the volume of waste generated during the field activities and the duration of storage time, the water in the drums may be pumped into a portable on-site storage tank. Storing the water in a tank would reduce the number of drums needed. Each type of waste will be segregated during the field activity and containerized separately. All storage containers will be labeled appropriately. Wastes will be stored on-site in a secured, accessible staging area until the analytical results of the monitoring are interpreted. At that time, each segregated waste will be evaluated based on the field data, and disposal arrangements will be executed in accordance with appropriate local, state, or federal regulations. The Contratcor will refer to the U.S. EPA's *Management of Investigation-Derived Wastes During Site Inspections* (U.S. EPA, 1991) for guidance on off-site disposal policy, if this action is deemed necessary.

SECTION 10

SAMPLE CONTAINER PROCUREMENT

All sample containers to be used during the sampling program will be purchased by the Contractor from a reputable supplier capable of providing the bottle quantity and type that meets or exceeds the strict quality control requirements set forth by the U.S. EPA in OSWER Directive No. 9240.0-05A.

The contaminant-free sample containers (bottles) used for analyzing CLP TCL and TAL analytes for this sampling effort will be prepared according to the procedures specified in the U.S. EPA's *Specifications and Guidance for Obtaining Contaminant-Free Sample Containers*, (U.S. EPA, 1993) or the most current revision. It will be ensured that the bottles used for the sampling activity do not contain target organic and inorganic contaminants exceeding the level specified in the above-mentioned document. For non-CLP TCL and TAL types of analytes, bottles shall either be cleaned in the same way as for the similar types of analytes or it will be negotiated with the bottle supplier(s) to clean and test the bottles for the analytes of interest to exceed approximately one-third of the required quantitation limits. Specifications for the bottles will be verified by checking the supplier's certified statement and analytical results for each bottle lot, and will be documented on a continuing basis. The FTL or his/her designee will record the bottle lot numbers associated with each sample collected during the sampling effort. This data will be maintained in the project evidence file and will be available, if requested, for U.S. EPA review.

SUMMA Canisters will be used for air sampling. These canisters must be obtained by the laboratory performing the analysis. The laboratory should ship each canister certified as clean and evacuated to an absolute pressure of 0.05 mm Hg. The interior surfaces of the

canisters must be treated by the SUMMA passivation process.
In addition, the data for field blanks and trip blanks will be monitored for contamination, and corrective actions will be taken as soon as a problem is identified. This will be accomplished either by discontinuing the use of a specific bottle lot, contacting the bottle supplier(s) for retesting the representative bottle from a suspect log, resampling the suspected samples, validating the data (taking into account that the contaminants could be introduced by the laboratory [i.e., common laboratory solvents, sample handling artifacts, etc.] or could be bottle QC problem) so as to make an educated determination if the bottles, and hence the data, are still usable.

For the SCL site project, the corrective actions will be conducted in a comprehensive manner in order to avoid the use of identified contaminated lot(s) from other projects, and to ensure that if the bottle supplier(s) is deemed unresponsive or unable to provide cleaned bottles as specified, then other U.S. EPA-related projects are not negatively impacted by the use of the noncompliant bottles.

If resampling is deemed necessary, the Contractor will require authorization for additional effort. Any schedule delays will be brought to the attention of the U.S. EPA RPM.

SECTION 11

REFERENCES

International Air Transport Association; January, 1993; *Dangerous Goods Regulations*, 34th Edition; IATA Resolution 618, Attachment "A."

U.S. EPA; December 1987; *A Compendium of Superfund Operations Methods*, EPA/540/P-87/001.

U.S. EPA; March 1989; *Region V CRL Sample Handling Manual*.

U.S. EPA; December 1988; *User's Guide to the Contract Laboratory Program*; EPA/617-003/84306.

U.S. EPA; 1991; *Management of Investigation - Derived Wastes During Site Inspection.*

U.S. EPA; 1993; *Specifications and Guidance for Obtaining Contaminant-Free Sample Containers*.

APPENDIX B

SPECIAL ANALYTICAL SERVICES (SAS) REQUESTS

II. INTERFERENCES, ANALYSIS RATE, AND SAFETY

A. Interferences

1. Impurities in the purge gas, organic compounds outgassing from the plumbing ahead of the trap, and solvent vapors in the laboratory account for the majority of contamination problems. The analytical system must be demonstrated to be free from contamination under the conditions of the analysis by running laboratory reagent blanks.

2. Samples can be contaminated by diffusion of volatile organics (particularly fluorocarbons and methylene chloride) through the septum seal into the sample during shipment and storage. A field reagent blank prepared from reagent water and carried through the sampling and handling protocol can serve as a check on such contamination.

3. Contamination by carry-over can occur whenever high level and low level samples are sequentially analyzed. To reduce carry-over, the purging device and sample syringe must be rinsed with reagent water between sample analyses. Whenever an unusually concentrated sample is encountered, it should be followed by an analysis of reagent water to check for cross contamination. For samples containing large amounts of water-soluble materials, suspended solids, high boiling compounds or high purgeable levels, it may be necessary to wash the purging device with a detergent solution, rinse it with distilled water, and then dry it in a 105^{o} oven between analyses. The trap and other parts of the system are also subject to contamination, therefore, frequent bakeout and purging of the entire system may be required.

purgeables which are then detected with a photo-ionization detector and then a halide-specific detector (connected in series). This method is based on EPA Method 601.

The Determination of Volatile Organic Compounds in Water
By Gas Chromatography/HECD

I. SUMMARY

A. Analytes

This method covers the determination of a number of volatile organics. The following parameters may be determined by this method:

PARAMETER	STORET NUMBER	CAS NUMBER
DICHLORODIFLUOROMETHANE	34668	75-71-8
TRICHLOROFLUOROMETHANE	34488	75-69-4
TETRAHYDROFURAN	-	109-99-9

B. Matrix

This is a purge and trap gas chromatographic/Photo-ionizatio detector/Hall Electrolytic Conductivity detector method applicable to t determination of the compounds listed above in ground water, surface water and drinking water.

C. Other Purgeable Organics

These can also be determined by this method (see 40 CFR Part 136, Appendi A).

D. General Method

An inert gas is bubbled through a 5-mL water sample contained in specially-designed purging chamber at ambient temperature. The purgeable are efficiently transferred from the aqueous phase to the vapor phase The vapor is swept through a sorbent trap where the purgeables ar trapped. After purging is complete, the trap is heated and backflushe with the inert gas to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate th

I. DATA REQUIREMENTS

See instruction number 8 above. For additional analytical requirement see EPA Methods 502.2 and 524.2.

II. QC REQUIREMENTS - Do not use designated field blanks for QA audits.

See EPA Methods 502.2 and 524.2.

III. ACTION REQUIRED IF LIMITS ARE EXCEEDED:

Contact SMO.

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services. Should you have any questions or need any assistance, please call the Sample Management Office.

Note: Laboratory data rejection and non-payment will be recommended if methods other than those specified in this document are used. The Trap must have coconut charcoal.

8. Special technical instruction (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.):

The three compounds (i.e., THF CAS# 109-99-9, CCL2F2 CAS# 74-71-8 & CCL3F CAS# 74-69-4) detection limits required are 10 µg/L. If any sample has a positive hit for THF at or above 40 µg/L confirmation must be done by GC/MS using EPA Method 524.2. Confirmation on a second column is required for any sample that have a positive hit at or above 40 µg/L for CCL2F2 and CCL3F using EPA Method 502.2.

Contact SMO if you have any problem.

9. Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain of Custody documentation, etc.). If not completed, format of results will be left to program discretion.

All procedures used must be clearly identified. All original raw data, forms, calculation worksheets, instrument read-outs, preparation forms, internal sample and/or extract chain of custody forms, strip charts, and copies of pages from preparation and analysis logbooks shall be submitted. If originals were submitted in another data package, photocopies may be submitted with a record of the location of the originals.

All records of analysis and calculations shall be legible and sufficient to recalculate all sample as to source, lot number, and sample number.

Results will be reported as µg/L.

10. Other (use additional sheets or attach supplementary information, as needed):

All original sample tags, chain of custody forms, SAS packing lists, airbills, and original data shall be submitted to the Region within the time frame listed in section 6 above. Copies of the results should be submitted to the Contractor.

11. Name of sampling/shipping contact: To be provided by the Contractor.

Phone:

SAS Number

☐

U.S. Environmental Protection Agency
ESD/MQAB
77 West Jackson Street, Chicago, Illinois 60604
PHONE: (312) 353-2720 or FAX (312) 353-4342

SPECIAL ANALYTICAL SERVICES
Client Request

☐ Regional Transmittal ☐ Telephone Request

A. EPA Region/Client: Region V
B. RSCC Representative: Brian P. Freeman
C. Telephone Number: (312) 353-2720
D. Date of Request: To be determined by the Contractor
E. Site Name: Stoughton City Landfill, Stoughton, Wisconsin

Please provide below a description of your request for Special Analytical Services under the Contract Laboratory Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delays in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. **General description of analytical service requested:**
   Analysis of low-level nonstandard volatile organics (specifically, Tetrahydrofuran (THF), Dichlorodifluoromethane (CCL2F2), and Trichlorofluoromethane (CCl3F) by EPA Methods 502.2 and 524.2. For routine groundwater monitoring, only THF and DCDFM analysis is requested.

2. **Definition and number of work units involved (specify whether whole samples or fractions; whether aqueous or soil and sediments; and whether low, medium, or high concentration):**
   Forty-eight groundwater samples for analysis of THF DCDFM and TCFM during baseline monitoring. Thirty-four groundwater samples for analysis of THF and DCDFM during each round of routine groundwater monitoring. These totals do not include trip blank samples and MS/MSD samples.

3. **Purposes of analysis (specify whether Superfund [Remedial or Enforcement], RCRA, NPDES, etc.):**
   Superfund - Operation and Maintenance

4. **Estimated date(s) of collection:**
   Routine groundwater monitoring samples to be collected on a semi-annual basis as determined by the contractor. The baseline groundwater monitoring samples will be collected immediately after the placement of the cap.

5. **Estimated date(s) and method of shipment:** Daily, overnight courier (Federal Express)

6. **Number of days analysis and data required after laboratory receipt of samples:**
   Laboratory should report results within 30 days of receipt of samples.

7. **Analytical protocol required (attach copy if other than a protocol currently used in this program):**
   Low-level analysis of groundwater samples in accordance with EPA Method 502.2 and 524.2.

This document was prepared by Roy F. Weston, Inc., expressly for U.S. EPA. It shall not be released or disclosed in whole or in part without the express, written permission of U.S. EPA.

B. Analysis Rate

On a day when it is necessary to run an initial calibration curve, it would be possible to analyze approximately 10-12 samples in a 24 hour period. It would take about 7 hours to construct the calibration curve.

If it is not necessary to construct an initial calibration curve it would be possible to run an additional 7 samples in a 24 hour period bringing the total to 17 to 19.

C. Safety Information

The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. The laboratory is responsible for maintaining a current awareness file of OSHA regulations regarding the safe handling of the chemicals specified in this method. A reference file of material data handling sheets should also be made available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available and have been identified for the information of the analyst.

The following parameters have been tentatively classified as known or suspected, human or mammalian carcinogens: carbon tetrachloride, chloroform, 1,4-dichlorobenzene, and vinyl chloride. Primary standards of these toxic compounds should be prepared in a hood. A NIOSH/MESA approved toxic gas respirator should be worn when the analyst handles high concentrations of these toxic compounds.

III. APPARATUS AND CHEMICALS

A. Glassware/Hardware

1. Vial--40-mL capacity, equipped with a screw cap with a hole in the center. Detergent wash, rinse with tap and distilled water, and dry at 105°C before use.

2. Septum-Teflon-faced silicone. Detergent wash, rinse with tap and distilled water, and dry at 105° for 1 hr. before use.

3. Syringes--5-mL, glass hypodermic with Luerlok end.

4. Micro syringes--10-uL, 25-uL, 100-uL, 0.006 in. ID needle.

5. Syringe valve--2-way, with Luer ends.

6. Vial--15-mL, crimp-cap, with Teflon cap liner.

7. Balance--Analytical, capable of accurately weighing 0.0001g.

8. 10 mL and 100 mL volumetric flasks - class A, with ground glass stoppers.

B. Instrumentation/Operating Conditions

1. A purge and trap autosampler manufactured by Tekmar (LSC-II with ALS autosampler) is used to purge the samples. The autosampler has 10 sparge vessels that accept 5 mL samples for purging. The trapping system consists of a 25 cm long 1/8" O.D. stainless tube packed with 8 cm of activated charcoal, 8 cm of silica gel, 8 cm of TENAX, and 1 cm of 3% OV-1. This trap can be rapidly heated to 180°C and desorbed via a six port valve onto the GC analytical column for analysis.

The operating conditions are:

a. Purge for 11 minutes with helium at a flow of 40 mL/min.

b. Desorb for 4 minutes at 180°C.

c. Bake the traps for 32 minutes at 180°C.

2. A gas chromatograph manufactured by Hewlett-Packard (Model 5880A) or Tracor (Model 540) is utilized. This gas chromatograph is temperature programmable and can utilize packed or capillary columns.

The operating conditions for the 1% SP-1000 packed column are:

a. Helium carrier gas at 40 mL/minute.

b. The oven temperature program is 45°C for 3 minutes then 8°C/minute to 220°C; hold for 24 minutes.

c. Injector temperature is 250°C.

The operating conditions for the N-octane confirmation column are:

d. Helium carrier gas at 40 mL/minute.

e. The oven temperature program is 45°C for 3 minutes then 6°C/minute to 130°C; hold for 20 minutes.

f. Injector temperature is 250°C.

3. Columns

   a. 1/8" x 8'-stainless steel column packed with 1% SP-1000 on carbopack B.

   b. 1/8" x 6'-stainless steel column packed with N-octane on porisil C are utilized.

4. Detectors

   a. Photo-ionization detector (hNU, Inc. Model 52 or Tracor Model 703) operated under the following conditions:

      1. Detector temperature is 250°C

      2. Detector Lamp is 10.2 EV

      3. Lamp intensity setting is 1.

   b. Hall 700A Electrolytic Conductivity detector operated under the following conditions:

      1. Detector temperature is 250°C.

      2. Reactor temperature is 850°C.

      3. Solvent flow of n-propanol is 0.5 mL/minute.

      4. Hydrogen flow is 30 mL/minute.

      5. Electrometer range setting is 100.

5. Data system - A Hewlett-Packard 5880A series GC terminal with Level Four capability or a Nelson Analytical Data System based on IBM-compatible software.

