SAP Worksheet #1 -- Title and Approval Page
(UFP-QAPP Manual Section 2.1)

DRAFT FINAL
SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)
April 15, 2010

UFP-SAP for Operations, Maintenance, and Monitoring of the
Groundwater Treatment Plant
GM-38 Area, Naval Weapons Industrial Reserve Plant
Bethpage, New York

Prepared for:
Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic
NAVFAC, MIDLANT OPNEEV
Environmental Restoration
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Prepared under:
Contract No. N62472-99-D-0032
Contract Task Order Number 0096

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Approval Signature: _____
Tetra Tech EC, Inc. Project Manager
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Lora Fly

Approval Signature: _____
NYSDEC Project Engineer
Steven Scharf

EXECUTIVE SUMMARY

This Uniform Federal Policy (UFP)-Sampling and Analysis Plan (SAP) describes the operation, maintenance, and monitoring (OM&M) activities associated with the groundwater treatment plant (GWTP) at the Naval Weapons Industrial Reserve Plant (NWIRP), GM-38 Area, in Bethpage, New York. The UFP-SAP was prepared by Tetra Tech EC, Inc. (TtEC) on behalf of Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic under Contract Number N62472-99-D-0032, Contract Task Order Number 0096.

As stated in the Navy's Record of Decision (ROD), the purpose of the groundwater treatment system is to "Eliminate, to the extent practical, site-related contaminants from the affected public water supplies and to prevent, to the extent practical, the future contamination of public water supplies through the implementation of the offsite groundwater remediation." The treatment system has been designed for a 5 to 10-year operational life. It is not intended to remediate groundwater contamination in the local aquifer to non-detectable levels. Rather, the intent of the system is to remove mass, reduce elevated volatile organic compound (VOC) levels to levels similar to those in the surrounding aquifer, and minimize the impacts on water supply wells and currently unaffected portions of the aquifer.

Several sampling and monitoring programs will be conducted as part of the GWTP operations. These include:

- sampling and monitoring of influent, effluent, and intermediate process streams during the start-up period;
- sampling and monitoring of influent, effluent, and intermediate process streams during the prove-out period;
- sampling and monitoring of process streams (including influent, effluent, and intermediate) for routine operations; and
- sampling and monitoring of groundwater.

During the start-up period, various process streams will be sampled and/or monitored. The purpose of this sampling and monitoring is for tracking and documenting GWTP operation performance as well as for regulatory compliance. The start-up period is defined as the first 30 days of operations. During the system start-up period, all samples will be collected on a weekly basis, including those required for regulatory purposes as well as those not required for regulatory compliance purposes but are beneficial to ensure the GWTP is operating properly. Aqueous and air samples will be collected from the process streams via sample ports.

Following the start-up period, a prove-out period will begin and extend until the GWTP has been functional for an additional 5 months. The same process streams will be sampled as during the start-up period, and the purpose of this sampling and monitoring is to ensure the GWTP is operating in accordance with the design specifications and that effluent streams meet all regulatory and disposal facility requirements. During the system prove-out period, all samples will be collected on a weekly basis, including those required for regulatory purposes as well as those not required for regulatory compliance purposes but are beneficial to ensure the GWTP is operating according to design specifications. Based on the data that is collected during the start-up and prove-out periods, TtEC may decide to reduce the frequency of sampling and analyses for the influent process water and some of the intermediate process streams. Aqueous and air samples will be collected from the process streams via sample ports.

During routine operations, the same process streams as those sampled during the start-up and prove-out periods will be sampled and/or monitored. It should be noted that most of this sampling and monitoring is for the purpose of tracking and documenting the performance of plant operations and not for regulatory compliance reporting purposes. Only the process effluent streams will be sampled for regulatory compliance purposes for the parameters identified by New York State Department of Environmental Conservation (NYSDEC) and the disposal facilities at the designated frequency. Based on experience gained in operating the GWTP, following the start-up and prove-out periods as discussed below, TtEC

may reduce the frequency of sampling and analyses for the influent process water and some of the intermediate process streams for plant operations. All analytical parameters for regulatory compliance will be collected monthly (samples for pH will be collected weekly) and analyzed at a laboratory certified by the State of New York for these parameters. Samples from recovery wells RW-1 and RW-3 as well as the treated effluent will be collected once every two weeks.

Sampling and monitoring of the groundwater from the 12 existing and proposed monitoring wells will be performed throughout the period of operation of the GWTP and for two years beyond the shut-down of GWTP operations to determine the effectiveness of the remediation activities and monitor the hydraulic containment and capture of the groundwater "hot spot" by the recovery wells. Water level measurements will be performed in all 12 monitoring wells on a quarterly basis. In addition, samples for water quality monitoring will be collected from eight of the 12 wells on a quarterly basis for the first two years from the start of GWTP operations, on a semi-annual basis for years three and four, and then on an annual basis from the fifth year onwards. It was deemed unnecessary to collect samples from all 12 wells because some of them are in close proximity and are therefore expected to have the same water quality.

The final determination to take the GWTP off-line will be made by the Navy in consultation with NYSDEC. When concentrations of chlorinated VOCs in the GM-38 Area groundwater "hot spot" are equal to those concentrations in the surrounding aquifer, TtEC will make the recommendation to the Navy that operations at the GWTP be terminated. With consent from the Navy and NYSDEC, sampling and monitoring of the groundwater quality will continue for two years (on a quarterly basis) beyond the shut-down of the GWTP operations.

SAP Worksheets

List of Figures

Appendices

ACRONYMS

AA	Atomic Absorption
AES	Atomic Emission Spectrometry
bgs	Below Ground Surface
B.S.	Bachelor of Science
COC	Chain of Custody
CFR	Code of Federal Regulations
DI	Deionized
DoD	Department of Defense
DOT	Department of Transportation
DQI	Data Quality Indicator
DQO	Data Quality Objective
EFANE	Engineering Facility Northeast
EPA	Environmental Protection Agency
FOL	Field Operations Leader
FT	Feet
FTMR	Field Task Modification Request
GC/MS	Gas Chromatograph/Mass Spectrometer
GWTP	Groundwater Treatment Plant
HASP	Health and Safety Plan
HDPE	High Density Polyethylene
HSM	Health and Safety Manager
hr	Hour
ICP	Inductively Coupled Plasma
L	Liter
lb	Pound
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management Systems
LQAP	Laboratory Quality Assurance Plan
m^3	Cubic Meter
MDL	Method Detection Limit
mg	Milligram
MPC	Measurement Performance Criteria
MS	Matrix Spike
M.S.	Master of Science
MSD	Matrix Spike Duplicate
NA	Not Applicable
NAVFAC	Naval Facilities Engineering Command
NFESC	Naval Facilities Engineering Service Center
NGC	Northrop Grumman Corporation
NIST	National Institute of Standards and Technology
NTU	Nephelometric Turbidity Unit
NWIRP	Naval Weapons Industrial Reserve Plant
NYSDEC	New York State Department of Environmental Conservation
OM&M	Operations, Maintenance, and Monitoring
OSHA	Occupational Safety and Health Administration
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PAL	Project Action Limit
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
Ph.D.	Doctor of Philosophy
PM	Project Manager
PQO	Project Quality Objective
QA	Quality Assurance

QAM	Quality Assurance Manager
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
QSM	Quality Systems Manual
%R	Percent Recovery
RAC	Remedial Action Contract
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RPD	Relative Percent Difference
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SPDES	State Pollution Discharge Elimination System
SSHO	Site Safety and Health Officer
SVOC	Semi-Volatile Organic Compound
TAT	Turnaround Time
TBD	To Be Determined
TCE	Trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TSS	Total Suspended Solids
TtEC	Tetra Tech EC, Inc.
UFP	Uniform Federal Policy
ug (µg)	Microgram
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

SAP Worksheet #2 -- SAP Identifying Information
(UFP-QAPP Manual Section 2.2.4)

Site Name/Number: **GM-38 Area, Naval Weapons Industrial Reserve Plan (NWIRP)**
Operable Unit: **OU2**
Contractor Name: **Tetra Tech EC, Inc. (TtEC)**
Contract Number: **N62472-99-D-0032**
Contract Title: **U.S. Navy Southwest Remedial Action Contract (RAC)**
Work Assignment Number (optional): CTO 0096

1. This Sampling and Analysis Plan (SAP) was prepared in accordance with the requirements of the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) (EPA, 2005) and United States Environmental Protection Agency (EPA) Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS (2002). Identify any additional guidance used to prepare SAP: None

2. Identify regulatory program: New York State Pollution Discharge Elimination System (SPDES)

3. This SAP is a project-specific SAP.

4. List dates of scoping sessions that were held:

Scoping Session	Date
Email correspondence and telephone conversations with the Navy to discuss the Operations, Maintenance, and Monitoring (OM&M) Plan	May 2009

5. List dates and titles of any SAP documents written for previous site work that are relevant to the current remediation.

Title	Date
No other sampling and analysis plans have been developed for the OM&M phase of the remediation.	Not Applicable (NA)

6. List organizational partners (stakeholders) and connection with lead organization:
New York State Department of Environmental Conservation (NYSDEC) (regulatory oversight) and Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic (property owner).

7. Lead organization (see Worksheet #7 for detailed list of data users) NAVFAC Mid-Atlantic

8. If any required SAP elements or required information are not applicable to the project or are provided elsewhere, then note the omitted SAP elements and provide an explanation for their exclusion below:
Cross-walk omitted, not needed.

SAP Worksheet #3 -- Distribution List

(UFP-QAPP Manual Section 2.3.1)

Name of SAP Recipient	Title/Role	Organization	Telephone Number	Email Address or Mailing Address	Document Control Number
Lora Fly	Remedial Project Manager (RPM)	NAVFAC Mid-Atlantic	757-444-0781	lora.fly@navy.mil	Not Applicable (NA)
Steven Scharf	Project Engineer	NYSDEC	518-402-9620	sxscharf@gw.dec.state.ny.us	NA
Stavros Patselas	Project Manager (PM)	TtEC	215-702-4099	stavros.patselas@tetratech.com	NA
Maheyar Bilimoria	OM&M Engineer	TtEC	215-702-4049	maheyar.bilimoria@tetratech.com	NA
TBD	Field Operations Leader (FOL)/Site Safety Officer(SSHO)	TtEC	TBD	TBD	NA
Lynn Arabia	Project Chemist	TtEC	973-630-8356	lynn.arabia@tetratech.com	NA
Veronica Bortot	Project Manager	TestAmerica – Pittsburgh	412-963-2435	Veronica.Bortot@testamericainc.com	NA
TBD	Project Manager	Air Toxics, Ltd.	800-985-5955	TBD	NA

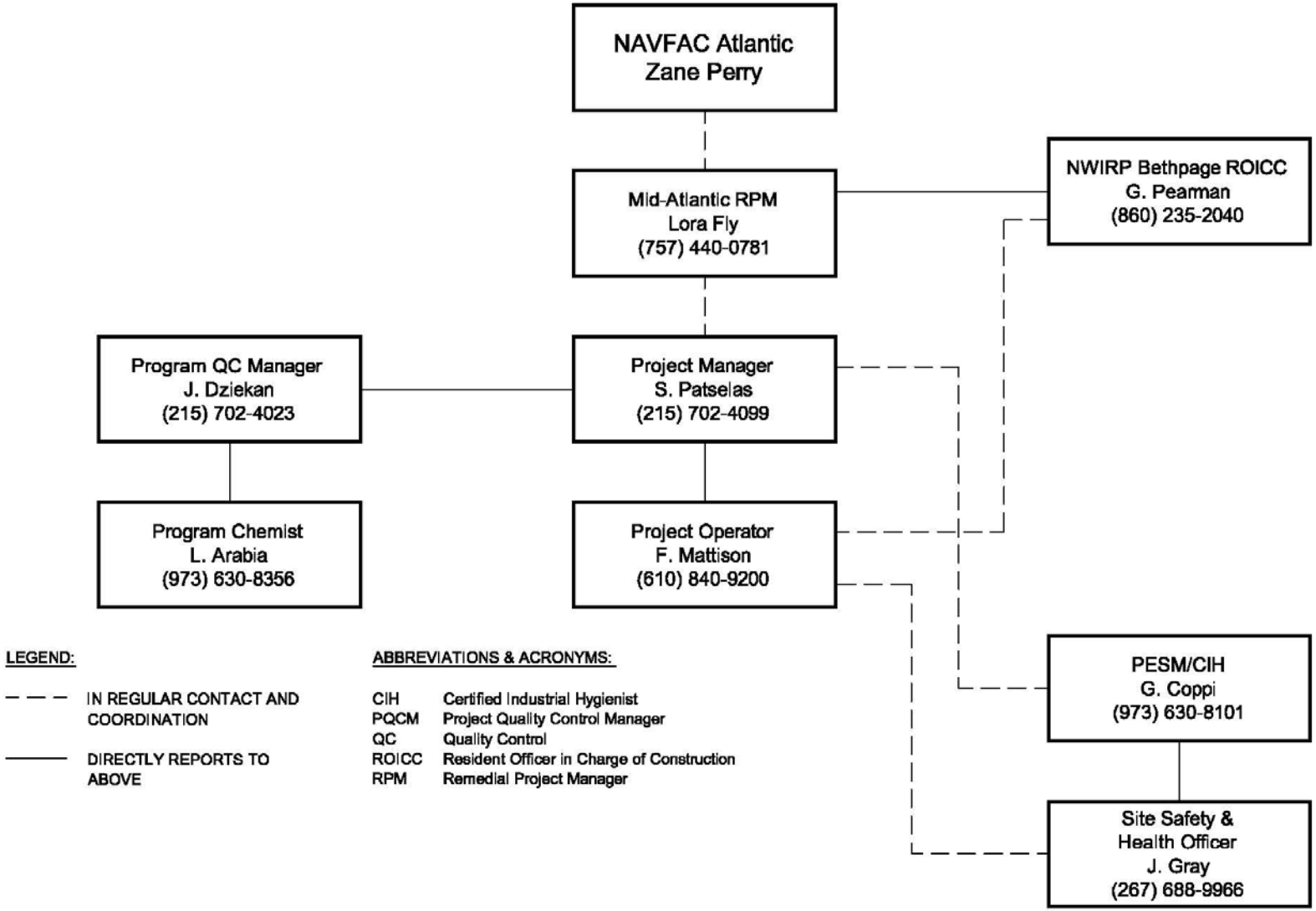
SAP Worksheet #4 -- Project Personnel Sign-Off Sheet

(UFP-QAPP Manual Section 2.3.2)

Name	Organization/Title/Role	Telephone Number (optional)	Signature/Email Receipt	SAP Section Reviewed	Date SAP Read
Stavros Patselas	TtEC/Project Manager	215-702-4099	C. Joblon for S. Patselas	All	8/28/09
Maheyar Bilimoria	TtEC/OM&M Engineer	215-702-4049		All	8/21/09
Jonathan Dziekan	TtEC/ Program Quality Assurance Manager (QAM)	215-702-4023			
Lynn Arabia	TtEC/ Project Chemist	973-630-8356		All	8/19/09
Fred Mattison	ECOR Solutions, Inc. / Plant Operator	610-840-9200			
TBD	TtEC/FOL/SSHO	TBD			
Veronica Bortot	TestAmerica – Pittsburgh / Project Manager	412-963-2435			
TBD	Air Toxics, Ltd. / Project Manager	800-985-5955			

SAP Worksheet #5 -- Project Organizational Chart

(UFP-QAPP Manual Section 2.4.1)



SAP Worksheet #6 -- Communication Pathways

(UFP-QAPP Manual Section 2.4.2)

Communication Driver	Responsible Entity	Name	Phone Number	Procedure (timing, pathways, etc.)
SAP Amendments	RPM	Lora Fly	757-444-0781	Immediately informs TtEC PM. Document via Field Task Modification Request (FTMR) form.
Changes in Schedule	TtEC PM	Stavros Patselas	215-702-4099	Informs Navy RPM via schedule impact letter as soon as impact is realized.
Unanticipated field conditions that would require a change in plan and result in FTMRs	ECOR Plant Operator TtEC FOL TtEC Project Manager	Fred Mattison TBD Stavros Patselas	610-840-9200 TBD 215-702-4099	FOL informs PM; PM informs RPM; RPM issues scope change if warranted; scope change to be implemented before work is executed. Document via FTMR form.
Conditions adverse to quality or health and safety	ECOR Plant Operator TtEC FOL TtEC PM TtEC QAM TtEC Health and Safety Manager (HSM) TtEC Site Safety and Health Officer (SSHO) Navy RPM	Fred Mattison TBD Stavros Patselas Jonathan Dziekan Grey Coppi Joe Gray Lora Fly	610-840-9200 TBD 215-702-4099 215-702-4023 973-630-8101 267-688-9966 757-444-0781	Responsible party immediately informs subcontractors, the Navy, and Project Team to stop work and re-initiate work upon corrective action.
Analytical data quality issues	TestAmerica – Pittsburgh PM Air Toxics, Ltd. PM TtEC Project Chemist	Veronica Bortot TBD Lynn Arabia	412-963-2435 TBD 973-630-8356	Immediately notify TtEC Project Chemist. Notify data review staff and TtEC PM if necessary.

SAP Worksheet #7 -- Personnel Responsibilities and Qualifications Table
(UFP-QAPP Manual Section 2.4.3)

Data users: TtEC, NYSDEC (regulatory oversight), and Navy (property owner).

