

Appendix D

Quality Assurance Project Plan (QAPP)

Prepared for:
National Grid
Brooklyn, New York

Quality Assurance Project Plan

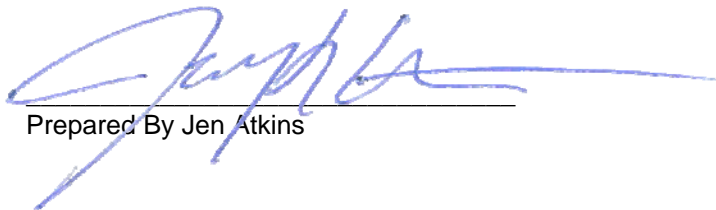
Metropolitan Former MGP Site
Brooklyn, New York
NYSDEC Site No.: 224046
Order on Consent Index #: A2-0552-0606

AECOM, Inc.
May 2009
Document No.: 01765-075

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Prepared By Jen Atkins



Reviewed By Greg Malzon

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List of Acronyms

%R	Percent recovery
ASP	Analytical services program
ASTM	American Society for Testing Materials
CAMP	Community Air Monitoring Plan
CAR	Corrective Action Request
CLP	Contract laboratory program
COC	Chain of custody
CRDLs	Contract Required Detection Limits
CRQLs	Contract Required Quantitation Limits
DQOs	Data quality objectives
DUSR	Data Usability Summary Report
EDD	Electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
GC/MS	Gas Chromatography/Mass Spectroscopy
HASP	Health and safety plan
LIMS	Laboratory information management system
MDLs	Method detection limits
MGP	Manufactured gas plant
MS	Matrix spike
MSD	Matrix spike duplicate
NIST	National Institute of Standards and Technology
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PA	Preliminary assessment
PID	Photoionization detector
PQL	Practical quantitative limit
QA	Quality assurance
QAO	Quality assurance officer
QAPP	Quality Assurance Project Plan
QC	Quality control
RI	Remediation Investigation
RPD	Relative percent difference
SOPs	Standard operating procedures
TCLP	Toxicity characteristics leaching procedure
USEPA	United States Environmental Protection Agency
VOA	Volatile organic analysis
VOCs	Volatile organic compounds

1.0 Introduction

This Quality Assurance Project Plan (QAPP) details the protocols and procedures that will be followed during the proposed Remedial Investigation (RI) that will occur at the National Grid Metropolitan former manufactured gas plant (MGP) site. The purpose of these protocols and procedures is to ensure that all project activities will be performed in a manner consistent with the data quality objectives (DQOs) established for the project and all data collected during the RI are precise, accurate, representative, comparable, and complete.

1.1 Project description

The Metropolitan former MGP site is located at 124 – 136 2nd Avenue, Brooklyn, Kings County, New York 11215, east of the Gowanus Canal, between the Gowanus Expressway (Highway 278) and the New York City Transit train bridge and associated subway rail line. A portion of the site was the subject of previous extensive remedial/redevelopment activities undertaken by independent third parties with NYSDEC oversight. The investigation associated with this QAPP is intended to address those portions of the site that were not associated with the previous remedial/redevelopment activities, i.e. the “Current Site”. These areas are generally bounded to the north and west by the Gowanus Canal, to the east by a parcel of land occupied by the Lowe’s Supply store (part of the previous remediation) and 2nd Avenue, and to the south by 13th Street.

The Current Site is being investigated in accordance with Administrative Consent Order Index # A2-0552-0606 between KeySpan and the NYSDEC. The RI is designed to delineate the extent of MGP impacts observed during the preliminary assessment (PA) performed in September 1986 and the various environmental investigations conducted at the Site between 1997 and 2003.

1.2 Scope of work

The scope of work at the Site is described in the Remedial Investigation Work Plan dated May 2009. The following tasks will be performed as a part of the RI:

- Pre-investigation coordination (i.e., access agreements)
- Utility clearance
- Mobilization
- Surface soil sampling and analysis (if applicable)
- Soil boring advancement, subsurface soil sampling and analysis
- Monitoring well installation and development
- Groundwater sampling and analysis
- Aquifer slug testing at selected locations
- Sub-slab soil vapor and indoor air sampling and analysis
- Investigation-derived waste management
- Community air monitoring
- Site survey
- Data validation evaluation, and reporting

1.3 Data quality objectives

DQOs are qualitative and quantitative statements to ensure that data of known and appropriate quality are obtained during sampling and analysis activities. Data developed during the RI will be used to fulfill the overall objectives of the project. These objectives are to:

- Fill data gaps to determine the nature and extent of MGP impacts at the Site and offsite. Specifically, to delineate the areal extent of MGP impacts, determine the surface and subsurface characteristics of the Site, identify sources of contamination, migration pathways, and potential human or ecological receptors at the Site and offsite. The DQOs for delineation data include:
 - data will identify MGP-related constituents in soil and groundwater
 - data will be collected using a systematic method to delineate the perimeter of MGP-related impacts
 - analytical methods will be of sufficient sensitivity that method detection limits (MDLs) and practical quantitation limits (PQLs) measure constituent concentrations at or below constituent NYSDEC guidance values.
- Perform a soil vapor and indoor air survey in accordance with New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York. The DQOs for vapor intrusion data include:
 - data will identify MGP-related constituents in soil vapor and indoor air (if present)
 - data will be collected using a systematic method to determine whether vapor intrusion of MGP-related impacts is occurring
 - analytical methods will be of sufficient sensitivity to meet a minimum PQL of at most one part per billion.

1.3.1 Data quality levels

There are five analytical levels of data quality which may be used to accomplish these Site objectives. They are typically designated as follows:

- Level I – Field screening or analysis using portable instruments, calibrated to non-compound specific standards
- Level II – Field analysis using portable instruments, calibrated to specific compounds
- Level III – Non-Contract Laboratory Program (CLP/ASP) laboratory methods
- Level IV – ASP-CLP Routine Analytical Services methods
- Level V – Non-standard analytical methods.

To meet the specific objectives of this project, Levels I and III data quality levels will be utilized.

1.3.1.1 Level I – field screening methods

These tests, which are quantitative and/or semi-quantitative, are classified as field screening evaluations, even though they typically are not used for site characterization purposes.

Soil and soil headspace screening will be conducted using a photoionization detector (PID) to determine the soil boring interval(s) that will be submitted for analytical laboratory analysis.

In addition, as part of the Health and Safety Plan (HASP) and the Community Air Monitoring Plan (CAMP), worker safety and ambient air quality may be monitored using one or more of a variety of field screening tests. Applicable equipment may include but not be limited to: a PID, Draeger tubes, and personal monitors to test for volatile organic vapors, or a combustible gas indicator to test for explosive potential. Worker health and safety requirements are specified in the HASP.

1.3.1.2 Level III – Non-Contract Laboratory Program (CLP/ASP) laboratory methods

Samples will be analyzed according to the required United States Environmental Protection Agency (USEPA) SW-846, ASTM, and USEPA Compendium air methods described in the most recent editions of the USEPA reference methods (see section 7.0). Data will be analyzed using Level III Non-Contract Laboratory Program (CLP/ASP) laboratory methods; however, the laboratory will provide Level IV data packages for all data including hazardous waste classification data. Laboratory data will be reported in the New York State Analytical Services Program (ASP) Category B deliverables format. This level of data quality will ensure the generation of legally and technically defensible data for project use. The laboratory performing the analysis of samples will be certified for the specific parameters pursuant to NYSDOH ELAP Certification program.

2.0 Project organization

This RI will be completed for National Grid by AECOM Environment, an environmental contractor (the Contractor), who will arrange for the drilling and analytical services and provide an onsite field representative to perform the soil logging, soil sampling, surveying, and groundwater sampling. The Contractor will also perform the data interpretation and reporting tasks.

Key contacts for this project are as follows:

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Laboratory Representative:

CHEMTECH

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CHEMTECH

Krupa Dubey

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3.0 Quality assurance/quality control objectives for measurement of data

3.1 Introduction

The quality assurance and quality control (QA/QC) objectives for all measurement data include precision, accuracy, representativeness, completeness, and comparability. These objectives are defined in following subsections. They are formulated to meet the requirements of the USEPA SW-846. The analytical methods and their Contract Required Quantitation Limits (CRQLs) and Contract Required Detection Limits (CRDLs) are provided in Section 7.

3.2 Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value (USEPA, 1987). Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), range (maximum value minus minimum value), relative range, and relative percent difference (RPD) are common.

For this project, field sampling precision will be determined by analyzing coded duplicate samples (labeled so that the laboratory does not recognize them as duplicates) for the same parameters, and then, during data validation (Section 8), calculating the RPD for field duplicate sample results.

Analytical precision will be determined by the laboratory by calculating the RPD for the results of the analysis of internal QC duplicates and matrix spike duplicates. The formula for calculating RPD is as follows:

$$RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

where:

RPD= Relative Percent Difference

V1, V2 = The two values to be compared

|V1 - V2| = The absolute value of the difference between the two values

(V1 + V2)/2 = The average of the two values

For soil samples, the data quality objectives for analytical precision, calculated as the RPD between duplicate analyses, is presented in Table 3-1.

The same is presented for groundwater in Table 3-2 and air samples in Table 3-3.