6. The retention times for the analytes of interest (using the operational conditions specified) and the method detection limits are:

Analyte	1% SP-1000	N-Octane	MDL (ug/L)
Dichlorodifluoromethane	3.24	1.17	1.5
Trichlorofluoromethane	8.53	2.91	0.4
Tetrahydrofuran	10.49	7.11	15
Bromochloromethane (I.S.)	9.47	9.93	-
a,a,a-Trifluorotoluene (I.S.)	23.03	14.15	-

7. The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the value is above zero^{G}. The MDL concentration listed were obtained using reagent water. The MDL actually achieved in a given analysis will vary depending on instrument sensitivity and matrix effects.

C. Reagents and SARM's

1. **Reagent water** -- Reagent water is defined as a water in which an interferent is not observed at or above the MDL of the parameters of interest.

   Reagent water is generated by passing de-ionized water through a carbon filter bed containing about 1 lb. of activated carbon (Filtrasorb-300, Calgon Corp., or equivalent). Reagent water should meet the following criteria to qualify as ASTM Type II water:

Grade of Water	Maximum Total Matter (mg/L)	Maximum Electrical Conductivity at 25C (umho/cm)	Maximum Electrical Resistivity at 25C (m cm)	Maximum Color Retention Time of KM_nO_4 (min.)
Type II	0.1	1.0	1.0	60

2. Sodium thiosulfate--(ACS) Granular. Baker Chemical.

3. Trap materials:

   a. 2,6-Diphenylene oxide polymer--Tenax, (60/80 mesh), chromatographic grade. Supelco, Inc.

   b. Methyl silicone packing--3% OV-1 on Chromosorb-W (60-80 mesh). Supelco, Inc.

   c. Silica gel--35/60 mesh, Davison, grade-15. Supelco, Inc.

   d. Coconut charcoal -- 6/10 mesh seived to 26 mesh. Supelco, Inc.

4. Methanol--Pesticide quality. Burdick & Jackson.

5. Standard Reference Materials

Compound	Source	Purity
Dichlorodifluoromethane	Alpha Gaz	99.0%
Trichlorofluoromethane	Chem Serv	99+%
Tetrahydrofuran	Burdick & Jackson	>99.9%
Bromochloromethane (I.S.)	Aldrich Chemical	99%
a,a,a-Trifluorotoluene (I.S.)	Chem Serv	98%

6. All off-the-shelf materials will be positively identified by mass spectrometry and will have their purities estimated by gas chromatography/flame ionization detection.

IV. CALIBRATION

A. Initial Calibration

1. Preparation of Standards

    a. Stock standard solutions - Stock standard solutions may be prepared from pure standard materials or purchased as certified solutions. Prepare stock standard solutions in methanol using assayed liquids or gases as appropriate. Because of the toxicity of some of the organohalides, primary dilutions of these materials should be prepared in a hood. A NIOSH/MESA approved toxic gas respirator should be used when the analyst handles high concentrations of such materials.

        1. Place about 9.8 mL of methanol into a 10-mL ground glass stoppered volumetric flask. Allow the flask to stand, unstoppered, for about 10 min. or until all alcohol wetted surfaces have dried. Weigh the flask to the nearest 0.1 mg.

        2. Add the assayed reference material:

            a. Liquid - Using a 100 uL syringe, immediately add two or more drops of assayed reference material to the flask, then reweigh. Be sure that the drops fall directly into the alcohol without contacting the neck of the flask.

b. Gases - To prepare standards for any of the six halocarbons that boil below 30° C (bromomethane, chloroethane, chloromethane, dichlorodifluoromethane, trichlorofluoromethane, vinyl chloride), fill a 5-mL valved gas-tight syringe with the reference standard to the 5.0-mL mark. Lower the needle to 5 mm above the methanol meniscus. Slowly introduce the reference standard above the surface of the liquid (the heavy gas will rapidly dissolve into the methanol).

3. Reweigh, dilute to volume, stopper, then mix by inverting the flask several times. Calculate the concentration in ug/uL from the net gain in weight. When compound purity is assayed to be 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard. Commercially prepared stock standards can be used at any concentration if they are certified by the manufacturer or by an independent source.

4. Store standards at -10°C in septum capped bottles, the stock standards must be replaced each month. Diluted solutions must be replaced each week.

5. All standards prepared for use throughout the laboratory are assigned a code number. The standard code number is entered in the standard notebook with

b. Gases - To prepare standards for any of the six halocarbons that boil below 30° C (bromomethane, chloroethane, chloromethane, dichlorodifluoromethane, trichlorofluoromethane, vinyl chloride), fill a 5-mL valved gas-tight syringe with the reference standard to the 5.0-mL mark. Lower the needle to 5 mm above the methanol meniscus. Slowly introduce the reference standard above the surface of the liquid (the heavy gas will rapidly dissolve into the methanol).

3. Reweigh, dilute to volume, stopper, then mix by inverting the flask several times. Calculate the concentration in ug/uL from the net gain in weight. When compound purity is assayed to be 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard. Commercially prepared stock standards can be used at any concentration if they are certified by the manufacturer or by an independent source.

4. Store standards at -10°C in septum capped bottles, the stock standards must be replaced each month. Diluted solutions must be replaced each week.

5. All standards prepared for use throughout the laboratory are assigned a code number. The standard code number is entered in the standard notebook with

all information regarding the preparation of that standard, i.e., date, analyst, name of each compound and amount used, final volume, solvent used and date disposed. All standard containers are labeled with the standard's code, date and analyst's initials.

6. The instrument response obtained for each compound in a newly prepared standard is compared to the response obtained from the previously prepared standard before they are used in the method.

2. Instrument Calibration

a. Using the stock standards, prepare two calibration standards (one for the compounds of interest and one for the internal standards) at the following levels:

Compound	Concentration Level in Methanol (ug/mL)
Dichlorodifluoromethane	10
Trichlorofluoromethane	10
Tetrahydrofuran	100
Bromochloromethane (I.S.)	5
a,a,a-Trifluorotoluene (I.S.)	10

b. Prepare a three-point calibration curve by adding 2.0, 10, and 20 uL of calibration standard to 5.0 mL of reagent water. This is equivalent to 4.0, 20, and 40 ug/L of dichlorodifluoromethane and trichlorofluoromethane, and 40, 200, and 400 ug/L of tetrahydrofuran.

c. 10 uL of internal standard spiking solution is added to each 5.0 mL of calibration standard. This is equivalent to 10 ug/L of bromochloromethane and 20 ug/L of a,a,a-trifluorotoluene.

Calculations are performed by the Internal Standard procedure. The response of bromochloromethane is used to quantify dichlorodifluoromethane and trichlorofluoromethane and the response of trifluorotoluene is used to quantify tetrahydrofuran. Equations for performing the Internal Standard procedure are provided in Section VIII. Calculations.

3. The Analysis of Calibration Data

If samples are analyzed on the same day that Initial Calibration is performed, a mid-level calibration check standard must be analyzed after sample analyses are complete. The calibration check standard must be prepared by the laboratory using stock standards prepared independently from those used for calibration. The response must agree within ± 25% of the mean response as determined from the Initial Calibration. After seven calibrations the response must agree within +/- two standard deviations. If the response fails, the mid-level standard should be reanalyzed. If the standard fails a second time all samples analyzed since the last satisfactory calibration should be reanalyzed after repeating the Initial Calibration.

B. Daily Calibration

1. Preparative standards

   Standards are prepared as in section IV.A.1.

2. Instrument Calibration

   The daily calibration curve as established in section IV.A.2. is utilized.

   The working calibration curve or RF must be verified on each working day by the measurement of a QC check sample at the midpoint of the calibration curve. The response must be within ± 25%.

3. Analysis of Calibration Data

   Calibration standards shall be analyzed each day to verify that instrument response has not changed from previous calibration. Before sample analysis each day, the mid-level standard shall be analyzed. The response must fall within ± 25% of the mean response from prior Initial/Daily Calibrations. If the response fails this test, the daily standard shall be reanalyzed. If the response from the second analysis is not within ± 25% of the mean response from prior Initial/Daily Calibrations, Initial Calibration must be performed before analyzing samples.

   After sample analyses are completed each day, the mid-level standard shall be analyzed again. The response must again meet the criteria outlined above. If, after two tries the mid-level check standard still does not fall within ± 25% of the mean response, the system is considered to have failed. Initial Calibration must be performed and all samples analyzed since the last acceptable calibration must be reanalyzed.

V. SAMPLE HANDLING STORAGE

A. Sampling Procedure

1. All water samples must be iced or refrigerated at 4°C from the time of collection until analysis. If the sample contains residual chlorine, add sodium thiosulfate preservative (10 mg/40 mL is sufficient for up to 5 ppm Cl_2). EPA Methods 330.4 and 330.5 may be used for measurement of residual chlorine. Field test kits can be used for this purpose.

2. Grab samples must be collected in glass containers having a total volume of at least 25 mL. Fill the sample bottle just to overflowing in such a manner that no air bubbles pass through the sample as the bottle is being filled. Seal the bottle so that no air bubbles are entrapped. If preservative has been added, shake vigorously for 1 minute. Maintain the hermetic seal on the sample bottle until time of analysis.

B. Containers

o **40-ml Vials**

a) Scrub and wash bottles in detergent.
b) Rinse with copious amounts of distilled water.
3) Rinse with acetone.
4) Rinse with methylene chloride (Nanograde or equivalent).
5) Rinse with hexane (Nanograde or equivalent).
6) Air dry.
7) Heat to 200°C.
8) Allow to cool.
9) Cap with clean caps with Teflon liners.

- **Bottle Caps**
  1) Remove paper liners from caps.
  2) Wash with detergent.
  3) Rinse with distilled water.
  4) Dry at 40°C.

- **Teflon Liners (avoid contact with fingers)**
  1) Wash with detergent.
  2) Rinse with distilled water.
  3) Rinse with acetone.
  4) Rinse with hexane (Nanograde or equivalent).
  5) Air day.
  6) Place liners in cleaned caps.
  7) Heat to 40°C for 2 hours.
  8) Allow to cool.
  9) Use to cap cleaned bottles.

C. Storage Conditions

Store samples at 4°C until analysis.

D. Holding time limits.

All samples must be analyzed within 14 days of collection.

E. Solution Verification

Whenever new stock solutions are prepared, the response is verified versus the old standards and must be within ± 25 percent. New stock solutions are typically prepared every two months.

VI. Procedure

A. Separations

Section III.B.2. summarizes the gas chromatograph operating conditions. Section III.B.6. shows the approximate retention times on a 1% SP1000 column under these conditions.

B. Instrumental Analysis

1. Calibrate the system daily as described in Section IV.B.

2. Adjust the purge gas (helium) flow rate to 40 mL/min. Attach the trap inlet to the purging device, and set the purge and trap system to purge. Open the syringe valve located on the purging device sample introduction needle.

3. Allow the sample to come to ambient temperature prior to introducing it to the syringe. Remove the plunger from a 5-mL syringe and attach a closed syringe valve. Open the sample bottle and carefully pour the sample into the syringe barrel to just short of overflowing. Replace the syringe plunger and compress the sample. Open the syringe valve and vent any residual air while adjusting the sample volume to 5.0 mL. Since this process of taking an aliquot destroys the validity of the sample for future analysis, the analyst should fill a second syringe at this time to protect against possible loss of data. Add 10.0 uL of the internal standard spiking solution through the valve bore, then close the valve.

4. Attach the syringe-syringe valve assembly to the syringe valve on the purging device. Open the syringe valves and inject the sample into the purging chamber.

5. Close both valves and purge the sample for 11.0 ± 0.1 min. at ambient temperature.

6. After the 11-min. purge time, attach the trap to the chromatograph, adjust the purge and trap system to the desorb mode and begin to temperature program the gas chromatograph. Introduce the trapped materials to the GC column by rapidly heating the trap to 180°C while backflushing the trap with an inert gas between 20 and 60 mL/min. for 4 min.

7. While the trap is being desorbed into the gas chromatograph, empty the purging chamber using the sample introduction syringe. Wash the chamber with two 5-mL flushes of reagent water.

8. After desorbing the sample for 4 min., recondition the trap by returning the purge and trap system to the purge mode. The trap temperature should be maintained at 180°C. After approximately 7 min. turn off the trap heater and open the syringe valve to stop the gas flow through the trap. When the trap is cool, the next sample can be analyzed.

9. Identify the parameters in the sample by comparing the retention times of the peaks in the sample chromatogram with those of the peaks in standard chromatograms. The width of the retention time window used to make identifications is the mean absolute retention time window from certification +/- three standard deviations. Daily adjustments to the retention time window will be made based on the retention time of the daily calibration standard +/- three standard deviations as determinations during certification.

10. If the response for a peak exceeds the working range of the system, prepare a dilution of the sample with reagent water from the aliquot in the second syringe and reanalyze.

VII. Calculations

A. To determine the concentration of individual compounds in the sample, use the internal standard calibration procedure. Tabulate peak area responses against concentration for each compound and the internal standard, and calculate response factors (RF) for each compound using Equations 1 and 2.

Equation 1

$$RF = \frac{(As)(Cis)}{(Ais)(Cs)}$$

where:

As = Response for the parameter to be measured.
Ais = Response for the internal standard.
Cis = Concentration of the internal standard (ug/L).
Cs = Concentration of the parameter to be measured (ug/L).

Equation 2

$$\text{Concentration (ug/L)} = \frac{(As)(Cis)}{(Ais)(RF)}$$

where:

As = Response for the parameter to be measured.
Ais = Response for the internal standard.
Cis = Concentration of the internal standard (ug/L).

8. Report results in ug/L without correction for recovery data. All QC data obtained should be reported with the sample results.

VIII. DAILY QUALITY CONTROL

A. Control Samples

1. The following types of QC samples shall be included in each analytical lot:

   a. Each 12-hour shift, a reagent water method blank must be analyzed to verify that the laboratory is not a source of sample contamination.

   b. The laboratory must spike 10% of all samples in duplicate with control analytes at the midpoint level of the calibration curve to verify performance (accuracy and precision).

2. Spiking stock solutions are prepared separately from the calibration stock solutions. The same standard reference materials outlined in Section III.C.5. are used.

3. Using the spiking stock solutions, prepare a working matrix spike at the following levels:

Compound	Concentration Level in Methanol (ug/ml)
Dichlorodifluoromethane	10
Trichlorofluoromethane	10
Tetrahydrofuran	100

4. Analyze one 5-ml sample aliquot to determine the background concentration (B) of each parameter. Spike a second 5-mL aliquot with 10 uL of the working matrix spike solution and analyze it to determine the concentration after spiking (A) of

each parameter. Calculate each percent recovery (%R) as 100 (A-B)%/T where T is the true value of the spike. Compare the percent recovery (%R) for each parameter with the corresponding acceptance criteria found in Table 1.