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Stavros Patselas	PM	TtEC	Oversees project, financial, schedule, and technical day-to-day management of the project. • Ensures timely resolution of project-related technical, quality, and safety questions associated with TtEC operations. • Functions as the primary TtEC interface with the Navy RPM, regulators, TtEC field and office personnel, and laboratory points of contact. • Ensures that TtEC health and safety issues related to this project are communicated effectively to all personnel and off-site laboratories. • Monitors and evaluates all TtEC subcontractor performance. • Coordinates and oversees work performed by TtEC field and office technical staff (including data review, data interpretation, and report preparation). • Coordinates and oversees maintenance of all TtEC project records. • Coordinates and oversees review of TtEC project deliverables. • Prepares and issues final TtEC deliverables to the Navy.	B.S., Civil and Environmental Engineering, 13 years environmental experience
Maheyar Bilimoria	OM&M Engineer	TtEC	Oversees operation, maintenance and operation of the GWTP in accordance with design. • Ensures timely resolution of project-related technical questions associated with GWTP operations. • Functions as the primary TtEC interface with the TtEC field and office personnel and the plant operator. • Oversee plant operation subcontractor. • Coordinates and oversees work performed by TtEC field	Ph.D., Chemical Engineering, 35 years environmental experience

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
			and office technical staff (including data review, data interpretation, and report preparation). • Reviews TtEC project deliverables.	
Joseph Gray	SSHO	TtEC	Supervises, coordinates, and performs field sampling activities • Ensures that all health and safety requirements are implemented. • Functions as the on-site communications link between field staff members and TtEC PM. • Alerts off-site analytical laboratories of any special health and safety hazards associated with environmental samples. • Oversees the mobilization and demobilization of all field equipment and subcontractors. • Coordinates and manages the field technical staff. • Adheres to the work schedules provided by the TtEC PM. • Ensures the proper maintenance of site logbooks, field logbooks, and field recordkeeping. • Initiates FTMRs (field change orders) when necessary. • Identifies and resolves problems in the field via consultation with the PM, implements and documents corrective action procedures, and provides communication between the field team and project management.	BS, Environmental Engineering, 16 years environmental experience
Fred Mattison	Plant Operator	ECOR Solutions, Inc.	Remotely operates the plant, performs minor maintenance, oversees subcontractors during major maintenance or upgrade activities, and responds to alarm conditions or plant shut-downs. • Ensures that all health and safety requirements are implemented. • Adheres to the work schedules provided by the TtEC PM. • Ensures the proper maintenance of the GWTP recordkeeping.	TBD

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Lynn Arabia	Project Chemist	TtEC	Coordinates analyses with laboratory chemists, ensures the scope is followed, provides quality assurance reviews of data packages, and communicates with TtEC staff. • Ensures that the project meets objectives from the standpoint of laboratory performance. • Provides technical advice to the TtEC team on matters of project chemistry. • Monitors and evaluates subcontractor laboratory performance. • Ensures timely resolution of laboratory-related technical, quality, or other issues effecting project goals. • Functions as the primary interface with the subcontracted laboratory and the TtEC PM. • Coordinates and oversees work performed by the subcontracted laboratory. • Coordinates and oversees review of laboratory deliverables. • Recommends appropriate laboratory corrective actions. • Reviews chemistry and validation information in SAP.	B.S., Chemistry, 17 years environmental experience
Grey Coppi, CIH	HSM	TtEC	Oversees Remedial Action Contract (RAC) Health and Safety Program.	M.S, Environmental Health Science B.S., Health Science, 23 years of environmental experience
Jonathan Dziekan	QAM	TtEC	Reviews SAP, oversees preparation of laboratory scope, coordinates with lab, and oversees data quality review. Ensures quality aspects of the RAC program. • Develops, maintains, and monitors Quality Assurance (QA) policies and procedures. • Provides training to TtEC staff in QA/Quality Control (QC) policies and procedures. • Conducts systems and performance audits to monitor compliance with environmental regulations, contractual requirements, QAPP requirements, and corporate policies and procedures.	M.S., Civil and Environmental Engineering; 9 years of environmental experience

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
			• Audits project records. • Monitors subcontractor quality controls and records. • Assists in the development of corrective action plans and ensuring correction of non-conformances reported in internal or external audits. • Ensures that this SAP meets TtEC, Navy, and NYSDEC requirements. • Prepares QA reports for management.	
Veronica Bortot	PM	TestAmerica – Pittsburgh	Coordinates analyses with laboratory chemist, ensures that scope is followed, performs quality assurance reviews of data packages, and communicates with TtEC.	TBD
TBD	PM	Air Toxics, Ltd.	Coordinates analyses with laboratory chemist, ensures that scope is followed, performs quality assurance reviews of data packages, and communicates with TtEC.	TBD

SAP Worksheet #8 -- Special Personnel Training Requirements Table

(UFP-QAPP Manual Section 2.4.4)

All field personnel will have appropriate training to conduct the field activities to which they are assigned. Additionally, each site worker will be required to have completed a 40-hour course (and 8-hour refresher, if applicable) in Health and Safety Training as described under Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120(b)(4). Safety requirements will be addressed in greater detail in the TtEC Health and Safety Plan (HASP). The HASP will be submitted as a separate document.

The selected analytical laboratories (TestAmerica, Pittsburgh and Air Toxics, Ltd.) will successfully complete the laboratory evaluation process required as part of the Naval Facilities Engineering Service Center (NFESC) Quality Assurance Program and described in the Department of Defense (DoD) Quality Systems Manual (QSM) dated April 2009.

In addition, the Operator of the groundwater treatment plant (GWTP) will be required to participate in a field training program given by TtEC and/or selected equipment manufacturer representatives. The training will address equipment operation, maintenance, safety requirements and troubleshooting, and other subjects required to properly operate the GWTP.

The training requirements of 6 NYCRR Part 650 will be applicable for the plant operator.

SAP Worksheet #9 -- Project Scoping Session Participants Sheet

(UFP-QAPP Manual Section 2.5.1)

Project Name: Naval Weapons Industrial Reserve Plant Projected Date(s) of Remediation: 2009 through 2014 Project Manager: Stavros Patselas	Site Name: GM-38 Area Site Location: Bethpage, New York

Date of Session: Emails – May 2009
Scoping Session Purpose: Identify OM&M Plan Elements and Information Required to Complete OM&M Plan

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Stavros Patselas	Project Manager	TtEC	215-702-4099	Stavros.Patselas@tetratech.com	Contractor point of contact.
Maheyar Bilimoria	OM&M Engineer	TtEC	215-702-4049	Maheyar.Bilimoria@tetratech.com	Oversee GWTP OM&M.
Lora Fly	RPM	NAVFAC Mid-Atlantic	757-444-0781	Lora.Fly@navy.mil	Navy point of contact.

SAP Worksheet #10 -- Problem Definition
(UFP-QAPP Manual Section 2.5.2)

10.1 SITE DESCRIPTION

10.1.1 Site Location

NWIRP Bethpage is located in east-central Nassau County, Long Island, New York, approximately 30 miles east of New York City. The Navy's property totaled approximately 109.5 acres and was formerly a Government Owned Contractor-Operated (GOCO) facility that was operated by the Northrop Grumman Corporation (NGC) until September 1998. NWIRP Bethpage is bordered on the north, west, and south by property owned, or formerly owned, by NGC that covered approximately 605 acres, and, on the east, by a residential neighborhood.

The GM-38 Area refers to a cluster of monitoring wells that were installed in the 1990s by NGC and that first identified an isolated groundwater contaminant plume in this area. The GM-38 Area is approximately 8,500 feet south-southeast and hydraulically downgradient of NWIRP Bethpage. The GWTP is located within a utility easement that is located east of Broadway Avenue, west of the Seaford Oyster Bay Expressway (Route 135), and between the north and south dead ends of Windhorst and Herman Avenues.

10.1.2 Site Background

NWIRP Bethpage is currently listed by NYSDEC as an “inactive hazardous waste site” (#1-30-003B), as is NGC (#1-30-003A) and the Hooker/RUCO site (#1-30-004) located less than 1/2 mile west of NWIRP Bethpage.

NWIRP Bethpage was established in 1941. Since inception, the primary mission of the facility has been the research, prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. The facilities at NWIRP Bethpage include four plants (Nos. 3, 5, and 20, used for assembly and prototype testing; and No. 10, which contains a group of quality control laboratories), two warehouse complexes, a salvage storage area, water recharge basins, an industrial wastewater treatment plant, and several smaller support buildings.

Historical operations that resulted in hazardous material generation at the facility included metal finishing processes, maintenance operations, painting of aircraft and components, and other activities that involve aircraft manufacturing. Wastes generated by plant operations were disposed directly into either drainage sumps, dry wells, and/or on the ground surface, resulting in the disposal of a number of hazardous wastes, including the volatile organic compounds (VOCs) tetrachloroethene (PCE) and trichloroethene (TCE), the semivolatile organic compounds (SVOCs) polychlorinated biphenyls (PCBs), and the inorganic analytes chromium and cadmium. Some of these contaminants have migrated from the points of disposal to surrounding areas, including the soils of these surrounding areas and the groundwater beneath and downgradient of the NWIRP Bethpage property.

Chlorinated VOCs were identified in the GM-38 Area in moderately deep (220 to 470 feet below ground surface [bgs]) groundwater at concentrations greater than 500 micrograms per liter (µg/L). The contaminated groundwater in the area represents a relatively large mass of chlorinated VOCs that would remain for extended periods and could adversely affect public water supplies in the area, as well as other downgradient water supplies. Two public water supply systems are present in the general area and extract groundwater at depths ranging from 540 to 740 feet bgs. Navy- and contractor-funded systems are in place at the public water supply wells to remove VOCs from the water prior to distribution.

10.2 PROBLEM SUMMARY

As stated in the Navy's Record of Decision (ROD), the purpose of the groundwater treatment system is to "Eliminate, to the extent practical, site-related contaminants from the affected public water supplies and to prevent, to the extent practical, the future contamination of public water supplies through the implementation of the offsite groundwater remediation." The treatment system has been designed for a 5 to 10 year operational life. It is not intended to remediate groundwater contamination in the local aquifer to non-detectable levels. Rather, the intent of the system is to remove mass, reduce elevated VOC levels to levels similar to those in the surrounding aquifer, and minimize the impacts on water supply wells and currently unaffected portions of the aquifer.

10.3 PROJECT DECISION STATEMENTS

This SAP was prepared primarily to address samples to be collected from the GWTP and the eight monitoring wells and used to evaluate the effectiveness of the treatment plant.

1. If weekly grab samples from the effluent show no exceedances of the stated discharge limitations for 24 consecutive weekly sampling events then, the sampling will be monthly.

2. Monthly grab samples will be collected from the influent, effluent, and two intermediate locations of the vapor phase treatment system. If the results of these monthly grab samples show exceedances of allowable limits for the air permit equivalent then, the GWTP vapor phase treatment system may need to be modified.

3. Water level measurements will be performed in all 12 monitoring wells on a quarterly basis. In addition, samples for water quality monitoring will be collected from eight of the 12 wells on a quarterly basis for the first two years from the start of GWTP operations, on a semi-annual basis for years three and four, and then on an annual basis from the fifth year onwards. If the water level measurements do not show a sufficient capture zone for the groundwater "hot spot" then, the placement and/or the screened intervals and/or the pumping rates from the recovery wells may need to be modified. Also, if the groundwater samples from the eight wells show exceedances then, the GWTP operations may need to be modified and/or sampling frequency may not be reduced during the plant operations.

SAP Worksheet #11 -- Project Quality Objectives/Systematic Planning Process Statements
(UFP-QAPP Manual Section 2.6.1)

Project quality objectives (PQOs) are qualitative and quantitative statements that specify the type, quantity, and quality of the data required to support decisions during remedial activities. PQOs can be defined as what the end user expects to obtain from the analysis results, and are developed by the entire project team using a systematic planning process. Figure 11-1 presents a flowchart of this process; although the activities are presented in a sequential manner, the entire planning process is iterative and earlier activities can, and should, be re-visited as required throughout the life of the project.

PQOs are generally developed through a seven step process, with a graded approach being implemented according to the complexity of the project:

- Step 1 State the problem
- Step 2 Identify the decision
- Step 3 Identify inputs to the decision
- Step 4 Define the study boundaries
- Step 5 Develop a decision rule
- Step 6 Specify limits on decision errors
- Step 7 Optimize the design for obtaining data

Worksheets #9 and #10 contain information on the project scoping sessions and project definition. Overall project objectives are:

- Sample and monitor influent and effluent streams during the start-up period and the prove-out period.
- Sample and monitor process streams (including influent and effluent) during routine operations.
- Monitor the groundwater level in 12 monitoring wells and sample eight of these 12 monitoring wells.

Who Will Use the Data?
TtEC, NYSDEC (regulatory oversight), and Navy (property owner).

What Will the Data be Used For?
- To monitor the operations within the GWTP;
- To confirm the GWTP effluent is acceptable for discharge per the SPDES permit equivalent;
- To confirm the GWTP vapor is acceptable for discharge per the air permit equivalent; and
- To monitor hydraulic containment and capture of the groundwater “hot spot.”

What Type of Data are Needed?
The sampling program will include the following:

- Sampling and Monitoring during the Start-Up – Sampling and monitoring of the GWTP performance will be implemented during the start-up period in 2009 in order to ensure that the system is operating properly and that effluent streams meet all regulatory, and disposal facility requirements. The start-up period is defined as the first 30 days of operations. During the start-up period, 12 process streams (either aqueous or air) will be sampled and/or monitored as shown on Worksheet #18. The purpose of this sampling and monitoring is for tracking and documenting GWTP operations performance as well as for regulatory compliance. During the system start-up period, all samples will be collected on a weekly basis. Only the process effluent streams will be sampled for regulatory compliance purposes for the parameters identified by NYSDEC and for disposal purposes for the parameters identified by the disposal facilities, at the designated frequency. All analytical parameters for regulatory compliance will analyzed at a laboratory certified by the State of New York for these parameters.

- Sampling and Monitoring during the Prove-Out – Sampling and monitoring of the GWTP performance will be implemented during the prove-out period in 2009 and 2010 in order to ensure that the GWTP is operating in accordance with the design specifications and that effluent streams meet all regulatory, and disposal facility requirements. The prove-out period is defined as the second through the sixth months of operations. During the prove-out period, the same 12 process streams (either aqueous or air) will be sampled and/or monitored (see Worksheet #18). The purpose of this sampling and monitoring is to ensure the GWTP is operating in accordance with the design specifications and that effluent streams meet all regulatory, and disposal facility requirements. During the system prove-out period, all samples will be collected on a weekly basis. Based on the data that is collected during the start-up and prove-out periods, TtEC may decide to reduce the frequency of sampling and analyses for the influent process water and some of the intermediate process streams. Only the process effluent streams will be sampled for regulatory compliance purposes for the parameters identified by NYSDEC and for disposal purposes for the parameters identified by the disposal facilities, at the designated frequency. All analytical parameters for regulatory compliance will be analyzed at a laboratory certified by the State of New York for these parameters.

- Sampling and Monitoring during Routine Operations – Routine operations will commence at the end of the prove-out period (i.e., after the end of the first six months of operations). During routine operations, the same 12 process streams (either aqueous or air) will be sampled and/or monitored (see Worksheet #18). It should be noted that most of this sampling and monitoring is for the purpose of tracking and documenting the performance of plant operations and not for regulatory compliance reporting purposes. Only the process effluent streams will be sampled for regulatory compliance purposes for the parameters identified by NYSDEC and for disposal purposes for the parameters identified by the disposal facilities, at the designated frequency. Based on experience gained in operating the GWTP, following the start-up and prove-out periods, TtEC may reduce the frequency of sampling and analyses for the influent process water and intermediate process streams. All analytical parameters for regulatory compliance will be collected monthly (samples for pH will be collected weekly) and analyzed at a laboratory certified by the State of New York for these parameters. Samples from recovery wells RW-1 and RW-3 and treated effluent will be collected once every two weeks.

- Sampling and Monitoring of the Groundwater – Sampling and monitoring of the groundwater from the existing monitoring wells will be performed throughout the period of operation of the GWTP and for two years beyond the shut-down of GWTP operations to determine the effectiveness of the remediation activities and monitor the hydraulic containment and capture of the groundwater "hot spot" by the recovery wells. Water level measurements will be performed in all 12 monitoring wells on a quarterly basis. In addition, samples for water quality monitoring will be collected from eight of the 12 wells on a quarterly basis for the first two years from the start of GWTP operations, on a semi-annual basis for years three and four, and then on an annual basis from the fifth year onwards. It was deemed unnecessary to collect samples from all 12 wells because some of them are in close proximity to each other and are therefore expected to have the same water quality. The final determination to take the GWTP off-line will be made by the Navy in consultation with NYSDEC. When concentrations of chlorinated VOCs in the GM-38 Area groundwater "hot spot" are equal to those concentrations in the surrounding aquifer, TtEC will make the recommendation to the Navy that operations at the GWTP be terminated. With consent from the Navy and NYSDEC, sampling and monitoring of the groundwater quality for the same parameters will continue for two years (on a quarterly basis) beyond the shut-down of the GWTP operations. Worksheet #17 presents the wells that will be sampled for water quality monitoring.

How "Good" do the Data Need to be in Order to Support the Environmental Decision?

The overall QA/QC objective for the sampling activities is to provide data of known and documented quality through the use of developed and implemented procedures. Quality characteristics for data are determined by the evaluation of the precision, accuracy, representativeness, comparability, and completeness (PARCC) of the analytical results, and sensitivity and blank contamination elimination. Data quality objectives for each of these

parameters are determined based on the level of data required. Specific QA/QC objectives for the definitive data are presented on Worksheet #12.

How much data are needed?
The field program for the GM-38 Area GWTP is presented in Worksheets #18, #19, and #20.

Where, When, and How Should the Data be Collected/Generated?
Worksheet #16 presents the project schedule.

Worksheet #17 presents the sampling program design and rationale. Worksheet #18 presents the sampling methods. Worksheet #21 provides the standard operating procedures (SOPs) that govern the various types of sampling.

Who Will Collect and Generate the Data?
Qualified personnel from either TtEC or the GWTP operating subcontractor will collect samples from the 13 process streams. TtEC personnel or the GWTP operating subcontractor will collect samples from the monitoring wells. Personnel from the subcontracted laboratory will generate definitive data using specific analytical methods and guidelines. Additional information on project personnel is provided in Worksheets #5 through #7.

How Will the Data be Reported?
The analytical laboratories will tabulate and compile analytical results and associated QA/QC information. Results from the off-site laboratory analyses are to be reported on standard EPA forms in standard units for the matrix and analysis (e.g., ug/L for organics and metals in groundwater samples). Field screening parameters (e.g., pH) will be reported in standard units for the analysis. Tabular data will be provided in Excel files by the laboratory.

How will the Data be Archived?