Table 3-1 Quality Control Limits For Soil Samples

Analytical	Analytical Method ^(a)	Matrix Spike (MS) Compounds	Laboratory Accuracy and Precision			Surrogate Compounds	Surrogate Recovery (%)
			MS/MSD ^(b) Recovery (%)	MS/MSD RPD ^(c) (%)	LCS ^(d) Recovery (%)		
VOCs ^(e)	8260B	1,1-Dichloroethane	77-139	20	50-150	Toluene-d8 Bromofluorobenzene 1,2-Dichloroethane-d4	63-124 50-133 54-142
		Trichloroethene	81-129	20	82-113		
		Benzene	83-135	20	81-118		
		Toluene	79-140	20	81-115		
		Chlorobenzene	80-141	20	83-114		
SVOCs ^(f)	8270C	Phenol	42-105	20	48-96	Nitrobenzene-d5 2-Fluorobiphenyl Terphenyl-d14 Phenol-d5 2-Fluorophenol 2,4,6-Tribromophenol	28-110 32-109 30-150 29-104 23-104 24-112
		2-Chlorophenol	52-107	20	54-92		
		1,4-Dichlorobenzene	40-101	20	57-86		
		N-Nitroso-di-n-propylamine	63-97	20	49-99		
		1,2,4-Trichlorobenzene	42-98	20	57-93		
		4-Chloro-3-methylphenol	60-100	20	57-92		
		Acenaphthene	65-100	20	52-97		
		4-Nitrophenol	45-95	20	24-120		
		2,4-Dinitrotoluene	56-104	20	61-101		
		Pentachlorophenol	33-111	20	32-102		
		Pyrene	49-120	20	53-103		
PCBs (as Aroclors)	8082	Aroclor-1016	55-128	20	67-121	TCMX DCB	44-141 34-145
		Aroclor-1260	58-140	20	78-128		
Pesticides	8081A	4,4'-DDD	35-165	20	86-133	TCMX DCB	30-158 30-161
		4,4'-DDE	50-144	20	80-130		
		4,4'-DDT	23-170	20	72-141		
		Aldrin	57-145	20	84-133		
		alpha-BHC	37-154	20	81-136		
		beta-BHC	51-161	20	83-132		
		delta-BHC	43-159	20	77-131		
		gamma-BHC (Lindane)	48-159	20	83-135		
		alpha-Chlordane	44-156	20	88-132		
		gamma-Chlordane	61-147	20	87-135		

Analytical	Analytical Method ^(a)	Matrix Spike (MS) Compounds	Laboratory Accuracy and Precision			Surrogate Compounds	Surrogate Recovery (%)
			MS/MSD ^(b) Recovery (%)	MS/MSD RPD ^(c) (%)	LCS ^(d) Recovery (%)		
Pesticides (cont.)	8081A	Dieldrin	41-154	20	81-129		
		Endosulfan II	52-151	20	85-132		
		Endosulfan sulfate	32-162	20	76-135		
		Endrin	31-165	20	82-134		
		Endrin aldehyde	48-152	20	85-134		
		Endrin ketone	70-141	20	87-132		
		Heptachlor	41-155	20	85-132		
		Heptachlor epoxide	44-160	20	86-132		
		Methoxychlor	44-163	20	82-137		
		Toxaphene	50-150	20	50-150		
Herbicides	8151A	2,4,5-TP (Silvex)	47-128	20	47-128	2,4-DCAA	50-130
		2,4,5-T	72-130	20	72-130		
		2,4-D	55-122	20	55-122		
Inorganics ^(h)	6010B	Inorganic Analyte	75-125 ⁽ⁱ⁾	20 ⁽ⁱ⁾	80-120	NA	NA
	6020		75-125 ⁽ⁱ⁾	20 ⁽ⁱ⁾	80-120		
	7471A		75-125 ⁽ⁱ⁾	20 ⁽ⁱ⁾	80-120		
	ASTM D4282-02 (free cyanide)		75-125 ⁽ⁱ⁾	20 ⁽ⁱ⁾	90-110		

Notes

(a) Analytical Methods: USEPA SW-846, 3rd edition, Revision 1, November 1990, any subsequent revisions shall supersede this information

(b) Matrix Spike/Matrix Spike Duplicate

(c) Relative Percent Difference

(d) Laboratory Control Sample

(e) Target Compound List Volatile Organic Compounds

(f) Target Compound List Semivolatile Organic Compounds

(g) Limits are advisory only

(h) Target Analyte List Inorganics (metals and cyanide)

(i) Matrix spike only

(j) Laboratory duplicate RPD

NA - Not Applicable

Table 3-2 Quality Control Limits for Water Samples

Analytical	Analytical Method ^(a)	Matrix Spike Compounds	Laboratory Accuracy and Precision			Surrogate Compounds	Surrogate Recovery (%)
			MS/MSD ^(b) Recovery (%)	MS/MSD RPD ^(c) (%)	LCS ^(d) Recovery (%)		
VOCs ^(e)	8260B	1,1-Dichloroethane	55-139	20	55-139	Toluene-d8 Bromofluorobenzene 1,2-Dichloroethane-d4	83-117 74-123 75-124
		Trichloroethene	55-138	20	61-138		
		Benzene	85-121	20	66-125		
		Toluene	83-123	20	68-121		
		Chlorobenzene	85-119	20	70-122		
SVOCs ^(f)	8270C	Phenol	11-48	20	10-100	Nitrobenzene-d5 2-Fluorobiphenyl Terphenyl-d14 Phenol-d5 2-Fluorophenol 2,4,6-Tribromophenol	30-120 35-111 26-135 30-77 30-78 27-118
		2-Chlorophenol	35-99	20	41-91		
		1,4-Dichlorobenzene	49-88	20	53-91		
		N-Nitroso-di-n-propylamine	55-127	20	54-116		
		1,2,4-Trichlorobenzene	62-105	20	59-104		
		4-Chloro-3-methylphenol	12-125	20	46-97		
		Acenaphthene	68-99	20	63-101		
		4-Nitrophenol	10-89	20	10-78		
		2,4-Dinitrotoluene	61-99	20	67-106		
		Pentachlorophenol	39-107	20	33-100		
Pyrene	72-112	20	64-108				
PCBs (as Aroclors)	8082	Aroclor-1016	30-150	20	65-126	TCMX DCB	42-133 30-141
		Aroclor-1260	36-147	20	76-131		
Pesticides	8081A	4,4'-DDD	55-177	20	86-134	TCMX DCB	30-150 45-131
		4,4'-DDE	54-126	20	89-126		
		4,4'-DDT	55-160	20	74-138		
		Aldrin	57-167	20	83-131		
		alpha-BHC	63-178	20	87-136		
		beta-BHC	50-150	20	88-131		
		delta-BHC	98-131	20	78-128		
		gamma-BHC (Lindane)	89-138	20	86-133		
		alpha-Chlordane	69-144	20	88-131		
		gamma-Chlordane	76-126	20	92-133		

Analytical	Analytical Method ^(a)	Matrix Spike Compounds	Laboratory Accuracy and Precision			Surrogate Compounds	Surrogate Recovery (%)
			MS/MSD ^(b) Recovery (%)	MS/MSD RPD ^(c) (%)	LCS ^(d) Recovery (%)		
Pesticides (cont.)	8081A	Dieldrin	72-136	20	81-132		
		Endosulfan I	84-127	20	91-132		
		Endosulfan II	79-138	20	90-129		
		Endosulfan sulfate	84-134	20	99-130		
		Endrin	75-143	20	87-130		
		Endrin aldehyde	62-160	20	95-133		
		Endrin ketone	87-135	20	90-130		
		Heptachlor	63-131	20	85-131		
		Heptachlor epoxide	82-125	20	89-132		
		Methoxychlor	76-161	20	88-139		
		Toxaphene	50-150	20	50-150		
Herbicides	8151A	2,4,5-TP (Silvex)	48-140	20	48-140	2,4-DCAA	45-140
		2,4,5-T	60-145	20	60-145		
		2,4-D	60-138	20	60-138		
Inorganics ^(h)	6010B	Inorganic Analyte	75-125 ⁽ⁱ⁾	20 ⁽ⁱ⁾	80-120	NA	NA
	6020		75-125 ⁽ⁱ⁾	20 ⁽ⁱ⁾	80-120	NA	NA
	7470A		75-125 ⁽ⁱ⁾	20 ⁽ⁱ⁾	80-120	NA	NA
	9012 (cyanide)		75-125 ⁽ⁱ⁾	20 ⁽ⁱ⁾	80-120	NA	NA

Notes

(a) Analytical Methods: USEPA SW-846, 3rd edition, Revision 1, November 1990, any subsequent revisions shall supersede this information

(b) MS/MSD = Matrix Spike/Matrix Spike Duplicate

(c) RPD = Relative Percent Difference

(d) LCS = Laboratory Control Sample

(e) Target Compound List Volatile Organic Compounds

(f) Target Compound List Semivolatile Organic Compounds

(g) Limits are advisory only

(h) Target Analyte List Inorganics (metals and cyanide)

(i) Matrix spike only

(j) Laboratory duplicate RPD

NA - Not Applicable

Table 3-3 Quality Control Limits For Air Samples

Analytical Parameter	Analytical Method ^(a)	Analyte Compounds	LCS ^(d) Recovery (%)	Duplicate RPD ^{(c), (e)} (%)	Laboratory Accuracy and Precision			
					MS/MSD ^(b) Recovery (%)	MS/MSD RPD ^(c) (%)	Surrogate Compounds	Surrogate Recovery (%)
VOCs	TO-15 Mod.	Acetone	60-140	25	NA	NA	Toluene-d8 Bromofluorobenzene 1,2-Dichloroethane-d4	70-130 70-130 70-130
		Bromodichloromethane	60-140	25				
		Butadiene, 1,3-	60-140	25				
		Carbon Disulfide	60-140	25				
		Chloro-1-Propene, -3 (Allyl Chloride)	60-140	25				
		Chlorodibromomethane	60-140	25				
		Cumene	60-140	25				
		Dichloroethylene, Trans-1,2-	60-140	25				
		Dioxane, 1,4-	60-140	25				
		Hexane	60-140	25				
		Methyl Ethyl Ketone	60-140	25				
		Methyl Isobutyl Ketone	60-140	25				
		Methyl Tert-Butyl Ether (MTBE)	60-140	25				
		Naphthalene	60-140	25				
		Propylbenzene, N-	60-140	25				
		Tribromomethane (Bromoform)	60-140	25				
		Cyclohexane	60-140	25				
		2-Hexanone	60-140	25				
		4-Ethyltoluene	60-140	25				
		Ethanol	60-140	25				
		Heptane	60-140	25				
		2-Methylpentane	60-140	25				
		Isopentane	60-140	25				
		2,3-Dimethylpentane	60-140	25				
		2,2,4-Trimethylpentane	60-140	25				
		Indene	60-140	25				
Indan	60-140	25						
Thiopene	60-140	25						
2-Propanol	60-140	25						
Tetrahydrofuran	60-140	25						