5. If any individual %R falls outside the range for recovery, that parameter has failed the acceptance criteria. A QC check standard containing each parameter that failed must be prepared and analyzed.
    a. Prepare the QC check standard by adding 10 uL of QC check sample concentrate (Section VIII.A.3.) to 5 mL of reagent water. The QC check standard needs only to contain the parameters that failed criteria in the test in Section VIII.A.4.
    b. Analyze the QC check standard to determine the concentration measured (A) of each parameter. Calculate each percent recovery as 100 (A/T)%, where T is the true value of the standard concentration.
    c. Compare the percent recovery (%R) for each parameter with the corresponding QC acceptance criteria found in Table 1. Only parameters that failed the test need to be compared with these criteria. If the recovery of any such parameter falls outside the designated range, the laboratory performance for that parameter is judged to be out of control, and the problem must be immediately identified and corrected. The analytical result for that parameter in the unspiked sample is suspect and may not be reported for regulatory compliance purposes.

6. Repeat the analysis for the matrix spike duplicate. The corresponding acceptance criteria for percent recovery (%R) must

be met and the relative percent difference between duplicate data must be less than 30%. To calculate the relative percent difference, use the following formula:

$$\%D = \frac{A_1 - A_2}{(A_1 + A_2)/2} \times 100\%$$

7. Field duplicates may be analyzed to assess the precision of the environmental measurement.

B. Control Charts

As part of the QC program for this project, Shewhart control charts will be generated for accuracy and precision.

TABLE 1 - QC Acceptance Criteria

Parameter	Range for %R
Dichlorodifluoromethane	42-142
Trichlorofluoromethane	78-124
Tetrahydrofuran	64-140

IX. REFERENCES

A. "Determination of Volatile Organics in Water by Purge and Trap Method," Method 465-8, Minnesota Department of Health

B. Federal Register, Vol. 44, No. 231, Thursday, Nov. 29, 1979

C. Federal Register, Vol. 44, No. 233, Monday, December 3, 1979

D. "The Determination of Halogenated Chemicals in Water By The Purge and Trap Method," Method 502.1, EPA #600/4-81-059

E. Federal Register, Vol. 49, No. 209, Friday, Oct. 26, 1984

F. USATHAMA QA Program, 2nd Edition, March 1987

G. 40 CFR Part 136, Appendix B.

ATTACHMENT II

Non-Standard Volatile Organics Analysis SOP (7/88)

CALIBRATION STANDARDS	SPIKE AMOUNTS (ug/l)	FREQUENCY
Dichlorodifluoromethane	10	Initial calibration to prepare a 3 point curve per SOP (7/88).
THF	100	
Bromochloromethane (internal standard)	10	
a,a,a-trifluorotoluene (internal standard)	20	

SPIKE COMPOUNDS	SPIKE AMOUNTS (ug/ml)	QC CONTROL LIMITS (% R)
THF	100 ug/l	42 - 142
Dichlorodifluoromethane	20 ug/l	64 - 140

APPENDIX C

STANDARD OPERATING PROCEDURES (SOPs) FOR FIELD INSTRUMENTS

FIELD MEASUREMENT OF PH, TEMPERATURE AND SPECIFIC CONDUCTIVITY IN WATER

1. Scope and Application

This method is applicable to samples of stormwater, surface water, potable water supplies, and groundwater with measurement occurring at the sampling point.

2. Apparatus

The Corning M90 is a portable, microprocessor based pH, specific conductivity, and temperature meter.

3. Reagents

A) pH reference buffer solutions:

1) pH = 4.00
2) pH = 7.00
3) pH = 10.00

B) Specific conductivity buffer solutions:

1) Conductivity standards A or B = 1413 µS or 12.88 mS

C) Distilled water

4. Calibration Procedures

A) Select sensor (i.e. pH, conductivity)
B) One point calibration

1) Place the sensor in the calibrating medium:

Measurement	Solution	Reading
pH	pH = 7 buffer	7.00 pH (25°C)
Cond	Hold in free air	0.00 µS
TDS	Hold in free air	0.00 mg/L

2) Press CAL - cal 1 is displayed. After endpointing, the display automatically updates to the calibrated value shown, or the temperature compensated value.

3) If READ is pressed after cal 1 update, the meter assumes one point calibration only is required. Samples can now be measured.

C) Two point calibration

1) Follow one point calibration. Place sensor in second calibrating medium:

During SI's, calibration for pH measurements will utilize the two point calibration option. Section 7-1 of the QAPP addresses the required frequency and documentation for field equipment calibration.

Measurement	Solution	Reading
pH	pH 4 or pH 10 buffer	4.00 or 10.01 pH (at 25°C)
Cond	Cond std A or B	1413 uS or 12.88 mS
TDS	Cond std A or B	706 mg/L or 6.44 g/L

2) Press CAL - cal 2 is displayed. After endpointing the display automatically updates to the calibrated value shown or the temperature compensated value.

5. Sample Handling and Preparation

Samples collected for pH, specific conductivity, total dissolved solids and temperature should be obtained directly from the sampling point. Groundwater samples being tested during well purging can be obtained directly from the bailer.

6. Procedures

Select sensor for required measurement (i.e. pH sensor or conductivity sensor). Attach sensor to the M90 meter. Calibrate meter to the solution corresponding to type of sensor. Meter is now ready to make a measurement following these steps:

A) Prepare sensor

   1) pH - remove the sensor wetting cap and slide the vent sleeve to expose the fill hole.

   2) Specific conductivity/TDS - immerse probe to halfway point in solution.

   3) Temperature - pH and conductivity sensors automatically measure temperature.

B) Press MODE, READ, CAL, or M to turn meter and start measurement. Place sensor into solution. Automatic endpoint detection freezes the display when plateau is reached; to manually endpoint press READ. Press READ again to start new measurement.

C) After use, close the fill hole and replace the wetting cap (pH).

7. Trouble-Shooting and Maintenance

A) Use distilled water when transferring from one solution to another.

B) Response time is a function of the sensor and the solution. If the solutions are at different temperatures (or ionic strength - pH only), allow more time for the sensor to respond.

C) Avoid handling the sensor tip.

D) Make sure no large air bubbles are trapped under the sensor when making measurements.

E) Do not use calibration standards after the expiration date.

F) Wetting caps should contain:

pH - pH 7 buffer

G) For greatest accuracy, callibrants and samples should be at the same temperature.

H) pH - keep the electrode filled with the appropriate fill solution to prevent reading drift.

I) Conductivity - the sensor shield and probe should be kept clean. Make sure no air bubbles are in the cell chamber during measurement.

8. Verification of Accuracy

Following the last of the four replicate measurements, immerse the rinsed sensor in each of the reference solutions used to calibrate the meter/sensor prior to sample measurements. If the readings are not within 0.10 units of the reference values, recalibrate the meter/sensor and redo the measurement of the sample just tested.

9. Reporting

A) pH - report the average value of the replicate measurements to the nearest 0.1 units.

B) Temperature - report the average value of the replicate measurements to the nearest 1°C.

C) Specific Conductivity/TDS - report the average value of the replicate measurements to three significant digits.

STANDARD OPERATING PROCEDURE
FIELD MEASUREMENT OF TURBIDITY

1. Scope and Application

This method is applicable to samples of groundwater, potable water supplies, surface water, and stormwater with measurement occurring at the sampling point.

2. Apparatus

The Hach Model 2100P Portable Turbidimeter and accessories will be used for measuring turbidity.

3. Principle of Operation

The model 2100P Portable Turbidimeter operates on the nephelometric principle of turbidity measurement. This instrument meets the design criteria specified by the United States Environmental Protection Agency, Method 180.1.

4. Range of Measurement

The instrument measures turbidity from 0.01 to 1000 NTU in automatic range mode with automatic decimal point placement. The manual range mode measures turbidity in three ranges: 0.01 to 9.99, 10 to 99.9 and 100 to 1000 NTU. The instrument has an accuracy within 2 percent of reading plus stray light from 0-1000 NTU.

5. Calibration

Calibration of the 2100P Turbidimeter is based on formazin, the primary standard for turbidity. The initial calibration is done at the factory. A formazin recalibration should be done at least once every three months. The equipment should be recalibrated (as required) and its batteries checked before shipping it to the field. Recalibration should be done according to the procedure described in the instrument manual (Section 3.6).

6. Sample Handling

To ensure a representative sample, mix every sample thoroughly before aliquots are taken. It is recommended to collect at least one liter sample in a clean container and thoroughly mix before measurement. Do not allow the sample to settle. When sampling from a tap, allow the water to run for at least five minutes before sampling.

7. Turbidity Measurement Procedure

Follow the instrument manual (Section 2) for turbidity measurement. The following general steps should be used to measure turbidity:

A. Collect a representative sample in a clean container. Fill a sample cell to the line (about 15 mL), taking care to handle the sample cell by the top. Cap the cell.

B. Wipe the cell with a soft, lint-free cloth to remove moisture and fingerprints.

C. Apply a thin film of silicone oil on the sample cell surface. Wipe with a soft cloth to obtain an even film over the entire surface.

D. Place the instrument on a flat, sturdy surface. Do not hold the instrument while making measurements. Press: I/O.

E. Put the sample cell in the instrument cell compartment so the diamond or orientation mark aligns with the raised orientation mark in front of the cell compartment. Close the cover.

F. Select manual or automatic range selection by pressing the "RANGE" key. Using automatic range selection is recommended. When the instrument is turned on, the instrument defaults to the range mode and measurement range which was used during the last measurement. The display will show "AUTO RNG" when the instrument is in automatic range selection. If the instrument defaults to automatic range mode, the first "RANGE" key stroke brings the selection into manual range mode. The second, third, and fourth key strokes put the instrument in the 0.00-9.99, 10 to 99.9 or 100-1000 NTU range respectively. Another key stroke brings the selection back to automatic range mode.

G. Turn signal averaging mode on or off by pressing the "SIGNAL AVERAGE" key. The instrument defaults to the last operating mode selected. The display will show "SIG AVG" when the instrument is using signal averaging. Use signal average mode only if the sample causes an unstable reading.

H. Press: "READ". The display will show " —— NTU" then the turbidity in NTU. Record the turbidity after the lamp symbol turns off.

8. Trouble Shooting

The detailed trouble shooting procedures are described in Section 5 of the instrument manual. Enter the diagnostic mode by pressing the "DIAG" key. The diagnostic mode allows access to information about instrument function which may be useful for servicing and troubleshooting. Pressing and holding the I/O key turns on all the display icons and elements to determine if all the elements and icons are functioning. Error messages indicate sample interferences and/or instrument malfunction. The probable cause and corrective action for each diagnostic code and error message are described in Section 5 of the instrument manual.

9. Maintenance

Keep the turbidimeter and accessories as clean as possible and store the instrument in the carrying case when not in use. Avoid prolonged exposure to sunlight and ultraviolet light. Wipe spills up promptly. Wash sample cells with non-abrasive laboratory detergent, rinse with distilled water, and air dry. Battery and lamp replacement should be performed according to the instructions outlined in Section 4 of the instrument manual.

10. Reference

Portable Turbidimeter Model 2100P - Instrument and Procedure Manual, HACH Company, 1993.

FIELD MEASUREMENT OF DISSOLVED OXYGEN (DO)

1. Scope and Application

Dissolved oxygen (DO) levels in natural waters and wastewater depend on the physical, chemical, and biochemical activities in the waterbody. Conversely, growth of many aquatic organisms as well as the rate of corrosivity, are dependent on the DO concentration. Thus, analysis for DO is a key test in water pollution and waste treatment process control. If at all possible, DO measurements should be taken in-situ, since concentrations may show a large change in a short time if the sample is not adequately preserved.

The monitoring method discussed herein is limited to the use of dissolved oxygen meters only. Chemical methods of analysis (i.e., Winkler methods) are available, but require more equipment and greater sample manipulation. Furthermore, DO meters, using a membrane electrode, are suitable for highly polluted waters, because the probe is completely submersible, and is free from interference caused by color, turbidity, colloidal material or suspended matter.

2. Apparatus

The following equipment is needed to measure dissolved oxygen concentration:

A. YSI Model 56 dissolved oxygen meter or equivalent.
B. Dissolved oxygen/temperature probe for above meter.
C. Sufficient cable to allow the probe to contact the sample.

3. Reagents

Distilled water

4. Calibration Procedures/Measurement Techniques

Probes differ as to specifics in use. Follow the manufacturer's instructions to obtain accurate readings. The following general steps should be used to measure the dissolved oxygen concentration:

A. The equipment should be calibrated and its batteries checked in the laboratory before going to the field.

B. The probe should be conditioned in a water sample for as long a period as practical before its use in the field. Long periods of dry storage followed by short periods of use in the field may result in inaccurate readings.

C. The instrument should be calibrated in the field before each measurement or group of closely spaced measurements by placing the probe in water sample of known dissolved oxygen concentration (i.e., determined by Winkler method) or in a freshly air-saturated water sample of known temperature. DO values for air-saturated water can be determined by consulting a table listing oxygen solubilities as a function of temperature and salinity (Attachment B).

D. Immerse the probe in the sample. Be sure to provide for sufficient flow past the membrane, either by stirring the sample, or placing the probe in a flowing stream. Probes without stirrers placed in wells can be moved up and down.

E. Record the dissolved oxygen content and temperature of the sample in a field logbook.

F. Recalibrate the probe when the membrane is replaced, or as needed. Follow the manufacturers' instructions. Duplicate analyses should agree within ± 0.1 mg/L.

Note than in in-situ placement of the probe is preferable, since sample handling is not involved. This however, may not always be practical. Be sure to record whether the liquid was analyzed in-situ, or if a sample was taken.

Special care should be taken during sample collection to avoid turbulence which can lead to increased oxygen solubilization and positive test interference.