- Data from TtEC's subcontract laboratories will be received in electronic and hardcopy formats specified in the contract and then reviewed by TtEC personnel.
- All electronic data will be input into the project's database.
- Generated data (field- and/or laboratory-related) will be stored in the project files when not undergoing processing/review.
- Hard copies of field data (i.e., field logbooks and field data sheets) will be archived in the project files.
- Hard copies of analytical data received by TtEC will be archived in the project files for 10 years after contract expiration.

SAP Worksheet #12 -- Measurement Performance Criteria Table

(UFP-QAPP Manual Section 2.6.2)

Measurement Performance Criteria Table – *Aqueous Field Quality Control Samples*

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Cooler Temperature Indicator	VOCs, Mercury, and Total Suspended Solids (TSS)	One per cooler	Accuracy / Representativeness	Between 2 and 6 degrees Celcius.	S
Field Duplicate		One per 20 samples	Precision (field)	50% Relative Percent Difference (RPD)	S&A
Field Blank*		One per 20 samples	Representativeness	No analyte > quantitation limit (QL)	S&A
All samples		All samples	Sensitivity	Method detection limits (MDLs) < project action limits listed on Worksheet #15	A
All samples		All samples	Data Completeness	95% overall	S&A
Trip Blank	VOCs	One per cooler	Accuracy	No analyte > QL	S&A

* - Applicable to groundwater sampling from the eight monitoring wells.

Measurement Performance Criteria Table – *Air Field Quality Control Samples*

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Field Duplicate	VOCs	1 per 20 samples	Precision (field)	50% RPD	S&A
All samples		All samples	Sensitivity	MDLs < project action limits listed on Worksheet #15	A
All samples		All samples	Data Completeness	95% overall	S&A

Measurement Performance Criteria Table – *Spent Air Stripper Media Field Quality Control Samples*

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Cooler Temperature Indicator	TCLP VOCs and TCLP Metals	One per cooler	Accuracy / Representativeness	Between 2 and 6 degrees Celcius.	S
All samples		All samples	Sensitivity	MDLs < project action limits listed on Worksheet #15	A
All samples		All samples	Data Completeness	95% overall	S&A

SAP Worksheet #13 -- Secondary Data Criteria and Limitations Table
(UFP-QAPP Manual Section 2.7)

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (originating organization, data types, data generation / collection dates)	How Data Will Be Used	Limitations on Data Use
Final Design	Final Design for GM-38 Area Groundwater Remediation, NWIRP Bethpage, NY, May 8, 2006	TtEC Design information for the GWTP	Construct and operate the GWTP.	None.
Record of Decision by Engineering Facility Northeast (EFANE)	Record of Decision NWIRP Bethpage, NY, Operable Unit 2 Groundwater, NYS Registry 1-3-003B, April 2003 (Revision 1)	EFANE Record of Decision	Identify remedial actions for groundwater at NWIRP.	None.
Record of Decision by NYSDEC	Record of Decision, Operable Unit 2 Groundwater, Northup Grumman and NWIRP Sites, Nassau County, Site Numbers 1-30-003A & B, March 2001	NYSDEC Record of Decision	Identify remedial actions for groundwater at Northup Grumman and NWIRP.	None.

SAP Worksheet #14 -- Summary of Project Tasks
(UFP-QAPP Manual Section 2.8.1)

Characterization activities for this project will include the following:

- Sampling and monitoring of the GWTP performance during the start-up period in 2009 in order to ensure that the system is operating properly and that effluent streams meet all regulatory and disposal facility requirements.

- Sampling and monitoring of the GWTP during the prove-out period in 2009 and 2010 in order to ensure that the system is operating in accordance with the design specifications and meets all regulatory and disposal facility requirements.

- Sampling and monitoring of influent, effluent, and intermediate process streams within the GWTP for the purpose of evaluating the operation and performance of the process equipment used for air stripping, bag filtration, liquid-phase and vapor-phase granular activated carbon adsorption, and backwashing during routine operations.

- Sampling and monitoring of the groundwater to determine the effectiveness of the remediation activities and monitor the hydraulic containment and capture of the groundwater "hot spot" by the recovery wells.

The SOPs and field forms referenced below and in the worksheets are included in Appendices A and B, respectively.

- **QC Tasks –** Worksheet #20 provides a summary of the required field QC samples by matrix. Field QC samples will be labeled and shipped according to the procedures outlined below.

  Field Equipment Rinsate Blanks
  A field blank will be collected to evaluate the potential for residual chemical contamination of environmental samples from inadequate decontamination of field equipment. Field blanks will be collected by pouring reagent (analyte-free) water over and/or through decontaminated equipment, and collecting the rinsate. Field blanks will be collected at a frequency of five percent of the total samples (i.e., one blank for up to every 20 samples) for chemical parameters when non-disposable sampling equipment is used. Analysis of field blanks will be identical to analysis of the associated environmental samples, and the blanks will be preserved as indicated in the applicable methods. Sufficient equipment will be available and field activities scheduled, as possible, to minimize the number of field blanks required.

  Trip Blanks
  A trip blank serves to detect possible cross-contamination of samples resulting from handling, storage and shipment procedures. Trip blanks consist of volatile organic analysis (VOA) vials filled with deionized (DI) water prior to initiation of daily field activities and preserved accordingly, which accompany the day's environmental samples through collection and shipment to the laboratory. In addition, trip blanks are stored by the laboratory under the same conditions as the environmental samples. A trip blank must accompany each cooler containing aqueous samples for VOC analysis, and will be analyzed identically to the associated environmental samples. All aqueous VOC samples will be consolidated in one cooler for daily shipment, as possible, to minimize the number of trip blanks required.

  Cooler Temperature Blanks
  A cooler temperature blank will be included in each cooler of samples shipped from the Site to verify that the cooler temperature has been maintained at 4 ± 2°C. A vial will be filled with either

potable or DI water, unpreserved, and labeled with "Cooler Temperature Indicator" and the date. The laboratory will record the temperature of the blank water on the chain of custody (COC) form immediately upon cooler arrival.

- **Analytical Tasks -** The aqueous samples from the GWTP will be analyzed for select VOCs (1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, PCE, 1,1,1-trichloroethane, TCE, and vinyl chloride), mercury, and/or total suspended solids (TSS) by a subcontracted laboratory, TestAmerica – Pittsburgh. The aqueous samples from the monitoring wells will be analyzed for Target Compound List (TCL) VOCs, mercury, and TSS by a subcontracted laboratory, TestAmerica – Pittsburgh. The air samples from the GWTP vapor phase will be analyzed for select VOCs (1,2-dichloroethane, 1,2-dichloroethene, toluene, 1,1,2-trichloroethane, TCE, vinyl chloride, and xylene) by a subcontracted laboratory, AirToxics, Ltd. Spent air stripper media will be analyzed for Toxicity Characteristic Leaching Procedure (TCLP) VOCs and TCLP metals by a subcontracted laboratory, TestAmerica – Pittsburgh, prior to disposal. The subcontracted laboratories will need to be approved by the NFESC. Analyses will be performed in accordance with the analytical methods identified in Worksheet #23. The subcontracted laboratories will meet the QLs specified in Worksheet #15. The subcontracted laboratories will perform the chemical analyses following laboratory-specific operating procedures developed based on the methods listed in Worksheet #23. Aqueous samples from the GWTP will be analyzed for pH with a hand-held pH meter and groundwater samples from the monitoring wells will be analyzed for pH just prior to sampling with a water quality meter.

- **Data Management -** Project data will be managed according to the procedures outlined on the following worksheets:

  - Project documentation and records
    - Field sample collection and field measurement records - See Worksheets #27 and #29
    - Laboratory data package deliverables - See Worksheet #30
    - Data assessment documents and records - See Worksheet #29

  - Data recording formats - See Worksheet #27

  - Data handling, management, tracking, and control - See Worksheet #29

- **Assessment and Oversight** - See Worksheet #32 for assessment findings and corrective actions and Worksheet #33 for QA management reports.

- **Data Review -** Data reviews will be conducted in accordance with the procedures outlined on the following worksheets:

  - Data verification – See Worksheet #34
  - Data validation – See Worksheets #35 and #36
  - Usability assessment – See Worksheet #37

SAP Worksheet #15 -- Reference Limits and Evaluation Table

(UFP-QAPP Manual Section 2.8.1)

Matrix: *Aqueous*
Analytical Group: *VOCs*

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal[1] (µg/L)	Achievable Laboratory Limits[2]	
					QL (µg/L)	MDL (µg/L)
Dichlorodifluoromethane	75-71-8	5	NYSDEC[3]	1.0	1.0	0.2590
Chloromethane	74-87-3	5	NYSDEC[3]	1.0	1.0	0.2665
Vinyl Chloride	75-01-4	2	SPDES Effluent Limitation[4]	1.0	1.0	0.2906
Bromomethane	74-83-9	5	NYSDEC[3]	1.0	1.0	0.3039
Chloroethane	75-00-3	5	NYSDEC[3]	1.0	1.0	0.2491
Trichlorofluoromethane	75-69-4	5	NYSDEC[3]	1.0	1.0	0.0804
1,1-Dichloroethene	75-35-4	5	SPDES Effluent Limitation[4]	1.0	1.0	0.2814
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	5	NYSDEC[3]	1.0	1.0	0.3016
Acetone	67-64-1	50	NYSDEC[3]	5.0	5.0	2.5
Carbon Disulfide	75-15-0	60	NYSDEC[3]	1.0	1.0	0.1956
Methyl Acetate	79-20-9	--	NYSDEC[3]	1.0	1.0	0.1025
Methylene Chloride	75-09-2	5	NYSDEC[3]	1.0	1.0	0.3177
trans-1,2-Dichloroethene	156-60-5	5	SPDES Effluent Limitation[4]	1.0	1.0	0.2722
Methyl tert-Butyl Ether	1634-04-4	10	NYSDEC[3]	1.0	1.0	0.2019
1,1-Dichloroethane	75-34-3	5	SPDES Effluent Limitation[4]	1.0	1.0	0.2432
cis-1,2-Dichloroethene	156-59-2	5	SPDES Effluent Limitation[4]	1.0	1.0	0.2738
2-Butanone	78-93-3	50	NYSDEC[3]	5.0	5.0	0.4981

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal[1] (µg/L)	Achievable Laboratory Limits[2]	
					QL (µg/L)	MDL (µg/L)
Bromochloromethane	74-97-5	5	NYSDEC[3]	1.0	1.0	0.2903
Chloroform	67-66-3	7	NYSDEC[3]	1.0	1.0	0.2415
1,1,1-Trichloroethane	71-55-6	5	SPDES Effluent Limitation[4]	1.0	1.0	0.2505
Cyclohexane	110-82-7	--	NYSDEC[3]	1.0	1.0	0.2972
Carbon Tetrachloride	56-23-5	5	NYSDEC[3]	1.0	1.0	0.3041
Benzene	71-43-2	1	NYSDEC[3]	1.0	1.0	0.2732
1,2-Dichloroethane	107-06-2	0.6	SPDES Effluent Limitation[4]	1.0	1.0	0.2145
Trichloroethene	79-01-6	5	SPDES Effluent Limitation[4]	1.0	1.0	0.2932
Methylcyclohexane	108-87-2	--	NYSDEC[3]	1.0	1.0	0.3165
1,2-Dichloropropane	78-87-5	1	NYSDEC[3]	1.0	1.0	0.1798
Bromodichloromethane	75-27-4	50	NYSDEC[3]	1.0	1.0	0.2016
cis-1,3-Dichloropropene	10061-01-5	0.4	NYSDEC[3]	1.0	1.0	0.1945
4-Methyl-2-Pentanone	108-10-1	--	NYSDEC[3]	5.0	5.0	0.2256
Toluene	108-88-3	5	NYSDEC[3]	1.0	1.0	0.2336
trans-1,3-Dichloropropene	10061-02-6	0.4	NYSDEC[3]	1.0	1.0	0.1834
1,1,2-Trichloroethane	79-00-5	1	NYSDEC[3]	1.0	1.0	0.1959
Tetrachloroethene	127-18-4	5	SPDES Effluent Limitation[4]	1.0	1.0	0.2361
2-Hexanone	591-78-6	50	NYSDEC[3]	5.0	5.0	0.5345
Dibromochloromethane	124-48-1	50	NYSDEC[3]	1.0	1.0	0.1649
1,2-Dibromoethane	106-93-4	--	NYSDEC[3]	1.0	1.0	0.2299
Chlorobenzene	108-90-7	5	NYSDEC[3]	1.0	1.0	0.2255

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal[1] (µg/L)	Achievable Laboratory Limits[2]	
					QL (µg/L)	MDL (µg/L)
Ethylbenzene	100-41-4	5	NYSDEC[3]	1.0	1.0	0.1816
Xylenes (total)	1330-20-7	5	NYSDEC[3]	3.0	3.0	0.6187
Styrene	100-42-5	5	NYSDEC[3]	1.0	1.0	0.2177
Bromoform	75-25-2	50	NYSDEC[3]	1.0	1.0	0.2453
Isopropylbenzene	98-82-8	5	NYSDEC[3]	1.0	1.0	0.2227
1,1,2,2-Tetrachloroethane	79-34-5	5	NYSDEC[3]	1.0	1.0	0.1539
1,3-Dichlorobenzene	541-73-1	3	NYSDEC[3]	1.0	1.0	0.1630
1,4-Dichlorobenzene	106-46-7	3	NYSDEC[3]	1.0	1.0	0.1780
1,2-Dichlorobenzene	95-50-1	3	NYSDEC[3]	1.0	1.0	0.2176
1,2-Dibromo-3-chloropropane	96-12-8	0.04	NYSDEC[3]	1.0	1.0	0.2411
1,2,4-Trichlorobenzene	120-82-1	5	NYSDEC[3]	1.0	1.0	0.1509
1,2,3-Trichlorobenzene	87-61-6	5	NYSDEC[3]	1.0	1.0	0.1587

BOLD identifies the select VOCs for which the GWTP aqueous samples will be analyzed.

1 The Project Quantitation Limit Goal may be higher for some constituents but the MDL is low enough to detect these compounds below the Project Action Limit as estimated concentrations.

2 Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 NYSDEC Ambient Water Quality Standards and Guidance Values, Class GA.

4 Based on NYSDEC Ambient Water Quality Standards and Guidance Values, Class GA.

Matrix: *Aqueous*

Analytical Group: *Mercury*

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Achievable Laboratory Limits[1]	
					QL (µg/L)	MDL (µg/L)
Mercury	7439-97-6	0.25	SPDES Effluent Limitation	0.2	0.2	0.0205

1 Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

Matrix: *Aqueous*

Analytical Group: *TSS*

Analyte	CAS Number	Project Action Limit (mg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (mg/L)	Achievable Laboratory Limits[1]	
					QL (mg/L)	MDL (mg/L)
TSS	NA	--	NYSDEC[2]	4.0	4.0	2.0

1 Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.
2 NYSDEC Ambient Water Quality Standards and Guidance Values, Class GA.

Matrix: *Air*
Analytical Group: *VOCs*

Analyte	CAS Number	Project Action Limit[1] (lb/hr)	Project Action Limit Reference	Project Quantitation Limit Goal ($\mu g/m^3$)	Achievable Laboratory Limits[2]	
					QL ($\mu g/m^3$)	MDL ($\mu g/m^3$)
1,2-Dichloroethane	107-06-2	0.09	NYSDEC Air Permit Emission Discharge Limit	2.0	2.0	TBD
1,2-Dichloroethene	540-59-0	0.01	NYSDEC Air Permit Emission Discharge Limit	2.0	2.0	TBD
Toluene	108-88-3	0.03	NYSDEC Air Permit Emission Discharge Limit	1.9	1.9	TBD
1,1,2-Trichloroethane	79-00-5	Below Reporting Threshold	NYSDEC Air Permit Emission Discharge Limit	2.7	2.7	TBD
Trichloroethene	79-01-6	Below Reporting Threshold	NYSDEC Air Permit Emission Discharge Limit	2.7	2.7	TBD
Vinyl Chloride	75-01-4	Below Reporting Threshold	NYSDEC Air Permit Emission Discharge Limit	1.3	1.3	TBD
Xylene	1330-20-7	Below Reporting Threshold	NYSDEC Air Permit Emission Discharge Limit	2.2	2.2	TBD

1 The project action level is presented in pounds per hour as it was presented in air permit equivalent approved by NYSDEC.
2 Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. The MDL is instrument specific and will be determined during sample analysis.

