QUALITY ASSURANCE PROJECT PLAN

SARNEY FARM SUPERFUND SITE
BENSON HILL ROAD
DOVER PLAINS, DUTCHESS COUNTY, NEW YORK

Prepared for:

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Project No. 3610170146

REVISED DRAFT

October 25, 2016

Revised February 21, 2017

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APPENDICES

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1.0 INTRODUCTION

This document is the Quality Assurance Project Plan (QAPP) for the annual groundwater monitoring program at the Sarney Farms Superfund Site in Amenia, New York. The format of this document is based on the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP, March, 2005). This document was originally submitted to the United States Environmental Protection Agency, Region 2 (USEPA), as a draft on October 25, 2016. The attached revision (Revision 1) has been modified to address each of the EPA's comments dated November 21, 2016.

Consistent with the sampling requirements prescribed in the USEPA letter dated September 8, 2016, this QAPP includes procedures associated with groundwater, surface water, and sediment sampling. In addition, the analyte list (Worksheet 15) is consistent with USEPA requirements for the Site.

QAPP Worksheet #1 Title and Approval Page

Site Name/Project Name: Sarney Farms Superfund Site
Site Location: Benson Hill Road, Dover Plains, Dutchess County, New York

Document Title: **Quality Assurance Project Plan**

Lead Organization:

Preparer's Name and Organizational Affiliation: Michael Cote and Chris Ricardi, AMEC E&E, P.C.

Preparer's Address, Telephone Number, and E-mail Address:

Michael Cote
c/o Amec Foster Wheeler Environment and Infrastructure Inc. (Amec)
1090 Elm Street, Suite 201
Rocky Hill, Connecticut 06067
860-257-5539

Chris Ricardi
Amec
511 Congress Street, Suite 200
Portland, Maine 04101
207-828-3694

Preparation Date (Day/Month/Year): October 25, 2016

Investigative Organization's Project Manager/Date: _____
Signature

Printed Name/Organization: Michael Cote - Amec

Investigative Organization's Project QA Officer/Date _____
Signature

Printed Name/Organization: Chris Ricardi - Amec

Approval Signatures/Date: _____
Signature

Printed Name/Title: Kevin Willis/Project Manager
Approval Authority: USEPA Region II

QAPP Worksheet #2 QAPP Identifying Information

UFP-QAPP SECTION 2.2.4

Site Name/Project Name: Sarney Farms Superfund Site **Title:** n/a

Site Location: Benson Hill Rd., Dover Plains, Dutchess County, New York **Revision Number:** (Draft)

Site Number/Code: n/a **Date:** October 25, 2016

Operable Unit: OU3 (groundwater)

Contractor Name: AMEC E&E, P.C.

Contractor Number: n/a

Contract Title: n/a

Work Assignment Number: AMEC E&E, P.C. #3610-17-0146

1. **Identify regulatory program:**

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) amended by the Superfund Amendments and Reauthorization Act (SARA)

2. **Identify approval entity:**

USEPA Region II

3. **The QAPP is (select one):** ☐Generic ✓Project Specific

4. **List dates of scoping sessions that were held:** N/A

5. **List dates and titles of QAPP documents written for previous site work, if applicable:**

Title	Approval Date
Quality Assurance Project Plan	5/28/1998

6. **List organizational partners (stakeholders) and connection with lead organization:**

Kevin Willis, USEPA Project Manager

7. **List data users:**
USEPA, NYSDEC, Amec, Pitney Bowes, Inc., Cytec Industries, Inc.

8. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusions below:

All necessary elements are included in this QAPP.

QAPP Worksheet #2 QAPP Identifying Information

Identify where each required QAPP element is located in the QAPP (provide section, worksheet, table, or figure number) or other project planning documents (provide complete document title, date, section number, page numbers, and location of the information in the document). Type "NA" for the QAPP elements that are not applicable to the project. Provide an explanation in the QAPP.

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	UFP-QAPP Documents
Project Management and Objectives		
2.1 Title and Approval Page	- Title and Approval Page	Worksheet #1 Title and Approval Page
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	The Table of Contents is provided following the QAPP cover page. Worksheet #2 QAPP Identifying Information
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	Worksheet # 3 Distribution List and Worksheet #4 Project Personnel Sign-Off
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - Special Personnel Training Requirements Table	Worksheet #5 Project Organization Chart, Worksheet #6 Communication Pathways, Worksheet #7 Personnel Responsibilities and Qualifications, and Worksheet #8 Special Personnel Training Requirements
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Planning Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps (historical and present)	Worksheet #9 Project Team Planning Sessions Participants Sheet and Worksheet #10 Problem Definition for Project DQOs

QAPP Worksheet #2 QAPP Identifying Information

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	UFP-QAPP Documents
2.6 Project Quality Objectives and Measurement Performance Criteria 2.6.1 Development of Project Quality Objectives Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria Table	Worksheet #11 Project Quality Objectives/Systematic Planning Process Statements and Worksheet #12 Measurement Performance Criteria for Project Analytes
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	Worksheet #13 Secondary Data Criteria and Limitations Table
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation Table - Project Schedule/Timeline Table	Worksheet #14 Summary of Project Tasks, Worksheets #15 Reference Limits and Evaluation for specific monitoring activities and Worksheet #16 Project Schedule/Timeline
Measurement/Data Acquisition		
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume, and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.3 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.4 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/SOP Requirements Table - Analytical Methods/SOP Requirements Table - Field Quality Control Sample Summary Table - Sampling SOPs - Project Sampling SOP References Table - Field Equipment Calibration, Maintenance, Testing, and Inspection Table	Worksheet #17 Sampling Design and Rationale, Worksheet #18 Sampling Locations and Methods/SOP Requirements. Worksheet #19 Analytical SOP Requirements (see Appendix C), Worksheet #20 Sample Quantities and Control Frequencies, Worksheet #21 Field Sampling SOP References and Worksheet #22 Field Equipment Calibration, Maintenance, Testing and Inspection

QAPP Worksheet #2 QAPP Identifying Information

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	UFP-QAPP Documents
Procedures 3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References Table - Analytical Instrument Calibration Table - Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	Worksheet #23 Analytical SOP References. Worksheet #24 Analytical Instrument Calibration, and Worksheet #25 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Analytical SOPs can be found in Appendix C.
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow Diagram - Example Chain-of-Custody Form and Seal	Details concerning the field sampling procedures can be found in Appendix A and Appendix B). Worksheet #26 Sample handling System and Worksheet #27 Sample Custody Requirements
3.4 Quality Control Samples 3.4.1 Sampling Quality Control Samples 3.4.2 Analytical Quality Control Samples	- QC Samples Table - Screening/Confirmatory Analysis Decision Tree	Worksheets #28 presents QC sample information for project analytes
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records Table - Analytical Services Table - Data Management SOPs	Worksheet #29 Project Documents and Records and Worksheet #30 Analytical Services. See Worksheet #14 for the Data management Plan
Assessment/Oversight		
4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	- Assessments and Response Actions - Planned Project Assessments Table - Audit Checklists - Assessment Findings and Corrective Action Responses Table	Worksheet #31 Planned Project assessments and Worksheet #32 Assessment Findings and Corrective Action Responses
4.2 QA Management Reports		Worksheet #33 QA Management Reports
4.3 Final Project Report		

QAPP Worksheet #2 QAPP Identifying Information

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	UFP-QAPP Documents
Data Review		
5.1 Overview		
5.2 Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.2.1 Step IIa Validation Activities 5.2.2.2 Step IIb Validation Activities 5.2.3 Step III: Usability Assessment 5.2.3.1 Data Limitations and Actions from Usability Assessment 5.2.3.2 Activities	- Verification (Step I) Process Table - Validation (Steps IIa and IIb) Process Table - Validation (Steps IIa and IIb) Summary Table - Usability Assessment	Worksheet #34 Verification (Step I) Process, Worksheet #35 Validation (Steps IIa and IIb) Process, Worksheet #36 Validation (Steps IIa and IIb) Summary, and Worksheet #37 Usability Assessment
5.3 Streamlining Data Review 5.3.1 Data Review Steps To Be Streamlined 5.3.2 Criteria for Streamlining Data Review 5.3.3 Amounts and Types of Data Appropriate for Streamlining	None	NA

QAPP Worksheet #3 Distribution List

UFP-QAPP Manual Section 2.3.1
List those entities to whom copies of the approved QAPP, subsequent QAPP revisions, addenda, and amendments will be sent.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 3 Distribution List

QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address	Document Control Number
Brian Quillia	Client Project Manager	Pitney Bowes, Inc.	(203) 922-4413	(203) 617-3175	brian.quillia@pb.com	
Donald MacMath	Client Project Manager	Cytec Industries, Inc.	(609) 860-3081	(609) 860-2210	donald.macmath@solvay.com	
Michael Mason	Project Manager	New York State Department of Environmental Conservation (NYSDEC)	(518) 402-9814			
Kevin Willis	Project Manager	USEPA, Region 2	(212) 637-4252		willis.kevin@epamail.epa.gov	
Michael Cote	Project Manager	Amec	(860) 257-5539	none	michael.cote@amecfw.com	
Mark Netzer	Technical Lead	Amec	(860) 257-5533	none	mark.netzer@amecfw.com	
Chris Ricardi	Project QA Officer/Project Chemist	Amec	(207) 775-5401	(207) 772-4762	christian.ricardi@amecfw .com	

Data Management Function	Title	Name	Telephone	Comments
TestAmerica Buffalo, Amherst, NY.	Laboratory Project Manager	Becky Mason	413 572-4000	Overall coordination of project between Amec and TAL Buffalo.
TestAmerica Buffalo, Amherst, NY.	Laboratory Quality Assurance Manager	David Orlowski	716 504-9832	Responsible for addressing QA/QC issues involving project field samples and analyses complete at the TAL Buffalo laboratory.

Field and Analytical Corrective Actions	AMEC Project QA Officer	Chris Ricardi	(207) 775-5401	The need for corrective action for field and analytical issues will be determined by QA Officer in conjunction with the Project Manager, the Field Program Coordinator, or the Laboratory QA Manager, as appropriate.
Release of Analytical Data	AMEC Project QA Officer	Chris Ricardi	(207) 775-5401	No final analytical data can be released until validation is completed and Data QA Officer has approved the release.
QAPP Amendments	AMEC Project QA Officer	Chris Ricardi	(207) 775-5401	Any major changes to the QAPP must be approved by the QA Officer, the Project Manager, and the Project Site Manager before the changes can be implemented.

QAPP Worksheet #4 Sign Off Sheet

UFP-QAPP Manual Section 2.3.2
Have copies of this form signed by key project personnel from each organization to indicate that they have read the applicable sections of the QAPP and will perform the tasks as described. Ask each organization to forward signed sheets to the central project file.

Project Personnel Sign-Off Sheet

Organization: AMEC E&E, P.C.

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Michael Cote	Project Manager	860-257-5539		
Christian Ricardi	Project QA Officer/Project Chemist	207-775-5401		
Mark Netzer	Technical/Field Lead	860-257-5533		

Project Personnel Sign-Off Sheet (cont.)

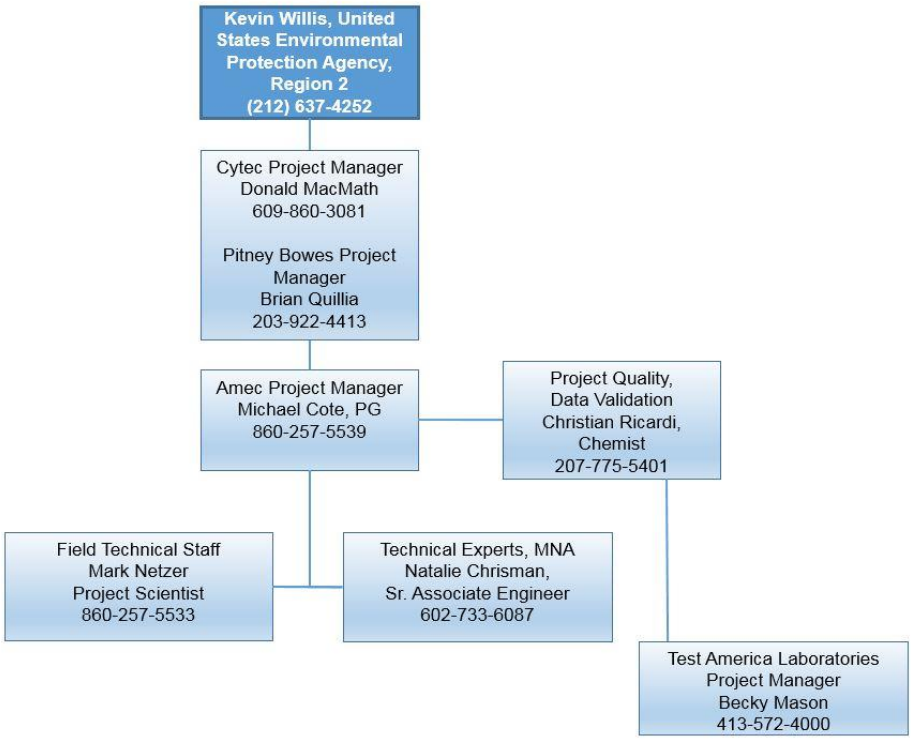
Organization: Test America Laboratories

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Becky Mason	Project Manager	413 572-4000		
David Orlowski	Laboratory Quality Assurance Manager	716 504-9832		

QAPP Worksheet #5 Organizational Chart

UFP-QAPP Manual Section 2.4.1

Identify reporting relationships between all organizations involved in the project, including the lead organization and all contractor and subcontractor organizations. Identify the organizations providing field sampling, on-site and off-site analysis,and data review services, including the names and telephone numbers of all project managers, project team members, and/or project contacts for each organization.



QAPP Worksheet #6 Communication Pathways

UFP-QAPP Manual Section 2.4.2
Describe the communication pathways and modes of communication that will be used during the project, after the QAPP has been approved. Describe the procedures for soliciting and/or obtaining approval between project personnel, between different contractors, and between samplers and laboratory staff. Describe the procedure that will be followed when any project activity originally documented in an approved QAPP requires real-time modification to achieve project goals or a QAPP amendment is required. Describe the procedures for stopping work and identify who is responsible.

Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Lead point of contact for Sarney Farm Superfund Site	EPA Project Lead	Kevin Willis	212-637-4252	Receives and reviews all analytical reports and findings
Points of Contact for Cytec Industries and Pitney Bowes	Client Remediation Managers	Don MacMath Brian Quillia	609-860-3081 203-922-4413	Overall project management, guidance and review of reports
Point of contact with EPA, Client Remediation Managers, Technical lead	Amec Project Manager	Michael Cote	860-257-5539	Project planning, execution, coordination of activities, reporting, coordinate contract and financial management; manage project schedules and budgets
Coordinate Field QA Activities, laboratory oversight, data management, and data validation. Implementation of QAPP; QAPP Amendments; Field and Analytical Corrective Actions.	QA Officer	Chris Ricardi	207-775-5401	Implementation of QA program and coordination with Field Technical Lead. Laboratory technical oversight. Advise project team on QA issues and communicate with site leaders on quality planning and issue resolution. Resolve technical issues related to analytical chemistry.