ATTACHMENT B
VARIATION OF DISSOLVED OXYGEN CONCENTRATION IN WATER AS A FUNCTION OF TEMPERATURE AND SALINITY

Temperature	Chloride Concentration in Water					Difference /100 mg
	0	5000	10000	15000	20000	Chloride
	Dissolved Oxygen mg/l					
0	14.6	13.8	13.0	12.1	11.3	0.017
1	14.2	13.4	12.6	11.8	11.0	0.016
2	13.8	13.1	12.3	11.5	10.8	0.015
3	13.5	12.7	12.0	11.2	10.5	0.015
4	13.1	12.4	11.7	11.0	10.3	0.014
5	12.8	12.1	11.4	10.7	10.0	0.014
6	12.5	11.8	11.1	10.5	9.8	0.014
7	12.2	11.5	10.9	10.2	9.6	0.013
8	11.9	11.2	10.6	10.0	9.4	0.013
9	11.6	11.0	10.4	9.8	9.2	0.012
10	11.3	10.7	10.1	9.6	9.0	0.012
11	11.1	10.5	9.9	9.4	8.8	0.011
12	10.8	10.3	9.7	9.2	8.6	0.011
13	10.6	10.1	9.5	9.0	8.5	0.011
14	10.4	9.9	9.3	8.8	8.3	0.010
15	10.2	9.7	9.1	8.6	8.1	0.010
16	10.0	9.5	9.0	8.5	8.0	0.010
17	9.7	9.3	8.8	8.3	7.8	0.010
18	9.5	9.1	8.6	8.2	7.7	0.009
19	9.4	8.9	8.5	8.0	7.6	0.009
20	9.2	8.7	8.3	7.9	7.4	0.009
21	9.0	8.6	8.1	7.7	7.3	0.009
22	8.8	8.4	8.0	7.6	7.1	0.008
23	8.7	8.3	7.9	7.4	7.0	0.008
24	8.5	8.1	7.7	7.3	6.9	0.008
25	8.4	8.0	7.6	7.2	6.7	0.008
26	8.2	7.8	7.4	7.0	6.6	0.008
27	8.1	7.7	7.3	6.9	6.5	0.008
28	7.9	7.5	7.1	6.8	6.4	0.008
29	7.8	7.4	7.0	6.6	6.3	0.008
30	7.6	7.3	6.9	6.5	6.1	0.008
31	7.5					
32	7.4					
33	7.3					
34	7.2					
35	7.1					
36	7.0					
37	6.9					
38	6.8					
39	6.7					
40	6.6					
	6.5					
41						
42	6.4					
43	6.3					
44	6.2					
45	6.1					
	6.0					
46						
47	5.9					
48	5.8					
49	5.7					
50	5.6					

APPENDIX D

COMPLETED SAMPLE DOCUMENTATION EXAMPLES AND REQUIREMENTS

Attachment II

EPA

United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 818 Alexandria, VA 22313
703 557-2490 FTS 557-2490

Organic Traffic Report & Chain of Custody Record
(For Organic CLP Analysis)

SAS No. (if applicable):

Case No.: Case #

1. Project Code:
Account Code:
Regional Information:
Non-Superfund Program:
Site Name: Site Name
City, State: City, State
Site Spill ID: Code

2. Region No.: V
Sampling Co.: Company Name
Sampler (Name): Sampler Name
Sampler Signature: Sampler Signature

3. Type of Activity

Lead	Pre-Remedial	Remedial	Removal
SF ☒	PA ☐	RIFS ☒	CLEM ☐
PRP ☐	SSI ☐	RD ☐	REMA ☐
ST ☐	LSI ☐	RA ☐	REM ☐
FED ☐		O&M ☐	OIL ☐
		NPLD ☐	UST ☐

4. Date Shipped: Date
Carrier: Carrier Name
Airbill Number: Airbill Number

5. Ship To:
Laboratory Name
Address
Attn: Name

6. Preservative (Enter in Column D)
1. HCl
2. HNO3
3. $NaHSO_4$
4. H_2SO_4
5. Other (SAS) *(Specify)*
6. Ice only
N. Not preserved

7. Sample Description (Enter in Column A)
1. Surface Water
2. Ground Water
3. Leachate
4. Rinsate
5. Soil/Sediment
6. Oil (SAS)
7. Waste (SAS)
8. Other (SAS) *(Specify)*

CLP Sample Numbers (from labels)	A Enter # from Box 7	B Conc. Low Med High	C Sample Type: Comp./Grab	D Preservative from Box 6	E RAS Analysis VOA	BNA	Pest/PCB	High ARO/TOX	F Regional Specific Tracking Number or Tag Numbers	G Station Location Number	H Mo/Day/Year/Time Sample Collection	I Sampler Initials	J Corresp. CLP Inorg. Samp. No.	K Designated Field QC
EPA01	2	L	G	1	X				5-12357→12362	MW01	Date/Military Time		MEPA01	
EPA01						X	X		5-12363→12366	MW01	Date/Military Time			
EPA02				1	X				5-12367→12368	MW02	Date/Military Time		MEPA02	
EPA02						X	X		5-12369→12370	MW02	Date/Military Time			
EPA03				1	X				5-12371→12372	MW03	Date/Military Time		MEPA03	EPA03-EPA04
EPA03						X	X		5-12373→12374	MW03	Date/Military Time			Field duplicate
EPA04				1	X				5-12375→12376	MW03	Date/Military Time		MEPA04	
EPA04	↓					X	X		5-12377→12378	MW03	Date/Military Time			
EPA05	3			1	X				5-12379→12380	FB01	Date/Military Time		MEPA05	Field Blank
EPA05	3	↓	↓			X	X		5-12381→12382	FB01	Date/Military Time			

Shipment for Case complete? (Y/N): Circle One
Page 1 of #
Sample used for a spike and/or duplicate: EPA01
Additional Sampler Signatures:
Chain of Custody Seal Number: COC Seal #s

CHAIN OF CUSTODY RECORD

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

Received by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks Is custody seal intact? Y/N/none

Split Samples ☐ Accepted *(Signature)*

Attachment I

EPA

United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 818 Alexandria, VA 22313
703 557 2490 FTS 557 2490

Inorganic Traffic Report & Chain of Custody Record

(For Inorganic CLP Analysis)

SAS No. (if applicable)

Case No. Case #

1. Project Code

Account Code

2. Region No. V

Sampling Co. Company Name

4. Date Shipped Date

Carrier Carrier Name

Regional Information

Sampler (Name) Sampler Name

Airbill Number Airbill Number

Non-Superfund Program

Sampler Signature Sampler Signature

5. Ship To
Laboratory Name
Address
Attn: Name

Site Name Site Name

City, State City, State

Site Spill ID Code

4. Type of Activity

Lead		Pre Remedial		Remedial		Removal	
SF	☒	PA	☐	RIFS	☒	CLEM	☐
PRP	☐	SSI	☐	RD	☐	REMA	☐
ST	☐	LSI	☐	RA	☐	REM	☐
FED	☐			O&M	☐	OIL	☐
				NPLD	☐	UST	☐

6. Preservative (Enter in Column D)
1. HCl
2. HNO3
3. NaOH
4. H_2SO_4
5. $K_2CR_2O_7$
6. Ice only
7. Other (SAS) (Specify)
N. Not preserved

7. Sample Description (Enter in Column A)
1. Surface Water
2. Ground Water
3. Leachate
4. Rinsate
5. Soil/Sediment
6. Oil (SAS)
7. Waste (SAS)
8. Other (SAS) (Specify)

CLP Sample Numbers (from labels)	A Enter # from Box 7	B Conc. Low Med High	C Sample Type: Comp / Grab	D Preservative from Box 6	E - RAS Analysis: Metals Total	Metals Dissolved	Cyanide	Low Conc. Nitrate/Nitrite	Low Conc. Fluoride	High pH	High Conductivity	F Regional Specific Tracking Number or Tag Numbers	G Station Location Number	H Mo/Day/Year/Time Sample Collection	I Sampler Initials	J Corresp. CLP Org. Samp. No.	K Designated Field QC
MEPA01	2	L	G	2	X							5-12345-12346	MW01	Date/Military Time		EPA01	
MEPA01				3			X					5-12347-12348	MW01	Date/Military Time			
MEPA02				2	X							5-12349	MW02	Date/Military Time		EPA02	
MEPA02				3			X					5-12350	MW02	Date/Military Time			
MEPA03				2	X							5-12351	MW03	Date/Military Time		EPA03	MEPA03-MEPA04
MEPA03				3			X					5-12352	MW03	Date/Military Time			Field duplicates
MEPA04				2	X							5-12353	MW03	Date/Military Time		EPA04	
MEPA04	↓			3			X					5-12354	MW03	Date/Military Time			
MEPA05	3			2	X							5-12355	FB01	Date/Military Time		EPA05	Field Blank
MEPA05	3	↓	↓	3			X					5-12356	FB01	Date/Military Time			" "

Shipment for Case complete? (Y/N) Circle One

Page 1 of #

Sample used for a spike and/or duplicate MEPA01

Additional Sampler Signatures

Chain of Custody Seal Number COC Seal #s

CHAIN OF CUSTODY RECORD

Relinquished by: (Signature) Signature	Date / Time Date Military Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Received by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks Is custody seal intact? Y/N/none	

EPA Form [illegible] (Rev. [illegible]) Replaces EPA Fo[illegible] previous [illegible] which [illegible] be u[illegible]

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

DATE: 20 AUGUST 1991

SUBJECT: COMBINATION TRAFFIC REPORT/CHAIN OF CUSTODY FORMS

FROM: JAN PELS, RSCC JPels
Laboratory Scientific Support Section, CRL

TO: ALL REGION V SAMPLERS USING THE CONTRACT LABORATORY PROGRAM (CLP)

The latest printing of the combination traffic report (TR) and chain of custody (COC) forms has been completed. All versions of the traffic report form prior to this printing cannot-be used after August 31. Please collect all old forms you have been sent and return them to me by September 15. Note that you should keep the old chain of custody forms, which will still be used for samples shipped to the EPA Central Regional Laboratory (CRL) in Chicago.

Please note that there are certain fields that are optional to fill out, such as sampler's initials, split sample section, and account code. The new form should eliminate redundant work by having all of the information that is currently written on the chain of custody form and on the traffic report form combined on one form, so keep this in mind when using the form.

If you are tracking bottle lot numbers, cooler numbers, etc., on the current COC forms, you can use the Regional Information box. If samples are being collected for a PRP oversight project, indicate 'PRP oversight' in the Regional Information box.

Remember that we do not request dissolved metals. Also, on the organic form, we are preserving all volatiles samples, including residential well samples as of February 1991, so you need to list the preservative number (HCl) in column D.

Note that since you are listing tag numbers and preservatives, that you must put the metals (water) sample information on one line and the cyanide information on another line. This would apply for the volatiles (waters will be preserved with HCl) and the BNA and Pest/PCBs fractions (they will have no preservative). Since the metals and cyanide fractions are taken from the same soil bottle, they can be written on one line.

Since these forms must be filled out on a per cooler basis, like the current chain of custody forms, the fact that you can only list up to 10 samples shouldn't be an issue since you are limited by the size of the cooler. A second form can be filled out for additional samples in the cooler; this revision has a box to note the number of pages, i.e., forms sent in a cooler.

This revision of the forms has a box for chain of custody seal numbers (remember that we use two seals per cooler).

The inorganic form has new analytes listed (nitrate/nitrite, fluoride, pH and conductivity). The nitrate/nitrite and fluoride is planned for a new low level water (residential well) RAS SOW, and the pH and conductivity are optional tests under the current High Concentration SOW. The lo lever water inorganic RAS SOW is not in place yet, so these fields should not be used at th time.

Please call if you have any questions on these additional analytes. For routine inorganic analyses on water and soil samples, you still will only ask for total metals and/or cyanide.

The organic form also has an additional field for the current High Concentration SOW, the ARO/TOX. Please call if you have questions about this high concentration analysis. For routine organic analyses on water and soil, you will still only ask for VOA, BNA and/or Pest/PCB.

Note that the organic traffic report says that extra volume is required for the matrix spike/matrix spike duplicate. This only applies to the routine low/medium/water/soil RAS SOWs. Remember that organic residential well samples (currently a RAS plus SAS) have Performance Evaluation (PE) samples sent with real samples to the lab and that you do not collect extra volume for this contract; you must list the PE samples on this form. You will not have tag numbers for these PEs, nor time/date of sampling, etc. Note which are PE ampules in the designated field QC field.

The lower right hand corner has a section for documenting whether split samples were accepted/declined by any PRPs. If you are currently using a separate form for this purpose, please let me know. The Office of Regional Counsel (ORC) will need to make a determinati on whether you can use this field in place of your current form. This issue was not rais during the review that was done by the ORC.

Use the far right empty field to notate which samples are field blanks, field duplicates (i.e., which samples are duplicates of which others), PE samples, and which are blind QC samples (we rarely send double blind QC samples). This information does not transfer onto the lab's copies.

There is a field to list the sample number that should be used for laboratory QC analyses (matrix spike/matrix spike duplicate or spike/duplicate). Please be sure to always designate a sample on a one per 20 samples/per matrix basis per case. Remember that you must supply extra volume for all water samples, except for the organic residential well samples shipped to the CLP as a RAS/SAS.

Note that the bottom section of the form has a box for the laboratory receiving the samples to sign and note whether the custody seal is intact; there has been some confusion on the part of some field samplers, who have occasionally filled in this box.

One major change is that the top copy of the form is submitted to the RSCC, with original signatures, to include in the evidence file. SMO receives the second copy and the lab gets the bottom two copies. Once the lab signs their copies, the lab signs them and returns them to SMO and the Region, so that we will have their original signature for the the evidence file. **PLEASE STRESS THIS TO ALL FIELD SAMLERS, SINCE THIS DOCUMENT IS USED TO TRACE THE SAMPLE FROM COLLECTION TO RECEIPT AT THE LAB AND IS A VERY IMPORTANT DOCUMENT.** You may make a photocopy to keep in your files, but you must send the RSCC the original.

Attached is an example for the forms correctly filled out. Please have samplers review this form carefully prior to using them in the field.

Also attached are instructions prepared by SMO on the use of the forms. Remember that these instructions are general instructions and do not contain Regional requirements; Region V's requirements supercede these instructions (specifically regarding the chain of custody seal numbers being listed, and tracking tag numbers). Please call if you have any questions on Region V's requirements.

Below is a list of things to remember when using these forms:

1) These forms are for exclusive use in the CLP. The old COC forms will still be used for samples shipped to the EPA Central Regional Laboratory (CRL).

2) A TR/COC form must be filled out on a per cooler basis.

3) The top copy with the original signatures is sent to the Region V RSCC.

4) All samples contained in a cooler must be listed on the form, including field blanks, field duplicates, and any performance evaluation (PE) samples sent with field samples.

5) The 'dissolved' metals box on the inorganic TR/COC should not be checked off. Filtered and unfiltered metals samples must be given separate EPA sample numbers, listed separately on the ITR/COC and both should have 'total' metals checked off on the form.

6) Extra sample volume must be sent for all organic and inorganic water samples on a one per twenty sample basis, with the exception of the organic residential well samples sent under a RAS/SAS contract.

7) Each TR/COC must be signed and dated properly.

Again, these forms must be used beginning September 1 and all other revisions of these forms must be returned to me by September 15.

Please call if you have any questions or comments on these forms. Another printing will be done within the next two months, so there is still time to correct problems with the forms.

Attachments

SAMPLER INSTRUCTIONS FOR USE OF MULTI-SAMPLE ORGANIC AND INORGANIC TRAFFIC REPORTS/CHAIN-OF-CUSTODY FORMS EPA FORM #9110-1 (INORGANICS) AND FORM 9110-2 (ORGANICS)

1/20/89
REV. 2/91
REV. 7/91

A. Introduction - Samples and Sample Numbers

The Contract Laboratory Program (CLP) Organic and Inorganic Multi-Sample Traffic Reports/Chain-of-Custody Forms (TRs) document samples shipped to CLP laboratories. They also enable SMO and the Region to track samples and ensure that the samples are shipped to the appropriate contract laboratory. You must use TRs each time you ship Routine Analytical Services (RAS) samples to a CLP laboratory. The TRs may document up to 10 samples shipped to one CLP laboratory under one Case Number and RAS analytical program.