Matrix: *Spent Air Stripper Media*
Analytical Group: TCLP *VOCs*

Analyte	CAS Number	Project Action Limit (mg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (mg/L)	Achievable Laboratory Limits[1]	
					QL (mg/L)	MDL (mg/L)
Benzene	71-43-2	0.5	40 CFR Part 261 Regulatory Level	0.05	0.05	0.0099
2-Butanone	78-93-3	200	40 CFR Part 261 Regulatory Level	0.05	0.05	0.0108
Carbon Tetrachloride	56-23-5	0.5	40 CFR Part 261 Regulatory Level	0.05	0.05	0.0108
Chlorobenzene	108-90-7	100	40 CFR Part 261 Regulatory Level	0.05	0.05	0.0053
Chloroform	67-66-3	6.0	40 CFR Part 261 Regulatory Level	0.05	0.05	0.0101
1,2-Dichloroethane	107-06-2	0.5	40 CFR Part 261 Regulatory Level	0.05	0.05	0.0096
1,1-Dichloroethene	75-35-4	0.7	40 CFR Part 261 Regulatory Level	0.05	0.05	0.0107
Tetrachloroethene	127-18-4	0.7	40 CFR Part 261 Regulatory Level	0.05	0.05	0.0082
Trichloroethene	79-01-6	0.5	40 CFR Part 261 Regulatory Level	0.05	0.05	0.0080
Vinyl Chloride	75-01-4	0.2	40 CFR Part 261 Regulatory Level	0.05	0.05	0.0129

1 Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

Matrix: *Spent Air Stripper Media*
Analytical Group: TCLP *Metals*

Analyte	CAS Number	Project Action Limit (mg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (mg/L)	Achievable Laboratory Limits[1]	
					QL (mg/L)	MDL (mg/L)
Arsenic	7440-38-2	5.0	40 CFR Part 261 Regulatory Level	0.050	0.050	0.00274
Barium	7440-39-3	100	40 CFR Part 261 Regulatory Level	0.200	0.200	0.00062
Cadmium	7440-43-9	1.0	40 CFR Part 261 Regulatory Level	0.050	0.050	0.00013
Chromium	7440-47-3	5.0	40 CFR Part 261 Regulatory Level	0.050	0.050	0.00057
Lead	7439-92-1	5.0	40 CFR Part 261 Regulatory Level	0.050	0.050	0.00126
Mercury	7439-97-6	0.2	40 CFR Part 261 Regulatory Level	0.0002	0.0002	0.000038
Selenium	7782-49-2	1.0	40 CFR Part 261 Regulatory Level	0.050	0.050	0.00304
Silver	7440-22-4	5.0	40 CFR Part 261 Regulatory Level	0.050	0.050	0.00068

1 Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

SAP Worksheet #16 -- Project Schedule / Timeline Table
(UFP-QAPP Manual Section 2.8.2)

Activity	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Draft OM&M Plan/UFP-SAP to Navy	TtEC	07/15/09		Draft OM&M Plan/UFP-SAP	
Navy Review	Navy			NA	NA
Revised Draft OM&M Plan/UFP-SAP to Regulators	TtEC	NA	NA	Draft OM&M Plan/UFP-SAP	
Regulator Review	NYSDEC	NA	NA	NA	
Draft Final OM&M Plan/UFP-SAP to Regulators	TtEC	08/05/09	9/25/09	Draft Final OM&M Plan/UFP-SAP	09/25/09
Regulator Review	NYSDEC	9/25/09	10/25/09	NA	
Final OM&M Plan/UFP-SAP to Navy and Regulators	Navy and NYSDEC	10/25/09	11/25/09	Final OM&M Plan/UFP-SAP	11/25/09
Discharge Monthly Reports	TtEC	TBD	TBD	Discharge Monthly Reports	Monthly
Data Review	TtEC	TBD	TBD	Final Analytical Data Tables	TBD

SAP Worksheet #17 -- Sampling Design and Rationale
(UFP-QAPP Manual Section 3.1.1)

Several sampling and monitoring programs will be conducted as part of the GWTP operations. These include:

1) sampling and monitoring of influent, effluent, and intermediate process streams during the start-up period;
2) sampling and monitoring of influent, effluent, and intermediate process streams during the prove-out period;
3) sampling and monitoring of process streams (including influent, effluent, and intermediate) for routine operations; and
4) sampling and monitoring of groundwater.

17.1 SAMPLING AND MONITORING GWTP PERFORMANCE DURING START-UP PERIOD

Sampling and monitoring of the GWTP performance will be implemented during the start-up period in 2009 in order to ensure that the system is operating properly and that effluent streams meet all regulatory and disposal facility requirements. The start-up period is defined as the first 30 days of operations. During the start-up period, the process streams as listed on Worksheet #18 will be sampled and/or monitored. The purpose of this sampling and monitoring is for tracking and documenting GWTP operations performance as well as for regulatory compliance. During the system start-up period, all samples will be collected on a weekly basis. Only the process effluent streams will be sampled for regulatory compliance purposes for the parameters identified by NYSDEC and for disposal purposes for parameters as required by the disposal facilities, at the designated frequency. All analytical parameters for regulatory compliance will be collected weekly and analyzed at a laboratory certified by the State of New York for these parameters, TestAmerica – Pittsburgh and Air Toxics, Ltd.

17.2 SAMPLING AND MONITORING GWTP PERFORMANCE DURING PROVE-OUT PERIOD

Sampling and monitoring of the GWTP performance will be implemented during the prove-out period in 2009 in order to ensure that the GWTP is operating in accordance with the design specifications and that effluent streams meet all regulatory and disposal facility requirements. The prove-out period is defined as the second through the sixth months of operations. During the prove-out period, the process streams as listed on Worksheet #18 will be sampled and/or monitored. The purpose of this sampling and monitoring is for ensuring that the GWTP is operating in accordance with the design specifications and that effluent streams meet all regulatory and disposal facility requirements. During the system prove-out period, all samples will be collected on a weekly basis. Based on the data that is collected during the start-up and prove-out periods, TtEC may decide to reduce the frequency of sampling and analyses for the influent process water and some of the intermediate process streams. Only the process effluent streams will be sampled for regulatory compliance purposes for the parameters identified by NYSDEC and for disposal purposes for parameters as required by the disposal facilities, at the designated frequency. All analytical parameters for regulatory compliance will be collected weekly and analyzed at a laboratory certified by the State of New York for these parameters, TestAmerica – Pittsburgh and Air Toxics, Ltd.

17.3 SAMPLING AND MONITORING FOR ROUTINE OPERATIONS

Routine operations will commence at the end of the prove-out period (i.e., after the end of the first six months of operations). During routine operations, the process streams as listed on Worksheet #18 will be sampled and/or monitored. It should be noted that most of this sampling and monitoring is for the purpose of tracking and documenting the performance of plant operations and not for regulatory compliance reporting purposes. Only the process effluent streams will be sampled for regulatory compliance purposes for the parameters identified by NYSDEC and for disposal purposes for parameters as required by the disposal facilities, at the designated frequency. Based on experience gained in operating the GWTP following the start-up and prove-out periods, TtEC may reduce the frequency of

sampling and analyses for the influent process water and some of the intermediate process streams. All analytical parameters for regulatory compliance will be collected monthly (samples for pH will be collected weekly) and analyzed at a laboratory certified by the State of New York for these parameters, TestAmerica – Pittsburgh and Air Toxics, Ltd. Samples from recovery wells RW-1 and RW-3 and treated effluent will be collected once every two weeks.

17.4 SAMPLING AND MONITORING OF GROUNDWATER IN GM-38 AREA

Sampling and monitoring of the groundwater from up to 12 monitoring wells (will be performed throughout the period of operation of the GWTP and for two years beyond the shut-down of GWTP operations to determine the effectiveness of the remediation activities and monitor the hydraulic containment and capture of the groundwater "hot spot" by the recovery wells. The 12 wells are located as follows:

- There will be three monitoring wells near recovery well RW-1 that are screened between 395 and 435 feet below ground surface (feet bgs). RW-1 MW-1 is located approximately 140 feet northwest of RW-1, and RW-1 MW-2 is located approximately 50 feet north of RW-1. RW-1 MW-3 is proposed to be located approximately 400 feet northeast of RW-1, on the eastern side of Seaford Oyster Bay Expressway.

- There are three monitoring wells near recovery well RW-2 that are screened between 470 and 510 feet bgs. RW-2 MW-1 is located approximately 60 feet northwest of RW-2, RW-2 MW-2 is located approximately 20 feet west of RW-2, and RW-2 MW-3 is located approximately 100 feet west of RW-2.

- There are four proposed monitoring wells near recovery well RW-3. Two of these four wells (RW-3 MW-1 and RW-3 MW-3) are proposed to be screened between 320 and 340 feet bgs. The other two wells (RW-3 MW-2 and RW-3 MW-4) are proposed to be screened between 475 and 495 feet bgs. RW-3 MW-1 and RW-3 MW-2 are proposed to be located approximately 500 feet west of cluster GM-38, at the intersection of Arthur Avenue and Leroy Avenue. RW-3 MW-3 and RW-3 MW-4 are proposed to be located approximately 400 feet north of the intersection of Arthur Avenue and Broadway, on Broadway between Helena Avenue and Russell Avenue.

- There is one monitoring well near injection well IW-1. IW-1 MW-1 is screened between 130 and 150 feet bgs and is located approximately 20 feet south of IW-1.

- There are two monitoring wells GM-38D and GM-38D2 that are located approximately 320 feet west of RW-2, at the corner of Arthur Avenue and Broadway. GM-38D is screened between 320 and 340 feet bgs and GM-38D2 is screened between 475 and 495 feet bgs. TtEC does not have access to GM-38D and GM-38D2 for monitoring purposes.

- Monitoring well TP-1 is proposed to be screened between 450 and 470 feet bgs and to be located approximately 350 feet north of the GWTP building, alongside the GWTP access road.

Water level measurements will be performed in all 12 monitoring wells on a quarterly basis. In addition, samples for water quality monitoring will be collected from eight of the 12 wells (RW-1 MW-1, RW-1 MW-3, RW-2 MW-1, RW-3 MW-1, RW-3 MW-2, RW-3 MW-3, RW-3 MW-4, TP1) on a quarterly basis for the first two years from the start of GWTP operations, on a semi-annual basis for years three and four, and then on an annual basis from the fifth year onwards. It was deemed unnecessary to collect samples from all 12 wells because some of them are in close proximity and are therefore expected to have the same water quality. The final determination to take the GWTP off-line will be made by the Navy in consultation with NYSDEC. When concentrations of chlorinated VOCs in the GM-38 Area groundwater "hot spot" are equal to those concentrations in the surrounding aquifer, TtEC will make the recommendation to the Navy that operations at the GWTP be terminated. With consent from the Navy and NYSDEC, sampling and monitoring of the groundwater quality for the same parameters will continue for two years (on a quarterly basis) beyond the shut-down of the GWTP operations.

SAP Worksheet #18 -- Sampling Locations and Methods/SOP Requirements Table

(UFP-QAPP Manual Section 3.1.1)

Sampling Location	Matrix	Analytical Group	Number of Samples	Sampling SOP Reference[1]
Influent from RW-1 – sample port BV-103	Aqueous	Select VOCs, Mercury, TSS, pH[2]	1 per sampling event	1
Influent from RW-3 – sample port BV-104	Aqueous	Select VOCs, Mercury, TSS, pH[2]	1 per sampling event	1
Air Stripper Effluent – sample port BV-115	Aqueous	Select VOCs, Mercury, TSS, pH[2]	1 per sampling event	1
Bag Filter Effluent – sample port BV-124	Aqueous	Select VOCs, Mercury, TSS, pH[2]	1 per sampling event	1
Treated Effluent to stormwater manhole and injection well IW-1 – sample port BV-127	Aqueous	Select VOCs, Mercury, pH[2]	1 per sampling event	1
LGAC-1 outlet (for series flow) – sample port BV-145	Aqueous	Select VOCs, Mercury, pH[2]	1 per sampling event	1
LGAC-2 outlet (for series flow) – sample port BV-149	Aqueous	Select VOCs, Mercury, pH[2]	1 per sampling event	1
LGAC-3 outlet (for series flow) – sample port BV-153	Aqueous	Select VOCs, Mercury, pH[2]	1 per sampling event	1
Off-gas VGAC-1 Inlet – sample port BV-132	Air	Select VOCs	1 per sampling event	2
Off-gas between VGAC-1 and VGAC-2 – sample port BV-134	Air	Select VOCs	1 per sampling event	2
Off-gas between VGAC-2 and VGAC-3 – sample port BV-136	Air	Select VOCs	1 per sampling event	2
Off-gas between VGAC-3 and Exhaust Stack – sample port BV-139	Air	Select VOCs	1 per sampling event	2
Monitoring Wells	Aqueous	TCL VOCs, Mercury, TSS, pH[2]	8 during each round[3]	3, 4, 5
Spent air stripper packing /filter / adsorber media – composite sample	Spent Air Stripper Media	TCLP VOCs, TCLP Metals	TBD[4]	8

1 SOP or worksheet that describes the sample collection procedures. SOPs are provided in Appendix A.

2 A hand-held meter will be used to analyze for pH.

3 All 12 wells will have groundwater level measurements collected prior to each round of groundwater sampling.

4 The number of samples will be determined during the initial operation of the GWTP. It is unknown at this time how often the media will need to be replaced.

SAP Worksheet #19 -- Analytical SOP Requirements Table
(UFP-QAPP Manual Section 3.1.1)

Matrix	**Analytical Group**	**Analytical and Preparation Method / SOP Reference**[1]	**Containers** (number, size, and type)	**Sample volume** (units)	**Preservation Requirements** (chemical, temperature, light protected)	**Maximum Holding Time**[2] (preparation / analysis)
Aqueous	VOCs (Select and TCL)	EPA 624	(3) 40 ml VOA vials w/Teflon lined septum	5 ml	1:1 HCl to pH<2; cool to 4°C	14 days
Aqueous	Mercury	EPA 245.1	1 500-mL HDPE	100 ml	1:1 HNO_3 to pH<2; cool to 4°C	28 days
Aqueous	TSS	SM 2540D	1 250-mL HDPE	250 ml	cool to 4°C	7 days
Spent Air Stripper Packing/ Filter /Adsorber Media	TCLP VOCs	SW-846 1311/8260B	(3) 40 ml VOA vials w/Teflon lined septum or 1 4-oz glass jar with Teflon lined septum	100 grams	cool to 4°C	14 days / 14 days
Spent Air Stripper Packing/ Filter /Adsorber Media	TCLP Metals	SW-846 1311/6010C/7470A	1 8-oz glass jar	100 grams	cool to 4°C	180 days / 180 days (except Mercury – 28 days / 28 days)
Trip Blank	VOCs (Select and TCL)	EPA 624	(2) 40 ml VOA vials w/Teflon lined septum	5 ml	1:1 HCl to pH<2; cool to 4°C	14 days
Air	Select VOCs	TO-15	1 6-liter Summa canister	1 L	None	30 days

1 See the Analytical SOP References Table (Worksheet #23).
2 Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.

SAP Worksheet #20 -- Field Quality Control Sample Summary Table
(UFP-QAPP Manual Section 3.1.1)

Trip blanks will be collected when aqueous samples for VOC analysis are being collected. A trip blank serves to detect possible cross-contamination of samples resulting from handling, storage and shipment procedures. Trip blanks consist of VOA vials filled with DI water prior to initiation of daily field activities and preserved accordingly, which accompany the day's environmental samples through collection and shipment to the laboratory. In addition, trip blanks are stored by the laboratory under the same conditions as the environmental samples. A trip blank must accompany each cooler containing aqueous samples for VOC analysis, and will be analyzed identically to the associated environmental samples. All VOC samples will be consolidated in one cooler for daily shipment, as possible, to minimize the number of trip blanks required for the field program.

Field rinsate blanks will be collected during groundwater sampling of the monitoring wells. Laboratory supplied field blank water will be pumped through a decontaminated submersible pump into VOA vials for VOC analysis and into high density polyethylene (HDPE) bottles for mercury. Field rinsate blanks will be collected one per decontamination event, not to exceed 1 per 20 samples.

Field duplicate samples will be collected during groundwater sampling of the monitoring wells, process water sampling, and air sampling from the stack of the vapor-phase granular activated carbon adsorption units. Field duplicates will be collected one per 20 samples per media. Field duplicates will be collected in the same manner for the same analyses as the primary sample for which it is a duplicate.

All aqueous samples designated for chemical analysis will be put in coolers with ice to cool the samples to 4º C. Temperature blanks will be added to each cooler to verify that samples were stored at the correct temperature during shipment. These blanks will be used to help qualitatively determine the representativeness and comparability of the data as well as any biases or imprecision that might result from deviations in storage requirements. Elevated storage temperatures can cause loss of target analytes (e.g., via microbial degradation). The air samples will be shipped in boxes to the laboratory as cooling is not required.

Matrix	Analytical Group	No. of Sampling Locations[1]	No. of Field Duplicates	No. of MS/MSD[2]	No. of Field Blanks	No. of VOA Trip Blanks[3]	No. of PT Samples[4]	Total No. of Samples to Lab
Process Water - Aqueous	Select VOCs	8	1	1	0	1	0	11
Process Water - Aqueous	Mercury	8	1	1	0	0	0	10
Process Water - Aqueous	TSS	8	1	0	0	0	0	9
Process Water - Aqueous	pH[5]	8	0	0	0	0	0	8
Process Air	Select VOCs	4	1	0	0	0	0	5
Spent Air Stripper Packing/ Filter /Adsorber Media	TCLP VOCs	TBD[6]	0	0	0	0	0	TBD[5]
Spent Air Stripper Packing/ Filter /Adsorber Media	TCLP Metals	TBD[6]	0	0	0	0	0	TBD[5]
Groundwater - Aqueous	TCL VOCs	8	1	1	1	2	0	13
Groundwater - Aqueous	Mercury	8	1	1	1	0	0	11
Groundwater - Aqueous	TSS	8	1	0	0	0	0	9
Groundwater - Aqueous	pH[5]	8	0	0	0	0	0	8

1 Samples will be collected at the same location for multiple rounds. The numbers presented in this table are for one round of process aqueous and air sampling and one round of groundwater sampling.

2 Although the matrix spike/matrix spike duplicate (MS/MSD) is not typically considered a field QC sample, it is included here because location determination is often established in the field.
3 One per cooler per day of sampling for VOCs.
4 Batch or project-specific proficiency testing (PT) samples is optional. PT samples require additional field sample for analyses.
5 A hand-held meter will be used to analyze for pH.
6 The number of samples will be determined during the initial operation of the GWTP. It is unknown at this time how often the media will need to be replaced.