Analytical Parameter	Analytical Method ^(a)	Analyte Compounds	LCS ^(d) Recovery (%)	Duplicate RPD ^{(c), (e)} (%)	Laboratory Accuracy and Precision			
					MS/MSD ^(b) Recovery (%)	MS/MSD RPD ^(c) (%)	Surrogate Compounds	Surrogate Recovery (%)
VOCs	TO-15 Mod.	Benzene	70-130	25	NA	NA	Toluene-d8 Bromofluorobenzene 1,2-Dichloroethane-d4	70-130 70-130 70-130
		Bromomethane	70-130	25				
		Carbon Tetrachloride	70-130	25				
		Chlorobenzene	70-130	25				
		Chloroethane	70-130	25				
		Chloroform	70-130	25				
		Dibromoethane, 1,2- (Ethylene Dibromide)	70-130	25				
		Dichlorobenzene, 1,2-	70-130	25				
		Dichlorobenzene, 1,3-	70-130	25				
		Dichlorobenzene, 1,4-	70-130	25				
		Dichlorodifluoromethane (Freon 12)	70-130	25				
		Dichloroethane, 1,1-	70-130	25				
		Dichloroethane, 1,2-	70-130	25				
		Dichloroethylene, 1,1-	70-130	25				
		Dichloroethylene, Cis-1,2-	70-130	25				
		Dichloromethane (Methylene Chloride)	70-130	25				
		Dichloropropane, 1,2-	70-130	25				
		Dichloropropene, Cis-1,3-	70-130	25				
		Dichloropropene, Trans-1,3-	70-130	25				
		1,2-Dichloro-1,1,2,2,-tetrafluoroethane	70-130	25				
		Ethyl Benzene	70-130	25				
		Fluorotrichloromethane (Freon 11)	70-130	25				
		Methyl Chloride	70-130	25				
		Styrene	70-130	25				
		Tetrachloroethane, 1,1,2,2-	70-130	25				
		Tetrachloroethylene (PCE)	70-130	25				
		Toluene	70-130	25				
		Trichloro-1,2,2-Trifluoroethane, 1,1,2-	70-130	25				
Trichlorobenzene, 1,2,4-	70-130	25						

Analytical Parameter	Analytical Method ^(a)	Analyte Compounds	LCS ^(d) Recovery (%)	Duplicate RPD ^{(c), (e)} (%)	Laboratory Accuracy and Precision			
					MS/MSD ^(b) Recovery (%)	MS/MSD RPD ^(c) (%)	Surrogate Compounds	Surrogate Recovery (%)
VOCs	TO-15 Mod.	Trichloroethane, 1,1,1-	70-130	25	NA	NA	Toluene-d8 Bromofluorobenzene 1,2-Dichloroethane-d4	70-130 70-130 70-130
		Trichloroethane, 1,1,2-	70-130	25				
		Trimethylbenzene, 1,3,5-	70-130	25				
		Vinyl Chloride	70-130	25				
		m,p-xylene	70-130	25				
		o-xylene	70-130	25				
		Hexachlorobutadiene	70-130	25				
		alpha-chlorotoluene	70-130	25				
Fixed Gas	ASTM D1945 Mod.	Helium	75-125	30	NA	NA	NA	NA

Notes

(a) USEPA, 1999. Compendium Method TO-15, Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared-Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). January 1999.

American Society of Testing Materials, 2003. D1945-03. Standard Test Method for Analysis of Natural Gas by Gas Chromatograph, 2003.

(b) Matrix Spike/Matrix Spike Duplicate

(c) Relative Percent Difference

(d) Laboratory Control Sample

(e) Laboratory duplicate RPD

NA - Not Applicable

3.3 Accuracy

Accuracy is a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern (Taylor, 1987), or the difference between a measured value and the true or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material, and is expressed as the percent of the known quantity which is recovered or measured. The recovery of a given analyte is dependent upon the sample matrix, method of analysis, and the specific compound or element being determined. The concentration of the analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement. Concentrations of analytes which are close to the detection limits are less accurate because they are more affected by such factors as instrument "noise". Higher concentrations will not be as affected by instrument noise or other variables and thus will be more accurate.

Sampling accuracy may be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy is typically assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks. Additionally, initial and continuing calibrations must be established and be within method control limits. Instrument and method analytical accuracy can then be determined for any sample set.

Accuracy is normally measured as the percent recovery (%R) of a known amount of analyte, called a spike, added to a sample (matrix spike) or to a blank (blank spike). The %R is calculated as follows:

$$\% R = \frac{SSR - SR}{SA} \times 100$$

where:

%R = Percent recovery
 SSR = Spike sample result: concentration of analyte obtained by analyzing the sample with the spike added
 SR = Sample result: the background value, i.e., the concentration of the analyte obtained by analyzing the sample
 SA = Spiked analyte: concentration of the analyte spike added to the sample

The acceptance limits for accuracy for each parameter are presented in Tables 3-1, 3-2, and 3-3.

3.4 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter which is most concerned with the proper design of the sampling program (USEPA, 1987). Samples must be representative of the environmental media being sampled. Selection of sample locations and sampling procedures will incorporate consideration of obtaining the most representative sample possible.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree that is technically possible, that the data derived represents the in-place quality of the material sampled. Every effort will be made to ensure that chemical compounds will not be introduced into the sample via sample containers, handling, and analysis. Decontamination of sampling devices and digging equipment will be performed between samples as outlined in Appendix C of the RI Work Plan. Analysis of field blanks, trip

blanks, and method blanks will also be performed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated during data validation through the analysis of coded field duplicate samples. The analytical laboratory will also follow acceptable procedures to assure the samples are adequately homogenized prior to taking aliquots for analysis, so the reported results are representative of the sample received.

Chain-of-custody procedures will be followed to document that contamination of samples has not occurred during container preparation, shipment, and sampling. Details of blank, duplicate and chain-of-custody procedures are presented in Sections 4 and 5.

3.5 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid (USEPA, 1987). The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested. Completeness is defined as follows for all sample measurements:

$$\%C = \frac{V}{T} \times 100$$

where:

%C = Percent completeness
 V = Number of measurements judged valid
 T = Total number of measurements

3.6 Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another (USEPA, 1987). The comparability of all data collected for this project will be ensured by:

- Using identified standard methods for both sampling and analysis phases of this project
- Requiring traceability of all analytical standards and/or source materials to the USEPA or National Institute of Standards and Technology (NIST)
- Requiring that all calibrations be verified with an independently traceable standard from a source other than that used for calibration (if applicable)
- Using standard reporting units and reporting formats including the reporting of QC data
- Performing a complete data validation on all of the analytical results, including the use of data qualifiers in all cases where appropriate
- Requiring that all validation qualifiers be considered any time an analytical result is used for any purpose

These steps will ensure all future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

4.0 Sampling program

4.1 Introduction

The sampling program will provide data concerning the presence and the nature and extent of contamination of groundwater, soil, soil vapor and air. This section presents sample collection procedures, sample container preparation procedures, sample preservation procedures, sample holding times, and field QC sample requirements. Sample matrices and the anticipated number of environmental and QC samples to be collected are given in Table 4-1. Actual numbers of sampling may change based on field conditions.

4.2 Sample collection

Soil, groundwater, and air samples will be collected at the Site. The location and frequency of sampling and the methods selected for field procedures and laboratory analysis are described in detail in the RI Work Plan.

4.3 Sample container preparation and sample preservation

All sample containers will be new and will meet the specifications required by the USEPA. Copies of the sample container QC analyses will be provided by the laboratory for each container lot used for sample collection. The containers will be labeled and the appropriate preservatives will be added. The container requirements are shown in Tables 4-2, 4-3, and 4-4.

Samples shall be preserved according to the preservation techniques given in Tables 4-2 through 4-4. Preservatives will be added to the sample bottles by the laboratory prior to their shipment in sufficient quantities to ensure that proper sample pH is met. Following sample collection, the sample bottles should be placed on ice in the shipping cooler, cooled to 4 ± 2 °C with ice and delivered to the laboratory within 48 hours of collection. Chain-of-custody (COC) procedures are described in Section 5.

4.4 Sample holding times

The sample holding times for organic and inorganic parameters are given in Tables 4-2 through 4-4 and must be in accordance with the NYSDEC ASP requirements. Holding times for Toxicity Characteristic Leaching Procedure (TCLP) samples are given in Table 4-5. The NYSDEC ASP holding times must be strictly adhered to by the laboratory. Any holding time exceedances must be reported to National Grid.

4.5 Field quality control samples

To assess field sampling and decontamination performance, two types of "blanks" will be collected and submitted to the laboratory for analyses. In addition, the precision of field sampling procedures will be assessed by collecting coded field duplicates and matrix spike/matrix spike duplicates (MS/MSDs). The blanks will include the following.

- Trip Blanks – A trip blank will be prepared before the sample containers are sent by the laboratory. The trip blank will consist of a 40-ml VOA vial containing distilled, deionized water, which accompanies the other water sample bottles into the field and back to the laboratory. A trip blank will be included with each shipment of water samples for volatiles analysis. The trip blank will be analyzed for volatile organic compounds to assess any contamination from sampling, transport, storage, and internal laboratory procedures.

- Rinseate Blanks – Rinseate blanks will be taken at a minimum frequency of one per 20 field samples per sample matrix. Rinseate blanks are used to determine the effectiveness of the decontamination procedures for sampling equipment. It is a sample of reagent water provided by the laboratory that has passed through a decontaminated bailer or other sampling apparatus. It is usually collected as a last step in the decontamination procedure, prior to taking an environmental sample. The rinseate blank may be analyzed for all or some of the parameters of interest.

The duplicates collected to assess field/laboratory precision will consist of the following.

- Coded Field Duplicate – To determine the representativeness of the sampling methods, coded field duplicates will be collected. The samples are termed "coded" because they will be labeled in such a manner that the laboratory will not be able to determine that they are field duplicate samples. This will eliminate any possible bias that could arise. Field duplicates will be taken at a minimum frequency of one per 20 field samples per sample matrix.
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) – MS/MSD samples (MS/MSD for organics; MS and laboratory duplicate for inorganics) will be collected at a frequency of one pair per 20 field samples. MS/MSD samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes. The advisory acceptance limits for MS/MSD %R and RPDs are given in Tables 3-1 and 3-2.