Please note that the TR includes a chain-of-custody record which is located at the bottom of the form. The form is used as physical evidence of sample custody. According to EPA enforcement requirements, official custody of samples must be maintained and documented from the time of collection until the time the samples are introduced as evidence in the event of litigation. You are responsible for the care and custody of the sample until sample shipment.

A sample is considered to be in your custody if any of the following criteria are met:

1. The sample is in your possession or is in your view after being in your possession,
2. The sample was in your possession and then locked up or sealed to prevent tampering, or
3. The sample is in a secured area.

CLP sample types are defined by the RAS analytical program. There are currently three organic/inorganic programs: Low/medium concentration inorganic, low/medium concentration organic, and high concentration organic. Low/medium inorganic samples may be analyzed for Total Metals, Cyanide or both. Low/medium organic samples may be analyzed for Volatile Organics (VOAs), Base/Neutral/Acid (BNAs), Pesticide/PCBs, or any combination of these. High concentration organic samples may be analyzed for VOAs, BNA/Pesticide/PCBs, and Aroclors/toxaphenes. Inorganic samples are documented on Inorganic TRs. Organic and high concentration samples are documented on Organic TRs.

A CLP sample is one matrix - water or soil - never both. The CLP sample is further defined as consisting of all the sample aliquots from one station location, for each matrix and RAS analytical program. For example, let's say you were sampling at Pond A. You plan to collect one water sample and one soil/sediment sample, each to be analyzed for VOAs, BNAs, Pesticide/PCBs, Total Metals and Cyanide. All the bottles for the <u>organic water</u> analyses at this station - VOA vials, BNA jars, and Pesticide/PCB jars - make up one organic CLP sample, not three. All of the bottles for the organic soil analysis make up the second organic CLP sample. The bottle for inorganic soil analysis makes up the second inorganic CLP sample from Pond A. Even though you have collected a water and a soil for five different analyses from Pond A, you've collected four CLP samples - an organic water, organic soil, inorganic water, and an inorganic soil.

The CLP generates unique Sample Numbers that must be assigned to each organic, and inorganic sample. The unique CLP Sample Numbers are printed at SMO on adhesive labels and distributed to the Regional RSCC as requested. It is your responsibility to assign this critical Sample Number correctly and to transcribe it accurately on the TR.

Organic Sample Numbers are in the format XX123, and have ten labels per strip: four for extractables, two for VOAs, and four blank (extra). (See Attachment 1.) DESTROY THE UNUSED LABELS to prevent duplication of Sample Numbers.

Inorganic Sample Numbers are in the format MXX123 and have seven labels per strip: two for Total Metals, two for Cyanide and three extra (see Attachment 1). Remember that the unique Sample Number must only be used once. DESTROY THE EXTRA LABELS.

Use only the labels provided to the Region in which you are sampling. CLP Sample Numbers are alphabetically coded to correspond with each Region as follows:

Letter Code Organic	Inorganic	Region	Letter Code Organic	Inorganic	Region
A	MA	I	F	MF	VI
B	MB	II	G	MG	VII
C	MC	III	H	MH	VIII
D	MD	IV	Y	MY	IX
E	ME	V	J	MJ	X

REMEMBER:

- o TRs must be used for each Case No. with every shipment of samples to each CLP laboratory.
- o Organic samples, high concentration samples, and inorganic samples are assigned separate, unique Sample Numbers. Each sample consists of all the sample aliquots from a sample station location for analysis in one of the three analytical programs.
- o A CLP RAS sample will be analyzed as either a water or a soil sample.
- o Prevent accidental duplication of Sample Numbers by destroying unused labels.
- o Use the Sample Numbers specific to your Region.
- o Call SMO (telephone number 703/557-2490 or 703/684-5678) if you have any questions about using TRs.

B. Completing the Form - Case Documentation

Enter the SAS No. (if applicable) and Case No. at the top right of the form. Complete the boxes in the header:

Box No. 1

Project Code/Site Information

Enter the Project Code; Account Code; Regional Information; Non-Superfund Program; Site Name; City, State, and Site Spill Identifier in the designated spaces.

If sampling is not under the Superfund program, enter the name of program, e.g., RCRA, in the box titled "Non-Superfund program".

Box No. 2

Regional Information:

Enter the Region number, the name of your sampling company, and your name and signature in the designated spaces.

Box No. 3

Type of Activity:

Check Funding Level of sampling. Next check the code which describes the task of the sampling mission:

Funding Level

SF	- Superfund
PRP	- Potential Responsible Party
ST	- State
FED	- Federal

Pre-Remedial

PA	- Preliminary Assessment
SSI	- Screening Site Investigation
LSI	- Listing Site Investigation

Remedial

RIFS	- Remedial Investigation Feasibility Study
RD	- Remedial Design
O&M	- Operations and Maintenance
NPLD Delete	- National Priorities List

Removal

CLEM	-	Classic Emergency
REMA	-	Removal Assessment
REM	-	Removal
OIL	-	Oil Response
UST	-	Underground Storage Tank Response

Box No. 4

Shipping Information:

Enter the date shipped, the carrier for example; Federal Express, Purolator, or Airborne and the airbill number in the appropriate spaces.

Box No. 5

Ship To:

Enter the name of the CLP Laboratory contact (Sample Custodian), laboratory and its full address in the box.

Box No. 6

Preservative

Box provides a list of commonly used preservatives. Please enter the appropriate preservative used in Column D.

Box No. 7

Sample Description

Box provides a list of the description/matrices of samples that are collected. Please enter appropriate description in Column A.

C. Completing the Form - Sample Documentation

Carefully transcribe the CLP Sample No. from the printed sample labels on the TR in the space provided.

Complete columns A through G to describe the sample:

Column A. Sample Description:

Enter the appropriate sample description code from Box 7.

NOTE: Describe BLANKS as #3 "Leachate" in Column A.

Note: Item #6 "Oil" and Item #7 "Waste" are for RAS PLUS SAS projects only. Do not ship oily samples or waste samples without making prior arrangements with SMO.

Column B. Concentration:

Organic - If sample is estimated to be low or medium concentration, enter "L". When shipping RAS Plus SAS High Concentration samples (previously arranged with SMO), enter "H".

Inorganic - Enter "L" for low concentration, "M" for medium concentration, and "H" for high concentration (under previous RAS Plus SAS arrangement).

NOTE: Ship medium and high concentration organic and inorganic samples in metal cans.

Column C: Sample Type Composite/Grab

Please enter which type of sample you collected.

Column D: Preservative Used

Please enter preservation used (i.e., HCL, NAOH, HNO_3, H_2SO_4) refer to Box 6 or the reference number of the preservation (1-7,N).

Column E: RAS Analysis:

Check the analytical fractions requested for each sample, for example, VOAs, SVs, and Pesticides are for low/medium concentration organics. Total metals and cyanide are for low/medium concentration inorganics. VOAS, SV/Pesticides and Aroclors are for high concentration organics. Metals, Cyanide, pH/conductivity are for high concentration inorganic samples.

Note: Either total or dissolved metals can be requested for each individual inorganic sample assigned a unique sample number, but not both analyses. ARO/TOX analyses can only be requested for high concentration samples.

Column F: Regional Specific Tracking Number or Tag Numbers.

Enter the Region Specific tracking number or tag number in the space provided.

Column G: Station Location Number:

Enter the station location in the space provided.

Column H: Mo/Day/Year/Time of Sample Collection:

Record the month, day, year, and time in military time (e.g. 1600 hours = 4:00 pm), of sample collection.

Column I: Sampler Initials

Enter your initials

Column J: Corresponding CLP Organic/Inorganic Sample No.:

Enter the corresponding CLP Sample No. for organic or inorganic analysis.

Column K: Designated Field QC

Enter the appropriate qualifier for "Blind" Field QC samples in this column.

Please note that all samples must have a qualifier.

Blind Field QC	Qualifier
Blind Blanks	B
Blind Field Duplicates	D
Blind Field Spikes	S
Blind PE Samples	PE
Not a QC Sample	___

Box Titled "Shipment for Case Complete (Y/N)":

This should reflect the status of the samples scheduled at a lab for a specific Case. When ALL samples scheduled/collected for shipment to a lab for a specific Case have been shipped the Case is complete.

Box Titled "Page 1 of "

Please enter the number of TRs per shipment.

Box Titled "Sample used for Spike and /or Duplicate"

Please enter sample used for spike and or duplicate sample.

Box Titled "Additional Sampler Signatures"

Please record any additional sampler signatures you are unable to record in Box 2.

Box Titled "Chain of Custody Seal Number"

Sampler should enter the Chain of Custody Seal Number if applicable.

Box Titled "Split Samples Accepted/Declined":

Sampler should ask sight owner, PRP, etc. whether they want split samples taken. The split samples are either accepted or declined. Sampler should record their signature and check the appropriate box.

How and when to separate and send Traffic Report/Chain of Custody form copies:

When all paper work has been completed by the sampler and samples are ready to be shipped the bottom two copies of the Traffic Report/Chain of Custody forms should be placed in a plastic bag and taped to the inside of the cooler. The second copy of the Traffic Report/Chain of Custody form must be returned to the SMO within five days of the sample shipment. The top copy is the Regions' copy for their records.

D. Instructions on the Reverse

Instructions summarizing CLP sample volumes, packaging and shipment reporting requirements are printed on the back of the TRs.

EPA United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 818 Alexandria, VA 22313
703-557 2490 FTS 557-2490

Special Analytical Service
Packing List/Chain of Custody

SAS No. 1234 E

1. Project Code
Account Code
Regional Information
Non-Superfund Program
Site Name: Landfill
City, State: Chicago, IL
Site Spill ID: ZZ

2. Region No.: V
Sampling Co.: Your Company
Sampler (Name): Your Name
Sampler Signature: Your Signature

3. Type of Activity
Lead: SF ☐ PRP ☐ ST ☐ FED ☐
Pre-Remedial: PA ☐ SSI ☐ LSI ☐
Remedial: RIFS ☒ RD ☐ RA ☐ O&M ☐ NPLD ☐
Removal: CLEM ☐ REMA ☐ REM ☐ OIL ☐ UST ☐

4. Date Shipped: 3/1/91
Carrier: Fed Ex
Airbill Number: 12345678

5. Ship To
Lab Name
Address
Attn: ______

6. Sample Description (Enter in Column A)
1. Surface Water
2. Ground Water
3. Leachate
4. Rinsate
5. Soil/Sediment
6. Oil
7. Waste
8. Other (Specify)

7. Preservative (Enter in Column C)
1. HCl
2. HNO3
3. $NAHSO_4$
4. H_2SO_4
5. NAOH
6. Other (SAS) (Specify)
7. Ice only
N. Not preserved

Sample Numbers	A Matrix Enter from Box 6	B Conc Low Med High	C Preservative Used from Box 7	D Analysis	E Sample used for spike and/or duplicate	F Regional Specific Tracking Number or Tag Number	G Station Location Identifier	H Mo/Day/Year/Time Sample Collection	I Sampler Initials	J Designated Field QC
1. E01	2	L	4	TOC, Nitr., COD		5-12345	FB-01	3/1/91 9:00		Blank
2. E02	2	L	4	↓ ↓ ↓		5-12347	MW-02	3/1/91 10:00		
3. E03	2	L	4			5-12348	MW-03	3/1/91 11:00		
4. E04	2	L	4		X	5-12349→12350	MW-04	3/1/91 13:00		
5. E01	2	L	7	SO4, TSS, TDS		5-12351	FB-01	3/1/91 9100		Blank
6. E02	2	L	7	↓ ↓ ↓		5-12352	MW-02	3/1/91 10:00		
7. E03	2	L	7			5-12353	MW-03	3/1/91 11:00		
8. E04	2	L	7		X	5-12354→12355	MW04	3/1/91 13100		
9.										
10.										

Shipment for SAS complete? [✓ Y] N

COC Seal #s 45678-4567

CHAIN OF CUSTODY RECORD

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Signature	3/1/91 18:00				

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

Received by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks Is custody seal intact? Y/N/none

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

DATE: 21 MAY 1991

SUBJECT: COMBINATION SAS PACKING LIST/CHAIN OF CUSTODY FORM

FROM: JAN PELS, RSCC

TO: ALL SAMPLERS

The new combination SAS packing list and chain of custody (COC) form has been printed. A limited supply of the form is available for a trial run to work out the bugs. Please use this form for any work you have coming up in the near future so that we can get your feedback for consideration when preparing the final revision. When you use this new form, please note any problems you have filling it out and forward these comments to me by June 5, 1991. Any improvements in the form will be made then prior to the final printing. Since this form was modeled after the combination TR/COC form, any improvements that will be made to the TR/COC form will automatically be incorporated into this form.

Please note that there are certain fields that are optional to fill out, such as samplers initials, split sample section, account code, and regional information. The concept with the new form is to eliminate redundant work by having all of the information that is currently written on the chain of custody form and on the traffic report form combined on one form, so keep this in mind when using the form.

If you are tracking bottle lot numbers, cooler numbers, etc. on the current COC forms, you can use the blank space across the middle of the form or blank space above the top border to write this information in.

Note that since you are listing tag numbers and preservatives, that you must list the analytical parameters in groups; this means that if you are collecting water samples for analytes such as total organic carbon, sulfate, chemical oxygen demand, total dissolved solids, etc., each group of analytes which will be taken out of a specifically preserved bottle should be listed on one line. See the attached example form.

Since these forms must be filled out on a per cooler basis, like the current chain of custody form, the fact that you can only list up to 10 samples shouldn't be an issue since you are limited by the size of the cooler. A second form can be filled out for additional samples in the cooler.

Remember to still write in the chain of custody seal numbers across the blank space between the SAS information and the COC information. It doesn't really matter where you list these numbers on the form as long as it doesn't interfere with other information on the form. The revised form will have a box for the COC seal numbers.

I must remind you that if you have more than one lab performing SAS analyses under the same SAS number, you must assign different sample numbers each lab's samples. Since SAS sample numbers are not tracked in a database, the field length for SAS sample numbers is not fixed. You can have sample numbers as high as E1000, as an example.

The lower right hand corner has a section for documenting whether split samples were accepted/declined by any PRPs. If you are currently using a separate form for this purpose, please let me know. The Office of Regional Counsel will need to make a determination on whether you can use this field in place of your current form. This issue was not raised during the review that was done by the ORC.

Attached is an example of the form filled out. Please have samplers review this form carefully prior to using them in the field.

One major change is that the top copy of the form is submitted to the RSCC, with original signatures, to include in the evidence file. SMO receives the second copy and the lab gets the bottom two copies. Once the lab signs their copies, the lab returns them to SMO and the Region, so that we will have their original signature for the the evidence file. **PLEASE STRESS THIS TO ALL FIELD SAMLERS, SINCE THIS DOCUMENT IS USED TO TRACE THE SAMPLE FROM COLLECTION TO RECEIPT AT THE LAB AND IS A VERY IMPORTANT DOCUMENT.** You may make a photocopy to keep in your files, but you must send us the original.