SAP Worksheet #21 -- Project Sampling SOP References Table
(UFP-QAPP Manual Section 3.1.2)

Reference Number	Title, Revision Date and/or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
1	Sampling of Process Aqueous Samples, Rev 0	TtEC	NA	N	
2	Sampling of Process Vapor Samples, Rev 0	TtEC	NA	N	
3	Water Level Measurement, Rev 0	TtEC	Water Level Indicator	N	
4	Field Parameter Measurements During Groundwater Sampling, Rev 0	TtEC	Water Quality Meter	N	
5	Groundwater Sampling [Low Flow Purge Procedure], Rev 0	TtEC	Low Flow Submersible Pump	N	
6	Decontamination – Field Instrumentation – Probes, Water Quality Meters, etc., Rev 0	TtEC	NA	N	
7	Decontamination – Non-disposable Chemical Sampling Equipment, Rev 0	TtEC	NA	N	
8	Sampling of Spent Air Stripper Packing/Filter/Adsorber Material, Rev 0	TtEC	NA	N	

SAP Worksheet #22 -- Field Equipment Calibration, Maintenance, Testing, and Inspection Table
(UFP-QAPP Manual Section 3.1.2.4)

Field Equipment	Calibration Activity	Maintenance Activity	Testing/ Inspection Activity	Frequency	Acceptance Criteria		Corrective Action	Responsible Person	SOP Reference
PID	Calibrate with standard gasses	NA	NA	Prior to day's activities; end of day's activities; anytime anomaly suspected	+/- 5 ppm		Clean probe, replace battery, replace probe	TtEC FOL	SOPs 3, 5
PID	NA	NA	Visual inspection	Prior to day's activities	No defects noted		Replace probe	TtEC FOL	SOPs 3, 5
PID	NA	Check/replace battery	NA	Prior to day's activities; anytime anomaly suspected	+/- 5 ppm		Replace battery; replace probe	TtEC FOL	SOPs 3, 5
Water Level Indicator	NA	NA	Visual inspection	Prior to day's activities; end of day's activities; anytime anomaly suspected	No defects noted		Replace	TtEC FOL	SOPs 3, 5, 6
Water Level Indicator	NA	NA	Auditory inspection	Prior to day's activities; end of day's activities; anytime anomaly suspected	Audio tone for contact with water (markings in increments of ± 0.01 feet)		Replace	TtEC FOL	SOPs 3, 5, 6
Water Level Indicator	NA	Check/replace battery	NA	Prior to day's activities; anytime anomaly suspected	Audio tone for contact with water/NAPL		Replace battery	TtEC FOL	SOPs 3, 5, 6
Water Quality Meter	Calibrate with standard solutions	NA	NA	Prior to day's activities; end of day's activities; anytime anomaly suspected	pH Meter	± 0.1 units	Clean probe, replace battery, replace membrane, replace probe	TtEC FOL	SOPs 4, 5, 6
					Dissolved Oxygen	± 3%			
					Specific Conductivity	± 1% of full scale			
					ORP	± 10 mV			
					Temperature	± 0.1 °C			
					Turbidity	± 2 NTU			

Field Equipment	Calibration Activity	Maintenance Activity	Testing/ Inspection Activity	Frequency	Acceptance Criteria		Corrective Action	Responsible Person	SOP Reference
Water Quality Meter	NA	NA	Visual inspection	Prior to day's activities	No defects noted		Replace probe	TtEC FOL	SOPs 4, 5, 6
Water Quality Meter	NA	Check/replace battery	NA	Prior to day's activities; anytime anomaly suspected	pH Meter	± 0.1 units	Replace battery; replace probe	TtEC FOL	SOPs 4, 5, 6
					Dissolved Oxygen	± 3%			
					Specific Conductivity	± 1% of full scale			
					ORP	± 10 mV			
					Temperature	± 0.1 °C			
					Turbidity	± 2 NTU			

SAP Worksheet #23 -- Analytical SOP References Table
(UFP-QAPP Manual Section 3.2.1)

SOP Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?[1] (Y/N)
EPA 624	Appendix A to Part 136, Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, Method 624 - Purgeables	Definitive	Aqueous – VOCs (Select and TCL)	Gas Chromatograph / Mass Spectrometer (GC/MS)	TestAmerica – Pittsburgh	N
EPA 245.1	Method 245.1, Determination of Mercury in Water by Cold Vapor Atomic Absorption Spectrometry, Revision 3.0	Definitive	Aqueous – Mercury	Cold Vapor Atomic Absorption (AA)	TestAmerica – Pittsburgh	N
SM 2540D	Solids in Water	Definitive	Aqueous – TSS	Analytical Balance	TestAmerica – Pittsburgh	N
SW-846 1311/8260B	Toxicity Characteristic Leaching Procedure / Volatile Organic Compounds by GC/MS	Definitive	Spent Air Stripper Media – TCLP VOCs	GC/MS	TestAmerica – Pittsburgh	N
SW-846 1311/6010C/ 7470A	Toxicity Characteristic Leaching Procedure / Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) / Mercury in Liquid Waste (Manual Cold-Vapor Technique)	Definitive	Spent Air Stripper Media – TCLP Metals	ICP-AES / Cold Vapor AA	TestAmerica – Pittsburgh	N
TO-15	Determination Of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By GC/MS	Definitive	Air – Select VOCs	GC/MS	Air Toxics, Ltd.	N

1 If yes, then specify the modification that has been made. Note that any analytical SOP modification made relative to project specific needs must be reviewed and approved by the Navy Quality Assurance Officer (QAO).

SAP Worksheet #24 -- Analytical Instrument Calibration Table

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
GC/MS	Initial Calibration Continuing Calibration	After major instrument maintenance Every 12 hours	%Relative Standard Deviation <30% %Difference < 30%	Check instrument performance, perform maintenance, recalibrate	Subcontract Laboratory GC/MS Technician	EPA 624; TO-15; SW-846 8260B
ICP-AES	Initial Calibration Continuing Calibration	Every analytical run Every 10 samples and at end of run	correlation coefficient >=0.995 all analytes within +/- 10%	Check instrument performance, perform maintenance, recalibrate	Subcontract Laboratory ICP-AES Technician	SW-846 6010C
Cold Vapor AA	Initial Calibration Continuing Calibration	Every analytical run Every 10 samples and at end of run	correlation coefficient >=0.995 within +/- 10%	Check instrument performance, perform maintenance, recalibrate	Subcontract Laboratory Cold Vapor Technician	EPA 245.1; SW-846 7470A

1 See Analytical SOP References Table (Worksheet #23).

SAP Worksheet #25 -- Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table
(UFP-QAPP Manual Section 3.2.3)

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
GC/MS	Check for leaks, replace gas line filters, recondition or replace trap, replace column, clean injection port/liner, replace Electron Mulitplier	Monitor instrument performance via Continuing Calibration Verification	Monitor instrument performance via Continuing Calibration Verification	Daily, after every 12 hours of operation	%Difference < = 30%	Replace connections, replace gas line filters, replace trap, replace GC column, clip column, replace injection port liner, clean injection port, replace Electron Multiplier	Subcontract Laboratory GC/MS Technician	EPA 624; TO-15; SW-846 8260B
Cold Vapor AA	Perform leak test, change tubing, clean window, clean filters	Monitor instrument performance via Continuing Calibration Verification and CCBlank	Monitor instrument performance via Continuing Calibration Verification and CC Blank	Daily, after every 10 samples, and at end of run	within +/- 10%, Hg not > quantitation limit	Replace connections, replace pump tubing, clean all filters	Subcontract Laboratory Cold Vapor Technician	EPA 245.1; SW-846 7470A
ICP-AES	Perform leak test, change pump tubing, change torch and window, clean filters	Monitor instrument performance via Continuing Calibration Verification and Continuing Calibration Blank	Monitor instrument performance via Continuing Calibration Verification and Continuing Calibration Blank	Daily, after every 10 samples	All analytes within +/- 10%, no analytes > quantitation limit	Replace pump tubing, replace torch and window, clean all filters	Subcontract Laboratory ICP Technician	SW-846 6010C

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
Analytical Balance	Clean surface	Weigh known National Institute of Standards and Technology (NIST) calibrated weights	Class "S" weights Class "1" Weights	Daily when in use Monthly	Criteria dependent on type of balance	Recalibration	Subcontract Laboratory Technician	All that involve any weighing of samples
Thermometers	NA	Calibration	Calibration against NIST thermometer	Annual	Temperature within ± 1 scale division	Replace thermometer if unable to calibrate	Subcontract Laboratory Technician	All sample/ standard storage units and drying ovens use thermometers

1 See Analytical SOP References Table (Worksheet #23).

SAP Worksheet #26 – Sample Handling System
(UFP-QAPP Manual Appendix A)

Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): FOL (TBD)/TtEC or Plant Operator (Fred Mattison)/ECOR Solutions, Inc.
Sample Packaging (Personnel/Organization): FOL (TBD)/TtEC or Plant Operator (Fred Mattison)/ECOR Solutions, Inc.
Coordination of Shipment (Personnel/Organization): FOL (TBD)/TtEC or Plant Operator (Fred Mattison)/ECOR Solutions, Inc.
Type of Shipment/Carrier: Federal Express
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Custodian, TestAmerica – Pittsburgh or Air Toxics, Ltd.
Sample Custody and Storage (Personnel/Organization): Sample Custodian, TestAmerica – Pittsburgh or Air Toxics, Ltd.
Sample Preparation (Personnel/Organization): Preparation Laboratory Staff, TestAmerica – Pittsburgh or Air Toxics, Ltd.
Sample Determinative Analysis (Personnel/Organization): Laboratory Technicians, TestAmerica – Pittsburgh or Air Toxics, Ltd.
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): 1
Sample Extract/Digestate Storage (No. of days from extraction/digestion) : 60 days from submittal of final data report
Biological Sample Storage (No. of days from sample collection): NA
SAMPLE DISPOSAL
Personnel/Organization: Sample Custodian, TestAmerica – Pittsburgh or Air Toxics, Ltd.
Number of Days from Analysis: 60 days from submittal of final data report

SAP Worksheet #27 – Sample Custody Requirements Table

(UFP-QAPP Manual Section 3.3.3)

27.1 SAMPLE DESIGNATION AND TRACKING SYSTEM

Each sample collected will be assigned a unique sample tracking number designated by an alphanumeric code that will identify the site and contain a sequential sample number. The sample tracking number will consist of alpha-numeric characters identifying the site, sample medium, location, and date. Any other pertinent information regarding sample identification will be recorded on the sample log sheets or in the field logbooks. The alpha-numeric (A-N) coding to be used in the sample system is described below.

AAAAA	-	AAA	-	AA	-	AAAA or AANN	-	MMDDYYYY
(Site ID)	-	(Area)	-	(Medium)	-	(Location)	-	(Date)

Site identifier:	NWIRP for Naval Weapons Industrial Reserve Plant
Area identifier	GM-38
Medium identifier:	GW for groundwater well samples, PS for process stream water samples, and AIR for air samples from the vapor phase treatment system
Location identifier:	Monitoring well number or location within process stream or vapor phase treatment system
Date:	All samples will be dated to identify the associated sampling period

Example: The water sample collected from the Naval Weapons Industrial Reserve Plant, GM-38 Area from the stream process influent from RW-1 on December 12, 2009 would be identified as: NWIRP-GM-038-PS-IRW1-12122009.

QC Samples collected during a sampling program typically use the same coding system as the environmental samples. Duplicate samples will have "DUP" added to the end of the sample IDs. Additional volumes for laboratory QC samples (MS/MSD samples) have no separate sample identifier codes, but will be designated on the chain-of-custody record and field sheets.

27.2 SAMPLE COLLECTION DOCUMENTATION

A project-specific field logbook will be used to keep daily records of significant events, observations, and measurements during groundwater sampling and process sampling. The field logbook also will be used to document all sampling activities. Logbook entries will be made with indelible ink to provide a permanent record, and any errors in the logbook will be verified, crossed through, and initialed by the person discovering the error. The field logbooks are intended to provide sufficient data and observations to reconstruct events that occurred during sampling activities. Field logbooks should be permanently bound and pre-paginated; designated forms should be used whenever possible to ensure that field records are complete. The following items are examples of information that may be included in a field logbook:

- Name, date, and time of entry
- Names and responsibilities of field crew members
- Name and titles of any site visitors
- Descriptions of field procedures, and problems encountered
- Samples collected at each location
- Sample identification numbers of all samples collected
- Date and time of collection
- Sample collector
- Sample collection method
- Decontamination procedures
- Weather conditions
- Site observations

- Site sketches
- Health and Safety issues including personal protective equipment
- Log of photographs

The following sections outline the information that will be documented in the field according to the medium to be sampled and the activities to be performed. Examples of these forms can be found in Appendix B.

27.3 FIELD SAMPLE HANDLING AND CHAIN-OF CUSTODY PROCEDURES

Custody of samples must be maintained and documented at all times to ensure the integrity of each sample from collection through analysis. An accurate written record is necessary to trace the possession and handling of the sample; this documentation is referred to as the "chain of custody" form. Chain of custody begins when samples are collected in the field and is maintained by storing the samples in secure areas until custody can be passed on. All samples will be delivered to the laboratory accompanied by a chain-of-custody form that will describe the sample identifiers, dates and times of sample collection, analytical parameters, and persons responsible for the sample integrity.

Prior to sample collection, sample containers will be labeled with the sample location number, sampler's name, date, and analytical fraction. Following collection, samples will be placed on ice in a secure cooler or in a box, as applicable, and attended by TtEC personnel or placed in locked vehicles or designated storage areas until shipment to an off-site laboratory.

For aqueous and spent air stripper media samples, the samples will be shipped to the laboratory in coolers packed with bubble wrap, or equivalent packing material, to cushion the samples and prevent breakage. Ice will be added to the coolers to maintain the required temperature (4º C) of the samples. A container filled with water and labeled "temperature blank" will be included in each cooler. The temperature of this blank will be measured by the laboratory upon sample receipt to verify acceptable sample preservation temperature. The coolers will be taped and sealed with a signed custody seal to ensure that chain of custody is maintained. For air samples, the samples will be shipped to the laboratory in boxes with the canister regulators wrapped with bubble wrap, or equivalent packing material, to cushion the regulators and prevent breakage. The boxes will be taped and sealed with a signed custody seal to ensure that chain of custody is maintained. Samples will be shipped to the laboratory via Federal Express to ensure that maximum sample holding times are not exceeded. The maximum allowable sample holding times for each analysis are presented in Worksheet #19. This worksheet also lists the sample containers, chemical preservatives, and temperature condition requirements to maintain the integrity of the sample.

Each sample collected will be assigned a unique sampling tracking number, as described above. The sample number, sample collection date and time, and a list of the sample analyses to be performed will be recorded on each container and also on the chain-of-custody form. The chain-of-custody form is a two-part form: the original accompanies the samples to the analytical laboratory, and the copy will be archived in the project files. The following information will be recorded on the chain-of-custody form:

- Project name and number
- Sample matrix
- Sample collector's name
- Dates/times of sample collection
- Sample identification numbers
- Number and type of containers for each sample aliquot
- Type of preservation
- QC sample designation
- Analysis method
- Special handling instructions
- Destination of samples
- Name, date, time, and signature of each individual releasing the shipping container

The field crew will attempt to identify any potentially high concentration samples on the chain-of-custody form.

27.4 LABORATORY CUSTODY PROCEDURES

The condition of the shipping cooler/box, custody seals, coolant, integrity and condition of the samples and presence and accuracy of the chain-of-custody documentation will be recorded upon sample receipt. The Laboratory Sample Custodian will then log the samples into a computerized Laboratory Information Management System (LIMS). Any discrepancies will be immediately brought to the attention of the Subcontractor Laboratory's Project Manager for discussion and resolution with the TtEC. Login information will be distributed electronically to each laboratory section, where Supervisors track analyses, holding times and due dates. Special technical instructions including customized analyte lists, special reporting limits, and any other pertinent information will also be contained within the LIMS and accessible to all staff.

The process of logging samples into LIMS assigns each sample a unique laboratory identification number in ascending sequence. After assignment of sample numbers and required tests for all samples in a submittal, the LIMS generates login paperwork summarizing each project. The Subcontractor Laboratory's Project Manager will review the sample receipt and login paperwork to assure that the login process was performed correctly.

The LIMS sheet tracks the status of each test and work order according to the project due date and lists the number of incomplete samples in each laboratory section's backlog. As work is completed and reviewed for each test, the updated information will be recorded in the LIMS. This ensures visibility for project status and due dates, and provides a means of tracking samples through the entire analytical process. This also allows project managers to determine the laboratory's capacity by viewing the backlog of samples in house.

All transfers of samples and sample extracts/digestates will be recorded in custody logs. The entire laboratory facility is maintained as a secure, limited access facility. All documents received with a sample delivery group (SDG) and/or generated in the course of the analyses of samples will be kept confidential. Documentation procedures for record content, format, corrections, dates and signatures will be implemented to meet the requirements for legally defensible data.