Coordinate Field Activities and provide Daily Field Progress Reports to site leads	Field Technical Leader	Mark Netzer	860-257-5533	Conduct and direct sampling, provide daily field progress reports, including sample logs, chains of custody, and other information to the Project Manager. Assist in preparation of reports.
Reporting Lab Data Quality Issues, Test America Laboratories	Laboratory Project Manager Laboratory Quality Manager	Becky Mason David Orlowski	413-572-4000	All QA/QC issues involving project field samples will be reported by the Laboratory QA Manager to Project Manager and Data QA Manager within 2 business days.

QAPP Worksheet #7 Personnel Responsibilities and Qualifications Table

UFP-QAPP Manual Section 2.4.3
Identify project personnel associated with each organization, contractor, and subcontractor participating in responsible roles. Include data users, decision-makers, project managers, QA officers, project contacts for organizations involved in the project, project health and safety officers, geotechnical engineers and hydrogeologists, field operation personnel, analytical services, and data reviewers.

Personnel Responsibilities and Qualifications Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience, Qualifications
Michael Cote*	Project Manager	Amec	Lead efforts related to the technical approach and level of effort required to address each element of tasks; provide day-to-day communication, both within and outside the Amec team; supervise project work, including integrating the efforts of all supporting disciplines; oversee the preparation of reports; provide for quality control (QC) and quality review during the performance of the work; forming and maintaining a project team with expertise in disciplines appropriate to accomplish the work; review and approve the scope of work and QAPP; and develop task schedules.	B.S. Geology, 30 years of experience in all aspects of environmental site investigation and remediation

Name	Title	**Organizational Affiliation**	**Responsibilities**	**Education and Experience, Qualifications**
Christian Ricardi*	Project Quality Manager	Amec	Preparation of QAPP; providing QA support to field sampling operations; supporting project chemist coordination of subcontract laboratory; coordinating data validation with project chemist; reviewing data validation reports to ensure compliance with QAPP requirements and technical accuracy; bringing any QC problems to the attention of the Project Manager and coordinating any necessary corrective actions related to project quality; and interfacing with appropriate technical personnel for project QA matters, including field activities, analytical laboratory, data validation and questions relating to QA protocols and compliance.	Designated Amec QA Officer (National Registry of Certified Chemists – Environmental Analytical Chemist)
Mark Netzer*	Field Technical Lead	Amec	Conduct and direct sampling consistent with the QAPP, recordation of field data, assistance in report preparation (see also Field Technicians and Scientists duties, below)	B.S. Environmental Science, more than six years of field sampling and data recordation experience. Well qualified director of field programs.
Natalie Chrisman*	Senior Associate Engineer	Amec	Evaluation of Monitored Natural Attenuation data and associated reporting in support of the project	M.S. Environmental Eng., B.S. Civil Eng., over 20 years of developing and implementing remediation solutions

Name	Title	**Organizational Affiliation**	**Responsibilities**	**Education and Experience, Qualifications**
TBD	Field Technicians and Scientists	Amec	Understanding and implementing the sampling and the QAPP requirements as they relate to their duties; collecting samples, conducting field measurements, and decontaminating equipment according to documented procedures stated in the QAPP; ensuring that field instruments are properly operated, calibrated, and maintained, and that adequate documentation is kept for all instruments; collecting the required QC samples and thoroughly documenting QC sample collection; ensuring that field documentation procedures are followed and data are complete and accurate; complete field logbook entries documenting daily activities; and complete all FDRs applicable to tasks assigned.	TBD
Becky Mason	Laboratory Project Manager	Test America Laboratories	Implement and adhere to the QA and corporate policies and procedures within the laboratory; approving Standard Operating Procedures (SOPs); maintain adequate staffing; implement internal/external audit findings and corrective actions	Laboratory designated Manager

Name	Title	**Organizational Affiliation**	**Responsibilities**	**Education and Experience, Qualifications**
David Orlowski	Laboratory Quality Manager	Test America Laboratories	Approving the laboratory SOPs; ensure and improve quality within the laboratory; supervise and provide guidance and training to laboratory staff; address all client inquiries involving data quality issues; perform QA audits and assessments; track external and internal findings of QA audits; and coordinate laboratory certification and accreditation programs	Laboratory designated QA Manger

*Resumes are attached as Appendix E.

QAPP Worksheet #8 Special Personnel Training Requirements Table

UFP-QAPP Manual Section 2.4.4
Provide the following information for those projects requiring personnel with specialized training. Attach training records and/or certificates to the QAPP or note their location.

☐ Worksheet Not Applicable (State Reason)

Worksheet #8 Special Personnel Training Requirements Table

Project Function	Specialized Training – Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
Field Activities	40-hour HAZWOPER with 8-hour Annual Refresher	OSHA Certified training Professionals	40 hr – upon hire; 8 hr - annually	Field operations personnel	Amec	Amec project offices
Groundwater Sampling	Low Stress Sampling Procedures	Amec	NA	Field operations personnel	Amec	PM verification of experience

QAPP Worksheet #9 Project Scoping Session Participation Sheet

UFP-QAPP Manual Section 2.5.1

Complete this worksheet for each project scoping session held. Identify project team members who are responsible for planning the project.

Project Scoping Session Participants Sheet

Project Name Sarney Farm Superfund Site **Projected Date(s) of Sampling** annually, August		**Site Name** Sarney Farm Superfund Site **Site Location** Amenia, Dutchess Plains, New York			
Date of Session: **Scoping Session Purpose:**					
Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**	**Project Role**
Project Involves annual groundwater sampling consistent with EPA requirements and periodic solid-phase sampling as directed by EPA; no scoping sessions were required.					

QAPP Worksheet #10 Problem Definition

UFP-QAPP Manual Section 2.5.2
Clearly define the problem and the environmental questions that should be answered for the current investigation and develop the project decision "If…, then…" statements in the QAPP, linking data results with possible actions. The prompts below are meant to help the project team define the problem. They are not comprehensive.

☐ Worksheet Not Applicable (State Reason)

Worksheet #10 Problem Definition

The problem to be addressed by the project: *Evaluation of the continued degradation of Volatile Organic Compounds (VOCs), predominantly 1,2-Dichloroethane (12DCA), in groundwater located in a small area of the Sarney Farm Site. The results of groundwater sampling activities to date reveal that some contaminants are still present at concentrations above health based drinking water standards. This updated site-specific QAPP will provide the framework for continued groundwater sampling and surface water/sediment sampling as required. In addition, groundwater monitoring will be performed to evaluate the continued absence of constituents of concern in five near-site private water supply wells.*

QAPP Worksheet #11 Project Quality Objectives/Systematic Planning Process Statements

UFP-QAPP Manual Section 2.6.1
Use this worksheet to develop project quality objectives (PQOs) in terms of type, quantity, and quality of data determined using a systematic planning process. Provide a detailed discussion of PQOs in the QAPP. List PQOs in the form of qualitative and quantitative statements. These statements should answer questions such as those listed below. These questions are examples only, however; they are neither inclusive nor appropriate for all projects.

☐ Worksheet Not Applicable (State Reason)

Worksheet #11 Project Quality Objectives /Systematic Planning Process Statements

Who will use the data? *Amec, their clients, and overseeing agencies will use the data.*
What will the data be used for? *The primary objectives of this work is evaluate the continued degradation of residual low-level VOCs in bedrock groundwater at the Sarney farm Superfund Site and the continued absence of constituents of concern in private water supply wells. Additionally, data will be used to evaluate the surface water and sediment of Cleaver Swamp proximal to the area of groundwater VOC impact.*
What type of data are needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques) *Primarily, VOC analytical data from groundwater will be collected from on-site monitoring wells and off-site private water supply wells. As specified in a September 8, 2016 letter from the USEPA to Pitney Bowes, beginning in 2017, a minimum of five annual groundwater monitoring events from 5 off-site water supply wells and 8 on-Site monitoring wells will be conducted. For the 2017 monitoring event, the USEPA has added groundwater analyses for 1,4-dioxane and monitored natural attenuation parameters to the analyte list, and VOCs are to be analyzed in sediment and surface water samples from Cleaver Swamp adjacent to the Site. The USEPA states that they will notify Pitney Bowes if such additional analyses are required in subsequent sampling events.*
How "good" do the data need to be in order to support the environmental decision? *The quality of data needed to achieve the Project Quality Objectives is described using data quality indicator goals (precision, accuracy, representativeness, comparability, completeness, selectivity, and sensitivity) required of each analytical parameter used for each media sampled. The limits set on each of these items are referred to as measurement performance criteria and are defined in Worksheets 12, 15, 28, and 36. Measurement performance have been established for each parameter in order to ensure the data are sound, highly defensible, and with low enough quantitation limits to support human health evaluations.*
How much data are needed? (number of samples for each analytical group, matrix, and concentration) *Five private water supply wells, eight bedrock groundwater monitoring wells, co-located surface water and sediment samples.*
Where, when, and how should the data be collected/generated? *Sampling has historically occurred annually during the third quarter (August). Data will be generated in accordance with USEPA guidelines and consistent with attached Standard Operating Procedures (SOPs).*
Who will collect and generate the data? *Amec will collect the environmental samples. Samples will be analyzed by TestAmerica Buffalo located in Amherst, NY. Field data and laboratory data will be managed and reported by Amec.*

Worksheet #11 Project Quality Objectives /Systematic Planning Process Statements

How will the data be reported? *The analytical laboratory will provide a report and data deliverables electronically. Results will be validated and entered into an electronic database as described in Worksheet #14. Data will be presented in an Annual Groundwater Monitoring Report within 45-days of receipt of the final laboratory data.*
How will the data be archived? *Amec will maintain the validated analytical results in their Technical Environmental Database (TED).*

QAPP Worksheet #12 Measurement Performance Criteria Table

UFP-QAPP Manual Section 2.6.2
Complete this worksheet for each matrix, analytical group, and concentration level. Identify the data quality indicators (DQIs), measurement performance criteria (MPC), and QC sample and/or activity used to assess the measurement performance for both the sampling and analytical measurement systems. Use additional worksheets if necessary. If MPC for a specific DQI vary within an analytical parameter, i.e., MPC are analyte-specific, then provide analyte-specific MPC on an additional worksheet.

☐ Worksheet Not Applicable (State Reason)

A summary of analytical methods that will be used during annual groundwater monitoring program is included in Table 1. Project-specific measurement performance criteria are established for analytical methods described in detail in Worksheet 12 for each analytical method and media planned for the investigation. In addition, the project-specific method performance criteria are summarized for laboratory control samples (LCS), matrix spikes, field duplicates, lab duplicates, and surrogates on Table 2. Additional information on analytical method sensitivity, target analytes, and detection limits is provided on Worksheet 15. The criteria listed in Table 2 are based on reviews on general technical information provided in multiple analytical method guidance documents and UESPA Region II data validation guidelines, and the professional judgment of the project chemists. They provide stream-lined technically defensible QC limit goals that establish a minimum level of accuracy and precision where lab data will be accepted without qualification during data validation. The purpose of this section is to state the specific QC objectives for the DQIs for the project analytical methods and data validation. Results may be qualified during the data validation step described in Worksheet 36 if QC measurements fall outside the established ranges. The tables are included on the following pages.

Worksheet #12 Measurement Performance Criteria Table

Matrix	Groundwater, Surface Water
Analytical Group	VOC
Concentration Level	Low

Sampling Procedure[1]	**Analytical Method/SOP2**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)**
S-1	SW-846 8260, L-1	Precision - Overall	RPD ≤ 50 when positive results for both samples are ≥ 2x RLRL RPD ≤ 50 when positive result for one sample is ≥ 2x RLRL and positive result for other sample is < 2x RLRL No situations where one result is detected at ≥ 2x RLRL and other result is not detected.	Field Duplicates	S & A
		Accuracy/Precision – Laboratory (1)	Percent recoveries 70-13, RPDs ≤ 50	Matrix Spike/Matrix Spike Duplicate	A
		Accuracy/Bias (1)	Percent recoveries 70 - 130	Laboratory Control Sample	A
		Accuracy/Bias (1)	Percent recoveries 70 - 130	Surrogates	A
		Accuracy/Bias	50 to 200% of calibration standard. Retention time within 30 seconds of calibration standard	Internal Standards	A
		Accuracy/Bias - Contamination	No target compounds > RLRL (RLRL	Method Blanks, Storage Blanks, Equipment Blanks, Trip Blanks	S & A
		Completeness	Field 90%, Laboratory 95%	Data Completeness Check	S & A
		Sensitivity	MDL/RL evaluated versus project action limits. See Worksheet #15	MDL Study	A

Worksheet #12 Measurement Performance Criteria Table

Matrix	Groundwater
Analytical Group	1,4-Dioxane
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
S-1	EPA 522, L-2	Precision - Overall	RPD ≤ 50 when positive results for both samples are ≥ 2x RLRL RPD ≤ 50 when positive result for one sample is ≥ 2x RLRL and positive result for other sample is < 2x RLRL No situations where one result is detected at ≥ 2x RLRL and other result is not detected.	Field Duplicates	S & A
		Accuracy/Precision - Laboratory	Percent recoveries 70-130, RPDs ≤ 30	Matrix Spike/Matrix Spike Duplicate	A
		Accuracy/Bias	Percent recoveries 70 - 130	Laboratory Control Sample	A
		Accuracy/Bias	Percent recoveries 50 - 150	Reporting Limit level Laboratory Control Sample	A
		Accuracy/Bias	Percent recoveries 70 - 130	Surrogates	A
		Accuracy/Bias - Contamination	70 - 130% of most recent CCV. Retention time within 30 seconds of midpoint of ICAL	Internal Standards	A
		Accuracy/Bias-Contamination	No target compounds > 1/3 RL	Method Blanks, Equipment Blanks	S & A
		Completeness	Field 90%, Laboratory 95%	Data Completeness Check	

Worksheet #12 Measurement Performance Criteria Table

Matrix	Groundwater
Analytical Group	1,4-Dioxane
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
		Sensitivity	MDL/RL selected for low concentration evaluation. See Worksheet #15	MDL Study	S & A

Worksheet #12 Measurement Performance Criteria Table

Matrix	Groundwater
Analytical Group	Monitored Natural Attenuation (MNA) Parameters[1]
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)

Worksheet #12 Measurement Performance Criteria Table

Matrix	Groundwater
Analytical Group	Monitored Natural Attenuation (MNA) Parameters[1]
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
S-1	See Table 1 and Worksheet 23	Precision - Overall	RPD ≤ 50 when positive results for both samples are ≥ 2x RL RPD ≤ 50 when positive result for one sample is ≥ 2x RL and positive result for other sample is < 2x RL No situations where one result is detected at ≥ 2x RL and other result is not detected.	Field Duplicates	S & A
		Accuracy/Precision - Laboratory	Percent recoveries: Lab Limits	Matrix Spike/Matrix Spike Duplicate	A
		Accuracy/Bias	Percent recoveries: Lab Limits	Laboratory Control Sample	A
		Accuracy/Bias	Percent recoveries: Lab Limits	Surrogates	A
		Accuracy/Bias - Contamination	No target compounds > RL	Method Blanks, Storage Blanks, Equipment Blanks, Trip Blanks	S & A
		Completeness	Field 90%, Laboratory 95%	Data Completeness Check	S & A
		Sensitivity	MDL/RL established by the laboratory. See Worksheet 15	MDL Study	A

1). MNA parameters include total organic carbon (TOC), nitrate/nitrite, total and dissolved iron, sulfate, sulfite, and methane.