Please use this form as soon as you can in place of the old SAS packing lists and chain of custody forms. Once our small supply is used up, we'll go back to the old forms until the final, revised forms are printed.

Remember that for samples shipped to the CRL, the regular Chain of Custody form must be used with the CRL request forms. This combination form, as well as the TR/COCs are only for use in the CLP.

Please call if you have any questions on the use of this form.

Thank you.

APPENDIX E

SPECIFICATIONS AND GUIDANCE FOR OBTAINING CONTAMINANT FREE SAMPLE CONTAINERS

United States
Environmental Protection
Agency

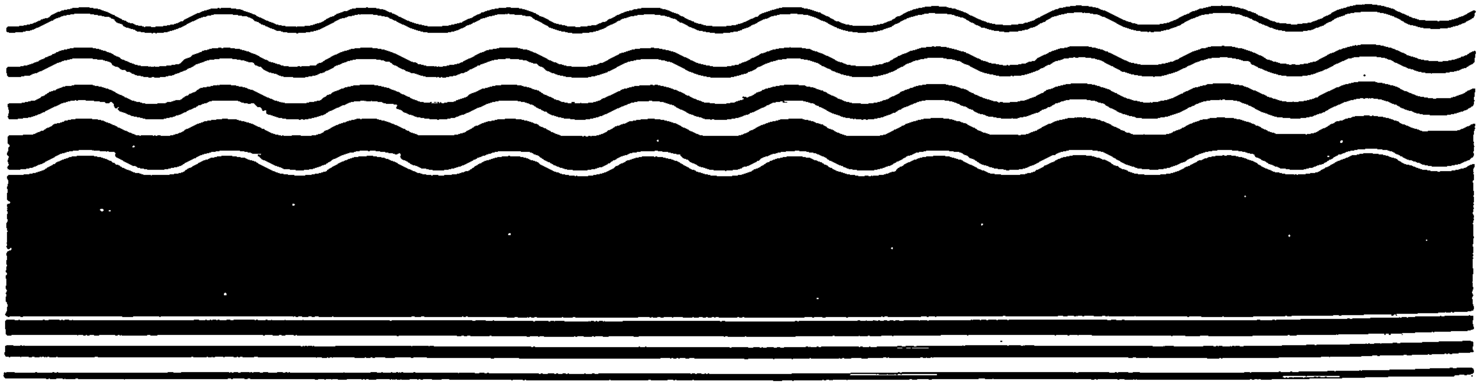
Office of
Solid Waste and
Emergency Response
Washington, DC 20460

Publication 9240.0-05A
EPA540/R-93/051
PB93-963316
December 1992

Superfund

EPA

Specifications and Guidance for Contaminant-Free Sample Containers



OSWER Directive # 9240.0-05A
December 1992

SPECIFICATIONS AND GUIDANCE
FOR
CONTAMINANT-FREE SAMPLE CONTAINERS

Office of Emergency and Remedial Response
Office of Solid Waste and Emergency Response
U.S. Environmental Protection Agency
Washington, DC 20460

TABLE OF CONTENTS

SECTION I

INTRODUCTION

In August 1989, the Environmental Protection Agency's (EPA) Office of Emergency and Remedial Response (OERR) decentralized Superfund's Sample Container Repository program (OSWER Directive #9240.0-05). In conjunction with the decentralization of Superfund's bottle program, OERR issued specifications and guidance for preparing contaminant-free sample containers to assist the Regions in obtaining appropriate sample containers from commercially available suppliers.

The December 1992 version of "Specifications and Guidance for Contaminant-Free Sample Containers" revises the specifications and provides a single source of standardized specifications and guidance on appropriate cleaning procedures for preparing contaminant-free sample containers that meet all Contract Laboratory Program (CLP) detection/quantitation limits, including those for low concentration analyses.[1] Although the specifications and guidance procedures contained in this document are based on CLP low concentration requirements, they also are suitable for use in other analytical programs.

Specifications and guidance for preparing contaminant-free sample containers are provided in the sections that follow and are intended to describe one approach for obtaining cleaned, contaminant-free sample containers for use by groups performing sample collection activities under Superfund and other hazardous waste programs. Although other cleaning procedures may be used, sample containers must meet the criteria specified in Section II. In certain instances, the user of the sample containers may require exact adherence to the cleaning procedures and/or quality control analysis described in this document. In other instances, the user may require additional or different cleaning procedures and/or quality control analysis of the sample containers. The specific needs of the bottle user will determine the requirements for the cleaning and quality control analysis of the sample containers as long as the minimum criteria are met. It is the responsibility of the bottle user to define the sample container preparation, cleaning, and quality control requirements.

The document has been extensively reviewed and revised since the August 1989 iteration, and important enhancements have been incorporated, including:

- Removing references to the color of the closures;
- Allowing the use of polypropylene closures as an alternative to phenolic closures;
- Referencing CLP Low Concentration Organics and Inorganics Statements of Work for the analysis of calibration verification solutions and blanks;
- Including cleaning and quality control procedures for fluoride and nitrate/nitrite;
- Removing the hexane rinse from the cleaning procedure for container types A, E, F, G, H, J, and K (semivolatile organics, pesticides, metals, cyanide, and fluoride in soils and water);

---

[1] Because this document does not address the procurement of contaminant-free sample containers, the title was changed from "Specifications and Guidance for Obtaining Contaminant-Free Sample Containers" to "Specifications and Guidance for Contaminant-Free Sample Containers."

- Adding the recommendation that the bottle vendor establish and submit a Quality Assurance Plan (QAP);

- Changing the QA/QC documentation requirements so that copies of the raw data from the analyses of the QC containers are available upon request and not automatically sent to the bottle purchaser;

- Changing the permanent lot number assignment to a nine-digit number from an eight-digit number, where the extra digit represents the analysis parameter;

- Adding Chemical Abstract Services (CAS) registry number for the inorganic analytes in Table 1; and

- Recommending an annual demonstration of the bottle vendor's ability to meet detection limits and establish reproducibility of the cleaning techniques.

OERR and the EPA Regions decided to use the most stringent CLP requirements available to set the specifications for obtaining contaminant-free sample containers. As a result, the CLP Inorganics and Organics Low Concentration Statement of Work (SOW) requirements were selected as the basis for these specifications. Major factors in this decision included the desire to have a set of bottle cleaning specifications that met or exceeded all analytical requirements and the related need to avoid potential misuse of cleaned bottles (e.g., using a container cleaned by a multi-concentration procedure for a low concentration sample). OERR will reevaluate this decision if the low concentration requirements are deemed to be too stringent.

Most environmental sampling and analytical applications offer numerous opportunities for sample contamination. For this reason, contamination is a common source of error in environmental measurements. The sample container itself represents one such source of sample contamination. Hence, it is vital that sample containers used within the Superfund program meet strict specifications established to minimize contamination which could affect subsequent analytical determinations. Superfund sampling and analysis activities require all component materials (caps, liners, septa, packaging materials, etc.) provided by the bottle preparer to meet the criteria limits of the bottle specifications listed within Section II.

Section III provides guidance on cleaning procedures for preparing contaminant-free sample containers that meet the specifications contained in Section II. The procedures provided in this section are intended to provide sample containers that meet all current CLP Low Concentration Inorganics and Organics detection/quantitation levels.

In selecting cleaning procedures for sample containers, it is important to consider all of the parameters of interest. Although a given cleaning procedure may be effective for one parameter or type of analysis, it may be ineffective for another. When multiple determinations are performed on a single sample or on a subsample from a single container, a cleaning procedure may actually be a source of contamination for some analytes while minimizing contamination in others. It should be the responsibility of the bottle supplier to verify that the cleaning procedures actually used satisfy the quality control requirements set forth in Section IV.

Two aspects of quality assurance (i.e., quality control and quality assessment) must be applied to sample containers as well as to the analytical measurements. Quality control includes the application of good laboratory practices and standard operating procedures especially designed for the cleaning of sample containers. The cleaning operation should be based on protocols especially designed for specific contaminant problems. Strict adherence to these cleaning protocols is imperative. Quality assessment of the cleaning process depends largely on monitoring for adherence to the respective protocols. Because of their critical role in the quality assessment of the cleaning operation, protocols must be carefully designed and followed. Guidance is provided in Section IV on design and implementation of quality assurance and quality control protocols.

SECTION II

SAMPLE CONTAINER AND COMPONENT MATERIAL SPECIFICATIONS

This Section identifies sample containers commonly used in the Superfund program and provides specifications for contaminant-free sample containers for each bottle type.

A. CONTAINER MATERIAL

A variety of factors affect the choice of containers and cap material. These include resistance to breakage, size, weight, interferences with analytes of interest, cost, and availability.

Container types A through L (Figure 1, pages 6-7) are designated as the type of sample containers that have been used successfully in the past. Kimax or Pyrex brand borosilicate glass is inert to most materials and is recommended where glass containers are used (i.e., pesticides and other organics). Conventional polyethylene is recommended when plastic is acceptable because of its lower cost and lower adsorption of metal ions. The specific sampling situation will determine the use of plastic or glass.

While the sample containers shown in Figure 1 are utilized primarily for Superfund sampling activities, they also may be used for sampling activities under other programs, such as the Resource Conservation and Recovery Act (RCRA).

B. MAXIMUM CONTAMINANT LEVEL SPECIFICATIONS FOR SAMPLE CONTAINERS

The CLP, through a series of technical caucuses, has established inorganic Contract Required Detection Limits (CRDL) and organic Contract Required Quantitation Limits (CRQL) which represent the minimum quantities needed to support the hazardous substance identification and monitoring requirements necessary for remedial and other actions at hazardous waste sites.

For inorganic sample containers, the CRDLs listed in Table 1, page 8, are the specifications for maximum trace metal contamination. Concentration at or above these limits on any parameter should preclude these containers from use in collecting inorganic samples.

The CRQL specifications for organic sample containers are listed in Table 2, pages 9-13. When the CRQL in Table 2 is multiplied by the appropriate factor listed below, the resulting value then represents the maximum concentration allowed for particular sample containers based on organic CLP sample sizes for routine analyses.

Container type	Multiple of CRQL
A	1.0
B	0.5
D	10.0
E	8.0
F	4.0
G	2.0
H	0.5
J	0.5
K	2.0

The philosophy used for determining the maximum permissible amount of contamination in a sample container was to consider the number of aliquots of sample that are available in the container and assume that the contamination present would be uniformly distributed in all of the aliquots. This assumption, and the assumption that there should be no more than one-half the CRQL contributed by the container, resulted in the establishment of contamination limits by container type. For example, the volume of container type D is sufficient to allow 20 volatile determinations. Therefore, if 10 times the CRQL of contaminant is present in the cleaned bottle, each aliquot tested will contain one-half of the CRQL of contaminant due to the contribution from the bottle.

C. GROSS CONTAMINATION

Gross contamination is defined as greater than two hundred times the acceptable concentration values in Tables 1 or 2 (multiplied by the appropriate factor), unless the cleaning procedure is successful in reducing the amount of contamination to within specifications. If this is not achieved, the grossly contaminated materials should be discarded and replaced to prevent cross contamination with other batches of containers. The bottle preparer should inspect all materials to ensure conformance with the required specifications.

FIGURE 1

SAMPLE CONTAINER SPECIFICATIONS

Container Type	Specifications
A	Container: 80-oz amber glass, ring handle bottle/jug, 38-mm neck finish. Closure: polypropylene or phenolic cap, 38-430 size; 0.015-in Teflon liner. Total Weight: 2.45 lbs.
B	Container: 40-mL glass vial, 24-mm neck finish. Closure: polypropylene or phenolic, open-top, screw cap, 15-cm opening, 24-400 size. Septum: 24-mm disc of 0.005-in Teflon bonded to 0.120-in silicon for total thickness of 0.125-in. Total Weight: 0.72 oz.
C	Container: 1-L high-density polyethylene, cylinder-round bottle, 28-mm neck finish. Closure: polyethylene cap, ribbed, 28-410 size; F217 polyethylene liner. Total Weight: 1.89 oz.
D	Container: 120-mL wide mouth, glass vial, 48-mm neck finish. Closure: polypropylene cap, 48-400 size; 0.015-in Teflon liner. Total Weight: 4.41 oz.
E	Container: 16-oz tall, wide mouth, straight-sided, flint glass jar, 63-mm neck finish. Closure: polypropylene or phenolic cap, 63-400 size; 0.015-in Teflon liner. Total Weight: 9.95 oz.
F	Container: 8-oz short, wide mouth, straight-sided, flint glass jar, 70-mm neck finish. Closure: polypropylene or phenolic cap, 70-400 size; 0.015-in Teflon liner. Total Weight: 7.55 oz.

FIGURE 1

SAMPLE CONTAINER SPECIFICATIONS

(Continued)

Container Type	Specifications
G	Container: 4-oz tall, wide mouth, straight-sided, flint glass jar, 48-mm neck finish. Closure: polypropylene or phenolic cap, 48-400 size; 0.015-in Teflon liner. Total Weight: 4.70 oz.
H	Container: 1-L amber, Boston round, glass bottle, 33-mm pour-out neck finish. Closure: polypropylene or phenolic cap, 33-430 size; 0.015-in Teflon liner. Total Weight: 1.11 lbs.
J	Container: 32-oz tall, wide mouth, straight-sided, flint glass jar, 89-mm neck finish. Closure: polypropylene or phenolic cap, 89-400 size; 0.015-in Teflon liner. Total Weight: 1.06 lbs.
K	Container: 4-L amber glass, ring handle bottle/jug, 38-mm neck finish. Closure: polypropylene or phenolic cap, 38-430 size; 0.015-in Teflon liner. Total Weight: 2.88 lbs.
L	Container: 500-mL high-density polyethylene, cylinder-round bottle, 28-mm neck finish. Closure: polypropylene cap, ribbed, 28-410 size; F217 polyethylene liner. Total Weight: 1.20 oz.