SAP Worksheet #28 -- Laboratory QC Samples Table

(UFP-QAPP Manual Section 3.4)

Matrix	Aqueous
Analytical Group	VOCs (Select and TCL)
Analytical Method/ SOP Reference	EPA 624

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	1 per batch or 1 per 20 samples	No target analytes > 1/2 the Quantitation Limit		First re-analyze, possibly re-extract batch	Subcontractor Laboratory GC/MS Technician	Bias / Contamination	No target analytes > 1/2 the QL	
Laboratory Control Sample	1 per batch or 1 per 20 samples	Laboratory Defined		Flag Outliers	Subcontractor Laboratory GC/MS Technician	Accuracy	Laboratory Defined	
Matrix Spike/ Matrix Spike Duplicate	1 per batch or 1 per 20 samples	Laboratory Defined		Flag Outliers	Subcontractor Laboratory GC/MS Technician	Accuracy / Precision	Laboratory Defined	
Calibration Verification Standard	Beginning of each 12 hour shift	+/- 15% of response from initial calibration		Check instrument, restore initial settings (if necessary), re-analyze calibration verification standard, re-calibrate	Subcontractor Laboratory GC/MS Technician	Accuracy	+/- 15% of response from initial calibration	
Surrogates	Each sample	4-Bromofluoro-benzene	74-121 %R	Check instrument performance, re-analyze and qualify data	Subcontractor Laboratory GC/MS Technician / Data Reviewer	Accuracy / Bias	4-Bromofluoro-benzene	74-121 %R
		Dibromofluoro-methane	80-120 %R				Dibromofluoro-methane	80-120 %R
		Toluene-d8	81-117 %R				Toluene-d8	81-117 %R
		Dichloroethene-d4	80-120 %R				Dichloroethene -d4	80-120 %R
Internal Standards	Each sample	Area counts –50% to +100% of Initial Calibration IS or Continuing Calibration IS area counts; Retention times +/- 30 secs of Continuing Calibration		Check instrument performance, reanalyze and qualify data	Subcontractor Laboratory GC/MS Technician / Data Reviewer	Precision / Accuracy / Bias	Area counts –50% to +100% of Initial Calibration IS or Continuing Calibration IS area counts; Retention times +/- 30 secs of Continuing Calibration	

Matrix	Aqueous
Analytical Group	Mercury
Analytical Method/ SOP Reference	EPA 245.1

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per batch or 1 per 20 samples	No target analytes > 1/2 the Quantitation Limit	Redigest and reanalyze	Subcontractor Laboratory Technician	Bias / Contamination	No target analytes > 1/2 the QL
Laboratory Control Sample	1 per batch or 1 per 20 samples	%Recovery 85% - 115%	Redigest and reanalyze	Subcontractor Laboratory Technician	Accuracy / Bias / Contamination	%Recovery 85% - 115%
Duplicate Sample	1 per 20 samples	RPD <=20%	Qualify data	Data Reviewer	Precision	RPD <=20%
Matrix Spike	1 per 20 samples	%Recovery 70% - 130%	Perform post-digestion spike analysis, qualify data	Subcontractor Laboratory Technician / Data Reviewer	Accuracy / Bias	%Recovery 70% - 130%
Post-digestion Spike	For compounds outside of QC limits in Matrix Spike	%Recovery 75% - 125%	Qualify data	Data Reviewer	Accuracy / Bias	%Recovery 75% - 125%
Calibration Verification Standard	Beginning, end and periodically during run (every 10^{th} sample)	Immediately following calibration, ± 5% of calibration; otherwise, ± 10% of calibration	Check instruments, recalibrate, reanalyze affected samples	Subcontractor Laboratory Technician / Data Reviewer	Sensitivity	Immediately following calibration, ± 5% of calibration; otherwise, ± 10% of calibration

Matrix	Aqueous
Analytical Group	TSS
Analytical Method / SOP Reference	SM 2540D

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	1 per ≤ 20 samples	no constituent > QL	Suspend analysis until source rectified	Laboratory Wet Chemistry Technician	Accuracy	no constituent > QL
Laboratory Duplicate Sample	1 per ≤ 20 samples	± 25% RPD	Reanalyze	Laboratory Wet Chemistry Technician	Precision	± 25% RPD

Matrix	Air
Analytical Group	Select VOCs
Analytical Method / SOP Reference	TO-15

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	1 per 24 hours	No target analytes > 1/2 the Quantitation Limit	Reanalyze	Subcontractor Laboratory Technician	Bias / Contamination	No target analytes > 1/2 the QL
Laboratory Replicate Sample	1 per ≤ 20 samples	± 25%RPD	Qualify data	Data Reviewer	Precision	± 25%RPD
Internal Standards	Each sample	Area counts –50% to +100% of Initial Calibration IS or Continuing Calibration IS area counts; Retention times ± 33 secs of Continuing Calibration	Check instrument performance, reanalyze and qualify data	Subcontractor Laboratory Technician / Data Reviewer	Precision / Accuracy / Bias	Area counts –50% to +100% of Initial Calibration IS or Continuing Calibration IS area counts; Retention times ± 33 secs of Continuing Calibration

Matrix	Spent Air Stripper Media
Analytical Group	TCLP VOCs
Analytical Method/ SOP Reference	SW-846 1311/ 8260B

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	1 per batch or 1 per 20 samples	No target analytes > 1/2 the Quantitation Limit		First re-analyze, possibly re-extract batch	Subcontractor Laboratory GC/MS Technician	Bias / Contamination	No target analytes > 1/2 the QL	
Calibration Verification Standard	Beginning of each 12 hour shift	+/- 15% of response from initial calibration		Check instrument, restore initial settings (if necessary), re-analyze calibration verification standard, re-calibrate	Subcontractor Laboratory GC/MS Technician	Accuracy	+/- 15% of response from initial calibration	
Surrogates	Each sample	4-Bromofluoro-benzene	74-121 %R	Check instrument performance, re-analyze and qualify data	Subcontractor Laboratory GC/MS Technician / Data Reviewer	Accuracy / Bias	4-Bromofluoro-benzene	74-121 %R
		Dibromofluoro-methane	80-120 %R				Dibromofluoro-methane	80-120 %R
		Toluene-d8	81-117 %R				Toluene-d8	81-117 %R
		Dichloroethene-d4	80-120 %R				Dichloroethene -d4	80-120 %R
Internal Standards	Each sample	Area counts –50% to +100% of Initial Calibration IS or Continuing Calibration IS area counts; Retention times +/- 30 secs of Continuing Calibration		Check instrument performance, reanalyze and qualify data	Subcontractor Laboratory GC/MS Technician / Data Reviewer	Precision / Accuracy / Bias	Area counts –50% to +100% of Initial Calibration IS or Continuing Calibration IS area counts; Retention times +/- 30 secs of Continuing Calibration	

Matrix	Spent Air Stripper Media
Analytical Group	TCLP Metals
Analytical Method / SOP Reference	SW-846 1311/ 6010C; SW-846 7470A

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	1 per batch or 1 per 20 samples	No target analytes > 1/2 the Quantitation Limit	Redigest and reanalyze	Subcontractor Laboratory Technician	Bias / Contamination	No target analytes > 1/2 the QL
Laboratory Control Sample	1 per batch or 1 per 20 samples	%Recovery 80% - 120%	Redigest and reanalyze	Subcontractor Laboratory Technician	Accuracy / Bias / Contamination	%Recovery 80% - 120%
Duplicate Sample	1 per 20 samples	RPD <=20%	Qualify Data	Data Reviewer	Precision	RPD <=20%
Matrix Spike	1 per 20 samples	%Recovery 80% - 120%	Perform post-digestion spike analysis, qualify data	Subcontractor Laboratory Technician / Data Reviewer	Accuracy / Bias	%Recovery 80% - 120%
Post-digestion Spike	For compounds outside of QC limits in Matrix Spike	%Recovery 75% - 125%	Qualify data	Data Reviewer	Accuracy / Bias	%Recovery 75% - 125%
Interference Check Sample [ICP Analysis Only]	Beginning, end and periodically during run (2 times every 8 hours)	± 2 times QL of true value or ± 20% of true value, whichever is greater	Check calculations and instruments, reanalyze affected samples	Subcontractor Laboratory Technician / Data Reviewer	Sensitivity	± 2 times QL of true value or ± 20% of true value, whichever is greater
ICP Serial Dilution	Per analytical run	%Difference 90% - 110%	Qualify data	Data Reviewer	Accuracy / Bias	%Difference 90% - 110%

SAP Worksheet #29 -- Project Documents and Records Table
(UFP-QAPP Manual Section 3.5.1)

Document	Where Maintained
Sample Collection Documents and Records • Field logbook (and sampling notes) • Field sample forms (e.g. groundwater purge sheets, operation checklists, etc.) • Chain-of-custody records • Sample shipment airbills • Photographs • Field Task Modification Forms • Sampling and Analysis Plan • Field Sampling SOPs	TtEC project file.
Laboratory Documents and Records • Sample receipt/login form • Sample storage records • Sample preparation logs • Standard traceability logs • Equipment Calibration logs • Sample analysis run logs • Equipment maintenance, testing, and inspection logs • Corrective action forms • Reported field sample results • Reported results for standards, quality control checks, and quality control samples • Data completeness checklists • Sample storage and disposal records • Telephone logs • Extraction/clean-up records • Raw data	TtEC project file, Long-term data package storage at third-party professional document storage firm (Business Records Management, Inc.).
Data Assessment Documents and Records • Field Sampling Audit Checklist (if an audit is conducted) • Analytical Audit Checklist (if an audit is conducted) • Data Review Memoranda	TtEC project file.

Procedures for data handling, management, tracking, and control are described below.

29.1 DATA HANDLING, MANAGEMENT, TRACKING, AND CONTROL

29.1.1 Data Handling and Management - After the groundwater sampling and process sampling events are completed, the groundwater purge sheets and operation checklists will be organized by date and filed in the project files. The field logbooks for this project will be used only for this site and will also be categorized and maintained in the project files after the completion of the sampling. Project personnel completing concurrent field sampling activities may maintain multiple field logbooks. When possible, logbooks will be segregated by sampling activity. The field logbooks will be titled based on date and activity.

29.1.2 Data Tracking and Control - The TtEC PM (or designee) is responsible for the overall tracking and control of data generated for the project.

- **Data Tracking**. Data are tracked from its generation to its archiving in the TtEC project-specific files. The Project Chemist (or designee) is responsible for tracking the samples collected and shipped to the contract laboratory. Upon receipt of the data packages from the analytical laboratory, the Project

Chemist will oversee the data review effort, which includes verifying that the data packages are complete and results for all samples have been delivered by the analytical laboratory.

- **Data Storage, Archiving, and Retrieval**. The data packages received from the subcontractor laboratory are tracked in the data review logbook. After the data are reviewed, the data packages are entered into the TtEC file system and archived in secure files. The field records including field logbooks, sample log sheets, and chain-of-custody records will be submitted by the FOL to be entered into the file system prior to archiving in secure project files. The project files are audited for accuracy and completeness. At the completion of the Navy contract, the records will be returned to the Navy by TtEC.

- **Data Security**. The TtEC project files are restricted to designated personnel only. Records can only be borrowed temporarily from the project file using a sign-out system. Access to the data files is restricted to qualified personnel only. File and data backup procedures are routinely performed.

SAP Worksheet #30 -- Analytical Services Table

(UFP-QAPP Manual Section 3.5.2.3)

Matrix	Analytical Group	Sample Locations/ID Number	Analytical Method	Data Package Turnaround Time	Laboratory / Organization	Backup Laboratory / Organization
Aqueous	VOCs (Select and TCL)	See Worksheet #18	EPA 624	15 days	TestAmerica – Pittsburgh 301 Alpha Drive Pittsburgh, PA 15238 (412) 963-2435	Not Applicable
Aqueous	Mercury	See Worksheet #18	EPA 245.1	15 days	TestAmerica – Pittsburgh 301 Alpha Drive Pittsburgh, PA 15238 (412) 963-2435	Not Applicable
Aqueous	TSS	See Worksheet #18	SM 2540D	15 days	TestAmerica – Pittsburgh 301 Alpha Drive Pittsburgh, PA 15238 (412) 963-2435	Not Applicable
Air	Select VOCs	See Worksheet #18	TO-15	15 days	Air Toxics, Ltd. 180 Blue Ravine Road, Suite B Folsom, CA 95630 (800) 985-5955	Not Applicable
Spent Air Stripper Packing/ Filter /Adsorber Media	TCLP VOCs	See Worksheet #18	SW-846 1311/8260B	15 days	TestAmerica – Pittsburgh 301 Alpha Drive Pittsburgh, PA 15238 (412) 963-2435	Not Applicable
Spent Air Stripper Packing/ Filter /Adsorber Media	TCLP Metals	See Worksheet #18	SW-846 1311/6010C/ 7470A	15 days	TestAmerica – Pittsburgh 301 Alpha Drive Pittsburgh, PA 15238 (412) 963-2435	Not Applicable

SAP Worksheet #31 -- Planned Project Assessments Table
(UFP-QAPP Manual Section 4.1.1)
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Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA)	Person(s) Responsible for Monitoring Effectiveness of CA
Health and Safety	1 per contract year	Internal	TtEC	Determined at the time of the audit. Will be a TtEC corporate H&S representative or qualified designee	TtEC PM (Stavros Patselas)	Auditor and Health and Safety Manager	Health and Safety Manager (Grey Coppi)
Laboratory Systems Audit	Every 18 months	External	NFESC	Determined at the time of the audit. Will be a Navy representative or qualified designee	Laboratory QA Manager	Laboratory QA Manager	Laboratory QA Manager
Field Sampling Systems Audit	1 per contract year *	Internal	TtEC	Determined at the time of the audit. Will be a TtEC corporate QA representative or qualified designee	TtEC PM (Stavros Patselas)	Auditor and QAM	QAM
Field Supervision	Daily during sampling events	Internal	TtEC	TtEC FOL (TBD)	TtEC FOL (TBD)	TtEC FOL and Field Crew	TtEC FOL, PM, QAM
Project Supervision	Daily	Internal	TtEC	TtEC PM (Stavros Patselas)	TtEC FOL (TBD)	TtEC PM and TtEC FOL	TtEC PM and TtEC FOL

*Whether an audit is conducted or not is determined at the program level, not the project level. The remainder of the table explains how an audit will be handled if an audit occurs.

System audits will be performed as appropriate to ensure that the work is being implemented in accordance with the approved project SOPs and in an overall satisfactory manner.

- During the groundwater sampling, the TtEC FOL will supervise the field operations. The FOL will perform a daily check to ensure the equipment is properly decontaminated, samples are collected and handled properly, and fieldwork is accurately and neatly documented. Corrective actions will be implemented immediately if any non-compliance is detected.

- During the plant operations, the Plant Operator will supervise the plant operations. The Plant Operator will perform checks to ensure the equipment is operating properly, samples are collected according to schedule, and changes are accurately and neatly documented. Corrective actions will be implemented immediately if any non-compliance is detected.

- System audits of the laboratory will be performed regularly and in accordance with NFESC guidance and DoD QSM (2009), as provided in the Laboratory Quality Assurance Plan (LQAP).

- The data reviewer(s) will review the data to ensure that the analytical results were obtained through the approved methodology, and the appropriate levels of QC were followed. The data review effort will be supervised by the TtEC Project Chemist or designee.

The TtEC PM will oversee the FOL, Plant Operator, and data reviewers, and check that management of the acquired data proceeds in an organized manner.

An independent performance audit of field activities may be conducted at the discretion of and under the direction of the QAM. If a formal field audit is conducted, the QAM (or designee) will check that sample collection, handling, and shipping protocols, as well as equipment decontamination and field documentation procedures, are being performed in accordance with the approved project planning documents and SOPs. These audits and laboratory systems audits will identify the following:

- The assessed entity (e.g., field crew, office personnel, etc. and the associated project, field event, office, etc.)
- Whether the audit is internal or external
- Location and date(s) of assessment
- Assessment team members
- Type of assessment
- Scope of assessment
- Documents to be reviewed
- Notification dates
- Proposed assessment schedule
- Assessment number
- Contract number

Assessment findings that require corrective action initiate a sequence of events that include documentation of deficiencies, notification of findings, request for corrective action, implementation of corrective action, and follow-up assessment of the corrective action effectiveness. The procedures for handling any SAP deviations and project deficiencies that are identified through the planned project assessments are summarized in Worksheet #32.

Potential problems may involve non-conformance with the SOPs and/or analytical procedures established for the project or other unforeseen difficulties. Any person identifying a condition adverse to project quality will notify the PM. The PM, with the assistance of the QAM, will be responsible for developing and

initiating appropriate corrective action. If the identified deficiencies involve field work, this will be done through the FOL; if the deficiencies involve the laboratory, this will be done through the Laboratory PM/QA Manager. The corrective actions will require follow-through to the point of verifying that the corrective action has been effective. Corrective actions may include resampling and/or reanalyzing samples or amending or adjusting project procedures. If warranted by the severity of the problem (e.g., if a change in the approved plan is required), the Navy will be notified in writing and the Navy's approval will be obtained before any change is implemented. Minor changes will be documented for the main file by the TtEC PM. Additional work that depends on a non-conforming activity will not be performed until the problem has been eliminated. The overall corrective action responsibility for system audits will reside with the PM. The overall corrective action responsibility for field audits will reside with the TtEC QAM.

SAP Worksheet #32 -- Assessment Findings and Corrective Action Responses

(UFP-QAPP Manual Section 4.1.2)

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Time Frame of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Time Frame for Response
Field Supervision	Site log book, groundwater purge sheets, plant operation checklists	TtEC PM (Stavros Patselas), FOL (TBD), Plant Operator (Fred Mattison)	Immediately	Entry in site log book	TtEC PM (Stavros Patselas), TtEC FOL (TBD)	24 hours
Project Supervision	Written report	TtEC Program Manager (Andy Bolt)	Monthly	Written memorandum	TtEC Program Manager (Andy Bolt)	Within a week of notification
Field Sampling System Audit	Audit checklist and written audit finding summary	TtEC PM (Stavros Patselas), TtEC FOL (TBD), Plant Operator (Fred Mattison), and TtEC Program Management (Andy Bolt)	Dependant on the finding, if major a stop work may be issue immediately, however if minor within 1 week of audit	Written memorandum	TtEC QAM (George Sze), Auditor, and Program Manager (Andy Bolt)	Within 48 hours of notification
Laboratory System Audit	Written audit report	Laboratory Manager and QA Manager	Not specified by NFESC	Letter	NFESC	Specified by NEFSC

SAP Worksheet #33 -- QA Management Reports Table

(UFP QAPP Manual Section 4.2)

Type of Report	Frequency	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipient(s)
Data review report	Per SDG	Within 3 weeks of receipt of laboratory data	TtEC Data Reviewers	TtEC PM (Stavros Patselas) and TtEC project file
Major analysis problem identification (Internal Memorandum)	When persistent analysis problems are detected	Immediately upon detection of problem	TtEC QAM (Jonathan Dziekan)	TtEC PM, QAM, and project file
Discharge Monitoring Reports	Monthly for duration of the GWTP operations	Monthly	TtEC PM (Stavros Patselas)	NAVFAC RPM (Lora Fly), NYSDEC Project Engineer (Steven Scharf), and TtEC project file
Laboratory QA Report	When significant plan deviations result from unanticipated circumstances	Immediately upon detection of problem	Subcontracted Laboratory QA Manager	TtEC PM, QAM, and project file

SAP Worksheet #34 -- Verification (Step I) Process Table

(UFP-QAPP Manual Section 5.2.1)

Verification Input	Description	Internal / External	Responsible for Verification
Chain-of-custody forms	The TtEC FOL or designee will review and sign the chain-of-custody form to verify that all samples listed are included in the shipment to the laboratory and that the sample information is accurate. The forms will be signed by the sampler and a copy will be retained for the project file, Project Manager, and data reviewers.	Internal	TtEC sampler and FOL
SAP sample tables	Verify that all proposed samples listed in the SAP tables have been collected.	Internal	TtEC FOL or designee
Chain-of-custody forms	The laboratory sample custodian will review the sample shipment for completeness and integrity, and will sign accepting the shipment. The TtEC Project Chemist, data reviewers, and/or designee will check that the chain-of-custody form was signed/dated by the TtEC FOL or designee relinquishing the samples and also by the laboratory sample custodian receiving the samples for analyses.	Internal/ External	1 - Laboratory sample custodian 2 - TtEC Project Chemist, data reviewers, and/or designee
Analytical data package	All analytical data packages will be verified internally for completeness by the laboratory performing the work. The laboratory QA Manager will sign the case narrative for each data package.	Internal	Laboratory QAM
Analytical data package	The data package will be verified for completeness by TtEC data reviewers. Missing information will be requested from the laboratory, and the data review will be suspended until missing data are received.	External	TtEC Project Chemist, data reviewers, and/or designee
Electronic data deliverables	The electronic data will be verified against the chain-of-custody form and hard copy data package for accuracy and completeness.	External	TtEC Project Chemist, data reviewers, and/or designee