Worksheet #12 Measurement Performance Criteria Table

Matrix	Soil, Sediment
Analytical Group	VOC
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP2	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
S-2	SW-846 8260, L-1	Precision - Overall	RPD ≤ 100 when positive results for both samples are ≥ 2x RLRL RPD ≤ 100 when positive result for one sample is ≥ 2x RLRL and positive result for other sample is < 2x RLRL No situations where one result is detected at ≥ 2x RLRL and other result is not detected.	Field Duplicates	S & A
		Accuracy/Precision	Percent recoveries 70 - 130, RPDs ≤ 35	Matrix Spike/Matrix Spike Duplicate	A
		Accuracy/Bias	Percent recoveries 70 - 130	Laboratory Control Sample	A
		Accuracy/Bias	Percent recoveries 70 - 130	Surrogates	A
		Accuracy/Bias	50 to 200% of calibration standard. Retention time within 30 seconds of calibration standard	Internal Standards	A
		Accuracy/Bias - Contamination	No target compounds > RLRL (except methylene chloride must be < 10 x RLRL and acetone and 2-butanone must be < 2x RLRL)	Method Blanks Storage Blanks Equipment Blanks Trip Blanks	S & A
		Completeness	Field 90%, Laboratory 95%	Data Completeness Check	S & A

Worksheet #12 Measurement Performance Criteria Table

Matrix	Soil, Sediment
Analytical Group	VOC
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP2	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
		Sensitivity	RL/MDL evaluated versus project action limits. See Worksheet #15	MDL Study	A

Table 1 – Analytical Methods

Analytical Parameter	Analytical Method	GW	SW	SED
VOCs	8260	X	X	X
1,4-dioxane	522	X		
Total Organic Carbon	9060A	X		
Nitrate/nitrite as N	353.2	X		
Total Iron	6010C	X		
Dissolved Iron	6010C	X		
Sulfate	300.0	X		
Sulfide	SM 4500 S2 F	X		
Methane	RSK-175	X		
Field Parameters				
Temperature	Field measurement	X		
Conductivity	Field measurement	X		
pH	Field measurement	X		
Dissolved oxygen	Field measurement	X		
Oxidation/reduction potential	Field measurement	X		
Turbidity	Field measurement	X		

VOCs- Volatile Organic Compounds, GW- Groundwater, SW- Surface Water, SED- Sediment

Table 2 – Project QC Limits

Analytical Parameter	Analytical Method	QC Test	Sediment %R	Sediment RPD	Water %R	Water RPD
VOCs	SW-846 8260	LCS	70-130		70-130	
		MS/MSD	70-130	35	70-130	20
		surrogates	70-130		70-130	
		field duplicates		100		50
1,4-Dioxane	522	Worksheet 12 for QC limits based on Method 522. Field Duplicates				50
MNA Parameters[1]		Laboratory QC limits will be used for LCS, and MS/MSD. Field Duplicates				50

1. MNA parameters include total organic carbon (TOC), nitrate/nitrite, total and dissolved iron, sulfate, sulfite, and methane.

QAPP Worksheet #13 Secondary Data Criteria and Limitations Table

UFP-QAPP Manual Section 2.7
Identify all secondary data and information that will be used for the project and their originating sources. Specify how the secondary data will be used and the limitations on their use.

Secondary Data Criteria Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/Collection Dates)	How Data Will Be Used	Limitations on Data Use
Historical Groundwater Monitoring Data	Regarding historical data, since 1999 groundwater from the site monitoring wells has been sampled on a quarterly, semi-annual, or annual basis for volatile organic constituents (VOCs). Since 1985, 27 sampling events of private potable wells near the site for VOCs have been conducted. In addition, several monitoring well sampling events for various monitored natural attenuation parameters have been periodically conducted at the site.	AMEC E&E, PC and predecessor/sister companies (e.g. Amec Foster Wheeler Environment and Infrastructure, Inc., AMEC Environment and Infrastructure, Inc., MACTEC)	The historical data will be used as a comparative tool to evaluate temporal changes in groundwater quality over time.	The historical data will not be used to demonstrate compliance.

QAPP Worksheet #14 Summary of Project Tasks

UFP-QAPP Manual Section 2.8.1 -
Provide a brief overview of the listed project activities.

☐ Worksheet Not Applicable (State Reason)

Sampling Tasks:

Groundwater from monitoring wells MW-7D, MW-9D, and MW-10D will be sampled annually. Monitoring wells MW-9D and MW-10D are equipped with multi-level samplers with sample points at three depths in each well. Monitoring well MW-7D has two discrete sampling zones. A total of eight monitoring well samples will be collected from these three wells, plus one field duplicate, one equipment blank, and one trip blank per sample cooler (4 estimated). These groundwater samples will be collected in accordance with USEPA Region II's Groundwater Sampling Procedure for Low-Stress (Low-Flow) Purging and Sampling. During 2017, the monitoring well groundwater samples will be analyzed for VOCs, 1,4-dioxane, and monitored natural attenuation (MNA) parameters (total organic carbon, nitrate, total and dissolved iron, sulfate, sulfide, and methane). After 2017, VOCs and MNA parameters will be analyzed in monitoring well groundwater samples in 2018, 2019, 2020, and 2021.

Groundwater samples will be collected annually from five residential wells known as the Emerson, Gray (151 BHR), Hurlburt, Leinert, and Sarney wells and submitted for laboratory analysis. A trip blank will also be analyzed by this method. The residential samples will be collected by utilizing an outside spigot. If an aerator is present, it will be removed prior to sample collection. The faucet will be allowed to discharge for approximately 10 to 15 minutes prior to sample collection. These samples will be analyzed for VOCs.

In 2017 only, consistent with attached SOPs, one sediment sample and one co-located surface water sample will be collected from Cleaver Swamp immediately west of monitoring well MW-9D. These samples will be analyzed for VOCs.

Analysis Tasks:

- Monitoring well groundwater samples will be analyzed for VOCs, 1,4-dioxane, and MNA parameters as described above in sampling tasks.
- Private monitoring well groundwater samples, and a surface water and co-located sediment sample will be analyzed for VOCs as described above in sampling tasks.

Quality Control Tasks: The quality control (QC) samples are described in Worksheet #20. Field instrument testing is described in Worksheet #22.

Secondary Data: Data from previously collected annual sampling events

Data Management Tasks:

Laboratory data will be entered into the Amec Technical Environmental Data (TED) data management system for use in preparing the monitoring reports and subsequent documents.

The data management plan has five elements: 1) sample designation system, 2) field activities, 3) sample tracking and management, 4) data management system, and 5) document control.

1. *Sample Designation System:* Samples collected during Site activities shall be assigned unique sample identification (ID) numbers. These numbers are necessary to identify and track each of the samples collected for analysis during completion of the project. In addition, the sample ID numbers shall be used to identify analytical results received from field activities or laboratory, and to report data in the annual report.

Sample IDs for previously collected samples will be included in the database as they were originally identified, and a list sample designations for future sampling events is presented below.

Monitoring Well Sample IDs:
MW-7S
MW-7D
MW-9D1
MW-9D2
MW-9D3
MW-10D1
MW-10D2
MW-10D3

Private Water Supply Well IDs:
Sarney
Leinert
Hurlburt
Emerson
151 BHR

Sediment Sample
2017 SED-1

Surface Water Sample
2017 SW-1

2. *Field Activities:* Field Logbooks will be used to document procedures performed by field personnel. The field logbooks provide a daily hand written account of all field activities. Logbooks are hardcover books that are permanently bound. All entries are made in permanent black or blue ink, and corrections are made with a single line with the author initials and date. Each page of the logbook will be dated and signed by the person completing the log. Partially completed pages will have a line drawn through the unused portion at the end of each day.

The cover of each logbook will be entitled with the facility and project name "Sarney Farm", the Amec project number, and the date the logbook was started.

The field logbook is a record of all site activities completed for each day or operation. Entries are made daily to document the important activities of that day. The Field Operations Leader, or designee, will complete the site logbook. At a minimum the logbook will contain the following information:

- names, titles, and affiliations of all project related personnel present at the site during each day of operation;
- a brief summary of all activities completed for each day of operation;
- a listing of any changes made to established work plan or QAPP procedures;
- a summary of any problems encountered during the day including a description of corrective actions and impacts on the project; and
- record of health and safety issues.

Field logbooks will provide the means of recording the chronology of data collection activities performed during the investigation. As such, entries will be described in as much detail as possible so that a particular situation could be reconstructed without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be stored in the project files when not in use. Each logbook will be identified by the project-specific document number. All logbooks will be water resistant and have sequentially numbered pages.

The cover of each logbook will contain the following:

- project name
- project number
- field book start date
- field book end date

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, and names of all sampling team members present will be entered. Each page of the logbook will be signed and dated by the person making the entry. All entries will be made in permanent ink, signed, and dated and no erasures or obliterations will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark which is signed and dated by the sampler. The correction shall be written adjacent to the error.

Field activities will be fully documented. Upon receipt of the field logbook for a particular activity, the designated person recording the notes will begin recording notes on a new page. The person recording the notes will sign the top of the new page and indicate the date, time, and weather conditions, prior to recording information about the field activity. The field logbook will document all Field Data Record forms that are used during investigation activities. When the designated person recording the notes either relinquishes the field logbook to another team member or turns the book in at the end of the day, the person relinquishing the field logbook will affix a signature and date to the bottom of the last page used. If the page is not complete, a diagonal line will be struck across the blank portion of the page. Information included in the logbook or associated field data record forms will include, but may not be limited to:

- description and chronology of activities, including entry and exit times
- names of all people involved in sampling activities and organizational affiliations
- level of personal protection used
- any changes made to planned protocol
- names of visitors to the site during sampling and reason for their visit
- sample location and sample identification codes for collected analytical samples
- dates (month/day/year) and times (military) of sample collection
- measurement equipment identification (model/manufacturer) and calibration information (if not recorded on a FDR)
- field monitoring instrument results (if not recorded on a FDR)
- site observations (if not recorded on a FDR)
- sample collection methods and equipment (if not recorded on a FDR)
- sample collection date and time (if not recorded on a FDR)
- sample depths (if not recorded on a FDR)
- whether grab or composite sample collected (if not recorded on a FDR)
- sample description (color, odor, texture, etc.) (if not recorded on a FDR)
- tests or analyses to be performed (if not recorded on a FDR)
- sample preservation and storage conditions (if not recorded on a FDR)
- equipment decontamination procedures (if not recorded on an FDR)
- QC sample collection,
- unusual observations
- record of photographs
- sketches or diagrams
- signature of person recording the information

Field logbooks will be reviewed on a daily basis by the Amec Field Technical Leader.

Field Data Record Forms:

Field data records will be used to record sample collection information in real time during field activities. A complete set of Field Data Records is provided in Appendix B of the QAPP. These forms are designed to capture data from each type of field activity that is completed. Field personnel are instructed to utilize these forms during the field activities for which each form was designed.

- Field Equipment Calibration Log
- Surface Water - Sediment Sampling Log
- Low Flow Groundwater Sampling Log
- Chain of Custody Records
- Well Development Log

As with the field logbooks, all documentation will be recorded in permanent ink. Corrections to errors in documentation or recorded calculations will be made by first striking out the error with a single line so as not to obliterate the original entry. Then the replacement entry or value will be inserted where appropriate. The person originating the change will initial and date each separate change. All revisions, deletions, and changes will be made in indelible ink.

Photographs:

Field personnel may need to take photos to document field activities. Examples of items that may require photographic documentation include:

- general site topography
- sampling locations
- existing monitoring locations
- physical appearance of environmental samples
- physical appearance of ground water, surface water, sediment, and soil

A field logbook entry or Photograph Log will be used to record the date, time, and description (caption) of photographs taken at the site. Digital photographs will be downloaded from the camera and photographic files saved on the project drive.

Equipment Calibration Log:

An FDR form will be used to record which instruments were calibrated each day (identified by manufacturer, model number and serial number), the individual who performed the calibration, and any notes regarding the maintenance of the instrument.

Health and Safety Log:

A logbook entry will be used to record any Health and Safety issues that arise during field activities. Any injuries, illnesses, use of first aid supplies, use of personal protective equipment (for levels A, B or C only, if needed), or possible work-related symptoms will be recorded in the log together with the date, the name(s) of the affected individual(s), and a description of the incident. The designated Health and Safety Officer (HSO) and Field Operations Lead (FOL) will be responsible for these entries.

Field QC Sample Record:

During field sampling investigations the FOL will maintain a record of all field QC samples that are generated. Field QC samples include QC blanks (e.g., field blanks, trip blanks, and/or equipment blanks), field duplicates, and MS/MSD samples. This record will be provided to the project chemist for use during data validation.

Field Documentation Management System:

The Amec project manager will maintain an inventory of all logbooks used during the program and will be responsible for ensuring that they are archived in the project files following the completion of the investigation.

Completed FDRs will be maintained by the Amec Field Leader during the duration of the program and will be archived in the project files following completion of the sampling effort.

3. ***Sample Tracking and Management:*** This section documents the procedures that will be followed to identify and track samples collected in the field, samples delivered or shipped to a fixed laboratory for analysis, and sample transfer throughout the laboratory.

A chain of custody record and groundwater sample collection FDRs (Appendix B), will be completed to document sample collection and shipment of samples to the laboratory. The goal of each COC record is the same: to document the identification, source, contents, condition, date/time and parties involved in each sample's collection and transfer. Labels are created for every bottle needed for a sample to identify the exact sample. The COC forms and sample IDs are verified by the field sample leader and during data validation. In addition to hardcopy lab reports, electronic data deliverables (EDDs) are obtained from the laboratory. The EDD data is directly loaded into the TED which is used to prepare tables with a summary of samples, analytical parameters, and sample collection dates. This summary is used to track the project schedule and sample analysis and reporting status. The data base is also used to track sample data reporting by off-site laboratories and verify completeness of the data deliverables.