TABLE 1

INORGANIC ANALYTE SPECIFICATIONS

	Analyte	CAS Number	CRDL[1] (μg/L)
1.	Aluminum	7429-90-5	100
2.	Antimony	7440-36-0	5
3.	Arsenic	7440-38-2	2
4.	Barium	7440-39-3	20
5.	Beryllium	7440-41-7	1
6.	Cadmium	7440-43-9	1
7.	Calcium	7440-70-2	500
8.	Chromium	7440-47-3	10
9.	Cobalt	7440-48-4	10
10.	Copper	7440-50-8	10
11.	Iron	7439-89-6	500
12.	Lead	7439-92-1	2
13.	Magnesium	7439-95-4	500
14.	Manganese	7439-96-5	10
15.	Mercury	7439-97-6	0.2
16.	Nickel	7440-02-0	20
17.	Potassium	7440-09-7	750
18.	Selenium	7782-49-2	3
19.	Silver	7440-22-4	10
20.	Sodium	7440-23-5	500
21.	Thallium	7440-28-0	10
22.	Vanadium	7440-62-2	10
23.	Zinc	7440-66-6	20
24.	Cyanide	57-12-5	10
25.	Fluoride	16984-48-8	200
26.	Nitrate/Nitrite	1-005	100

---

[1] CRDLs are based on the CLP Inorganics Low Concentration SOW

TABLE 2

ORGANIC COMPOUND SPECIFICATIONS

	Volatiles	CAS Number	CRQL[1] (μg/L)
1.	Chloromethane	74-87-3	1
2.	Bromomethane	74-83-9	1
3.	Vinyl Chloride	75-01-4	1
4.	Chloroethane	75-00-3	1
5.	Methylene Chloride	75-09-2	2
6.	Acetone	67-64-1	5
7.	Carbon Disulfide	75-15-0	1
8.	1,1-Dichloroethene	75-35-4	1
9.	1,1-Dichloroethane	75-34-3	1
10.	cis-1,2-Dichloroethene	156-59-4	1
11.	trans-1,2-Dichloroethene	156-60-5	1
12.	Chloroform	67-66-3	1
13.	1,2-Dichloroethane	107-06-2	1
14.	2-Butanone	78-93-3	5
15.	Bromochloromethane	74-97-5	1
16.	1,1,1-Trichloroethane	71-55-6	1
17.	Carbon Tetrachloride	56-23-5	1
18.	Bromodichloromethane	75-27-4	1
19.	1,2-Dichloropropane	78-87-5	1
20.	cis-1,3-Dichloropropene	10061-01-5	1
21.	Trichloroethene	79-01-6	1
22.	Dibromochloromethane	124-48-1	1
23.	1,1,2-Trichloroethane	79-00-5	1
24.	Benzene	71-43-2	1
25.	trans-1,3-Dichloropropene	10061-02-6	1
26.	Bromoform	75-25-2	1
27.	4-Methyl-2-pentanone	108-10-1	5
28.	2-Hexanone	591-78-6	5
29.	Tetrachloroethene	127-18-4	1
30.	1,1,2,2-Tetrachloroethane	79-34-5	1

[1] CRQLs are based on the CLP Organics Low Concentration SOW

TABLE 2 (cont.)

ORGANIC COMPOUND SPECIFICATIONS

	Volatiles	CAS Number	CRQL[1] (μg/L)
31.	1,2-Dibromoethane	106-93-4	1
32.	Toluene	108-88-3	1
33.	Chlorobenzene	108-90-7	1
34.	Ethylbenzene	100-41-4	1
35.	Styrene	100-42-5	1
36.	Xylenes (total)	1330-20-7	1
37.	1,3-Dichlorobenzene	541-73-1	1
38.	1,4-Dichlorobenzene	106-46-7	1
39.	1,2-Dichlorobenzene	95-50-1	1
40.	1,2-Dibromo-3-chloropropane	96-12-8	1

---

[1] CRQLs are based on the CLP Organics Low Concentration SOW

TABLE 2 (cont.)

ORGANIC COMPOUND SPECIFICATIONS

	Semivolatiles	CAS Number	CRQL[1] (µg/L)
1.	Phenol	108-95-2	5
2.	bis-(2-Chlorethyl)ether	111-44-4	5
3.	2-Chlorophenol	95-57-8	5
4.	2-Methylphenol	95-48-7	5
5.	2,2'-oxybis-(1-Chloropropane)	108-60-1	5
6.	4-Methylphenol	106-44-5	5
7.	N-Nitroso-di-n-dipropylamine	621-64-7	5
8.	Hexachloroethane	67-72-1	5
9.	Nitrobenzene	98-95-3	5
10.	Isophorone	78-59-1	5
11.	2-Nitrophenol	88-75-5	5
12.	2,4-Dimethylphenol	105-67-9	5
13.	bis-(2-Chloroethoxy)methane	111-91-1	5
14.	2,4-Dichlorophenol	120-83-2	5
15.	1,2,4-Trichlorobenzene	120-82-1	5
16.	Naphthalene	91-20-3	5
17.	4-Chloroaniline	106-47-8	5
18	Hexachlorobutadiene	87-68-3	5
19.	4-Chloro-3-methylphenol	59-50-7	5
20.	2-Methylnaphthalene	91-57-6	5
21.	Hexachlorocyclopentadiene	77-47-4	5
22.	2,4,6-Trichlorophenol	88-06-2	5
23.	2,4,5-Trichlorophenol	95-95-4	20
24.	2-Chloronaphthalene	91-58-7	5
25.	2-Nitroaniline	88-74-4	20
26.	Dimethylphthalate	131-11-3	5
27.	Acenaphthylene	208-96-8	5
28.	2,6-Dinitrotoluene	606-20-2	5
29.	3-Nitroaniline	99-09-2	20
30.	Acenaphthene	83-32-9	5

---

[1] CRQLs are based on the CLP Organics Low Concentration SOW

TABLE 2 (cont.)

ORGANIC COMPOUND SPECIFICATIONS

	Semivolatiles	CAS Number	CRQL[1] (µg/L)
31.	2,4-Dinitrophenol	51-28-5	20
32.	4-Nitrophenol	100-02-7	20
33.	Dibenzofuran	132-64-9	5
34.	2,4-Dinitrotoluene	121-14-2	5
35.	Diethylphthalate	84-66-2	5
36.	4-Chlorophenyl-phenylether	7005-72-3	5
37.	Fluorene	86-73-7	5
38.	4-Nitroaniline	100-01-6	20
39.	4,6-Dinitro-2-methylphenol	534-52-1	20
40.	N-Nitrosodiphenylamine	86-30-6	5
41.	4-Bromophenyl-phenylether	101-55-3	5
42.	Hexachlorobenzene	118-74-1	5
43.	Pentachlorophenol	87-86-5	20
44.	Phenanthrene	85-01-8	5
45.	Anthracene	120-12-7	5
46.	Di-n-butylphthalate	84-74-2	5
47.	Fluoranthene	206-44-0	5
48	Pyrene	129-00-0	5
49.	Butylbenzylphthalate	85-68-7	5
50.	3,3'-Dichlorobenzidine	91-94-1	5
51.	Benz[a]anthracene	56-55-3	5
52.	Chyrsene	218-01-9	5
53.	bis-(2-Ethylhexyl)phthalate	117-81-7	5
54.	Di-n-octylphthalate	117-84-0	5
55.	Benzo[b]fluoranthene	205-99-2	5
56.	Benzo[k]fluoranthene	207-08-9	5
57.	Benzo[a]pyrene	50-32-8	5
58.	Indeno(1,2,3-cd)pyrene	193-39-5	5
59.	Dibenz[a,h]anthracene	53-70-3	5
60.	Benzo[g,h,i]perylene	191-24-2	5

[1] CRQLs are based on the CLP Organics Low Concentration SOW

TABLE 2 (cont.)

ORGANIC COMPOUND SPECIFICATIONS

Pesticides/PCBs	CAS Number	CRQL[1] (μg/L)
alpha-BHC	319-84-6	0.01
beta-BHC	319-85-7	0.01
delta-BHC	319-86-8	0.01
gamma-BHC (Lindane)	58-89-9	0.01
Heptachlor	76-44-8	0.01
Aldrin	309-00-2	0.01
Heptachlor epoxide	1024-57-3	0.01
Endosulfan I	959-98-8	0.01
Dieldrin	60-57-1	0.02
4,4'-DDE	72-55-9	0.02
Endrin	72-20-8	0.02
Endosulfan II	33213-65-9	0.02
4,4'-DDD	72-54-8	0.02
Endosulfan sulfate	1031-07-8	0.02
4,4'-DDT	50-29-3	0.02
Methoxychlor	72-43-5	0.10
Endrin ketone	53494-70-5	0.02
Endrin aldehyde	7421-36-3	0.02
alpha-Chlordane	5103-71-9	0.01
gamma-Chlordane	5103-74-2	0.01
Toxaphene	8001-35-2	1.0
Aroclor-1016	12674-11-2	0.20
Aroclor-1221	11104-28-2	0.20
Aroclor-1232	11141-16-5	0.40
Aroclor-1242	53469-21-9	0.20
Aroclor-1248	12672-29-6	0.20
Aroclor-1254	11097-69-1	0.20
Aroclor-1260	11096-82-5	0.20

QLs are based on the CLP Organics Low Concentration SOW

SECTION III

SAMPLE CONTAINER PREPARATION AND CLEANING PROCEDURES

This Section is provided as guidance for the preparation of sample containers that meet the contaminant-free specifications contained in Section II. There are various procedures for cleaning sample containers depending upon the analyses to be performed on the sample. The following cleaning procedures are modeled after those specified for the Superfund Sample Container Repository program. Other suitable cleaning procedures exist and may be used as long as the sample containers meet the criteria established in Section II. In some instances, the specific needs of the bottle user may dictate exact adherence to the sample container preparation and cleaning procedures that follow; while in other instances, modifications may be required. It is the responsibility of the bottle user to define the sample container preparation, cleaning, and quality control requirements.

A. Cleaning Procedure for Container Types: A, E, F, G, H, J, and K

1. Sample Type: Semivolatile Organics, Pesticides, Metals, Cyanide, and Fluoride in Soils and Water.

    a. Wash glass bottles, Teflon liners, and caps with hot tap water using laboratory grade nonphosphate detergent.

    b. Rinse three times with copious amounts of tap water to remove detergent.

    c. Rinse with 1:1 nitric acid (reagent grade HNO_3, diluted with ASTM Type I deionized water).

    d. Rinse three times with ASTM Type I organic free water.

    e. Oven dry bottles, liners, and caps at 105-125°C for one hour.

    f. Allow bottles, liners, and caps to cool to room temperature in an enclosed contaminant-free environment.

    g. Rinse bottles with pesticide grade methylene chloride (or other suitable solvents specified by the bottle user) using 20 mL for ½-gallon containers; 10 mL for 32-oz and 16-oz containers; and 5 mL for 8-oz and 4-oz containers.

    h. Oven dry bottles, liners, and caps at 105-125°C for one hour.

    i. Allow bottles, liners, and caps to cool to room temperature in an enclosed contaminant-free environment.

    j. Place liners in lids and cap containers.

    k. Label each container with the lot number and pack in a case.

    l. Label exterior of each case with the lot number.

    m. Store in a contaminant-free area.

h. Label exterior of each case with the lot number.

i. Store in a contaminant-free area.

2. Sample Type: Nitrate/Nitrite in Soils and Water.

a. Substitute reagent grade sulfuric acid (H_2SO_4) for nitric acid in step C.1.c.

b. Follow all other steps in the cleaning procedure described in part C.1 above.

SECTION IV

SAMPLE CONTAINER QUALITY ASSURANCE AND QUALITY CONTROL REQUIREMENTS

A. Quality Assurance

The objectives of this Section are to: (1) present procedures for evaluating quality assurance (QA) information to ensure that specifications identified in Section II have been met: and (2) discuss techniques for the quality control (QC) analysis of sample containers to be used in conjunction with the cleaning procedures contained in Section III.

The bottle vendor should establish a Quality Assurance Plan (QAP) with the objective of providing sound analytical chemical measurements, production procedures, and tracking systems. The QAP should incorporate procedures for the inspection of incoming raw materials; preparation, cleaning, and labeling of container lots; quality control analyses of cleaned container lots; document control, including all documentation required for analysis, packing, shipping, and tracking of container lots; any necessary corrective actions; and any quality assessment measures implemented by management to ensure acceptable performance. The QAP should be available and provided to the bottle purchaser upon request.

Major QA/QC activities should include the inspection of all incoming materials, QC analysis of cleaned lots of containers, and monitoring of the container storage area. Complete documentation of all QC inspection results (acknowledging acceptance or rejection) should be kept as part of the permanent bottle preparation files. QA/QC records (e.g., preparation/QC logs, analytical data, data tapes, storage log) also should be stored in a central location within the facility.

Documentation indicating that the container lot has passed all QA/QC requirements should be provided by the bottle vendor to the bottle purchaser with each container lot. Documentation should include a signed and dated cover statement affirming that all QA/QC criteria were met. Copies of raw data from applicable analyses of the QC containers, laboratory standards, check samples, and blanks should be available and provided upon request. Original documentation should be retained for at least 10 years. Minimum documentation that should be available, if applicable, for each lot of containers includes:

- A statement that "Sample container lot ____ meets or exceeds all QA/QC criteria established in 'Specifications and Guidance for Contaminant-Free Sample Containers;'"
- Reconstructed Ion Chromatographs (RICs) from volatile and semivolatile organics determinations, including calibration verification standards, check samples, and blanks;
- GC chromatographs from pesticides determinations, including calibration verification standards, check samples, and blanks;
- ICP, hydride-ICP, or ICP-MS instrument readouts from metals determinations, including calibration verification standards, check samples, and blanks;
- AA raw data sheets and instrument readouts from metals determinations, including calibration verification standards, check samples, and blanks; and
- Cyanide, fluoride, and nitrate/nitrite raw data sheets and instrument readouts from these determinations, including calibration verification standards, check samples, and blanks.

Prior to the first shipment of containers, and at least annually thereafter, the bottle vendor should demonstrate its ability to meet the CRDLs and CRQLs, and establish the reproducibility of the cleaning techniques for each bottle type. The ability to meet the CRDLs and CRQLs is accomplished through the determination of instrument detection limits (IDLs). The bottle vendor should use the procedures in the current CLP Low Concentration Inorganics and Organics SOWs to determine IDLs. IDLs should be below the CRDLs or CRQLs. To establish the reproducibility for each bottle type, the bottle vendor should randomly pick seven containers from a cleaned lot and analyze as described in the Quality Control Analysis part of this Section. Parameter concentrations should be at or below the CRDL or CRQL for each bottle type. Documentation from these analyses should be available and provided upon request.

1. Incoming Materials Inspection:

A representative item from each case of containers should be checked for conformance with specifications provided in Section II. Any deviation should be considered unacceptable. A log of incoming shipments should be maintained to identify material type, purchase order number, and delivery date. The date of incoming inspection and acceptance or rejection of the material should also be recorded on this log.

2. Quality Control Inspection of Cleaned Lots of Containers:

Following container cleaning and labeling, containers should be randomly selected from each container lot to be used for QC purposes. The two categories of QC containers should be as follows:

a. Analysis QC Containers:

One percent of the total number of containers in each lot should be designated as the analysis QC container(s). For lots of less than 100 containers, one container should be designated as the analysis QC container. The sample container preparer should analyze the analysis QC container(s) to check for contamination prior to releasing the associated container lot for shipment. The QC analyses procedures specified in the Quality Control Analysis part of this Section for determining the presence of semivolatile and volatile organics, pesticides, metals, cyanide, fluoride, and nitrate/nitrite should be utilized.