Table 4-1 Summary of Samples and Analyses

Matrix ^(a)	Parameter	Analytical Method	Field Samples				QC Blanks		Total
			Field Samples	Field Duplicate	MS/MSD ^(b) (Total)	Sub-Total	Trip Blank	Rinse Blank	
Surface Soil Samples	VOCs	EPA SW 8260B (NY ASP OLM04.2)	18	-	-	18	-	-	18
	TCL VOCs + 10	EPA SW 8260B (NY ASP OLM04.2)	4	1	1	6	1	1	8
	SVOCs	EPA SW 8270C (NY ASP OLM04.2)	18	-	-	18	-	-	18
	TCL SVOCs + 20	EPA SW 8270C (NY ASP OLM04.2)	4	1	1	6	-	1	7
	Free Cyanide	ASTM Method D4282-02 (Microdiffusion) (extraction by EPA Method 9013A)	22	1	1	24	-	1	25
	RCRA 8 Metals	EPA SW 6010B/6020/7471A Series (NY ASP ILM04.1)	18	-	-	18	-	-	18
	TAL Metals	EPA SW 6010B/6020/7471A Series (NY ASP ILM04.1)	4	1	1	6	-	1	7
	PCBs (as Aroclors)	EPA SW 8082 (NY ASP Category B)	4	1	1	6	-	1	7
	Pesticides	EPA SW 8081A (NY ASP Category B)	4	1	1	6	-	1	7
Herbicides	EPA SW 8151A (NY ASP Category B)	4	1	1	6	-	1	7	
Subsurface Soil Samples	VOCs	EPA SW 8260B (NY ASP OLM04.2)	33	1	1	35	2	1	38
	TCL VOCs + 10	EPA SW 8260B (NY ASP OLM04.2)	8	1	1	10	1	1	12
	SVOCs	EPA SW 8270C (NY ASP OLM04.2)	33	1	1	35	-	1	36
	TCL SVOCs + 20	EPA SW 8270C (NY ASP OLM04.2)	8	1	1	10	-	1	11
	Free Cyanide	ASTM Method D4282-02 (Microdiffusion) (extraction by EPA Method 9013A)	41	2	2	45	-	2	47
	RCRA 8 Metals	EPA SW 6010B/6020/7471A Series (NY ASP ILM04.1)	33	1	1	35	-	1	36
	TAL Metals	EPA SW 6010B/6020/7471A Series (NY ASP ILM04.1)	8	1	1	10	-	1	11
	PCBs (as Aroclors)	EPA SW 8082 (NY ASP Category B)	8	1	1	10	-	1	11
	Pesticides	EPA SW 8081A (NY ASP Category B)	8	1	1	10	-	1	11
Herbicides	EPA SW 8151A (NY ASP Category B)	8	1	1	10	-	1	11	
Groundwater Samples	VOCs	EPA SW 8260B (NY ASP OLM04.2)	13	-	-	13	-	-	13
	TCL VOCs + 10	EPA SW 8260B (NY ASP OLM04.2)	7	1	1	9	1	1	11
	SVOCs	EPA SW 8270C (NY ASP OLM04.2)	13	-	-	13	-	-	13
	TCL SVOCs + 20	EPA SW 8270C (NY ASP OLM04.2)	7	1	1	9	-	1	10
	Total Cyanide	EPA SW 9012/9010A (NY ASP ILM04.1)	20	1	1	22	-	1	23

Matrix ^(a)	Parameter	Analytical Method	Field Samples				QC Blanks		Total
			Field Samples	Field Duplicate	MS/MSD ^(b) (Total)	Sub-Total	Trip Blank	Rinse Blank	
Groundwater Samples (cont.)	RCRA 8 Metals	EPA SW 6010B/6020/7470A Series (NY ASP ILM04.1)	13	-	-	13	-	-	13
	TAL Metals	EPA SW 6010B/6020/7470A Series (NY ASP ILM04.1)	7	1	1	9	-	1	10
	PCBs (as Aroclors)	EPA SW 8082 (NY ASP Category B)	7	1	1	9	-	1	10
	Pesticides	EPA SW 8081A (NY ASP Category B)	7	1	1	9	-	1	10
	Herbicides	EPA SW 8151A (NY ASP Category B)	7	1	1	9	-	1	10
Soil Gas Samples	VOCs + Naphthalene	EPA TO-15	4	1	-	5	-	1	6
Indoor Air Samples	VOCs + Naphthalene	EPA TO-15	4	-	-	4	-	-	4
Ambient Air Samples	VOCs + Naphthalene	EPA TO-15	1	-	-	1	-	-	1
Waste Characterization (solids)	TCLP VOCs	EPA SW 1311/8260B (NY ASP OLM04.2)	5	-	-	5	-	-	5
	TCLP SVOCs	EPA SW 1311/8270C (NY ASP OLM04.2)	5	-	-	5	-	-	5
	TCLP Metals	EPA SW 1311/6010B/7470A (NY ASP ILM04.1)	5	-	-	5	-	-	5
	Total PCBs	EPA SW 8082 (NY ASP Category B)	5	-	-	5	-	-	5
	Total Petroleum Hydrocarbons	DRO: EPA SW 8015 modified GRO: EPA SW 8015 modified	5	-	-	5	-	-	5
	Corrosivity	EPA SW Method 9045C	5	-	-	5	-	-	5
	Ignitability	EPA SW Method 1010A	5	-	-	5	-	-	5
	Reactive Cyanide and Sulfide	EPA SW Chapter 7, Sections 7.3.3.2 and 7.3.4.2	5	-	-	5	-	-	5
Total Organic Halogens	EPA SW Method 9020B	5	-	-	5	-	-	5	

Notes

TCL - Target Compound List

TAL - Target Analyte List

TCLP – Toxicity Characteristic Leaching Procedure

(a) Number of samples is approximate and for information purposes only.

(b) Matrix spike / matrix spike duplicate for organic analyses; matrix spike and laboratory duplicate for inorganic analysis.

Table 4-2 Soil and Waste Sample Containerization and Holding Times

Analysis	Bottle Type	Preservation ^(a)	Holding Time ^(b)
Volatile Organic Compounds (VOCs)	Wide-mouth glass w/ Teflon lined cap	Cool to 4°C	10 days
Extractable Organic Compounds ^(c)	Wide-mouth glass w/ Teflon lined cap	Cool to 4°C	10 days*
Metals	Wide-mouth plastic or glass	Cool to 4°C	6 months, except mercury (26 days)
Cyanide (free)	Wide-mouth plastic	Cool to 4°C	10 days
TCLP Organic Compounds	Wide-mouth glass w/ Teflon lined cap	Cool to 4°C	See Table 4-5
TCLP Metals	Wide-mouth plastic or glass	Cool to 4°C	See Table 4-5
Total Petroleum Hydrocarbons (TPH)	DRO: Clear glass GRO: Clear glass	DRO: Cool to 4°C GRO: Cool to 4°C	DRO: 7 days to extraction/40 days to analysis GRO: 14 days
Corrosivity	Clear glass	None	Analyze ASAP
Ignitability	Clear glass	None	Analyze ASAP
Reactive Cyanide and Sulfide	Clear glass	None	Analyze ASAP
Total Organic Halogens	Amber glass	pH < 2 with H ₂ SO ₄ , Cool to 4°C, Dark	28 days

Notes

(a) All samples to be preserved with ice during collection and transport

(b) Days from verified time of sample receipt (VTSR).

(c) Semivolatile organic compounds, PCBs, pesticides, herbicides.

* Soxhlet or sonication procedures for extraction and concentration of soil/waste samples for SVOCs must be completed within 5 days of VTSR. Soxhlet or sonication procedures for extraction and concentration of soil/sediment/waste samples for PCBs must be completed within 5 days of VTSR. Extracts of soil samples must be analyzed within 40 days of extraction.

Table 4-3 Water Sample Containerization and Holding Times

Analysis	Bottle Type	Preservation ^(a)	Holding Time ^(b)
Volatile Organic Compounds (VOCs)	(2) 40 mL glass vial with Teflon septum	Cool to 4°C	10 days
Extractable Organic Compounds ^(c)	1000 mL glass w/ Teflon-lined cap	Cool to 4°C	5 days*
Metals	1000 mL plastic bottle	Nitric Acid to pH < 2 Cool to 4°C	6 months, except mercury (26 days)
Cyanide	500 mL plastic bottle	NaOH to pH > 12 Cool to 4°C	10 days

Notes

- (a) All samples to be preserved in ice during collection and transport.
- (b) Days from validated time of sample receipt (VTSR)
- (c) Semivolatile organic compounds, PCBs, pesticides, herbicides

* Continuous liquid-liquid extraction is the required extraction for water samples for SVOCs. Continuous liquid-liquid extraction and concentration of water samples for SVOC analysis must begin within 5 days and be completed within 7 days of VTSR. Extracts of water samples must be analyzed within 40 days of extraction.

Table 4-4 Soil Gas, Indoor, and Ambient Air Sample Containerization and Holding Times

Analysis	Bottle Type	Preservation	Holding Time ^(b)
Volatile Organic Compounds (VOCs)	6 L Summa [®] canister ^(a)	NA	30 days
Fixed Gases (Helium)	6 L Summa [®] canister ^(a)	NA	30 days

Notes

(a) Stainless steel SUMMA[®] canisters must be certified clean by the laboratory using TO-15 § 8.4.1. The canisters will be delivered to the field with a pressure of 28-30" Hg. Canisters received with a vacuum pressure less than 25" Hg will not be used.

(b) Days from date of sample collection. The holding time for the TO-15 analysis is 30 days. The holding time for an evacuated canister is 30 days. After 30 days, unused canisters must be exchanged for recently cleaned canisters.

Table 4-5 TCLP^(a) Sample Holding Times

Analytical Parameter	From: Sample Collection To: TCLP Extraction*	From: TCLP Extraction To: Preparative Extraction	From: Preparative Extraction To: Determinative Analysis
Volatiles	7 days	NA	7 days
Semivolatiles	5 days	7 days	40 days
PCBs (as Aroclors)	5 days	7 days	40 days
Mercury	5 days	NA	28 days
Metals (except Mercury)	180 days	NA	180 days

Notes:

NA - Not Applicable.

(a) Toxicity Characteristic Leaching Procedure.

*Times shown are from verified time of sample receipt (VSTR).

5.0 Sample tracking and custody

5.1 Introduction

This section presents sample custody procedures for both the field and laboratory. Implementation of proper custody procedures for samples collected in the field is the responsibility of field personnel. Both laboratory and field personnel involved in collection and transfer of samples will be trained as to the purpose and procedures for sample custody prior to implementation.