Data Management System: Data from field activities and measurements may be entered into the TED data base.

Data Transformation and Reduction: Data generated through field activities or by the subcontract laboratory, will be reduced and validated prior to reporting. Measurements and sample collection information will be transcribed directly into the field logbook or onto standardized forms. If errors are made, results will be legibly crossed out, initialed and dated by the person recording the data, and corrected in a space adjacent to the original (erroneous) entry.

- logbooks and standardized forms have been filled out completely and that the information recorded accurately reflects the activities that were performed;
- records are legible and in accordance with good record keeping procedures, i.e., entries are signed and dated, data are not obliterated, changes are initialed, dated, and explained;
- sample collection, handling, preservation, and storage procedures were conducted in accordance with the protocols described in the QAPP, and that any deviations were documented and approved by the appropriate personnel; and
- analytical instrumentation was calibrated and operated in accordance with the procedures specified in the QAPP.

Laboratory data reduction procedures will be performed according to procedures in the laboratory's QA Manuals.

Data Transfer and Transmittal: All laboratory data will be provided by the laboratory in both electronic and hard copy format. The electronic data will be imported into the Amec TED database. During data validation a quality assurance review of sample results will be completed to ensure that the data in the database match the hard copy provided by the laboratory.

Laboratory data will be maintained in a computerized database to allow easy retrieval of information and electronic transfer of the data to other parties. As samples are obtained and shipped to laboratories for analysis, a new database record will be created for each sample number, containing the date of sampling, sample location, Field Sample ID, sample depth, sample type (field vs. QA/QC), analyses to be performed, and laboratory name. As laboratory analytical results are received, and validated, the results will be imported to the database.

Data Analysis and Reporting:

Once data are entered into the TED and validation is completed, data reports will be generated as needed to support monitoring report preparation. TED is a computerized database management system designed to manage a large amount of sampling and analytical data will be used. The data management system is intended to serve as the database for data generated in past phases of the project as well as the current phase. The data management system is designed to provide the technical project staff with a vehicle to sort, arrange, and thereby analyze data with speed and efficiency, while allowing user-specified reporting and graphics capabilities.

5. ***Document Control:*** Management of field data is described above. Laboratory data will be maintained as described in the laboratory's QA Manuals. Amec is the custodian of the project files and will maintain the contents of the files, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, and data reviews in a secured, limited access area.

6. ***Documentation and Records:*** Technical records used to document field activities and project investigations will make up the majority of records generated during remedial investigations at the site. A summary of field records and data generation records is presented in Worksheet #29.

Assessment/Audit Tasks:

No field audits are planned for this program. It is the responsibility of the project manager and field leader to review project execution and verify that procedures described in project planning documents and this QAPP are followed.

Laboratory Audits: No laboratory audits are planned for this program.

Corrective Actions: Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP. Corrective actions include procedures to promptly investigate, document, evaluate and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures for the actions are described below.

Data Review Tasks: See Worksheets #36 and #37.

QAPP Worksheet #15 Contaminants of Concern and Other Target Analytes Table (Reference Limits and Evaluation Table

UFP-QAPP Manual Section 2.8.1 ☐ Worksheet Not Applicable (State Reason)
Complete this worksheet for each matrix, analytical group, and concentration level. Identify the target analytes/contaminants of concern and project-required action limits. Next, determine the quantitation limits (QLs) that must be met to achieve the project quality objectives. Finally, list the published and achievable detection and quantitation limits for each analyte.

The sampling program is described in Worksheet 14. Samples will be collected from the following media:

- Groundwater
- Surface Water
- Sediment

The Analytical Approach

Goals for analytical method sensitivity include the identification of Project Quantitation Limits (PQLs) and method detection limits (MDLs). PQLs presented in Worksheet 15 have been established for each parameter based on detection limit information provided by the laboratory. In accordance the UFP-QAPP format, Project Action Limits (PALs) are also identified for each parameter. In accordance with procedures under CERCLA, detection limits are compared to applicable groundwater standards and/or risk screening levels. Analytical results from the monitoring sampling events will be compared to the following NY State and federal criteria listed on Worksheet 15. The PAL values were obtained from the following sources:

Groundwater Human Health and Ecological PALs

The Human Health groundwater PAL for each chemical is the minimum value from the following sources:

- USEPA Maximum Contaminant Levels (MCLs) for Drinking Water
- NY Ambient Water Quality Standards (NYS WQS) and Guidance Values and Groundwater Effluent Limitations, Division of Water Technical and Operational Guidance Series (1.1.1) and amendments. 6 NYCRR Parts 700-706.

Detections limits established for this project are consistent with low concentration methods used during monitoring programs under CERCLA. These methods have detection limits similar to routine USEPA Contract Laboratory Program (CLP) methods and are designed to provide information on the nature of contamination for a large suite of analytes from multiple methods. A summary of groundwater standards and laboratory detection limits is provided in the Worksheet 15. The primary chemical contaminant at the Site is 12DCA.

Volatile Organic Constituents, MDLs, RLs, and Regulatory Criteria						
CAS #	Analytes	MDL	RL	Units	USEPA MCL	NYS WQS
71-55-6	1,1,1-Trichloroethane	0.28	0.5	ug/L	200	5
79-00-5	1,1,2-Trichloroethane	0.08	0.5	ug/L	5	1
75-34-3	1,1-Dichloroethane	0.24	0.5	ug/L		5
75-35-4	1,1-Dichloroethene	0.34	0.5	ug/L	7	5
87-61-6	1,2,3-Trichlorobenzene	0.35	0.5	ug/L		5
120-82-1	1,2,4-Trichlorobenzene	0.27	0.5	ug/L	70	5
95-63-6	1,2,4-Trimethylbenzene	0.23	0.5	ug/L		5
95-50-1	1,2-Dichlorobenzene	0.22	0.5	ug/L	600	3
107-06-2	1,2-Dichloroethane	0.25	0.5	ug/L	5	0.6
78-87-5	1,2-Dichloropropane	0.18	0.5	ug/L	5	1
108-67-8	1,3,5-Trimethylbenzene	0.25	0.5	ug/L		5
541-73-1	1,3-Dichlorobenzene	0.33	0.5	ug/L		3
106-46-7	1,4-Dichlorobenzene	0.33	0.5	ug/L	75	3
78-93-3	2-Butanone (MEK)	2.2	2.5	ug/L		50
591-78-6	2-Hexanone	0.72	2.5	ug/L		50
108-10-1	4-Methyl-2-pentanone (MIBK)	0.63	2.5	ug/L		5
67-64-1	Acetone	1.07	2.5	ug/L		50
71-43-2	Benzene	0.09	0.5	ug/L	5	1
75-15-0	Carbon disulfide	0.22	0.5	ug/L		60
56-23-5	Carbon tetrachloride	0.33	0.5	ug/L	5	5
108-90-7	Chlorobenzene	0.24	0.5	ug/L	100	5
75-00-3	Chloroethane	0.37	0.5	ug/L		5
67-66-3	Chloroform	0.22	0.5	ug/L		7
74-87-3	Chloromethane	0.22	0.5	ug/L		5
156-59-2	cis-1,2-Dichloroethene	0.26	0.5	ug/L	70	5
75-71-8	Dichlorodifluoromethane	0.14	0.5	ug/L		5

Volatile Organic Constituents, MDLs, RLs, and Regulatory Criteria						
CAS #	Analytes	MDL	RL	Units	USEPA MCL	NYS WQS
100-41-4	Ethylbenzene	0.3	0.5	ug/L	700	5
75-09-2	Methylene Chloride	0.21	0.5	ug/L	5	5
179601-23-1	m-Xylene & p-Xylene	0.28	0.5	ug/L		10
91-20-3	Naphthalene	0.26	0.5	ug/L		5
103-65-1	N-Propylbenzene	0.29	0.5	ug/L		5
95-47-6	o-Xylene	0.32	0.5	ug/L		5
127-18-4	Tetrachloroethene	0.12	0.5	ug/L	100	5
108-88-3	Toluene	0.25	0.5	ug/L	5	5
156-60-5	trans-1,2-Dichloroethene	0.18	0.5	ug/L	1000	5
79-01-6	Trichloroethene	0.22	0.5	ug/L	100	5
75-69-4	Trichlorofluoromethane	0.15	0.5	ug/L	5	5
75-01-4	Vinyl chloride	0.06	0.5	ug/L		5
100-42-5	Styrene	0.17	0.5	ug/L	2	2
	Total Xylene	0.28	1	ug/L	10000	5
123-91-1	1,4-Dioxane	0.2	.057	ug/L		

Water Chemistry Parameter MDLs, RLs, and Regulatory Criteria						
Analytes	Method	MDL	RL	Units	USEPA MCL	NYS WQS
Methane	RSK-175	0.29	0.58	ug/L	Not applicable (NA)	NA
Sulfate	EPA 300.0	0.349	2	mg/L	NA	NA
Iron	EPA 6010C	0.0193	0.05	mg/L	NA	NA
Nitrate/nitrite	EPA 353.2	0.02	0.05	mg/L	NA	NA
Sulfide	SM 4500-S2 F	0.67	1	mg/L	NA	NA
Total Organic Carbon	EPA 9060A	0.434	1	mg/L	NA	NA

Solid and Sediment MDLs, RLs, and Regulatory Criteria						
CAS #	Analytes	MDL	RL	Units	USEPA MCL	NYS WQS
71-55-6	1,1,1-Trichloroethane	0.363	5	ug/Kg	NA	NA
79-00-5	1,1,2-Trichloroethane	0.65	5	ug/Kg	NA	NA
75-34-3	1,1-Dichloroethane	0.61	5	ug/Kg	NA	NA
75-35-4	1,1-Dichloroethene	0.612	5	ug/Kg	NA	NA
87-61-6	1,2,3-Trichlorobenzene	0.531	5	ug/Kg	NA	NA
120-82-1	1,2,4-Trichlorobenzene	0.304	5	ug/Kg	NA	NA
95-63-6	1,2,4-Trimethylbenzene	0.96	5	ug/Kg	NA	NA
95-50-1	1,2-Dichlorobenzene	0.391	5	ug/Kg	NA	NA
107-06-2	1,2-Dichloroethane	0.251	5	ug/Kg	NA	NA
78-87-5	1,2-Dichloropropane	2.5	5	ug/Kg	NA	NA
108-67-8	1,3,5-Trimethylbenzene	0.322	5	ug/Kg	NA	NA
541-73-1	1,3-Dichlorobenzene	0.257	5	ug/Kg	NA	NA
106-46-7	1,4-Dichlorobenzene	0.7	5	ug/Kg	NA	NA
78-93-3	2-Butanone (MEK)	1.83	25	ug/Kg	NA	NA
591-78-6	2-Hexanone	2.5	25	ug/Kg	NA	NA
108-10-1	4-Methyl-2-pentanone (MIBK)	1.64	25	ug/Kg	NA	NA
67-64-1	Acetone	4.21	25	ug/Kg	NA	NA
71-43-2	Benzene	0.245	5	ug/Kg	NA	NA
75-15-0	Carbon disulfide	2.5	5	ug/Kg	NA	NA
56-23-5	Carbon tetrachloride	0.484	5	ug/Kg	NA	NA
108-90-7	Chlorobenzene	0.66	5	ug/Kg	NA	NA
75-00-3	Chloroethane	1.13	5	ug/Kg	NA	NA
67-66-3	Chloroform	0.309	5	ug/Kg	NA	NA
74-87-3	Chloromethane	0.302	5	ug/Kg	NA	NA
156-59-2	cis-1,2-Dichloroethene	0.64	5	ug/Kg	NA	NA

Solid and Sediment MDLs, RLs, and Regulatory Criteria						
CAS #	Analytes	MDL	RL	Units	USEPA MCL	NYS WQS
75-71-8	Dichlorodifluoromethane	0.413	5	ug/Kg	NA	NA
100-41-4	Ethylbenzene	0.345	5	ug/Kg	NA	NA
75-09-2	Methylene Chloride	2.3	5	ug/Kg	NA	NA
179601-23-1	m-Xylene & p-Xylene	0.84	10	ug/Kg	NA	NA
91-20-3	Naphthalene	0.67	5	ug/Kg	NA	NA
103-65-1	N-Propylbenzene	0.4	5	ug/Kg	NA	NA
95-47-6	o-Xylene	0.653	5	ug/Kg	NA	NA
100-42-5	Styrene	0.25	5	ug/Kg	NA	NA
127-18-4	Tetrachloroethene	0.671	5	ug/Kg	NA	NA
108-88-3	Toluene	0.378	5	ug/Kg	NA	NA
156-60-5	trans-1,2-Dichloroethene	0.516	5	ug/Kg	NA	NA
79-01-6	Trichloroethene	1.1	5	ug/Kg	NA	NA
75-69-4	Trichlorofluoromethane	0.473	5	ug/Kg	NA	NA
75-01-4	Vinyl chloride	0.61	5	ug/Kg	NA	NA
1330-20-7	Xylenes, Total	0.84	10	ug/Kg	NA	NA

QAPP Worksheet #16 Project Schedule Timeline Table

UFP-QAPP Manual Section 2.8.2
List all project activities as well as the QA assessments that will beperformed during the course of the project. Include the anticipated start and completion dates.

☐ Worksheet Not Applicable (State Reason)

- Annual groundwater and private well sampling event completed in August.
- 2017 surface water and sediment sampling completed in August 2017.
- Laboratory analysis and reporting within one month of sample collection.
- Data validation report completed upon receipt of laboratory data.
- Annual Groundwater Monitoring report completed within 45 days of receipt of final laboratory data.

QAPP Worksheet #17 Sample Design and Rationale

UFP-QAPP Manual Section 3.1.1
Describe the project sampling approach. Provide the rationale for selecting sample locations and matrices for each analytical group and concentration level.

Sampling Design and Rationale

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach):

Sampling Approach

The groundwater sampling at Sarney Farm is conducted as prescribed by the EPA. Historically, in conjunction with a 1980s / 1990s drum removal and soil remediation project at the site, groundwater impacts were evaluated as directed by the EPA via the installation and sampling of numerous overburden and bedrock monitoring wells at the Sarney Farm site. After numerous groundwater monitoring events and determination of the distribution of VOC impact in groundwater, the EPA approved the abandonment of 23 monitoring wells at the property. The current EPA specified groundwater monitoring program requires annual sampling, which is generally conducted in the third quarter of each year, of monitoring wells MW-7D (shallow and deep), MW-9D (zones 1 [deep], 2 [intermediate], and 3 [shallow]), MW-10D (zones 1 [deep], 2 [intermediate], and 3 [shallow]), and five private residential water supply wells (Sarney, Emerson, Leinert [formerly Taylor], Gray-Morantz [a.k.a. 151 BHR], and Hurlburt).

In a letter dated September 8, 2016, the EPA requested, that on-site Cleaver Swamp surface water and sediment be sampled during the 2017 sampling event. EPA also requested that 1, 4-dioxane be added for the 2017 sampling event, and natural attenuation parameters be added to the groundwater analytical suite for the next 5 years (2017, 2018, 2019, 2020, and 2021).

Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations) [May refer to map or Worksheet #18 for details]:

Sampling Design and Rationale:

- Groundwater: To be sampled at the monitoring wells (listed above) specified by the EPA; groundwater to be analyzed for VOCs by EPA Method 8260 (low level), 1,4-dioxane by EPA Method 522 (low level), Total Organic Carbon (TOC) by EPA Method 9060A, Nitrate/Nitrite by EPA Method 353.2, Total Iron by EPA Method 6010C, Dissolved Iron (field filtered) by EPA Method 6010C, Sulfate by EPA Method 300, Sulfide by EPA Method SM 4500 S2 F, and Methane by EPA Method RSK-175.

- Surface Water in Cleaver Swamp: to be sampled adjacent to the monitoring well with the highest VOCs concentrations (MW-9D) for VOCs by EPA Method 8260 (low level).

- Sediment in Cleaver Swamp: to be sampled adjacent to the monitoring well with the highest VOCs concentrations (MW-9D) for VOCs by EPA Method 8260 (low level).

- Monitored Natural Attenuation (MNA) will be evaluated by determining changes in contaminant concentrations as a primary line of evidence to support MNA as an implemented remedial strategy. Tools such as the Mann-Kendall Test (a common non-parametric statistical approach) will be employed in this evaluation. In addition, trends in the concentrations of VOC daughter products and changes in groundwater geochemical data trends will be reviewed.

QAPP Worksheet #18 Sampling Locations and Methods/SOP Requirements Table

UFP-QAPP Manual Section 3.1.1
List all site locations that will be sampled and include sample/ ID number, if available. (Provide a range of sampling locations of ID numbers if a site has a large number). Specify matrix and, if applicable, depth at which samples will be taken. Only a short reference for the sampling location rationale is necessary for the table. The text of the QAPP should clearly identify the detailed rationale associated with each reference. Complete all required information, using additional worksheets if necessary.

Sampling Locations and Methods/SOP Requirements Table

Sampling Location-ID Number	Matrix	Well Open Borehole Depth - (feet below grade or surface) or SW-SED depth	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
MW-7D-S	Groundwater	39-72	VOCs, 1,4-dioxane MNA, NA	Low Low NA	1 GW sample	S-1	EPA Specified
MW-7D-D	Groundwater	72-101	VOCs, 1,4-dioxane MNA, NA	Low Low NA	1 GW Sample; 1 Duplicate	S-1	EPA Specified
MW-9D-3	Groundwater	38-55	VOCs, 1,4-dioxane MNA, NA	Low Low NA	1 GW sample	S-1	EPA Specified
MW-9D-2	Groundwater	55-102	VOCs, 1,4-dioxane MNA, NA	Low Low NA	1 GW sample	S-1	EPA Specified
MW-9D-1	Groundwater	102-147	VOCs, 1,4-dioxane MNA, NA	Low Low NA	1 GW sample	S-1	EPA Specified

Sampling Location-ID Number	Matrix	Well Open Borehole Depth - (feet below grade or surface) or SW-SED depth	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
MW-10D-3	Groundwater	110-144	VOCs, 1,4-dioxane MNA, NA	Low Low NA	1 GW sample	S-1	EPA Specified
MW-10D-2	Groundwater	68-110	VOCs, 1,4-dioxane MNA, NA	Low Low NA	1 GW sample	S-1	EPA Specified
MW-10D-1	Groundwater	40-68	VOCs, 1,4-dioxane MNA, NA	Low Low NA	1 GW sample	S-1	EPA Specified
Five Private Potable Wells	Groundwater	Outside tap	VOCs	Low	1 sample per well (5 total)	n/a	EPA Specified
CS-SW	Surface Water	0.25	VOCs	Low	1 SW sample	S-2	Proximity to highest concentrations of GW contaminants
CS-SED	Sediment	0.5	VOCs	Low	1 SED sample	S-2	Proximity to highest concentrations of GW contaminants

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).
GW = Groundwater; MW=Monitoring well; CS = Cleaver Swamp; SW = Surface Water; SED = Sediment; MNA = Monitored Natural Attenuation; NA = Analytical Group Not Applicable (see Worksheet #19)

QAPP Worksheet #19 Analytical SOP Requirements Table

UFP-QAPP Manual Section 3.1.1
For each matrix, analytical group, and concentration level, list the analytical and preparation method/SOP and associated sample volume, container specifications, preservation requirements, and maximum holding time.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 19 Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference [1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Groundwater	VOCs	Low	8260C / L-1	3 x 40 ml	3 x 40 ml VOA vials	pH < 2 w/HCl: No headspace; Cool, 0-6ºC	14 days to analysis
Groundwater	1,4-Dioxane	Low	522/ L-2	2 x 250ml	2 x 250ml Glass	Cool 0-6°C	7 days extract 40 days analysis
Groundwater	Total Organic Carbon (TOC)	NA	9060A	3 x 40 ml	3 x 40 ml	pH < 2 w/HCl: No headspace; Cool, 0-6ºC	28 days to analysis
Groundwater	Nitrate/Nitrite	NA	353.2	125 mL	125 mL plastic	pH <2 w/H2SO4;Cool 0-6°C	28 days to analysis
Groundwater	Total Iron	NA	6010C	250 mL	250 mL plastic	pH<2 w/HNO3	180 days to analysis
Groundwater	Dissolved Iron (field filtered)	NA	6010C	250 mL	250 mL plastic	pH<2 w/HNO3	180 days to analysis
Groundwater	Sulfate	NA	300.0	50 mL	60 mL plastic	Cool 0-6°C	28 days to analysis
Groundwater	Sulfide	NA	SM 4500 S2 F	250 mL	250 mL plastic	NaOH, Zinc Acetate Cool 0-6°C	7 days to analysis
Groundwater	Methane	NA	RSK-175	3 x 40 ml	3 x 40 ml VOA vials	pH < 2 w/HCl: No headspace; Cool, 0-6ºC	14 days to analysis

Worksheet # 19 Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference [1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Surface Water	VOCs	Low	8260C / L-1	3 x 40 ml	3 x 40 ml VOA vials	pH < 2 w/HCl: No headspace; Cool, 0-6ºC	14 days to analysis
Sediment	VOCs	Low	8260C / L-1	5g per vial	VOA TerraCore Kit	Cool, 0-6ºC Methanol – 1 vial	48 hours to freezer storage 14 days to analysis

QAPP Worksheet #20 Field Quality Control Sample Summary Table

UFP-QAPP Manual Section 3.1.1
Summarize by matrix, analytical group, and concentration level the number of field QC samples that will be collected and sent to the laboratory.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 20 Field Quality Control Sample Summary Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference1	No. of Sampling Locations*	No. of Field Duplicate Pairs	No. of MS /MSD	No. of Field Blanks	No. of Equip. Blanks	No. of Trip Blanks**	Total No. of Samples to Lab*
Groundwater	VOC	Low	L-1	13	5%	5%	1	1	1	16
Groundwater Chemistry Parameters	GW Chem	NA	See Worksheet 23	8	5%	5%	1	1	1	11
Surface Water	VOC	Low	L-1	1	5%	5%	0	0	1	2
Sediment	VOC	Low	L-1	1	5%	5%	0	1	1	3

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet_#23).
* Information on specific sampling locations and scope is provided in Worksheet 14
** One trip blank per sample cooler (4 total)

QAPP Worksheet #21 Project Sampling SOP References Table

UFP-QAPP Manual Section 3.1.2
List all SOPs associated with project sampling including, but not limited to, sample collection, sample preservation, equipment cleaning and decontamination, equipment testing, inspection and maintenance, supply inspection and acceptance, and sample handling and custody. Include copies of the SOPs as attachments or reference all in the QAPP. Sequentially number sampling SOP references in the Reference Number column. The reference number can be used throughout the QAPP to refer to a specific SOP.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 21 Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Check if yes)	Comments
S-1	SOP No. S-1, Low Flow / Low Stress Groundwater Sampling.	Amec	Primarily: adjustable rate, peristaltic pump with Polyethylene and silicone tubing; Where necessary: adjustable rate, submersible (bladder) pump with Polyethylene tubing	N	None
S-2	SOP No. S-2, Surface Water and Sediment Sampling	Amec	Sample containers, stainless steel bowl and spoon	N	None
S-3	SOP No. S-3, Calibration of Field Instruments for Water Quality Parameters.	Amec	Water quality parameter meter, turbidity meter	N	None
S-4	SOP No. S-4, Decontamination of Field Equipment.	Amec	Liquinox, deionized water, methanol, 10% nitric acid, scrub brushes, wash basins, aluminum foil, polyethylene sheeting	N	None

Worksheet # 21 Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Check if yes)	Comments
S-5	SOP No. S-5, Monitoring Well Development.	Amec	Portable submersible pump, adjustable rate, peristaltic pump and tubing	N	None
S-6	SOP No. S-6, Procedures for Measuring Groundwater Levels	Amec	Electronic water level indicator	N	None
S-7	SOP No. S-7, Sample Packaging and Shipment	Amec	Coolers, plastic bags, duct tape, vermiculite, bubble wrap, ice, chains of custody	N	None
S-8	SOP No. S-8, Sample Chain of Custody Procedure	Amec	Chains of custody, custody seals, sample labels	N	None
S-9	SOP No. S-9, Use of Field Logbooks	Amec	Field Logbooks	N	None

QAPP Worksheet #22 Field Equipment Calibration, Maintenance, Testing, and Inspection Table

UFP-QAPP Manual Section 3.1.2.4
Identify all field equipment and instruments (other than analytical instrumentation) that require calibration, maintenance, testing, or inspection and provide the SOP reference number for each type of equipment. In addition, document the frequency of activity, acceptance criteria, and corrective action requirements on the worksheet.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 22 Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
Peristaltic Pump	NA	NA	Operation	Visual inspection for defective parts	Each pump prior to use	No visually defective parts, Pump is operable, Conformance to manufacturer standards	Repair, replace parts; use backup pump	FOL, Field Technician	S-4
Peristaltic Pump	NA	Cleaning	NA	NA	Each pump prior to use	No visually dirty parts	Re-clean	FOL, Field Technician	S-4
Peristaltic Pump	NA	NA	Equipment Blank (EB)	NA	Daily	No target analytes $\geq$ QL and no interferences detected	If EB levels impact data usability, re-clean, retest and resample and/or qualify data during data validation	FOL, Field Technician	S-4
Portable Submersible Pump	NA	NA	Operation	Visual inspection for defective parts	Each pump prior to use	No visually defective parts Pump is operable	Replace parts; Repair if not operable or use backup pump	FOL, Field Technician	S-4

Worksheet # 22 Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
Portable Submersible Pump	NA	Cleaning	NA	NA	Each pump prior to use	No visually dirty parts	Re-clean	FOL, Field Technician	S-4
Portable Submersible Pump	NA	NA	Equipment Blank (EB)	NA	Daily	No target analytes $\geq$ QL and no interferences detected	If EB levels impact data usability, re-clean, retest and resample and/or qualify data during data validation	FOL, Field Technician	S-4

[1]Specify the appropriate reference letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #23 Analytical SOP References Table

UFP-QAPP Manual Section 3.2.1
List all SOPs that will be used to perform on-site or off-site analysis. Indicate whether the procedure produces screening or definitive data. Sequentially number analytical SOP reference in the Reference Number column. Include copies of the SOPs as attachments or reference in the QAPP. The reference number can be used throughout the QAPP to refer to a specific SOP.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 23 Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
L-1	See Appendix C	Definitive	VOCs	GC/MS	TAL Buffalo	N
L-2	See Appendix C	Definitive	1,4-Dioxane	GC/MS	TAL Burlington	N
L-3	See Appendix C	Definitive	Methane	GC/FID	TAL Buffalo	N
L-4	See Appendix C	Definitive	Sulfate	Ion Chromatograph	TAL Buffalo	N
L-5	See Appendix C	Definitive	Iron	ICP	TAL Buffalo	N
L-6	See Appendix C	Definitive	Nitrate/nitrite	Lachat	TAL Buffalo	N
L-7	See Appendix C	Definitive	Sulfide	Colorimetric	TAL Buffalo	N
L-8	See Appendix C	Definitive	Total Organic Carbon	OI Analytical Carbon Analyzer	TAL Buffalo	N

QAPP Worksheet #24 Analytical Instrument Calibration Table

UFP-QAPP Manual Section 3.2.2
Identify all analytical instrumentation that requires calibration and provide the SOP reference number for each. In addition, document the frequency, acceptance criteria, and corrective action requirements on the worksheet.

Worksheet # 24 Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
Gas Chromatography/Mass Spectrometry (GC/MS) for 8260C	Instrument performance check (tune).	Beginning of each 12-hour analysis period.	Acceptance limits specified in method	Re-tune instrument per manufacturers specifications	Analyst	L-1 (BF-MV-013)
	Initial Calibration (ICAL)	Prior to analysis of samples, 6 points for all analytes.	%RSD ≤ 20% or linear regression coefficient ≥ 0.99	Correct problem then repeat ICAL		
	Calibration verification	Daily before any sample analysis and every 12 hours	Recoveries of all compounds shall fall within ±30% of the expected values or up to 50% for our defined poor performing compounds	Reanalyze and qualify data		
Gas Chromatography/Mass Spectrometry (GC/MS) Selected Ion Monitoring (SIM) for 1,4-dioxane by Method 522	Minimum five-point initial calibration	Prior to sample analysis	One of the options below: Option 1: RSD for each analyte ≤20%; Option 2: linear least squares regression r≥0.995; Option 3: non-linear regression coefficient of determination (COD) r2 ≥0.99 (6 point shall be used for second order).	Correct problem then repeat ICAL	Analyst	L-2

Worksheet # 24 Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
	Calibration Verification (CV)	Beginning of each analytical sequence if ICAL previously run; end of analytical sequence; every 10 samples or 12 hour shift, whichever is sooner.	±20% difference	(1)Evaluate the samples, if %D≥20 and sample results are <PQL, narrate. (2)if %D ≥20 at the end of sequence and is likely due to matrix, evaluate samples between opening and closing CV, narrate as needed.		
Gas Chromatography-Flame Ionization Detector (GC-FID) for Methane by RSK-175	Minimum five-point initial calibration	Prior to sample analysis	One of the options below: Option 1: RSD ≤15%; Option 2: linear least squares regression r≥0.995;	Correct problem then repeat ICAL	Analyst	L-3 (BF-GV-01)
	Second source calibration verification (ICV)	One after each ICAL	±15% of true value.	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat ICAL.		
	Calibration Verification(CCV)	Analyzed every 20 samples or every 8 hours, whichever comes first, and at the end of each analysis sequence.	±15% of expected value from the ICAL	Reanalyze and qualify data		
Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) for Iron	minimum one high standard and a calibration blank.	Daily prior to sample analysis.	If more than one calibration standard is used, r ≥0.995.	Correct problem and repeat calibration.	Analyst	L5 (BF-ME-009)

Worksheet # 24 Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
	Second source calibration verification (ICV)	One after each ICAL	All project analytes within ±10% of true value.	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat ICAL.		
	Continuing Calibration Verification (CCV)	After every 10 samples and at the end of the analysis sequence.	within ±10% of true value	Reanalyze and qualify data		
	Low level calibration check standard	daily, after one point ICAL.	Per SOP Table 7.12	Correct problem and reanalyze.		
General Chemistry Methods TOC – 9060A Nitrate/nitrite – 353.2 Sulfate – 300.0 Sulfide – SM4500 S2 F	Initial Calibration	Per SOP	R2 > 0.995, RSD's for the Calibration points must be below 20%.	Per SOP	Analyst	L-4, L-6, L-7, L-8 (BF-WC-031, BF-WC-021, BF-MB-007, BF-WC-030)
	Second source calibration verification (ICV)	One after each ICAL	All project analytes within ±10% of true value.	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat ICAL.		
	Continuing Calibration Verification (CCV)	1 in 10 or fewer samples	90-110%	Per SOP		

QAPP Worksheet #25 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

UFP-QAPP Manual Section 3.2.3
Identify all analytical instruments that require maintenance, testing, or inspection and provide the SOP reference number for each. In addition, document the frequency, acceptance criteria, and corrective action requirements on the worksheet.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 25 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
GC/MS	Replace pump oil as needed	VOCs, SVOC-SIM	Check connection, bake out instrument, leak test	See L-1 (BF-MV-013)		Inspect system, correct problem, rerun calibration and affected samples	Analyst	LF-1 and L-2
	Change gas line dryers as needed							
	Perform ion source cleaning and filament replacement							
	Replace injection port liner weekly or as needed							
	Clip column							
	Replace gas chromatography (GC) column as needed							
	Manual tuning							
	Replace electron multiplier							
	Check that gas supply is sufficient and delivery pressure is adequate							
	Bake out lines and column							

Worksheet # 25 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
GC-FID	Change gas line dryers as needed Replace injection port liner weekly or as needed Clip column Replace gas chromatography (GC) column as needed Check that gas supply is sufficient and delivery pressure is adequate Bake out lines and column	Methane by RSK-175	Check connection, bake out instrument, leak test	See BF-GV-001		Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-3
ICP-AES	Change capillary and pump tubing Check liquid argon tank Replace and realign plasma torch Clean nebulizer and spray chamber	Total and Dissolved Iron by 6010C	Check connection, clean instrument, leak test	See BF-ME-009		Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-5
TOC Analyzer		TOC by Method 9060A	Check connection, clean instrument	See BF-WC-031		Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-8

Worksheet # 25 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
Ion Chromatography		Sulfate by Method 300.0		Prior to ICAL and/or as necessary.	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	L-4
Colorimetric		Sulfide by SM 4500 S2 F		Prior to ICAL and/or as necessary.	Acceptable ICAL or CCV	Correct the problem and repeat ICAL or CCV.	Analyst, Department Manager	L-7
Lachat Analyzer	Replace or cut flow line as needed. Change components as needed.	Nitrate/nitrite by Method 353.2		Prior to ICAL and/or as necessary.	Acceptable ICAL or CCV	Correct the problem and repeat ICAL or CCV.	Analyst, Department Manager	L-6

[1] Refer to the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #26 Sample Handling System

UFP-QAPP Manual Appendix A
Use this worksheet to identify components of the project-specific sample handling system. Record personnel, and their organizational affiliations, who are primarily responsible for ensuring proper handling, custody, and storage of field samples from the time of collection, to laboratory delivery, to final sample disposal. Indicate the number of days field samples and their extracts/digestates will be archived prior to disposal.

Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Field Technical Lead (Mark Netzer), AMEC E&E, PC
Sample Packaging (Personnel/Organization): Field Technical Lead (Mark Netzer), AMEC E&E, PC
Coordination of Shipment (Personnel/Organization): Field Technical Lead (Mark Netzer), AMEC E&E, PC
Type of Shipment/Carrier: Delivery in sample coolers by field crew or Laboratory Courier
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Laboratory Project Manager (Becky Mason), Test America Laboratories
Sample Custody and Storage (Personnel/Organization): Laboratory Project Manager (Becky Mason), Test America Laboratories
Sample Preparation (Personnel/Organization): Laboratory Project Manager (Becky Mason), Test America Laboratories
Sample Determinative Analysis (Personnel/Organization): Laboratory Project Manager (Becky Mason), Test America Laboratories
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): up to four days
Sample Extract/Digestate Storage (No. of days from extraction/digestion): within SW846 prescribed hold time for extract and analysis as required
Biological Sample Storage (No. of days from sample collection): not applicable
SAMPLE DISPOSAL
Personnel/Organization: Laboratory Project Manager (Becky Mason), Test America Laboratories
Number of Days from Analysis: not before sample hold time pursuant to SW846 has expired

QAPP Worksheet #27 Sample Custody Requirements

UFP-QAPP Manual Section 3.3.3
Describe the procedures that will be used to maintain sample custody and integrity. Include examples of chain-of-custody forms, traffic reports, sample identification, custody seals, laboratory sample receipt forms, and laboratory sample transfer forms. Attach or reference applicable SOPs.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 27 Sample Custody Requirements

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):

Sample Collection:

- During sample collection procedures, the assigned field sampler will be aware of custody requirements and maintain secure custody of all equipment and containers used in the collection of samples.
- Container labels will be prepared and attached to each sample container. Labels will include the following: Site/project name, unique field sample ID, analysis to be performed, preservative if applicable, and date and time of collection.
- The field sampler will securely affix the sample label to the container with clear packing tape.
- Check the cap on the sample container to confirm that it is properly sealed.
- Complete groundwater sampling Field Data Record (FDR) in Appendix B and field notebook entries for each sample collected.
- The field sampler will maintain continuous custody of samples until shipment of samples or transfer to laboratory courier.
- The field sampler will store collected samples in a sample cooler with bagged ice.
- A Chain of Custody (COC) form is completed to document transfer of samples to the laboratory. The appropriate personnel will sign and date the chain-of-custody form to document the sample custody transfer.
- Upon completion of all assigned sampling activities, field documents logbooks, FDR(s), COCs will be provided to the project manager to maintain in project files.

Worksheet # 27 Sample Custody Requirements

Samples will be packaged for shipment as outlined following:

- Use indelible ink only, no pencil (a ball point pen is best). Corrections are made by drawing a single line through the error, and dating and initialing the strike through (erasures and obliterations are not allowed).
- Using strapping tape, secure the outside drain plug at the bottom of the cooler.
- Place one or two layers of bubble wrap on the bottom of the cooler.
- Wrap sample containers in bubble wrap and place into the cooler(s).
- Double bag ice in zipper-type plastics bags and place on top of the samples, filling the remaining space within the cooler.
- If shipping the sample cooler to a laboratory, record the airbill number on the COC, sign, date and time on the COC.
- Place the signed COC in a zipper-type plastic bag and tape to the inside cover of the sample cooler.
- Seal the sample cooler by wrapping both ends with strapping tape and also tape around the lid seal.
- Sign and date two custody seals and place across the lid seal at opposing ends/sides of the sample cooler. Place a strip of clear tape across each custody seal affixed to the sample cooler.
- Upon transfer of the cooler to the shipping company, call the receiving laboratory representative and provide them information regarding the sample shipment including number of sample coolers, project name, and airbill number for tracking purposes.
- If the sample cooler is to be picked up by a designated laboratory courier, maintain custody of sample cooler(s) in a secure location until the courier arrives.
- Review the COC with the designated courier, sign, data and time the COC relinquishing to the courier.
- Have the courier sign, date and time the COC acknowledging receipt of the sample cooler.
- Obtain a copy of the signed COC from the courier.
- The designated courier will maintain secure custody of the sample cooler(s) for delivery to the laboratory the same day of receipt of the sample cooler(s).
- If delivering the sample cooler(s) directly to the laboratory during demobilization, the sample cooler(s) will be maintained in a secure location during the demobilization.
- Laboratory sample receiving personnel will sign, date and time the COC acknowledging receipt of sample cooler(s).
- A copy of the signed COC will be provided to the project manager.

Worksheet # 27 Sample Custody Requirements

Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal):

Samples will be received and logged in by a designated sample custodian or his/her designee. Upon sample receipt, the sample custodian will

- examine the shipping containers to verify that the custody tape is intact;
- examine all sample containers for damage;
- determine if the temperature required for the requested testing program has been maintained during shipment and document the temperature on the chain-of-custody or sample login records;
- compare samples received against those listed on the chain-of-custody or traffic report;
- verify that sample holding times have not been exceeded;
- examine all shipping records for accuracy and completeness;
- determine sample pH (if applicable) and record on chain-of-custody or sample login forms;
- with the exception of VOC samples, aliquots which require acidification will be checked with pH paper and recorded on the chain-of-custody or sample login forms. VOC samples will be checked after the water in the vial has been analyzed.
- sign and date the chain-of-custody or traffic report immediately (if shipment is accepted) and attach the air bill;
- note any problems associated with the coolers and/or samples on the cooler receipt form and notify the Laboratory Project Manager, who will be responsible for contacting the Project Manager;
- attach laboratory sample container labels with unique laboratory identification and test; and
- place the samples in the proper laboratory storage.

Following receipt, samples will be logged in according to the following procedure:

- The samples will be entered into the laboratory tracking system. At a minimum, the following information will be entered: project name or identification, unique sample numbers (both client and internal laboratory), type of sample, required tests, date and time of laboratory receipt of samples, and field identification provided by field personnel.
- The Laboratory Project Manager will be notified of sample arrival.
- The completed chain-of-custody or traffic report, air bills, and any additional documentation will be placed in the final evidence file.

Worksheet # 27 Sample Custody Requirements

Sample Identification Procedures:
Samples collected during Site activities shall be assigned unique sample identification (ID) numbers. These numbers are necessary to identify and track each of the samples collected for analysis during completion of the project. In addition, the sample ID numbers shall be used to identify and retrieve the analytical results received from the laboratory, as well as other data related to the sample.

Media	Location	Sample ID	QC Code
GW	MW-10D-1	MW-10D-1	FS
GW	MW-10D-2	MW-10D-2	FS
GW	MW-10D-3	MW-10D-3	FS
GW	MW-7D-D	MW-7D-D	FS
GW	MW-7D-D	MW-7D-D DUP	FD
GW	MW-7D-S	MW-7D-S	FS
GW	MW-9D-1	MW-9D-1	FS
GW	MW-9D-2	MW-9D-2	FS
GW	MW-9D-3	MW-9D-3	FS
TW	151BHR	151 BHR	FS
TW	EMERSON	EMERSON	FS
TW	HURLBERT	HURLBURT	FS
TW	LIENERT	LIENERT	FS
TW	SARNEY	SARNEY	FS
BW	QC	TP-01	TB
BW	QC	TP-02	TB
BW	QC	EB-01	EB

Notes:
GW = Groundwater
TW = Tap Water
BW = Blank Water
QC = Quality Control
FS = Field Sample
FD = Field Duplicate
TB = Trip Blank
EB = Equipment Blank

Worksheet # 27 Sample Custody Requirements

Chain-of-custody Procedures:

Completed chain of custody (COC) forms are required for all samples to be analyzed. COC forms will be initiated by the field sampling crew in the field. The COC will contain the unique sample identification, sample date and time, sample description, sample type, preservation (if any), and analyses required. The original COC form will accompany the samples to the laboratory. Copies of the COC will be made prior to shipment (or multiple copy forms will be used) for field documentation. The COC forms will remain with the samples at all times. The samples and signed COC forms will remain in the possession of the sampling crew until the samples are delivered to the express carrier (e.g. Federal Express), transferred to the designated laboratory courier, hand delivered to the permanent laboratory, or placed in secure storage.

Sample labels will be completed for each sample using waterproof ink. The completed sample labels will be affixed to each sample bottle and covered with clear tape.

QAPP Worksheet #28 QC Samples Table

UFP-QAPP Manual Section 3.4
Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limits exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet # 28 QC Samples Table

Matrix:	Groundwater and surface water	**Sampling SOP:**	S-1, S-2	**Field Sampling Organization:**	Amec
Analytical Group:	VOC	**Analytical Method/ SOP Reference:**	8260C / L-1	**Analytical Organization:**	TestAmerica Buffalo
Concentration Level:	Low	**Sampler's Name:**	TBD	**No. of Sample Locations:**	8

QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Instrument Tune with BFB	Prior to initial calibration and calibration verification	Acceptance limits specified in method	Re-tune instrument per manufacturers specifications	Analyst and Data Validator	NA	Limits specified in USEPA Method 8260C
Initial Calibration	Prior to sample analysis	Ave. response factor for SPCCs ≥0.3, RSD for SPCCs ≤20%	Correct problem then repeat ICAL	Analyst and Data Validator	Accuracy/bias and Precision	RRF ≥0.05, RSD ≤30%
Retention time window position establishment for each analyte and surrogate	Once per ICAL	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	NA	Analyst	Accuracy/bias	NA
Evaluation of relative retention times (RRT)	With each sample	RRT of each target analyte within ±0.06 RRT units.	Correct problem, then rerun ICAL.	Analyst and Data Validator	Accuracy/bias	Review target compound RRTs, qualify results as required.

QAPP Worksheet # 28 QC Samples Table

Matrix:	Groundwater and surface water	**Sampling SOP:**	S-1, S-2	**Field Sampling Organization:**	Amec
Analytical Group:	VOC	**Analytical Method/ SOP Reference:**	8260C / L-1	**Analytical Organization:**	TestAmerica Buffalo
Concentration Level:	Low	**Sampler's Name:**	TBD	**No. of Sample Locations:**	8

QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Calibration Verification	Daily before any sample analysis and every 12 hours	Average RF for SPCCs ≥0.30, percent difference ≤20	Reanalyze and qualify data	Analyst and Data Validator	Accuracy/bias and Precision	RRF ≥0.05, %D between the initial calibration RRF and CCV ≤25%
Method Blank	One every 12 hours prior to sample analysis	No analytes detected > RL (RL for common lab contaminants) and >1/10 the regulatory limit (whichever is greater).	Re-clean, retest, re-extract, reanalyze, and/or qualify data	Analyst and Data Validator	Accuracy/bias-Contamination	No target compounds ≥ RL
Cooler Temperature Blank	1 per sample cooler	4°C, ± 2°C	Resample and/or qualify data	FOL and data Validator	Accuracy/bias-Preservation	4°C, ± 2°C
Trip Blank	1 per sample cooler	4°C, ± 2°C	Resample and/or qualify data	FOL and data Validator	Accuracy/bias-Preservation	4°C, ± 2°C
Field Duplicate	One per 10	NA	Qualify data	Data Validator	Accuracy/bias	RPD ≤50 when positive results for both samples are ≥2x QL RPD ≤50 when positive result for one sample is ≥2x QL and positive result for other sample is ≤2x QL
Matrix Spike	One per 20	Project control limits	Reanalyze and qualify data	Analyst and Data Validator	Accuracy/bias	Percent recoveries 70-130
Matrix Spike Duplicates	One per 20	Project control limits, RPD ≤30 with MS	Reanalyze and qualify data	Analyst and Data Validator	Accuracy/ precision//bias	Percent recoveries 70-130 RPD ≤30 with MS
LCS	One per analysis day	Project control limits	Reanalyze and qualify data	Analyst and Data Validator	Accuracy	Percent recoveries 70-130
LCS Duplicate	One per analysis day	Project control limits	Reanalyze and qualify data	Analyst and Data Validator	Accuracy/ precision//bias	Percent recoveries 70-130 RPD ≤30 with LCS
Surrogates	4 per sample	Project control limits	Re-extract and reanalyze	Analyst and Data Validator	Accuracy/bias	Percent recoveries 70-130

QAPP Worksheet # 28 QC Samples Table

Matrix:	Groundwater and surface water	**Sampling SOP:**	S-1, S-2	**Field Sampling Organization:**	Amec
Analytical Group:	VOC	**Analytical Method/ SOP Reference:**	8260C / L-1	**Analytical Organization:**	TestAmerica Buffalo
Concentration Level:	Low	**Sampler's Name:**	TBD	**No. of Sample Locations:**	8

QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards (ISs)	4 per sample	Retention times: ± 30 seconds from retention times of the midpoint standard in the ICAL; EICP area within -50% to 100% of ICAL midpoint standard	Reanalyze and qualify data	Analyst and Data Validator	Accuracy/bias and Precision	Area counts: 50% to 200% of areas in associated continuing calibration standard Retention times: ±30 seconds from retention times in associated continuing calibration standard

QAPP Worksheet # 28 QC Samples Table

Matrix:	GW	**Sampling SOP:**	S-1	**Field Sampling Organization:**	Amec
Analytical Group:	1,4-Dioxane	**Analytical Method/ SOP Reference:**	USEPA 522 / L-2	**Analytical Organization:**	TestAmerica Burlington
Concentration Level:	Low	**Sampler's Name:**	TBD	**No. of Sample Locations:**	8

QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Instrument Tune with DFTPP	Prior to initial calibration	Acceptance limits specified in SOP	Reanalyze, retune mass spectrometer; no samples may be analyzed without a valid tune.	Analyst and Data Validator	NA	Limits specified in USEPA Region I Validation Guidelines (1996)
Five-point initial calibration	Before sample analysis, when CCVs indicate calibration is no longer valid; after major instrument maintenance	Average RF; readback of each point ≤20% difference from true value (40% for the lowest calibration point).	Instrument maintenance, standard, inspection, recalibration	Analyst and Data Validator	Accuracy/bias and Precision	Readback of each point ≤20% difference from true value (40% for the lowest calibration point).
Second source calibration verification (ICV)	Immediately after each initial calibration	%R ±20% of true value.	Correct problem and verify second source standard. Reanalyze. If that fails, repeat initial calibration; no samples should be analyzed without an acceptable ICV.	Analyst and Data Validator	Accuracy/bias and Precision	All project analytes within ±20% of true value.
Retention time window position establishment for each analyte and surrogate	Once per ICAL	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	NA	Analyst	Accuracy/bias	NA
Evaluation of relative retention times (RRT)	With each sample			Analyst and Data Validator	Accuracy/bias	Review target compound RRTs, qualify results as required.

QAPP Worksheet # 28 QC Samples Table

Matrix:	GW	**Sampling SOP:**	S-1	**Field Sampling Organization:**	Amec
Analytical Group:	1,4-Dioxane	**Analytical Method/ SOP Reference:**	USEPA 522 / L-2	**Analytical Organization:**	TestAmerica Burlington
Concentration Level:	Low	**Sampler's Name:**	TBD	**No. of Sample Locations:**	8

QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Continuing Calibration Verification	Beginning of each 12-hour window, every 10th field sample, and the end of the sequence, at alternating concentrations.	Low level: %R ± 50% of true value; Medium and high level: %R ±30% of true value	Re-analyze once, if still outside criteria perform corrective action repeated failures require new ICAL and all associated samples since last successful CCV, unless CCV is high and samples are non-detects.	Analyst and Data Validator	Accuracy/bias and Precision	%R ± 50% of true value; Medium and high level: %R ±30% of true value
Surrogates	Each sample, standard, blank	%R ± 30% of true value	Evaluate data and determine if a matrix effect or analytical error is indicated. If analytical error, re-analyze or re-extract. If matrix effect, review project DQOs to determine if a matrix effect must be confirmed by re-analysis. Flag all reported values outside of control limits.	TestAmerica Laboratory	Accuracy/Bias	Per Laboratory SOP

QAPP Worksheet # 28 QC Samples Table

Matrix:	GW	**Sampling SOP:**	S-1	**Field Sampling Organization:**	Amec
Analytical Group:	1,4-Dioxane	**Analytical Method/ SOP Reference:**	USEPA 522 / L-2	**Analytical Organization:**	TestAmerica Burlington
Concentration Level:	Low	**Sampler's Name:**	TBD	**No. of Sample Locations:**	8

QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per extraction batch of 20 or fewer samples	< 1/3 RL	Examine project DQO's and take appropriate corrective action, which may include re-analysis of MB, re-extraction of batch, and/or non-conformance memo (NCM). Corrective action must be documented on NCM. If there are detects in samples, or if all detects are > 10 X MB level, re-prep and reanalysis may not be required.	TestAmerica Laboratory	Contamination	Lab RL 0.20 ug/L
Cooler Temperature Blank	1 per sample cooler			FOL and data Validator	Accuracy/bias-Preservation	4°C, ± 2°C
Field Duplicate	One per 10			Data Validator	Accuracy/bias	RPD ≤50 when positive results for both samples are ≥2x QL RPD ≤50 when positive result for one sample is ≥2x QL and positive result for other sample is ≤2x QL

QAPP Worksheet # 28 QC Samples Table

Matrix:	GW	**Sampling SOP:**	S-1	**Field Sampling Organization:**	Amec
Analytical Group:	1,4-Dioxane	**Analytical Method/ SOP Reference:**	USEPA 522 / L-2	**Analytical Organization:**	TestAmerica Burlington
Concentration Level:	Low	**Sampler's Name:**	TBD	**No. of Sample Locations:**	8

QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike/Matrix Spike Duplicates (MS/MSD)	One per extraction batch of 20 or fewer samples.	%R ± 30% of true value	None if laboratory control sample passes. Flag all reported values outside of control limits.	TestAmerica Laboratory	Accuracy/Bias and Precision	Per laboratory SOP
Laboratory Control Sample	One per extraction batch of 20 or fewer samples	50-150 (RL LCS); 70-130 (medium or high level LCS)	Examine project DQO's and take appropriate corrective action, which may include re-analysis of LCS, re-extraction of batch, and/or non-conformance memo (NCM). Corrective action must be documented on NCM. Flag all reported values outside of control limits.	TestAmerica Laboratory	Accuracy	Per Laboratory SOP
Internal Standard	Each sample, standard, Blank	EICP area ± 30% of that in the most recent CCV. RT ± 30 seconds from RT of midpoint of the ICAL.	Reanalyze Sample	TestAmerica Laboratory	Instrument Performance	Per Laboratory SOP
Method Detection Limits	Upon initial demonstration of capability. Verify MDL and LOQ annually.	Per Laboratory SOP	Reanalyze MDL	TestAmerica Laboratory	Sensitivity	Low enough to support CRQLs

QAPP Worksheet # 28 QC Samples Table

Matrix:	Groundwater	**Sampling SOP:**	S-1	**Field Sampling Organization:**	Amec
Analytical Group:	MNA Parameters	**Analytical Method/ SOP Reference:**	L-3 to L-8	**Analytical Organization:**	TestAmerica Buffalo
Concentration Level:	NA	**Sampler's Name:**	TBD	**No. of Sample Locations:**	8

QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Instrument Calibration	Prior to sample analysis	Acceptance limits specified in method or lab SOP	Evaluate instrument per manufacturers specifications	Analyst and Data Validator	NA	Laboratory Method Protocol
Second source calibration verification (ICV)	One after each ICAL	All project analytes within ±25% of true value.	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat ICAL.	Analyst and Data Validator	Accuracy/bias and Precision	All project analytes within ±25% of true value.
Continuing Calibration Verification	Daily before any sample analysis and every 12 hours	Acceptance limits specified in method or lab SOP	New Initial Calibration	Analyst and Data Validator	Accuracy/bias and Precision	Laboratory Method Protocol
Method Blank	One every batch	Acceptance limits specified in method or lab SOP	Evaluate instrument per manufacturers specifications	Analyst and Data Validator	Accuracy/bias-Contamination	No target compounds ≥ RL
Instrument Blank	As needed to assess carryover from high concentration samples	Acceptance limits specified in method or lab SOP	Evaluate instrument per manufacturers specifications	Analyst and Data Validator	Accuracy/bias-Contamination	No target compounds ≥ RL
Field Duplicate	One per 20	Project Limits	Data Qualification	Data Validator	Accuracy/bias	RPD ≤50 when positive results for both samples are ≥2x QL RPD ≤50 when positive result for one sample is ≥2x QL and positive result for other sample is ≤2x QL
Laboratory Matrix Spike	One per 20	Laboratory Limits		Analyst and Data Validator	Accuracy/bias	Laboratory Limits
Matrix Spike Duplicates	One per 20	Laboratory Limits		Analyst and Data Validator	Accuracy/ Precision/bias	Laboratory Limits

QAPP Worksheet # 28 QC Samples Table

Matrix:	Groundwater	**Sampling SOP:**	S-1	**Field Sampling Organization:**	Amec
Analytical Group:	MNA Parameters	**Analytical Method/ SOP Reference:**	L-3 to L-8	**Analytical Organization:**	TestAmerica Buffalo
Concentration Level:	NA	**Sampler's Name:**	TBD	**No. of Sample Locations:**	8

QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
LCS	One per batch	Laboratory Limits		Analyst and Data Validator	Accuracy/bias	Laboratory Limits
LCS Duplicate	One per batch	Laboratory Limits		Analyst and Data Validator	Accuracy/ Precision/bias	Laboratory Limits
Surrogates	1 per sample	Laboratory Limits		Analyst and Data Validator	Accuracy/bias	Laboratory Limits

QAPP Worksheet # 28 QC Samples Table

Matrix:	Soil, Sediment	**Sampling SOP:**	S-2	**Field Sampling Organization:**	Amec
Analytical Group:	VOC	**Analytical Method/ SOP Reference:**	8260C / L-1	**Analytical Organization:**	TestAmerica Buffalo
Concentration Level:	Low	**Sampler's Name:**	TBD	**No. of Sample Locations:**	1

QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Instrument Tune with BFB	Prior to initial calibration and calibration verification	Acceptance limits specified in method	Re-tune instrument per manufacturers specifications	Analyst and Data Validator	NA	Limits specified in USEPA Method 8260C
Initial Calibration	Prior to sample analysis	Ave. response factor for SPCCs ≥0.3, RSD for SPCCs ≤20%	Correct problem then repeat ICAL	Analyst and Data Validator	Accuracy/bias and Precision	RRF ≥0.05, RSD ≤30%
Retention time window position establishment for each analyte and surrogate	Once per ICAL	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	NA	Analyst	Accuracy/bias	NA
Evaluation of relative retention times (RRT)	With each sample	RRT of each target analyte within ±0.06 RRT units.	Correct problem, then rerun ICAL.	Analyst and Data Validator	Accuracy/bias	Review target compound RRTs, qualify results as required.
Calibration Verification	Daily before any sample analysis and every 12 hours	Average RF for SPCCs ≥0.30, percent difference ≤20	Reanalyze and qualify data	Analyst and Data Validator	Accuracy/bias and Precision	RRF ≥0.05, %D between the initial calibration RRF and CCV ≤25%
Method Blank	One every 12 hours prior to sample analysis	No analytes detected > RL (RL for common lab contaminants) and >1/10 the regulatory limit (whichever is greater).	Re-clean, retest, re-extract, reanalyze, and/or qualify data	Analyst and Data Validator	Accuracy/bias-Contamination	No target compounds ≥ RL
Cooler Temperature Blank	1 per sample cooler	4°C, ± 2°C	Resample and/or qualify data	FOL and data Validator	Accuracy/bias-Preservation	4°C, ± 2°C
Trip Blanks	1 per sample cooler	4°C, ± 2°C	Resample and/or qualify data	FOL and data Validator	Accuracy/bias-Preservation	4°C, ± 2°C

QAPP Worksheet # 28 QC Samples Table

Matrix:	Soil, Sediment	**Sampling SOP:**	S-2	**Field Sampling Organization:**	Amec
Analytical Group:	VOC	**Analytical Method/ SOP Reference:**	8260C / L-1	**Analytical Organization:**	TestAmerica Buffalo
Concentration Level:	Low	**Sampler's Name:**	TBD	**No. of Sample Locations:**	1

QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	One per 10	NA	Qualify data	Data Validator	Accuracy/bias	RPD ≤100 when positive results for both samples are ≥2x QL RPD ≤100 when positive result for one sample is ≥2x QL and positive result for other sample is ≤2x QL
Matrix Spike	One per 20	Project control limits	Reanalyze and qualify data	Analyst and Data Validator	Accuracy/bias	Percent recoveries 70-130
Matrix Spike Duplicates	One per 20	Project control limits, RPD ≤30 with MS	Reanalyze and qualify data	Analyst and Data Validator	Accuracy/ precision//bias	Percent recoveries 70-130 RPD ≤30 with MS
LCS	One per analysis day	Project control limits	Reanalyze and qualify data	Analyst and Data Validator	Accuracy	Percent recoveries 70-130
LCS Duplicate	One per analysis day	Project control limits	Reanalyze and qualify data	Analyst and Data Validator	Accuracy/ precision//bias	Percent recoveries 70-130 RPD ≤30 with LCS
Surrogates	4 per sample	Project control limits	Re-extract and reanalyze	Analyst and Data Validator	Accuracy/bias	Percent recoveries 70-130
Internal Standards (ISs)	4 per sample	Retention times: ± 30 seconds from retention times of the midpoint standard in the ICAL; EICP area within -50% to 100% of ICAL midpoint standard	Reanalyze and qualify data	Analyst and Data Validator	Accuracy/bias and Precision	Area counts: 50% to 200% of areas in associated continuing calibration standard Retention times: ±30 seconds from retention times in associated continuing calibration standard

QAPP Worksheet #29 Project Documents and Records Table

UFP-QAPP Manual Section 3.5.1
Identify the documents and records that will be generated for all aspects of the project including, but not limited to, sample collection and field measurement, on-site and off-site analysis, and data assessment.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 29 Project Documents and Records Table

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
Field Logbooks	Equipment Calibration Logs	Sample Receipt, Custody and Tracking Records	PM Review of Sampling Event Records	
COC Records	Equipment Maintenance, Testing and Inspection Logs	Standard Traceability Logs	Data Validation Checklists	
Shipping Bills	Field Activity Forms	Equipment Calibration Summary	Data Validation Reports	
FDRs	Field logbooks	Sample Preparation Logs	Corrective Action Forms	
Sample Tracking	Calibration Standard Certificates	Instrument Logs - Run Logs		
Corrective Action Reports (if needed)	FDRs	Equipment Maintenance, Testing and Inspection Logs		
		Corrective Action Forms		
		Sample and QC Sample Results Reports		
		Instrument Printout (raw data) for field samples, standards, QC checks and QC samples		
		MDL Study Records		
		Email		

QAPP Worksheet #30 Analytical Services Table

UFP-QAPP Manual Section 3.5.2.3
Complete this worksheet for each matrix, analytical group, and concentration level. Identify all laboratories or organizations that will provide analytical services for the project, including on-site screening, on-site definitive, and off-site laboratory analytical work. If applicable, identify the subcontractor laboratories and backup laboratory or organization that will be used if the primary laboratory or organizations cannot be used.

☐ Worksheet Not Applicable (State Reason)

Test America-Buffalo holds certifications for method analyses under the New York Department of Health (NYDOH) Environmental Laboratory Approval Program (ELAP), and the National Environmental Laboratory Accreditation Program (NELAP). The NYDOH does not certify for 1,4-dioxane for Method 522. Test America-Burlington holds certification for 1,4-dioxane by Method 522 under the Department of Defense Environmental Laboratory Accreditation Program (DOD ELAP). Certification documents are provided in Appendix D.

Worksheet # 30 Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Location/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number
Groundwater	VOCs	low	See Worksheet 14	L-1	10 Calendar Days	TAL Buffalo	NA
Groundwater	1,4-dioxane	low	See Worksheet 14	L-2	10 Calendar Days	TAL Burlington	NA
Groundwater	Methane	NA	See Worksheet 14	L-3	10 Calendar Days	TAL Buffalo	NA
Groundwater	Sulfate	NA	See Worksheet 14	L-4	10 Calendar Days	TAL Buffalo	NA
Groundwater	Total and Dissolved Iron	NA	See Worksheet 14	L-5	10 Calendar Days	TAL Buffalo	NA
Groundwater	Nitrate/nitrite	NA	See Worksheet 14	L-6	10 Calendar Days	TAL Buffalo	NA
Groundwater	Sulfide	NA	See Worksheet 14	L-7	10 Calendar Days	TAL Buffalo	NA
Groundwater	TOC	NA	See Worksheet 14	L-8	10 Calendar Days	TAL Buffalo	NA

Worksheet # 30 Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Location/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number
Surface Water	VOCs	low	See Worksheet 14	L-1	10 Calendar Days	TAL Buffalo	NA
Sediment	VOCs	low	See Worksheet 14	L-1	10 Calendar Days	TAL Buffalo	NA

Sampling Scope is identified in Worksheet #14.

QAPP Worksheet #31 Planned Project Assessments Table

UFP-QAPP Manual Section 4.1.1
Identify the type, frequency, and responsible parties of planned assessment activities that will be performed for the project.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 31 Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
Field Sampling Event Plan Review	Before sampling 1 / year	Internal	Amec	Mark Netzer Technical Lead	Field Sampling Team	Michael Cote Project Manager	Michael Cote Project Manager
Fixed Laboratory Technical Systems Audit	None scheduled	NA	NA	NA	NA	NA	NA
Field Logbooks and FDR Review	Daily	Internal	Amec	Mark Netzer Technical Lead	Field Sampling Team	Michael Cote Project Manager	Michael Cote Project Manager
Sampling Event Review	post sampling 1 / year	Internal	Amec	Michael Cote Project Manager	Michael Cote Project Manager	Michael Cote Project Manager	Michael Cote Project Manager

QAPP Worksheet #32 Assessment Findings and Corrective Action Responses

UFP-QAPP Manual Section 4.1.2
For each type of assessment describe procedures for handling QAPP and project deviations encountered during the planned project assessments.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 32 Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Field Sampling Event Plan Review	Email and Direct Communication	Michael Cote Project Manager Amec Foster Wheeler	Prior to sampling event	Email and Direct Communication	Michael Cote Project Manager Amec Foster Wheeler	Prior to sampling event
Fixed Laboratory Technical Systems Audit	ND	NA	NA	NA	NA	NA
Sampling Event Review	Memorandum - email	Brian Quillia Client Project Manager Pitney Bowes, Inc. Donald MacMath Client Project Manager Cytec Industries, Inc.	Upon Completion	Memorandum	Brian Quillia Client Project Manager Pitney Bowes, Inc. Donald MacMath Client Project Manager Cytec Industries, Inc.	Upon Completion

QAPP Worksheet #33 QA Management Reports Table

UFP-QAPP Manual Section 4.2
Identify the frequency and type of planned QA Management Reports, the projected delivery date, the personnel responsible for report preparation, and the report recipients.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 33 QA Management Reports Table

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Verbal Status Report	As needed	At the end of field activities	Michael Cote Project Manager Amec Foster Wheeler	Brian Quillia Client Project Manager for Pitney Bowes, Inc. Donald MacMath Client Project Manager for Cytec Industries, Inc.
Annual Long Term Monitoring Report	Annually	45 days after receipt of final laboratory data	Mark Netzer Technical Lead Amec Foster Wheeler Michael Cote Project Manager Amec Foster Wheeler	Brian Quillia Client Project Manager for Pitney Bowes, Inc. Donald MacMath Client Project Manager for Cytec Industries, Inc.

QAPP Worksheet #34 Verification (Step I) Process Table

UFP-QAPP Manual Section 5.2.1
Describe the processes that will be followed to verify project data. Verification inputs include items such as those listed in Table 9 of the UFP-QAPP Manual (Section 5.1). Describe how each item will be verified, when the activity will occur, and what documentation is necessary, and identify the persons responsible. *Internal* or *external* is in relation to the data generator.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 34 Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
COCs and Shipping Forms	Chain-of-Custody forms and shipping documentation will be reviewed to verify completeness and that laboratory sample receipt records confirm samples were received and recorded in accordance with field records. When everything checks out, a copy of the COC will be retained in the site file.	Internal	Mark Netzer Technical Lead Amec Foster Wheeler
Field Logbooks and FDRs	Field records will be reviewed on a daily basis to ensure notes are accurate, all necessary information has been documented, and applicable FDR forms are complete.	Internal	Mark Netzer Technical Lead Amec Foster Wheeler
Field Instrument Calibration Records	Calibration FDRs will be reviewed on a daily basis to ensure notes are accurate, and instruments are calibrated in accordance with QAPP objectives.	Internal	Mark Netzer Technical Lead Amec Foster Wheeler
Water Chemistry Parameters Field Data	All water parameter measurements from sampling activities will be reviewed on a daily basis to ensure the results are representative and reasonable.	Internal	Mark Netzer Technical Lead Amec Foster Wheeler
Laboratory Data Packages*	All laboratory data packages will be verified internally by the laboratory performing the work for completeness prior to submittal.	Internal	Test America Laboratories
Laboratory Data Packages	All final laboratory data packages will be verified for content upon receipt.	External	TBD, Amec Foster Wheeler Project Chemist
Data Validation	Lab data reports will be technically reviewed for accuracy and completeness. Data validation is completed as specified in this QAPP.	Internal	TBD, Amec Foster Wheeler Project Chemist
Data Validation Reports	All data validation reports will be reviewed for completeness and technical content.	Internal	Chris Ricardi, Project QA Officer, Amec Foster Wheeler

*Requires a signature after review has been completed.

QAPP Worksheet #35 Validation (Steps IIa and IIb) Process Table

UFP-QAPP Manual Section 5.2.2
Describe the processes that will be followed to validate project data. Validation inputs include items such as those listed in Table 9 of the UFP-QAPP Manual (Section 5.1). Describe how each item will be validated, when the activity will occur, and what documentation is necessary and identify the person responsible. Differentiate between steps IIa and IIb of validation.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 35 Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	Sampling Methods and Procedures	Establish that required sampling methods were used and that any deviations were noted. Provide that the sampling procedures and field measurements met performance criteria and that any deviations were documented.	Mark Netzer Technical Lead, Amec
IIa	Analytical Method and Procedures	Establish that analytical methods specified in the QAPP were used and that any deviations were noted. The laboratory will provide that QC samples met performance criteria and that any deviations were documented in the report.	David Orlowski, Laboratory QA Manager Test America Laboratories, Project Data Validator (TBD), Chris Ricardi, Project QA Officer, Amec
IIb	Documentation of QAPP QC Sample Results	Establish that all QAPP required QC samples were collected and analyzed.	TBD, Project data Validator, Amec, Chris Ricardi, Project QA Officer, Amec
IIb	Project Quantitation Limits	Determine that the project quantitation limits, outlined in the QAPP, were achieved.	TBD, Project data Validator, Amec, Chris Ricardi, Project QA Officer, Amec
IIb	Lab Electronic Data Deliverable (EDD)	Verify electronic data are complete and match the hardcopy laboratory reports	TBD, Project data Validator, Amec, Chris Ricardi, Project QA Officer, Amec
IIb	Performance Criteria	Evaluate QC data associated with the samples designated in Worksheet #36 against project specific performance criteria established in the QAPP and laboratory Quality Assurance Manual (QAM).	TBD, Project data Validator, Amec, Chris Ricardi, Project QA Officer, Amec
IIb	Validation Report	Summarize data verification and validation components included in the Performance Review. Include final, qualified data and explanation of all qualifiers.	TBD, Project data Validator, Amec, Chris Ricardi, Project QA Officer, Amec
IIb	NY EDD Environmental Data Submission	Upon Completion of Data Validation electronic data will be provided by Amec Foster Wheeler to NYSDEC for incorporation into the DEC Environmental Information Management System (EIMS).	Michael Mason Project Manager New York State Department of Environmental Conservation (NYSDEC)

QAPP Worksheet #36 Validation (Steps IIa and IIb) Summary Table

UFP-QAPP Manual Section 5.2.2
Identify the matrices, analytical groups, and concentration levels that each entity performing validation will be responsible for, as well as criteria that will be used to validate those data.

☐ Worksheet Not Applicable (State Reason)

Worksheet # 36 Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
Amec	Groundwater, Surface Water,and Sediment	VOCs	Low	USEPA Stage 2A (S2aVM), Worksheet 12 QC limits, and USEPA Region II Data Validation Guidelines (for applicable Stage 2A checks).	TBD, Amec Data Validator
Amec	Groundwater	1,4-dioxane	Low	USEPA Stage 2A (S2aVM) and Method 522 as indicated in Worksheet 12.	TBD, Amec Data Validator
Amec	Groundwater	MNA parameters	NA	USEPA Stage 2A (S2aVM), Laboratory Method SOPs, and Worksheet 12.	TBD, Amec Data Validator

Data validation will be completed manually by the Amec Project Chemist and QA Officer.

U.S. Environmental Protection Agency (USEPA), 2009. "Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use"; Office of Solid Waste and Emergency Response; EPA-540-R-08-005; January 2009.

USEPA Region 2, 2008. "Validating Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) SW-846 Method 8260B and 8260C"; SOP # HW-24, Revision 4, Hazardous Waste Support Branch; September 2014.

USEPA Staged Validation Checklist - Stage 2A, Amec Foster Wheeler (see Appendix F)

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #37 Usability Assessment

DATA USABILITY

Prior to completing the monitoring report, an assessment will be completed to determine if validated laboratory data collected during the investigation are consistent with the project quality objectives established for the project. The assessment of data usability will be completed at the end of each major sample collection event. The assessment will include a review of any field program issues, sample collection issues, field measurement issues, or laboratory data quality issues that were identified during the field sampling event and subsequent data review process. A data usability evaluation will be completed that provides a discussion of field sampling problems that prevented collection of all samples, or other situations where data that were specified in work plans were not obtained. Evaluation of precision, accuracy representativeness, comparability and completeness (PARCC) parameters will be completed during data validation and chemistry reviews. Data may be qualified as estimated and potentially biased during data validation. Some results may be qualified as estimated or rejected based on the guidelines and QC results. Data gaps will be identified and interpretations on the significance of the data gaps and data quality uncertainties will be summarized in the report. Interpretations of the limitations on the use of the data, and the significance of data gaps will be included in the data usability evaluation.

Appendix A
Field Sampling SOPs

- **S-1 Low-Flow/Low-Stress Groundwater Sampling**
- **S-2 Surface Water/Sediment Sampling**
- **S-3 Calibration of Field Instrumentation for Water Quality Parameters**
- **S-4 Decontamination of Field Equipment**
- **S-5 Monitoring Well Development**
- **S-6 Procedures for Measuring Groundwater Levels**
- **S-7 Sample Packaging And Shipment**
- **S-8 Sample Chain of Custody Procedure**
- **S-9 Use of Field Logbooks**
- **S-11 Monitoring Well and Piezometer Installation Procedures**
- **S-16 Calibration Procedure for PID**

Appendix B
Field Data Records

- **Field Instrument Calibration Log**
- **Low Flow Groundwater Sampling Log**
- **Groundwater/Pore Water Grab Sampling Log**
- **Surface Water/Sediment Sampling Log**
- **Well Development Log**
- **Chain of Custody (typical)**

Appendix C
Laboratory SOPs

- **L-1 VOCs (Method 8260)**
- **L-2 1,4-Dioxane (Method 522)**
- **L-3 Methane (Method RSK-175)**
- **L-4 Sulfate (Method 300.0)**
- **L-5 Iron (Method 353.2)**
- **L-6 Nitrate (Method 353.2)**
- **L-7 Sulfide (Method SM 4500-S2 F)**
- **L-8 Total Organic Carbon (Method 9060A)**

Appendix D
Laboratory Certifications

Appendix E
Resumes

Appendix F
USEPA Staged Validation Checklist - Stage 2A