SAP Worksheet #35 -- Validation (Steps IIa and IIb) Process Table
(UFP-QAPP Manual Section 5.2.2) (Figure 37 UFP-QAPP Manual) (Table 9 UFP-QAPP Manual)

Step IIa / IIb[1]	Validation Input	Description	Responsible for Validation (name, organization)
IIa	Field SOPs	Ensure that all sampling SOPs were followed and any field deviations were documented.	TtEC PM, Plant Operator, FOL, or designee
IIa	Analytical SOPs	Ensure that the laboratory followed the analytical SOPs cited in the SAP and any method deviations were approved by TtEC and documented in the case narrative.	TtEC Project Chemist, data reviewers, and/or designee
IIa	Chain-of-custody	Ensure that the custody and integrity of the samples were maintained from collection to analysis and the custody records are complete and any deviations are recorded.	TtEC Project Chemist, data reviewers, and/or designee
IIa	Holding times	Ensure that the samples were shipped and stored at the required temperature and that sample pH for chemically preserved samples meet the requirements listed in Worksheet #19. Verify that the analyses were performed within the holding times listed in Worksheet #19.	TtEC Project Chemist, data reviewers, and/or designee
IIa	Data results	Check the summary form results against the raw data. Check calculations for accuracy.	TtEC Project Chemist, data reviewers, and/or designee
IIa	Standards	Ensure that the standards used in the field and laboratory are traceable and meet the contract, method, and procedural requirements.	TtEC Project Chemist, data reviewers, and/or designee
IIa/IIb	Laboratory data results for accuracy	Ensure that the laboratory QC samples listed in Worksheet #28 were analyzed and that the measurement performance criteria (MPC) listed in Worksheets #12 and #28 were met for all field samples and QC analyses. Verify that field QC samples were collected (if applicable) and analyzed and that the analytical QC criteria set up for this project were met.	TtEC Project Chemist, data reviewers, and/or designee
IIa/IIb	Laboratory duplicate analyses for precision	Ensure laboratory precision by checking the RPD or percent difference values from laboratory duplicate analyses, matrix spike/matrix spike duplicates, and laboratory control sample/laboratory control sample duplicates. Ensure compliance with the methods and project MPC accuracy goals listed in Worksheets #12 and/or #28.	TtEC Project Chemist, data reviewers, and/or designee
IIa/IIb	Sample results for representativeness	Validate that the laboratory recorded the temperature at sample receipt and the pH of the chemically preserved samples to ensure sample integrity from sample collection to analysis.	TtEC Project Chemist, data reviewers, and/or designee
IIb	Project Quantitation Limits for sensitivity	Validate that the project QLs and MDLs listed in Worksheet #15 were achieved.	TtEC Project Chemist, data reviewers, and/or designee
IIa/IIb	Project action limits	Discuss the impact of matrix interferences or sample dilutions performed because of the high concentration of one or more contaminant, on the other target compounds reported as no-detected. Document this usability issue and inform the Project Manager.	TtEC Project Chemist, data reviewers, and/or designee

Step IIa / IIb[1]	Validation Input	Description	Responsible for Validation (name, organization)
IIb	Analytical data deviations	Determine the impact of any deviation from sampling or analytical methods and SOP requirements and matrix interference effects on the analytical results.	TtEC Project Chemist, data reviewers, and/or designee
IIb	Sample coordinates	Verify that sample locations are correct and in accordance with the SAP proposed locations.	TtEC FOL, Plant Operator, or designee
IIa/IIb	Data review report	Review of: • chain-of-custody and sample receipt documents to verify sample identities. • sample log-in documents to verify any potential problems with sample custody, integrity, preservation, labeling, etc. • field blank data to ascertain any problems with container or preservative contamination, or field contamination. • method blank data to determine the presence and approximate concentration of sources of contamination in the analytical process. • matrix spike data as a measure of matrix effects and analytical precision. • field and laboratory duplicate data as a measure of sampling technique applicability, homogeneity, and analytical precision. • standard reference material or laboratory control sample data as a measure of analytical accuracy. Data will be compared to the certified acceptable ranges of analytical values. • sample dates, extraction/digestion dates, and analysis dates to determine whether maximum holding times were met or exceeded. Where appropriate, data qualifiers will be incorporated into certain data summary tables generated for this project. A brief summary of the data QA/QC review will be included in the final report.	TtEC Project Chemist, data reviewers, and/or designee

1 IIa=Compliance with methods, procedures, and contracts (see Table 10, page 117, UFP-QAPP manual, V.1, March 2005).
IIb=Comparison with measurement performance criteria in the SAP (see Table 11, page 118, UFP-QAPP manual, V.1, March 2005).

SAP Worksheet #36 –Analytical Data Validation (Steps IIa and IIb) Summary Table
(UFP-QAPP Manual Section 5.2.2.1)

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator
IIa/IIb	Aqueous	VOCs (Select and TCL)	Criteria for EPA 624 listed in Worksheets #12 and #28. If not included in Worksheet #12 or #28, default to USEPA National Functional Guidelines SOPs/USEPA Region II SOPs.	TtEC Project Chemist (Lynn Arabia), data reviewers, or designee
IIa/IIb	Aqueous	Mercury	Criteria for EPA 624 listed in Worksheets #12 and #28. If not included in Worksheet #12 or #28, default to USEPA National Functional Guidelines SOPs/USEPA Region II SOPs.	TtEC Project Chemist (Lynn Arabia), data reviewers, or designee
IIa/IIb	Air	Select VOCs	Criteria for EPA 624 listed in Worksheets #12 and #28. If not included in Worksheet #12 or #28, default to USEPA National Functional Guidelines SOPs/USEPA Region II SOPs.	TtEC Project Chemist (Lynn Arabia), data reviewers, or designee

SAP Worksheet #37 -- Usability Assessment
(UFP-QAPP Manual Section 5.2.3)

Data Usability

37.1 ACCURACY ASSESSMENT
Sample collection accuracy cannot be evaluated because there is no standard by which to judge such accuracy. Instead of a quantitative evaluation of sample collection accuracy, compliance with field SOPs will be the metric.

The accuracy of chemical analyses will be assessed through the use of surrogate spikes, MSs, laboratory control samples (LCSs), calibration check standards, internal standards, and blanks. Blanks will be used to infer the potential for positive biases because of contamination. To assure the accuracy of the analytical procedures, at least 1 of every 20 environmental samples will be spiked with known amounts of target analytes (i.e., MSs) prior to preparation for analysis. The spiked samples will be analyzed and the concentrations of each target analyte observed in the spiked sample will be compared to the reported value of the analyte in the unspiked sample to determine the percent recovery (%R) of the analyte. Control charts are plotted by the laboratory for each target analyte and are kept on matrix- and analyte-specific bases. The %R for a spiked sample is calculated using the following formula:

$$\%R = \frac{\text{Amount in Spiked Sample} - \text{Amount in Sample}}{\text{Known Amount Added}} \text{ X } 100\,\%$$

LCSs and surrogate spikes are also analyzed to assess accuracy. The %R calculation for LCSs and surrogate spikes is as follows:

$$\%R = \frac{\text{Experimental Concentration}}{\text{Certified or Known Concentration}} \text{ X } 100\,\%$$

37.2 PRECISION ASSESSMENT
Laboratory duplicate samples (for inorganic analyses) and MSD samples (for organic analyses) will be prepared and analyzed at a minimum frequency of 1 per every 20 environmental samples per matrix. The RPD between a sample or MS (Sample 1) and its duplicate or MSD (Sample 2) is calculated for chemical analyses using the following formula:

$$RPD = \frac{\left|\text{Amount in Sample 1} - \text{Amount in Sample 2}\right|}{0.5\,(\text{Amount in Sample 1} + \text{Amount in Sample 2})} \text{ X } 100\,\%$$

37.3 COMPLETENESS ASSESSMENT
Completeness for this project will be determined based on the number of sample results for each target analyte and each sample type that are usable as determined through data assessment review. Data values rejected during validation (indicated by an “R” or “UR” flag) will be considered unusable unless additional review and documentation by one or more technical team members demonstrates that the rejection was erroneous. To monitor completeness, the number of usable, valid results for each media and analyte will be counted and compared to the completeness objectives.

Percent completeness will be calculated using the following equation:

$$\%\ \text{Completeness} = \frac{(\text{Number of Valid Measurements})}{(\text{Number of Measurements Planned})} \text{ x } 100\%$$

A completeness of at least 95 percent will be expected to be obtained. If this does not occur, the project team will evaluate the effect of not meeting this completeness goal based on conditions that exist at that time.

37.4 OVERALL USABILITY

Immediately after generation, field data, such as data recorded on groundwater purge sheets or operation checklists, will be examined for errors by the data generator. This examination will compare results to field conditions with an attempt to reconcile any apparent anomalies. The FOL or Plant Operator will be responsible for reviewing the field logs each day of field work to verify that the data appear reasonable based on field conditions. The FOL or Plant Operator will look for gross inconsistencies among field data sheets.

Laboratory data will be examined upon receipt from the laboratory in a series of evaluations. The project team will be responsible for evaluating data usability. Depending on project constraints after data collection, this may be done by a subgroup of team members issuing a data usability report to the rest of the team for concurrence prior to completing the monthly Discharge Monitoring Report or it could require inclusion of a data usability assessment section in the report that is submitted to the team for concurrence. This decision will be made by the NAVFAC RPM in conjunction with the team.

After data review, the data will be reconciled with data quality objectives (DQOs) to determine whether sufficient data of acceptable quality are available for decision making. A series of inspections and analyses will be performed to estimate several of the data set characteristics. The evaluations will include simple summary statistics for target analytes, such as maximum concentrations, minimum concentrations, numbers of samples exhibiting no detectable analytes, number of samples exhibiting detectable analytes, and proportion of samples with detectable and undetectable analytes. The data will be presented in a tabular format. These inspections and analyses will be designed to:

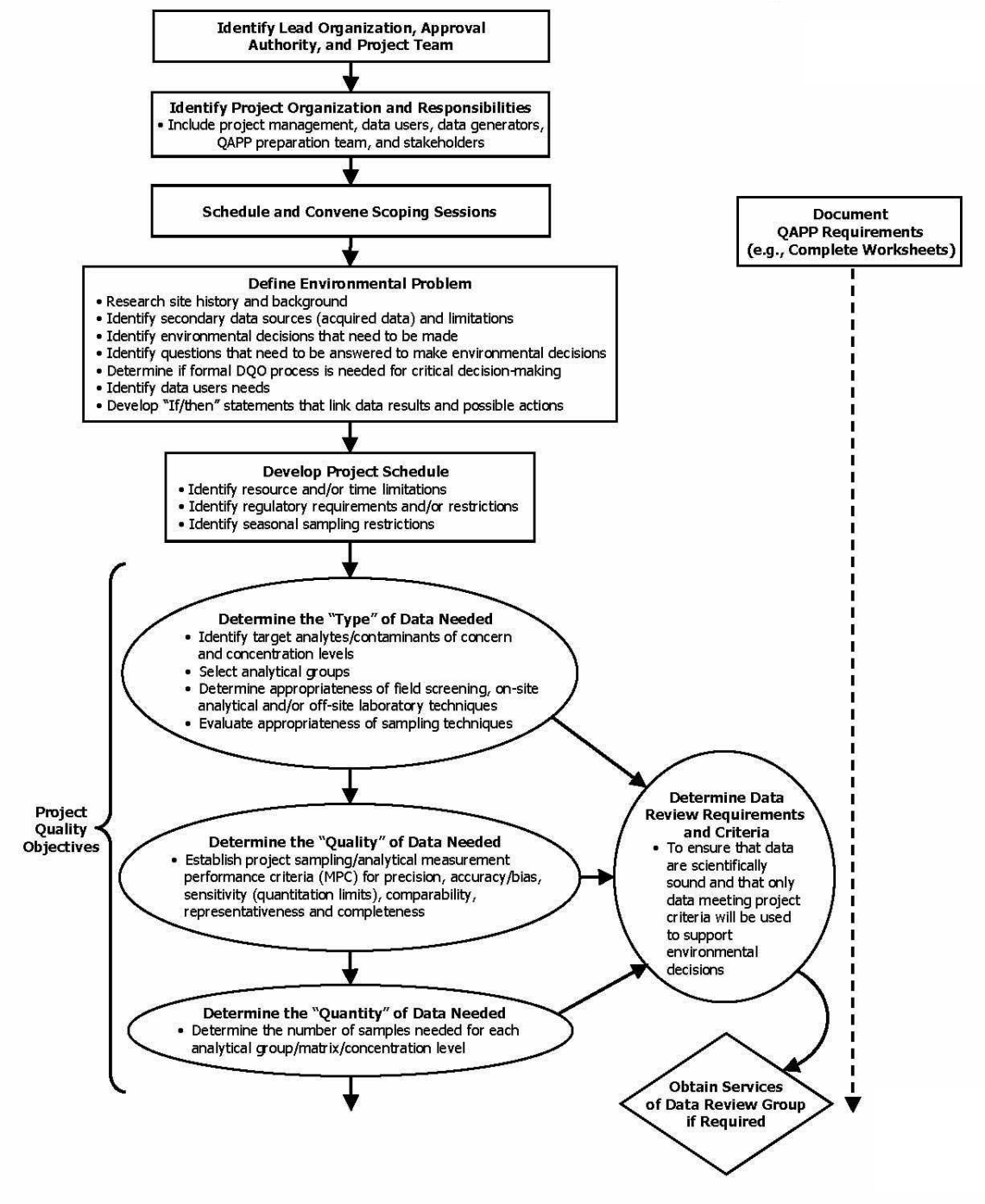
- Identify deviations, if any, from the field sampling SOPs.
- Identify deviations, if any, from the laboratory analytical SOPs.
- Identify deviations, if any, from the SAP.
- Identify deviations, if any, from the data review process.
- Identify and explain the impacts of elevated MDLs, instrument detection limits, and QLs, especially if MDLs exceed project action limits (PALs).
- Identify unusable data (i.e., data qualified as “R”).
- Evaluate the effects of “J” qualified data on data usability and decision making.
- Evaluate project assumptions.
- Evaluate adherence to investigation objectives and decision rules.
- Ensure completion of corrective actions.
- Evaluate effects of deviations from planned procedures and processes on the interpretation and utility of the data.
- Identify remaining data gaps.

For data summaries and mathematical manipulations, analytes that are not detected will be represented by a concentration equal to one-half the sample-specific MDL (inorganics) or QL (organics).

If necessary, investigation objectives may be revised in anticipation of additional data collection.

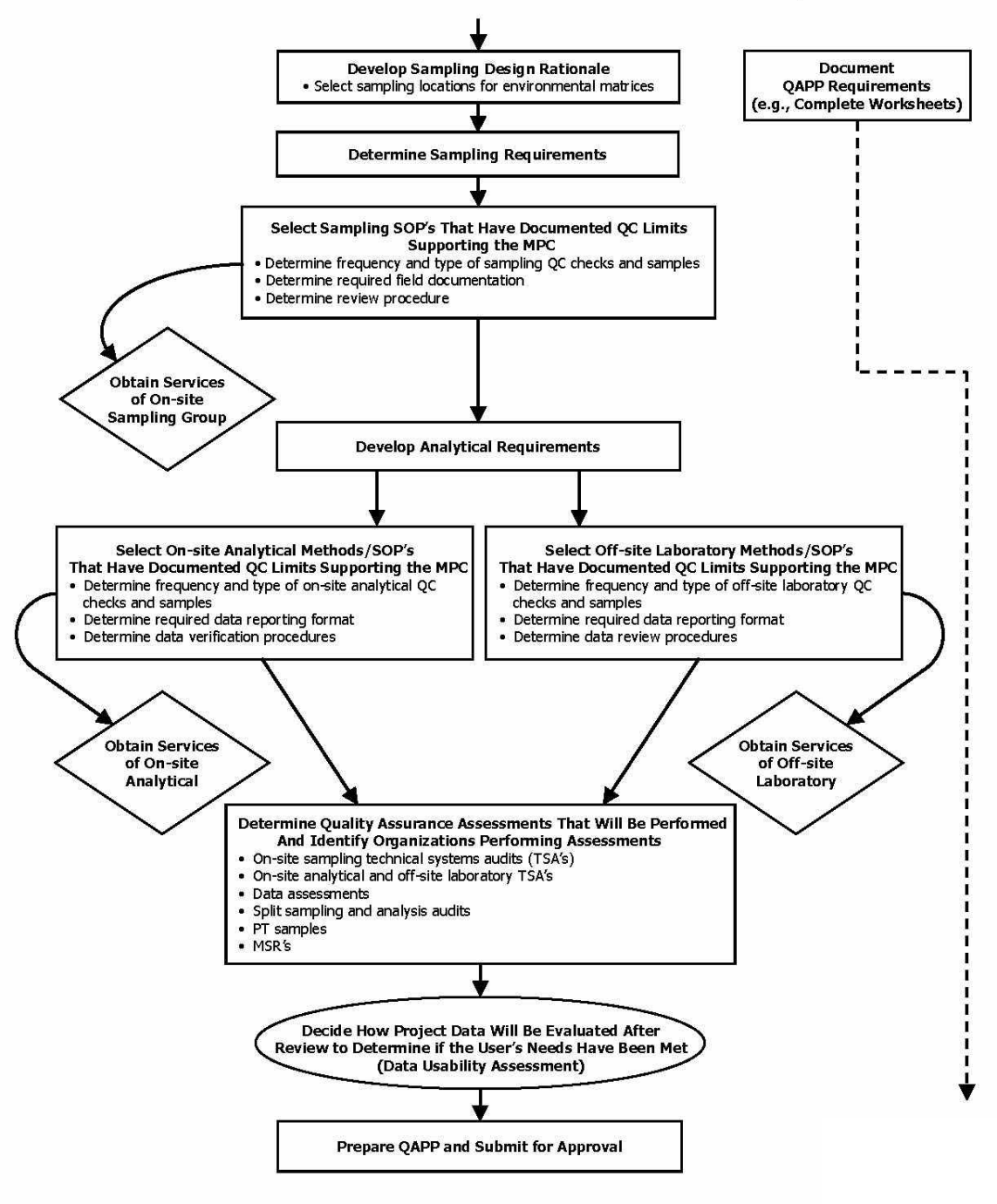
Figures

FIGURE 11-1
SYSTEMATIC PLANNING PROCESS
OPERATION, MAINTENANCE, AND MONITORING PLAN QAPP FOR THE GM-038 GROUNDWATER TREATMENT PLANT



Continued on Page No. 2

FIGURE 11-1
SYSTEMATIC PLANNING PROCESS
OPERATION, MAINTENANCE, AND MONITORING PLAN QAPP FOR THE GM-038 GROUNDWATER TREATMENT PLANT



Appendix A

Field Standard Operating Procedures

Sampling of Process Aqueous Samples (SOP 001)

Process water samples will be collected from various sampling ports within the GWTP building according to the following procedure:

1. Be aware that the nominal process water flow rate through the GWTP is 1100 gallons per minute and that the process water pipelines are under pressure (up to 60 psig). Be aware that the process water contains chlorinated VOCs and follow the proper health and safety guidelines as identified in the SHSP.