For each analysis QC container(s), an appropriate QC number should be assigned that cross-references the QC container to the related lot of containers. For example, the QC number could be a seven-digit number sequentially assigned to each lot that has undergone QC analysis. Under this numbering scheme, the first alphabetical character would be the container type letter from Figure 1, the next four digits would be assigned sequentially in numerical order starting with "0001" for the first lot to undergo QC analyses, the sixth character would indicate the number of QC container for the lot, (e.g., "1" for the first QC container in the lot, "2" for the second, etc.) and the last character would be either a "C" to indicate clearance or an "R" to indicate rejection.

If the representative analysis QC container(s) passes QC inspection, the related lot of containers should be released, and the appropriate QC number should be entered in the preparation/QC log to indicate clearance of the lot for shipment.

If the analysis QC container(s) are found to be contaminated per the specified QC analysis procedures, the appropriate QC rejection number should be assigned and entered in the preparation/QC log. Any container labels should be removed and the entire lot returned for reprocessing under a new lot number. Excessive QC rejection for a particular container type should be noted for future reference.

A laboratory standard, check sample, and a blank should be run with each QC analysis. A calibration verification standard should be analyzed once every 12 hours. All QC analysis results should be kept in chronological order by QC report number in a central QC file. The QC numbers assigned should be documented in the preparation/QC log, indicating acceptance or rejection and date of analysis.

A container lot should not be released for shipment prior to QC analysis and clearance. Once the containers have passed QC inspection, the containers should be stored in a contaminant-free area until packaging and shipment.

b. Storage QC Containers:

One QC container per lot should be designated as the storage QC container. The storage QC container should be separated from the lot after cleaning and labeling and should be stored in a designated contaminant-free area for one year. The date the container is placed in the storage area should be recorded in the storage QC container log.

If contamination of the particular container lot comes into question at any time following shipment, the storage QC container should be removed from the storage area and analyzed using the QC analysis procedures for that container type (see Quality Control Analysis, this Section). Upon removal, containers should be logged out of the storage area.

The designated storage area should be monitored continuously for volatile contaminants in the following manner. A precleaned, 40-mL vial that has passed a QC inspection should be filled with ASTM Type I organic-free water and be placed in the storage area. This vial should be changed at one-week intervals. The removed vial should be subjected to analysis for volatile organics as described in the Quality Control Analysis part of this Section. Any peaks indicate contamination. Identify contaminants, if present, and include the results in a report to all clients who purchased bottles from the affected lot(s).

B. Quality Control Analysis

The types of QC analyses correlate with the types of containers being analyzed and their future use in sample collection. The QC analyses are intended for the determination of:

- Semivolatile organics and pesticides;
- Volatile organics;
- Metals;
- Cyanide;
- Fluoride; and
- Nitrate/Nitrite.

QC analyses should be performed according to the container type and related sample type and utilize the specific method(s) described below.

1. Determination of Semivolatile Organics and Pesticides:

Container Types: A, E, F, G, H, J, and K

a. Sample Preparation:

- Add 60 mL of pesticide-grade methylene chloride to the container and shake for two minutes.

- Transfer the solvent to a Kuderna-Danish (KD) apparatus equipped with a three-ball Snyder column. Concentrate to less than 10 mL on a steam bath. Split the solvent into two 5 mL fractions for semivolatile and pesticide determinations.

- Add 50 mL of pesticide-grade hexane (for pesticide determinations only) to the KD apparatus by slowly pouring down through the Snyder column. Concentrate to less than 10 mL to effect solvent replacement of hexane for methylene chloride.

- Concentrate the solvent to 1 mL using a micro-Snyder column.

- Prepare a solvent blank by adding 60 mL of the rinse solvent used in step "g" of the cleaning procedure for container types A, E, F, G, H, J, and K (Section III page 14) directly to a KD apparatus, and proceed as above.

b. Semivolatile Organics Sample Analysis:

- Instrument calibration should be performed as described in the most recent CLP Low Concentration Organics SOW with the following exceptions:

  (1) If problems are encountered meeting the %RSD criteria on the initial calibration for semivolatiles, the high concentration point should be deleted and a four-point calibration used.

  (2) The low concentration standard should be used for the continuing calibration standard for semivolatile analyses.

  (3) The percent difference window should be widened to ± 30 percent for all compounds.

- Inject 1 μL of solvent into a gas chromatograph/mass spectrometer (GC/MS).

- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Organics SOW.

- Blanks should be run as described in the most recent CLP Low Concentration Organics SOW.

- If compounds other than those listed in Table 2 are found in the container blank that are not in the solvent blank at a peak height or peak area greater than 20 percent of the nearest internal standard, the containers should be rejected (See Section II, Table 2 for compound specifications).

- Identify and quantitate any contaminant(s) that cause rejection of a container lot.

- A standard mixture of the nine semivolatile organic compounds listed in Table 3 (page 26) with concentrations in the 5-20 ppb range should be analyzed to ensure that sensitivities are achieved that will meet contract required quantitation limits. This standard should be prepared from a different source from the calibration standards.

c. Pesticides Sample Analysis:

- Instrument calibration should be performed as described in the most recent CLP Low Concentration Organics SOW.
- Inject 1 μL of solvent into a gas chromatograph (GC) equipped with an electron capture detector (ECD).
- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Organics SOW.
- Blanks should be run as described in the most recent CLP Low Concentration Organics SOW.
- If compound peaks other than those listed in Table 2 are at a peak height or peak area greater than 5 percent of the peak height or peak area of tetra chloro-m-xylene, the containers should be rejected (See Section II, Table 2).
- Identify and quantitate any contaminant(s) that cause rejection of a container lot.
- A standard mixture of the seven pesticide compounds listed in Table 3 (page 26) with concentrations in the 0.01 to 1 ppb range should be analyzed to ensure that sensitivities are achieved that will meet contract required quantitation limits. This standard should be prepared from a different source from the calibration standards.

2. Determination of Volatile Organics:

Container Types: B and D

a. Sample Preparation:

- Fill the container with ASTM Type I organic-free water.
- Cap the container and let stand for 48 hours.

b. Sample Analysis:

- Instrument calibration should be performed as described in the most recent CLP Low Concentration Organics SOW with the following exceptions:

  (1) If problems are encountered meeting the %RSD criteria on the initial calibration for volatiles, the high concentration point should be deleted and a four-point calibration used.

  (2) The low concentration standard should be used for the continuing calibration standard for volatile analyses.

  (3) The percent difference window should be widened to ± 30 percent.

- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Organics SOW.

- Blanks should be run as described in the most recent CLP Low Concentration Organics SOW. The blank should consist of an aliquot of the ASTM Type I water used in the sample preparation.

- If compounds other than those listed in Table 2 are found in the container blank that are not in the solvent blank at a peak height or peak area greater than 20 percent of the nearest internal standard, the containers should be rejected (See Section II. Table 2 for compound specifications).

- Identify and quantitate any contaminant(s) that cause rejection of a container lot.

- A standard mixture of the five volatile organic compounds listed in Table 3 (page 26) with concentrations in the 1-5 ppb range should be analyzed to ensure that sensitivities are achieved that will meet contract required quantitation limits. This standard should be prepared from a different source from the calibration standards.

3. Determination of Metals:

Container Types: A, C, E, F, G, H, J, K and L

a. Sample Preparation:

- Add 100 mL of ASTM Type I deionized water to the container, and acidify with 1.0 mL of reagent-grade HNO_3. Cap and shake for three to five minutes.

- Cap the container and let stand for 48 hours.

- Treat the sample as a dissolved metals sample. Analyze the undigested water using the most recent CLP Low Concentration Inorganics SOW.

b. Sample Analysis:

- Instruments used for the analysis of the samples should meet the contract required detection limits in Table 1.

- The ASTM Type I deionized water should be analyzed before use on the bottles that are designated for analysis to ensure that contaminated water is not used for rinsing the bottles.

- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW.

- Blanks should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW. A calibration blank is a solution made up exactly like the sample preparation solution. The calibration blank should be less than the values contained in Table 1.

- A set of standards in the expected working range should be analyzed with each analytical run. The acid matrix of the standards, blank, and quality control samples should match that of the samples.

- Concentrations at or above the detection limit for each parameter (listed in Table 1) should be cause for rejection of the lot of containers. NOTE: The sodium detection limit for container types A. E. F. G. H. J. and K is 5000 μg/L unless the containers will be used for low concentration analyses, then the detection limit is 500 μg/L.

4. Determination of Cyanide:

Container Types: A. C. E. F. G. H. J. K and L

a. Sample Preparation:

- Place 250 mL of ASTM Type I deionized water in the container. Add 1.25 mL of 6*N* NaOH (for container types F and G use 100 mL of ASTM Type I deionized water and 0.5 mL of 6*N* NaOH). Cap the container and shake vigorously for two minutes.

b. Sample Analysis:

- Analyze an aliquot as described in the most recent CLP Low Concentration Inorganics SOW.

- The detection limit should be 10 μg/L or lower.

- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW.

- Blanks should be run as described in the most recent CLP Low Concentration Inorganics SOW. The calibration blank should consist of an aliquot of the ASTM Type I water used above.

- A set of standards in the expected working range, a check sample, and blank should be prepared exactly as the sample was prepared.

- The detection of 10 μg/L cyanide (or greater) should be cause for rejection of the lot of containers. NOTE: Contamination could be due to the container, the cap, or the NaOH.

5. Determination of Fluoride:

Container Types: A. C. E. F. G. H. J. K and L

a. Sample Preparation:

- Place 250 mL of ASTM Type I deionized water in the container (for container types F and G use 100 mL of ASTM Type I deionized water). Cap the container and shake vigorously for two minutes.

b. Sample Analysis:

- Analyze an aliquot as described in the most recent CLP Low Concentration Inorganics SOW.

- The detection limit should be 200 μg/L or lower.

- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW.

- Blanks should be run as described in the most recent CLP Low Concentration Inorganics SOW. The calibration blank should consist of an aliquot of the ASTM Type I water used above.

- A set of standards in the expected working range, a check sample, and blank should be prepared exactly as the sample was prepared.

- The detection of 200 µg/L (or greater) of fluoride should be cause for rejection of the lot of containers. NOTE: Contamination could be due to the container or the cap.

6. Determination of Nitrate/Nitrite:

Container Types: A, C, E, F, G, H, J, K and L

a. Sample Preparation:

- Place 250 mL of ASTM Type I deionized water in the container (for container types F and G use 100 mL of ASTM Type I deionized water). Cap the container and shake vigorously for two minutes.

b. Sample Analysis:

- Analyze an aliquot as described in the most recent CLP Low Concentration Inorganics SOW.

- The detection limit should be 100 µg/L or lower.

- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW.

- Blanks should be run as described in the most recent CLP Low Concentration Inorganics SOW. The calibration blank should consist of an aliquot of the ASTM Type I water used above.

- A set of standards in the expected working range, a quality control sample, and blank should be prepared exactly as the sample was prepared.

- The detection of 100 µg/L (or greater) of nitrate/nitrite should be cause for rejection of the lot of containers. NOTE: Contamination could be due to the container or the cap.

C. Preparation and Labeling

Sampling for environmental specimens requires that sample containers be transported to field sites prior to sample collection. As a result, considerable time may elapse between the receipt of sample containers and collection of the samples. Because of the large number of samples taken at any one site, accounting for all sample containers can become extremely difficult. The following guidance on the identification and tracking of sample containers is based on procedures that have been used successfully in the CLP bottle program.

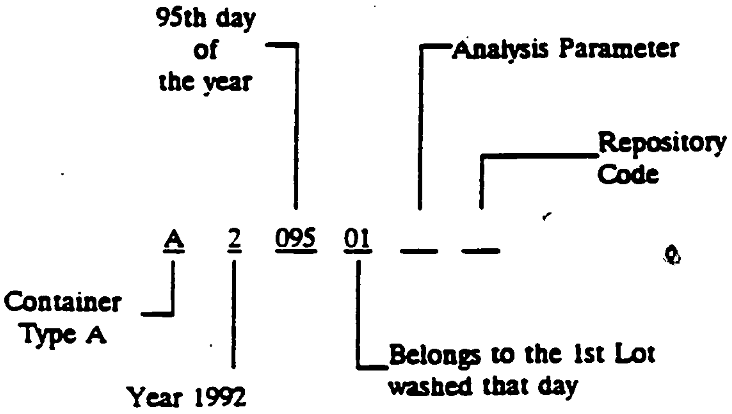
1. Each shipment should be inspected to verify that the requested number of cleaned and prepared sample containers have been supplied and meet the requirements specified in Section II (Tables 1 and 2). If any shipment fails to meet the required specifications, it should be discarded and replaced with a supply of sample containers that meet the required criteria.

2. The sample containers should be removed and prepared in accordance with the methods designated below.

3. A permanent nine-digit lot number should be assigned to each lot of sample containers for identification and tracking purposes throughout the life of the containers. Figure 2 provides an example of a lot number sequence.

FIGURE 2

LOT NUMBER SEQUENCE



a. The first digit represents the container type in Section II (Figure 1).

b. The second digit represents the last digit of the calendar year.

c. The next three digits represents the day of the year on which the sample containers were washed.

d. The sixth and seventh digits represent the daily lot number.

e. The eighth digit represents the analysis parameter where:

A = Semivolatile organics, pesticides, metals, cyanide, and fluoride;
B = Metals, cyanide, and fluoride;
V = Volatile organics;
S = Semivolatile organics and/or pesticides;
M = Metals;
C = Cyanide;
F = Fluoride; and
N = Nitrate/nitrite.

f. The final digit represents the identification of the person who prepared the lot.

4. The lot number for each container should be entered, along with the date of washing, type of container, and number of containers per lot, into the preparation/QC log book.

5. Lot numbers printed with solvent resistant ink on a nonremovable label should remain with the corresponding containers throughout the cleaning procedure.

6. After sample container cleaning and drying, the label should be affixed to the containers in a permanent manner.

7. At least one face should be clearly marked, excluding the top and bottom faces, of each case of sample containers with the assigned lot numbers.

TABLE 3

STANDARD MIXTURES OF ORGANIC COMPOUNDS TO VERIFY SENSITIVITY

Volatiles	Semivolatiles	Pesticides
Methylene Chloride	Nitrobenzene	Gamma-BHC
Acetone	4-Chloroaniline	Heptachlor
2-Butanone	2,6-Dinitrotoluene	Aldrin
Trichloroethene	Diethylphthalate	Dieldrin
Toluene	4-Bromophenyl-phenylether	Endrin
	Hexachlorobenzene	4,4'-DDT
	Pentachlorophenol	Aroclor 1260
	Di-n-butylphthalate	
	bis(2-Ethylhexyl)phthalate	

*U.S. G.P.O.:1993-341-835:81056