Evidence of sample traceability and integrity is provided by COC procedures. These procedures document the sample traceability from the selection and preparation of the sample containers by the laboratory, to sample collection, to sample shipment, to laboratory receipt and analysis. The sample custody flowchart is shown in Figure 5-1. A sample is considered to be in a person's custody if the sample is:

- In a person's possession
- Maintained in view after possession is accepted and documented
- Locked and tagged with Custody Seals so that no one can tamper with it after having been in physical custody
- In a secured area which is restricted to authorized personnel

5.2 Field sample custody

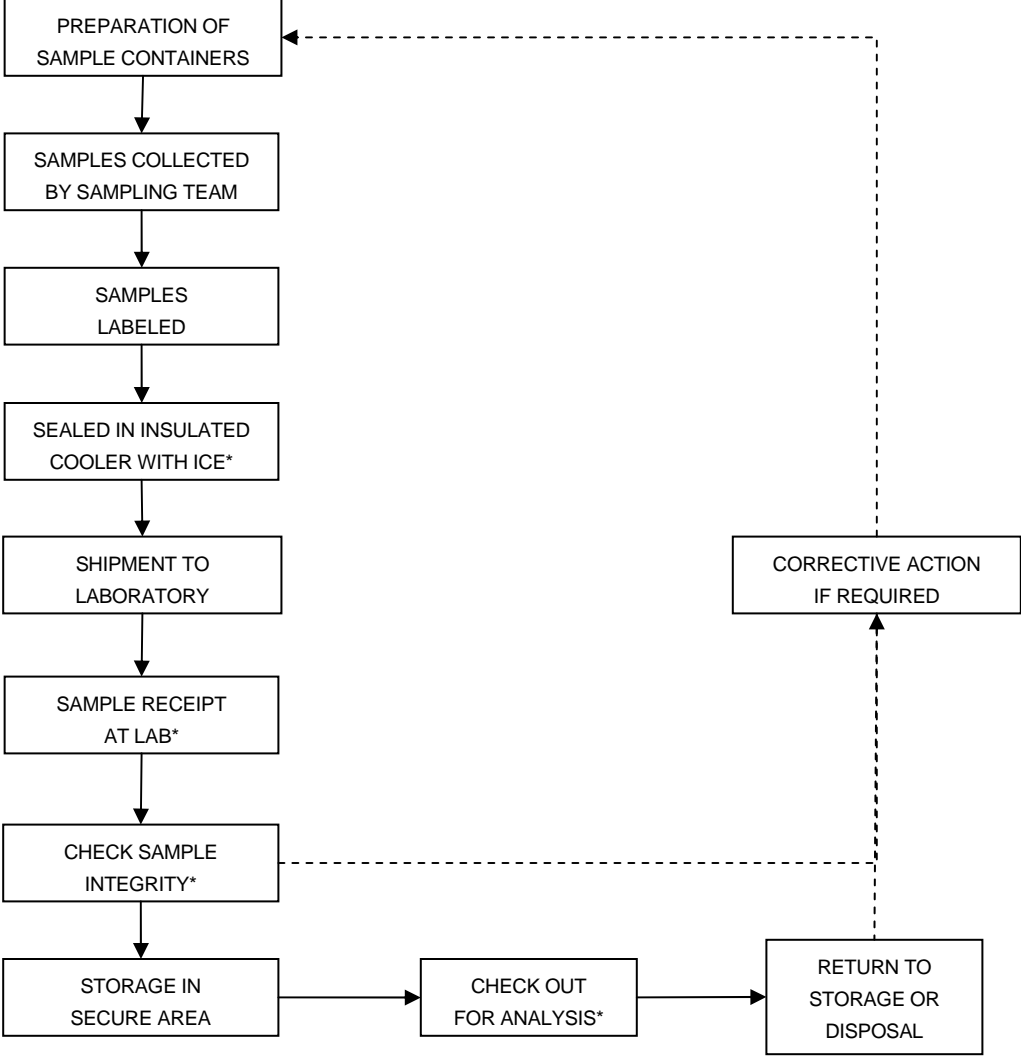
A COC record (Figure 5-2 or similar) accompanies the sample containers from selection and preparation at the laboratory, during shipment to the field for sample collection and preservation, and during the return to the laboratory. Triplicate copies of the COC must be completed for each sample set collected.

The COC lists the field personnel responsible for taking samples, the project name and number, the name of the analytical laboratory to which the samples are sent, and the method of sample shipment. The COC also lists a unique description of every sample bottle in the set. If samples are split and sent to different laboratories, a copy of the COC record will be sent with each sample.

The REMARKS space on the COC is used to indicate if the sample is a matrix spike, matrix spike duplicate, or any other sample information for the laboratory. Since they are not specific to any one sample point, trip and field blanks are indicated on separate rows. Once all bottles are properly accounted for on the form, a sampler will write his or her signature and the date and time on the first **RELINQUISHED BY** space. The sampler will also write the method of shipment, the shipping cooler identification number, and the shipper airbill number on the top of the COC. Errors in field records will be crossed out with a single line in ink and initialed by the author.

One copy of the COC is retained by sampling personnel and the other two copies are put into a sealable plastic bag and taped inside the lid of the shipping cooler. The cooler lid is closed, custody seals provided by the laboratory are affixed to the latch and across the back and front lids of the cooler, and the person relinquishing the samples signs their name across the seal. The seal is taped, and the cooler is wrapped tightly with clear packing tape. It is then relinquished by field personnel to personnel responsible for shipment, typically an overnight carrier. The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the sample will not be analyzed.

Figure 5-1 Sample Custody Flowdown



*Requires Sign-Off On Chain-Of-Custody.

Figure 5-2 Chain-Of-Custody Record

CHAIN OF CUSTODY RECORD									
Client Name		Purchase Order		Analyses Requested		Turnaround Time		Compliance Monitoring	
Address		Phone/Fax #		Standard: Other: _____		Standard: Rush: 24 Hr _____ 48 Hr _____		Yes: _____ No: _____	
City		Report Attention:		Number of Containers		Remarks		Lab Use Only Sub-Sample pH _____	
State		Signature:		Preservative*					
Zip		Sample Identification		See Key Below					
Date Sampled	Time Sampled	Sample Type *	Signature	Print Name	Company	Date	Time		

Custody Seal Intact
 Yes _____ No _____ None _____

Sample Temperature
 Degrees C _____

Relinquished By: _____

Received By: _____

Relinquished By: _____

Received By: _____

Relinquished By: _____

Received By Laboratory: _____

Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense. The analytical results associated with this COC apply only to the samples as they are received by the laboratory. The liability of the laboratory is limited to the amount paid for the report.

Terms: Net thirty days on approved credit.

*KEY: Sample Type: 1=Drinking Water, 2=Surface Water, 3=Ground Water, 4=Waste Water, 5=Soil, 6=RCRA, 7=Other
 Preservative: 1=NaOH, 2=NaOH + ZnOAC, 3=HNO3, 4=H2SO4, 5=Na2S2O3, 6=None, 7=Other

SEM COC
Form Revised
02/01

5.3 Laboratory sample custody

The Project Manager or Field Team Leader will notify the laboratory of upcoming field sampling activities and the subsequent shipment of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival.

The following laboratory sample custody procedures will be used:

- The laboratory will designate a sample custodian who will be responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.
- Upon receipt of the samples, the custodian will check cooler temperature, and check the original COC documents and compare them with the labeled contents of each sample container for correctness and traceability. The sample custodian will sign the COC record and record the date and time received.
- Care will be exercised to annotate any labeling or descriptive errors. In the event of documentation or sample integrity issues, the laboratory will immediately contact the Project Manager or Field Team Leader as part of the corrective action process. A qualitative assessment of each sample container will be performed to note any anomalies, such as broken or leaking bottles. This assessment will be recorded as part of the incoming COC procedure.
- The soil, water, and air samples will be stored in a secured area until analyses commence, at a temperature of approximately 4 ± 2 °C if required.
- A laboratory tracking record will accompany the sample or sample fraction through final analysis for control.

A copy of the tracking record will accompany the laboratory report and will become a permanent part of the project records.

6.0 Calibration procedures

6.1 Field instruments

All field analytical equipment will be calibrated immediately prior to each day's use. The calibration procedures will conform to manufacturer's standard instructions and are described in the Appendix C of RI Work Plan. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. Records of all instrument calibration will be maintained by the Field Team Leader. Copies of all the instrument manuals will be maintained onsite by the Field Team Leader.

Calibration procedures for instruments used for monitoring health and safety hazards (e.g., photoionization detector [PID] and explosimeter) are provided in the HASP. More frequent calibration may be needed depending on conditions encountered in the field.

6.2 Laboratory instruments

The laboratory will follow all calibration procedures and schedules as specified in the sections of the USEPA SW-846 and subsequent updates that apply to the instruments used for the analytical methods given in Section 7.

7.0 Analytical procedures

7.1 Introduction

Soil, water, and waste samples will be analyzed according to the USEPA SW-846 "*Test Methods for Evaluating Solid Waste*," November 1986, 3rd edition and subsequent updates. Air and soil gas samples will be analyzed according to the USEPA Compendium Method TO-15, *Determination of VOCs in Air Collected in Specially Prepared-Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)*, January 1999 and helium (fixed gas) analyses will be performed using American Society for Testing Materials (ASTM), Method 1945 modified. The methods to be used for the laboratory analysis of water and soil samples are presented in Tables 7-1 and 7-2. The soil gas and ambient air samples will be analyzed by USEPA Method TO-15 as presented in Table 7-3. These methods were selected because they attain the quantitation limits and DQOs required by the project, which are compiled on Tables 7-1 through 7-3.

Table 7-1 Project Quantitation Limits for Soil and Water

CAS No.	Analysis/Compound	Method	Quantitation Limits		State of New York Standards	
			Water (µg/L)	Soil (µg/kg)	Water ^(a) (µg/L)	Soil ^(b) (µg/kg)
Volatile Organics						
71-55-6	1,1,1-Trichloroethane	SW8260B	5	5	5	800
79-34-5	1,1,2,2-Tetrachloroethane	SW8260B	5	5	5	600
79-00-5	1,1,2-Trichloroethane	SW8260B	5	5	1	
76-13-1	1,1,2-Trichlorotrifluoroethane	SW8260B	5	5	5	
75-34-3	1,1-Dichloroethane	SW8260B	5	5	5	200
75-35-4	1,1-Dichloroethene	SW8260B	5	5	5	400
120-82-1	1,2,4-Trichlorobenzene	SW8260B	5	5	5	3400
96-12-8	1,2-Dibromo-3-Chloropropane	SW8260B	5	5	0.04	
106-93-4	1,2-Dibromoethane	SW8260B	5	5	0.0006	
95-50-1	1,2-Dichlorobenzene	SW8260B	5	5	3	7900
107-06-2	1,2-Dichloroethane	SW8260B	5	5	0.6	100
78-87-5	1,2-Dichloropropane	SW8260B	5	5	1	
541-73-1	1,3-Dichlorobenzene	SW8260B	5	5	3	1600
106-46-7	1,4-Dichlorobenzene	SW8260B	5	5	3	8500
78-93-3	2-Butanone	SW8260B	25	25	50	300
591-78-6	2-Hexanone	SW8260B	25	25	50	
108-10-1	4-Methyl-2-Pentanone	SW8260B	25	25		1000
67-64-1	Acetone	SW8260B	25	25	50	200
71-43-2	Benzene	SW8260B	5	5	1	60
75-27-4	Bromodichloromethane	SW8260B	5	5	50	
75-25-2	Bromoform	SW8260B	5	5	50	
74-83-9	Bromomethane	SW8260B	5	5	5	
75-15-0	Carbon Disulfide	SW8260B	5	5		2700
56-23-5	Carbon Tetrachloride	SW8260B	5	5	5	600
108-90-7	Chlorobenzene	SW8260B	5	5	5	1700
75-00-3	Chloroethane	SW8260B	5	5	5	1900
67-66-3	Chloroform	SW8260B	5	5	7	300
74-87-3	Chloromethane	SW8260B	5	5	5	
156-59-2	cis-1,2-Dichloroethene	SW8260B	5	5	5	
10061-01-5	cis-1,3-Dichloropropene	SW8260B	5	5	0.4	
110-82-7	Cyclohexane	SW8260B	5	5		
124-48-1	Dibromochloromethane	SW8260B	5	5	50	
75-71-8	Dichlorodifluoromethane	SW8260B	5	5	5	
100-41-4	Ethyl Benzene	SW8260B	5	5	5	5500
98-82-8	Isopropylbenzene	SW8260B	5	5	5	
79-20-9	Methyl Acetate	SW8260B	5	5		
1634-04-4	Methyl tert-butyl Ether	SW8260B	5	5		
108-87-2	Methylcyclohexane	SW8260B	5	5		
75-09-2	Methylene Chloride	SW8260B	5	5	5	100
100-42-5	Styrene	SW8260B	5	5	930	
10061-02-6	t-1,3-Dichloropropene	SW8260B	5	5	0.4	
127-18-4	Tetrachloroethene	SW8260B	5	5	5	1400
108-88-3	Toluene	SW8260B	5	5	5	1500
156-60-5	trans-1,2-Dichloroethene	SW8260B	5	5	5	300
79-01-6	Trichloroethene	SW8260B	5	5	5	700
75-69-4	Trichlorofluoromethane	SW8260B	5	5	5	

CAS No.	Analysis/Compound	Method	Quantitation Limits		State of New York Standards	
			Water (µg/L)	Soil (µg/kg)	Water ^(a) (µg/L)	Soil ^(b) (µg/kg)
Volatile Organics (continued)						
75-01-4	Vinyl Chloride	SW8260B	5	5	2	200
136777-61-2	m/p-Xylenes	SW8260B	10	10	5	1200
95-47-6	o-Xylene	SW8260B	5	5	5	
Semivolatile Organics						
92-52-4	1',1-Biphenyl	SW8270C	10	330	5	
108-60-1	2,2'-oxybis(1-Chloropropane)	SW8270C	10	330	5	
95-95-4	2,4,5-Trichlorophenol	SW8270C	10	330		100
88-06-2	2,4,6-Trichlorophenol	SW8270C	10	330		
120-83-2	2,4-Dichlorophenol	SW8270C	10	330		400
105-67-9	2,4-Dimethylphenol	SW8270C	10	330		
51-28-5	2,4-Dinitrophenol	SW8270C	10	330		200
121-14-2	2,4-Dinitrotoluene	SW8270C	10	330	5	
606-20-2	2,6-Dinitrotoluene	SW8270C	10	330	5	1000
91-58-7	2-Chloronaphthalene	SW8270C	10	330	10	
95-57-8	2-Chlorophenol	SW8270C	10	330		800
91-57-6	2-Methylnaphthalene	SW8270C	10	330		36400
95-48-7	2-Methylphenol	SW8270C	10	330		100
88-74-4	2-Nitroaniline	SW8270C	10	330	5	430
88-75-5	2-Nitrophenol	SW8270C	10	330		330
91-94-1	3,3'-Dichlorobenzidine	SW8270C	10	330	5	n/a
65794-96-9	3+4-Methylphenols	SW8270C	10	330		900
99-09-2	3-Nitroaniline	SW8270C	10	330	5	500
534-52-1	4,6-Dinitro-2-methylphenol	SW8270C	10	330		
101-55-3	4-Bromophenyl-phenyl ether	SW8270C	10	330		
59-50-7	4-Chloro-3-methylphenol	SW8270C	10	330		240
106-47-8	4-Chloroaniline	SW8270C	10	330	5	220
7005-72-3	4-Chlorophenyl-phenyl ether	SW8270C	10	330		
100-01-6	4-Nitroaniline	SW8270C	10	330	5	
100-02-7	4-Nitrophenol	SW8270C	10	330		100
83-32-9	Acenaphthene	SW8270C	10	330	20	50000
208-96-8	Acenaphthylene	SW8270C	10	330		41000
98-86-2	Acetophenone	SW8270C	10	330		
120-12-7	Anthracene	SW8270C	10	330	50	50000
1912-24-9	Atrazine	SW8270C	10	330	7.5	
56-55-3	Benzo(a)anthracene	SW8270C	10	330	0.002	224
50-32-8	Benzo(a)pyrene	SW8270C	10	330	ND	61
205-99-2	Benzo(b)fluoranthene	SW8270C	10	330	0.002	1100
191-24-2	Benzo(g,h,i)perylene	SW8270C	10	330		50000
207-08-9	Benzo(k)fluoranthene	SW8270C	10	330	0.002	1100
100-52-7	Benzaldehyde	SW8270C	10	330		
111-91-1	bis(2-Chloroethoxy)methane	SW8270C	10	330	5	
111-44-4	bis(2-Chloroethyl)ether	SW8270C	10	330	1	
117-81-7	bis(2-Ethylhexyl)phthalate	SW8270C	10	330	5	50000
85-68-7	Butylbenzylphthalate	SW8270C	10	330	50	50000
105-60-2	Caprolactam	SW8270C	10	330		
86-74-8	Carbazole	SW8270C	10	330		
218-01-9	Chrysene	SW8270C	10	330	0.002	400
53-70-3	Dibenzo(a,h)anthracene	SW8270C	10	330		14

CAS No.	Analysis/Compound	Method	Quantitation Limits		State of New York Standards	
			Water (µg/L)	Soil (µg/kg)	Water ^(a) (µg/L)	Soil ^(b) (µg/kg)
Semivolatile Organics (continued)						
132-64-9	Dibenzofuran	SW8270C	10	330		6200
84-66-2	Diethylphthalate	SW8270C	10	330	50	7100
131-11-3	Dimethylphthalate	SW8270C	10	330	50	2000
84-74-2	Di-n-butylphthalate	SW8270C	10	330	50	8100
117-84-0	Di-n-octyl phthalate	SW8270C	10	330	50	50000
206-44-0	Fluoranthene	SW8270C	10	330	50	50000
86-73-7	Fluorene	SW8270C	10	330	50	50000
118-74-1	Hexachlorobenzene	SW8270C	10	330	0.04	410
87-68-3	Hexachlorobutadiene	SW8270C	10	330	0.5	
77-47-4	Hexachlorocyclopentadiene	SW8270C	10	330	5	
67-72-1	Hexachloroethane	SW8270C	10	330	5	
193-39-5	Indeno(1,2,3-cd)pyrene	SW8270C	10	330	0.002	3200
78-59-1	Isophorone	SW8270C	10	330	50	4400
91-20-3	Naphthalene	SW8270C	10	330	10	13000
98-95-3	Nitrobenzene	SW8270C	10	330	0.4	200
621-64-7	N-Nitroso-di-n-propylamine	SW8270C	10	330		
86-30-6	N-Nitrosodiphenylamine	SW8270C	10	330	50	
87-86-5	Pentachlorophenol	SW8270C	10	330		1000
85-01-8	Phenanthrene	SW8270C	10	330	50	50000
108-95-2	Phenol	SW8270C	10	330		30
129-00-0	Pyrene	SW8270C	10	330	50	50000
Metals						
7429-90-5	Aluminum	6010B / 6020	50	5000	2000	SB
7440-36-0	Antimony	6010B / 6020	25	2500	6	SB
7440-38-2	Arsenic	6010B / 6020	10	1000	50	7500
7440-39-3	Barium	6010B / 6020	50	5000	2000	300000
7440-41-7	Beryllium	6010B / 6020	3	300	3	160
7440-43-9	Cadmium	6010B / 6020	3	300	5	1000
7440-70-2	Calcium	6010B / 6020	1000	100000		SB
7440-47-3	Chromium	6010B / 6020	5	500	100	10000
7440-48-4	Cobalt	6010B / 6020	15	1500	5	30000
7440-50-8	Copper	6010B / 6020	10	1000	1000	25000
7439-89-6	Iron	6010B / 6020	50	5000	600	2000000
7439-92-1	Lead	6010B / 6020	6	600	50	400 ^(c)
7439-95-4	Magnesium	6010B / 6020	1000	100000	35000	SB
7439-96-5	Manganese	6010B / 6020	10	1000	600	SB
7440-02-0	Nickel	6010B / 6020	20	2000	200	13000
7440-09-7	Potassium	6010B / 6020	1000	100000		SB
7782-49-2	Selenium	6010B / 6020	10	1000	20	2000
7440-22-4	Silver	6010B / 6020	5	500	100	SB
7440-23-5	Sodium	6010B / 6020	1000	100000		SB
7440-28-0	Thallium	6010B / 6020	20	2000	0.5	SB
7440-62-2	Vanadium	6010B / 6020	20	2000		150000
7440-66-6	Zinc	6010B / 6020	20	2000	5000	20000
7439-97-6	Mercury	7471A	0.2	10	1.4	100
Inorganics						
n/a	Cyanide, Free	ASTM D4282-		60		
n/a	Cyanide, Total	9012 / 9010A	10		400	

CAS No.	Analysis/Compound	Method	Quantitation Limits		State of New York Standards	
			Water (µg/L)	Soil (µg/kg)	Water ^(a) (µg/L)	Soil ^(b) (µg/kg)
Pesticides						
72-54-8	4,4'-DDD	8081	0.05	1.7	0.3	2900
72-55-9	4,4'-DDE	8081	0.05	1.7	0.2	2100
50-29-3	4,4'-DDT	8081	0.2	1.7	0.2	2100
309-00-2	Aldrin	8081	0.05	1.7	ND	41
319-84-6	alpha-BHC	8081	0.05	1.7	0.01	110
319-85-7	beta-BHC	8081	0.2	1.7	0.04	200
319-86-8	delta-BHC	8081	0.05	1.7	0.04	300
58-89-9	gamma-BHC (Lindane)	8081	0.05	1.7	0.05	60
5103-71-9	alpha-Chlordane	8081	0.05	1.7		540
5566-34-7	gamma-Chlordane	8081	0.05	1.7		540
57-74-9	Chlordane	8081	0.5	17	0.05	540
60-57-1	Dieldrin	8081	0.05	1.7	0.004	44
959-98-8	Endosulfan I	8081	0.05	1.7		900
33213-65-9	Endosulfan II	8081	0.05	1.7		900
1031-07-8	Endosulfan sulfate	8081	0.05	1.7		1000
72-20-8	Endrin	8081	0.05	1.7	ND	100
7421-93-4	Endrin aldehyde	8081	0.05	1.7	5	
53494-70-5	Endrin ketone	8081	0.05	1.7	5	
76-44-8	Heptachlor	8081	0.05	1.7	0.04	100
1024-57-3	Heptachlor epoxide	8081	0.05	1.7	0.03	20
72-43-5	Methoxychlor	8081	0.05	1.7	35	
8001-35-2	Toxaphene	8081	0.5	17	0.06	
PCB's						
12674-11-2	Aroclor-1016	8082	0.5	17	0.09* Applies to the sum of the PCBs	1000 (total surface soil) 10000 (total subsurface soil)
11104-28-2	Aroclor-1221	8082	0.5	17		
11141-16-5	Aroclor-1232	8082	0.5	17		
53469-21-9	Aroclor-1242	8082	0.5	17		
12672-29-6	Aroclor-1248	8082	0.5	17		
11097-69-1	Aroclor-1254	8082	0.5	17		
11096-82-5	Aroclor-1260	8082	0.5	17		
37324-23-5	Aroclor-1262	8082	0.5	17		
11100-14-4	Aroclor-1268	8082	0.5	17		
Herbicides						
93-72-1	2,4,5-TP (Silvex)	8151	2	67	0.26	700
n/a	2,4,5-T	8151	2	67		1900
n/a	2,4-D	8151	2	67		500
94-80-4	2,4-DB	8151	2	67		

Notes:

N/A - Not Applicable

SB - soil background

ND - not detected

(a) - Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, NYSDEC, October 1993, reissued June 1998

(b) - Determination of Soil Cleanup Objectives and Cleanup Levels, NYSDEC, January 24, 1994

(c) - EPA Guidance on Residential Lead-Based Paint, Lead Contaminated Dust, and Lead Contaminated Soil, July 14, 1994

Table 7-2 Practical Quantitation Limits (PQLs) for TCLP

Compound	SW-846 Analysis	Water (µg/L)
TCLP Volatile Organic Compounds		
Benzene	1311 / 8260B	25
Carbon Tetrachloride	1311 / 8260B	25
Chloroform	1311 / 8260B	25
1,2-Dichloroethane	1311 / 8260B	25
1,1-Dichloroethene	1311 / 8260B	25
2-Butanone	1311 / 8260B	125
Tetrachloroethene	1311 / 8260B	25
Trichloroethene	1311 / 8260B	25
Vinyl Chloride	1311 / 8260B	25
TCLP Semivolatile Organic Compounds		
2-Methylphenol	1311 / 3510 / 8270B	10
3 & 4-Methylphenol	1311 / 3510 / 8270B	10
1,4-Dichlorobenzene	1311 / 3510 / 8270B	10
2,4-Dinitrotoluene	1311 / 3510 / 8270B	10
Hexachlorobutadiene	1311 / 3510 / 8270B	10
Hexachloroethane	1311 / 3510 / 8270B	10
Hexachlorobenzene	1311 / 3510 / 8270B	10
Nitrobenzene	1311 / 3510 / 8270B	10
Pentachlorophenol	1311 / 3510 / 8270B	10
Pyridine	1311 / 3510 / 8270B	10
2,4,5-Trichlorophenol	1311 / 3510 / 8270B	10
2,4,6-Trichlorophenol	1311 / 3510 / 8270B	10
TCLP Metals		
Arsenic	1311 / 3010 / 6010B	10
Barium	1311 / 3010 / 6010B	50
Cadmium	1311 / 3010 / 6010B	3
Chromium	1311 / 3010 / 6010B	5
Lead	1311 / 3010 / 6010B	6
Selenium	1311 / 3010 / 6010B	10
Silver	1311 / 3010 / 6010B	5
Mercury	7470A	0.2
TCLP Pesticides		
Chlordane	1311 / 8081A	0.5
Endrin	1311 / 8081A	0.05
Heptachlor (and its hydroxide)	1311 / 8081A	0.05
Lindane	1311 / 8081A	0.05
Methoxychlor	1311 / 8081A	0.05
Toxaphene	1311 / 8081A	0.5
TCLP Pesticides		
2,4-D	1311 / 8151A	2
2,4,5-TP Silvex	1311 / 8151A	2

Notes:

ND - Not Determined

Table 7-3 Project Quantitation Limits for Air

Analysis / Compound	Method	Quantitation Limits Soil Gas/Air ($\mu\text{g}/\text{M}^3$)
Fixed Gases		
Helium	ASTM D1945 mod.	16360 (0.01%)
Volatile Organics ¹		
Freon 12	TO-15 Mod.	0.81
Freon 114	TO-15 Mod.	1.14
Chloromethane	TO-15 Mod.	0.34
Vinyl Chloride	TO-15 Mod.	0.42
Bromomethane	TO-15 Mod.	0.63
Chloroethane	TO-15 Mod.	0.43
Freon 11	TO-15 Mod.	0.92
1,1-Dichloroethene	TO-15 Mod.	0.64
Freon 113	TO-15 Mod.	1.26
Methylene Chloride	TO-15 Mod.	0.56
1,1-Dichloroethane	TO-15 Mod.	0.66
cis-1,2-Dichloroethene	TO-15 Mod.	0.64
Chloroform	TO-15 Mod.	0.81
1,1,1-Trichloroethane	TO-15 Mod.	0.89
Carbon Tetrachloride	TO-15 Mod.	1.03
Benzene	TO-15 Mod.	0.52
1,2-Dichloroethane	TO-15 Mod.	0.66
Trichloroethene	TO-15 Mod.	0.89
1,2-Dichloropropane	TO-15 Mod.	0.76
cis-1,3-Dichloropropene	TO-15 Mod.	0.74
Toluene	TO-15 Mod.	0.61
trans-1,3-Dichloropropene	TO-15 Mod.	0.74
1,1,2-Trichloroethane	TO-15 Mod.	0.89
Tetrachloroethene	TO-15 Mod.	1.11
1,2-Dibromoethane (EDB)	TO-15 Mod.	1.26
Chlorobenzene	TO-15 Mod.	0.76
Ethyl Benzene	TO-15 Mod.	0.71
m,p-Xylene	TO-15 Mod.	0.71
o-Xylene	TO-15 Mod.	0.71
Styrene	TO-15 Mod.	0.69
1,1,2,2-Tetrachloroethane	TO-15 Mod.	1.13
1,3,5-Trimethylbenzene	TO-15 Mod.	0.81
1,2,4-Trimethylbenzene	TO-15 Mod.	0.81
1,3-Dichlorobenzene	TO-15 Mod.	0.98
1,4-Dichlorobenzene	TO-15 Mod.	0.98
alpha-Chlorotoluene	TO-15 Mod.	0.85
1,2-Dichlorobenzene	TO-15 Mod.	0.98
1,2,4-Trichlorobenzene	TO-15 Mod.	6.12
Hexachlorobutadiene	TO-15 Mod.	8.69
Propylene	TO-15 Mod.	1.4
1,3-Butadiene	TO-15 Mod.	1.77

Analysis / Compound	Method	Quantitation Limits Soil Gas/Air ($\mu\text{g}/\text{M}^3$)
Acetone	TO-15 Mod.	1.93
Carbon Disulfide	TO-15 Mod.	2.58
trans-1,2-Dichloroethene	TO-15 Mod.	3.22
2-Butanone (MEK)	TO-15 Mod.	2.42
Hexane	TO-15 Mod.	2.9
Tetrahydrofuran	TO-15 Mod.	2.42
Cyclohexane	TO-15 Mod.	2.74
1,4-Dioxane	TO-15 Mod.	2.9
Bromodichloromethane	TO-15 Mod.	5.47
4-Methyl-2-pentanone	TO-15 Mod.	3.38
2-Hexanone	TO-15 Mod.	3.38
Dibromochloromethane	TO-15 Mod.	6.92
Bromoform	TO-15 Mod.	8.37
4-Ethyltoluene	TO-15 Mod.	4.03
Ethanol	TO-15 Mod.	1.55
Methyl tert-butyl ether	TO-15 Mod.	2.9
Heptane	TO-15 Mod.	3.38
Naphthalene	TO-15 Mod.	4.35
2-Methylpentane	TO-15 Mod.	2.9
Isopentane	TO-15 Mod.	2.42
2,3-Dimethylpentane	TO-15 Mod.	3.38
2,2,4-Trimethylpentane	TO-15 Mod.	3.86
Indene	TO-15 Mod.	3.86
Indan	TO-15 Mod.	3.86
Thiopene	TO-15 Mod.	2.74
2-Propanol	TO-15 Mod.	1.93

Notes

(1) The final quantitation limit (QL) is adjusted to reflect the initial pressurization step, dilution required to bring target analyte levels into the calibration range, and/or minimize matrix interferences

Final QL = QL * DF, DF was assumed to be 1.61 for a 6-L Canister, with 5 in. Hg Final Canister Pressure.

8.0 Data reduction, assessment, and reporting

8.1 Data reduction

Data collected during the field investigation will be reduced in accordance with SW-846 protocols and reviewed by the laboratory QA personnel. The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the USEPA SW-846 and subsequent updates.

8.2 Data quality assessment

NYSDEC recommends two levels of data review. The basic review is a Data Usability Summary Report (DUSR). Current NYSDEC policy is to require this level of review for analytical data from investigations on most sites. Full data validation is called for at sites where the data will be used in litigation, or where problems are expected with data quality (such as where matrix interference is expected to be significant). The laboratory deliverables (i.e., NYSDEC ASP Category B) are the same in both cases, and a DUSR can be upgraded to full validation at a later time if necessary. For this investigation a DUSR will be performed.

Based on the results of data assessment, the validated analytical results reported by the laboratory will be assigned one of the following USEPA-defined data usability qualifiers:

- U – Not detected at given value
- UJ – Estimated not detected at given value
- J – Estimated value
- N – Presumptive evidence at the value given
- R – Result not useable
- No Flag – Result accepted without qualification

Trained and experienced data assessors, who meet NYSDEC approval criteria, will perform the data review. Résumés of people who will perform the data validation and prepare the DUSR will be provided to NYSDEC for review and approval, upon request.

8.2.1 Data usability summary report

Data for this investigation will be evaluated and qualification applied in accordance with the *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*, USEPA-540-R-07-003, July 2007 and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA-540-R-04-004, October 2004, as they applied to the analytical methods employed. A DUSR will be generated in accordance with USEPA Region II guidelines.

The DUSR will include a review and an evaluation of all the analytical results. To ensure compliance with the analytical method protocols the following parameters will be reviewed:

- Chain-of-custody forms
- Holding times
- Initial and continuing calibrations
- Blanks
- Laboratory control standards and matrix spikes

- Surrogate recoveries
- Matrix interference checks
- Field and laboratory duplicates
- Sample data

The DUSR will contain a description of the samples and parameters reviewed. Any deficiencies identified during the review will be noted and the effect on the generated data will be discussed. Any re-sampling or reanalysis recommendations will be then be made to the investigation's Project Manager. The results of the evaluation will be incorporated into the final investigative report.

8.2.2 Data validation

The determination to validate data will be made based on the presence of data anomalies, suspect data, or laboratory issues. Data will be validated and qualifications applied in accordance with *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*, USEPA-540-R-07-003, July 2007 and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA-540-R-04-004, October 2004, as they applied to the analytical methods employed. If applicable, a data validation report will be prepared and reviewed by the Quality Assurance Office (QAO) before issuance. The data validation report will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each sample delivery group will follow. For each of the organic analytical methods, the following parameters will be assessed:

- Holding times
- Instrument tuning
- Instrument calibrations
- Blank results
- System monitoring compounds or surrogate recovery compounds (as applicable)
- Internal standard recovery results
- MS and MSD results
- Field duplicate results
- Target compound identification
- Result calculations
- Pesticide cleanup (if applicable)
- Compound quantitation and reported detection limits
- System performance
- Results verification

For each of the inorganic compounds, the following will be assessed:

- Holding times
- Calibrations
- Blank results

- Interference check sample
- Laboratory check samples
- Duplicates
- Matrix Spike(s)
- Furnace atomic absorption analysis QC
- ICP serial dilutions
- Results verification and reported detection limits
- Result calculations

8.3 Data reporting

The data package provided by the laboratory will contain all items discussed above in a “CLP-equivalent” format. Data quality issues will be discussed in a case narrative included with the data report. The completed copies of the COC records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

Two copies of the analytical data packages and an electronic data deliverable (EDD) will be provided by the laboratory approximately 30 days after receipt of a complete sample delivery group. The Project Manager will immediately arrange for filing one package. A second copy and the EDD will be used to generate summary tables. These tables will form the database for assessment of the site contamination condition.

The EDD format required is current format Earthsoft EQuIS[®] Environmental Data Management Software.

Each EDD must be formatted and copied using an MS-DOS operating system. To avoid transcription errors, data will be loaded directly into the ASCII format from the laboratory information management system (LIMS). If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

The Project Manager or Task Manager will maintain close contact with the QA reviewer to ensure all nonconformance issues are resolved prior to use of the data.

9.0 Internal quality control checks

QC procedures and checks are used to evaluate the precision and accuracy of analytical data. Field QC checks are used to identify potential problems associated with sample collection procedures. Laboratory QC checks are used to identify problems associated with sample preparation and analysis.

9.1 Field quality control checks

To check the quality of data from field sampling efforts, blanks and duplicate samples will be collected for analysis. Field duplicate and rinseate blank samples will be collected at a frequency of one in 20 samples. Trip blank samples will be analyzed at a frequency of one per each shipment of VOC samples. Field MS/MSD samples will be collected at a frequency of one in 20 samples. These samples will be treated as separate samples for identification, logging, and shipping purposes. Analytical results on blanks and duplicates will be reported with the data.

9.2 Laboratory quality control checks

The analytical laboratory must have an implemented QC program documented in a QA manual to ensure the reliability and validity of the analysis performed at the laboratory. All analytical procedures are documented in writing as standard operating procedures (SOPs) and each SOP must include a QC section that addresses the minimum QC requirements for the procedure. The internal QC checks differ slightly for each individual procedure, but in general the QC requirements include the following:

- Method blanks
- Reagent/preparation blanks (applicable to inorganic analysis)
- Instrument blanks
- MS/MSDs
- Surrogate spikes (organic methods only)
- Analytical spike (applicable to graphite furnace analysis)
- Laboratory control samples
- Internal standard areas for GC/MS analysis
- Mass tuning for GC/MS analysis
- Endrin/4,4'-DDT degradation checks for pesticide analysis
- Second, dissimilar column confirmation for pesticide and polychlorinated biphenyl (PCB) analysis

All data obtained will be properly recorded. The data package will include a full deliverable package capable of allowing the recipient to reconstruct QC information and compare it to QC acceptance criteria. The laboratory will reanalyze any samples associated with nonconforming quality control checks, if sufficient volume is available. It is expected that sufficient volumes/weights of samples will be collected to allow for reanalysis when necessary.

10.0 Performance and system audits and frequency

Two types of audit procedures are conducted during any environmental investigation: performance and system audits. These audits are performed on the laboratory as well as field activities. The laboratory and field auditors will be independent of the function they will be auditing. Audits will be documented and maintained by the Contractor Project Manager.

10.1 Performance audits

10.1.1 Laboratory performance audits

Laboratory performance audits are administered by the laboratory QA department on a periodic basis (e.g., semi-annually). The audit samples are used to monitor accuracy and identify and resolve problems in sample preparation and analysis techniques, which lead to the generation of nonconforming data.

The laboratory performance audits include verification of each analyst's record keeping, proper use and understanding of procedures, and accuracy evaluation. Corrective action will be taken for any performance failure noted.

10.1.2 Field performance audits

The QAO or designee will perform field performance audits of the field sample team on an annual basis at a minimum. The field team leader will review all field data. The analytical results of the field blanks and replicate samples are indirect audits of the level of performance of field activities. If a nonconformance is found in the evaluation of field QC data, corrective action will be taken to resolve the issue. The corrective action will be documented.

10.2 System audits

10.2.1 Laboratory system audits

Laboratory system audits will be conducted against the QA Manual and the administrative and method SOPs, by the laboratory QA department, on an annual basis. System audits are used to ensure that all aspects of the laboratory's QC program are effective. This involves a thorough review of all laboratory practices and documentation to confirm that work is performed according to project specifications.

Outside agency performance and system audits may be used to verify contract compliance or the laboratory's ability to meet requirements for analytical methods and documentation. Copies of current certifications and accreditations may be used in lieu of an audit by the Project Manager.

10.2.2 Field system audits

The QAO or designee shall perform field system audits of the field sampling team on an annual basis at a minimum. All field activities will be audited to ensure that the field work is being performed according to the approved work plans, QAPP, and method procedures. Accuracy, precision, and documentation clarity will be evaluated. Any time a deficiency is noted during an ongoing systems audit, the project manager or designee will inform the field staff immediately so that corrective actions may be implemented.

11.0 Preventive maintenance

11.1 Field instrument preventive maintenance

Written procedures will establish the schedule for servicing critical items in order to minimize the downtime of the measurement system(s). Field instruments will be checked and calibrated daily before use. Calibration checks will be documented on the field calibration log sheets. Critical spare parts such as tape and batteries will be kept on-site to reduce potential downtime. Backup instruments and equipment will be available on-site or within 1-day shipment to avoid delays in the field schedule.

11.2 Laboratory instrument preventive maintenance

Designated laboratory employees regularly perform routine scheduled maintenance and repair of all instruments. All maintenance that is performed is documented in the laboratory's operating records. All laboratory instruments are maintained in accordance with manufacturer's specifications. The laboratory's QA Manual specifies the typical frequency with which components of key analytical instruments or equipment will be serviced.

11.3 Records

Logs shall be established to record maintenance and service. All maintenance records will be controlled and traceable to the designated equipment, instruments, tools, or gauges. Records produced shall be reviewed, maintained, and filed by the operators at the laboratories. The QAO may audit the field maintenance records to verify complete adherence to these procedures.

12.0 Corrective action

12.1 Introduction

The following procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, and corrected.

12.2 Procedure description

When a significant condition adverse to quality is noted at site, laboratory, or subcontractor location, the cause of the condition will be determined and corrective action will be taken to preclude recurrence. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, Contractor Project Manager, Field Team Leader, and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

All project personnel have the responsibility, as part of the normal work duties, to promptly identify, report, and investigate conditions adverse to quality. Corrective actions will be initiated as follows.

- When predetermined acceptance standards are not attained
- When procedure or data compiled are determined to be deficient
- When equipment or instrumentation is found to be faulty
- When samples and analytical test results are not clearly traceable
- When quality assurance requirements have been violated
- When designated approvals have been circumvented
- As a result of system and performance audit findings
- As a result of a management assessment
- As a result of laboratory/field comparison studies
- As required by USEPA SW-846 and subsequent updates, or by the NYSDEC ASP

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, will monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at the sites, laboratories, or contractor locations. Activities or documents ascertained to be nonconforming with quality assurance requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 12-1 or similar). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the Contractor Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file.

Any project personnel may identify issues requiring corrective action; however, the QAO is responsible for documenting, numbering, logging, and verifying the closeout action. The Contractor Project Manager will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

Figure 12-1 Corrective Action Form

CORRECTIVE ACTION REQUEST					
Number: _____		Date: _____			
TO: _____					
<p>You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by _____</p>					
CONDITION:					
REFERENCE DOCUMENTS:					
RECOMMENDED CORRECTIVE ACTIONS:					
_____	_____	_____	_____	_____	_____
Originator	Date	Approval	Date	Approval	Date
RESPONSE					
CAUSE OF CONDITION					
CORRECTIVE ACTION					
(A) RESOLUTION					
(B) PREVENTION					
(C) AFFECTED DOCUMENTS					
C.A. FOLLOW-UP:					
CORRECTIVE ACTION VERIFIED BY: _____					
DATE: _____					

13.0 References

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- United States Environmental Protection Agency (USEPA), 1986. SW-846 Test Method for Evaluating Solid Waste, Washington, D.C., November 1986,
- USEPA, 1987. *Data Quality Objectives for Remedial Response Actions Activities: Development Process*, EPA/540/G-87/003, OSWER Directive 9355.0-7, Washington, D.C.
- USEPA, 1999a. Compendium Method TO-15, Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). January 1999.
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