2. Partially open the ball valve at the sample port for a few seconds and collect the process water in a 5-gallon bucket in order to flush out any dead zones. Close the ball valve at the sample port and empty the water in the bucket into the GWTP sump.

3. Partially open the ball valve at the sample port for a few seconds once more and collect the process water in a dedicated clean glass beaker. Close the ball valve at the sample port and quickly transfer an appropriate volume of the sample from the beaker into the proper sample vials and bottles.

4. Samples for VOCs must be collected first. The sample vials and bottles should be preserved and filled according to the procedures specified below and in the QAPP.

5. Fill all sample vials and bottles by allowing the water to flow gently down the inside of the vial or bottle with minimal turbulence. Cap each vial or bottle as it is filled.

6. Preserve and label the samples, and record them on the Chain of Custody form and in the field logbook. Place the sample vials and bottles immediately into a cooler for shipment and maintain at 4^{o}C.

7. The filling and preservation procedures will be:

    - VOCs - Determine the amount of 1:1 HCl preservative required to adjust the pH of the sample to less than 2 in an extra 40 ml glass vial. Add this volume to the empty 40 ml vials prior to sampling. Fill each container with sample to just overflowing so that no air bubbles are entrapped inside. If effervescence occurs, submit the sample without preservative and note on the chain of custody form.

    - Other Parameters - Fill each container and preserve immediately as required. To test for pH, pour a minimal portion of sample onto broad range pH paper to verify that the appropriate pH level has been obtained.

Sampling of Process Vapor Samples (SOP 002)

Process vapor samples will be collected from the four sampling ports in the VGAC unit within the GWTP building according to the following procedure:

1. This procedure involves the collection of a 30-minute integrated sample using 6-liter Summa canisters supplied by the laboratory. Be aware that the nominal process vapor flow rate through the GWTP is 8,000 cubic feet per minute and that the process vapor pipelines are under pressure (up to 50 inches of water or 94 mm of Hg). Be aware that the process vapor contains chlorinated VOCs and follow the proper health and safety guidelines as identified in the HASP. Be aware that the Summa canisters and associated hardware are expensive containers that need to be handled with special care.

2. Verify the initial vacuum of the canister as received from the laboratory utilizing the following steps. Confirm that the valve on the canister is closed. Remove the brass cap from the canister and attach the critical orifice flow controller to the canister. Attach the brass cap to the other end of the flow controller. After ensuring that the ¼ inch Swagelok fittings are tight using a 9/16 inch wrench and that you have a closed leak-free train, quickly open and close the canister valve. Read the vacuum on the built-in gauge on the flow controller. The initial vacuum should be greater than 25 in of Hg. If this is not the case, do not use that canister for sampling and call the laboratory to arrange for a replacement. Record the gauge reading in the "initial vacuum" column on the chain of custody form.

3. Connect a purge line to the sample port making sure that the other end is vented outside the GWTP building. Partially open the ball valve at the sample port for a few seconds and allow the line to purge in order to flush out any dead zones. Close the ball valve at the sample port. Disconnect the purge line. UNDER NO CIRCUMSTANCES SHOULD THE VAPORS FROM THE SAMPLE PORT BE VENTED INSIDE THE GWTP. Some of the chlorinated VOCs can be immediately dangerous to life and health.

4. Remove the brass cap from the flow controller and connect the sample train to the sample port. After ensuring that the ¼ inch Swagelok fittings are tight using a 9/16 inch wrench, that you have a closed leak-free train, and that the canister and flow controller are properly supported, quickly open the canister valve (1/2 turn) and the ball valve on the sample port.

5. Monitor the integrated sampling process periodically. After 30 minutes, record the "final vacuum" on the chain of custody form by reading the vacuum on the built-in gauge on the flow controller. Close the canister valve and the ball valve on the sample port.

6. Detach the sampling train from the sample port. Detach the flow controller from the canister and replace the brass cap on the canister. Fill out the canister sample tag and log book making sure that the information matches that recorded on the chain of custody form. DO NOT attach any labels to the surface of the canister or write on the canister.

Sampling of Process Vapor Samples (SOP 002) [cont'd]

7. Return the canisters and the flow controllers to the laboratory in the boxes and packaging provided. Place the chain of custody form (after retaining the appropriate copies) in the box with the canister. Tape the box shut and place custody seals at each opening.

Water Level Measurement (SOP 003)

Static water level measurements will be taken in the 14 installed monitoring wells prior to each groundwater sampling event. Additional rounds of measurements may be collected throughout the field activities under the direction of the FOL.

Water level measurements will be conducted in accordance with the following procedure:

1. Groundwater level measurements will be collected from all monitoring wells primarily using an electronic water level indicator. An interface probe will also be used during the initial measurement round and periodically through the program to check for the presence of free product. Water levels will be measured, relative to surveyed datum (i.e., top of well riser), at a specific mark on the casing, to the nearest 0.01 foot.

2. Electronic water level indicators will preferably be the type with water level markings on the cable at increments of 0.01 foot or less.

3. All electronic water level measurements will be recorded in the appropriate field logbook or data sheet.

4. The electronics of the water level indicator will be checked prior to the commencement of measurements with a jar of water and the depths calibrated on the ground against a steel tape.

5. The water level indicator cable, tape and probe will be decontaminated between wells by rinsing with deionized water (see SOP 006).

Field Parameter Measurements During Groundwater Sampling (SOP 004)

Field parameters (temperature, pH, turbidity, ORP, specific conductance, and dissolved oxygen) will be monitored during purging of the monitoring wells utilizing a Horiba® water quality meter or equivalent. Measurements will be conducted in accordance with the manufacturer's instructions and the following procedure:

1. Calibrate the water quality meter as per manufacturer's instructions.

2. For low flow purging of the monitoring wells:

    - Attach a flow-through cell to the Teflon-lined polyethylene tubing. Position the water quality meter probe in the flow-through cell. Begin purging the monitoring well, following SOP 005 (Groundwater Sampling [Low Flow Purge Procedure]).

    - After the cell has been "flushed" at least twice, begin monitoring the field parameters, and continue approximately every 3 to 5 minutes during purging. All water quality measurements will be recorded in the appropriate field logbook or on a well purge data sheet.

    - When the indicator parameters have stabilized for three consecutive readings (see Step 11 of SOP 005 (Groundwater Sampling [Low Flow Purge Procedure])), the well is considered stabilized and ready for sample collection. Remove the flow-through cell from the tubing.

3. The probe of the water quality meter will be decontaminated between wells by rinsing with deionized water (see SOP 006).

Groundwater Sampling [Low Flow Purge Procedure] (SOP 005)

Groundwater samples will be collected from 9 monitoring wells installed at the Site. Groundwater samples will be obtained starting at the least contaminated well and proceeding systematically to the well likely to be most contaminated.

1. Check and record the condition of the well for any damage or evidence of tampering.

2. Remove the well cap.

3. Measure well headspace with a PID and record the reading in the field logbook.

4. Measure and record the depth to water, as stated in SOP 003 (Water Level Measurement), and record the measurement in the field logbook. Do not measure the depth to the bottom of the well at this time (to avoid disturbing any sediment that may have accumulated). Obtain depth to bottom information from installation information in the field logbook or drilling logs. Calculate volume of the water column.

5. Lay out plastic sheeting and place the monitoring, purging and sampling equipment on the sheeting. To avoid cross-contamination, do not let any downhole equipment touch the ground.

6. Re-check and record the depth to water after approximately 5 minutes at the well location. If the measurement has changed more than 0.01 foot, check and record the measurement again, then begin well purging.

7. Attach and secure the Teflon-lined polyethylene tubing to the low-flow submersible pump. As the pump is slowly lowered into the well, secure the safety drop cable, tubing, and electrical lines to each other using nylon stay-ties placed approximately 5 feet apart.

8. Set the pump at approximately the middle of the screen and/or the best depth based on the stratigraphy of the well. Be careful not to place the pump intake less than 2 feet above the bottom of the well as this may cause mobilization of any sediment present in the bottom of the well. Start pumping the well at 0.2 to 0.5 liters per minute.

9. Monitor the water level in the well periodically during pumping, and ideally the pump rate should equal the well recharge rate with little or no water level drawdown in the well (drawdown shall be 0.3 foot or less). There should be at least 1 foot of water over the pump intake so there is no risk of the pump suction being broken, or entrapment of air in the sample. Record the pumping rate adjustments and depth(s) to water in the logbook. Pumping rates should, if needed, be reduced to the minimum capabilities of the pump (0.1 to 0.2 liters per minute) to avoid purging the well dry. However, if the recharge rate of the well is very low and the well is purged dry, then wait until the well has recharged to a sufficient level and collect the appropriate volume of sample with the submersible pump.

Groundwater Sampling [Low Flow Purge Procedure] (SOP 005) [cont'd]

10. Purge the well at a low-flow rate (from 0.2 to 0.5 liters per minute). During purging, monitor the field parameters (temperature, pH, turbidity, Eh, specific conductance, and dissolved oxygen) approximately every 3 to 5 minutes. A flow-through cell will be used to monitor the field parameters (see SOP 004). Begin measuring field parameters after the flow-through cell has been "flushed" with groundwater twice.

11. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings, as follows:

    - 0.1 for pH
    - 3 percent for specific conductance
    - 10 percent for dissolved oxygen
    - 10 percent for turbidity
    - 10 mV for ORP

    Dissolved oxygen and turbidity usually require the longest time to achieve stabilization. The pump must not be removed from the well between purging and sampling.

12. Once the field parameters have stabilized, collect the samples directly from the end of the tubing. Volatiles and analyses that degrade by aeration must be collected first. The bottles should be preserved and filled according to the procedures specified below and in the QAPP.

13. Fill all sample bottles by allowing the pump discharge to flow gently down the inside of the bottle with minimal turbulence. Cap each bottle as it is filled.

14. The filling and preservation procedures will be:

    - VOCs – The laboratory will determine the approximate amount of 1:1 HCl preservative required to adjust the pH of a sample to less than 2 and will add this volume to the empty 40 ml vials prior to sampling. Fill each container with sample to just overflowing so that no air bubbles are entrapped inside. Test one vial to determine if the pH is below 2. If effervescence occurs, submit the sample in bottleware without preservative and note on the chain of custody form.

    - Other Parameters - Fill each container, careful of any preservative added by the laboratory. To test for pH, pour a minimal portion of sample onto broad range pH paper to verify that the appropriate pH level has been obtained.

15. Label the samples and record them on the chain of custody. Place immediately into a cooler for shipment and maintain at 4EC.

Groundwater Sampling [Low Flow Purge Procedure] (SOP 005) [cont'd]

16. Carefully remove the pump assembly from the well. The Teflon-lined polyethylene tubing will be dedicated to each well. The tubing should be placed in a large plastic garbage bag, sealed, and labeled with the appropriate well identification number.

17. After sampling is complete, measure the total depth of the well.

18. Close and lock the well.

Decontamination – Field Instrumentation - Probes, Water Quality Meters, etc. (SOP 006)

Field instrumentation (such as water level probes, water quality meters, etc.) will be decontaminated between sample locations by rinsing with deionized water. If visible contamination still exists on the equipment after the rinse, an Alconox detergent scrub will be added, and the probe thoroughly rinsed again.

Decontamination of sampling equipment will be kept to a minimum in the field and wherever possible, dedicated disposable sampling equipment will be used. Any decontamination fluids generated will be stored in U.S. Department of Transportation (DOT)-approved 55-gallon drums or in an on-site storage tank (liquids only) until disposal. Personnel directly involved in equipment decontamination will wear appropriate protective clothing, as stated in the HASP.

Decontamination – Non-Disposable Chemical Sampling Equipment (SOP 007)

Wherever possible, disposable equipment will be used for groundwater and process water sampling events and decontamination will not be required. Should non-disposable sampling equipment be used, it will be decontaminated prior to collecting each sample. Decontamination of non-disposable sampling equipment used to collect samples for chemical analyses (i.e., pumps, beakers, etc.) will be conducted as described below:

1. Remove all visible contaminants using laboratory detergent (i.e., Alconox) and potable water scrub.

2. Potable water rinse.

3. De-ionized water rinse.

4. Air dry.

5. Wrap or cover exposed ends of equipment with aluminum foil for transport and handling.

Decontamination of sampling equipment will be kept to a minimum in the field and, whenever possible, dedicated disposable sampling equipment will be used. Decontamination fluids will be stored in appropriately sized DOT-approved containers or in an on-site storage tank (liquids only) until transported off-site for disposal. Personnel directly involved in equipment decontamination will wear appropriate protective clothing, as stated in the HASP.

Sampling of Spent Air Stripper Packing/Filter/Adsorber Material (SOP 008)

Spent air stripper packing/filter/adsorber material will be collected prior to disposal according to the following procedure:

1. To obtain a sample of the spent air stripper packing/filter/adsorber material, use a disposable scoop to dig into the material at random locations.

2. Collect a sufficient volume of material to fill the applicable bottleware and place in a disposable aluminum pan. Homogenize the material thoroughly. Separate the material into the appropriate containers for the analysis of TCLP VOCs and TCLP metals.

3. Label the samples and record them on the chain of custody form and in the field logbook. Place the sample vials and jars immediately into a cooler for shipment and maintain at 4^{o}C.

Appendix B

Field Forms

APPENDIX B-1
SAMPLE LABEL AND TtEC CUSTODY SEAL (TYPICAL)
GM-038 GROUNDWATER TREATMENT PLANT

Sample No.
Sample Location
Matrix / Type
Date / Time
Sampler
Analysis
Preservation

TETRA TECH **SIGNATURE: _____ DATE: _____ TIME: _____**	**SAMPLE CUSTODY SEAL**	**SEAL BROKEN** **BY: _____** **DATE: _____**

APPENDIX B-2
TtEC CHAIN OF CUSTODY FORM (TYPICAL)
GM-038 GROUNDWATER TREATMENT PLANT

TETRA TECH

CHAIN OF CUSTODY RECORD

PROJECT					NO. CONTAINERS										REMARKS OR SAMPLE LOCATION	PRESERVATION	
SAMPLERS: (Signature)																ICED	SPECIFY CHEMICALS ADDED AND FINAL pH IF KNOWN
SAMPLE NUMBER	DATE	TIME	COMP.	GRAB													

Relinquished by: (Signature) (1)	Date / Time	Received by: (Signature)	Relinquished by: (Signature) (4)	Date / Time	Shipped via:
Relinquished by: (Signature) (2)	Date / Time	Received by: (Signature)	Received for Laboratory by: (Signature)	Date / Time	Shipped via:
Relinquished by: (Signature) (3)	Date / Time	Received by: (Signature)	Remarks		

APPENDIX B-3
EQUIPMENT/INSTRUMENT CALIBRATION AND MAINTENANCE FORM (TYPICAL)
GM-038 GROUNDWATER TREATMENT PLANT

PROJECT: _____ **PROJECT No.:** _____ **DATE:** _____ **SHEET** _____ **of** _____

INSTRUMENT (NAME / MODEL NO. / SERIAL NO.): _____

MANUFACTURER: _____ **DATE PURCHASED or LEASED:** _____

CALIBRATION LOGSHEET

CALIBRATION DATE	INITIAL SETTINGS	STANDARD(S) USED	PROCEDURE	ADJUSTMENTS MADE	FINAL SETTINGS	SIGNATURE	COMMENTS

MAINTENANCE LOGSHEET

MAINTENANCE DATE	REASON FOR MAINTENANCE	MAINTENANCE PERFORMED	SIGNATURE	COMMENTS

APPENDIX B-4
FIELD CHANGE REQUEST FORM (TYPICAL)
GM-038 GROUNDWATER TREATMENT PLANT

FCR Number: _____

Field Change Request Title: _____

To: _____ **Location:** _____

Date: _____

Description:

_____

_____

Reason for Change:

_____

_____

Recommended Disposition:

_____

_____

_____	_____	_____
Field Operations Lead (or designee) [print name]	Signature	Date

I have reviewed the above change request, and

[ ] approve the modification.

[ ] do not approve the modification.

The above change request has been discussed with *client* personnel:

[ ] Yes (see below).

[ ] No. The change is minor and does not need *client* concurrence.

_____	_____	_____
Project Manager [print name]	Signature	Date

I have reviewed the above change request, and

[ ] concur with the modification.

[ ] do not concur with the modification.

_____	_____	_____
NAVFAC Remedial Project Manager [print name]	Signature	Date

Distribution:

NAVFAC Remedial Project Manager
TtEC Program Manager
TtEC Project Manager
Field Operations Lead
Project File
Other: