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NCBC DAVISVILLE
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FINAL COASTAL ZONE MANAGEMENT CONSISTENCY DETERMINATION QUONSET DEVELOPMENT CORPORTION OUTFALL 001 REMEDIAL INVESTIGATION FORMER NCBC DAVISVILLE RI

02/01/2014

RESOLUTION CONSULTANTS

COASTAL ZONE MANAGEMENT CONSISTENCY DETERMINATION
QDC Outfall 001 Remedial Investigation, Former Naval Construction Battalion Center Davisville, North Kingstown, Rhode Island
FINAL

Prepared for:

Department of the Navy
Naval Facilities Engineering Command
BRAC Program Management Office, East
4911 South Broad Street
Philadelphia, Pennsylvania 19112

Comprehensive Long-Term Environmental Action Navy
Contract Number N62470-11-D-8013

CTO WE23

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February 2014

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Attachments

1.0 PROJECT DESCRIPTION

1.1 Project Location and Background

Quonset Development Corporation (QDC) Outfall 001 is located in the central portion of the Former Naval Construction Battalion Center (NCBC) Davisville facility, to the west of Allen Harbor. Installation Restoration Program (IRP) Site 09 (Allen Harbor Landfill) is located to the northeast of the outfall, IRP Site 16 (Former Fire Training Area and Creosote Dip Tank) is located to the east and south of the outfall, the historic Allen Madison State Historic Site is located to the south, and the Former Construction Equipment Department (CED) Area is located to the west. QDC Outfall 001 is located near the parking lot at the end of Marine Road, behind a chain-link fence that surrounds the parking area for recreational users of Allen Harbor Landfill and Calf Pasture Point. Undeveloped wetlands are present to the east of the outfall. Groundwater flow direction in the outfall area is toward the east.

During stormwater outfall maintenance activities in the summer of 2008, QDC excavated soil that was present downstream from QDC Outfall 001. During this excavation, QDC observed stained soils and olfactory evidence of contamination. QDC stockpiled this soil adjacent to the outfall and contacted the Navy. Analytical results from the soil stockpile sample indicated the presence of total petroleum hydrocarbons (TPH; >10,000 mg/kg), volatile organic compounds (VOCs; primarily methyl-, chloro-, and propyl-benzenes), polychlorinated biphenyls (PCBs; 0.3 mg/kg Aroclor-1260), polycyclic aromatic hydrocarbons (PAHs), and metals (420 mg/kg lead). In December 2008 the soil stockpile was transported under a non-hazardous waste manifest for disposal at ESMI of New Hampshire.

Based on a review of historical as-built drawings of drainage systems at the former NCBC Davisville, Outfall 001 is the discharge point for an underground drainage line that originated from the former Building 224. Building 224 was part of the CED Area located approximately 1,000 feet to the southwest of the outfall. Building 224 was used by the Navy as a vehicle maintenance and truck washing facility. Contaminated materials and wash pad residues from these activities or other historical activities at the CED Area may have been disposed of into the Building 224 drainage system and discharged into the outfall area. The drainage pipe has been inactive since at least 2006 when Building 224 was demolished. Chemicals used during historical truck maintenance activities (and other historical activities that occurred in and around the Building 224 area) probably

entered the drainage system and were transported along the length of the pipe, discharging into soils in the drainage swale downstream from the pipe and migrating with the flow of surface water further downstream toward the wetland area. Contaminants migrating toward the wetland area will either accumulate in the wetland or migrate to groundwater. Prior to July 2013, transport into Allen Harbor via surface flow seemed unlikely given the presence of a wooden wall structure that contained a culvert that was approximately 90% below ground surface and plugged with soil at its base. In July 2013 QDC, in coordination with Rhode Island Coastal Resources Management Council (CRMC) under CRMC Maintenance Certification M 2013-04-080, removed the wooden structure and plugged culvert and scraped out the area subject to stormwater flowage (ASSF).

The QDC Outfall 001 area consists of an emergent wetland approximately 0.5 acre in size, surrounded by approximately 1.5 acres of forested wetland. A Functions and Values Assessment of the wetland was performed by Resolution and is included as Attachment B. The Drainage Ditch exits the northeast corner of the emergent wetland, runs approximately 300 feet northeast, and connects to an adjacent wetland to the northeast. Prior to July 2013, the former ASSF did not appear to be hydraulically connected to the tidal wetland to the east due to the wooden wall structure and plugged culvert. Standing water was only present in the western most part of the former ASSF and the depression immediately adjacent to the former plugged culvert intermittently, usually following significant rain events, based on site visits performed by Resolution between August 2012 and January 2013. The area between these two endpoints of the former ASSF remained dry. However, after wooden wall structure and plugged culvert were removed and the ASSF was scraped out by QDC in July 2013, the resulting Drainage Ditch allows for periodic flow from the wetland towards Allen Harbor.

1.2 Project Overview

In the wetland area downstream from the outfall, sediments contain PAHs, PCBs, and metals at concentrations exceeding risk screening levels. While there is no risk screening criterion for ETPH in sediment, the concentrations of ETPH in the sediment samples were an order of magnitude higher than the respective soil criterion, the RIDEM DEC for Residential Soils. The sediment samples collected in the wetland were only collected from the 0 to 6 inch horizon and were limited to within an approximate 30 foot radius of the area of the wetland immediately downstream of the area of the 2008 soil excavation. The extent of sediment contamination in the wetland requires additional delineation both vertically and laterally. Surface water, shallow ground water within the wetland,

and groundwater sampling are necessary to determine if these matrices have been impacted. In addition, the lateral and vertical extent of sediment contamination along with impacts to surface water, and groundwater will need to be delineated in the Drainage Ditch that exits the northeast corner of the wetland.

The Remedial Investigation outlined in the SAP is intended to delineate both vertically and horizontally the extent of impacts in the soil and sediment downstream of QDC Outfall 001, determine if the QDC-001 Outfall discharge has impacted surface water and/or shallow ground water in the wetland and Drainage Ditch, and determine if groundwater beneath the soil and sediment have been impacted. In addition, one boring will be advanced in the upland area 50 feet downgradient of catch basin CB-3 to confirm that the section of drain pipe that showed evidence of water infiltration did not impact subsurface soil. If inspection of the catch basins during the maintenance cleaning reveals deterioration or catch basins without a competent bottom, additional borings will be advanced adjacent to the catch basins to determine if the subsurface has been impacted. The Remedial Investigation is designed around a risk assessment framework. Sufficient data will be collected to identify potentially impacted areas, assess potential risks posed, refine the understanding of the local hydrogeology in and around the wetland, and complete the Remedial Investigation phase of the CERCLA process.

1.2.1 Site Preparation

Clearing

Prior to the initiation of the field investigation, either the driller or a separate subcontractor will clear (i.e., cut) the invasive common reed (*Phragmites australis*) in the wetland. This clearing is necessary to allow access to the wetland for a track mounted direct push drill rig. Powered string trimmers, hand tools, and/or brush cutters will be used for this task. The cut common reed (*Phragmites australis*) will be left in place, it will not be removed from the site for disposal. For access and health and safety reasons, minimal clearing of vegetation (e.g., cutting of branches, brush clearing) may also be required in the upland areas where sampling is to occur.

Sample Location Mark Out

Once the wetland study area has been cleared, Resolution will conduct a site visit to mark out the locations of the proposed borings and monitoring wells. The mark out of the locations will be utilized for utility clearance (described below).

Utility Clearance

Prior to the initiation of intrusive field work, utility clearance will be coordinated with QDC and Dig Safe.

Swamp Mats

It is anticipated that swamp mats, plywood, and/or DURA-BASE® mats will be required in the wetland to distribute the weight of the drill rig and allow access to all the sample locations. The driller or a separate subcontractor will be responsible for laying out the swamp mats, plywood, and/or DURA-BASE® mats prior to the start of the remedial investigation. The swamp mats, plywood, and/or DURA-BASE® mats will be removed at the conclusion of the remedial investigation.

1.2.2 Remedial Investigation

Surface and Subsurface Sediment Sample Collection

An estimated 80 sediment samples from 20 locations (four depths from each location) will be collected within the wetland. To the extent possible, surface and subsurface sediment samples will be collected using a direct push drill rig. In the event that a direct push drill rig is not able to access a location, hand corers and/or hand augers will be used. The SAP identifies sample locations and depths for the surface and subsurface samples; however, it is possible these will be modified in the field based on actual field conditions. Proposed boring locations are shown and Figure 10-5 of the Tier II Sampling and Analysis Plan (SAP), which is included as Attachment A.

Surface and Subsurface Soil Sample Collection

An estimated 30 soil samples from 10 locations (three depths per location) in the Drainage Ditch swale and 18 soil samples from 6 locations (three depths per location) in and around the footprint

of the 2008 excavation will be collected. In addition, 6 soil samples from 2 locations (three depths per location) will be collected during monitoring well installation at the well pairs installed upgradient of the wetland and adjacent to the outfall and one soil boring (three depths) will be advanced along the drain pipe approximately 50 feet downgradient of catch basin CB-3. Surface and subsurface soil samples will be collected using a direct push drill rig. The SAP identifies sample depths for the surface and subsurface samples; however, it is possible these will be modified in the field based on actual field conditions. Proposed boring locations are shown and Figure 10-6 of the Tier II SAP, which is included as Attachment A.

Monitoring Well Installation

Three shallow/intermediate well pairs will be installed during the Remedial Investigation as follows:

- one upgradient of the wetland;
- one adjacent to the 2008 excavation; and
- one within the wetland.

Shallow wells in and adjacent to the wetland will be screened from 2 ft to 12 ft bgs to properly seal the well at the surface. If a clear determination can be made in the field between fill material and underlying native materials, the screen length may be reduced to fully span the upper hydrostratigraphic unit (e.g. if the native materials are observed less than 12 ft bgs the shallow well will be installed to that depth). Intermediate monitoring wells will be installed using a 10 foot screen length from the upper hydrostratigraphic boundary (fill/native boundary) to 10 feet into the native materials. A determination of the start and end depth of the intermediate monitoring well screens will be determined in the field. If a clear boundary is not observed, then the intermediate well screens will be installed from 12 ft to 22 ft bgs. Proposed new monitoring well locations are shown on Figure 10-8 of the Tier II SAP, which is included as Attachment A.

Surface Water Sampling

Surface water samples will be collected from 5 locations within the wetland and 2 locations in the Drainage Ditch. Proposed surface water sample locations are shown on Figure 10-8 of the Tier II SAP, which is included as Attachment A.

Groundwater Sample Collection (Permanent Monitoring Wells)

The newly installed monitoring wells, as well as existing monitoring wells PGU-Z3-03S and PGU-Z3-03D, will be sampled once properly developed. Proposed new monitoring well locations and existing monitoring wells PGU-Z3-03S and PGU-Z3-03D are shown and Figure 10-8 of the Tier II SAP, which is included as Attachment A.

Grab Groundwater Sample Collection

Grab groundwater samples will be collected from temporary wells at 5 locations in the wetland, 3 locations in the Drainage Ditch, and potentially from the soil borings if evidence of impacts is detected. Proposed temporary well locations are presented on Figure 10-8 of the Tier II SAP, which is included as Attachment A

2.0 APPLICABLE SECTION OF COASTAL RESOURCE MANAGEMENT PROGRAM

The project is located in an area that is contiguous to coastal features (Allen Harbor, Narragansett Bay [see Figure 10-1 and Figure 10-2 of the Tier II SAP located in Attachment A]). The applicable sections for project type are listed below.

2.1 Section 300.1 Tidal Water, Shoreline Features, and Contiguous Areas

Section 300.1 Category B Requirements (1-11)

1.) This field investigation is necessary to delineate both vertically and horizontally the extent of impacts in the soil and sediment downstream of QDC Outfall 001, determine if the QDC-001 Outfall discharge has impacted surface water and/or shallow ground water in the wetland and Drainage Ditch, to determine if groundwater beneath the soil and sediment have been impacted, and to determine if areas along the drain line/catch basins leading to the outfall have been impacted in support of the Remedial Investigation as required by Navy/EPA/State regulation and policy. Ultimately, the planned investigation and subsequent environmental restoration, as necessary, will also allow productive reuse of property.

2.) All applicable ordinances, standards, codes and environmental requirements have or will be met in accordance with Title 15 of the Code of Federal Regulations, Part 930 Subpart C, Consistency for Federal Activities to the extent consistent with 42 U.S.C. section 9621(e)(1). The Navy has determined this action is consistent with the Rhode Island Coastal Resources Plan to the maximum extent practicable.

3.) Land area to be affected by the implementation of the proposed action is detailed in Figures 10-5 through 10-8 of the Tier II SAP, which is included as Attachment A.

This project will not:

4.) Result in significant impacts on erosion and/or deposition processes along the coastal shorelines or in tidal waters.

5.) Result in significant impacts on the abundance and diversity of plant and animal life.

6.) Unreasonably interfere with, impair, or significantly impact existing access to, or use of, tidal waters and/or the shore.

7.) Result in significant impacts to water circulation, flushing, turbidity, and sedimentation.

8.) Result in significant deterioration in the quality of the water in the immediate vicinity as defined by the Department of Environmental Management.

9.) Result in significant impacts to areas of historic and archaeological significance.

10.) Result in the significant conflicts with water-dependent uses and activities such as recreational boating, fishing, swimming, navigation, and commerce.

11.) Result in adverse scenic impact to the area.

2.2 Section 300. 2 – Filling, Removing, or Grading of Shoreline Features

2.2.1 Section 300.1 Category B Requirements (1-11)

As indicated in Figure 10-2, the remedial investigation work planned for the QDC Outfall 001 area is not located at the shoreline but is located in an area which is contiguous to the shoreline. No permanent structures are proposed for the purposes of conducting this work. Excess water and solids generated as a consequence of the remedial investigation activities will be collected and managed as wastes in accordance with RIDEM, EPA, and Department of Transportation (DOT) requirements.

As described in Section 1.2.1, clearing of the invasive common reed (*Phragmites australis*) in the wetland using powered string trimmers, hand tools, and/or brush cutters will be performed prior to the field investigation in order to mark out sample locations, perform utility clearance, and allow access for the direct-push drill rig. For access and health and safety reasons, minimal clearing of vegetation (e.g., cutting of branches, brush clearing) may also be required in the upland areas where sampling is to occur. All clearing will be kept to a minimum and performed in a manner to minimize environmental impacts to the maximum extent possible. Swamp mats, plywood, and/or DURA-BASE® mats will be placed in the wetland to distribute the weight of the drill rig and allow access to all the sampling points. The swamp mats, plywood, and/or DURA-BASE® mats will be removed at the conclusion of the remedial investigation.

As described in Section 1.2.2, soil, sediment, and surface water sampling, along with groundwater monitoring well installation and sampling will be conducted in and around the area of the wetland downgradient of the QDC Outfall 001. A track mounted direct-push drill rig will be used for the borings and monitoring well installation. The borings for the sampling and monitoring well installation are not anticipated to exceed 22 ft bgs, but may extend deeper based on field observations. The diameter of the borings will not exceed 12 inches. Excess groundwater and solids generated as a consequence of the field investigation will be collected and treated as IDW in accordance with RIDEM and EPA requirements.

No work is planned along the shoreline. The remedial investigation activities at QDC Outfall 001 will be in compliance with the standards and policies stated in Section 300.2 of the CRMP to the maximum extent practicable.

2.3 Section 300.12 Coastal Wetland Mitigation

The delineated wetland area in which this work is proposed, includes approximately 2 acres of seasonally to permanently flooded palustrine emergent marsh habitat surrounded by palustrine forested wetland habitats. The wetland is located just north and east of QDC Outfall 001. The emergent portion is dominated by dense stands of the invasive species *Phragmites australis*. The presence of invasive plants creates a decline in native species and diminishes the suitability of available habitat. Therefore, the proposed work, including the pre-clearing of the common reed (*Phragmites australis*) in the emergent wetland, will be compliant with the standards and policies stated in Section 300.12 of the CRMP to the maximum extent practicable. No adverse wetlands impact is anticipated. No wetlands mitigation is required.

3.0 DETERMINATION

The project will not negatively impact current environmental resources at the QDC Outfall 001 remedial investigation area. Necessary measures will be taken to not disturb the surrounding areas or impact shoreline features. In accordance with 15 CFR 930 Subpart C, Consistency for Federal Activities, it has been determined this action is consistent to the maximum extent practicable with the RI CRMP.

Attachment A

Tier II Sampling and Analysis Plan QDC Outfall 001 Remedial Investigation Resolution Consultants Draft Revision 1, February 10, 2014

Tier II SAMPLING AND ANALYSIS PLAN
QDC Outfall 001 Remedial Investigation, Former Naval Construction Battalion Center (NCBC) Davisville, North Kingstown, Rhode Island

DRAFT

Prepared for:

Department of the Navy
Naval Facilities Engineering Command, Mid-Atlantic
9742 Maryland Ave.
Norfolk, VA 23511-3095

Contract Number N62470-11-D-8013

CTO WE23

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February 10, 2014

SAP Worksheet #1: Title and Approval Page

Draft Revision 1

Tier II SAMPLING AND ANALYSIS PLAN

February 10, 2014

QDC Outfall 001 Remedial Investigation
Former NCBC Davisville OU10
North Kingstown, RI

Prepared for:
Department of the Navy
Naval Facilities Engineering Command, Mid-Atlantic
9742 Maryland Ave.
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Prepared under:
Contract Number N62470-11-D-8013

CTO WE23

Review Signature: _____

Robert Shoemaker, CTO Manager — Date
Resolution Consultants

Approval Signature: _____

Ken Bowers/Chemist, QA Manager — Date
US Navy

Other Approval Signature: _____

Jeffery Dale, Navy RPM — Date
US Navy

EXECUTIVE SUMMARY

This Sampling and Analysis Plan (SAP) was prepared by Resolution Consultants (Resolution) for the U.S. Department of the Navy (Navy) and the Naval Facilities Engineering Command (NAVFAC). Resolution has conducted this work under NAVFAC Atlantic, Comprehensive Long-Term Environmental Action, Navy (CLEAN) Contract No. N62470-11-D-8013, Contract Task Order (CTO) WE23. This SAP pertains to planned field investigation and data evaluation for the Quonset Development Corporation (QDC) Outfall 001 Remedial Investigation (RI) at Operable Unit (OU) 10 of the former Naval Construction Battalion Center (NCBC) Davisville, North Kingstown, Rhode Island. This SAP follows the Navy Tier II format, which combines worksheets 4, 7 and 8; 18, 19, 20, and 30; 34, 35, and 36; and eliminates Worksheets 2, 3, 13, 16, 22, 24, 25, 26, 27, 29, 31, 32, and 33.

The primary objective of the investigation is to delineate both vertically and horizontally the nature and extent of impacts to sediment, soil, surface water, and groundwater downgradient of the QDC Outfall 001 and position the site for an appropriate response action per the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. The specific goals of the investigations are listed below and further defined in this SAP:

- Goal 1 – Delineate the nature and extent of historical release(s) to the wetland and Drainage Ditch and determine pathways for contaminant transport to and from the wetland and Drainage Ditch;
- Goal 2 – Provide data for evaluation in the human health and ecological risk assessments to determine whether potential risks/hazards to human and/or ecological receptors are above target levels; and
- Goal 3 – Determine if subsurface soil has been impacted in the area of the drain line 50 feet downgradient of Catch Basin-3 (CB-3) or in the areas of any catch basins that have deteriorated or do not have competent bottoms.

The investigation objectives will be accomplished through the following:

- Collection of 80 sediment samples from 20 location within the wetland;
- Collection of 5 surface water samples within the wetland;
- Collection of 5 grab groundwater samples within the wetland;
- Collection of 30 soil samples from 10 locations in the Drainage Ditch northeast of the wetland;

- Collection of 6 soil samples from 2 locations within the footprint of the excavation at Outfall 001;
- Collection of 6 soil samples from 2 locations on the Northwest side of the excavation at Outfall 001, and 6 soil samples from 2 locations on the Southeast side of the excavation at Outfall 001:
- Collection of 3 soil samples from 1 location downgradient of CB-3;
- Collection of 3 surface water samples in the Drainage Ditch;
- Collection of 3 grab groundwater samples in the Drainage Ditch;
- Installation and sampling of 3 shallow/intermediate groundwater pairs in and around the wetland; and
- Collection of groundwater samples from existing well pair PGU-Z3-03S/PGU-Z3-03D.

The soil, sediment, surface water, and groundwater data will be evaluated in order to determine potential risk to human or ecological receptors; and whether a removal or remedial action is warranted as part of the CERCLA process.

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Figures

Appendices

ACRONYMS AND ABBREVIATIONS

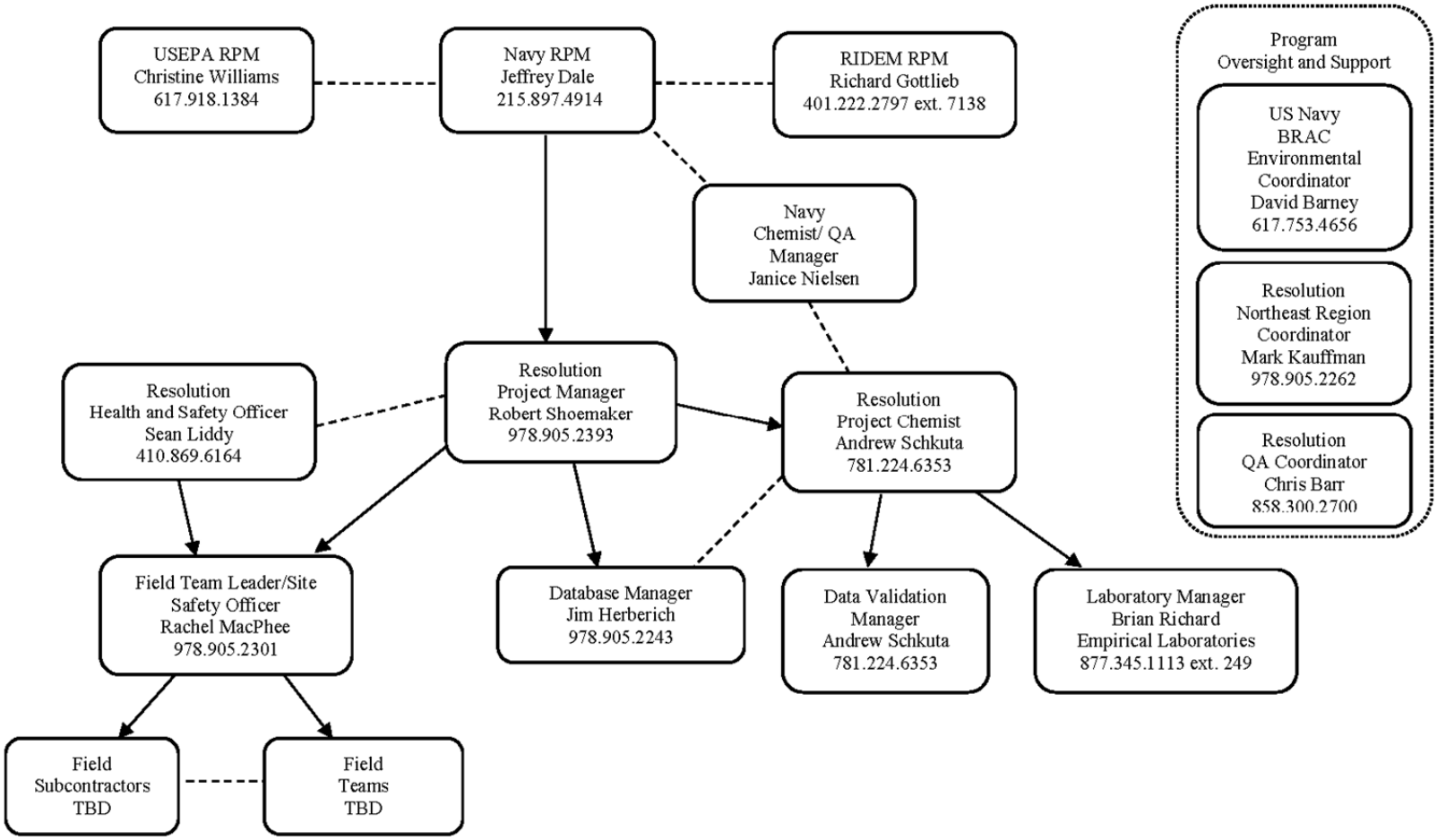
°C	Degrees Celsius
AVS/SEM	Acid Volatile Sulfides/Simultaneously Extracted Metals
ASSF	Area Subject to Stormwater Flowage
BERA	Baseline Ecological Risk Assessment
BGS	Below Ground Surface
BHHRA	Baseline Human Health Risk Assessment
BTAG	Biological Technical Assistance Group
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CB	Catch Basin
CED	Construction Equipment Department
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action, Navy
CoC	Chain-of-Custody
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CSM	Conceptual Site Model
CTO	Contract Task Order
DEC	Direct Exposure Criteria
DL	Detection Limit
DO	Dissolved Oxygen
DoD	Department of Defense
DQI	Data Quality Indicator
EE/CA	Engineering Evaluation and Cost Analysis
ELAP	Environmental Laboratory Accreditation Program
ETPH	Extractable Total Petroleum Hydrocarbon
ERA	Ecological Risk Assessment
FEMA	Federal Emergency Management Agency
FUDS	Formerly Utilized Defense Site
FS	Feasibility Study
FTL	Field Team Leader
FTMR	Field Task Modification Request
GRO	Gasoline Range Organic
GPS	Global Positioning System
HHRA	Human Health Risk Assessment
IDW	Investigation-Derived Waste
IR	Installation Restoration
IRP	Installation Restoration Program
LOD	Limit of Detection
LOQ	Limit of Quantitation
MCL	Maximum Contaminant Level
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NA	Not Applicable

NAVD	North American Vertical Datum
NAVFAC MIDLANT	Naval Facilities Engineering Command, Mid-Atlantic
NAVSTA	Naval Station
Navy	U.S. Department of the Navy
NEDD	Navy Electronic Data Deliverable
NIRIS	Naval Installation Restoration Information Solution
NOAA	National Oceanographic and Atmospheric Administration
NTU	Nephelometric Turbidity Unit
ORP	Oxidation-Reduction Potential
ORNL	Oak Ridge National Laboratories
OU	Operable Unit
PAHs	Polycyclic Aromatic Hydrocarbons
PAL	Project Action Limit
PCBs	Polychlorinated Biphenyls
PDF	Portable Document Format
PEM	Palustrine Emergent Marsh
PFO	Palustrine Forested Wetland
PID	Photoionization Detector
PM	Project Manager
PMO	Program Management Office
POC	Point of Contact
PPE	Personal Protective Equipment
PPM	Parts per Million
PQOs	Project Quality Objectives
PSLs	Project Screening Levels
QDC	Quonset Development Coporation
QA/QC	Quality Assurance/Quality Control
QSM	Quality Systems Manual
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
Resolution	Resolution Consultants
RI	Remedial Investigation
RIDEM	Rhode Island Department of Environmental Management
RPD	Relative Percent Difference
RPM	Remedial Program Manager
RTC	Response to Comments
RV	Recreational Vehicle
RSL	Regional Screening Levels
SA	Study Area
SAP	Sampling and Analysis Plan
SCV	Secondary Chronic Values
SI	Site Investigation
SOP	Standard Operating Procedure
SQBs	Sediment Quality Benchmarks
SQuiRTs	Screening Quick Reference Tables
SSO	Site Safety Officer
SVOCs	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TAT	Turnaround Time

TBD	To Be Determined
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USTs	Underground Storage Tanks
VOCs	Volatile Organic Compounds
VPH	Volatile Petroleum Hydrocarbon

SAP Worksheet #5: Project Organizational Chart (NCBC Davisville OU10)

Lines of Authority ———— Lines of Communication - - - - - - - - - - - -



SAP Worksheet #6: Communication Pathways (NCBC Davisville OU10)

(UFP-QAPP Manual Section 2.4.2)

The communication pathways for the SAP are shown below.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
Regulatory Agency Interface	Base Realignment and Closure (BRAC) Program Management Office (PMO) Northeast Naval Facilities Engineering Command, Mid-Atlantic (NAVFAC MIDLANT)	Jeffrey Dale	215.897.4914	Navy Remedial Program Manager (RPM) will interface with Regulatory Agency directly via phone or email as needed.
Field Progress Reports	Resolution	Robert Shoemaker	978.905.2393	The Resolution Field Team Leader will email daily field progress reports to the Resolution Project Manager (PM). In addition, there will be phone conversation between the Resolution Field Team Leader and the Resolution PM as needed.
Stop Work due to Safety Issues	Resolution	Rachel MacPhee	978.905.2301	The Resolution Site Safety Officer (SSO) will verbally inform onsite personnel, including subcontractors as soon as possible. The Resolution SSO will verbally inform the Resolution PM of the Stop Work condition as well as when it is resolved. As need be, the Resolution SSO and/or PM will work with the Resolution Health & Safety Officer to resolve issues.
SAP/Work Plan (WP) Changes prior to Field/ Laboratory Work	Resolution	Robert Shoemaker	978.905.2393	The Resolution PM will notify the Navy RPM either verbally or via email of any planned amendments to the SAP. The Resolution PM will document the changes via a Field Task Modification Request (FTMR) form and a concurrence letter.
SAP/WP Changes in the Field	Resolution	Rachel MacPhee	978.905.2301	The Resolution Field Team Leader will verbally notify the Resolution PM as soon as practical of realizing a need for an amendment. The Resolution PM will notify the Navy RPM either verbally or via email the same day of the realized change and the changes will be documented in a scheduled impact letter to the Navy RPM.
Field Corrective Actions	Resolution	Rachel MacPhee	978.905.2301	The need for corrective action for field issues will be determined by the Resolution Field Team Leader. The Resolution Field Team Leader will notify the Resolution PM.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
Sample Receipt Variances	Resolution	Andrew Schkuta	781.224.6353	The laboratory will notify the Resolution Project Chemist of any issues with respect to sample receipt. The Resolution Project Chemist will notify the Resolution PM and/or Field Team Leader.
Notification of Non-Usable Data	Empirical Laboratories	Marianne Walker	877.345.1113 extension 249	If the laboratory determines that any data they have generated is non-usable, the Laboratory PM will notify (verbally or via e-mail) the Resolution Project Chemist within 1 business day of when the issue is discovered. The Resolution Project Chemist will notify (verbally or via e-mail) the Resolution PM within 1 business day of the need for corrective action, if the non-usable data is a significant issue (i.e., critical sample data). Corrective action may include resampling and/or reanalyzing the affected samples. The Resolution Project Chemist will notify (verbally or via e-mail) Navy Project Chemist within 1 business day such that the Navy can determine if QA issues with the laboratory have the potential to impact other Navy projects. If the Resolution Project Chemist or data validator identifies non-usable data during the data validation process, the Resolution PM and Navy Project Chemist will be notified verbally or via e-mail within 48 hours of validation completion that a non-routine and significant laboratory quality deficiency has resulted in non-usable data. The Resolution PM will take corrective action appropriate for the identified deficiency to ensure the project objectives are met. The Resolution PM will notify (verbally or via e-mail) the Navy RPM of any problems with the laboratory or analysis that could significantly affect the usability of the data or project failures that impact the ability to complete the scope of work. The Navy RPM, may at his discretion, contact the Navy Project Chemist for assistance in problem resolution. Such notification will be made within 1 business day of when the issue is discovered.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
Reporting Lab Quality Variances	Resolution	Andrew Schkuta	781.224.6353	The laboratory will notify the Resolution Project Chemist of any issues in the analytical report case narrative.
Analytical Corrective Actions	Resolution	Andrew Schkuta	781.224.6353	The need for corrective action for analytical issues will be determined by the Resolution Project Chemist.
Laboratory Quality Issues	Resolution	Andrew Schkuta	781.224.6353	The Resolution Project Chemist will make the Resolution PM aware of any laboratory quality issues. The Resolution PM will notify the Navy RPM if any laboratory quality issues will significantly impact the project (i.e., significant meaning data is not useable or project schedule or costs have been majorly impacted). As appropriate, the Navy RPM will notify the Navy Chemist to ensure other Navy projects are not impacted.
Reporting Data Validation Issues	Resolution	Andrew Schkuta	781.224.6353	The Resolution Project Chemist will provide the Resolution PM with a report of any issues affecting data quality as identified during the validation process. As necessary, the Resolution Project Chemist will notify the laboratory as soon as possible if issues are found with the data and work with the laboratory to resolve any issues.
Data Validation Corrective Actions	Resolution	Andrew Schkuta	781.224.6353	The Resolution Project Chemist will notify the Resolution PM of any actions that may be required as a result of the data validation.

SAP Worksheet #9-1: Project Scoping Session Participants Sheet (NCBC Davisville OU10)

(UFP-QAPP Manual Section 2.5.1)

Project Name:	QDC Outfall 001 RI	**Site Name:**	NCBC Davisville (Former CED Area, OU10)
Projected Date(s) of Sampling:	Winter/Spring 2014	**Site Location:**	North Kingstown, RI
Project Manager:	Robert Shoemaker		
Date of Session:	11/28/2012		
Scoping Session Purpose:	Discuss Sampling Approach		

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Jeffrey Dale	BRAC RPM	BRAC PMO Northeast NAVFAC MIDLANT	215.897.4914	Jeffrey.M.Dale@navy.mil	Navy Project Management
Robert Shoemaker	CTO Manager	Resolution	978.905.2393	Robert.Shoemaker@aecom.com	Resolution Project Management

Comments/Decisions:

- Discussed the scope of the investigation
- Discussed review comments of the preliminary Worksheets 10, 11, and 17
- Discussed approach to groundwater sampling
- Discussed historical data from the Former NIKE PR-58 RI

Action Items:

- Set up a separate call with the risk assessors prior to submitting the internal draft SAP

Consensus Decisions:

- Need to add monitoring well pair (shallow and intermediate) upgradient of the wetland

SAP Worksheet #9-2: Project Scoping Session Participants Sheet (NCBC Davisville OU10)

(UFP-QAPP Manual Section 2.5.1)

Project Name:	QDC Outfall 001 RI	**Site Name:**	NCBC Davisville (Former CED Area, OU10)
Projected Date(s) of Sampling:	Winter/Spring 2014	**Site Location:**	North Kingstown, RI
Project Manager:	Robert Shoemaker		
Date of Session:	2/4/2013		
Scoping Session Purpose:	Discuss Risk Approach		

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Jeffrey Dale	BRAC RPM	BRAC PMO Northeast NAVFAC MIDLANT	215.897.4914	Jeffrey.M.Dale@navy.mil	Project Management
Robert Shoemaker	CTO Manager	Resolution	978.905.2393	Robert.Shoemaker@aecom.com	Project Management
David Barclift	Navy Risk Assessor	NAVFAC MIDLANT	215.897.4913	David.Barclift@navy.mil	Risk Assessor
Julie Kabel	Human Health Risk Assessor	Resolution	603.263.2145	Julie.Kabel@aecom.com	Human Health Risk Assessor
Christine Archer	Ecological Risk Assessor	Resolution	603.622.1556	Christine.Archer@aecom.com	Ecological Risk Assessor
Suzy Baird	Field Team Leader/Project Scientist	Resolution	978.905.2116	Suzy.Baird@aecom.com	Field Team Leader/Project Scientist

Comments/Decisions:

- Discussed the scope of the investigation, including discussion of pathways and endpoints to include in human health risk assessment (HHRA)
- Discussed use of existing background data

Action Items:

- Include Federal Emergency Management Agency (FEMA) flood zones in figures
- Navy to provide Coddington Cove Risk Assessment

Consensus Decisions:

- Will need to include groundwater in the hypothetical future off-site residential exposure
    - Will include decision statement – if groundwater not potable then it will not be included in HHRA
- Will add construction/utility worker exposure scenario in HHRA
- Soil and sediment will be evaluated separately in the HHRA because the evaluation of soil exposure pathways included inhalation of fugitive dust and evaluation of sediment exposure pathways does not

SAP Worksheet #9-3: Project Scoping Session Participants Sheet (NCBC Davisville OU10)

(UFP-QAPP Manual Section 2.5.1)

Project Name:	QDC Outfall 001 RI	**Site Name:**	NCBC Davisville (Former CED Area, OU10)
Projected Date(s) of Sampling:	Winter/Spring 2014	**Site Location:**	North Kingstown, RI
Project Manager:	Robert Shoemaker		
Date of Session:	3/13/2013		
Scoping Session Purpose:	Discuss Internal Draft SAP		

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Jeffrey Dale	BRAC RPM	BRAC PMO Northeast NAVFAC MIDLANT	215.897.4914	Jeffrey.M.Dale@navy.mil	Project Management
Kenneth Bowers	Navy Chemist	NAVFAC MIDLANT	757.322.8341	Kenneth.A.Bowers@navy.mil	Project Chemist
Robert Shoemaker	CTO Manager	Resolution	978.905.2393	Robert.Shoemaker@aecom.com	Project Management
Kristen Durocher	Risk Assessor	Resolution	603.581.6608	Kristen.Durocher@aecom.com	Risk Assessment Review and Background Evaluation
Julie Kabel	Human Health Risk Assessor	Resolution	603.263.2145	Julie.Kabel@aecom.com	Human Health Risk Assessor
Christine Archer	Ecological Risk Assessor	Resolution	603.622.1556	Christine.Archer@aecom.com	Ecological Risk Assessor
Suzy Baird	Field Team Leader/Project Scientist	Resolution	978.905.2116	Suzy.Baird@aecom.com	Field Team Leader/Project Scientist

Comments/Decisions:

- Discussed recent comments on SAP regarding modifying sampling scope and adopting a more phased approach
- Discussed potential sources for background data

Action Items:

- Awaiting Coddington Cove Risk Assessment
- Awaiting information regarding background data

Consensus Decisions:

- Will not be broadly modifying scope of SAP
- Remove groundwater well pair from the area subject to stormwater flowage (ASSF)
- Eliminate surface water VOC samples
- Will add Allen-Madison House property to CSM/Worksheet 10

SAP Worksheet #9-4: Project Scoping Session Participants Sheet (NCBC Davisville OU10)

(UFP-QAPP Manual Section 2.5.1)

Project Name:	QDC Outfall 001 RI	**Site Name:**	NCBC Davisville (Former CED Area, OU10)
Projected Date(s) of Sampling:	Winter/Spring 2014	**Site Location:**	North Kingstown, RI
Project Manager:	Robert Shoemaker		
Date of Session:	11/14/2013		
Scoping Session Purpose:	Document Changes to the Sample Locations based on EPA Site Visit		

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Jeffrey Dale	BRAC RPM	BRAC PMO Northeast NAVFAC MIDLANT	215.897.4914	Jeffrey.M.Dale@navy.mil	Project Management
Christine Williams	USEPA	USEPA Region 1 Federal Facility Superfund Section	617.918.1384	williams.christine@epa.gov	EPA Project Manager
Robert Shoemaker	CTO Manager	Resolution	978.905.2393	Robert.Shoemaker@aecom.com	Project Management
Rachel MacPhee	Field Team Leader/Project Scientist	Resolution	978.905.2301	Rachel.macphee@aecom.com	Field Team Leader/Project Scientist

Comments/Decisions:

- Following a site visit, USEPA requested that two of the soil boring locations in the Drainage Ditch be moved; one moved to a location beyond the former wooden wall structure with the plugged culvert at its base, and one to a location where an abandoned outfall enters the drainage ditch. This request was included in the SAP comments dated November 14, 2013.

Action Items:

- The Navy will move these two locations and document the change in this Worksheet 9-4.

Consensus Decisions:

- The Navy agrees to move the two locations as requested by USEPA.

SAP Worksheet #9-5: Project Scoping Session Participants Sheet (NCBC Davisville OU10)

(UFP-QAPP Manual Section 2.5.1)

Project Name:	QDC Outfall 001 RI	**Site Name:**	NCBC Davisville (Former CED Area, OU10)
Projected Date(s) of Sampling:	Winter/Spring 2014	**Site Location:**	North Kingstown, RI
Project Manager:	Robert Shoemaker		
Date of Session:	12/16/2013		
Scoping Session Purpose:	Discuss EPA and RIDEM Risk Assessments comments on the Draft		

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Jeffrey Dale	BRAC RPM	BRAC PMO Northeast NAVFAC MIDLANT	215.897.4914	Jeffrey.M.Dale@navy.mil	Project Management
Dave Barclift	Navy Risk Assessor	NAVFAC MIDLANT	215.897.4913	David.Barclift@navy.mil	Risk Assessor
Robert Shoemaker	CTO Manager	Resolution	978.905.2393	Robert.Shoemaker@aecom.com	Project Management
Julie Kabel	Human Health Risk Assessor	Resolution	603.263.2145	Julie.Kabel@aecom.com	Human Health Risk Assessor
Christine Archer	Ecological Risk Assessor	Resolution	603.622.1556	Christine.Archer@aecom.com	Ecological Risk Assessor
Rachel MacPhee	Field Team Leader/Project Scientist	Resolution	978.905.2301	Rachel.macphee@aecom.com	Field Team Leader/Project Scientist

Comments/Decisions:

- Discussed comments on SAP regarding risk assessment approach
- Discussed EPA comment on SAP requesting analyzing PCBs as congeners instead of aroclors

Action Items:

- Navy to determine if there is an applicable background data set from another Rhode Island site

Consensus Decisions:

- A hypothetical future on-site resident exposure scenario will be added
- PCBs will be analyzed as Aroclors

SAP Worksheet #4, 7, and 8: Personnel Qualifications and Sign-off Sheet (NCBC Davisville OU10)

(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)

ORGANIZATION: Resolution Consultants

Name	Project Title/Role	Signature/Date
Robert Shoemaker	CTO Manager	
Andrew Schkuta	Project Chemist/Data Validation Manager	
Rachel MacPhee	Project Scientist/ Field Team Leader/Site Safety Officer	
Julie Kabel	Human Health Risk Assessor	
Christine Archer	Ecological Risk Assessor	

ORGANIZATION: Drilling Contractor

Name	Project Title/Role	Signature/Date
TBD		

ORGANIZATION: Empirical Laboratories, LLC

Name	Project Title/Role	Signature/Date
Marianne Walker	Project Manager	

*Signatures indicate personnel have read and agree to implement this SAP as written

SAP Worksheet #10-1: Conceptual Site Model, QDC Outfall 001 RI (NCBC Davisville OU10)

(UFP-QAPP Manual Section 2.5.2)

Overview

This SAP has been prepared to conduct an RI at QDC Outfall 001. The matrices to be sampled during the QDC Outfall 001 RI include sediment, soil, surface water, grab groundwater, and groundwater as defined below.

- Sediment – solid material located in the in the wetland
- Soil – solid material in the Drainage Ditch and from borings in the upland areas and within and around the footprint of the QDC excavation
- Surface Water – standing water, if any, in the wetland and Drainage Ditch
- Grab Groundwater – shallow groundwater collected from driven points
- Groundwater – groundwater collected from permanent monitoring wells

The overall objectives of the RI are to delineate both vertically and horizontally:

a) the extent of impacts in the sediment within the QDC wetland;

b) the extent of impacts to soil within the Drainage Ditch downstream of the wetland; and

c) the extent of possible impacts to subsurface soil beneath the pipe and catch basins leading to QDC-001 Outfall.

Additional objectives of the RI are:

d) to determine if surface water and groundwater downgradient of QDC Outfall 001 has been impacted

QDC Outfall 001 is located in the central portion of the Former NCBC Davisville facility, to the west of Allen Harbor. Installation Restoration Program (IRP) Site 09 (Allen Harbor Landfill) is located to the northeast of the outfall, IRP Site 16 (Former Fire Training Area and Creosote Dip Tank) is located to the east and south of the outfall, the historic Allen Madison State Historic Site is located to the south, and the Former Construction Equipment Department (CED) Area is located to the west. QDC Outfall 001 is located near the parking lot at the end of Marine Road, behind a chain-link fence that surrounds the parking area for recreational users of Allen Harbor Landfill and Calf Pasture Point. Undeveloped wetlands are present to the east of the outfall. Groundwater flow direction in the outfall area is toward the east.

During stormwater outfall maintenance activities in the summer of 2008, QDC excavated soil that was present downstream from the drain pipe outlet. During this excavation, QDC observed stained soils and olfactory evidence of contamination. QDC stockpiled this soil adjacent to the outfall and contacted the Navy. Analytical results from the soil stockpile sample indicated the presence of total petroleum hydrocarbons (TPH; >10,000 mg/kg), volatile organic compounds (VOCs; primarily methyl-, chloro-, and propyl-benzenes), polychlorinated biphenyls (PCBs; 0.3 mg/kg Aroclor-1260), polycyclic aromatic hydrocarbons (PAHs), and metals (420 mg/kg lead). In December 2008 the soil stockpile was transported under a non-hazardous waste manifest for disposal at ESMI of New Hampshire.

Based on a review of historical as-built drawings of drainage systems at the former NCBC Davisville, Outfall 001 is the discharge point for an underground drainage line that originated from the former Building 224. Building 224 was part of the CED Area located approximately 1,000 feet to the southwest of the outfall. Building 224 was used by the Navy as a vehicle maintenance and truck washing facility. Contaminated materials and wash pad residues from these activities or other historical activities at the CED Area may have been disposed of into the Building 224 drainage system and discharged into the outfall area. The drainage pipe has been inactive since at least 2006 when Building 224 was demolished. Chemicals used during historical truck maintenance activities (and other historical activities that occurred in and around the Building 224 area) probably entered the drainage system and were transported along the length of the pipe, discharging into soils in the drainage swale downstream from the pipe and migrating with the flow of surface water further downstream toward the wetland area. Contaminants migrating toward the wetland area will either accumulate in the wetland or migrate to groundwater. Prior to July 2013, transport into Allen Harbor via surface flow seemed unlikely given the presence of a wooden wall structure that contained a culvert that was approximately 90% below ground surface and plugged with soil at its base. In July 2013 QDC, in coordination with Rhode Island Coastal Resources Management Council (CRMC), removed the wooden structure and plugged culvert and scraped out the ASSF. The resulting Drainage Ditch now allows for periodic flow of surface water from the wetland toward Allen Harbor when the water table is sufficiently high.

The primary reference document that best describes key elements of the Conceptual Site Model (CSM) is the Drain Line Investigation and Data Report for Former CED Area/QDC Outfall 001, Former Naval Construction Battalion Center Davisville, North Kingstown, Rhode Island, Revision 1 (Tetra Tech, 2012). This reference document provides the majority of information discussed in this worksheet.

The following CSM figures have been developed to support this worksheet and the overall approach to the planned site investigation.

- Figure 10-1 – Regional Location,
- Figure 10-2 – Former CED Area and QDC Outfall 001
- Figure 10-3 – QDC Outfall 001 Wetland and Drainage Ditch
- Figure 10-4 – Potential Exposure Pathways
- Figure 10-5 – Proposed Sediment Sample Locations
- Figure 10-6 – Proposed Soil Sample Locations
- Figure 10-7 – Proposed Surface Water Locations
- Figure 10-8 – Proposed Groundwater Sample Locations
- Figure 10-9 – Historical Soil and Sediment Sample Locations

Operational History

The Former NCBC Davisville was primarily used for training the Navy Construction Battalion "Seabees" in construction operations. The area also served as freight yards and storage areas for construction materials. Based on a review of historical "as-built" drawings of drainage systems at the former NCBC, QDC Outfall 001 is the discharge point for an underground drainage pipeline that originates from the former Building 224. Building 224 was part of the CED Area and was located approximately 1,000 feet southwest of the outfall on a parcel of land bounded by Seabee Avenue to the west, Perimeter Road to the north, the Allen Madison State Historic Site to the south, and light wooded vegetation to the east (Figure 10-2).

The former Building 224 and nearby truck wash pad/oil water separator is the presumed source of contamination present in the outfall area. The building was used by the Navy as a vehicle-maintenance and truck-washing facility. Contaminants associated with materials used in these activities or in other historical activities conducted at the CED Area may have been disposed/released into the Building 224 drainage system, discharging at QDC Outfall 001. The areas of Building 224 that are presumed to have contributed to the contamination in the outfall area are summarized below.

- Study Area 01 – CED Drum Storage Area. Study Area 01 is an open field located north of Building 224. From the late 1960s to 1974, the area was used to store 55-gallon drums of solvents and waste oil, with as many as 500 drums stored at one time. The condition of the drums was reported to be deteriorated, and liquids may have leaked onto the ground. The drums were removed in 1974. For a brief time, from December 1991 to April 1992, the area was used as a leaching field that received storm water and surface water runoff from a truck-washing area located at Building 224. There are approximately nine storm water

catch basins in the study area 1 area that are connected to the pipe leading to QDC Outfall 001.

- An outdoor vehicle wash pad and oil-water separator existed north of Building 224, both of which drained into the pipe leading to QDC Outfall 001. The wash pad and oil water separator have since been removed (EA, 1995; EA, 1998).

The contaminated materials removed during these removal actions occurred as a result of the activities at the CED Area, and the same types of materials may have entered into the Building 224 drainage line. Therefore, waste oil and solvents, battery acid lead, TPH, and PCBs that may have entered into the drainage line are the potential sources of contamination present in the outfall area, and the contamination present at the wetland is being addressed under the Navy's IRP as part of the CED Area.

It is believed the primary source of contamination in the wetland is the vehicle wash pad, oil water separator, and former Building 224 drainage system. Additional contaminants (e.g., pesticides) may have also impacted the wetland during historical agricultural activities associated with the Allen Madison State Historic Site.

Site Description

The study area is currently undeveloped. A parking area for the Quonset Bike Path is located at the end of Marine Road approximately 600 feet northwest of QDC Outfall 001. Two legs of the Quonset Bike Path are located north of the QDC Outfall 001 wetland, one that travels northeast towards IRP Site 09 (Allen Harbor Landfill) and IRP Site 07 (Calf Pasture Point), and one that travels west towards Allen Harbor. Access to the QDC Outfall 001 area is currently impeded but not restricted by the chain link fence that surrounds the parking area located at the end of Marine Road. The Carriage Hill residential area is to the north.

The QDC Outfall 001 area consists of an emergent wetland approximately 0.5 acre in size, surrounded by approximately 1.5 acres of forested wetland (Resolution, 2012). A Drainage Ditch exits the northeast corner of the emergent wetland, runs approximately 300 feet northeast, and connects to an adjacent wetland to the northeast. Prior to July 2013, the Drainage Ditch (formerly the ASSF) contained a wooden wall structure that had a culvert at its base that was approximately 90% below ground surface and plugged with soil that appeared to prevent the wetland from being hydraulically connected to the tidal wetland to the east. Standing water was only present in the western most part of the former ASSF and the depression immediately adjacent to the former plugged culvert intermittently, usually following significant rain events, based on site visits performed by Resolution between August 2012 and January 2013. The area between these two endpoints of the former ASSF remained dry. However, after wooden wall structure and plugged

culvert were removed and the ASSF was scraped out by QDC in July 2013, the resulting Drainage Ditch allows for periodic flow from the wetland towards Allen Harbor.

The wetland and associated Drainage Ditch do not contain fish as these areas only intermittently contain surface water during periods when the water table is high. Therefore, these areas are not a source of fish for human consumption.

In August 2012, Resolution performed a function and values assessment of the wetland for the purposes of inventorying and planning, to qualitatively describe biological condition and integrity of wetland resource area and wildlife habitat, and to assist in the selection of assessment and measurement endpoints for a baseline ecological risk assessment (Resolution, 2012). The wetland is a state jurisdictional wetland pursuant to the RI Freshwater Wetlands Act, however due to its small size (i.e., less than 3-acres and less than 1-acre of marsh) it does not include a jurisdictional 50-foot Perimeter Wetland (Rule 4.00 of the RI Freshwater Wetlands Act). Much of this wetland can be described as palustrine emergent marsh (PEM) habitat surrounded by palustrine forested wetland (PFO) habitat. The wetland provides three (3) principal functions: Sediment/Toxicant Retention, Nutrient Removal, and Wildlife Habitat. The wetland's depressional characteristic helps to retain water volumes following heavy rain events for long enough duration to trap sediments and toxicants. In addition, dense stands of common reed also slow flow velocity and trap sediment and nutrients. However, the wetland is small in size and the Drainage Ditch located at its northeast corner allows some amounts of water to collect or possibly flow towards Allen Harbor following heavy rain events.

Previous Site Investigation Activities

Between 2001 and 2007 the Navy conducted annual groundwater monitoring of the deep and bedrock aquifers at IRP Site 03 – CED Solvent Disposal Area to evaluate concentrations of chlorinated volatile organic compounds (CVOCs) where solvents are reported to have been disposed during Navy operations at the CED Area. However, the majority of the CVOCs in groundwater beneath the CED Area are believed to be present as a result of a release from an upgradient property, the Former NIKE PR-58 US Army Corps of Engineers (USACE) Formerly Utilized Defense Site (FUDS). In addition, based on data from groundwater monitoring wells in the area of QDC Outfall 001 (e.g., MW-Z3-02, MW01-13D, and MW01-15D/R), the extent of CVOCs in the deep and bedrock aquifers does not extend beneath the QDC Outfall 001 wetland area (Johnson, 2011).

In 2010, Tetra Tech NUS Inc. (Tetra Tech) conducted a drain line investigation and Study Area Screening Evaluation (SASE). The following investigation activities were performed:

- Remote video inspection of the drain line was conducted to document the condition of the pipeline along its length and to identify connections to other underground pipelines using a General Electric Rovver® 100 robotic crawler with remote video technology.
- One test pit was excavated approximately 100 feet upstream of catch basin CB-5 where remote video inspection of the drain line had shown evidence of water infiltration at a drain line joint.
- Residual material samples were collected from the bottom of four catch basins along the drainline and one residual material sample was collected from the end drainline approximately two feet in from QDC Outfall 001.
- Five confirmatory soil samples were collected from the footprint of the excavation advanced near the outlet of QDC Outfall 001 by QDC in 2008. These previous sample locations are shown on Figure 10-9.
- Nine sediment samples were collected from the area of the wetland immediately downstream of QDC Outfall 001. These previous sample locations are shown on Figure 10-9.

Results of the investigations were documented in the Drain Line Investigation and Data Report for Former CED Area/QDC Outfall 001, Former Naval Construction Battalion Center Davisville, North Kingstown, Rhode Island, Revision 1 (Tetra Tech, 2012). The tabulated analytical data from this report is presented in Appendix D of this SAP. The following is a brief summary of the results of the investigation.

Remote Video Inspection of the Drain Line

On December 6, 2010, Tetra Tech performed the remote video inspection of the drain pipeline located between the former Building 224 and QDC Outfall 001 on December 6, 2010. Based on observations resulting from this inspection, the drain pipeline is constructed of five-foot sections of pre-cast concrete pipe. The sections are cemented together around the male end of the pipe, where it is inserted into the "bell" or female end of the pipe. The joints between the 5-foot sections are visible throughout the video inspection. Overall, the underground drain pipeline appeared to be in very good condition, with very little evidence of damage. The system appears to have accepted drainage from nine catch basins along the approximately 1,100 feet of inspected drain line pipe, and one of these catch basins, CB-1, was demolished during demolition of Building 224. In addition, connections to two other drainage systems were observed during inspection of the drain pipeline. The first is from the former oil/water separator located to the north of Building 224, and the second is believed to be from the former leach field in Study Area (SA) 01. For the purposes of this RI, these two additional drainage systems are considered components of the Building 224 drainage

system. Some of the joints in the drain pipeline between catch basins CB-5 and CB-4 displayed evidence of water intrusion. Test pit excavation activities performed to investigate to evaluate the extent of damage to the joints and impacts to underlying soil are described below.

Test Pit Excavation

One test pit was excavated approximately 100 feet upstream of catch basin CB-5 where remote video inspection of the drain line had shown evidence of water infiltration at a drain line joint. The test pit was excavated to a depth of approximately 6 feet below grade surface (bgs) to expose the pipe joint and soil sample was collected from 5.5 to 6.5 feet (equivalent to the depth immediately below the drain line pipe at the location of the joint and considered to be representative of soils beneath the drain line pipe that may have been impacted by a release from the pipe). The soil sample was analyzed for VOCs, semi-volatile organic compounds (SVOCs), PAHs, gasoline range organics (GRO), extractable total petroleum hydrocarbons (ETPH), PCBs, and target analyte list (TAL) metals. The project screening levels (PSLs) used for the test pit soil sample were the USEPA Regional Screening Levels (RSLs), Residential Soil Values. Ecological screening criteria were not applicable since the sample was collected from below a depth of 3 feet bgs. All detected concentrations of VOCs, SVOCs, PAHs, PCBs, GRO, and ETPH were below the associated PSLs. Arsenic, chromium, cobalt, and iron were detected at concentrations above the PSLs. However, these exceedances are not believed to be associated with a release of contamination from the drain line.

Residual Materials Samples

The residual materials samples were analyzed for VOCs, SVOCs, PAHs, GRO, ETPH, PCBs, and TAL metals. PSLs for residual materials were not established for this project; however, chemical concentrations in residual material samples were compared to the chemical concentrations in the confirmatory soil and sediment samples to qualitatively evaluate the extent to which residual material from the drain pipe may have historically been, and may continue to be, a source of contamination to the downstream environment.

The highest concentrations of most detected contaminants were in residual material collected from catch basin CB-5, which is the furthest downstream catch basin in the drain pipeline system. The sample collected from this catch basin contained elevated concentrations (relative to the soil/sediment PSLs) of the VOCs 1,2,4-trichlorobenzene, 1,2,4-trimethylbenzene, 1,4-dichlorobenzene, chlorobenzene, ethylbenzene, toluene, and total xylenes; for most of the detected PAHs; for PCB Aroclor-1254; and for four metals. The concentration of ETPH detected in this sample was 18,000 mg/kg. Similar contaminants were detected in the other residual material samples, but were generally present at lower concentrations. One notable exception is the

detection of the chlorinated solvents cis-1,2-dichloroethene (DCE) and vinyl chloride reported in two residual material samples collected from the two most upstream catch basins (CB-2 and CB-3). In general, the lowest concentrations of contaminants detected in residual material samples were from the sample collected from accumulated material within the drain line pipe approximately two feet in from QDC Outfall 001.

Confirmatory Soil Samples

During the Drain Line Investigations, five confirmatory soil samples were collected from the excavation advanced in 2008 by QDC to clear material from the outfall discharge opening and analyzed for VOCs, SVOCs, PAHs, GRO, ETPH, PCBs, and TAL metals. The PSLs for confirmatory soil samples are the lowest of human health and ecological screening values from the following sources: USEPA RSLs for Chemical Contaminants at Superfund Sites, Residential Soil Values (May 2010) (USEPA, 2010); Rhode Island Department of Environmental Management (RIDEM) Residential Direct Exposure Criteria (DEC) for TPH in soil (RIDEM, 2011); USEPA Ecological Soil Screening Levels for plants, invertebrates, and wildlife (USEPA, 2003, 2005, 2006, 2007, 2008); Oak Ridge National Laboratories (ORNL) Toxicological Benchmarks for plants (Efroymson, et al, 1997a); ORNL Toxicological Benchmarks for invertebrates (Efroymson, et al, 1997b); and USEPA Region 5 Ecological Screening Levels (USEPA, 2003).

Confirmatory soil samples contained several petroleum constituents at concentrations exceeding the PSLs, including trimethylbenzene, GRO, ETPH, and several PAHs. The PCBs Aroclor-1254 and Aroclor-1260 were also detected in select soil samples at levels exceeding the PSLs. The highest concentrations of petroleum constituents and PCBs were detected in the soil sample collected from the bottom of the excavation area closest to the outfall.

Several metals were detected in soil samples at levels exceeding the PSLs, including antimony, arsenic, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, vanadium, and zinc. The greatest number of exceedances were observed in the soil sample collected from the bottom of the excavation area closest to the outfall. In addition, the associated maximum concentrations of metals detected significantly exceeded the Davisville Phase II RI background surface soil data for antimony, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, mercury, nickel, silver, and zinc.

Sediment Samples

Nine sediment samples were collected and analyzed for VOCs, SVOCs, PAHs, GRO, ETPH, PCBs, and TAL metals. The PSLs for the sediment samples were the appropriate freshwater ecological screening levels selected from among: USEPA Region 3 Biological Technical Assistance Group

(BTAG) Freshwater Sediment Screening Benchmarks (USEPA, 2006b); sediment screening values derived using equilibrium partitioning theory, such as the Secondary Chronic Values (SCV) (Table 3 in Jones, et al., 1997) and the Ecotox Thresholds Sediment Quality Benchmarks (SQBs) (USEPA, 1996); and National Oceanographic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRTs) sediment benchmarks (Buchman,M. F., 2008).

In select sediment samples, all PAHs except naphthalene exceeded PSLs. The PCBs Aroclor-1254 and Aroclor-1260 were detected above PSLs in all sediment samples.

In select sediment samples, the metals antimony, barium, cadmium, chromium, copper, lead, mercury, nickel, and zinc exceeded PSLs. In addition, the maximum concentrations of metals in the sediment samples significantly exceeded the Davisville Phase II RI background surface soil data for aluminum, antimony, barium, beryllium, cadmium, calcium, chromium, copper, iron, lead, magnesium, mercury, nickel, selenium, silver, and zinc.

Other than PAHs, as noted above, there were no significant detections of SVOCs, VOCs, ETPH, or GRO in the sediment samples.

Comparison of Residual Material Sample Results to Soil and Sediment Sample Results

The types of contaminants detected in residual material samples are similar to those detected in soil and sediment samples, suggesting the contamination in the downstream area of QDC Outfall 001 may be attributed to the migration of contamination from the drain line pipe and catch basins. A comparison of concentration levels in the residual material sample collected from CB-5 with the contaminants detected in the soil samples collected from the footprint of the 2008 excavation area suggests the residual material could be a continuing source of contamination to environmental media downstream from the outfall. The chemical concentrations detected in the residual material sample collected from CB-5 (i.e., the most downstream catch basin) are generally greater than the concentrations detected in soil samples. However, the highest concentrations of contaminants found at CB-5 were predominantly similar to or greater than the highest concentrations found at any of the sediment samples.

Historic information is also available in the NIKE PR-58 RI report (Johnson, 2011). Incidental to their investigation of a CVOC plume, environmental samples were collected from groundwater well PGU-Z3-03D, Pore Water location PW-17, and Surface Water location PWS-17 (Figure 10-3). The tabulated analytical data from this report for these locations are presented in Appendix D. Data is summarized below.

Low concentrations (estimated below the reporting limit [RL]) of benzene, toluene, ethylbenzene, and xylenes (BTEX) and trimethylbenzene were detected in groundwater from PGU-Z3-03D.

Samples PW-17 and PWS-17 were co-located at the end of the QDC-001 outfall, and were collected prior to the QDC excavation in 2008. Analytical results for the surface and pore water are consistent with analytical results of wetland sediment in the Drain Line Investigation Report.

A former leach field is present to the north and slightly downgradient of the wetland that was addressed as Environmental Baseline Survey (EBS) review item 53. Three test pits were excavated in the sludge beds of the leach field and samples were collected for TPH, GRO, VOCs, SVOCs, pesticides, PCBs, and Resource Conservation and Recovery Act (RCRA) 8 metals. The detected VOCs, metals, and pesticides were below EPA and RIDEM industrial/commercial screening criteria. TPH, GRO, VOCs, SVOCs, and PCBs were not detected (EA, 1995; EA, 1998). Since the former leach field is slightly downgradient of the wetland, impacts to the wetland would not be expected.

January 2013 Wetland Hand Auger Field Investigation

In January 2013 Resolution advanced hand augers at three locations in an effort to investigate the composition (i.e., fill material or wetland sediment) and depth of the material in the wetland. The augers were advanced to depths ranging from 2.2 to 5 feet. The material observed in all three hand auger locations was organic freshwater wetland sediment, there was no fill layer observed. A total depth of the wetland sediment could not be determined using the hand augers, as the auger holes either hit refusal or collapsed at their terminal depths. Elevated photoionization detector (PID) readings ranging from 20 – 100 parts per million (PPM) and a petroleum odor were observed.

Maintenance Cleaning of the QDC Outfall 001 Drain Line and Associated Catch Basins

Residual material was present in catch basins and at various locations along the length of the drain pipeline. In certain sections of the line, up to 4 inches of dry, loose residual material were present along the bottom of the pipe, suggesting that water no longer flows along the length of the drain pipeline. Nevertheless, this material represented a potential threat of release to the environment if the catch basins were to become inundated with water, enabling this material to be mobilized toward the outfall and become a continuing source of contamination to environmental media located downstream of the outfall.

In December 2013, Resolution performed maintenance cleaning of the drain line and associated catch basins that lead to QDC Outfall 001. All associated catch basins were vactored out and the drain line was cleaned via high pressure water jetting. Once cleaned, the associated catch basins were inspected in order to determine if they had competent bottoms and/or if the sidewalls were compromised. Details regarding the maintenance cleaning can be found in the Maintenance Cleaning of the QDC Outfall 001 Drain Line and Associated Catch Basins Work Plan (Resolution, 2013). A Summary Report is also being prepared under separate cover.

Nature and Extent of Contamination

The confirmatory soil sampling results indicate that the 2008 excavation did not remove all of the contaminated soil from the area immediately downstream of QDC Outfall 001. The extent of soil contamination requires additional delineation both vertically and horizontally, and groundwater sampling needs to be performed to determine if groundwater has been impacted.

Video inspection of the drain pipeline indicated that the pipeline is in good condition and the soil sample collected from one location where the pipe displayed signs of water infiltration did not contain concentrations above PSLs. Therefore, the soil adjacent to and beneath the drain pipeline does not appear impacted. However, a second drain line joint approximately 50 feet downgradient from catch basin CB-3 also showed evidence of water infiltration (i.e., iron staining), but a test pit was not excavated in this area. In addition, catch basin integrity was not fully evaluated, as the bottoms of the catch basins were not visible for inspection due to the standing water present in the catch basins.

In the wetland area downstream from the outfall, sediments contain PAHs, PCBs, and metals at concentrations exceeding risk screening levels. While there is no risk screening criterion for ETPH in sediment, the concentrations of ETPH in the sediment samples were an order of magnitude higher than the respective soil criterion, the RIDEM DEC for Residential Soils. The sediment samples collected in the wetland were only collected from the 0 to 6 inch horizon and were limited to within an approximate 30 foot radius of the area of the wetland immediately downstream of the area of the 2008 soil excavation. The extent of sediment contamination in the wetland requires additional delineation both vertically and laterally. Surface water, shallow ground water within the wetland, and groundwater sampling are necessary to determine if these matrices have been impacted. In addition, the lateral and vertical extent of sediment contamination along with impacts to surface water, and groundwater will need to be delineated in the Drainage Ditch that exits the northeast corner of the wetland.

The RI outlined in this SAP is intended to delineate both vertically and horizontally the extent of impacts in the soil and sediment downstream of QDC Outfall 001, determine if the QDC-001 Outfall discharge has impacted surface water and/or shallow ground water in the wetland and Drainage Ditch, and determine if groundwater beneath the soil and sediment have been impacted. In addition, one boring will be advanced in the upland area 50 feet downgradient of catch basin CB-3 to confirm that the section of drain pipe that showed evidence of water infiltration did not impact subsurface soil. If inspection of the catch basins during the maintenance cleaning reveals deterioration or catch basins without a competent bottom, additional borings will be advanced adjacent to the catch basins to determine if the subsurface has been impacted. The RI is designed around a risk assessment framework. Sufficient data will be collected to identify potentially

impacted areas, assess potential risks posed, and complete the RI phase of the CERCLA process. Groundwater elevations in shallow and intermediate monitoring wells will be evaluated to assess whether the wetland is a groundwater recharge or discharge area.

CSM Summary

In addition to refining the extent of impacts, data collected during the RI will be used to better quantify potential risks to receptors and position the site for final environmental response actions. Figure 10-4 presents graphical potential exposure pathways. These pathways present the potential sources, pathways and receptors that are being evaluated through this investigation. An overall CSM summary is briefly presented below.

Sources and Release Mechanisms

The original source of contamination downstream of QDC Outfall 001 is the former CED Area, specifically the vehicle wash pad, oil water separator, and former Building 224 drainage system with possible contribution from material handling in the vicinity of Building 224. Primary release mechanisms consist of direct discharge of materials to the Building 224 drainage system and subsequent transport through the drain pipe line and QDC Outfall 001. Secondary release mechanisms could include volatilization of VOCs and certain PAHs, chemical leaching into surface water, and groundwater, and food-chain uptake.

Receptors and Exposure Pathways

Human Health

Due to the proximity of the Quonset Bike Path to the QDC Outfall 001, it is anticipated that current and future recreational users of the bike path may access the footprint of the 2008 excavation outside the outfall, wetland and Drainage Ditch.

The wetland cannot be developed for residential or commercial/industrial use without filling the wetland. In addition, the wetland area is within the FEMA flood zone, as shown on Figure 10-3. Therefore, it is assumed that future residential or commercial/industrial development of the on-site area is not likely to occur. For that reason, future on-site commercial/industrial receptors will not be evaluated in the risk assessment (e.g., direct contact with soil, etc.). However, for informational purposes a hypothetical future on-site residential exposure scenario will be evaluated in the HHRA. Exposure to site media associated with recreational use of the area by nearby residents and/or potential future residents of nearby land (e.g., soil, sediment, and surface water) is evaluated under the proposed current/future recreational/trespasser scenario, discussed below.

Groundwater underlying the site is not currently being used for potable use. RIDEM has classified groundwater underlying the site as Class GB, which is a RIDEM designation for groundwater that 'may not be suitable for public or private drinking water use without treatment due to known or presumed degradation (RIDEM, 2010)". However, the RI will include an assessment of potability based on salinity, cations, anions, and total dissolved solids (TDS) to help determine whether groundwater would be suitable for potable use in the case that a drinking water well were to be installed in the future. Therefore, the HHRA will evaluate exposure to groundwater underlying the site (via the direct contact pathways presented below) for a hypothetical future on-site and off-site residential scenario only if the potability assessment results indicate that the groundwater could theoretically be suitable for potable use. The potential groundwater to indoor air vapor intrusion pathway will also be evaluated for a hypothetical future on-site residential scenario.

Although development of the site is not considered likely to occur, it is assumed that a future construction/utility worker may access site media at the footprint of the 2008 excavation outside the outfall, wetland and Drainage Ditch assuming that construction or utility maintenance activities may occur in the future.

The receptors and exposure pathways that will be evaluated in the HHRA based on current and likely future land use are provided below:

<u>Current/Future Recreational/Trespasser (Adult and Child)</u>

- Exposure to surface soil (0-1 ft) (under a current use scenario) or combined surface and subsurface soil (from ground surface to a maximum depth equal to the top of the water table) (under a future use scenario) in the area of the 2008 excavation outside the outfall and Drainage Ditch through incidental ingestion, dermal contact and inhalation of airborne particles (i.e., fugitive dust) in outdoor air;
- Exposure to surface and subsurface sediment (to a maximum depth of 1 ft) in the wetland through incidental ingestion and dermal contact;
- Exposure to surface water in the wetland and Drainage Ditch through incidental ingestion and dermal contact.

<u>Future Construction/Utility Worker</u>

- Exposure to combined surface soil and subsurface soil (to a maximum depth equal to the top of the water table) in the area of the 2008 excavation outside the outfall and Drainage Ditch through incidental ingestion, dermal contact and inhalation of airborne particles (i.e., fugitive dust) in outdoor air;

- Exposure to surface and subsurface sediment in the wetland through incidental ingestion and dermal contact;
- Exposure to surface water in the wetland and Drainage Ditch through incidental ingestion and dermal contact.
- Exposure to groundwater through incidental ingestion, dermal contact, and inhalation of volatiles in outdoor air originating from the collection of groundwater in an excavation trench. Inhalation of excavation trench air will only be evaluated where volatiles in shallow groundwater are identified as chemicals of potential concern (COPCs).

Hypothetical Future On-Site Resident (Adult and Child)

As discussed above, the wetland cannot be developed for residential use without filling the wetland. In addition, the wetland area is subject to inundation by a 100 year and 500 year flood event according to FEMA, and as referenced on Figure 10-3. Therefore, it is assumed that future residential development of the on-site area is not likely to occur. However, the HHRA will evaluate a hypothetical future on-site residential scenario within the footprint of excavation outside the outfall, wetland and drainage ditch, for informational purposes.

The exposure pathways that will be evaluated for a hypothetical future on-site resident (adult and child) are as follows:

- Exposure to combined surface soil and subsurface soil (from ground surface to a maximum depth equal to the top of the water table) in the area of the 2008 excavation outside the outfall and drainage ditch through incidental ingestion, dermal contact and inhalation of airborne particles (i.e., fugitive dust) in outdoor air;
- Exposure to surface and subsurface sediment (to a maximum depth of 1 ft) in the wetland through incidental ingestion and dermal contact;
- Exposure to surface water in the wetland and drainage ditch through incidental ingestion and dermal contact;
- Exposure to groundwater through inhalation of indoor air via the potential vapor intrusion pathway.

As discussed above, the HHRA will evaluate the following exposure scenario only if the results of the potability assessment indicate that the groundwater could theoretically be suitable for potable use.

- Exposure to groundwater through ingestion of drinking water and dermal contact and inhalation during bathing;

Hypothetical Future Off-Site Resident

As discussed above, the HHRA will evaluate the following exposure scenario only if the potability assessment results indicate that the groundwater is suitable for potable use in the event a drinking water well is installed in the future:

- Exposure to groundwater through ingestion of drinking water and dermal contact and inhalation during bathing.

Representative exposure assumptions that will be used for evaluation of the above receptors are presented in the Risk Assessment Work Plan Technical Memorandum, provided as Appendix C.

Ecological

As described previously, the QDC Outfall 001 area includes a small emergent wetland (approximately 0.5 acre) surrounded by forested wetland and associated upland areas with a drainage swale exiting from the northeast corner of the emergent wetland. These areas may provide habitat for a variety of birds and mammals, as well as plant and invertebrate communities.

It is anticipated that ecological receptors may come in contact with surface soil (0 to 1 ft bgs) at the footprint of the 2008 excavation outside the outfall and within the Drainage Ditch (the Drainage Ditch only holds water intermittently so the material in the Drainage Ditch will be evaluated as soil). The 0 to 1 ft bgs soil horizon is expected to be the most biologically active zone in soil and, due to the seasonally elevated water table, deeper soils are expected to be intermittently saturated and therefore not applicable for ecological exposures. However, if the delineation of soil concentrations indicates higher concentrations in deeper soils (i.e., 1 to 2 ft, 2 to 4 ft), then additional evaluation of the deeper soils will be conducted to determine whether deep rooted plants and burrowing animals (if present) are likely to be impacted.

The Drainage Ditch may occasionally hold water so ecological receptors may be exposed to surface water intermittently. In the emergent wetland, ecological receptors may come in contact with surface sediment (0 to 0.5 ft bgs) and surface water. Due to the presence of standing water within the emergent wetland and the elevated water table in the vicinity of the wetland, burrowing animals are unlikely to be present and deeper sediments within the wetland are not proposed for evaluation.

Ecological receptors are not typically directly exposed to groundwater so the pathway to this medium is not complete and groundwater will not be directly evaluated in the ecological evaluation.

Given that the water table in the wetland is elevated to near ground surface, it is expected that the evaluation of surface water and sediment in the wetland will capture potential groundwater impacts on ecological receptors. Specifically, the surface water will be considered as a drinking water source for birds and mammals in the wildlife food web model and will also be evaluated relative to surface water screening values protective of aquatic receptors.

The toxicity values and exposure assumptions that will be used to evaluate the receptors listed below are presented in the Risk Assessment Work Plan Technical Memorandum, provided as Appendix C.

The following exposure pathways will be evaluated in the Ecological Risk Assessment (ERA):

- Soil invertebrates and plants directly exposed to site-related compounds in surface soil in the footprint of the 2008 excavation outside the outfall and within the Drainage Ditch.
- Wetland/benthic invertebrates and plants directly exposed to site-related compounds in surface sediment within the emergent wetland.
- Aquatic invertebrates directly exposed to site-related compounds in surface water within the emergent wetland and the Drainage Ditch (if standing water is present at the time of sampling).
- Birds and mammals exposed to site-related compounds through incidental ingestion of surface soil and sediment, ingestion of drinking water from the wetland, and by ingestion of contaminated prey items impacted by surface soil and sediment.

Due to the relatively small size of the wetland, Drainage Ditch, and the surrounding upland areas, it is anticipated that some wildlife receptors (e.g., raccoon) will be exposed to all media and may ingest food items from both wetland and upland sources. Details of the wildlife exposure parameters are provided in Appendix C and will include the raccoon (*Procyon lotor*), short-tailed shrew (*Blarina brevicauda*), meadow vole (*Microtus pennsylvanicus*), marsh wren (*Cistothorus palustris*), American robin (*Turdus migratorius*), and bobwhite quail (*Colinus virginianus*).

SAP Worksheet #11-1: Project Quality Objectives/Systematic Planning Process Statements, QDC Outfall 001 RI (NCBC Davisville OU10)

(UFP-QAPP Manual Section 2.6.1)

The QDC Outfall 001 RI is intended to complete the regulatory requirements for the RI phase of the CERCLA process. Although the primary project quality objectives (PQOs) entail delineating the nature and extent of impacts from releases from the QDC Outfall 001 drain line, there are multiple PQOs to be achieved through the planned investigation, as described in this worksheet. The PQOs were developed for this investigation based on the *Guidance on Systematic Planning Using the Data Quality Objectives Process* (USEPA QA/G-4) (USEPA, 2006c) and are presented below.

Step 1 – Problem Statement

The following conclusions have been made based on the SASE conducted on the QDC Outfall 001 drain line in 2010 (Tetra Tech, 2012):

- Confirmatory soil sample results in the footprint of the 2008 excavation immediately downstream of QDC Outfall 001 indicate that the excavation did not remove all the contaminated soil and impacted soil with concentrations above risk screening levels remains. The contaminants include VOCs, PAHs, PCBs, ETPH, and metals.
- Sediment samples collected from the wetland area immediately downstream of the soil excavation area indicate that releases from the QDC Outfall 001 have impacted the wetland with contaminants at concentrations above risk screening levels. The contaminants include PAHs, PCBs, and metals.
- The underground drain line between former Building 224 and QDC Outfall 001 is in very good condition and does not appear to have released contaminants to the soil around and beneath the drain line based on the test pit excavation sample collected by during the 2010 SASE (Tetra Tech, 2012). However, a second drain line joint approximately 50 feet downgradient from catch basin CB-3 that showed evidence of water infiltration (i.e., iron staining) was not investigated during the 2010 SASE.
- Residual materials present in catch basins and within the drain line contain contaminants at concentrations that may pose potential risk/hazard above target levels to human health and the environment. This residual material represents a potential continuing source of contamination to the wetland and will be removed by maintenance cleaning prior to conducting RI field work. However, catch basin integrity has not been fully evaluated. This evaluation will need to be done after the maintenance cleaning.

Problem Statement - Based on the existing data, the nature and extent of impacts resulting from prior releases through QDC Outfall 001, potential contaminant migration pathways, and/or potential risks to human and ecological receptors have not been fully defined. Horizontal and vertical delineation of soil and sediment is necessary to refine the extent of impacts and quantify the potential for associated risks, if present. Analysis of surface water and groundwater is necessary to determine if these matrices have been impacted from the soil and sediment. The hydraulic interaction between wetland surface water and groundwater needs to be evaluated to determine whether the wetland is a groundwater recharge or discharge area. The hydraulic gradients between the shallow and intermediate groundwater zones in and around the wetland need to be evaluated to develop and understanding of local groundwater flow. The area 50 feet downgradient of catch basin CB-3 and around any catch basins found to not have competent bottoms or show signs of deterioration need to be investigated for potential impacts to the subsurface soil.

Step 2 – Study Goals

The objective of the QDC Outfall 001 RI is to delineate the nature and extent of media impacted by releases from the QDC Outfall 001 drain line. The specific study goals of the planned investigation are listed below and intended to refine the CSM and position the site for identifying and selecting an appropriate response action per the CERCLA process.

- Goal 1 – Delineate the nature and extent of historical release(s) to the wetland and Drainage Ditch and determine pathways for contaminant transport to and from the wetland and Drainage Ditch;
- Goal 2 – Provide data for evaluation in the human health and ecological risk assessments to determine whether potential risks/hazards to human and/or ecological receptors are above target levels;
- Goal 3 – Determine if subsurface soil and groundwater has been impacted in the area of the drain line 50 feet downgradient of CB-3 or in the areas of any catch basins that have deteriorated or do not have competent bottoms.

To achieve these goals and ensure that appropriate data quality is obtained, Project Action Limits (PALs) were identified. PALs represent the levels of detection (LODs) that analytical data must meet in order to be of sufficient quality for use in the RI and risk assessment. These levels are designed to be equal to or lower than relevant human health and ecological screening levels. The PALs are not intended to be used as cleanup levels. Refer to Worksheet #15 for the specific PALs and associated sources.

Step 3 – Information Inputs

Information inputs will consist of environmental screening data and field samples from the QDC Outfall 001 area, as presented in this SAP. Figures 3-7 through 3-14 of the 2010 SASE (Tetra Tech, 2012) present prior exceedances in site media. Figures 10-5 through 10-8 present the planned sampling locations and Figure 10-9 presents historical sample locations. The following data will be collected to characterize the location and extent of site impacts:

- Surface soil sampling – VOCs, SVOCs, PAHs, Pesticides, PCBs, TPH, TAL metals, hexavalent chromium, acid volatile sulfides/simultaneously extracted metals (AVS/SEM), total organic carbon (TOC), pH, and grain size
- Subsurface soil sampling (including samples downgradient of compromised catch basins) – VOCs, SVOCs, PAHs, Pesticides, PCBs, TPH, TAL metals, and hexavalent chromium
- Surface sediment sampling – VOCs, SVOCs, PAHs, Pesticides, PCBs, TPH, TAL metals, hexavalent chromium, AVS/SEM, TOC, and grain size
- Subsurface sediment sampling - VOCs, SVOCs, PAHs, Pesticides, PCBs, TPH, TAL metals and hexavalent chromium
- Surface water/grab groundwater sampling – VOCs (grab groundwater only), SVOCs, PAHs, Pesticides, PCBs, total and dissolved TAL metals, hexavalent chromium (surface water only), cyanide, and sulfide
- Groundwater sampling - VOCs, SVOCs, PAHs, Pesticides, PCBs, TAL metals, hexavalent chromium, cyanide, sulfide, salinity, TDS, cations (sodium, calcium, potassium, magnesium), and anions (sulfate, chloride, bicarbonate, carbonate).
- Background/upgradient groundwater data – Representative background/upgradient groundwater concentrations for comparison to site-specific data
- Background soil and sediment data – If a suitable soil and sediment background data set can be identified, it will be used for comparison to site-specific data
- Risk Assessment Inputs - Exposure assumption inputs, toxicity/dose-response values, risk-based screening levels

Table 11-1 details the sampling rationale for the samples that will be collected during the investigation.

Table 11-1
Sampling Rationale Table
QDC Outfall 001 RI
NCBC Davisville, North Kingstown, RI

Study Area	Media	Target Depth	Target Parameters	Rationale
Footprint and perimeter of the 2008 Excavation	Surface soil	0 to 1 ft bgs	VOCs, SVOCs, PAHs, Pesticides, PCBs, TPH, TAL metals, hexavalent chromium[1], AVS/SEM, TOC, pH, and grain size	Assess presence and potential impacts to shallow soil and provide data for the risk assessments
Footprint and perimeter of the 2008 Excavation	Subsurface soil	1 to 2 ft bgs 2 to 4 ft bgs	VOCs, SVOCs, PAHs, Pesticides, PCBs, TPH, TAL metals, hexavalent chromium[1]	Assess presence and potential impacts to subsurface soil and provide data for the risk assessment (human health only)
Footprint of the 2008 Excavation	Groundwater	Shallow and intermediate aquifer	VOCs, SVOCs, PAHs, Pesticides, PCBs, TAL metals, hexavalent chromium[1], cyanide, sulfide, salinity, TDS, cations (sodium, calcium, potassium, magnesium), and anions (sulfate, chloride, bicarbonate, carbonate)	Assess presence and potential impacts to groundwater, provide hydraulic gradient information and provide data for the risk assessment (human health only)
Wetland	Surface Sediment	0 to 0.5 ft bgs	VOCs, SVOCs, PAHs, Pesticides, PCBs, TPH, TAL metals, hexavalent chromium[1], AVS/SEM, TOC, and grain size	Assess presence and potential impacts to shallow sediment and provide data for the risk assessments
Wetland	Subsurface Sediment	0.5 to 1 ft bgs 1 to 2 ft bgs 2 to 4 ft bgs	VOCs, SVOCs, PAHs, Pesticides, PCBs, TPH, TAL metals, hexavalent chromium[1]	Assess presence and potential impacts to shallow sediment and provide data for the risk assessment (human health only)
Wetland	Surface Water	NA	SVOCs, PAHs, Pesticides, PCBs, total and dissolved TAL metals, hexavalent chromium[1], cyanide, sulfide	Assess presence and potential impacts to surface water and provide data for the risk assessments
Wetland	Groundwater	Shallow and intermediate aquifer	VOCs, SVOCs, PAHs, Pesticides, PCBs, TAL metals, hexavalent chromium[1], cyanide, sulfide, salinity, TDS, cations (sodium, calcium, potassium, magnesium), and anions (sulfate, chloride, bicarbonate, carbonate)	Assess presence and potential impacts to groundwater, provide hydraulic gradient information, assess potability of the groundwater, and provide data for the risk assessment (human health only)
Wetland	Groundwater (grab samples)	Shallow aquifer	VOCs, SVOCs, PAHs, Pesticides, PCBs, TAL metals, cyanide, sulfide	Provide screening level data to aid in the assessment of presence and potential impacts to groundwater
Existing well pair PGU-Z3-03S/PGU-Z3-03D	Groundwater	Shallow and deep aquifer	VOCs, SVOCs, PAHs, Pesticides, PCBs, TAL metals, hexavalent chromium[1], cyanide, sulfide, salinity, TDS, cations (sodium, calcium, potassium, magnesium), and anions (sulfate, chloride, bicarbonate, carbonate)	Assess presence and potential impacts to groundwater, provide hydraulic gradient information, assess potability of the groundwater, and provide data for the risk assessment (human health only)

Table 11-1
Sampling Rationale Table
QDC Outfall 001 RI
NCBC Davisville, North Kingstown, RI

Study Area	Media	Target Depth	Target Parameters	Rationale
Drainage Ditch	Surface soil	0 to 1 ft bgs	VOCs, SVOCs, PAHs, Pesticides, PCBs, TPH, TAL metals, hexavalent chromium[1], AVS/SEM, TOC, pH, and grain size	Assess presence and potential impacts to shallow soil and provide data for the risk assessments
Drainage Ditch	Subsurface soil	1 to 2 ft bgs 2 to 4 ft bgs	VOCs, SVOCs, PAHs, Pesticides, PCBs, TPH, TAL metals, hexavalent chromium[1]	Assess presence and potential impacts to subsurface soil and provide data for the risk assessment (human health only)
Drainage Ditch	Surface Water	NA	SVOCs, PAHs, Pesticides, PCBs, total and dissolved TAL metals, hexavalent chromium[1], cyanide, sulfide	Assess presence and potential impacts to surface water and provide data for the risk assessments
Drainage Ditch	Groundwater (grab samples)	Shallow aquifer	VOCs, SVOCs, PAHs, Pesticides, PCBs, TAL metals, cyanide, sulfide	Provide screening level data to aid in the assessment of presence and potential impacts to groundwater
Upland Area	Groundwater	Shallow and intermediate aquifer	VOCs, SVOCs, PAHs, Pesticides, PCBs, TAL metals, hexavalent chromium[1], cyanide, sulfide, salinity, TDS, cations (sodium, calcium, potassium, magnesium), and anions (sulfate, chloride, bicarbonate, carbonate)	Provide background groundwater data upgradient of QDC Outfall 001 and provide hydraulic gradient information and provide data for the risk assessment (human health only)
Catch Basin CB-3 (50 ft downgradient)	Subsurface Soil	5-6 ft bgs 6-7 ft bgs 7-8 ft bgs	VOCs, SVOCs, PAHs, Pesticides, PCBs, TPH, TAL metals	Assess presence and potential impacts to subsurface soil in the area of the drain line that showed evidence of water infiltration (i.e., iron staining)
Catch Basins (TBD)	Subsurface Soil	TBD	VOCs, SVOCs, PAHs, Pesticides, PCBs, TPH, TAL metals	Assess presence and potential impacts to subsurface soil around any catch basins found to not have competent bottoms or have signs of deterioration upon inspection after the maintenance cleaning of the drain line and catch basins

[1] – At 10% of the sample locations that will provide data for the human health risk assessment, hexavalent chromium samples will be collected and trivalent chromium will be calculated. The hexavalent chromium sample locations will be selected such that the samples selected are evenly distributed through the human health risk assessment data set.

Step 4 – Study Boundaries

The area of soil excavation and wetland downstream of QDC Outfall 001 is approximately 0.5 acres. The investigation area will also include the Drainage Ditch that runs approximately 250 feet northeast and to an adjacent tidal wetland to the northeast. In addition, one soil boring will be advanced along the drain line leading to QDC Outfall 001 50 feet downgradient of CB-3. Additional borings may be advanced adjacent to the catch basins following their inspection after the maintenance cleaning of the drain line and catch basins. Refer to Figure 10-1 for the regional location and Figure 10-3 for the study area. Spatial and temporal boundaries are described below.

Spatial Boundaries

A key element for this investigation is to refine the lateral extent of impacts that may warrant site remediation and or site restrictions. The SASE conducted in 2010 identified VOCs, PAHs, PCBs, ETPH, and metals in footprint of the 2008 soil excavation and PAHs, PCBs, and metals in the wetland area immediately downstream of the 2008 soil excavation. However, the specific boundaries of impacts have not been fully delineated, including extent of impacts to groundwater and surface water. The approximate extent of identified impacts is shown on Figures 3-7 through 3-14 of the 2010 SASE (Tetra Tech, 2012). The planned investigation is designed to collect additional site data to better define the extent of site-related impacts. Proposed sampling locations and target sampling depths have been identified based on the SASE conducted in 2010 and the CSM (refer to Figures 10-5 through 10-8 and Table 11-1); however, it is anticipated that modifications may be made in the field based on actual field conditions (i.e., presence/absence of standing surface water, visual observations, etc.) to best refine the extent of potential impacts.

The depth of impacts is not known, as the SASE conducted in 2010 did not collect subsurface samples (i.e., borings). However, soil samples collected from the footprint of the 2008 soil excavation indicate that impacts are present at this depth, which is approximately 2 feet bgs. This investigation will include assessment of soil and sediment downgradient of QDC Outfall 001 to an estimated depth of 4 feet bgs to confirm that the vertical extent of impacts is defined. If PID measurements or other evidence of impacts are observed (e.g., visual/olfactory evidence), the boring at that location will be advanced further until no evidence of impacts is observed. At a minimum, all borings will be advanced at least to the top of the water table. Surface water samples will be co-located at 5 wetland sediment locations and 2 Drainage Ditch soil locations. Three shallow/intermediate well pairs (i.e., 6 wells total) will be installed as follows: one well pair upgradient of QDC Outfall 001, one well pair adjacent to the 2008 excavation outside of QDC Outfall 001, and one well pair in the wetland. Existing monitoring wells PGU-Z3-03S and PGU-Z3-03D will be re-developed and sampled as part of the RI. In addition to the permanent monitoring

wells, grab groundwater samples will be co-located at 5 wetland sediment locations and 3 Drainage Ditch soil locations.

For the soil boring advanced approximately 50 feet downgradient of catch basin CB-3, it is assumed that the depth to the bottom of the drain line is approximately 5.5 feet. Therefore, soil samples will be collected from 3 distinct horizons (5 to 6 ft, 6 to 7 ft, and 7 to 8 ft). If evidence of impacts (e.g., PID measurements, visual/olfactory evidence), additional samples will be collected. The boring will be advanced to the water table and a grab groundwater sample will also be collected.

Additional soils borings will be advanced adjacent to any catch basins that do not have competent bottoms or show signs of deterioration when inspected after the maintenance cleaning of the drain line and catch basins. The depths of the samples will be based on the depth of the catch basin and/or the depth of the signs of deterioration in the catch basin. If feasible, soil borings will be advanced through the bottom of the catch basin. If this is not feasible, soil borings will be advanced on the outlet side of the catch basin approximately 4 feet from the basin. Soil borings will be advanced to a depth of four feet below the bottom depth of the catch basin, unless field observations (e.g. PID readings, visual/olfactory indicators, etc.) dictate advancing deeper. The borings will be advanced to the water table and a grab groundwater sample will also be collected.

Temporal Boundaries

The temporal boundaries for this study will be the period of the actual field investigation, anticipated to occur in winter/spring of 2014. The soil and sediment sampling, monitoring well installation, and groundwater sampling will take place in the winter while the wetland is partially frozen. Surface water samples will be collected in the spring when the water table is high and surface water is present in the wetland and Drainage Ditch. If the soil and sediment sampling, monitoring well installation, and groundwater sampling cannot be conducted in the winter, it will be conducted in the late spring/early summer when the water table is low and there is less surface water present in the wetland and drainage ditch. Other than the presence/absence of surface water, there are no anticipated impacts to data quality or usability from seasonal variation.

Step 5 – Analytical Approach

The analytic approach for the planned investigation is comprised of a series of "if… then…" statements.

<u>Goal 1 – Refine the Extent of Historical Releases from Prior Operations and determine pathways for contaminant transport to and from the wetland</u>

- If compounds are present in site-specific groundwater, then they will be compared to data from the upgradient groundwater well to help determine whether they are site-related.
- If site-related compounds are present in site-specific environmental media, then their distribution will be used to refine the general site study area boundary.
- If site-related compounds exceed applicable criteria, then and interim removal action may be considered

Goal 2 – Evaluate potential risk/hazard to human and ecological receptors exposed to site media

- If the Tier IA human health risk based screening evaluation identifies compounds that are detected above risk-based screening levels, these compounds will be identified as COPCS and further evaluated in a Tier II Baseline Human Health Risk Assessment (BHHRA).
- For media for which a suitable background dataset is identified, COPCs identified based on the comparison to risk-based screening levels that are also determined to be consistent with background concentrations will be identified as non-site-related COPCs and further evaluated in the Tier II BHHRA.
- If the results of the potability assessment being performed as part of the RI indicate that the groundwater is suitable for potable use, based on salinity, cations, anions, and TDS, the HHRA will evaluate exposure to groundwater underlying the site via direct contact pathways (i.e., ingestion, dermal, and inhalation via showering/bathing) for a hypothetical future on-site and off-site residential scenario.
- If the Tier II BHHRA identifies unacceptable risks due to site-related compounds, then they will be identified as chemicals of concern (COC) for the site and the project team will meet and discuss the next appropriate action.
- If the Tier 1 ecological screening risk assessment identifies compounds with hazard quotients greater than 1, then those compounds and receptors for which they were identified may be further evaluated in Step 3a of a Tier 2 baseline ecological risk assessment (BERA).
- If the Step 3a Refinement identifies unacceptable risks due to site-related compounds, then the project team will meet and discuss the next appropriate action.

Goal 3 – Determine if subsurface soil has been impacted in the area of the drain line 50 feet downgradient of CB-3 or in the areas of any catch basins that have deteriorated or do not have competent bottoms.

- If site-related compounds are present in site-specific environmental media, then their distribution will be used to refine the general site study area boundary.

- If site-related compounds exceed applicable criteria, then and interim removal action may be considered

Step 6 – Performance Criteria

The objective of this section is to complete the following:

- Identify potential sources of study error (e.g., field error, analytical error, etc.)
- Establish and identify the methods used to reduce potential sources of error
- Determine how decision errors will be managed during the project

Sampling Strategy

The soil, sediment, surface water, grab groundwater, and groundwater sampling design was developed to further characterize contaminant concentrations in these matrices in the study area. A biased sampling design was created based on the point source (i.e., QDC Outfall 001), previously identified site impacts, and the assumed direction of flow that a release from QDC Outfall 001 would follow. The sampling design contains 20 sediment sampling locations (four depths each) within the wetland, 5 surface water sample locations co-located with sediment sample locations in the wetland, 5 grab groundwater sample locations co-located with sediment sampling locations in the wetland, 10 soil sampling locations within the Drainage Ditch (3 depths each), 2 surface water samples in the Drainage Ditch, 3 grab groundwater sample locations in the Drainage Ditch, and 3 newly installed shallow and intermediate permanent groundwater monitoring well pairs (i.e., 6 wells total) in and around the wetland and Drainage Ditch. One shallow and intermediate well pair will be installed immediately adjacent to QDC Outfall 001, one shallow and intermediate well pair will be installed upgradient of the wetland, and one shallow and intermediate well pair will be installed within the wetland. Subsurface soil/sediment samples will be collected during monitoring well installation based on field screening (i.e, PID readings) and visual observations. Existing well pair PGU-Z3-03S/PGU-Z3-03D will also be sampled as part of the sampling design. The type, number, and location of the samples and permanent monitoring wells may change based on field conditions.

In addition to the samples collected downgradient of QDC Outfall 001 and the upgradient permanent monitoring well pair, a soil boring will be advanced along the QDC Outfall 001 drain line approximately 50 feet downgradient from catch basin CB-3 to investigate potential impacts from a drain line joint that showed evidence of water infiltration (i.e., iron staining) during the 2010 SASE. Additional borings will also be advanced adjacent to any catch basins along the drain that show evidence of deterioration or do not have bottoms when inspected following the maintenance cleaning of the drain line and catch basins to be performed prior to the RI.

Potential Sources of Error

Potential sources of error in the RI may be divided into two main categories: sampling errors and measurement errors. A sampling error can occur when the sampling design, planning, and implementation do not provide for a representative range of heterogeneity at the site. A measurement error can occur when performance variance from laboratory instrumentation, analytical methods, and/or operator error occurs. USEPA identifies the combination of these errors as a "total study error" (USEPA, 2006c). One objective of the planned investigation is to reduce the total study error so that decision-makers can be confident that the data collected accurately represent the chemical characteristics of the sites.

Managing Decision Error

The investigation will utilize decision-error minimization techniques in sampling design, sampling methodologies, and laboratory analysis. Possible decision errors will be minimized during the field investigation by using the following methods:

- Evaluate available historical data and perform site reconnaissance visits as needed to identify site-related compounds, sampling locations, and site characteristics.
- Use standard field sampling methodologies (presented in Worksheet #21). Perform sampling activities in accordance with the standard operating procedures (SOPs) referenced in this SAP.
- Use applicable analytical methods (presented in Worksheet #23) for sample analysis by a competent analytical laboratory certified by the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) to reduce measurement errors.
- Confirm analytical data to identify and control potential laboratory error and sampling error by using spikes, blanks, and replicated samples.
- For analytical results that do not achieve desired PALs, include a discussion of alternate information inputs as part of the HHRA and ERA conclusions and uncertainty analysis.

Decision errors associated with judgmental sampling are based on sample design and measurement errors. Assuming that the best possible professional judgment was used to develop the sampling plan (e.g., position sampling locations), the most important decision errors will be associated with field and laboratory techniques involved in the collection and analysis of the data.

Sampling Methods and Procedures

- Possible decision errors generated by sampling errors will be minimized during the field investigation by applying standardized field sampling methodologies (presented in Worksheet #21).

Laboratory Analysis

- Possible decision errors generated by laboratory measurement errors will be minimized by using applicable analytical methods (presented in Worksheet #23) for sample analysis by a competent analytical laboratory evaluated and certified by the DoD ELAP.

Managing Laboratory Sampling Error

Control of potential laboratory error and sampling error will be minimized by using spikes, blanks, and duplicates. Sampling error may be introduced when the laboratory chemist selects a single portion of the field sample for laboratory analysis. Homogenizing the sample prior to selecting an aliquot for laboratory analysis will help to minimize the sampling error.

Step 7 – Obtaining the Data

The sampling design for QDC Outfall 001 RI was developed to optimize resources and generate data to satisfy the PQOs. The critical objective is to obtain a quality dataset for evaluation in the RI and risk assessments.

Field Screening

Field measurements will be recorded in a field logbook, onto field data collection sheets, and/or into an electronic field data collection device. Groundwater will be measured in the field for water level, pH, specific conductivity, turbidity, temperature, DO, and ORP. Field data will be compiled and stored in project folders, for subsequent use in evaluating analytical data and completing the RI report.

Sediment Sampling

An estimated 80 sediment samples from 20 locations (4 depths from each location) will be collected within the wetland. The primary intent is to better define the nature and extent of impacts and provide data for use in the risk assessment. The SASE performed in 2010 (Tetra Tech, 2012) delineated an approximate 30 foot radius in the wetland immediately downstream of the area of the 2008 soil excavation, and only collected samples from the 0 to 6 inch horizon. The RI will expand this data set to encompass the sediments in the entire wetland, as well as delineating vertically to 4 feet bgs or the top of the water table, whichever is deeper. In addition, it is

anticipated that one permanent well pair and five temporary monitoring wells will be installed at six of the sediment sampling locations. The sediment sampling locations are presented in Figure 10-5 and the sampling rationale is presented in Table 11-1. Planned samples may not be collected due to field conditions (e.g. inaccessibility to sample material, lack of recoverable material, etc.). Further details on the sediment sampling are provided in Worksheet #17.

Soil Sampling

An estimated 30 soil samples from 10 locations (3 depths from each location) will be collected within the Drainage Ditch, and 18 soil samples from 6 locations (3 depths from each location) will be collected within and around the footprint of the 2008 excavation. The primary intent is to better define the nature and extent of impacts and provide data for use in the risk assessment. In addition, there will be soil sampling associated with monitoring well installation upgradient of the wetland and adjacent to the 2008 excavation. An estimated 6 soil samples will be collected during the installation of the two well pairs (3 depths from each well pair), with additional samples being collected as necessary based on PID screening or visual evidence. An estimated 3 samples will be collected from the soil boring advanced along the drain pipe approximately 50 feet downgradient of catch basin CB-3 (3 depths starting at 5 ft). Additional subsurface samples will be collected from soils borings advanced adjacent to any catch basins that do not have competent bottoms or show signs of deterioration when inspected after the maintenance cleaning of the drain line and catch basins. The depths and number of the samples will be based on the depth of the catch basin and/or the depth of the signs of deterioration in the catch basin. The soil sampling locations are presented in Figure 10-6 and the sampling rationale is presented in Table 11-1. Further details on the soil sampling are provided in Worksheet #17.

Surface Water Sampling

At 7 sampling locations (5 in the wetland, 2 in the Drainage Ditch), a co-located surface water sample will be collected. The primary intent is to better define the nature and extent of impacts and provide data for use in the risk assessment. Surface water samples were not collected during the SASE performed in 2010 (Tetra Tech, 2012). The approximate surface water sampling locations are presented in Figure 10-7 and the sampling rationale is presented in Table 11-1. However, actual locations will be based on where surface water is present in the field at the time of the investigation. Further details on the surface water sampling are provided in Worksheet #17.

Groundwater Sampling

Three shallow/intermediate well pairs will be installed in and around the wetland as follows:

- one upgradient of the wetland to provide background groundwater data;

- one adjacent to the 2008 excavation to provide data in the area assumed to be most impacted; and
- one within the wetland to provide data downgradient of the outfall

Shallow wells in and adjacent to the wetland will be screened from 2 ft to 12 ft bgs to properly seal the well at the surface. If a clear determination can be made in the field between the fill material and underlying native materials, the screen length may be reduced to fully span the upper hydrostratigraphic unit (e.g., if the native materials are observed less than 12 ft bgs, the shallow well will be installed to that depth). Intermediate monitoring wells will be installed using a 10 foot screen length from the upper hydrostratigraphic boundary (i.e., fill/native boundary) to 10 feet into the native materials. A determination of the start and end depth of the intermediate monitoring well screens will be determined in the field. If a clean boundary is not observed, then the intermediate well screens will be installed from 12 ft to 22 ft bgs.

All 6 monitoring wells will be sampled during the RI, along with existing wells PGU-Z3-03S and PGU-Z3-03D. Permanent monitoring wells, including existing wells PGU-Z3-03S and PGU-Z3-03D, will be developed and allowed to equilibrate for 7 days prior to sampling. The monitoring well pair upgradient of the wetland will be selected to provide background groundwater data. If available, historical groundwater flow maps will be used to determine the optimum placement of the upgradient well. In addition, input from EPA and RIDEM will be considered. The other monitoring well pair locations were selected to assess potential impacts in the shallow and intermediate aquifer underlying the wetland and surrounding areas due to releases from QDC Outfall 001. Intermediate aquifer wells were included with the shallow wells because low concentrations (estimated below the RL) of BTEX and benzene compounds were detected in groundwater from deep aquifer monitoring well PGU-Z3-03D during the NIKE PR-58 groundwater investigation (see Appendix D). In addition, having shallow/intermediate well pairs will provide hydraulic gradient information that will be useful for assessing local groundwater elevations, flow, and contaminant fate and transport.

Grab groundwater samples will be collected from temporary wells at 5 locations in the wetland and 3 locations in the Drainage Ditch. The temporary wells will be distributed in the wetland and Drainage Ditch to provide additional spatial groundwater data and will be co-located at sediment sample locations in the wetland and soil sample locations in the Drainage Ditch. Grab groundwater samples will also be collected from soil borings if there is evidence of impacts. (e.g visual staining, elevated PID readings, olfactory evidence, etc.).

The approximate permanent and temporary monitoring well locations are presented in Figure 10-8 and the sampling rationale is presented in Table 11-1. The actual locations may change based on field conditions at the time of the investigation (e.g., refusal, location access issues, etc.). The number of temporary wells may increase or decrease based on the absence or presence of surface

water at the time of the investigation (i.e., if little surface water is present, more temporary wells may be installed, if a lot of surface water is present less temporary wells will be installed). Further details on the groundwater sampling are provided in Worksheet #17.

Analytical Laboratory Sample Management

The sample matrix, number of samples, and number and type of laboratory quality assurance and quality control (QA/QC) samples are summarized in the "Sample Details Table" of this SAP. Details on the analytical group, sample volumes, sample container specifications, preservation requirements, and maximum holding times are identified in combined Worksheet #18, #19, #20 and #30 of this SAP.

The laboratory will provide EQuIS electronic data deliverable files, portable document format (PDF) files of the data deliverables for all project data, and a hard copy of data deliverables for all results. Designated samples will be used to obtain necessary subsamples for laboratory QC measurements, which include laboratory duplicate samples and matrix spike/matrix spike duplicate (MS/MSD) samples. All analytical procedures will be performed in accordance with the laboratory SOPs.

Resolution will provide data validation services and verify and evaluate the usability of the data as identified in combined Worksheet #34 – 36 and Worksheet #37.

PDF copies of all analytical data packages will be stored on CD-ROM, archived in the NAVFAC LANT Administrative Record, and uploaded onto the Naval Installation Restoration Information Solution (NIRIS) system using the Navy Electronic Data Deliverable (NEDD) database format. All other data generated in the field and reports generated for the project will be stored as computer readable data files by Resolution.

SAP Worksheet #12-1: Field Quality Control Samples (NCBC Davisville OU10)

(UFP-QAPP Manual Section 2.6.2)

Soils, Sediments				
Trip Blanks	VOCs	One per cooler containing VOC Samples	Accuracy/Bias/ Contamination	No target compounds > ½ LOQ , except for common laboratory contaminants, which must be < LOQ
Equipment Rinsate Blanks	All	One per 20 field samples per matrix per sampling equipment	Accuracy/Bias/ Contamination	No target compounds > ½ LOQ , except for common laboratory contaminants, which must be < LOQ
Field Duplicates	VOCs, SVOCs, PAHs, Pesticides, PCBs, TPH	One per 10 field samples per matrix	Precision	RPD ≤ 50%, if both results are ≥2 x LOQ
	Metals, AVS/SEM, TOC	One per 10 field samples per matrix	Precision	RPD ≤ 50%, if both results are ≥4 x LOQ
Matrix Spike/Matrix Spike Duplicate	All	One per twenty samples, per matrix, per preparation batch	Accuracy/Bias/Precision	Per DoD QSM Limits; Refer to Worksheets 28
Cooler Temperature Indicator	All	One per cooler	Representativeness	Temperature ≤ 6 degrees Celsius.

SAP Worksheet #12.2: Field Quality Control Samples – Groundwater/Surface Water

(UFP-QAPP Manual Section 2.6.2)

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria
Groundwater, Surface Water				
Trip Blanks	VOCs	One per cooler containing VOC Samples	Accuracy/Bias/ Contamination	No target compounds > ½ LOQ , except for common laboratory contaminants, which must be < LOQ
Equipment Rinsate Blanks	All	One per 20 field samples per matrix per sampling equipment	Accuracy/Bias/ Contamination	No target compounds > ½ LOQ , except for common laboratory contaminants, which must be < LOQ
Field Duplicates	VOCs, SVOCs, PAHs, Pesticides, PCBs	One per 10 field samples per matrix	Precision	RPD ≤ 30%, if both results are ≥2 x LOQ
	Metals, Cyanide, Sulfide, Salinity, TDS, anions, hexavalent chromium	One per 10 field samples per matrix	Precision	RPD ≤ 30%, if both results are ≥4 x LOQ
Matrix Spike/Matrix Spike Duplicate	All	One per twenty samples, per matrix, per preparation batch	Accuracy/Bias/Precision	Per DoD QSM Limits; Refer to Worksheets 28
Cooler Temperature Indicator	All	One per cooler	Accuracy/Representativeness	Temperature ≤ 6 degrees Celsius.

SAP Worksheet #14-1: Summary of Project Tasks, QDC Outfall 001 (NCBC Davisville OU10)

(UFP-QAPP Manual Section 2.8.1)

Maintenance Cleaning of the QDC Outfall 001 Drain Pipe and Associated Catch Basins

Prior to the initiation of the RI, maintenance cleaning of the catch basins and drain line leading from the CED area to QDC Outfall 001 will be performed using vacuum trucks and water jetting. A separate work plan will be prepared for this work.

Clearing

Prior to the initiation of intrusive field work, Resolution will conduct a site visit to mark out the locations of the proposed borings and monitoring wells. The mark out of the locations will be utilized for utility clearance (described below). In addition, Resolution will identify any locations which will require clearing of vegetation in order to advance the borings. If clearing of vegetation is necessary, Resolution will arrange for the vegetation to be cleared prior to the initiation of field activities.

Utility Clearance

Prior to the initiation of intrusive field work, utility clearance will be coordinated with QDC and Dig Safe, and performed in accordance with SOP 3-01.

Surface and Subsurface Sediment Sample Collection

An estimated 80 sediment samples from 20 locations (four depths from each location) will be collected within the wetland. To the extent possible, surface and subsurface sediment samples will be collected using a direct push drill rig. It is anticipated that plywood, swamp mats, and/or DURA-BASE® mats will be required to get a track-mounted direct push drill rig to some/all of the locations in the wetland. In the event that a direct push drill rig is not able to access a location, the second option will be to use hand corers (e.g., Wildco hand corer), and the third option will be to use hand augers.

Table 11-1 identifies sample depths for the surface and subsurface samples; however, it is possible these will be modified in the field based on actual field conditions. Sediment samples will be collected and handled in accordance with SOP 3-17, 3-21, and/or 3-22 (depending on the methodology used to collect the sample) and analyzed for VOCs, SVOCs, PAHs, pesticides, PCBs, TPH, and TAL metals. Ten percent of the sediment samples will be analyzed for hexavalent chromium. Surface sediment samples will also be analyzed for AVS/SEM, TOC, and grain size. Proposed boring locations are shown and Figure 10-5 and sampling rational is provided in Table

11-1. In addition to the primary samples, QA/QC samples will be collected in accordance with this SAP.

Surface and Subsurface Soil Sample Collection

An estimated 30 soil samples from 10 locations (three depths per location) in the Drainage Ditch swale and 18 soil samples from 6 locations (three depths per location) in and around the footprint of the 2008 excavation will be collected. In addition, 6 soil samples from 2 locations (three depths per location) will be collected during monitoring well installation at the well pairs installed upgradient of the wetland and adjacent to the outfall and one soil boring (three depths) will be advanced along the drain pipe approximately 50 feet downgradient of catch basin CB-3. Surface and subsurface soil samples will be collected using a direct push drill rig unless conditions dictate use of another type of drill rig.

Table 11-1 identifies sample depths for the surface and subsurface samples; however, it is possible these will be modified in the field based on actual field conditions. Soil samples will be collected and handled in accordance with SOP 3-17 and 3-21 and analyzed for VOCs, SVOCs, PAHs, pesticides, PCBs, TPH, and TAL metals. 10% of the soil samples will be analyzed for hexavalent chromium. Surface soil samples will also be analyzed for AVS/SEM, TOC, pH, and grain size. Proposed boring locations are shown and Figure 10-6 and sampling rational is provided in Table 11-1. In addition to the primary samples, QA/QC samples will be collected in accordance with this SAP.

Monitoring Well Installation

Three shallow/intermediate well pairs will be installed during the RI as follows:

- one upgradient of the wetland;
- one adjacent to the 2008 excavation; and
- one within the wetland

Proposed new monitoring well locations are shown and Figure 10-8. The newly installed monitoring wells will be developed according to SOP 3-13 and allowed to equilibrate for 7 days prior to sampling. Shallow wells in and adjacent to the wetland will be screened from 2 ft to 12 ft bgs to properly seal the well at the surface. If a clear determination can be made in the field between fill material and underlying native materials, The screen length may be reduced to fully span the upper hydrostratigraphic unit (e.g. if the native materials are observed less than 12 ft bgs. the shallow well will be installed to that depth). Intermediate monitoring wells will be installed using a 10 foot screen length from the upper hydrostratigraphic boundary (fill/native boundary) to 10 feet into the

native materials. A determination of the start and end depth of the intermediate monitoring well screens will be determined in the field. If a clear boundary is not observed, then the intermediate well screens will be installed from 12 ft to 22 ft bgs.

Surface Water Sampling

Surface water samples will be collected from 5 locations within the wetland and 2 locations in the Drainage Ditch. Surface water samples will be collected and handled in accordance with SOP 3-10 Surface Water Sampling and analyzed for SVOCs, PAHs, pesticides, PCBs, total and dissolved TAL metals, cyanide, and sulfide. A minimum of one surface water sample will be analyzed for hexavalent chromium. In addition to the primary samples, QA/QC samples will be collected in accordance with this SAP.

Groundwater Sample Collection (Permanent Monitoring Wells)

Following development, the newly installed monitoring well will be allowed to stabilize for at least seven days prior to groundwater gauging and sampling. The newly installed monitoring wells, as well as existing monitoring wells PGU-Z3-03S and PGU-Z3-03D, will be gauged and sampled in accordance with SOP 3-14 and USEPA Region 1 Low-Flow Sampling Guidance for VOCs, SVOCs, PAHs, pesticides, PCBs, TAL metals, cyanide, sulfide, salinity, TDS, and anions (sulfate, chloride, bicarbonate, carbonate). A minimum of one groundwater sample will be analyzed for hexavalent chromium. Proposed new monitoring well locations and existing monitoring wells PGU-Z3-03S and PGU-Z3-03D are shown and Figure 10-8. Sampling rational is provided in Table 11-1. In addition to the primary samples, QA/QC samples will be collected in accordance with this SAP.

If warranted, subsequent rounds of groundwater sampling could be implemented using the same procedures outlined in this SAP.

Grab Groundwater Sample Collection

Grab groundwater samples will be collected from temporary wells at 5 locations in the wetland, 3 locations in the Drainage Ditch, and potentially from the soil borings if evidence of impacts is detected. Grab groundwater samples will be collected and handled in accordance with SOP 3-37 and analyzed for VOCs, SVOCs, PAHs, pesticides, PCBs, TAL metals, cyanide, and sulfide. Proposed temporary well locations are presented on Figure 10-8 and sampling rationale is provided in Table 11-1. Since the samples collected from the temporary wells are grab groundwater samples, additional grab groundwater QA/QC samples will not be collected. Trip blanks will be included for grab groundwater VOC samples.

Quality Assurance/Quality Control

The QA/QC sample collection frequency is as follows (also shown in Worksheet #12):

- **Equipment blanks** - 1 per 20 field samples, per matrix, per type of sampling equipment. Equipment blanks will not be submitted when dedicated sampling equipment is used (e.g., peristaltic pump with dedicated tubing). Equipment blanks will not be submitted for the analyses presented for physical and geochemical characterization of soil, groundwater, and sediment.
- **Trip blanks** - 1 per cooler containing VOC samples
- **Field duplicates** – (single blind samples) 1 per 10 field samples per matrix
- **MS/MSD or MS/Matrix Duplicate** - 1 per 20 samples per method and matrix

As mentioned previously, grab groundwater QA/QC samples will not be collected other than VOC trip blanks.

Equipment Decontamination

To the maximum extent possible, Resolution will utilize dedicated and disposable sampling equipment to avoid the potential for cross contamination of samples due to inadequate decontamination processes. The sampling equipment will include dedicated plastic scoops, disposable Teflon or polyethylene tubing, disposable gloves, and laboratory supplied sample bottles.

Non-disposable or non-dedicated sampling equipment (e.g., core barrels, stainless spoons, stainless bowls, surge blocks, submersible pumps, etc.) will be decontaminated prior to sampling and between samples. Cleaning of equipment is performed to prevent cross-contamination between samples and to maintain a clean working environment for all personnel. Decontamination will generally consist of a water rinse station to remove gross contamination (if needed), followed by a non-phosphate detergent (e.g., Alconox) water rinse, and a rinse with de-ionized water. If equipment is to be stored or transported, it will be wrapped in aluminum foil after air-drying. All decontamination water generated during decontamination of sampling equipment will be containerized as investigation-derived waste (IDW) and properly disposed of.

Investigation-Derived Waste Management

The IDW, consisting of soil cuttings, sediment cuttings, purge/well development water, water generated during decontamination processes and personal protective equipment (PPE), generated during the advancement of soil borings/monitoring wells, sediment sample collection, well

development/sampling and decontamination activities will be collected in properly labeled 55-gallon drums and temporarily stored on the site for subsequent off-site disposal. Subsequently, the containers will be characterized with laboratory analyses and properly disposed at a Navy approved disposal facility. The IDW will be handled in accordance with RIDEM Policy Memo 95-01 Guidelines for the Management of Investigative Derived Wastes. All disposal facilities will also be approved in the accordance with the Off-Site Rule CFR 300.440.

Land Surveying

A survey of the boring and monitoring well locations will be conducted at the end of the fieldwork by a Rhode Island-licensed surveyor under the direct supervision of Resolution. The locations will be tied into the existing base map developed for the site. After the monitoring wells are installed, a notch or mark will be made at the top of the inner casing. The vertical location of these points will be surveyed to a reference point determined in the field and reported to 0.01 of a foot. All elevations will be referenced to the North American Vertical Datum (NAVD) 1988. The horizontal locations of each point will be established from directly measuring from site features with an accuracy of 0.1 foot.

Laboratory Coordination, Data Management and Validation

Resolution's Project Chemist will track the samples from collections through analysis and obtain data reports from the laboratories within the allotted TAT from sample receipt. A signed certificate of analysis will be provided in the narrative section of each laboratory data package. The laboratory will submit the data in hard copy and an electronic format.

Analytical results will be validated according to the procedures in Worksheet #36. Resolution will be provided with the hard copy and EDD of the laboratory results and will add data validation qualifiers during data validation. The hardcopy and EDD will be checked for completeness and accuracy during data validation. The EDD results will be compared to the hardcopy results during data validation and then loaded into the database on validation is complete.

Risk Assessment

Following data collection, analysis and validation, a HHRA and ERA will be completed per the Risk Assessment Work Plan Technical Memorandum attached to this SAP as Appendix C.

Report Preparation

An RI report will be prepared to document the results of the planned investigation. The RI report elements will include a summary of field efforts, deviations from the work plan (if any), data tables

and figures, comprehensive discussion of the extent of site impacts, and all other standard USEPA and Navy requirements for RI Reports. In addition, the RI Report will include the results of the HHRA and ERA, to be conducted per the Risk Assessment Work Plan Technical Memorandum attached to this SAP as Appendix C.

Prior to preparing the RI report, the analytical results of the planned investigation will be used to evaluate whether an interim removal action is warranted, and will help refine the possible extent of such an action. Based on prior investigations conducted by the Navy, site impacts may warrant consideration of an interim action to accelerate the CERCLA process. If warranted, an EE/CA will be conducted to identify and compare candidate interim actions. The EE/CA would be followed with an Action Memorandum to document the recommended action for implementation. Post-action analytical results would then be available to replace and/or supplement the available site data and to refine the CSM. At that time, an RI report would be prepared to complete the RI phase of the CERCLA process.

SAP Worksheet #15: Establishing Laboratory Reference Limits (NCBC Davisville OU10)

(UFP-QAPP Manual Section 2.8.1)

The following table identifies the PALs and comparison of the PALs to analytical laboratory reference limits (i.e., LODs, LOQs and DLs). The PALs represent the limits of detection that analytical data must meet in order to be of sufficient quality for use in the RI, risk assessment, and remedial technology evaluation (e.g., EE/CA or FS). These levels are designed to represent the lowest of the relevant human health and ecological screening levels and other applicable criteria that will be used. The Navy has reviewed the analyses with LODs/LQOs/DLs that are above PALs and determined that the inability of laboratory analyses to achieve the PALs will not adversely impact the Navy's ability to achieve the project objectives. Further detail on the risk assessment approach is provided in the attached Risk Assessment Work Plan Technical Memorandum included as Attachment C of this SAP. The sources considered for development of PALs are referenced at the bottom of the following tables.

The following table is inclusive of the parameters of interest as well as the physical/geochemical parameters, where applicable:

- VOCs
- SVOCs
- PAHs
- Pesticides
- PCBs
- TPH
- Metals
- Hexavalent Chromium
- Chloride
- Sulfate
- Carbonate
- Bicarbonate
- Cyanide
- Sulfide
- TOC

- AVS/SEM
- TDS
- Salinity

Table 15-1
Project Action Limits (PALs) – Soil
Davisville
North Kingstown, Rhode Island

				Project Action Limits for Soil (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
VOCs via SW8260B	1,1,1,2-Tetrachloroethane	630-20-6	mg/kg	1.90E+00	USEPA Res Soil RSL	2.25E+02	USEPA R5 (shrew/vole)	1.90E+00	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,1,1-Trichloroethane	71-55-6	mg/kg	5.40E+02	RIDEM M1 Res Soil	2.98E+01	USEPA R5 (shrew/vole)	2.98E+01	USEPA R5 (shrew/vole)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,1,2,2-Tetrachloroethane	79-34-5	mg/kg	5.60E-01	USEPA Res Soil RSL	1.27E-01	USEPA R5 (shrew/vole)	1.27E-01	USEPA R5 (shrew/vole)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,1,2-Trichloroethane	79-00-5	mg/kg	1.60E-01	USEPA Res Soil RSL	2.86E+01	USEPA R5 (shrew/vole)	1.60E-01	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,1-Dichloroethane	75-34-3	mg/kg	3.30E+00	USEPA Res Soil RSL	2.01E+01	USEPA R5 (shrew/vole)	3.30E+00	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,1-Dichloroethene	75-35-4	mg/kg	2.00E-01	RIDEM M1 Res Soil	8.28E+00	USEPA R5 (shrew/vole)	2.00E-01	RIDEM M1 Res Soil	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,1-Dichloropropene	563-58-6	mg/kg	1.70E+00	USEPA Res Soil RSL	NA		1.70E+00	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2,3-Trichlorobenzene	87-61-6	mg/kg	4.90E+00	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2,3-Trichloropropane	96-18-4	mg/kg	5.00E-03	USEPA Res Soil RSL	3.36E+00	USEPA R5 (shrew/vole)	5.00E-03	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2,4-Trichlorobenzene	120-82-1	mg/kg	6.20E+00	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2,4-Trimethylbenzene	95-63-6	mg/kg	6.20E+00	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2-Dibromo-3-chloropropane	96-12-8	mg/kg	5.40E-03	USEPA Res Soil RSL	3.52E-02	USEPA R5 (shrew/vole)	5.40E-03	USEPA Res Soil RSL	0.01	Y	0.005	N	0.0025	N
VOCs via SW8260B	1,2-Dibromoethane	106-93-4	mg/kg	1.00E-02	RIDEM M1 Res Soil	1.23E+00	USEPA R5 (shrew/vole)	1.00E-02	RIDEM M1 Res Soil	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2-Dichlorobenzene	95-50-1	mg/kg	1.90E+02	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2-Dichloroethane	107-06-2	mg/kg	4.30E-01	USEPA Res Soil RSL	4.00E-01	USEPA R4 (unspecified)	4.00E-01	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2-Dichloropropane	78-87-5	mg/kg	9.40E-01	USEPA Res Soil RSL	3.27E+01	USEPA R5 (shrew/vole)	9.40E-01	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,3,5-Trimethylbenzene	108-67-8	mg/kg	7.80E+01	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,3-Dichlorobenzene	541-73-1	mg/kg	2.40E+00	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,3-Dichloropropane	142-28-9	mg/kg	1.90E+00	RIDEM M1 Res Soil	3.27E+01	USEPA R5 (shrew/vole)	1.90E+00	RIDEM M1 Res Soil	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,4-Dichlorobenzene	106-46-7	mg/kg	2.40E+00	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	2,2-Dichloropropane	594-20-7	mg/kg	9.40E-01	USEPA Res Soil RSL	3.27E+01	USEPA R5 (shrew/vole)	9.40E-01	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	2-Butanone	78-93-3	mg/kg	2.80E+03	USEPA Res Soil RSL	8.96E+01	USEPA R5 (shrew/vole)	8.96E+01	USEPA R5 (shrew/vole)	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	2-Chlorotoluene	95-49-8	mg/kg	1.60E+02	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	2-Hexanone	591-78-6	mg/kg	2.10E+01	USEPA Res Soil RSL	1.26E+01	USEPA R5 (shrew/vole)	1.26E+01	USEPA R5 (shrew/vole)	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	4-Chlorotoluene	106-43-4	mg/kg	1.60E+02	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	4-Methyl-2-pentanone	108-10-1	mg/kg	5.30E+02	USEPA Res Soil RSL	4.43E+02	USEPA R5 (shrew/vole)	4.43E+02	USEPA R5 (shrew/vole)	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	Acetone	67-64-1	mg/kg	6.10E+03	USEPA Res Soil RSL	2.50E+00	USEPA R5 (shrew/vole)	2.50E+00	USEPA R5 (shrew/vole)	0.02	N	0.01	N	0.005	N
VOCs via SW8260B	Benzene	71-43-2	mg/kg	1.10E+00	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Bromobenzene	108-86-1	mg/kg	3.00E+01	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Bromochloromethane	74-97-5	mg/kg	1.60E+01	USEPA Res Soil RSL	NA		1.60E+01	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Bromodichloromethane	75-27-4	mg/kg	2.70E-01	USEPA Res Soil RSL	5.40E-01	USEPA R5 (shrew/vole)	2.70E-01	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Bromoform	75-25-2	mg/kg	6.20E+01	USEPA Res Soil RSL	1.59E+01	USEPA R5 (shrew/vole)	1.59E+01	USEPA R5 (shrew/vole)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Bromomethane	74-83-9	mg/kg	7.30E-01	USEPA Res Soil RSL	2.35E-01	USEPA R5 (shrew/vole)	2.35E-01	USEPA R5 (shrew/vole)	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	Carbon Disulfide	75-15-0	mg/kg	8.20E+01	USEPA Res Soil RSL	9.41E-02	USEPA R5 (shrew/vole)	9.41E-02	USEPA R5 (shrew/vole)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Carbon tetrachloride	56-23-5	mg/kg	6.10E-01	USEPA Res Soil RSL	2.98E+00	USEPA R5 (shrew/vole)	6.10E-01	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Chlorobenzene	108-90-7	mg/kg	2.90E+01	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Chlorodibromomethane	124-48-1	mg/kg	6.80E-01	USEPA Res Soil RSL	2.05E+00	USEPA R5 (shrew/vole)	6.80E-01	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Chloroethane	75-00-3	mg/kg	1.50E+03	USEPA Res Soil RSL	NA		1.50E+03	USEPA Res Soil RSL	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	Chloroform	67-66-3	mg/kg	2.90E-01	USEPA Res Soil RSL	1.00E-03	USEPA R4 (unspecified)	1.00E-03	USEPA R4 (unspecified)	0.005	Y	0.0025	Y	0.00125	Y
VOCs via SW8260B	Chloromethane	74-87-3	mg/kg	1.20E+01	USEPA Res Soil RSL	1.04E+01	USEPA R5 (shrew/vole)	1.04E+01	USEPA R5 (shrew/vole)	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	cis-1,2-Dichloroethene	156-59-2	mg/kg	1.60E+01	USEPA Res Soil RSL	7.84E-01	USEPA R5 (shrew/vole)	7.84E-01	USEPA R5 (shrew/vole)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	cis-1,3-Dichloropropene	10061-01-5	mg/kg	1.70E+00	USEPA Res Soil RSL	3.98E-01	USEPA R5 (shrew/vole)	3.98E-01	USEPA R5 (shrew/vole)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Dibromomethane	74-95-3	mg/kg	2.50E+00	USEPA Res Soil RSL	6.50E+01	USEPA R5 (shrew/vole)	2.50E+00	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N

				Project Action Limits for Soil (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
VOCs via SW8260B	Dichlorodifluoromethane	75-71-8	mg/kg	9.40E+00	USEPA Res Soil RSL	3.95E+01	USEPA R5 (shrew/vole)	9.40E+00	USEPA Res Soil RSL	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	Ethylbenzene	100-41-4	mg/kg	5.40E+00	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Hexachlorobutadiene	87-68-3	mg/kg	6.10E+00	USEPA Res Soil RSL	3.98E-02	USEPA R5 (shrew/vole)	3.98E-02	USEPA R5 (shrew/vole)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Isopropylbenzene	98-82-8	mg/kg	2.70E+01	RIDEM M1 Res Soil	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Methylcyclohexane	108-87-2	mg/kg	7.00E+02	USEPA Res Soil RSL	NA		7.00E+02	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Methyl tert-butyl ether	1634-04-4	mg/kg	4.30E+01	USEPA Res Soil RSL	NA		4.30E+01	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Methylene chloride	75-09-2	mg/kg	3.60E+01	USEPA Res Soil RSL	2.00E+00	USEPA R4 (unspecified)	2.00E+00	USEPA R4 (unspecified)	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	Naphthalene	91-20-3	mg/kg	3.60E+00	USEPA Res Soil RSL	2.00E+01	ORNL (plants)	3.60E+00	USEPA Res Soil RSL	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	n-Butylbenzene	104-51-8	mg/kg	3.90E+02	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	n-Propylbenzene	103-65-1	mg/kg	3.40E+02	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	p-Isopropyltoluene	99-87-6	mg/kg	2.70E+01	RIDEM M1 Res Soil	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	sec-Butylbenzene	135-98-8	mg/kg	3.90E+02	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Styrene	100-42-5	mg/kg	1.30E+01	RIDEM M1 Res Soil	4.69E+00	USEPA R5 (shrew/vole)	4.69E+00	USEPA R5 (shrew/vole)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	tert-Butyl-Alcohol	75-65-0	mg/kg	NA		NA		NA	NA	0.02	N	0.01	N	0.005	N
VOCs via SW8260B	tert-Butylbenzene	98-06-6	mg/kg	3.90E+02	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Tetrachloroethene	127-18-4	mg/kg	8.60E+00	USEPA Res Soil RSL	5.00E-01	CCME (commercial)	5.00E-01	CCME (commercial)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Toluene	108-88-3	mg/kg	1.90E+02	RIDEM M1 Res Soil	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Total-1,2-Dichloroethene	540-59-0	mg/kg	7.00E+01	USEPA Res Soil RSL	7.84E-01	USEPA R5 (shrew/vole)	7.84E-01	USEPA R5 (shrew/vole)	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	trans-1,2-Dichloroethene	156-60-5	mg/kg	1.50E+01	USEPA Res Soil RSL	7.84E-01	USEPA R5 (shrew/vole)	7.84E-01	USEPA R5 (shrew/vole)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	trans-1,3-Dichloropropene	10061-02-6	mg/kg	1.70E+00	USEPA Res Soil RSL	3.98E-01	USEPA R5 (shrew/vole)	3.98E-01	USEPA R5 (shrew/vole)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Trichloroethene	79-01-6	mg/kg	4.40E-01	USEPA Res Soil RSL	1.00E-03	USEPA R4 (unspecified)	1.00E-03	USEPA R4 (unspecified)	0.005	Y	0.0025	Y	0.00125	Y
VOCs via SW8260B	Trichlorofluoromethane	75-69-4	mg/kg	7.90E+01	USEPA Res Soil RSL	1.64E+01	USEPA R5 (shrew/vole)	1.64E+01	USEPA R5 (shrew/vole)	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	Vinyl chloride	75-01-4	mg/kg	2.00E-02	RIDEM M1 Res Soil	1.00E-02	USEPA R4 (unspecified)	1.00E-02	USEPA R4 (unspecified)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Xylenes (total)	1330-20-7	mg/kg	6.30E+01	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.015	N	0.0075	N	0.00375	N
SVOCs via SW8270D	1,1-Biphenyl	92-52-4	mg/kg	5.10E+00	USEPA Res Soil RSL	6.00E+01	ORNL (plants)	5.10E+00	USEPA Res Soil RSL	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	1,2,4-Trichlorobenzene	120-82-1	mg/kg	6.20E+00	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	1,2-Dichlorobenzene	95-50-1	mg/kg	1.90E+02	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	1,2-Diphenylhydrazine	122-66-7	mg/kg	6.10E-01	USEPA Res Soil RSL	NA		6.10E-01	USEPA Res Soil RSL	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	1,3-Dichlorobenzene	541-73-1	mg/kg	2.40E+00	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	1,4-Dichlorobenzene	106-46-7	mg/kg	2.40E+00	USEPA Res Soil RSL	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	2,4,5-Trichlorophenol	95-95-4	mg/kg	3.30E+02	RIDEM M1 Res Soil	4.00E+00	ORNL (plants)	4.00E+00	ORNL (plants)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	2,4,6-Trichlorophenol	88-06-2	mg/kg	6.10E+00	USEPA Res Soil RSL	4.00E+00	ORNL (plants)	4.00E+00	ORNL (plants)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	2,4-Dichlorophenol	120-83-2	mg/kg	1.80E+01	USEPA Res Soil RSL	2.00E+01	ORNL (inverts)	1.80E+01	USEPA Res Soil RSL	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	2,4-Dimethylphenol	105-67-9	mg/kg	1.20E+02	USEPA Res Soil RSL	1.00E-02	USEPA R5 (plants)	1.00E-02	USEPA R5 (plants)	1.33	Y	0.667	Y	0.333	Y
SVOCs via SW8270D	2,4-Dinitrophenol	51-28-5	mg/kg	1.20E+01	USEPA Res Soil RSL	6.09E-02	USEPA R5 (shrew/vole)	6.09E-02	USEPA R5 (shrew/vole)	3.33	Y	1.67	Y	0.833	Y
SVOCs via SW8270D	2,4-Dinitrotoluene	121-14-2	mg/kg	9.00E-01	RIDEM M1 Res Soil	5.00E-02	USEPA R4 (unspecified)	5.00E-02	USEPA R4 (unspecified)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	2,6-Dichlorophenol	87-65-0	mg/kg	1.80E+01	USEPA Res Soil RSL	1.17E+00	USEPA R5 (shrew/vole)	1.17E+00	USEPA R5 (shrew/vole)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	2,6-Dinitrotoluene	606-20-2	mg/kg	9.00E-01	RIDEM M1 Res Soil	3.28E-02	USEPA R5 (shrew/vole)	3.28E-02	USEPA R5 (shrew/vole)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	2-Chloronaphthalene	91-58-7	mg/kg	6.30E+02	USEPA Res Soil RSL	1.22E-02	USEPA R5 (shrew/vole)	1.22E-02	USEPA R5 (shrew/vole)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	2-Chlorophenol	95-57-8	mg/kg	3.90E+01	USEPA Res Soil RSL	2.43E-01	USEPA R5 (shrew/vole)	2.43E-01	USEPA R5 (shrew/vole)	0.333	Y	0.167	N	0.0833	N
SVOCs via SW8270D	2-Methylnaphthalene	91-57-6	mg/kg	2.30E+01	USEPA Res Soil RSL	1.10E+00	Eco-SSL (mammals)	1.10E+00	Eco-SSL (mammals)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	2-Methylphenol	95-48-7	mg/kg	1.80E+03	USEPA Res Soil RSL	4.04E+01	USEPA R5 (shrew/vole)	4.04E+01	USEPA R5 (shrew/vole)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	2-Nitroaniline	88-74-4	mg/kg	6.10E+01	USEPA Res Soil RSL	7.41E+01	USEPA R5 (shrew/vole)	6.10E+01	USEPA Res Soil RSL	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	2-Nitrophenol	88-75-5	mg/kg	1.80E+03	USEPA Res Soil RSL	1.60E+00	USEPA R5 (shrew/vole)	1.60E+00	USEPA R5 (shrew/vole)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	3,3'-Dichlorobenzidine	91-94-1	mg/kg	1.10E+00	USEPA Res Soil RSL	6.46E-01	USEPA R5 (shrew/vole)	6.46E-01	USEPA R5 (shrew/vole)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	3-methylphenol & 4-methylphenol	65794-96-9	mg/kg	1.80E+03	USEPA Res Soil RSL	NA		1.80E+03	USEPA Res Soil RSL	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	3-Nitroaniline	99-09-2	mg/kg	2.40E+01	USEPA Res Soil RSL	3.16E+00	USEPA R5 (shrew/vole)	3.16E+00	USEPA R5 (shrew/vole)	1.33	N	0.667	N	0.0833	N
SVOCs via SW8270D	4,6-Dintro-2-methylphenol	534-52-1	mg/kg	4.90E-01	USEPA Res Soil RSL	1.44E-01	USEPA R5 (shrew/vole)	1.44E-01	USEPA R5 (shrew/vole)	3.33	Y	1.67	Y	0.833	Y
SVOCs via SW8270D	4-Bromophenyl phenyl ether	101-55-3	mg/kg	NA		NA		NA	NA	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	4-Chloro-3-methylphenol	59-50-7	mg/kg	5.00E+01	RIDEM M1 Res Soil	7.95E+00	USEPA R5 (shrew/vole)	7.95E+00	USEPA R5 (shrew/vole)	0.333	N	0.167	N	0.0833	N

				Project Action Limits for Soil (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
SVOCs via SW8270D	4-Chloroaniline	106-47-8	mg/kg	2.40E+00	USEPA Res Soil RSL	1.10E+00	USEPA R5 (shrew/vole)	1.10E+00	USEPA R5 (shrew/vole)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	4-Chlorophenyl phenyl ether	7005-72-3	mg/kg	NA		NA		NA	NA	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	4-Nitroaniline	100-01-6	mg/kg	2.40E+01	USEPA Res Soil RSL	2.19E+01	USEPA R5 (shrew/vole)	2.19E+01	USEPA R5 (shrew/vole)	1.33	N	0.667	N	0.333	N
SVOCs via SW8270D	4-Nitrophenol	100-02-7	mg/kg	1.80E+03	USEPA Res Soil RSL	5.12E+00	USEPA R5 (shrew/vole)	5.12E+00	USEPA R5 (shrew/vole)	1.33	N	0.667	N	0.333	N
SVOCs via SW8270D	Acenaphthene	83-32-9	mg/kg	4.30E+01	RIDEM M1 Res Soil	2.00E+01	ORNL (plants)	2.00E+01	ORNL (plants)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Acenaphthylene	208-96-8	mg/kg	2.30E+01	RIDEM M1 Res Soil	2.00E+01	ORNL (plants)	2.00E+01	ORNL (plants)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Anthracene	120-12-7	mg/kg	3.50E+01	RIDEM M1 Res Soil	2.00E+01	ORNL (plants)	2.00E+01	ORNL (plants)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Benz(a)anthracene	56-55-3	mg/kg	1.50E-01	USEPA Res Soil RSL	1.80E+01	Eco-SSL (inverts)	1.50E-01	USEPA Res Soil RSL	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	Benzidine	92-87-5	mg/kg	5.00E-04	USEPA Res Soil RSL	NA		5.00E-04	USEPA Res Soil RSL	3.33	Y	1.67	Y	0.833	Y
SVOCs via SW8270D	Benzo(a)pyrene	50-32-8	mg/kg	1.50E-02	USEPA Res Soil RSL	1.10E+00	Eco-SSL (mammals)	1.50E-02	USEPA Res Soil RSL	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	Benzo(b)fluoranthene	205-99-2	mg/kg	1.50E-01	USEPA Res Soil RSL	1.10E+00	Eco-SSL (mammals)	1.50E-01	USEPA Res Soil RSL	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	Benzo(g,h,i)perylene	191-24-2	mg/kg	8.00E-01	RIDEM M1 Res Soil	1.10E+00	Eco-SSL (mammals)	8.00E-01	RIDEM M1 Res Soil	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Benzo(k)fluoranthene	207-08-9	mg/kg	9.00E-01	RIDEM M1 Res Soil	1.10E+00	Eco-SSL (mammals)	9.00E-01	RIDEM M1 Res Soil	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Benzoic acid	65-85-0	mg/kg	2.40E+04	USEPA Res Soil RSL	NA		2.40E+04	USEPA Res Soil RSL	1.33	N	0.667	N	0.333	N
SVOCs via SW8270D	Benzyl alcohol	100-51-6	mg/kg	6.10E+02	USEPA Res Soil RSL	6.58E+01	USEPA R5 (shrew/vole)	6.58E+01	USEPA R5 (shrew/vole)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Bis(2-chlorethoxy)methane	111-91-1	mg/kg	1.80E+01	USEPA Res Soil RSL	3.02E-01	USEPA R5 (shrew/vole)	3.02E-01	USEPA R5 (shrew/vole)	0.333	Y	0.167	N	0.0833	N
SVOCs via SW8270D	Bis(2-chloroethyl) ether	111-44-4	mg/kg	2.10E-01	USEPA Res Soil RSL	2.37E+01	USEPA R5 (shrew/vole)	2.10E-01	USEPA Res Soil RSL	0.333	Y	0.167	N	0.0833	N
SVOCs via SW8270D	Bis(2-chloroisopropyl) ether	108-60-1	mg/kg	4.60E+00	USEPA Res Soil RSL	1.99E+01	USEPA R5 (shrew/vole)	4.60E+00	USEPA Res Soil RSL	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Bis(2-Ethylhexyl)phthalate	117-81-7	mg/kg	3.50E+01	USEPA Res Soil RSL	1.00E-01	USEPA R4 (unspecified)	1.00E-01	USEPA R4 (unspecified)	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	Butyl benzyl phthalate	85-68-7	mg/kg	2.60E+02	USEPA Res Soil RSL	1.00E-01	USEPA R4 (unspecified)	1.00E-01	USEPA R4 (unspecified)	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	Caprolactam	105-60-2	mg/kg	3.10E+03	USEPA Res Soil RSL	NA		3.10E+03	USEPA Res Soil RSL	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Carbazole	86-74-8	mg/kg	2.30E+02	USEPA Res Soil RSL	NA		2.30E+02	USEPA Res Soil RSL	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Chrysene	218-01-9	mg/kg	4.00E-01	RIDEM M1 Res Soil	1.10E+00	Eco-SSL (mammals)	4.00E-01	RIDEM M1 Res Soil	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Dibenz(a,h)anthracene	53-70-3	mg/kg	1.50E-02	USEPA Res Soil RSL	1.80E+01	Eco-SSL (inverts)	1.50E-02	USEPA Res Soil RSL	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	Dibenzofuran	132-64-9	mg/kg	7.80E+00	USEPA Res Soil RSL	NA		7.80E+00	USEPA Res Soil RSL	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Diethyl phthalate	84-66-2	mg/kg	3.40E+02	RIDEM M1 Res Soil	2.48E+01	USEPA R5 (shrew/vole)	2.48E+01	USEPA R5 (shrew/vole)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Dimethyl phthalate	131-11-3	mg/kg	1.90E+03	RIDEM M1 Res Soil	1.00E+02	ORNL (plants)	1.00E+02	ORNL (plants)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Di-n-butyl phthalate	84-74-2	mg/kg	6.10E+02	USEPA Res Soil RSL	1.50E-01	USEPA R5 (shrew/vole)	1.50E-01	USEPA R5 (shrew/vole)	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	Di-n-octyl phthalate	117-84-0	mg/kg	7.30E+01	USEPA Res Soil RSL	2.00E+02	ORNL (plants)	7.30E+01	USEPA Res Soil RSL	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Fluoranthene	206-44-0	mg/kg	2.00E+01	RIDEM M1 Res Soil	2.00E+01	ORNL (plants)	2.00E+01	RIDEM M1 Res Soil	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Fluorene	86-73-7	mg/kg	2.80E+01	RIDEM M1 Res Soil	2.00E+01	ORNL (plants)	2.00E+01	ORNL (plants)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Hexachlorobenzene	118-74-1	mg/kg	3.00E-01	USEPA Res Soil RSL	2.50E-03	USEPA R4 (unspecified)	2.50E-03	USEPA R4 (unspecified)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	Hexachlorobutadiene	87-68-3	mg/kg	6.10E+00	USEPA Res Soil RSL	3.98E-02	USEPA R5 (shrew/vole)	3.98E-02	USEPA R5 (shrew/vole)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	Hexachloroethane	67-72-1	mg/kg	4.30E+00	USEPA Res Soil RSL	5.96E-01	USEPA R5 (shrew/vole)	5.96E-01	USEPA R5 (shrew/vole)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	1.50E-01	USEPA Res Soil RSL	1.10E+00	Eco-SSL (mammals)	1.50E-01	USEPA Res Soil RSL	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	Isophorone	78-59-1	mg/kg	5.10E+02	USEPA Res Soil RSL	1.39E+02	USEPA R5 (shrew/vole)	1.39E+02	USEPA R5 (shrew/vole)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Naphthalene	91-20-3	mg/kg	3.60E+00	USEPA Res Soil RSL	2.00E+01	ORNL (plants)	3.60E+00	USEPA Res Soil RSL	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Nitrobenzene	98-95-3	mg/kg	4.80E+00	USEPA Res Soil RSL	1.31E+00	USEPA R5 (shrew/vole)	1.31E+00	USEPA R5 (shrew/vole)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	N-Nitrosodimethylamine	62-75-9	mg/kg	2.30E-03	USEPA Res Soil RSL	3.21E-05	USEPA R5 (shrew/vole)	3.21E-05	USEPA R5 (shrew/vole)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	N-Nitrosodi-n-propylamine	621-64-7	mg/kg	6.90E-02	USEPA Res Soil RSL	5.44E-01	USEPA R5 (shrew/vole)	6.90E-02	USEPA Res Soil RSL	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	N-Nitrosodiphenylamine	86-30-6	mg/kg	9.90E+01	USEPA Res Soil RSL	5.45E-01	USEPA R5 (shrew/vole)	5.45E-01	USEPA R5 (shrew/vole)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Pentachlorophenol	87-86-5	mg/kg	8.90E-01	USEPA Res Soil RSL	2.10E+00	Eco-SSL (birds)	8.90E-01	USEPA Res Soil RSL	1.33	Y	0.667	N	0.333	N
SVOCs via SW8270D	Phenanthrene	85-01-8	mg/kg	4.00E+01	RIDEM M1 Res Soil	2.00E+01	ORNL (plants)	2.00E+01	ORNL (plants)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Phenol	108-95-2	mg/kg	1.80E+03	USEPA Res Soil RSL	3.00E+01	ORNL (inverts)	3.00E+01	ORNL (inverts)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Pyrene	129-00-0	mg/kg	1.30E+01	RIDEM M1 Res Soil	1.10E+00	Eco-SSL (mammals)	1.10E+00	Eco-SSL (mammals)	0.333	N	0.167	N	0.0833	N
PAHs via SW8270D mod.	Acenaphthene	83-32-9	mg/kg	4.30E+01	RIDEM M1 Res Soil	2.00E+01	ORNL (plants)	2.00E+01	ORNL (plants)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Acenaphthylene	208-96-8	mg/kg	2.30E+01	RIDEM M1 Res Soil	2.00E+01	ORNL (plants)	2.00E+01	ORNL (plants)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Anthracene	120-12-7	mg/kg	3.50E+01	RIDEM M1 Res Soil	2.00E+01	ORNL (plants)	2.00E+01	ORNL (plants)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Benz(a)anthracene	56-55-3	mg/kg	1.50E-01	USEPA Res Soil RSL	1.80E+01	Eco-SSL (inverts)	1.50E-01	USEPA Res Soil RSL	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Benzo(a)pyrene	50-32-8	mg/kg	1.50E-02	USEPA Res Soil RSL	1.10E+00	Eco-SSL (mammals)	1.50E-02	USEPA Res Soil RSL	0.00667	N	0.00333	N	0.00167	N

				Project Action Limits for Soil (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
PAHs via SW8270D mod.	Benzo(b)fluoranthene	205-99-2	mg/kg	1.50E-01	USEPA Res Soil RSL	1.10E+00	Eco-SSL (mammals)	1.50E-01	USEPA Res Soil RSL	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Benzo(g,h,i)perylene	191-24-2	mg/kg	8.00E-01	RIDEM M1 Res Soil	1.10E+00	Eco-SSL (mammals)	8.00E-01	RIDEM M1 Res Soil	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Benzo(k)fluoranthene	207-08-9	mg/kg	9.00E-01	RIDEM M1 Res Soil	1.10E+00	Eco-SSL (mammals)	9.00E-01	RIDEM M1 Res Soil	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Chrysene	218-01-9	mg/kg	4.00E-01	RIDEM M1 Res Soil	1.10E+00	Eco-SSL (mammals)	4.00E-01	RIDEM M1 Res Soil	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Dibenz(a,h)anthracene	53-70-3	mg/kg	1.50E-02	USEPA Res Soil RSL	1.80E+01	Eco-SSL (inverts)	1.50E-02	USEPA Res Soil RSL	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Fluoranthene	206-44-0	mg/kg	2.00E+01	RIDEM M1 Res Soil	2.00E+01	ORNL (plants)	2.00E+01	RIDEM M1 Res Soil	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Fluorene	86-73-7	mg/kg	2.80E+01	RIDEM M1 Res Soil	2.00E+01	ORNL (plants)	2.00E+01	ORNL (plants)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	1.50E-01	USEPA Res Soil RSL	1.10E+00	Eco-SSL (mammals)	1.50E-01	USEPA Res Soil RSL	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Naphthalene	91-20-3	mg/kg	3.60E+00	USEPA Res Soil RSL	2.00E+01	ORNL (plants)	3.60E+00	USEPA Res Soil RSL	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Phenanthrene	85-01-8	mg/kg	4.00E+01	RIDEM M1 Res Soil	2.00E+01	ORNL (plants)	2.00E+01	ORNL (plants)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Pyrene	129-00-0	mg/kg	1.30E+01	RIDEM M1 Res Soil	1.10E+00	Eco-SSL (mammals)	1.10E+00	Eco-SSL (mammals)	0.00667	N	0.00333	N	0.00167	N
Pesticides via SW8081B	4,4'-DDD	72-54-8	mg/kg	2.00E+00	USEPA Res Soil RSL	2.10E-02	Eco-SSL (mammals)	2.10E-02	Eco-SSL (mammals)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	4,4'-DDE	72-55-9	mg/kg	1.40E+00	USEPA Res Soil RSL	2.10E-02	Eco-SSL (mammals)	2.10E-02	Eco-SSL (mammals)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	4,4'-DDT	50-29-3	mg/kg	1.70E+00	USEPA Res Soil RSL	2.10E-02	Eco-SSL (mammals)	2.10E-02	Eco-SSL (mammals)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	Aldrin	309-00-2	mg/kg	2.90E-02	USEPA Res Soil RSL	6.00E-05	TV (unspecified)	6.00E-05	TV (unspecified)	0.00067	Y	0.00034	Y	0.00011	Y
Pesticides via SW8081B	alpha-BHC	319-84-6	mg/kg	7.70E-02	USEPA Res Soil RSL	2.50E-03	USEPA R4 (unspecified)	2.50E-03	USEPA R4 (unspecified)	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	alpha-Chlordane	5103-71-9	mg/kg	5.00E-01	RIDEM M1 Res Soil	3.00E-05	TV (unspecified)	3.00E-05	TV (unspecified)	0.00067	Y	0.00034	Y	0.00011	Y
Pesticides via SW8081B	beta-BHC	319-85-7	mg/kg	2.70E-01	USEPA Res Soil RSL	1.00E-03	USEPA R4 (unspecified)	1.00E-03	USEPA R4 (unspecified)	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	delta-BHC	319-86-8	mg/kg	7.70E-02	USEPA Res Soil RSL	9.94E+00	USEPA R5 (shrew/vole)	7.70E-02	USEPA Res Soil RSL	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	Dieldrin	60-57-1	mg/kg	3.00E-02	USEPA Res Soil RSL	5.00E-04	USEPA R4 (unspecified)	5.00E-04	USEPA R4 (unspecified)	0.00067	Y	0.00034	N	0.00017	N
Pesticides via SW8081B	Endosulfan I	959-98-8	mg/kg	3.70E+01	USEPA Res Soil RSL	1.00E-05	TV (unspecified)	1.00E-05	TV (unspecified)	0.00067	Y	0.00034	Y	0.00017	Y
Pesticides via SW8081B	Endosulfan II	33213-65-9	mg/kg	3.70E+01	USEPA Res Soil RSL	1.00E-05	TV (unspecified)	1.00E-05	TV (unspecified)	0.00067	Y	0.00034	Y	0.00017	Y
Pesticides via SW8081B	Endosulfan sulfate	1031-07-8	mg/kg	3.70E+01	USEPA Res Soil RSL	1.00E-05	TV (unspecified)	1.00E-05	TV (unspecified)	0.00067	Y	0.00034	Y	0.00017	Y
Pesticides via SW8081B	Endrin	72-20-8	mg/kg	1.80E+00	USEPA Res Soil RSL	1.00E-03	USEPA R4 (unspecified)	1.00E-03	USEPA R4 (unspecified)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	Endrin aldehyde	7421-93-4	mg/kg	1.80E+00	USEPA Res Soil RSL	1.00E-03	USEPA R4 (unspecified)	1.00E-03	USEPA R4 (unspecified)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	Endrin ketone	53494-70-5	mg/kg	1.80E+00	USEPA Res Soil RSL	1.00E-03	USEPA R4 (unspecified)	1.00E-03	USEPA R4 (unspecified)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	gamma-BHC	58-89-9	mg/kg	5.20E-01	USEPA Res Soil RSL	5.00E-05	USEPA R4 (unspecified)	5.00E-05	USEPA R4 (unspecified)	0.00067	Y	0.00034	Y	0.00011	Y
Pesticides via SW8081B	gamma-Chlordane	5103-74-2	mg/kg	5.00E-01	RIDEM M1 Res Soil	3.00E-05	TV (unspecified)	3.00E-05	TV (unspecified)	0.00067	Y	0.00034	Y	0.00011	Y
Pesticides via SW8081B	Heptachlor	76-44-8	mg/kg	1.10E-01	USEPA Res Soil RSL	5.98E-03	USEPA R5 (shrew/vole)	5.98E-03	USEPA R5 (shrew/vole)	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	Heptachlor epoxide	1024-57-3	mg/kg	5.30E-02	USEPA Res Soil RSL	1.52E-01	USEPA R5 (shrew/vole)	5.30E-02	USEPA Res Soil RSL	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	Methoxychlor	72-43-5	mg/kg	3.10E+01	USEPA Res Soil RSL	1.99E-02	USEPA R5 (shrew/vole)	1.99E-02	USEPA R5 (shrew/vole)	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	Toxaphene	8001-35-2	mg/kg	4.40E-01	USEPA Res Soil RSL	1.19E-01	USEPA R5 (shrew/vole)	1.19E-01	USEPA R5 (shrew/vole)	0.033	N	0.022	N	0.011	N
PCBs via SW8082A	Aroclor-1016	12674-11-2	mg/kg	3.90E-01	USEPA Res Soil RSL	1.30E+00	CCME (residential/parkland)	3.90E-01	USEPA Res Soil RSL	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1221	11104-28-2	mg/kg	1.40E-01	USEPA Res Soil RSL	1.30E+00	CCME (residential/parkland)	1.40E-01	USEPA Res Soil RSL	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1232	11141-16-5	mg/kg	1.40E-01	USEPA Res Soil RSL	1.30E+00	CCME (residential/parkland)	1.40E-01	USEPA Res Soil RSL	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1242	53469-21-9	mg/kg	2.20E-01	USEPA Res Soil RSL	1.30E+00	CCME (residential/parkland)	2.20E-01	USEPA Res Soil RSL	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1248	12672-29-6	mg/kg	2.20E-01	USEPA Res Soil RSL	1.30E+00	CCME (residential/parkland)	2.20E-01	USEPA Res Soil RSL	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1254	11097-69-1	mg/kg	1.10E-01	USEPA Res Soil RSL	1.30E+00	CCME (residential/parkland)	1.10E-01	USEPA Res Soil RSL	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1260	11096-82-5	mg/kg	2.20E-01	USEPA Res Soil RSL	1.30E+00	CCME (residential/parkland)	2.20E-01	USEPA Res Soil RSL	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1262	37324-23-5	mg/kg	2.20E-01	USEPA Res Soil RSL	1.30E+00	CCME (residential/parkland)	2.20E-01	USEPA Res Soil RSL	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1268	11100-14-4	mg/kg	2.20E-01	USEPA Res Soil RSL	1.30E+00	CCME (residential/parkland)	2.20E-01	USEPA Res Soil RSL	0.0167	N	0.00833	N	0.00417	N
TPH via 8015C	TPH C9-C40	TPH-DRO	mg/kg	NA		NA		NA	NA	13.3	N	6.67	N	6.67	N
TAL Metals via SW6010C	Aluminum	7429-90-5	mg/kg	7.70E+03	USEPA Res Soil RSL	5.00E+01	ORNL (plants)	5.00E+01	ORNL (plants)	10	N	5	N	2.5	N
TAL Metals via SW6010C	Calcium	7440-70-2	mg/kg	NA		NA		NA	NA	250	N	100	N	50	N
TAL Metals via SW6010C	Iron	7439-89-6	mg/kg	5.50E+03	USEPA Res Soil RSL	2.00E+02	USEPA R4 (unspecified)	2.00E+02	USEPA R4 (unspecified)	7.5	N	3	N	1.5	N
TAL Metals via SW6010C	Magnesium	7439-95-4	mg/kg	NA		NA		NA	NA	250	N	150	N	50	N

				Project Action Limits for Soil (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
TAL Metals via SW6010C	Potassium	7440-09-7	mg/kg	NA		NA		NA	NA	250	N	150	N	50	N
TAL Metals via SW6010C	Sodium	7440-23-5	mg/kg	NA		NA		NA	NA	250	N	150	N	50	N
TAL Metals via SW6010C	Antimony	7440-36-0	mg/kg	3.10E+00	USEPA Res Soil RSL	2.70E-01	Eco-SSL (mammals)	2.70E-01	Eco-SSL (mammals)	0.5	Y	0.4	Y	0.25	N
TAL Metals via SW6010C	Arsenic	7440-38-2	mg/kg	3.90E-01	USEPA Res Soil RSL	1.80E+01	Eco-SSL (plants)	3.90E-01	USEPA Res Soil RSL	0.5	Y	0.3	N	0.15	N
TAL Metals via SW6010C	Barium	7440-39-3	mg/kg	1.50E+03	USEPA Res Soil RSL	3.30E+02	Eco-SSL (inverts)	3.30E+02	Eco-SSL (inverts)	2	N	0.5	N	0.25	N
TAL Metals via SW6010C	Beryllium	7440-41-7	mg/kg	1.50E+00	RIDEM M1 Res Soil	1.00E+01	ORNL (plants)	1.50E+00	RIDEM M1 Res Soil	0.25	N	0.1	N	0.05	N
TAL Metals via SW6010C	Cadmium	7440-43-9	mg/kg	7.00E+00	USEPA Res Soil RSL	3.60E-01	Eco-SSL (mammals)	3.60E-01	Eco-SSL (mammals)	0.25	N	0.1	N	0.05	N
TAL Metals via SW6010C	Chromium	7440-47-3	mg/kg	2.90E-01	USEPA Res Soil RSL	4.00E-01	ORNL (inverts)	2.90E-01	USEPA Res Soil RSL	0.5	Y	0.2	N	0.1	N
TAL Metals via SW6010C	Cobalt	7440-48-4	mg/kg	2.30E+00	USEPA Res Soil RSL	1.30E+01	Eco-SSL (plants)	2.30E+00	USEPA Res Soil RSL	0.625	N	0.5	N	0.25	N
TAL Metals via SW6010C	Copper	7440-50-8	mg/kg	3.10E+02	USEPA Res Soil RSL	2.80E+01	Eco-SSL (birds)	2.80E+01	Eco-SSL (birds)	0.5	N	0.4	N	0.2	N
TAL Metals via SW6010C	Lead	7439-92-1	mg/kg	1.50E+02	RIDEM M1 Res Soil	1.10E+01	Eco-SSL (birds)	1.10E+01	Eco-SSL (birds)	0.25	N	0.15	N	0.075	N
TAL Metals via SW6010C	Manganese	7439-96-5	mg/kg	1.80E+02	USEPA Res Soil RSL	2.20E+02	Eco-SSL (plants)	1.80E+02	USEPA Res Soil RSL	0.75	N	0.3	N	0.15	N
TAL Metals via SW6010C	Nickel	7440-02-0	mg/kg	1.50E+02	USEPA Res Soil RSL	3.80E+01	Eco-SSL (plants)	3.80E+01	Eco-SSL (plants)	0.5	N	0.3	N	0.15	N
TAL Metals via SW6010C	Selenium	7782-49-2	mg/kg	3.90E+01	USEPA Res Soil RSL	5.20E-01	Eco-SSL (plants)	5.20E-01	Eco-SSL (plants)	0.5	N	0.25	N	0.15	N
TAL Metals via SW6010C	Silver	7440-22-4	mg/kg	3.90E+01	USEPA Res Soil RSL	2.00E+00	USEPA R4 (unspecified)	2.00E+00	USEPA R4 (unspecified)	0.5	N	0.1	N	0.05	N
TAL Metals via SW6010C	Thallium	7440-28-0	mg/kg	7.80E-02	USEPA Res Soil RSL	5.69E-02	USEPA R5 (shrew/vole)	5.69E-02	USEPA R5 (shrew/vole)	0.4	Y	0.2	Y	0.15	Y
TAL Metals via SW6010C	Vanadium	7440-62-2	mg/kg	3.90E+01	USEPA Res Soil RSL	2.00E+00	ORNL (plants)	2.00E+00	ORNL (plants)	0.625	N	0.5	N	0.25	N
TAL Metals via SW6010C	Zinc	7440-66-6	mg/kg	2.30E+03	USEPA Res Soil RSL	4.60E+01	Eco-SSL (birds)	4.60E+01	Eco-SSL (birds)	1	N	0.5	N	0.25	N
TAL Metals via SW7471B	Mercury	7439-97-6	mg/kg	2.30E+01	RIDEM M1 Res Soil	1.58E-03	USEPA R5 (shrew/vole)	1.58E-03	USEPA R5 (shrew/vole)	0.033	Y	0.0266	Y	0.013	Y
SW3060A/7196A	Hexavalent Chromium	18540-29-9	mg/kg	2.90E-01	USEPA Res Soil RSL	4.00E-01	ORNL (inverts)	2.90E-01	USEPA Res Soil RSL	1	Y	0.8	Y	0.4	Y
EPA-821-R-91-100	AVS	ACIDSO2	umol/g	NA		NA		NA	NA	0.2	N	0.2	N	0.08	N
EPA-821-R-91-100	SEM-Cadmium	7440-43-9	umol/g	NA		NA		NA	NA	0.0011121	N	0.0004448	N	0.0002224	N
EPA-821-R-91-100	SEM-Copper	7440-50-8	umol/g	NA		NA		NA	NA	0.0098348	N	0.0031471	N	0.001967	N
EPA-821-R-91-100	SEM-Lead	7439-92-1	umol/g	NA		NA		NA	NA	0.000362	N	0.000362	N	0.000181	N
EPA-821-R-91-100	SEM-Mercury	7439-97-6	umol/g	NA		NA		NA	NA	0.000025	N	0.00001	N	0.00001	N
EPA-821-R-91-100	SEM-Nickel	7440-02-0	umol/g	NA		NA		NA	NA	0.0170358	N	0.0025554	N	0.0012777	N
EPA-821-R-91-100	SEM-Silver	7440-22-4	umol/g	NA		NA		NA	NA	0.002317	N	0.0011585	N	0.0006951	N
EPA-821-R-91-100	SEM-Zinc	7440-66-6	umol/g	NA		NA		NA	NA	0.0076476	N	0.0038238	N	0.0019119	N
Lloyd Kahn	Total Organic Carbon	TOC	mg/kg	NA		NA		NA	NA	800	N	400	N	200	N
ASTM D422-63	Grain Size (sieve and hydrometer)	GrainSize	percent	NA		NA		NA	NA	NA	N	NA	N	NA	N

Notes:
AVS - Acid Volatile Sulfide.
CAS - Chemical Abstracts Service.
DL - Detection Limit.
Eco - Indicates the selected PAL that is protective of ecological receptors.
HH - Indicates the selected PAL that is protective of human health receptors.
LOD - Limit of Detection.
LOQ - Limit of Quantitation.
NA - Not available/applicable.
PAL - Project Action Limit.
PAH - Polycyclic Aromatic Hydrocarbon.
PCB - Polychlorinated Biphenyls.
SEM - Simultaneously Extracted Metals.
SVOC - Semi-Volatile Organic Compound.
TPH – Total Petroleum Hydrocarbons
USEPA - United States Environmental Protection Agency.
VOC - Volatile Organic Compound.
Highlighting indicates the compound's laboratory reference value(s) is/are above the selected PAL.
(a) The PAL represents the limits of detection that analytical data must meet in order to be of sufficient quality for use in the Remedial Investigation, Risk Assessment, and remedial technology evaluation [e.g., engineering evaluation/cost analysis (EE/CA) or feasibility study (FS)].
PALs are presented for compounds proposed for laboratory analysis and therefore do not include groups of compounds (such as Total PAHs and Total PCBs) that will be calculated based on individual PAHs and individual aroclor data for evaluation.
(b) Indicates the lower of the PALs based on levels protective of human health and ecological receptors.
(c) HH PALs were selected based on the lower of the following sources:
RIDEM M1 Res Soil = RIDEM, 2011. Method 1 Soil Objectives. Direct Exposure Criteria. Value for Residential Exposure.
RIDEM M1 Comm Soil = RIDEM, 2011. Method 1 Soil Objectives. Direct Exposure Criteria. Value for Commercial/Industrial Exposure.
USEPA Res Soil RSL = USEPA Regional Screening Level for Residential Soil. November 2012. Values adjusted for a target hazard quotient of 0.1 to account for cumulative effects on the same target organ.
USEPA Comm Soil RSL = USEPA Regional Screening Level for Industrial Soil. November 2012. Values adjusted for a target hazard quotient of 0.1 to account for cumulative effects on the same target organ.

(d) Eco PALs were selected based on the following sources (parentheses indicate receptor to which PAL applies):

Eco-SSL = Eco-SSLs derived by USEPA according to USEPA guidance (2007). Values listed are current as of May 25, 2012. Individual Eco-SSL documents are available here - http://www.epa.gov/ecotox/ecossl/

ORNL (plants) = Efroymson, R.A., M.E. Will, G.W. Suter II and A.C. Wooten. 1997. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants: 1997 Revision, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN, ES/ER/TM-85/R3.

ORNL (inverts) = Efroymson, R.A., M.E. Will and G.W. Suter II. 1997. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN, ES/ER/TM-126/R2.

ORNL (birds/mammals) = Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals for Ecological Endpoints, Oak Ridge National Laboratory Oak Ridge, TN, ES/ER/TM-162/R2.

USEPA R5 = USEPA. 2003. USEPA Region 5 Ecological Screening Levels. Revision August 2003. Available on-line at http://www.epa.gov/reg5rcra/ca/edql.htm. Values based on shrew or vole unless otherwise noted.

USEPA R4 = USEPA. 2001. Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment. Originally published November 1995. Website version last updated November 30, 2001: http://www.epa.gov/region4/superfund/programs/riskassess/ecolbul.html

CCME = Canadian Council of Ministers of the Environment (2002). Canadian soil quality guidelines.

TV = Target Value. Dutch standards presented in Buchman (2008).

Table 15-2
Project Action Limits (PALs) – Sediment
Davisville
North Kingstown, Rhode Island

				Project Action Limits for Sediment (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
VOCs via SW8260B	1,1,1,2-Tetrachloroethane	630-20-6	mg/kg	1.65E+02	RSL Calculator	NA		1.65E+02	RSL Calculator	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,1,1-Trichloroethane	71-55-6	mg/kg	1.05E+05	RSL Calculator	3.02E-02	USEPA R3 (FW; EqP method)	3.02E-02	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,1,2,2-Tetrachloroethane	79-34-5	mg/kg	2.15E+01	RSL Calculator	1.36E+00	USEPA R3 (FW; EqP method)	1.36E+00	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,1,2-Trichloroethane	79-00-5	mg/kg	7.54E+01	RSL Calculator	1.24E+00	USEPA R3 (FW; EqP method)	1.24E+00	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,1-Dichloroethane	75-34-3	mg/kg	7.54E+02	RSL Calculator	2.70E-02	ORNL SCV (EqP method)	2.70E-02	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,1-Dichloroethene	75-35-4	mg/kg	2.63E+03	RSL Calculator	3.10E-02	USEPA R3 (FW; EqP method)	3.10E-02	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,1-Dichloropropene	563-58-6	mg/kg	4.30E+01	RSL Calculator	NA		4.30E+01	RSL Calculator	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2,3-Trichlorobenzene	87-61-6	mg/kg	3.26E+01	RSL Calculator	8.58E-01	USEPA R3 (FW; EqP method)	8.58E-01	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2,3-Trichloropropane	96-18-4	mg/kg	3.35E-02	RSL Calculator	NA		3.35E-02	RSL Calculator	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2,4-Trichlorobenzene	120-82-1	mg/kg	1.48E+02	RSL Calculator	2.10E+00	USEPA R3 (FW; EqP method)	2.10E+00	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2,4-Trimethylbenzene	95-63-6	mg/kg	NA		1.60E-01	ORNL SCV (EqP method)	1.60E-01	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2-Dibromo-3-chloropropane	96-12-8	mg/kg	1.25E+00	RSL Calculator	NA		1.25E+00	RSL Calculator	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	1,2-Dibromoethane	106-93-4	mg/kg	2.15E+00	RSL Calculator	NA		2.15E+00	RSL Calculator	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2-Dichlorobenzene	95-50-1	mg/kg	4.74E+03	RSL Calculator	1.65E-02	USEPA R3 (FW; EqP method)	1.65E-02	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2-Dichloroethane	107-06-2	mg/kg	4.72E+01	RSL Calculator	2.50E-01	ORNL SCV (EqP method)	2.50E-01	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,2-Dichloropropane	78-87-5	mg/kg	1.19E+02	RSL Calculator	3.33E-01	USEPA R5 (FW)	3.33E-01	USEPA R5 (FW)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,3,5-Trimethylbenzene	108-67-8	mg/kg	5.26E+02	RSL Calculator	1.60E-01	ORNL SCV (EqP method)	1.60E-01	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,3-Dichlorobenzene	541-73-1	mg/kg	7.96E+02	RSL Calculator	4.43E+00	USEPA R3 (FW; EqP method)	4.43E+00	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,3-Dichloropropane	142-28-9	mg/kg	1.05E+03	RSL Calculator	NA		1.05E+03	RSL Calculator	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	1,4-Dichlorobenzene	106-46-7	mg/kg	7.96E+02	RSL Calculator	5.99E-01	USEPA R3 (FW; EqP method)	5.99E-01	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	2,2-Dichloropropane	594-20-7	mg/kg	1.19E+02	RSL Calculator	NA		1.19E+02	RSL Calculator	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	2-Butanone	78-93-3	mg/kg	3.16E+04	RSL Calculator	2.70E-01	ORNL SCV (EqP method)	2.70E-01	ORNL SCV (EqP method)	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	2-Chlorotoluene	95-49-8	mg/kg	1.05E+03	RSL Calculator	5.00E-02	ORNL SCV (EqP method)	5.00E-02	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	2-Hexanone	591-78-6	mg/kg	2.63E+02	RSL Calculator	2.20E-02	ORNL SCV (EqP method)	2.20E-02	ORNL SCV (EqP method)	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	4-Chlorotoluene	106-43-4	mg/kg	1.05E+03	RSL Calculator	5.00E-02	ORNL SCV (EqP method)	5.00E-02	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	4-Methyl-2-pentanone	108-10-1	mg/kg	4.21E+03	RSL Calculator	3.30E-02	ORNL SCV (EqP method)	3.30E-02	ORNL SCV (EqP method)	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	Acetone	67-64-1	mg/kg	4.74E+04	RSL Calculator	8.70E-03	ORNL SCV (EqP method)	8.70E-03	ORNL SCV (EqP method)	0.02	Y	0.01	Y	0.005	N
VOCs via SW8260B	Benzene	71-43-2	mg/kg	7.82E+01	RSL Calculator	1.60E-01	ORNL SCV (EqP method)	1.60E-01	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Bromobenzene	108-86-1	mg/kg	4.21E+02	RSL Calculator	1.60E-01	ORNL SCV (EqP method)	1.60E-01	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Bromochloromethane	74-97-5	mg/kg	NA		NA		NA	NA	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Bromodichloromethane	75-27-4	mg/kg	6.93E+01	RSL Calculator	NA		6.93E+01	RSL Calculator	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Bromoform	75-25-2	mg/kg	3.12E+02	RSL Calculator	6.54E-01	USEPA R3 (FW; EqP method)	6.54E-01	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Bromomethane	74-83-9	mg/kg	7.37E+01	RSL Calculator	1.37E-03	USEPA R5 (FW)	1.37E-03	USEPA R5 (FW)	0.01	Y	0.005	Y	0.0025	Y
VOCs via SW8260B	Carbon Disulfide	75-15-0	mg/kg	5.26E+03	RSL Calculator	8.51E-04	USEPA R3 (FW; EqP method)	8.51E-04	USEPA R3 (FW; EqP method)	0.005	Y	0.0025	Y	0.00125	Y
VOCs via SW8260B	Carbon tetrachloride	56-23-5	mg/kg	6.14E+01	RSL Calculator	6.42E-02	USEPA R3 (FW; EqP method)	6.42E-02	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Chlorobenzene	108-90-7	mg/kg	1.05E+03	RSL Calculator	8.42E-03	USEPA R3 (FW; EqP method)	8.42E-03	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Chlorodibromomethane	124-48-1	mg/kg	2.93E+01	RSL Calculator	NA		2.93E+01	RSL Calculator	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Chloroethane	75-00-3	mg/kg	NA		NA		NA	NA	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	Chloroform	67-66-3	mg/kg	1.39E+02	RSL Calculator	2.20E-02	ORNL SCV (EqP method)	2.20E-02	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Chloromethane	74-87-3	mg/kg	NA	RSL Calculator	NA		NA	NA	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	cis-1,2-Dichloroethene	156-59-2	mg/kg	1.05E+02	RSL Calculator	NA		1.05E+02	RSL Calculator	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	cis-1,3-Dichloropropene	10061-01-5	mg/kg	4.30E+01	RSL Calculator	5.10E-05	ORNL SCV (EqP method)	5.10E-05	ORNL SCV (EqP method)	0.005	Y	0.0025	Y	0.00125	Y
VOCs via SW8260B	Dibromomethane	74-95-3	mg/kg	5.26E+02	RSL Calculator	NA		5.26E+02	RSL Calculator	0.005	N	0.0025	N	0.00125	N

				Project Action Limits for Sediment (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
VOCs via SW8260B	Dichlorodifluoromethane	75-71-8	mg/kg	1.05E+04	RSL Calculator	NA		1.05E+04	RSL Calculator	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	Ethylbenzene	100-41-4	mg/kg	3.91E+02	RSL Calculator	1.10E+00	USEPA R3 (FW; EqP method)	1.10E+00	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Hexachlorobutadiene	87-68-3	mg/kg	3.16E+01	RSL Calculator	2.65E-02	USEPA R5 (FW)	2.65E-02	USEPA R5 (FW)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Isopropylbenzene	98-82-8	mg/kg	5.26E+03	RSL Calculator	8.60E-02	USEPA R3 (FW; EqP method)	8.60E-02	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Methylcyclohexane	108-87-2	mg/kg	2.63E+02	RSL Calculator	NA		2.63E+02	RSL Calculator	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Methyl tert-butyl ether	1634-04-4	mg/kg	2.39E+03	RSL Calculator	NA		2.39E+03	RSL Calculator	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Methylene chloride	75-09-2	mg/kg	3.16E+02	RSL Calculator	3.70E-01	ORNL SCV (EqP method)	3.70E-01	ORNL SCV (EqP method)	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	Naphthalene	91-20-3	mg/kg	7.63E+02	RSL Calculator	1.76E-01	MacDonald (TEC)	1.76E-01	MacDonald (TEC)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	n-Butylbenzene	104-51-8	mg/kg	2.63E+03	RSL Calculator	1.60E-01	ORNL SCV (EqP method)	1.60E-01	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	n-Propylbenzene	103-65-1	mg/kg	4.08E+03	RSL Calculator	1.60E-01	ORNL SCV (EqP method)	1.60E-01	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	p-Isopropyltoluene	99-87-6	mg/kg	5.26E+03	RSL Calculator	5.00E-02	ORNL SCV (EqP method)	5.00E-02	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	sec-Butylbenzene	135-98-8	mg/kg	2.63E+03	RSL Calculator	1.60E-01	ORNL SCV (EqP method)	1.60E-01	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Styrene	100-42-5	mg/kg	1.05E+04	RSL Calculator	5.59E-01	USEPA R3 (FW; EqP method)	5.59E-01	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	tert-Butyl-Alcohol	75-65-0	mg/kg	NA		NA		NA	NA	0.02	N	0.01	N	0.005	N
VOCs via SW8260B	tert-Butylbenzene	98-06-6	mg/kg	2.63E+03	RSL Calculator	1.60E-01	ORNL SCV (EqP method)	1.60E-01	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Tetrachloroethene	127-18-4	mg/kg	3.16E+02	RSL Calculator	4.68E-01	USEPA R3 (FW; EqP method)	4.68E-01	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Toluene	108-88-3	mg/kg	4.21E+03	RSL Calculator	5.00E-02	ORNL SCV (EqP method)	5.00E-02	ORNL SCV (EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Total-1,2-Dichloroethene	540-59-0	mg/kg	4.74E+02	RSL Calculator	4.00E-01	ORNL SCV (EqP method)	4.00E-01	ORNL SCV (EqP method)	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	trans-1,2-Dichloroethene	156-60-5	mg/kg	1.05E+03	RSL Calculator	1.05E+00	USEPA R3 (FW; EqP method)	1.05E+00	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	trans-1,3-Dichloropropene	10061-02-6	mg/kg	4.30E+01	RSL Calculator	5.10E-05	ORNL SCV (EqP method)	5.10E-05	ORNL SCV (EqP method)	0.005	Y	0.0025	Y	0.00125	Y
VOCs via SW8260B	Trichloroethene	79-01-6	mg/kg	2.18E+01	RSL Calculator	9.69E-02	USEPA R3 (FW; EqP method)	9.69E-02	USEPA R3 (FW; EqP method)	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Trichlorofluoromethane	75-69-4	mg/kg	1.58E+04	RSL Calculator	NA		1.58E+04	RSL Calculator	0.01	N	0.005	N	0.0025	N
VOCs via SW8260B	Vinyl chloride	75-01-4	mg/kg	7.12E-02	RSL Calculator	2.02E-01	USEPA R5 (FW)	7.12E-02	RSL Calculator	0.005	N	0.0025	N	0.00125	N
VOCs via SW8260B	Xylenes (total)	1330-20-7	mg/kg	1.05E+04	RSL Calculator	1.60E-01	ORNL SCV (EqP method)	1.60E-01	ORNL SCV (EqP method)	0.015	N	0.0075	N	0.00375	N
SVOCs via SW8270D	1,1-Biphenyl	92-52-4	mg/kg	5.37E+02	RSL Calculator	1.22E+00	USEPA R3 (FW)	1.22E+00	USEPA R3 (FW)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	1,2,4-Trichlorobenzene	120-82-1	mg/kg	1.48E+02	RSL Calculator	2.10E+00	USEPA R3 (FW; EqP method)	2.10E+00	USEPA R3 (FW; EqP method)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	1,2-Dichlorobenzene	95-50-1	mg/kg	4.74E+03	RSL Calculator	1.65E-02	USEPA R3 (FW; EqP method)	1.65E-02	USEPA R3 (FW; EqP method)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	1,2-Diphenylhydrazine	122-66-7	mg/kg	3.08E+00	RSL Calculator	NA		3.08E+00	RSL Calculator	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	1,3-Dichlorobenzene	541-73-1	mg/kg	7.96E+02	RSL Calculator	4.43E+00	USEPA R3 (FW; EqP method)	4.43E+00	USEPA R3 (FW; EqP method)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	1,4-Dichlorobenzene	106-46-7	mg/kg	7.96E+02	RSL Calculator	5.99E-01	USEPA R3 (FW; EqP method)	5.99E-01	USEPA R3 (FW; EqP method)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	2,4,5-Trichlorophenol	95-95-4	mg/kg	4.08E+03	RSL Calculator	NA		4.08E+03	RSL Calculator	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	2,4,6-Trichlorophenol	88-06-2	mg/kg	4.08E+01	RSL Calculator	2.13E-01	USEPA R3 (FW; EqP method)	2.13E-01	USEPA R3 (FW; EqP method)	0.333	Y	0.167	N	0.0833	N
SVOCs via SW8270D	2,4-Dichlorophenol	120-83-2	mg/kg	1.22E+02	RSL Calculator	1.17E-01	USEPA R3 (FW; EqP method)	1.17E-01	USEPA R3 (FW; EqP method)	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	2,4-Dimethylphenol	105-67-9	mg/kg	8.15E+02	RSL Calculator	2.90E-02	USEPA R3 (FW)	2.90E-02	USEPA R3 (FW)	1.33	Y	0.667	Y	0.0833	Y
SVOCs via SW8270D	2,4-Dinitrophenol	51-28-5	mg/kg	8.15E+01	RSL Calculator	6.21E-03	USEPA R5 (FW)	6.21E-03	USEPA R5 (FW)	3.33	Y	1.67	Y	0.833	Y
SVOCs via SW8270D	2,4-Dinitrotoluene	121-14-2	mg/kg	7.88E+00	RSL Calculator	4.16E-02	USEPA R3 (FW; EqP method)	4.16E-02	USEPA R3 (FW; EqP method)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	2,6-Dichlorophenol	87-65-0	mg/kg	1.22E+02	RSL Calculator	1.17E-01	USEPA R3 (FW; EqP method)	1.17E-01	USEPA R3 (FW; EqP method)	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	2,6-Dinitrotoluene	606-20-2	mg/kg	4.08E+01	RSL Calculator	4.16E-02	USEPA R3 (FW; EqP method)	4.16E-02	USEPA R3 (FW; EqP method)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	2-Chloronaphthalene	91-58-7	mg/kg	4.21E+03	RSL Calculator	4.17E-01	USEPA R5 (FW)	4.17E-01	USEPA R5 (FW)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	2-Chlorophenol	95-57-8	mg/kg	2.63E+02	RSL Calculator	3.12E-02	USEPA R3 (FW; EqP method)	3.12E-02	USEPA R3 (FW; EqP method)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	2-Methylnaphthalene	91-57-6	mg/kg	1.53E+02	RSL Calculator	2.02E-02	USEPA R3 (FW)	2.02E-02	USEPA R3 (FW)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	2-Methylphenol	95-48-7	mg/kg	2.04E+03	RSL Calculator	1.20E-02	ORNL SCV (EqP method)	1.20E-02	ORNL SCV (EqP method)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	2-Nitroaniline	88-74-4	mg/kg	4.08E+02	RSL Calculator	NA		4.08E+02	RSL Calculator	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	2-Nitrophenol	88-75-5	mg/kg	1.22E+04	RSL Calculator	NA		1.22E+04	RSL Calculator	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	3,3'-Dichlorobenzidine	91-94-1	mg/kg	5.48E+00	RSL Calculator	1.27E-01	USEPA R3 (FW; EqP method)	1.27E-01	USEPA R3 (FW; EqP method)	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	3-methylphenol & 4-methylphenol	65794-96-9	mg/kg	1.22E+04	RSL Calculator	NA		1.22E+04	RSL Calculator	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	3-Nitroaniline	99-09-2	mg/kg	1.23E+02	RSL Calculator	NA		1.23E+02	RSL Calculator	1.33	N	0.667	N	0.0833	N
SVOCs via SW8270D	4,6-Dintro-2-methylphenol	534-52-1	mg/kg	3.26E+00	RSL Calculator	1.04E-01	USEPA R5 (FW)	1.04E-01	USEPA R5 (FW)	3.33	Y	1.67	Y	0.833	Y
SVOCs via SW8270D	4-Bromophenyl phenyl ether	101-55-3	mg/kg	NA		1.23E+00	USEPA R3 (FW; EqP method)	1.23E+00	USEPA R3 (FW; EqP method)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	4-Chloro-3-methylphenol	59-50-7	mg/kg	4.08E+03	RSL Calculator	3.88E-01	USEPA R5 (FW)	3.88E-01	USEPA R5 (FW)	0.333	N	0.167	N	0.0833	N

				Project Action Limits for Sediment (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
SVOCs via SW8270D	4-Chloroaniline	106-47-8	mg/kg	1.23E+01	RSL Calculator	1.46E-01	USEPA R5 (FW)	1.46E-01	USEPA R5 (FW)	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	4-Chlorophenyl phenyl ether	7005-72-3	mg/kg	NA		NA		NA	NA	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	4-Nitroaniline	100-01-6	mg/kg	1.23E+02	RSL Calculator	NA		1.23E+02	RSL Calculator	1.33	N	0.667	N	0.0833	N
SVOCs via SW8270D	4-Nitrophenol	100-02-7	mg/kg	1.22E+04	RSL Calculator	1.33E-02	USEPA R5 (FW)	1.33E-02	USEPA R5 (FW)	1.33	Y	0.667	Y	0.0833	Y
SVOCs via SW8270D	Acenaphthene	83-32-9	mg/kg	2.29E+03	RSL Calculator	6.70E-03	USEPA R3 (FW)	6.70E-03	USEPA R3 (FW)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	Acenaphthylene	208-96-8	mg/kg	2.29E+03	RSL Calculator	5.90E-03	USEPA R3 (FW)	5.90E-03	USEPA R3 (FW)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	Anthracene	120-12-7	mg/kg	1.14E+04	RSL Calculator	5.72E-02	MacDonald (TEC)	5.72E-02	MacDonald (TEC)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	Benz(a)anthracene	56-55-3	mg/kg	8.43E-01	RSL Calculator	1.08E-01	USEPA R3 (FW)	1.08E-01	USEPA R3 (FW)	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	Benzidine	92-87-5	mg/kg	2.94E-03	RSL Calculator	1.70E-03	ORNL SCV (EqP method)	1.70E-03	ORNL SCV (EqP method)	3.33	Y	1.67	Y	0.833	Y
SVOCs via SW8270D	Benzo(a)pyrene	50-32-8	mg/kg	8.43E-02	RSL Calculator	1.50E-01	MacDonald (TEC)	8.43E-02	RSL Calculator	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	Benzo(b)fluoranthene	205-99-2	mg/kg	8.43E-01	RSL Calculator	2.40E-01	USEPA R3 (FW)	2.40E-01	USEPA R3 (FW)	0.333	Y	0.167	N	0.0833	N
SVOCs via SW8270D	Benzo(g,h,i)perylene	191-24-2	mg/kg	1.14E+03	RSL Calculator	1.70E-01	USEPA R3 (FW)	1.70E-01	USEPA R3 (FW)	0.333	Y	0.167	N	0.0833	N
SVOCs via SW8270D	Benzo(k)fluoranthene	207-08-9	mg/kg	8.43E+00	RSL Calculator	2.40E-01	USEPA R3 (FW)	2.40E-01	USEPA R3 (FW)	0.333	Y	0.167	N	0.0833	N
SVOCs via SW8270D	Benzoic acid	65-85-0	mg/kg	1.63E+05	RSL Calculator	6.50E-01	USEPA R3 (FW)	6.50E-01	USEPA R3 (FW)	1.33	Y	0.667	Y	0.333	N
SVOCs via SW8270D	Benzyl alcohol	100-51-6	mg/kg	4.08E+03	RSL Calculator	1.10E-03	ORNL SCV (EqP method)	1.10E-03	ORNL SCV (EqP method)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	Bis(2-chlorethoxy)methane	111-91-1	mg/kg	1.22E+02	RSL Calculator	NA		1.22E+02	RSL Calculator	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Bis(2-chloroethyl) ether	111-44-4	mg/kg	3.91E+00	RSL Calculator	3.52E+00	USEPA R5 (FW)	3.52E+00	USEPA R5 (FW)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Bis(2-chloroisopropyl) ether	108-60-1	mg/kg	6.14E+01	RSL Calculator	NA		6.14E+01	RSL Calculator	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Bis(2-Ethylhexyl)phthalate	117-81-7	mg/kg	1.76E+02	RSL Calculator	1.80E-01	USEPA R3 (FW)	1.80E-01	USEPA R3 (FW)	0.333	Y	0.167	N	0.0833	N
SVOCs via SW8270D	Butyl benzyl phthalate	85-68-7	mg/kg	1.30E+03	RSL Calculator	1.09E+01	USEPA R3 (FW; EqP method)	1.09E+01	USEPA R3 (FW; EqP method)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Caprolactam	105-60-2	mg/kg	2.04E+04	RSL Calculator	NA		2.04E+04	RSL Calculator	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Carbazole	86-74-8	mg/kg	1.53E+03	RSL Calculator	NA		1.53E+03	RSL Calculator	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Chrysene	218-01-9	mg/kg	8.43E+01	RSL Calculator	1.66E-01	MacDonald (TEC)	1.66E-01	MacDonald (TEC)	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	Dibenz(a,h)anthracene	53-70-3	mg/kg	8.43E-02	RSL Calculator	3.30E-02	USEPA R3 (FW)	3.30E-02	USEPA R3 (FW)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	Dibenzofuran	132-64-9	mg/kg	5.26E+01	RSL Calculator	4.15E-01	USEPA R3 (FW; EqP method)	4.15E-01	USEPA R3 (FW; EqP method)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Diethyl phthalate	84-66-2	mg/kg	3.26E+04	RSL Calculator	6.03E-01	USEPA R3 (FW; EqP method)	6.03E-01	USEPA R3 (FW; EqP method)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Dimethyl phthalate	131-11-3	mg/kg	3.26E+04	RSL Calculator	NA		3.26E+04	RSL Calculator	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Di-n-butyl phthalate	84-74-2	mg/kg	4.08E+03	RSL Calculator	6.47E+00	USEPA R3 (FW; EqP method)	6.47E+00	USEPA R3 (FW; EqP method)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Di-n-octyl phthalate	117-84-0	mg/kg	4.89E+02	RSL Calculator	4.06E+01	USEPA R5 (FW)	4.06E+01	USEPA R5 (FW)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Fluoranthene	206-44-0	mg/kg	1.53E+03	RSL Calculator	4.23E-01	MacDonald (TEC)	4.23E-01	MacDonald (TEC)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Fluorene	86-73-7	mg/kg	1.53E+03	RSL Calculator	7.74E-02	MacDonald (TEC)	7.74E-02	MacDonald (TEC)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	Hexachlorobenzene	118-74-1	mg/kg	1.54E+00	RSL Calculator	2.00E-02	USEPA R3 (FW)	2.00E-02	USEPA R3 (FW)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	Hexachlorobutadiene	87-68-3	mg/kg	3.16E+01	RSL Calculator	2.65E-02	USEPA R5 (FW)	2.65E-02	USEPA R5 (FW)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	Hexachloroethane	67-72-1	mg/kg	2.85E+01	RSL Calculator	1.03E+00	USEPA R3 (FW; EqP method)	1.03E+00	USEPA R3 (FW; EqP method)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	8.43E-01	RSL Calculator	1.70E-02	USEPA R3 (FW)	1.70E-02	USEPA R3 (FW)	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	Isophorone	78-59-1	mg/kg	2.59E+03	RSL Calculator	4.32E-01	USEPA R5 (FW)	4.32E-01	USEPA R5 (FW)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Naphthalene	91-20-3	mg/kg	7.63E+02	RSL Calculator	1.76E-01	MacDonald (TEC)	1.76E-01	MacDonald (TEC)	0.333	Y	0.167	N	0.0833	N
SVOCs via SW8270D	Nitrobenzene	98-95-3	mg/kg	1.05E+02	RSL Calculator	1.60E-01	ORNL SCV (EqP method)	1.60E-01	ORNL SCV (EqP method)	0.333	Y	0.167	Y	0.0833	N
SVOCs via SW8270D	N-Nitrosodimethylamine	62-75-9	mg/kg	1.32E-02	RSL Calculator	NA		1.32E-02	RSL Calculator	0.333	Y	0.167	Y	0.0833	Y
SVOCs via SW8270D	N-Nitrosodi-n-propylamine	621-64-7	mg/kg	3.52E-01	RSL Calculator	NA		3.52E-01	RSL Calculator	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	N-Nitrosodiphenylamine	86-30-6	mg/kg	5.03E+02	RSL Calculator	2.68E+00	USEPA R3 (FW; EqP method)	2.68E+00	USEPA R3 (FW; EqP method)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Pentachlorophenol	87-86-5	mg/kg	3.76E+00	RSL Calculator	5.04E-01	USEPA R3 (FW; EqP method)	5.04E-01	USEPA R3 (FW; EqP method)	1.33	Y	0.667	Y	0.333	N
SVOCs via SW8270D	Phenanthrene	85-01-8	mg/kg	1.14E+04	RSL Calculator	2.04E-01	MacDonald (TEC)	2.04E-01	MacDonald (TEC)	0.333	Y	0.167	N	0.0833	N
SVOCs via SW8270D	Phenol	108-95-2	mg/kg	1.22E+04	RSL Calculator	4.20E-01	USEPA R3 (FW)	4.20E-01	USEPA R3 (FW)	0.333	N	0.167	N	0.0833	N
SVOCs via SW8270D	Pyrene	129-00-0	mg/kg	1.14E+03	RSL Calculator	1.95E-01	MacDonald (TEC)	1.95E-01	MacDonald (TEC)	0.333	Y	0.167	N	0.0833	N
PAHs via SW8270D mod.	Acenaphthene	83-32-9	mg/kg	2.29E+03	RSL Calculator	6.70E-03	USEPA R3 (FW)	6.70E-03	USEPA R3 (FW)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Acenaphthylene	208-96-8	mg/kg	2.29E+03	RSL Calculator	5.90E-03	USEPA R3 (FW)	5.90E-03	USEPA R3 (FW)	0.00667	Y	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Anthracene	120-12-7	mg/kg	1.14E+04	RSL Calculator	5.72E-02	MacDonald (TEC)	5.72E-02	MacDonald (TEC)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Benz(a)anthracene	56-55-3	mg/kg	8.43E-01	RSL Calculator	1.08E-01	USEPA R3 (FW)	1.08E-01	USEPA R3 (FW)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Benzo(a)pyrene	50-32-8	mg/kg	8.43E-02	RSL Calculator	1.50E-01	MacDonald (TEC)	8.43E-02	RSL Calculator	0.00667	N	0.00333	N	0.00167	N

				Project Action Limits for Sediment (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
PAHs via SW8270D mod.	Benzo(b)fluoranthene	205-99-2	mg/kg	8.43E-01	RSL Calculator	2.40E-01	USEPA R3 (FW)	2.40E-01	USEPA R3 (FW)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Benzo(g,h,i)perylene	191-24-2	mg/kg	1.14E+03	RSL Calculator	1.70E-01	USEPA R3 (FW)	1.70E-01	USEPA R3 (FW)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Benzo(k)fluoranthene	207-08-9	mg/kg	8.43E+00	RSL Calculator	2.40E-01	USEPA R3 (FW)	2.40E-01	USEPA R3 (FW)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Chrysene	218-01-9	mg/kg	8.43E+01	RSL Calculator	1.66E-01	MacDonald (TEC)	1.66E-01	MacDonald (TEC)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Dibenz(a,h)anthracene	53-70-3	mg/kg	8.43E-02	RSL Calculator	3.30E-02	USEPA R3 (FW)	3.30E-02	USEPA R3 (FW)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Fluoranthene	206-44-0	mg/kg	1.53E+03	RSL Calculator	4.23E-01	MacDonald (TEC)	4.23E-01	MacDonald (TEC)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Fluorene	86-73-7	mg/kg	1.53E+03	RSL Calculator	7.74E-02	MacDonald (TEC)	7.74E-02	MacDonald (TEC)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	8.43E-01	RSL Calculator	1.70E-02	USEPA R3 (FW)	1.70E-02	USEPA R3 (FW)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Naphthalene	91-20-3	mg/kg	7.63E+02	RSL Calculator	1.76E-01	MacDonald (TEC)	1.76E-01	MacDonald (TEC)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Phenanthrene	85-01-8	mg/kg	1.14E+04	RSL Calculator	2.04E-01	MacDonald (TEC)	2.04E-01	MacDonald (TEC)	0.00667	N	0.00333	N	0.00167	N
PAHs via SW8270D mod.	Pyrene	129-00-0	mg/kg	1.14E+03	RSL Calculator	1.95E-01	MacDonald (TEC)	1.95E-01	MacDonald (TEC)	0.00667	N	0.00333	N	0.00167	N
Pesticides via SW8081B	4,4'-DDD	72-54-8	mg/kg	1.03E+01	RSL Calculator	4.88E-03	MacDonald (TEC)	4.88E-03	MacDonald (TEC)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	4,4'-DDE	72-55-9	mg/kg	7.25E+00	RSL Calculator	3.16E-03	MacDonald (TEC)	3.16E-03	MacDonald (TEC)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	4,4'-DDT	50-29-3	mg/kg	1.03E+01	RSL Calculator	4.16E-03	MacDonald (TEC)	4.16E-03	MacDonald (TEC)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	Aldrin	309-00-2	mg/kg	1.45E-01	RSL Calculator	2.00E-03	USEPA R3 (FW)	2.00E-03	USEPA R3 (FW)	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	alpha-BHC	319-84-6	mg/kg	3.91E-01	RSL Calculator	6.00E-03	USEPA R3 (FW)	6.00E-03	USEPA R3 (FW)	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	alpha-Chlordane	5103-71-9	mg/kg	9.47E+00	RSL Calculator	3.24E-03	MacDonald (TEC)	3.24E-03	MacDonald (TEC)	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	beta-BHC	319-85-7	mg/kg	1.37E+00	RSL Calculator	5.00E-03	USEPA R3 (FW)	5.00E-03	USEPA R3 (FW)	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	delta-BHC	319-86-8	mg/kg	3.91E-01	RSL Calculator	6.40E+00	USEPA R3 (FW; EqP method)	3.91E-01	RSL Calculator	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	Dieldrin	60-57-1	mg/kg	1.54E-01	RSL Calculator	1.90E-03	MacDonald (TEC)	1.90E-03	MacDonald (TEC)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	Endosulfan I	959-98-8	mg/kg	2.45E+02	RSL Calculator	2.90E-03	USEPA R3 (FW)	2.90E-03	USEPA R3 (FW)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	Endosulfan II	33213-65-9	mg/kg	2.45E+02	RSL Calculator	1.40E-02	USEPA R3 (FW)	1.40E-02	USEPA R3 (FW)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	Endosulfan sulfate	1031-07-8	mg/kg	2.45E+02	RSL Calculator	5.40E-03	USEPA R3 (FW; EqP method)	5.40E-03	USEPA R3 (FW; EqP method)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	Endrin	72-20-8	mg/kg	1.22E+01	RSL Calculator	2.22E-03	MacDonald (TEC)	2.22E-03	MacDonald (TEC)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	Endrin aldehyde	7421-93-4	mg/kg	1.22E+01	RSL Calculator	2.22E-03	MacDonald (TEC)	2.22E-03	MacDonald (TEC)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	Endrin ketone	53494-70-5	mg/kg	1.22E+01	RSL Calculator	2.22E-03	MacDonald (TEC)	2.22E-03	MacDonald (TEC)	0.00067	N	0.00034	N	0.00017	N
Pesticides via SW8081B	gamma-BHC	58-89-9	mg/kg	3.01E+00	RSL Calculator	2.37E-03	MacDonald (TEC)	2.37E-03	MacDonald (TEC)	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	gamma-Chlordane	5103-74-2	mg/kg	9.47E+00	RSL Calculator	3.24E-03	MacDonald (TEC)	3.24E-03	MacDonald (TEC)	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	Heptachlor	76-44-8	mg/kg	5.48E-01	RSL Calculator	2.47E-03	MacDonald (TEC)	2.47E-03	MacDonald (TEC)	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	Heptachlor epoxide	1024-57-3	mg/kg	2.71E-01	RSL Calculator	2.47E-03	MacDonald (TEC)	2.47E-03	MacDonald (TEC)	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	Methoxychlor	72-43-5	mg/kg	2.04E+02	RSL Calculator	1.87E-02	USEPA R3 (FW; EqP method)	1.87E-02	USEPA R3 (FW; EqP method)	0.00067	N	0.00034	N	0.00011	N
Pesticides via SW8081B	Toxaphene	8001-35-2	mg/kg	2.24E+00	RSL Calculator	1.00E-04	USEPA R3 (FW)	1.00E-04	USEPA R3 (FW)	0.033	Y	0.022	Y	0.011	Y
PCBs via SW8082A	Aroclor-1016	12674-11-2	mg/kg	2.62E+00	RSL Calculator	5.98E-02	USEPA R3 (FW)	5.98E-02	USEPA R3 (FW)	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1221	11104-28-2	mg/kg	1.05E+00	RSL Calculator	5.98E-02	USEPA R3 (FW)	5.98E-02	USEPA R3 (FW)	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1232	11141-16-5	mg/kg	1.05E+00	RSL Calculator	5.98E-02	USEPA R3 (FW)	5.98E-02	USEPA R3 (FW)	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1242	53469-21-9	mg/kg	1.05E+00	RSL Calculator	5.98E-02	USEPA R3 (FW)	5.98E-02	USEPA R3 (FW)	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1248	12672-29-6	mg/kg	1.05E+00	RSL Calculator	5.98E-02	USEPA R3 (FW)	5.98E-02	USEPA R3 (FW)	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1254	11097-69-1	mg/kg	7.48E-01	RSL Calculator	5.98E-02	USEPA R3 (FW)	5.98E-02	USEPA R3 (FW)	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1260	11096-82-5	mg/kg	1.05E+00	RSL Calculator	5.98E-02	USEPA R3 (FW)	5.98E-02	USEPA R3 (FW)	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1262	37324-23-5	mg/kg	1.05E+00	RSL Calculator	5.98E-02	USEPA R3 (FW)	5.98E-02	USEPA R3 (FW)	0.0167	N	0.00833	N	0.00417	N
PCBs via SW8082A	Aroclor-1268	11100-14-4	mg/kg	1.05E+00	RSL Calculator	5.98E-02	USEPA R3 (FW)	5.98E-02	USEPA R3 (FW)	0.0167	N	0.00833	N	0.00417	N
TPH via 8015C	TPH C9-C40	TPH-DRO	mg/kg	NA		NA		NA	NA	13.3	N	6.67	N	6.67	N
TAL Metals via SW6010C	Aluminum	7429-90-5	mg/kg	5.26E+04	RSL Calculator	2.55E+04	NOAA SQuiRT (FW; TEL)	2.55E+04	NOAA SQuiRT (FW; TEL)	10	N	5	N	2.5	N
TAL Metals via SW6010C	Calcium	7440-70-2	mg/kg	NA		NA		NA	NA	250	N	100	N	50	N
TAL Metals via SW6010C	Iron	7439-89-6	mg/kg	3.69E+04	RSL Calculator	2.00E+04	USEPA R3 (FW)	2.00E+04	USEPA R3 (FW)	7.5	N	3	N	1.5	N
TAL Metals via SW6010C	Magnesium	7439-95-4	mg/kg	NA		NA		NA	NA	250	N	150	N	50	N
TAL Metals via SW6010C	Potassium	7440-09-7	mg/kg	NA		NA		NA	NA	250	N	150	N	50	N
TAL Metals via SW6010C	Sodium	7440-23-5	mg/kg	NA		NA		NA	NA	250	N	150	N	50	N
TAL Metals via SW6010C	Antimony	7440-36-0	mg/kg	2.11E+01	RSL Calculator	2.00E+00	USEPA R3 (FW)	2.00E+00	USEPA R3 (FW)	0.5	N	0.4	N	0.25	N
TAL Metals via SW6010C	Arsenic	7440-38-2	mg/kg	2.34E+00	RSL Calculator	9.79E+00	MacDonald (TEC)	2.34E+00	RSL Calculator	0.5	N	0.3	N	0.15	N

				Project Action Limits for Sediment (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
TAL Metals via SW6010C	Barium	7440-39-3	mg/kg	1.05E+04	RSL Calculator	4.80E+01	NOAA SQuiRT (Marine; AET)	4.80E+01	NOAA SQuiRT (Marine; AET)	2	N	0.5	N	0.25	N
TAL Metals via SW6010C	Berylliium	7440-41-7	mg/kg	1.05E+02	RSL Calculator	NA		1.05E+02	RSL Calculator	0.25	N	0.1	N	0.05	N
TAL Metals via SW6010C	Cadmium	7440-43-9	mg/kg	4.71E+01	RSL Calculator	9.90E-01	MacDonald (TEC)	9.90E-01	MacDonald (TEC)	0.25	N	0.1	N	0.05	N
TAL Metals via SW6010C	Chromium	7440-47-3	mg/kg	2.01E+00	RSL Calculator	4.34E+01	MacDonald (TEC)	2.01E+00	RSL Calculator	0.5	N	0.2	N	0.1	N
TAL Metals via SW6010C	Cobalt	7440-48-4	mg/kg	1.58E+01	RSL Calculator	5.00E+01	USEPA R3 (FW)	1.58E+01	RSL Calculator	0.625	N	0.5	N	0.25	N
TAL Metals via SW6010C	Copper	7440-50-8	mg/kg	2.11E+03	RSL Calculator	3.16E+01	MacDonald (TEC)	3.16E+01	MacDonald (TEC)	0.5	N	0.4	N	0.2	N
TAL Metals via SW6010C	Lead	7439-92-1	mg/kg	4.00E+02	RSL Calculator	3.58E+01	MacDonald (TEC)	3.58E+01	MacDonald (TEC)	0.25	N	0.15	N	0.075	N
TAL Metals via SW6010C	Manganese	7439-96-5	mg/kg	1.26E+03	RSL Calculator	4.60E+02	USEPA R3 (FW)	4.60E+02	USEPA R3 (FW)	0.75	N	0.3	N	0.15	N
TAL Metals via SW6010C	Nickel	7440-02-0	mg/kg	1.05E+03	RSL Calculator	2.27E+01	MacDonald (TEC)	2.27E+01	MacDonald (TEC)	0.5	N	0.3	N	0.15	N
TAL Metals via SW6010C	Selenium	7782-49-2	mg/kg	2.63E+02	RSL Calculator	2.00E+00	USEPA R3 (FW)	2.00E+00	USEPA R3 (FW)	0.5	N	0.25	N	0.15	N
TAL Metals via SW6010C	Silver	7440-22-4	mg/kg	2.63E+02	RSL Calculator	1.00E+00	USEPA R3 (FW)	1.00E+00	USEPA R3 (FW)	0.5	N	0.1	N	0.05	N
TAL Metals via SW6010C	Thallium	7440-28-0	mg/kg	5.26E-01	RSL Calculator	NA		5.26E-01	RSL Calculator	0.4	N	0.2	N	0.15	N
TAL Metals via SW6010C	Vanadium	7440-62-2	mg/kg	2.65E+02	RSL Calculator	5.70E+01	NOAA SQuiRT (Marine; AET)	5.70E+01	NOAA SQuiRT (Marine; AET)	0.625	N	0.5	N	0.25	N
TAL Metals via SW6010C	Zinc	7440-66-6	mg/kg	1.58E+04	RSL Calculator	1.21E+02	MacDonald (TEC)	1.21E+02	MacDonald (TEC)	1	N	0.5	N	0.25	N
TAL Metals via SW7471B	Mercury	7439-97-6	mg/kg	1.58E+01	RSL Calculator	1.80E-01	MacDonald (TEC)	1.80E-01	MacDonald (TEC)	0.033	N	0.0266	N	0.013	N
SW3060A/7196A	Hexavalent Chromium	18540-29-9	mg/kg	2.01E+00	RSL Calculator	4.34E+01	MacDonald (TEC)	2.01E+00	RSL Calculator	1	N	0.8	N	0.4	N
EPA-821-R-91-100	AVS	ACIDSO2	umol/g	NA		NA		NA	NA	0.2	N	0.2	N	0.08	N
EPA-821-R-91-100	SEM-Cadmium	7440-43-9	umol/g	NA		NA		NA	NA	0.00111	N	0.00044	N	0.000222	N
EPA-821-R-91-100	SEM-Copper	7440-50-8	umol/g	NA		NA		NA	NA	0.00983	N	0.00315	N	0.001967	N
EPA-821-R-91-100	SEM-Lead	7439-92-1	umol/g	NA		NA		NA	NA	0.00036	N	0.00036	N	0.000181	N
EPA-821-R-91-100	SEM-Mercury	7439-97-6	umol/g	NA		NA		NA	NA	2.5E-05	N	0.00001	N	0.00001	N
EPA-821-R-91-100	SEM-Nickel	7440-02-0	umol/g	NA		NA		NA	NA	0.01704	N	0.00256	N	0.001278	N
EPA-821-R-91-100	SEM-Silver	7440-22-4	umol/g	NA		NA		NA	NA	0.00232	N	0.00116	N	0.000695	N
EPA-821-R-91-100	SEM-Zinc	7440-66-6	umol/g	NA		NA		NA	NA	0.00765	N	0.00382	N	0.001912	N
Lloyd Kahn	Total Organic Carbon	TOC	mg/kg	NA		NA		NA	NA	800	N	400	N	200	N
ASTM D422-63	Grain Size (sieve and hydrometer)	GrainSize	percent	NA		NA		NA	NA	NA	N	NA	N	NA	N

Notes are presented on the next page.

Notes:

AET - Apparent Effect Threshold.
AVS - Acid Volatile Sulfide.
CAS - Chemical Abstracts Service.
DL - Detection Limit.
EqP - Equilibrium Partitioning.
Eco - Indicates the selected PAL that is protective of ecological receptors.
FW - Freshwater.
HH - Indicates the selected PAL that is protective of human health receptors.
LOD - Limit of Detection
LOQ - Limit of Quantitation.
NA - Not available/applicable.
NOAA - National Oceanic and Atmospheric Administration.
ORNL SCV - Oak Ridge National Laboratory Secondary Chronic Value.
PAH - Polycyclic Aromatic Hydrocarbon.
PAL - Project Action Limit.
PCB - Polychlorinated Biphenyls.
RIDEM - Rhode Island Department of Environmental Management.
SEM - Simultaneously Extracted Metals.
SQuiRT - Screening Quick Reference Tables.
SVOC - Semi-Volatile Organic Compound.
TEC - Threshold Effect Concentration.

TPH – Total Petroleum Hydrocarbons
USEPA - United States Environmental Protection Agency.
VOC - Volatile Organic Compound.

Highlighting indicates the compound's laboratory reference value(s) is/are above the selected PAL.
(a) The PAL represents the limits of detection that analytical data must meet in order to be of sufficient quality for use in the Remedial Investigation, Risk Assessment, and remedial technology evaluation [e.g., engineering evaluation/cost analysis (EE/CA) or feasibility study (FS)].
PALs are presented for compounds proposed for laboratory analysis and therefore do not include groups of compounds (such as Total PAHs and Total PCBs) that will be calculated based on individual PAHs and individual aroclor data for evaluation.
(b) Indicates the lower of the PALs based on levels protective of human health and ecological receptors.
(c) HH PALs were derived using the USEPA Regional Screening Level (RSL) Calculator (November 2012 version) by altering the residential soil RSLs based on the following site-specific exposure factors, which will be conservative inputs of sediment exposure:
Values were adjusted for a target hazard quotient of 0.1 to account for cumulative effects on the same target organ.
Exposure frequency (days/year) - 52
Exposure duration (years) - Adult - 24; Child - 6
Exposure time (hours/day) - 0 (inhalation pathway NA)
Adherence factor (mg/m^2) - 0.4
Body Weight (kg) - Adult - 70; Child - 15
Skin surface area (cm^2/day) - Adult - 4500; Child - 1459
Ingestion/intake rate (mg/day) - Adult - 100; Child - 200
(d) Eco PALs were selected based on the following sources (parentheses indicate specific type of screening value):
TEC = Consensus-based TEC values. MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39:20-31.
USEPA R3 = USEPA Region 3 freshwater sediment screening values (USEPA, 2006a). Marine values only used if no freshwater value is available (USEPA, 2006b). Available on-line at http://www.epa.gov/reg3hwmd/risk/eco/index.htm.
ORNL SCV = Sediment screening values derived using EqP approach. Jones, D., G. Suter II, and R. Hull. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision.
Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-95/R4. http://www.esd.ornl.gov/programs/ecorisk/benchmark_reports.html.
NOAA SQuiRT = Buchman, M.F., 2008. NOAA Screening Quick Reference Tables. NOAA OR&R Report 08-1. Seattle WA. Office of Response and Restoration Division National Oceanic and
Atmospheric Administration, 34 pages.
USEPA R5 = USEPA. 2003. USEPA Region 5 Ecological Screening Levels. Revision August 2003. Available on-line at http://www.epa.gov/reg5rcra/ca/edql.htm.

Table 15-3
Project Action Limits (PALs) – Groundwater
Davisville
North Kingstown, Rhode Island

Analytical Method	Compound	CAS	Units	Project Action Limits for Groundwater (a)		Laboratory Reference Limits					
				Value	Source (b)	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
VOCs via SW8260B	1,1,1,2-Tetrachloroethane	630-20-6	ug/L	5.00E-01	USEPA Tapwater RSL	1	Y	0.5	N	0.25	N
VOCs via SW8260B	1,1,1-Trichloroethane	71-55-6	ug/L	7.50E+02	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	1,1,2,2-Tetrachloroethane	79-34-5	ug/L	6.60E-02	USEPA Tapwater RSL	1	Y	0.5	Y	0.25	Y
VOCs via SW8260B	1,1,2-Trichloroethane	79-00-5	ug/L	5.00E+00	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	1,1-Dichloroethane	75-34-3	ug/L	2.40E+00	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	1,1-Dichloroethene	75-35-4	ug/L	7.00E+00	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	1,1-Dichloropropene	563-58-6	ug/L	4.10E-01	USEPA Tapwater RSL	1	Y	0.5	Y	0.25	N
VOCs via SW8260B	1,2,3-Trichlorobenzene	87-61-6	ug/L	7.00E+01	RIDEM M1 GA	2	N	1	N	0.5	N
VOCs via SW8260B	1,2,3-Trichloropropane	96-18-4	ug/L	6.50E-04	USEPA Tapwater RSL	2	Y	1	Y	0.5	Y
VOCs via SW8260B	1,2,4-Trichlorobenzene	120-82-1	ug/L	7.00E+01	RIDEM M1 GA	2	N	1	N	0.5	N
VOCs via SW8260B	1,2,4-Trimethylbenzene	95-63-6	ug/L	1.50E+00	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	1,2-Dibromo-3-chloropropane	96-12-8	ug/L	2.00E-01	RIDEM M1 GA	2	Y	1	Y	0.5	Y
VOCs via SW8260B	1,2-Dibromoethane	106-93-4	ug/L	5.00E-02	RIDEM M1 GA	1	Y	0.5	Y	0.25	Y
VOCs via SW8260B	1,2-Dichlorobenzene	95-50-1	ug/L	6.00E+02	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	1,2-Dichloroethane	107-06-2	ug/L	5.00E+00	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	1,2-Dichloropropane	78-87-5	ug/L	5.00E+00	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	1,3,5-Trimethylbenzene	108-67-8	ug/L	8.70E+00	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	1,3-Dichlorobenzene	541-73-1	ug/L	6.00E+02	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	1,3-Dichloropropane	142-28-9	ug/L	2.90E+01	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	1,4-Dichlorobenzene	106-46-7	ug/L	7.50E+01	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	2,2-Dichloropropane	594-20-7	ug/L	5.00E+00	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	2-Butanone	78-93-3	ug/L	4.90E+02	USEPA Tapwater RSL	10	N	5	N	2.5	N
VOCs via SW8260B	2-Chlorotoluene	95-49-8	ug/L	1.80E+01	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	2-Hexanone	591-78-6	ug/L	3.40E+00	USEPA Tapwater RSL	5	Y	2.5	N	1.25	N
VOCs via SW8260B	4-Chlorotoluene	106-43-4	ug/L	1.90E+01	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	4-Methyl-2-pentanone	108-10-1	ug/L	1.00E+02	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
VOCs via SW8260B	Acetone	67-64-1	ug/L	1.20E+03	USEPA Tapwater RSL	10	N	5	N	2.5	N
VOCs via SW8260B	Benzene	71-43-2	ug/L	5.00E+00	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	Bromobenzene	108-86-1	ug/L	5.40E+00	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	Bromochloromethane	74-97-5	ug/L	8.30E+00	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	Bromodichloromethane	75-27-4	ug/L	8.00E+01	USEPA MCL	1	N	0.5	N	0.25	N
VOCs via SW8260B	Bromoform	75-25-2	ug/L	8.00E+01	USEPA MCL	1	N	0.5	N	0.25	N
VOCs via SW8260B	Bromomethane	74-83-9	ug/L	7.00E-01	USEPA Tapwater RSL	2	Y	1	Y	0.5	N
VOCs via SW8260B	Carbon Disulfide	75-15-0	ug/L	7.20E+01	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	Carbon tetrachloride	56-23-5	ug/L	5.00E+00	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	Chlorobenzene	108-90-7	ug/L	1.00E+02	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	Chlorodibromomethane	124-48-1	ug/L	8.00E+01	USEPA MCL	1	N	0.5	N	0.25	N
VOCs via SW8260B	Chloroethane	75-00-3	ug/L	2.10E+03	USEPA Tapwater RSL	2	N	1	N	0.5	N
VOCs via SW8260B	Chloroform	67-66-3	ug/L	8.00E+01	USEPA MCL	1	N	0.5	N	0.25	N
VOCs via SW8260B	Chloromethane	74-87-3	ug/L	1.90E+01	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	cis-1,2-Dichloroethylene	156-59-2	ug/L	7.00E+01	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	cis-1,3-Dichloropropene	10061-01-5	ug/L	4.10E-01	USEPA Tapwater RSL	1	Y	0.5	Y	0.25	N

Analytical Method	Compound	CAS	Units	Project Action Limits for Groundwater (a)		Laboratory Reference Limits					
				Value	Source (b)	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
VOCs via SW8260B	Dibromomethane	74-95-3	ug/L	7.90E-01	USEPA Tapwater RSL	1	Y	0.5	N	0.25	N
VOCs via SW8260B	Dichlorodifluoromethane	75-71-8	ug/L	1.90E+01	USEPA Tapwater RSL	2	N	1	N	0.5	N
VOCs via SW8260B	Ethylbenzene	100-41-4	ug/L	7.00E+02	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	Hexachlorobutadiene	87-68-3	ug/L	2.60E-01	USEPA Tapwater RSL	2	Y	1	Y	0.5	Y
VOCs via SW8260B	Isopropylbenzene	98-82-8	ug/L	3.90E+01	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	Methylcyclohexane	108-87-2	ug/L	1.30E+03	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	Methyl tert-butyl ether	1634-04-4	ug/L	4.00E+01	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	Methylene chloride	75-09-2	ug/L	8.40E+00	USEPA Tapwater RSL	2	N	1	N	0.5	N
VOCs via SW8260B	Naphthalene	91-20-3	ug/L	1.00E+02	RIDEM M1 GA	2	N	1	N	0.5	N
VOCs via SW8260B	n-Butylbenzene	104-51-8	ug/L	7.80E+01	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	n-Propylbenzene	103-65-1	ug/L	5.30E+01	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	p-Isopropyltoluene	99-87-6	ug/L	3.90E+01	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	sec-Butylbenzene	135-98-8	ug/L	7.80E+01	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	Styrene	100-42-5	ug/L	1.10E+02	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	tert-Butyl-Alcohol	75-65-0	ug/L	NA		5	N	2.5	N	1.25	N
VOCs via SW8260B	tert-Butylbenzene	98-06-6	ug/L	7.80E+01	USEPA Tapwater RSL	1	N	0.5	N	0.25	N
VOCs via SW8260B	Tetrachloroethene	127-18-4	ug/L	5.00E+00	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	Toluene	108-88-3	ug/L	1.00E+03	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	Total-1,2-Dichloroethene	540-59-0	ug/L	7.00E+01	RIDEM M1 GA	2	N	1	N	0.5	N
VOCs via SW8260B	trans-1,2-Dichloroethene	156-60-5	ug/L	1.00E+02	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	trans-1,3-Dichloropropene	10061-02-6	ug/L	4.10E-01	USEPA Tapwater RSL	1	Y	0.5	Y	0.25	N
VOCs via SW8260B	Trichloroethene	79-01-6	ug/L	5.00E+00	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	Trichlorofluoromethane	75-69-4	ug/L	1.10E+02	USEPA Tapwater RSL	2	N	1	N	0.5	N
VOCs via SW8260B	Vinyl chloride	75-01-4	ug/L	2.00E+00	RIDEM M1 GA	1	N	0.5	N	0.25	N
VOCs via SW8260B	Xylenes (total)	1330-20-7	ug/L	1.00E+04	RIDEM M1 GA	3	N	1.5	N	0.75	N
SVOCs via SW8270D	1,1-Biphenyl	92-52-4	ug/L	8.30E-02	USEPA Tapwater RSL	1	Y	0.5	Y	0.25	Y
SVOCs via SW8270D	1,2,4-Trichlorobenzene	120-82-1	ug/L	7.00E+01	RIDEM M1 GA	5	N	2.5	N	1.25	N
SVOCs via SW8270D	1,2-Dichlorobenzene	95-50-1	ug/L	6.00E+02	RIDEM M1 GA	5	N	2.5	N	1.25	N
SVOCs via SW8270D	1,2-Diphenylhydrazine	122-66-7	ug/L	6.70E-02	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	1,3-Dichlorobenzene	541-73-1	ug/L	6.00E+02	RIDEM M1 GA	5	N	2.5	N	1.25	N
SVOCs via SW8270D	1,4-Dichlorobenzene	106-46-7	ug/L	7.50E+01	RIDEM M1 GA	5	N	2.5	N	1.25	N
SVOCs via SW8270D	2,4,5-Trichlorophenol	95-95-4	ug/L	8.90E+01	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	2,4,6-Trichlorophenol	88-06-2	ug/L	9.00E-01	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	2,4-Dichlorophenol	120-83-2	ug/L	3.50E+00	USEPA Tapwater RSL	5	Y	2.5	N	1.25	N
SVOCs via SW8270D	2,4-Dimethylphenol	105-67-9	ug/L	2.70E+01	USEPA Tapwater RSL	20	N	10	N	5	N
SVOCs via SW8270D	2,4-Dinitrophenol	51-28-5	ug/L	3.00E+00	USEPA Tapwater RSL	50	Y	25	Y	8.33	Y
SVOCs via SW8270D	2,4-Dinitrotoluene	121-14-2	ug/L	2.00E-01	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	2,6-Dichlorophenol	87-65-0	ug/L	3.50E+00	USEPA Tapwater RSL	5	Y	2.5	N	1.25	N
SVOCs via SW8270D	2,6-Dinitrotoluene	606-20-2	ug/L	1.50E+00	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	N
SVOCs via SW8270D	2-Chloronaphthalene	91-58-7	ug/L	5.50E+01	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	2-Chlorophenol	95-57-8	ug/L	7.10E+00	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	2-Methylnaphthalene	91-57-6	ug/L	1.00E+02	RIDEM M1 GA	5	N	2.5	N	1.25	N
SVOCs via SW8270D	2-Methylphenol	95-48-7	ug/L	7.20E+01	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	2-Nitroaniline	88-74-4	ug/L	1.50E+01	USEPA Tapwater RSL	20	Y	10	N	5	N
SVOCs via SW8270D	2-Nitrophenol	88-75-5	ug/L	4.50E+02	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	3,3'-Dichlorobenzidine	91-94-1	ug/L	1.10E-01	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	3-methylphenol & 4-methylphenol	65794-96-9	ug/L	4.50E+02	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	3-Nitroaniline	99-09-2	ug/L	3.30E+00	USEPA Tapwater RSL	20	Y	10	Y	5	Y
SVOCs via SW8270D	4,6-Dintro-2-methylphenol	534-52-1	ug/L	1.20E-01	USEPA Tapwater RSL	20	Y	10	Y	5	Y

Analytical Method	Compound	CAS	Units	Project Action Limits for Groundwater (a)		Laboratory Reference Limits					
				Value	Source (b)	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
SVOCs via SW8270D	4-Bromophenyl phenyl ether	101-55-3	ug/L	NA		5	N	2.5	N	1.25	N
SVOCs via SW8270D	4-Chloro-3-methylphenol	59-50-7	ug/L	1.10E+02	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	4-Chloroaniline	106-47-8	ug/L	3.20E-01	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	4-Chlorophenyl phenyl ether	7005-72-3	ug/L	NA		5	N	2.5	N	1.25	N
SVOCs via SW8270D	4-Nitroaniline	100-01-6	ug/L	3.30E+00	USEPA Tapwater RSL	20	Y	10	Y	5	Y
SVOCs via SW8270D	4-Nitrophenol	100-02-7	ug/L	4.50E+02	USEPA Tapwater RSL	20	N	10	N	5	N
SVOCs via SW8270D	Acenaphthene	83-32-9	ug/L	4.00E+01	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Acenaphthylene	208-96-8	ug/L	4.00E+01	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Anthracene	120-12-7	ug/L	1.30E+02	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Benz(a)anthracene	56-55-3	ug/L	2.90E-02	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Benzidine	92-87-5	ug/L	9.20E-05	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Benzo(a)pyrene	50-32-8	ug/L	2.00E-01	RIDEM M1 GA	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Benzo(b)fluoranthene	205-99-2	ug/L	2.90E-02	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Benzo(g,h,i)perylene	191-24-2	ug/L	8.70E+00	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Benzo(k)fluoranthene	207-08-9	ug/L	2.90E-01	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Benzoic acid	65-85-0	ug/L	5.80E+03	USEPA Tapwater RSL	100	N	50	N	25	N
SVOCs via SW8270D	Benzyl alcohol	100-51-6	ug/L	1.50E+02	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Bis(2-chlorethoxy)methane	111-91-1	ug/L	4.60E+00	USEPA Tapwater RSL	5	Y	2.5	N	1.25	N
SVOCs via SW8270D	Bis(2-chloroethyl) ether	111-44-4	ug/L	1.20E-02	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Bis(2-chloroisopropyl) ether	108-60-1	ug/L	3.10E-01	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Bis(2-Ethylhexyl)phthalate	117-81-7	ug/L	6.00E+00	USEPA MCL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Butyl benzyl phthalate	85-68-7	ug/L	1.40E+01	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Caprolactam	105-60-2	ug/L	7.70E+02	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Carbazole	86-74-8	ug/L	2.20E+01	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Chrysene	218-01-9	ug/L	2.90E+00	USEPA Tapwater RSL	5	Y	2.5	N	1.25	N
SVOCs via SW8270D	Dibenz(a,h)anthracene	53-70-3	ug/L	2.90E-03	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Dibenzofuran	132-64-9	ug/L	5.80E-01	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Diethyl phthalate	84-66-2	ug/L	1.10E+03	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Dimethyl phthalate	131-11-3	ug/L	1.10E+03	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Di-n-butyl phthalate	84-74-2	ug/L	6.70E+01	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Di-n-octyl phthalate	117-84-0	ug/L	1.90E+01	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Fluoranthene	206-44-0	ug/L	6.30E+01	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Fluorene	86-73-7	ug/L	2.20E+01	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Hexachlorobenzene	118-74-1	ug/L	1.00E+00	RIDEM M1 GA	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Hexachlorobutadiene	87-68-3	ug/L	2.60E-01	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Hexachloroethane	67-72-1	ug/L	5.10E-01	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	2.90E-02	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Isophorone	78-59-1	ug/L	6.70E+01	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Naphthalene	91-20-3	ug/L	1.00E+02	RIDEM M1 GA	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Nitrobenzene	98-95-3	ug/L	1.20E-01	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	N-Nitrosodimethylamine	62-75-9	ug/L	4.20E-04	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	N-Nitrosodi-n-propylamine	621-64-7	ug/L	9.30E-03	USEPA Tapwater RSL	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	N-Nitrosodiphenylamine	86-30-6	ug/L	1.00E+01	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Pentachlorophenol	87-86-5	ug/L	1.00E+00	RIDEM M1 GA	20	Y	10	Y	5	Y
SVOCs via SW8270D	Phenanthrene	85-01-8	ug/L	1.30E+02	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Phenol	108-95-2	ug/L	4.50E+02	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Pyrene	129-00-0	ug/L	8.70E+00	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
PAHs via SW8270D mod.	Acenaphthene	83-32-9	ug/L	4.00E+01	USEPA Tapwater RSL	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Acenaphthylene	208-96-8	ug/L	4.00E+01	USEPA Tapwater RSL	0.2	N	0.1	N	0.05	N

Analytical Method	Compound	CAS	Units	Project Action Limits for Groundwater (a)		Laboratory Reference Limits					
				Value	Source (b)	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
PAHs via SW8270D mod.	Anthracene	120-12-7	ug/L	1.30E+02	USEPA Tapwater RSL	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Benz(a)anthracene	56-55-3	ug/L	2.90E-02	USEPA Tapwater RSL	0.2	Y	0.1	Y	0.05	Y
PAHs via SW8270D mod.	Benzo(a)pyrene	50-32-8	ug/L	2.00E-01	RIDEM M1 GA	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Benzo(b)fluoranthene	205-99-2	ug/L	2.90E-02	USEPA Tapwater RSL	0.2	Y	0.1	Y	0.05	Y
PAHs via SW8270D mod.	Benzo(g,h,i)perylene	191-24-2	ug/L	8.70E+00	USEPA Tapwater RSL	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Benzo(k)fluoranthene	207-08-9	ug/L	2.90E-01	USEPA Tapwater RSL	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Chrysene	218-01-9	ug/L	2.90E+00	USEPA Tapwater RSL	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Dibenz(a,h)anthracene	53-70-3	ug/L	2.90E-03	USEPA Tapwater RSL	0.2	Y	0.1	Y	0.05	Y
PAHs via SW8270D mod.	Fluoranthene	206-44-0	ug/L	6.30E+01	USEPA Tapwater RSL	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Fluorene	86-73-7	ug/L	2.20E+01	USEPA Tapwater RSL	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	2.90E-02	USEPA Tapwater RSL	0.2	Y	0.1	Y	0.05	Y
PAHs via SW8270D mod.	Naphthalene	91-20-3	ug/L	1.00E+02	RIDEM M1 GA	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Phenanthrene	85-01-8	ug/L	1.30E+02	USEPA Tapwater RSL	0.4	N	0.2	N	0.1	N
PAHs via SW8270D mod.	Pyrene	129-00-0	ug/L	8.70E+00	USEPA Tapwater RSL	0.2	N	0.1	N	0.05	N
Pesticides via SW8081B	4,4'-DDD	72-54-8	ug/L	2.70E-02	USEPA Tapwater RSL	0.02	N	0.01	N	0.005	N
Pesticides via SW8081B	4,4'-DDE	72-55-9	ug/L	2.00E-01	USEPA Tapwater RSL	0.02	N	0.01	N	0.005	N
Pesticides via SW8081B	4,4'-DDT	50-29-3	ug/L	2.00E-01	USEPA Tapwater RSL	0.02	N	0.01	N	0.005	N
Pesticides via SW8081B	Aldrin	309-00-2	ug/L	4.00E-03	USEPA Tapwater RSL	0.02	Y	0.01	Y	0.0033	N
Pesticides via SW8081B	alpha-BHC	319-84-6	ug/L	6.20E-03	USEPA Tapwater RSL	0.02	Y	0.01	Y	0.0033	N
Pesticides via SW8081B	alpha-Chlordane	5103-71-9	ug/L	2.00E+00	RIDEM M1 GA	0.02	N	0.01	N	0.0033	N
Pesticides via SW8081B	beta-BHC	319-85-7	ug/L	2.20E-02	USEPA Tapwater RSL	0.02	N	0.01	N	0.0033	N
Pesticides via SW8081B	delta-BHC	319-86-8	ug/L	6.20E-03	USEPA Tapwater RSL	0.02	Y	0.01	Y	0.0033	N
Pesticides via SW8081B	Dieldrin	60-57-1	ug/L	1.50E-03	USEPA Tapwater RSL	0.02	Y	0.01	Y	0.005	Y
Pesticides via SW8081B	Endosulfan I	959-98-8	ug/L	7.80E+00	USEPA Tapwater RSL	0.02	N	0.01	N	0.0033	N
Pesticides via SW8081B	Endosulfan II	33213-65-9	ug/L	7.80E+00	USEPA Tapwater RSL	0.02	N	0.01	N	0.005	N
Pesticides via SW8081B	Endosulfan sulfate	1031-07-8	ug/L	7.80E+00	USEPA Tapwater RSL	0.02	N	0.01	N	0.005	N
Pesticides via SW8081B	Endrin	72-20-8	ug/L	2.00E+00	USEPA MCL	0.02	N	0.01	N	0.005	N
Pesticides via SW8081B	Endrin aldehyde	7421-93-4	ug/L	2.00E+00	USEPA MCL	0.02	N	0.01	N	0.005	N
Pesticides via SW8081B	Endrin ketone	53494-70-5	ug/L	2.00E+00	USEPA MCL	0.02	N	0.01	N	0.005	N
Pesticides via SW8081B	gamma-BHC	58-89-9	ug/L	2.00E-01	USEPA MCL	0.02	N	0.01	N	0.0033	N
Pesticides via SW8081B	gamma-Chlordane	5103-74-2	ug/L	2.00E+00	RIDEM M1 GA	0.02	N	0.01	N	0.0033	N
Pesticides via SW8081B	Heptachlor	76-44-8	ug/L	4.00E-01	USEPA MCL	0.02	N	0.01	N	0.0033	N
Pesticides via SW8081B	Heptachlor epoxide	1024-57-3	ug/L	2.00E-01	USEPA MCL	0.02	N	0.01	N	0.0033	N
Pesticides via SW8081B	Methoxychlor	72-43-5	ug/L	4.00E+01	USEPA MCL	0.02	N	0.01	N	0.0033	N
Pesticides via SW8081B	Toxaphene	8001-35-2	ug/L	3.00E+00	USEPA MCL	1	N	0.667	N	0.33	N
PCBs via SW8082A	Aroclor-1016	12674-11-2	ug/L	5.00E-01	RIDEM M1 GA	0.5	N	0.25	N	0.125	N
PCBs via SW8082A	Aroclor-1221	11104-28-2	ug/L	5.00E-01	RIDEM M1 GA	0.5	N	0.25	N	0.125	N
PCBs via SW8082A	Aroclor-1232	11141-16-5	ug/L	5.00E-01	RIDEM M1 GA	0.5	N	0.25	N	0.125	N
PCBs via SW8082A	Aroclor-1242	53469-21-9	ug/L	5.00E-01	RIDEM M1 GA	0.5	N	0.25	N	0.125	N
PCBs via SW8082A	Aroclor-1248	12672-29-6	ug/L	5.00E-01	RIDEM M1 GA	0.5	N	0.25	N	0.125	N
PCBs via SW8082A	Aroclor-1254	11097-69-1	ug/L	5.00E-01	RIDEM M1 GA	0.5	N	0.25	N	0.125	N
PCBs via SW8082A	Aroclor-1260	11096-82-5	ug/L	5.00E-01	RIDEM M1 GA	0.5	N	0.25	N	0.125	N
PCBs via SW8082A	Aroclor-1262	37324-23-5	ug/L	5.00E-01	RIDEM M1 GA	0.5	N	0.25	N	0.125	N
PCBs via SW8082A	Aroclor-1268	11100-14-4	ug/L	5.00E-01	RIDEM M1 GA	0.5	N	0.25	N	0.125	N
TAL Metals via SW6010C	Aluminum	7429-90-5	ug/L	1.60E+03	USEPA Tapwater RSL	50	N	25	N	12.5	N
TAL Metals via SW6010C	Calcium	7440-70-2	ug/L	NA		1250	N	500	N	250	N
TAL Metals via SW6010C	Iron	7439-89-6	ug/L	1.10E+03	USEPA Tapwater RSL	25	N	15	N	7.5	N
TAL Metals via SW6010C	Magnesium	7439-95-4	ug/L	NA		1250	N	750	N	250	N
TAL Metals via SW6010C	Potassium	7440-09-7	ug/L	NA		1250	N	750	N	250	N

Analytical Method	Compound	CAS	Units	Project Action Limits for Groundwater (a)		Laboratory Reference Limits					
				Value	Source (b)	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
TAL Metals via SW6010C	Sodium	7440-23-5	ug/L	NA		1250	N	750	N	250	N
TAL Metals via SW6010C	Antimony	7440-36-0	ug/L	6.00E+00	RIDEM M1 GA	2.5	N	2	N	1.25	N
TAL Metals via SW6010C	Arsenic	7440-38-2	ug/L	1.00E+01	RIDEM M1 GA	2.5	N	1.25	N	0.75	N
TAL Metals via SW6010C	Barium	7440-39-3	ug/L	2.00E+03	RIDEM M1 GA	10	N	2.5	N	1.25	N
TAL Metals via SW6010C	Beryllium	7440-41-7	ug/L	4.00E+00	RIDEM M1 GA	1.25	N	0.5	N	0.25	N
TAL Metals via SW6010C	Cadmium	7440-43-9	ug/L	5.00E+00	RIDEM M1 GA	1.25	N	0.5	N	0.25	N
TAL Metals via SW6010C	Chromium	7440-47-3	ug/L	1.00E+02	RIDEM M1 GA	2.5	N	1	N	0.5	N
TAL Metals via SW6010C	Cobalt	7440-48-4	ug/L	4.70E-01	USEPA Tapwater RSL	3.125	Y	2.5	Y	1.25	Y
TAL Metals via SW6010C	Copper	7440-50-8	ug/L	1.30E+03	USEPA MCL	2.5	N	2	N	1	N
TAL Metals via SW6010C	Lead	7439-92-1	ug/L	1.50E+01	RIDEM M1 GA	0.75	N	0.75	N	0.375	N
TAL Metals via SW6010C	Manganese	7439-96-5	ug/L	3.20E+01	USEPA Tapwater RSL	3.75	N	1.5	N	0.75	N
TAL Metals via SW6010C	Nickel	7440-02-0	ug/L	1.00E+02	RIDEM M1 GA	2.5	N	1.5	N	0.75	N
TAL Metals via SW6010C	Selenium	7782-49-2	ug/L	5.00E+01	RIDEM M1 GA	2.5	N	1.25	N	0.75	N
TAL Metals via SW6010C	Silver	7440-22-4	ug/L	7.10E+00	USEPA Tapwater RSL	2.5	N	0.5	N	0.25	N
TAL Metals via SW6010C	Thallium	7440-28-0	ug/L	2.00E+00	RIDEM M1 GA	2	N	1	N	0.75	N
TAL Metals via SW6010C	Vanadium	7440-62-2	ug/L	7.80E+00	USEPA Tapwater RSL	3.125	N	2.5	N	1.25	N
TAL Metals via SW6010C	Zinc	7440-66-6	ug/L	4.70E+02	USEPA Tapwater RSL	5	N	2.5	N	1.25	N
TAL Metals via SW7470A	Mercury	7439-97-6	ug/L	2.00E+00	RIDEM M1 GA	0.2	N	0.16	N	0.08	N
7196A	Hexavalent Chromium	18540-29-9	ug/L	1.00E+02	RIDEM M1 GA	25	N	20	N	1	N
Cyanide via SW9012B	Cyanide	57-12-5	ug/L	2.00E+02	RIDEM M1 GA	20	N	10	N	5	N
EPA 376	Sulfide	12597-04-5	ug/L	NA		4000	N	2000	N	800	N
SM 2520	Salinity	Salinity	percent	NA		NA	N	NA	N	NA	N
EPA 160.1	Total Dissolved Solids	TDS	ug/L	NA		20000	N	20000	N	20000	N
anions via SW9056A	sulfate	SO4	ug/L	NA		2500	N	1000	N	330	N
anions via SW9056A	chloride	Cl	ug/L	NA		500	N	330	N	170	N
Alkalinity via SM2320B	bicarbonate	HCO3	ug/L	NA		1000	N	1000	N	1000	N
Alkalinity via SM2320B	carbonate	CO3	ug/L	NA		1000	N	1000	N	1000	N

Notes are presented on the next page.

Notes:

CAS - Chemical Abstracts Service.

DL - Detection Limit.

LOD - Limit of Detection.

LOQ - Limit of Quantitation.

NA - Not available/applicable.

PAH - Polycyclic Aromatic Hydrocarbon.

PAL - Project Action Limit.

PCB - Polychlorinated Biphenyls.

SVOC - Semi-Volatile Organic Compound.

USEPA - United States Environmental Protection Agency.

VOC - Volatile Organic Compound.

Highlighting indicates the compound's laboratory reference value(s) is/are above the selected PAL.

(a) The PAL represents the limits of detection that analytical data must meet in order to be of sufficient quality for use in the Remedial Investigation, Risk Assessment, and remedial technology evaluation [e.g., engineering evaluation/cost analysis (EE/CA) or feasibility study (FS)]. PALs are presented for compounds proposed for laboratory analysis and therefore do not include groups of compounds (such as Total PCBs) that will be calculated based on individual aroclor data for evaluation.

(b) Groundwater PALs were selected based on the following hierarchy of sources:

1. Minimum of the following:

   RIDEM M1 GA = RIDEM, 2011. Method 1 GA Groundwater Objectives. Presumable to be suitable for drinking water use without treatment.

   USEPA MCL = USEPA Maximum Contaminant Levels (MCLs). USEPA Drinking Water Standards and Health Advisories. EPA 822-R-06-013. April 2012.

2. USEPA Tapwater RSL = USEPA Regional Screening Levels for Tapwater. May 2012.
3. RIDEM M1 GB = RIDEM, 2011. Method 1 GB Groundwater Objectives. Presumed not suitable for use as a current or potential source of drinking water.

Table 15-4
Project Action Limits (PALs) - Surface Water
Davisville
North Kingstown, Rhode Island

				Project Action Limits for Surface Water (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
SVOCs via SW8270D	1,1-Biphenyl	92-52-4	ug/L	NA		1.40E+02	USEPA R3 (FW)	1.40E+02	USEPA R3 (FW)	1	N	0.5	N	0.25	N
SVOCs via SW8270D	1,2,4-Trichlorobenzene	120-82-1	ug/L	3.50E+01	USEPA WQC	1.70E+00	RIDEM (FW chronic)	1.70E+00	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	N
SVOCs via SW8270D	1,2-Dichlorobenzene	95-50-1	ug/L	4.20E+02	RIDEM	1.80E+00	RIDEM (FW chronic)	1.80E+00	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	N
SVOCs via SW8270D	1,2-Diphenylhydrazine	122-66-7	ug/L	3.60E-02	USEPA WQC	3.10E-01	RIDEM (FW chronic)	3.60E-02	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	1,3-Dichlorobenzene	541-73-1	ug/L	3.20E+02	RIDEM	8.70E+00	RIDEM (FW chronic)	8.70E+00	RIDEM (FW chronic)	5	N	2.5	N	1.25	N
SVOCs via SW8270D	1,4-Dichlorobenzene	106-46-7	ug/L	6.30E+01	RIDEM	1.20E+00	RIDEM (FW chronic)	1.20E+00	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	2,4,5-Trichlorophenol	95-95-4	ug/L	1.40E+00	USEPA WQC	5.10E-01	RIDEM (FW chronic)	5.10E-01	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	2,4,6-Trichlorophenol	88-06-2	ug/L	1.40E+00	USEPA WQC	3.60E-01	RIDEM (FW chronic)	3.60E-01	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	2,4-Dichlorophenol	120-83-2	ug/L	7.70E+01	RIDEM	2.20E+00	RIDEM (FW chronic)	2.20E+00	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	N
SVOCs via SW8270D	2,4-Dimethylphenol	105-67-9	ug/L	3.80E+02	RIDEM	2.40E+00	RIDEM (FW chronic)	2.40E+00	RIDEM (FW chronic)	20	Y	10	Y	5	Y
SVOCs via SW8270D	2,4-Dinitrophenol	51-28-5	ug/L	6.90E+01	RIDEM	6.90E-01	RIDEM (FW chronic)	6.90E-01	RIDEM (FW chronic)	50	Y	25	Y	8.33	Y
SVOCs via SW8270D	2,4-Dinitrotoluene	121-14-2	ug/L	1.10E-01	USEPA WQC	3.40E+01	RIDEM (FW chronic)	1.10E-01	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	2,6-Dichlorophenol	87-65-0	ug/L	7.70E+01	RIDEM	2.20E+00	RIDEM (FW chronic)	2.20E+00	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	N
SVOCs via SW8270D	2,6-Dinitrotoluene	606-20-2	ug/L	1.10E-01	USEPA WQC	3.40E+01	RIDEM (FW chronic)	1.10E-01	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	2-Chloronaphthalene	91-58-7	ug/L	1.00E+03	RIDEM	3.96E-01	USEPA R5 (FW; mink)	3.96E-01	USEPA R5 (FW; mink)	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	2-Chlorophenol	95-57-8	ug/L	8.10E+01	RIDEM	2.90E+00	RIDEM (FW chronic)	2.90E+00	RIDEM (FW chronic)	5	Y	2.5	N	1.25	N
SVOCs via SW8270D	2-Methylnaphthalene	91-57-6	ug/L	NA		4.70E+00	USEPA R3 (FW)	4.70E+00	USEPA R3 (FW)	5	Y	2.5	N	1.25	N
SVOCs via SW8270D	2-Methylphenol	95-48-7	ug/L	1.00E+04	USEPA WQC	1.30E+01	USEPA R3 (FW)	1.30E+01	USEPA R3 (FW)	5	N	2.5	N	1.25	N
SVOCs via SW8270D	2-Nitroaniline	88-74-4	ug/L	NA		NA		NA	NA	20	N	10	N	5	N
SVOCs via SW8270D	2-Nitrophenol	88-75-5	ug/L	1.00E+04	USEPA WQC	1.92E+03	USEPA R3 (FW)	1.92E+03	USEPA R3 (FW)	5	N	2.5	N	1.25	N
SVOCs via SW8270D	3,3'-Dichlorobenzidine	91-94-1	ug/L	2.10E-02	USEPA WQC	4.50E+00	USEPA R3 (FW)	2.10E-02	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	3-methylphenol & 4-methylphenol	65794-96-9	ug/L	1.00E+04	USEPA WQC	NA		1.00E+04	USEPA WQC	5	N	2.5	N	1.25	N
SVOCs via SW8270D	3-Nitroaniline	99-09-2	ug/L	NA		NA		NA	NA	20	N	10	N	5	N
SVOCs via SW8270D	4,6-Dintro-2-methylphenol	534-52-1	ug/L	1.30E+01	RIDEM	2.30E+00	USEPA R4 (FW)	2.30E+00	USEPA R4 (FW)	20	Y	10	Y	5	Y
SVOCs via SW8270D	4-Bromophenyl phenyl ether	101-55-3	ug/L	NA		4.00E-01	RIDEM (FW chronic)	4.00E-01	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	4-Chloro-3-methylphenol	59-50-7	ug/L	1.00E+04	USEPA WQC	3.20E-01	RIDEM (FW chronic)	3.20E-01	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	4-Chloroaniline	106-47-8	ug/L	NA		2.32E+02	USEPA R3 (FW)	2.32E+02	USEPA R3 (FW)	5	N	2.5	N	1.25	N
SVOCs via SW8270D	4-Chlorophenyl phenyl ether	7005-72-3	ug/L	NA		NA		NA	NA	5	N	2.5	N	1.25	N
SVOCs via SW8270D	4-Nitroaniline	100-01-6	ug/L	NA		NA		NA	NA	20	N	10	N	5	N
SVOCs via SW8270D	4-Nitrophenol	100-02-7	ug/L	1.00E+04	USEPA WQC	6.00E+01	USEPA R3 (FW)	6.00E+01	USEPA R3 (FW)	20	N	10	N	5	N
SVOCs via SW8270D	Acenaphthene	83-32-9	ug/L	6.70E+02	RIDEM	1.90E+00	RIDEM (FW chronic)	1.90E+00	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	N
SVOCs via SW8270D	Acenaphthylene	208-96-8	ug/L	6.70E+02	RIDEM	1.90E+00	RIDEM (FW chronic)	1.90E+00	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	N
SVOCs via SW8270D	Anthracene	120-12-7	ug/L	8.30E+03	RIDEM	1.90E+00	RIDEM (FW chronic)	1.90E+00	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	N
SVOCs via SW8270D	Benz(a)anthracene	56-55-3	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Benzidine	92-87-5	ug/L	8.60E-05	USEPA WQC	3.90E+00	USEPA R3 (FW)	8.60E-05	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Benzo(a)pyrene	50-32-8	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Benzo(b)fluoranthene	205-99-2	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Benzo(g,h,i)perylene	191-24-2	ug/L	8.30E+02	RIDEM	4.40E+00	RIDEM (FW chronic)	4.40E+00	RIDEM (FW chronic)	5	Y	2.5	N	1.25	N
SVOCs via SW8270D	Benzo(k)fluoranthene	207-08-9	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Benzoic acid	65-85-0	ug/L	NA		4.20E+01	USEPA R3 (FW)	4.20E+01	USEPA R3 (FW)	100	Y	50	Y	25	N
SVOCs via SW8270D	Benzyl alcohol	100-51-6	ug/L	NA		8.60E+00	USEPA R3 (FW)	8.60E+00	USEPA R3 (FW)	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Bis(2-chlorethoxy)methane	111-91-1	ug/L	NA		NA		NA	NA	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Bis(2-chloroethyl) ether	111-44-4	ug/L	3.00E-02	USEPA WQC	1.90E+04	USEPA R5 (FW)	3.00E-02	USEPA WQC	5	Y	2.5	Y	1.25	Y

				Project Action Limits for Surface Water (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
SVOCs via SW8270D	Bis(2-chloroisopropyl) ether	108-60-1	ug/L	1.40E+03	RIDEM	NA		1.40E+03	RIDEM	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Bis(2-Ethylhexyl)phthalate	117-81-7	ug/L	1.20E+00	USEPA WQC	1.20E+01	RIDEM (FW chronic)	1.20E+00	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Butyl benzyl phthalate	85-68-7	ug/L	1.50E+03	RIDEM	1.90E+00	RIDEM (FW chronic)	1.90E+00	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	N
SVOCs via SW8270D	Caprolactam	105-60-2	ug/L	NA		NA		NA	NA	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Carbazole	86-74-8	ug/L	NA		NA		NA	NA	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Chrysene	218-01-9	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Dibenz(a,h)anthracene	53-70-3	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Dibenzofuran	132-64-9	ug/L	NA		3.70E+00	USEPA R3 (FW)	3.70E+00	USEPA R3 (FW)	5	Y	2.5	N	1.25	N
SVOCs via SW8270D	Diethyl phthalate	84-66-2	ug/L	1.70E+04	RIDEM	5.80E+01	RIDEM (FW chronic)	5.80E+01	RIDEM (FW chronic)	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Dimethyl phthalate	131-11-3	ug/L	2.70E+05	RIDEM	3.70E+01	RIDEM (FW chronic)	3.70E+01	RIDEM (FW chronic)	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Di-n-butyl phthalate	84-74-2	ug/L	2.00E+03	RIDEM	1.90E+01	USEPA R3 (FW)	1.90E+01	USEPA R3 (FW)	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Di-n-octyl phthalate	117-84-0	ug/L	2.00E+03	RIDEM	2.20E+01	USEPA R3 (FW)	2.20E+01	USEPA R3 (FW)	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Fluoranthene	206-44-0	ug/L	1.30E+02	RIDEM	4.40E+00	RIDEM (FW chronic)	4.40E+00	RIDEM (FW chronic)	5	Y	2.5	N	1.25	N
SVOCs via SW8270D	Fluorene	86-73-7	ug/L	1.10E+03	RIDEM	1.90E+00	RIDEM (FW chronic)	1.90E+00	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	N
SVOCs via SW8270D	Hexachlorobenzene	118-74-1	ug/L	2.80E-04	USEPA WQC	5.90E+00	RIDEM (FW chronic)	2.80E-04	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Hexachlorobutadiene	87-68-3	ug/L	4.40E-01	USEPA WQC	1.30E+00	USEPA R3 (FW)	4.40E-01	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Hexachloroethane	67-72-1	ug/L	1.40E+00	USEPA WQC	1.10E+00	RIDEM (FW chronic)	1.10E+00	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	Isophorone	78-59-1	ug/L	3.50E+01	USEPA WQC	1.30E+02	RIDEM (FW chronic)	3.50E+01	USEPA WQC	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Naphthalene	91-20-3	ug/L	NA		2.60E+00	RIDEM (FW chronic)	2.60E+00	RIDEM (FW chronic)	5	Y	2.5	N	1.25	N
SVOCs via SW8270D	Nitrobenzene	98-95-3	ug/L	1.70E+01	RIDEM	3.00E+01	RIDEM (FW chronic)	1.70E+01	RIDEM	5	N	2.5	N	1.25	N
SVOCs via SW8270D	N-Nitrosodimethylamine	62-75-9	ug/L	6.90E-04	USEPA WQC	1.17E+02	USEPA R3 (FW)	6.90E-04	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	N-Nitrosodi-n-propylamine	621-64-7	ug/L	5.00E-03	USEPA WQC	NA		5.00E-03	USEPA WQC	5	Y	2.5	Y	1.25	Y
SVOCs via SW8270D	N-Nitrosodiphenylamine	86-30-6	ug/L	3.30E+00	USEPA WQC	6.50E+00	RIDEM (FW chronic)	3.30E+00	USEPA WQC	5	Y	2.5	N	1.25	N
SVOCs via SW8270D	Pentachlorophenol	87-86-5	ug/L	2.70E-01	USEPA WQC	1.50E+01	RIDEM (FW chronic)	2.70E-01	USEPA WQC	20	Y	10	Y	5	Y
SVOCs via SW8270D	Phenanthrene	85-01-8	ug/L	8.30E+03	RIDEM	1.90E+00	RIDEM (FW chronic)	1.90E+00	RIDEM (FW chronic)	5	Y	2.5	Y	1.25	N
SVOCs via SW8270D	Phenol	108-95-2	ug/L	1.00E+04	USEPA WQC	5.60E+00	RIDEM (FW chronic)	5.60E+00	RIDEM (FW chronic)	5	N	2.5	N	1.25	N
SVOCs via SW8270D	Pyrene	129-00-0	ug/L	8.30E+02	RIDEM	4.40E+00	RIDEM (FW chronic)	4.40E+00	RIDEM (FW chronic)	5	Y	2.5	N	1.25	N
PAHs via SW8270D mod.	Acenaphthene	83-32-9	ug/L	6.70E+02	RIDEM	1.90E+00	RIDEM (FW chronic)	1.90E+00	RIDEM (FW chronic)	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Acenaphthylene	208-96-8	ug/L	6.70E+02	RIDEM	1.90E+00	RIDEM (FW chronic)	1.90E+00	RIDEM (FW chronic)	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Anthracene	120-12-7	ug/L	8.30E+03	RIDEM	1.90E+00	RIDEM (FW chronic)	1.90E+00	RIDEM (FW chronic)	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Benz(a)anthracene	56-55-3	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	0.2	Y	0.1	Y	0.05	Y
PAHs via SW8270D mod.	Benzo(a)pyrene	50-32-8	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	0.2	Y	0.1	Y	0.05	Y
PAHs via SW8270D mod.	Benzo(b)fluoranthene	205-99-2	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	0.2	Y	0.1	Y	0.05	Y
PAHs via SW8270D mod.	Benzo(g,h,i)perylene	191-24-2	ug/L	8.30E+02	RIDEM	4.40E+00	RIDEM (FW chronic)	4.40E+00	RIDEM (FW chronic)	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Benzo(k)fluoranthene	207-08-9	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	0.2	Y	0.1	Y	0.05	Y
PAHs via SW8270D mod.	Chrysene	218-01-9	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	0.2	Y	0.1	Y	0.05	Y
PAHs via SW8270D mod.	Dibenz(a,h)anthracene	53-70-3	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	0.2	Y	0.1	Y	0.05	Y
PAHs via SW8270D mod.	Fluoranthene	206-44-0	ug/L	1.30E+02	RIDEM	4.40E+00	RIDEM (FW chronic)	4.40E+00	RIDEM (FW chronic)	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Fluorene	86-73-7	ug/L	1.10E+03	RIDEM	1.90E+00	RIDEM (FW chronic)	1.90E+00	RIDEM (FW chronic)	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	3.80E-03	USEPA WQC	4.40E+00	RIDEM (FW chronic)	3.80E-03	USEPA WQC	0.2	Y	0.1	Y	0.05	Y
PAHs via SW8270D mod.	Naphthalene	91-20-3	ug/L	NA		2.60E+00	RIDEM (FW chronic)	2.60E+00	RIDEM (FW chronic)	0.2	N	0.1	N	0.05	N
PAHs via SW8270D mod.	Phenanthrene	85-01-8	ug/L	8.30E+03	RIDEM	1.90E+00	RIDEM (FW chronic)	1.90E+00	RIDEM (FW chronic)	0.4	N	0.2	N	0.1	N
PAHs via SW8270D mod.	Pyrene	129-00-0	ug/L	8.30E+02	RIDEM	4.40E+00	RIDEM (FW chronic)	4.40E+00	RIDEM (FW chronic)	0.2	N	0.1	N	0.05	N
Pesticides via SW8081B	4,4'-DDD	72-54-8	ug/L	3.10E-04	USEPA WQC	1.00E-03	USEPA (FW chronic)	3.10E-04	USEPA WQC	0.02	Y	0.01	Y	0.005	Y
Pesticides via SW8081B	4,4'-DDE	72-55-9	ug/L	2.20E-04	USEPA WQC	1.00E-03	USEPA (FW chronic)	2.20E-04	USEPA WQC	0.02	Y	0.01	Y	0.005	Y
Pesticides via SW8081B	4,4'-DDT	50-29-3	ug/L	2.20E-04	USEPA WQC	1.00E-03	RIDEM (FW chronic)	2.20E-04	USEPA WQC	0.02	Y	0.01	Y	0.005	Y
Pesticides via SW8081B	Aldrin	309-00-2	ug/L	4.90E-05	USEPA WQC	3.00E+00	USEPA R3 (FW)	4.90E-05	USEPA WQC	0.02	Y	0.01	Y	0.0033	Y
Pesticides via SW8081B	alpha-BHC	319-84-6	ug/L	2.60E-03	USEPA WQC	2.20E+00	USEPA R3 (FW)	2.60E-03	USEPA WQC	0.02	Y	0.01	Y	0.0033	Y

				Project Action Limits for Surface Water (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
Pesticides via SW8081B	alpha-Chlordane	5103-71-9	ug/L	8.00E-04	USEPA WQC	4.30E-03	RIDEM (FW chronic)	8.00E-04	USEPA WQC	0.02	Y	0.01	Y	0.0033	Y
Pesticides via SW8081B	beta-BHC	319-85-7	ug/L	9.10E-03	USEPA WQC	2.20E+00	USEPA R3 (FW)	9.10E-03	USEPA WQC	0.02	Y	0.01	Y	0.0033	N
Pesticides via SW8081B	delta-BHC	319-86-8	ug/L	2.60E-03	USEPA WQC	1.41E+02	USEPA R3 (FW)	2.60E-03	USEPA WQC	0.02	Y	0.01	Y	0.0033	Y
Pesticides via SW8081B	Dieldrin	60-57-1	ug/L	5.20E-05	USEPA WQC	5.60E-02	RIDEM (FW chronic)	5.20E-05	USEPA WQC	0.02	Y	0.01	Y	0.005	Y
Pesticides via SW8081B	Endosulfan I	959-98-8	ug/L	6.20E+01	RIDEM	5.60E-02	RIDEM (FW chronic)	5.60E-02	RIDEM (FW chronic)	0.02	N	0.01	N	0.0033	N
Pesticides via SW8081B	Endosulfan II	33213-65-9	ug/L	6.20E+01	RIDEM	5.60E-02	RIDEM (FW chronic)	5.60E-02	RIDEM (FW chronic)	0.02	N	0.01	N	0.005	N
Pesticides via SW8081B	Endosulfan sulfate	1031-07-8	ug/L	6.20E+01	RIDEM	5.60E-02	RIDEM (FW chronic)	5.60E-02	RIDEM (FW chronic)	0.02	N	0.01	N	0.005	N
Pesticides via SW8081B	Endrin	72-20-8	ug/L	5.90E-02	RIDEM	3.60E-02	RIDEM (FW chronic)	3.60E-02	RIDEM (FW chronic)	0.02	N	0.01	N	0.005	N
Pesticides via SW8081B	Endrin aldehyde	7421-93-4	ug/L	2.90E-01	RIDEM	3.60E-02	RIDEM (FW chronic)	3.60E-02	RIDEM (FW chronic)	0.02	N	0.01	N	0.005	N
Pesticides via SW8081B	Endrin ketone	53494-70-5	ug/L	5.90E-02	RIDEM	3.60E-02	RIDEM (FW chronic)	3.60E-02	RIDEM (FW chronic)	0.02	N	0.01	N	0.005	N
Pesticides via SW8081B	gamma-BHC	58-89-9	ug/L	9.80E-01	RIDEM	1.00E-02	USEPA R3 (FW)	1.00E-02	USEPA R3 (FW)	0.02	Y	0.01	N	0.0033	N
Pesticides via SW8081B	gamma-Chlordane	5103-74-2	ug/L	8.00E-04	USEPA WQC	4.30E-03	RIDEM (FW chronic)	8.00E-04	USEPA WQC	0.02	Y	0.01	Y	0.0033	Y
Pesticides via SW8081B	Heptachlor	76-44-8	ug/L	7.90E-05	USEPA WQC	3.80E-03	RIDEM (FW chronic)	7.90E-05	USEPA WQC	0.02	Y	0.01	Y	0.0033	Y
Pesticides via SW8081B	Heptachlor epoxide	1024-57-3	ug/L	3.90E-05	USEPA WQC	3.80E-03	RIDEM (FW chronic)	3.90E-05	USEPA WQC	0.02	Y	0.01	Y	0.0033	Y
Pesticides via SW8081B	Methoxychlor	72-43-5	ug/L	1.00E+02	USEPA WQC	3.00E-02	USEPA (FW chronic)	3.00E-02	USEPA (FW chronic)	0.02	N	0.01	N	0.0033	N
Pesticides via SW8081B	Toxaphene	8001-35-2	ug/L	2.80E-04	USEPA WQC	2.00E-04	RIDEM (FW chronic)	2.00E-04	RIDEM (FW chronic)	1	Y	0.667	Y	0.33	Y
PCBs via SW8082A	Aroclor-1016	12674-11-2	ug/L	6.40E-05	USEPA WQC	7.40E-05	USEPA R3 (FW)	6.40E-05	USEPA WQC	0.5	Y	0.25	Y	0.125	Y
PCBs via SW8082A	Aroclor-1221	11104-28-2	ug/L	6.40E-05	USEPA WQC	7.40E-05	USEPA R3 (FW)	6.40E-05	USEPA WQC	0.5	Y	0.25	Y	0.125	Y
PCBs via SW8082A	Aroclor-1232	11141-16-5	ug/L	6.40E-05	USEPA WQC	7.40E-05	USEPA R3 (FW)	6.40E-05	USEPA WQC	0.5	Y	0.25	Y	0.125	Y
PCBs via SW8082A	Aroclor-1242	53469-21-9	ug/L	6.40E-05	USEPA WQC	7.40E-05	USEPA R3 (FW)	6.40E-05	USEPA WQC	0.5	Y	0.25	Y	0.125	Y
PCBs via SW8082A	Aroclor-1248	12672-29-6	ug/L	6.40E-05	USEPA WQC	7.40E-05	USEPA R3 (FW)	6.40E-05	USEPA WQC	0.5	Y	0.25	Y	0.125	Y
PCBs via SW8082A	Aroclor-1254	11097-69-1	ug/L	6.40E-05	USEPA WQC	7.40E-05	USEPA R3 (FW)	6.40E-05	USEPA WQC	0.5	Y	0.25	Y	0.125	Y
PCBs via SW8082A	Aroclor-1260	11096-82-5	ug/L	6.40E-05	USEPA WQC	7.40E-05	USEPA R3 (FW)	6.40E-05	USEPA WQC	0.5	Y	0.25	Y	0.125	Y
PCBs via SW8082A	Aroclor-1262	37324-23-5	ug/L	6.40E-05	USEPA WQC	7.40E-05	USEPA R3 (FW)	6.40E-05	USEPA WQC	0.5	Y	0.25	Y	0.125	Y
PCBs via SW8082A	Aroclor-1268	11100-14-4	ug/L	6.40E-05	USEPA WQC	7.40E-05	USEPA R3 (FW)	6.40E-05	USEPA WQC	0.5	Y	0.25	Y	0.125	Y
TAL Metals via SW6010C	Aluminum	7429-90-5	ug/L	NA		8.70E+01	RIDEM (FW chronic)	8.70E+01	RIDEM (FW chronic)	50	N	25	N	12.5	N
TAL Metals via SW6010C	Calcium	7440-70-2	ug/L	NA		1.16E+05	USEPA R3 (FW)	1.16E+05	USEPA R3 (FW)	1250	N	500	N	250	N
TAL Metals via SW6010C	Iron	7439-89-6	ug/L	3.00E+02	RIDEM	1.00E+03	RIDEM (FW chronic)	3.00E+02	RIDEM	25	N	15	N	7.5	N
TAL Metals via SW6010C	Magnesium	7439-95-4	ug/L	NA		8.20E+04	USEPA R3 (FW)	8.20E+04	USEPA R3 (FW)	1250	N	750	N	250	N
TAL Metals via SW6010C	Potassium	7440-09-7	ug/L	NA		5.30E+04	USEPA R3 (FW)	5.30E+04	USEPA R3 (FW)	1250	N	750	N	250	N
TAL Metals via SW6010C	Sodium	7440-23-5	ug/L	NA		6.80E+05	USEPA R3 (FW)	6.80E+05	USEPA R3 (FW)	1250	N	750	N	250	N
TAL Metals via SW6010C	Antimony	7440-36-0	ug/L	5.60E+00	RIDEM	1.00E+01	RIDEM (FW chronic)	5.60E+00	RIDEM	2.5	N	2	N	1.25	N
TAL Metals via SW6010C	Arsenic	7440-38-2	ug/L	1.80E-02	USEPA WQC	1.50E+02	RIDEM (FW chronic)	1.80E-02	USEPA WQC	2.5	Y	1.25	Y	0.75	Y
TAL Metals via SW6010C	Barium	7440-39-3	ug/L	1.00E+03	USEPA WQC	4.00E+00	USEPA R3 (FW)	4.00E+00	USEPA R3 (FW)	10	Y	2.5	N	1.25	N
TAL Metals via SW6010C	Beryllium	7440-41-7	ug/L	NA		1.70E-01	RIDEM (FW chronic)	1.70E-01	RIDEM (FW chronic)	1.25	Y	0.5	Y	0.25	Y
TAL Metals via SW6010C	Cadmium	7440-43-9	ug/L	NA		2.46E-01	RIDEM (FW chronic)	2.46E-01	RIDEM (FW chronic)	1.25	Y	0.5	Y	0.25	Y
TAL Metals via SW6010C	Chromium	7440-47-3	ug/L	NA		1.10E+01	RIDEM (FW chronic)	1.10E+01	RIDEM (FW chronic)	2.5	N	1	N	0.5	N
TAL Metals via SW6010C	Cobalt	7440-48-4	ug/L	NA		2.30E+01	USEPA R3 (FW)	2.30E+01	USEPA R3 (FW)	3.125	N	2.5	N	1.25	N
TAL Metals via SW6010C	Copper	7440-50-8	ug/L	1.30E+03	RIDEM	8.96E+00	RIDEM (FW chronic)	8.96E+00	RIDEM (FW chronic)	2.5	N	2	N	1	N
TAL Metals via SW6010C	Lead	7439-92-1	ug/L	NA		2.52E+00	RIDEM (FW chronic)	2.52E+00	RIDEM (FW chronic)	0.75	N	0.75	N	0.375	N
TAL Metals via SW6010C	Manganese	7439-96-5	ug/L	5.00E+01	USEPA WQC	1.20E+02	USEPA R3 (FW)	5.00E+01	USEPA WQC	3.75	N	1.5	N	0.75	N
TAL Metals via SW6010C	Nickel	7440-02-0	ug/L	6.10E+02	RIDEM	5.20E+01	RIDEM (FW chronic)	5.20E+01	RIDEM (FW chronic)	2.5	N	1.5	N	0.75	N
TAL Metals via SW6010C	Selenium	7782-49-2	ug/L	1.70E+02	RIDEM	5.00E+00	RIDEM (FW chronic)	5.00E+00	RIDEM (FW chronic)	2.5	N	1.25	N	0.75	N
TAL Metals via SW6010C	Silver	7440-22-4	ug/L	NA		3.20E+00	USEPA R3 (FW)	3.20E+00	USEPA R3 (FW)	2.5	N	0.5	N	0.25	N
TAL Metals via SW6010C	Thallium	7440-28-0	ug/L	2.40E-01	RIDEM	1.00E+00	RIDEM (FW chronic)	2.40E-01	RIDEM	2	Y	1	Y	0.75	Y
TAL Metals via SW6010C	Vanadium	7440-62-2	ug/L	NA		2.00E+01	USEPA R3 (FW)	2.00E+01	USEPA R3 (FW)	3.125	N	2.5	N	1.25	N
TAL Metals via SW6010C	Zinc	7440-66-6	ug/L	7.40E+03	RIDEM	1.18E+02	RIDEM (FW chronic)	1.18E+02	RIDEM (FW chronic)	5	N	2.5	N	1.25	N
TAL Metals via SW7470A	Mercury	7439-97-6	ug/L	1.40E-01	RIDEM	7.70E-01	RIDEM (FW chronic)	1.40E-01	RIDEM	0.2	Y	0.16	Y	0.08	N
7196A	Hexavalent Chromium	18540-29-9	ug/L	NA		1.10E+01	RIDEM (FW chronic)	1.10E+01	RIDEM (FW chronic)	25	Y	20	Y	1	N

				Project Action Limits for Surface Water (a)						Laboratory Reference Limits					
				HH		Eco		Selected (b)							
Analytical Method	Compound	CAS	Units	Value (c)	Source	Value (d)	Source	Value	Source	LOQs	Is LOQ >PAL (Y/N)?	LODs	Is LOD>PAL (Y/N)?	DLs	Is DL>PAL (Y/N)?
Cyanide via SW9012B	Cyanide	57-12-5	ug/L	1.40E+02	RIDEM	5.20E+00	RIDEM (FW chronic)	5.20E+00	RIDEM (FW chronic)	20	Y	10	Y	5	N
EPA 376	Sulfide	12597-04-5	ug/L	NA		NA		NA	NA	4000	N	2000	N	800	N
SM 2520	Salinity	Salinity	percent	NA		NA		NA	NA	NA	N	NA	N	NA	N
EPA 160.1	Total Dissolved Solids	TDS	ug/L	NA		NA		NA	NA	20000	N	20000	N	20000	N

Notes:
CAS - Chemical Abstracts Service.
DL - Detection Limit.
Eco - Indicates the selected PAL that is protective of ecological receptors.
FW - Freshwater.
HH - Indicates the selected PAL that is protective of human health receptors.
LOD - Limit of Detection
LOQ - Limit of Quantitation.
NA - Not available/applicable.
PAH - Polycyclic Aromatic Hydrocarbon.
PAL - Project Action Limit.
PCB - Polychlorinated Biphenyls.
RIDEM - Rhode Island Department of Environmental Management.
SVOC - Semi-Volatile Organic Compound.
USEPA - United States Environmental Protection Agency.
VOC - Volatile Organic Compound.
Highlighting indicates the compound's laboratory reference value(s) is/are above the selected PAL.
(a) The PAL represents the limits of detection that analytical data must meet in order to be of sufficient quality for use in the Remedial Investigation, Risk Assessment, and remedial technology evaluation [e.g., engineering evaluation/cost analysis (EE/CA) or feasibility study (FS)].
PALs are presented for compounds proposed for laboratory analysis and therefore do not include groups of compounds (such as Total PAHs and Total PCBs) that will be calculated based on individual PAHs and individual aroclor data for evaluation.
(b) Indicates the lower of the PALs based on levels protective of human health and ecological receptors.
(c) HH PALs were selected based on the lower of the following sources:
State of Rhode Island and Providence Plantations Department of Environmental Management, Water Quality Regulations. For consumption of water and organisms. 2009.
USEPA National Recommended Water Quality Criteria for Priority Pollutants. Value for Human Health for the consumption of water and organisms. 2009.
(d) Eco PALs were selected based on the following sources (parentheses indicate specific type of screening value):
RIDEM = RIDEM Ambient Water Quality Criteria and Guidelines. Freshwater aquatic life chronic values (RIDEM, 2010; Table 1).
USEPA = National recommended water quality criteria. Freshwater aquatic life chronic values (USEPA, 2009).
USEPA R3 = USEPA Region 3 freshwater surface water screening values (USEPA, 2006c). Available on-line at http://www.epa.gov/reg3hwmd/risk/eco/index.htm.
USEPA R4 = USEPA. 2001. Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment. Originally published November 1995. Website version last updated November 30, 2001: http://www.epa.gov/region4/superfund/programs/riskassess/ecolbul.html
USEPA R5 = USEPA. 2003. USEPA Region 5 Ecological Screening Levels. Revision August 2003. Available on-line at http://www.epa.gov/reg5rcra/ca/edql.htm.

SAP Worksheet #17-1: Sampling Design and Rationale (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.1.1)

Overview

This section describes the sampling rationale and sampling design for the collection of surface and subsurface soil, sediment, surface water, grab groundwater, and groundwater samples for the QDC Outfall 001 RI. The general approach for the planned investigation is to collect a wide variety of site characterization data, designed to refine the CSM, evaluate whether an interim removal action is warranted, conduct the HHRA and ERA, and prepare an RI report to complete the RI phase of the CERCLA process. A key element of this investigation is to refine the lateral and vertical extent of site-related impacts that may warrant site remediation and/or site restrictions. The SASE performed in 2010 identified VOCs, SVOCs, PAHS, PCBs, petroleum hydrocarbons, and metals in the footprint of the 2008 soil excavation and in nearby wetland sediment. The specific boundaries of impacts to soil and sediment have not been fully delineated, and impacts to groundwater and surface water have not been evaluated. The RI is designed to better define the nature and extent of site-related impacts.

Further details regarding the specific DQOs for the planned investigation are presented in Worksheet #11, and PALs are quantified in Worksheet #15. The PALs represent the levels of detection that analytical data must meet in order to be of sufficient quality for use in the RI and risk assessment. These levels are designed to be equal to or lower than relevant human health and ecological screening levels. However, the PALs are not intended to be used as cleanup levels. The following paragraphs describe the general methodology and rationale for the specific sampling approach.

Field Screening

Organic vapor measurements will be recorded using a PID for the purpose of measuring the relative levels of VOCs. Headspace measurements will be obtained at each sampling depth interval during the collection of subsurface soil and sediment samples according to SOP 3-19 using the Top Sealing Bag method. The field screening data will be reviewed by the project team to best estimate the optimal locations for the collection of discreet VOC samples. Other field screening will consist of measurements associated with groundwater well development and sampling. Measurements of pH, specific conductivity, turbidity, temperature, DO, and ORP will be recorded in relevant field logs. PID reading will also be taken in the headspace of permanent groundwater monitoring wells once the cap has been removed prior to sampling or water level measurements. The specific methodology and procedures to be implemented for field screening are included within the SOPs provided with this SAP.

Sediment Sampling

An estimated 80 sediment samples from 20 locations (four depths from each location) will be collected within the wetland. The primary intent is to better define the nature and extent of impacts and provide data for use in the risk assessment. Sediment samples will be collected from 4 distinct horizons (0 to 0.5 ft, 0.5 to 1 ft, 1 to 2 ft, and 2 to 4 ft) in order to vertically delineate potential site-related impacts. Actual depths may be adjusted in the field based on field screening measurements or visual observations (i.e., If PID measurements or other visual/olfactory evidence of impacts are observed, the boring at that location will be advanced further until no evidence of impacts is observed), and the boring will at least be advanced until the water table is encountered. The assessment of the recreational/trespasser exposure pathway performed as part of the HHRA will evaluate potential risks associated with the combined surface sediment (0-0.5 ft) and subsurface sediment (0.5-1 ft) since it is likely that a recreational/trespasser would sink into the wetland to a maximum likely depth of 1 ft. The assessment of the construction/utility worker exposure pathway performed as part of the HHRA will evaluate potential risks associated with the combined surface sediment (0-0.5 ft) and subsurface sediment (0.5-4 ft) since it is likely that a construction/utility worker would perform more intrusive work and could dig to a maximum likely depth of 4 ft. The ecological risk assessment will evaluate only the surface sediment (0-0.5 ft).

Sediment sample locations are presented on Figure 10-5 and the sampling rationale is explained in Table 11-1. Proposed sampling locations may be refined based on actual field conditions (i.e., field screening, visual evidence of impact, strata type, depositional areas, etc.).

Sediment samples will be collected and handled in accordance with SOP 3-17, SOP 3-21, and/or SOP 3-22 (depending on the type of equipment used) and analyzed for VOCs, SVOCs, PAHs, pesticides, PCBs, TPH, and TAL metals. Ten percent of the sediment samples will be analyzed for hexavalent chromium. Surface sediment samples will also be analyzed for AVS/SEM, TOC, and grain size. In addition to the primary samples, QA/QC samples will be collected in accordance with this SAP.

Soil Sampling

An estimated 30 soil samples from 10 locations (three depths per location) in the Drainage Ditch and 18 soil samples from 6 locations (three depths per location) in and around the footprint of the 2008 excavation will be collected. In addition, 6 soil samples from 2 locations (three depths per location) will be collected during monitoring well installation at the well pairs installed upgradient of the wetland and adjacent to the outfall. The primary intent is to better define the nature and extent of impacts and provide data for use in the risk assessment. Soil samples will be collected from 3 distinct horizons (0 to 1 ft, 1 to 2 ft, 2 to 4 ft) in order to vertically delineate potential site-

related impacts. Actual depths may be adjusted in the field based field screening measurements or visual observations (i.e., If PID measurements or other visual/olfactory evidence of impacts are observed, the boring at that location will be advanced further until no evidence of impacts is observed), and the boring will at least be advanced until the water table is encountered. The assessment of the recreational/trespasser exposure pathway performed as part of the HHRA and the ecological risk assessment will only evaluate potential risk/hazard associated with the surface soil (0-1 ft). The assessment of the construction/utility worker exposure pathway performed as part of the HHRA will evaluate potential risk/hazard associated with the surface and subsurface soil to a maximum depth of 4 ft.

One soil boring will be advanced along the drain pipe approximately 50 feet downgradient of catch basin CB-3. The boring will be advanced to 8 feet. Soil samples will be collected from 3 distinct horizons (5 to 6 ft, 6 to 7 ft, and 7 to 8 ft). Additional soils borings will be advanced adjacent to any catch basins that do not have competent bottoms or show signs of deterioration when inspected after the maintenance cleaning of the drain line and catch basins. The depths of the samples will be based on the depth of the catch basin and/or the depth of the signs of deterioration in the catch basin. These soil borings will at least be advanced until the water table is encountered such that a grab groundwater sample can be collected.

Soil sampling locations are presented on Figure 10-6 and the sampling rationale is explained in Table 11-1. These locations will be field-adjusted as necessary to accomplish the DQOs for this program. The specific methodology and procedures to be implemented for soil sampling are included within the SOPs provided with this SAP.

Soil samples will be collected and handled in accordance with SOP 3-21 and analyzed for VOCs, SVOCs, PAHs, pesticides, PCBs, TPH, and TAL metals. Ten percent of the soil samples used in the human health risk assessment will be analyzed for hexavalent chromium. Surface soil samples used in the ecological risk assessment will also be analyzed for AVS/SEM, TOC, pH, and grain size. In addition to the primary samples, QA/QC samples will be collected in accordance with this SAP.

Surface Water

At the 5 sediment locations within the wetland and 2 soil locations in the Drainage Ditch, a co-located surface water sample will be collected. The primary intent is to better define the nature and extent of impacts and provide data for use in the risk assessment. The approximate surface water sample locations are shown on Figure 10-7 and the sampling rationale is explained in Table 11-1. However, actual locations will be based on if and where surface water is present at the time of the investigation. If little surface water is present, additional grab groundwater samples may be collected from temporary groundwater wells in place of some/all of the surface water samples.

Surface water samples will be collected and handled in accordance with SOP 3-10. The surface water and grab groundwater samples will be analyzed for SVOCs, PAHs, pesticides, PCBs, total and dissolved TAL metals, cyanide, and sulfide. Ten percent of the surface water samples will be analyzed for hexavalent chromium. In addition to the primary samples, QA/QC samples will be collected in accordance with this SAP.

Groundwater Sampling

Three shallow/intermediate well pairs will be installed during the RI. Permanent monitoring wells will be developed according to SOP 3-13 and allowed to equilibrate for 7 days prior to sampling. All 6 installed monitoring wells will be sampled during the RI, along with existing wells PGU-Z3-03S and PGU-Z3-03D. The monitoring well locations are presented on Figure 10-8 and the sampling rationale is explained in Table 11-1. Groundwater samples will be collected and handled in accordance with SOP 3-24 and USEPA Region 1 Low-Flow Sampling Guidance and analyzed for VOCs, SVOCs, PAHs, pesticides, PCBs, TAL metals, cyanide, sulfide, salinity, TDS, and anions (sulfate, chloride, bicarbonate, carbonate). Ten percent of the groundwater samples will be analyzed for hexavalent chromium. The groundwater salinity and TDS data will be used to evaluate the potability of the aquifer in order to better quantify whether a future drinking water exposure pathway is realistic. Cation (sodium, calcium, potassium, magnesium) and anion data will be used as part of the groundwater background analysis. In addition to the primary samples, QA/QC samples will be collected in accordance with this SAP. Depth to water measurements from these groundwater monitoring wells will be used to assess local groundwater elevations, gradient, and flow.

In addition to the groundwater samples collected from permanent monitoring wells, grab groundwater samples will be collected from temporary wells at 5 locations in the wetland, 3 locations in the Drainage Ditch, at the location 50 feet downgradient from catch basin CB-3, and at any borings advanced to investigate deteriorated catch basins. The temporary well locations are presented on Figure 10-8 and the sampling rationale is explained in Table 11-1. Grab groundwater samples will be collected and handled in accordance with SOP 3-37 and analyzed for VOCs, SVOCs, PAHs, pesticides, PCBs, TAL metals, cyanide, and sulfide. Since the samples collected from the temporary wells are grab groundwater samples, additional grab groundwater QA/QC samples will not be collected.

The assessment of the construction/utility worker exposure pathway performed as part of the HHRA will evaluate the potential risk/hazard associated with groundwater collected from permanent monitoring wells screened at depths less than 15 ft bgs. The assessment of the hypothetical future off-site resident exposure pathway performed as part of the HHRA will evaluate the potential risk/hazard associated with groundwater collected from permanent monitoring wells.

Sample Shipping

Samples will be shipped or picked up by a courier on the day of sampling or as soon as logistically possible. The samples will be preserved, chilled, etc. in accordance with this SAP. All sample shipments to a designated laboratory will contain appropriate CoC forms.

SAP Worksheet #18, 19, 20, and 30: Field Project Implementation (Field Project Instructions) (NCBC Davisville, OU10)

(UFP-QAPP Manual Section 3.1.1)

(Laboratory Name and Address): Empirical Laboratories, 621 Mainstream Drive, Suite 270, Nashville, TN 37228

(Point of Contact Name): Brian Richard, Project Manager

(Phone Number): 877-345-1113, ext. 249

ELAP Certification: L2226 (expires November 30, 2015)

Field IDs	Sample Type[1]	Parameter	Method	Field Filter	No. of Bottles	Type of Bottle	Preservative	Hold Time[2]
Surface Soil Samples[3]:								
QF-SS06-0012 QF-SS07-0012 QF-SS08-0012 QF-SS09-0012 QF-SS10-0012 QF-SS11-0012 QF-SS12-0012 QF-SS13-0012 QF-SS14-0012 QF-SS15-0012 QF-SS00-DUP1 QF-SS16-0012 QF-SS17-0012 QF-SS19-0012 QF-SS20-0012 QF-SS21-0012 QF-SS22-0012 QF-SS23-0012 QF-SS00-DUP2 QF-SS00-EB01	Normal Normal Normal Normal Normal Normal Normal Normal Normal Normal Field Duplicate Normal Normal NormalNormal Normal Normal Normal Field Duplicate Equipment Blank	AVS/SEM	EPA-821-R-91-100/ 6010C	No	1	4 oz jar, no headspace	Cool, 4ºC	21 days**
		TOC	Lloyd Khan	No	1	4 oz jar	Cool, 4ºC	14 days
		Grain Size (Sieve and Hydrometer)	ASTM D422-63	No	1	1 qt ziploc	none	none
		VOCs	5035A/8260B	No	3	40 ml VOAs 2x5ml H_20 5ml MeOH	Cool, 4ºC	Freeze within 48 hrs; Analyze within 14 days
		SVOCs	3546/8270D	No	1	4 oz jar	Cool, 4ºC	14 days*
		PAHs	3546/8270D-mod.	No	1	4 oz jar	Cool, 4ºC	14 days*
		Pesticides	3546/8081B	No	1	4 oz jar	Cool, 4ºC	14 days*
		PCBs	3546/8082A	No	1	4 oz jar	Cool, 4ºC	14 days*
		TPH	8015C	No	1	4 oz jar	Cool, 4ºC	14 days*
		TAL Metals	3050B/ 6010C/7471B	No	1	4 oz jar	Cool, 4ºC	28 days for mercury; 180 days for other metals
		Hexavalent Chromium[4]	SW3060A/7196A	No	1	4 oz jar	Cool, 4ºC	24 hours (ORP) 30 days
		pH	9045D	No	1	4 oz jar	Cool, 4ºC	Analyze as soon as possible

Field IDs	Sample Type[1]	Parameter	Method	Field Filter	No. of Bottles	Type of Bottle	Preservative	Hold Time[2]
Subsurface Soil Samples[3]:								
QF-SB06-0102	Normal	VOCs	5035A/8260B	No	3	40 ml VOAs 2x5ml H_20 5ml MeOH	Cool, 4ºC	Freeze within 48 hrs; Analyze within 14 days
QF-SB06-0204	Normal							
QF-SB07-0102	Normal							
QF-SB07-0204	Normal	SVOCs	3546/8270D	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SB08-0102	Normal							
QF-SB08-0204	Normal	PAHs	3546/8270D-mod.	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SB09-0102	Normal							
QF-SB09-0204	Normal	Pesticides	3546/8081B	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SB10-0102	Normal							
QF-SB10-0204	Normal	PCBs	3546/8082A	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SB00-DUP1	Field Duplicate							
QF-SB11-0102	Normal	TPH	8015C	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SB11-0204	Normal							
QF-SB12-0102	Normal	TAL Metals	3050B/ 6010C/7471B	No	1	4 oz jar	Cool, 4ºC	28 days for mercury; 180 days for other metals
QF-SB12-0204	Normal							
QF-SB13-0102	Normal	Hexavalent Chromium[4]	SW3060A/7196A	No	1	4 oz jar	Cool, 4ºC	24 hours (ORP) 30 days
QF-SB13-0204	Normal							
QF-SB14-0102	Normal							
QF-SB14-0204	Normal							
QF-SB15-0102	Normal							
QF-SB15-0204	Normal							
QF-SB00-DUP2	Field Duplicate							
QF-SB16-0102	Normal							
QF-SB16-0204	Normal							
QF-SB17-0102	Normal							
QF-SB17-0204	Normal							
QF-SB00-DUP3	Field Duplicate							
QF-SB18-0506	Normal							
QF-SB18-0607	Normal							
QF-SB18-0708	Normal							
QF-SB19-0102	Normal NormalNormal							
QF-SB19-0204	Normal							
QF-SB20-0102	Normal							
QF-SB20-0204	Normal							
QF-SB21-0102	Normal							
QF-SB21-0204	Normal							
QF-SB22-0102	Normal							
QF-SB22-0204	Normal							
QF-SB23-0102	Field Duplicate							
QF-SB23-0204	Equipment Blank							
QF-SB00-DUP4	Equipment Blank							
QF-SB00-EB01								
QF-SB00-EB02								

Field IDs	Sample Type[1]	Parameter	Method	Field Filter	No. of Bottles	Type of Bottle	Preservative	Hold Time[2]
Surface Sediment Samples[3]:								
QF-SD06-0006	Normal	VOCs	5035A/8260B	No	3	40 ml VOAs 2x5ml H20 5ml MeOH	Cool, 4ºC	Freeze within 48 hrs; Analyze within 14 days
QF-SD06-0612	Normal							
QF-SD07-0006	Normal							
QF-SD07-0612	Normal	SVOCs	3546/8270D	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SD08-0006	Normal							
QF-SD08-0612	Normal	PAHs	3546/8270D-mod.	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SD09-0006	Normal	Pesticides	3546/8081B	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SD09-0612	Normal							
QF-SD10-0006	Normal	PCBs	3546/8082A	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SD10-0612	Normal	TPH	3546/8015C	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SD00-DUP1	Field Duplicate	TAL Metals	3050B/ 6010C/7471B	No	1	4 oz jar	Cool, 4ºC	28 days for mercury; 180 days for other metals
QF-SD11-0006	Normal							
QF-SD11-0612	Normal							
QF-SD12-0006	Normal	Hexavalent Chromium[4]	SW3060A/7196A	No	1	4 oz jar	Cool, 4ºC	24 hours (ORP) 30 days
QF-SD12-0612	Normal							
QF-SD13-0006	Normal	AVS/SEM	EPA-821-R-91-100/ 6010C	No	1	4 oz jar, no headspace	Cool, 4ºC	21 days**
QF-SD13-0612	Normal							
QF-SD14-0006	Normal	TOC	Lloyd Khan	No	1	4 oz jar	Cool, 4ºC	14 days
QF-SD14-0612	Normal							
QF-SD15-0006	Normal	Grain Size	ASTM D422-63	No	1	1 qt ziploc	none	none
QF-SD15-0612	Normal							
QF-SD00-DUP2	Field Duplicate							
QF-SD16-0006	Normal							
QF-SD16-0612	Normal							
QF-SD17-0006	Normal							
QF-SD17-0612	Normal							
QF-SD18-0006	Normal							
QF-SD18-0612	Normal							
QF-SD19-0006	Normal							
QF-SD19-0612	Normal							
QF-SD20-0006	Normal							
QF-SD20-0612	Normal							
QF-SD00-DUP3	Field Duplicate							
QF-SD21-0006	Normal							
QF-SD21-0612	Normal							
QF-SD22-0006	Normal							
QF-SD22-0612	Normal							
QF-SD23-0006	Normal							
QF-SD23-0612	Normal							
QF-SD24-0006	Normal							
QF-SD24-0612	Normal							
QF-SD25-0006	Normal							
QF-SD25-0612	Normal							
QF-SD00-DUP4	Field Duplicate							
QF-SD00-EB01	Equipment Blank							

Field IDs	Sample Type[1]	Parameter	Method	Field Filter	No. of Bottles	Type of Bottle	Preservative	Hold Time[2]
QF-SD00-EB02	Equipment Blank							
Subsurface Sediment Samples[3]:								
QF-SD06-0102	Normal	VOCs	5035A/8260B	No	3	40 ml VOAs 2x5ml H_20 5ml MeOH	Cool, 4ºC	Freeze within 48 hrs; Analyze within 14 days
QF-SD06-0204	Normal							
QF-SD07-0102	Normal							
QF-SD07-0204	Normal	SVOCs	3546/8270D	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SD08-0102	Normal							
QF-SD08-0204	Normal	PAHs	3546/8270D-mod.	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SD09-0102	Normal							
QF-SD09-0204	Normal	Pesticides	3546/8081B	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SD10-0102	Normal							
QF-SD10-0204	Normal	PCBs	3546/8082A	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SD00-DUP5	Field Duplicate							
QF-SD11-0102	Normal	TPH	3546/8015C	No	1	4 oz jar	Cool, 4ºC	14 days*
QF-SD11-0204	Normal							
QF-SD12-0102	Normal	TAL Metals	3050B/ 6010C/7471B	No	1	4 oz jar	Cool, 4ºC	28 days for mercury; 180 days for other metals
QF-SD12-0204	Normal							
QF-SD13-0102	Normal	Hexavalent Chromium[4]	SW3060A/7196A	No	1	4 oz jar	Cool, 4ºC	24 hours (ORP) 30 days
QF-SD13-0204	Normal							
QF-SD14-0102	Normal							
QF-SD14-0204	Normal							
QF-SD15-0102	Normal							
QF-SD15-0204	Normal							
QF-SD00-DUP6	Field Duplicate							
QF-SD16-0102	Normal							
QF-SD16-0204	Normal							
QF-SD17-0102	Normal							
QF-SD17-0204	Normal							
QF-SD18-0102	Normal							
QF-SD18-0204	Normal							
QF-SD19-0102	Normal							
QF-SD19-0204	Normal							
QF-SD20-0102	Normal							
QF-SD20-0204	Normal							
QF-SD00-DUP7	Field Duplicate							
QF-SD21-0102	Normal							
QF-SD21-0204	Normal							
QF-SD22-0102	Normal							
QF-SD22-0204	Normal							
QF-SD23-0102	Normal							
QF-SD23-0204	Normal							
QF-SD24-0102	Normal							
QF-SD24-0204	Normal							
QF-SD25-0102	Normal							
QF-SD25-0204	Normal							

Field IDs	Sample Type[1]	Parameter	Method	Field Filter	No. of Bottles	Type of Bottle	Preservative	Hold Time[2]
QF-SD00-DUP8	Field Duplicate							
QF-SD00-EB03	Equipment Blank							
QF-SD00-EB04	Equipment Blank							
Surface Water samples:								
QF-SW-01	Normal	SVOCs	3510C/8270D	No	2	1-L Ambers	Cool, 4ºC	7 days*
QF-SW-02	Normal	PAHs	3510C /8270D-mod.	No	2	1-L Ambers	Cool, 4ºC	7 days*
QF-SW-03	Normal	Pesticides	3510C /8081B	No	2	1-L Ambers	Cool, 4ºC	7 days*
QF-SW-04	Normal	PCBs	3510C /8082A	No	2	1-L Ambers	Cool, 4ºC	7 days*
QF-SW-05	Normal	Total TAL Metals	3005A/ 6010C/7470A	No	1	500 ml HDPE	HNO_3, Cool, 4ºC	28 days for mercury; 180 days for other metals
QF-SW-06	Normal							
QF-SW-07	Normal	Dissolved TAL Metals	3005A/ 6010C/7470A	Yes	1	500 ml HDPE	HNO_3, Cool, 4ºC	28 days for mercury; 180 days for other metals
QF-SW-DP	Field Duplicate							
QF-SW-EB	Equipment Blank	Hexavalent Chromium[4]	7196A	No	1	250 ml HDPE	Cool, 4ºC	24 hours
		Cyanide	9010C	No	1	250 ml HDPE	NaOH, Cool, 4ºC	14 days
		Sulfide	EPA 376	No	1	2 x 250 ml HDPE	Cool, 4ºC, $Zn(O_2CCH_3)_2$ and NaOH	7 days
		Total Dissolved Solids	EPA 160.1	No	1	500 ml HDPE	Cool, 4ºC	7 days
Groundwater samples[5]:								
QDC1-MW01S	Normal	VOCs	5030B/8260B	No	3	40 ml VOAs	HCl, Cool, 4ºC	14 days
QDC1-MW01I	Normal	SVOCs	3510C/8270D	No	2	1-L Ambers	Cool, 4ºC	7 days*
QDC1-MW02S	Normal	PAHs	3510C /8270D-mod	No	2	1-L Ambers	Cool, 4ºC	7 days*
QDC1-MW02I	Normal	Pesticides	3510C /8081B	No	2	1-L Ambers	Cool, 4ºC	7 days*
QDC1-MW03S	Normal	PCBs	3510C /8082A	No	2	1-L Ambers	Cool, 4ºC	7 days*
QDC1-MW03I	Normal	Total TAL Metals	3005A/ 6010C/7470A	No	1	500 ml HDPE	HNO_3, Cool, 4ºC	28 days for mercury; 180 days for other metals
QDC1-MW04S	Normal							
QDC1-MW04I	Normal	Hexavalent Chromium[4]	7196A	No	1	250 ml HDPE	Cool, 4ºC	24 hours
PGU-Z3-03S	Normal							
PGU-Z3-03D	Normal	Cyanide	9010C	No	1	250 ml HDPE	NaOH, Cool, 4ºC	14 days
QDC1-DUP01	Field Duplicate							
		Sulfide	EPA 376	No	1	2 x 250 ml HDPE	Cool, 4ºC, $Zn(O_2CCH_3)_2$ and NaOH	7 days
		Salinity	SM 2520	No	1	125 ml HDPE	Cool, 4ºC	28 days
		Total Dissolved Solids	EPA 160.1	No	1	500 ml HDPE	Cool, 4ºC	7 days
		Sulfate, Chloride	9056A	No	1	125 ml HDPE	Cool, 4ºC	28 days
		Carbonate, Bicarbonate	TBD	No	1	125 ml HDPE	Cool, 4ºC	28 days

Field IDs	Sample Type[1]	Parameter	Method	Field Filter	No. of Bottles	Type of Bottle	Preservative	Hold Time[2]
Trip Blank samples[6]:								
QF-SO-TB01 QF-SO-TB02 QF-SD-TB01 QF-SD-TB02	Trip Blank-Soils Trip Blank-Soils Trip Blank-Sediment Trip Blank-Sediment	VOCs	5035A/8260B	No	3	40 ml VOAs 2x5ml H_20 5ml MeOH	Cool, 4ºC	Freeze within 48 hrs; Analyze within 14 days
QF-AQ-TB01 QG-AQ-TB02	Trip Blank-Waters Trip Blank-Waters	VOCs	5030B/8260B	No	3	40 ml VOAs	HCl, Cool, 4ºC	14 days

Notes:
[1] - MS/MSD samples will be collected at a rate of one pair per 20 field samples. The actual sample used for the MS/MSD will be determined in the field.
[2] - Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.
[3] - The last four numbers of the field IDs indicate assumed sample depth interval (actual depth interval may be modified in the field): 0006=0-6 in bgs, 0612=6-12 in bgs, 0012=0-12 in bgs, 0102=1-2 ft bgs, 0204=2-4 ft bgs, 0506=5-6 ft bgs, 0607=6-7 ft bgs, 0708=7-8 ft bgs
[4] - Hexavalent Chromium samples will be included for 10% of the samples. The soil/sediment hold time is 30 days from collection to extraction, and 7 days from extraction to analysis.
[5] - The groundwater sample IDs will be appended with a date in MMDDYY format to document the day the well was sampled. For example, if well QDC1-MW01S was sampled on November 28, 2013, the sample IDs would be QDC1-MW01S-112813
[6] - Trip Blank samples will be collected at a rate of one per cooler of VOC samples. The numerical value following the "TB" will be increased sequentially (e.g., 01, 02, 03, etc.) to accommodate the number of VOC sample coolers shipped on a given day. The Field ID will also be appended with a date in MMDDYY format to document the day the VOC cooler was shipped. For example, for a cooler of sediment samples shipped on November 28, 2013, the trip blank sample ID would be QF-SD-TB01-112813.
*** - Extraction holding time. The holding time from extraction to analysis is 40 days.**
**** - AVS evolution holding time. The holding time for analysis of AVS after evolution is 24 hours. SEM must be analyzed within 180 days after AVS evolution.**

SAP Worksheet #21: Project Sampling SOP References Table (NCBC Davisville OU10)

(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
3-01	Utility Clearance	Resolution	Ground Penetrating Radar, Air Knife	N	
3-02	Log Books	Resolution		N	
3-03	Record Keeping, Sample Labeling, and Chain-of-Custody	Resolution		N	
3-04	Sampling Handling, Storage and Shipping	Resolution		N	
3-05	IDW Management	Resolution		N	
3-06	Equipment Decontamination	Resolution		N	
3-07	Land Surveying	Resolution	GPS	N	
3-10	Surface Water Sampling	Resolution	Dip Sampler, Kemmerer Sampler, Teflon Bailer, Peristaltic Pump	N	
3-12	Monitoring Well Installation	Resolution	Direct-push or HSA Drill Rig	N	
3-13	Monitoring Well Development	Resolution	Surge Block, Bailer, Submersible Pump, Oil Water Interface Probe	N	
3-14	Monitoring Well Sampling	Resolution	YSI, Turbidity Meter, Peristaltic Pump, Water Level Meter	N	
3-16	Soil and Rock Classification	Resolution		N	
3-17	Direct Push Sampling Techniques	Resolution	Direct-push Drill Rig	N	
3-19	Headspace Screening for Total VOCs	Resolution	PID	N	
3-20	Operation and Calibration of a PID	Resolution	PID	N	

Reference Number	Title, Revision Date and / or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
3-21	Surface and Subsurface Soil Sampling	Resolution	Direct-push or HSA Drill Rig	N	
3-22	Sediment Sampling	Resolution	Grab/Hand Sampler, GPS	N	
3-24	Water Quality Parameter Testing	Resolution	YSI, Turbidity Meter, Peristaltic Pump	N	
3-37	Grab Groundwater Sampling	Resolution	YSI, Turbidity Meter, Peristaltic Pump, Water Level Meter	N	

SAP Worksheet #23-1: Analytical SOP References Table[1] (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.2.1)

(Laboratory Name and Address): Empirical Laboratories, 621 Mainstream Drive, Suite 270, Nashville, TN 37228

(Point of Contact Name): Brian Richard, Project Manager

(Phone Number): 877-345-1113, ext. 249

ELAP Certification: L2226 (expires November 30, 2015)

Lab SOP Number	Title, Revision Date, and/or Number	Date Last Revisited if not Revised	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM1 (Y/N)	Modified for Project Work (Y/N)
QS10	Laboratory Sample Receiving, Log In and Storage 09/17/2012 R19	NA	Receiving	NA	NA	N	N
QS11	Field Sampling & Bottle Kit Preparation 08/20/2012 R15	NA	Sampling/Kits	NA	NA	N	N
QS14	Analytical Laboratory Waste Disposal 01/23/2013 R08	NA	Waste	NA	NA	N	N
SOP100	Metals Digestion/Preparation Methods 3005A/USEPA CLPILM0 4.1 Aqueous, 3010A, 3030C, 3050B, USEPA CLPILM0 4.1 (Soil/Sediment), 200.7, Standard Methods 3030C 21st See Addendum for USEPA CLPILM 05.2 (Aqueous & Soil/Sediment) 03/07/2012 R23	NA	Definitive	Metals Water/Soil	NA	N	N
SOP103	Mercury Analysis in Water by Manual Cold Vapor Technique Methods USEPA SW846 7470A & 245.1 CLP-M 4.1 (NJDEP DOES NOT ACCEPT CLPILM 04.1 AFTER JUNE, 2003), ADDENDUM FOR USEPA CLP ILM 05.2 08/13/2012 R21	NA	Definitive	Mercury Water	CVAA	N	N
SOP104	Mercury Analysis in Soil/Sediment by Manual Cold Vapor Technique Methods SW846 7471A, 7471B , EPA 245.5 & CLPILM 04.1 (NJDEP DOES NOT ACCEPT CLPILM 04.1 AFTER JUNE, 2003), ADDENDUM FOR USEPA CLP ILM 05.2 10/31/2012 R21	NA	Definitive	Mercury Soil	CVAA	N	N

Lab SOP Number	Title, Revision Date, and/or Number	Date Last Revisited if not Revised	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM1 (Y/N)	Modified for Project Work (Y/N)
SOP105	METALS BY INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROMETRY (ICP-AES) TECHNIQUE References: SW-846, Method 6010B, December 1996; SW-846, Method 6010C, Revision 3 February 2007; USEPA, Method 200.7, June 1991; Standard Methods 19th Edition 2340B; 1995 USEPA CLP, ILM 04.1. See Addendum for USEPA CLPILM 05.2 08/13/2012 R19	NA	Definitive	Metals Soil/Water	ICP	N	N
SOP153	Sulfide by Method 376.1 and Standard Methods SM4500S F(21st ED, Titrimetric, Iodine) with Sample Pretreatment to Remove Interfering Substances or to Concentrate the Sulfide 12/21/2012 R05 Reviewed NA	NA	Definitive	Sulfide Water	Titrimetric	N	N
SOP164	Distillation of Aqueous/Solid Samples for Cyanide, Total and Amenable; SW846 METHOD 9012A/9012B, USEPA Methods 335.1 or 335.4, Standard Methods SM 4500-CN C-1999 or SM 4500-CN G-1999, CLP ILMO 4.1[See Addendum for USEPA CLPILM 05.2] 11/01/2012 R18	NA	Preparation	Cyanide Soil/Water	Spectrometer	N	N
SOP174	Residue, Non-Filterable Total Suspended Solids and Volatile Suspended Solids Standard Methods SM 2540D-1997 (TSS), SM 2540 E-1997 (VSS) Gravimetric, Dried at 103 to 105°C 08/20/2012 R08	NA	Definitive	TDS Water	Gravimetric	N	N
SOP175	Post-Distillation Analysis for Cyanide Using LACHAT Flow Injection Analyzer Methods 335.4; SW846 9012A/B, Standard Methods SM4500-CN C-1999, SM 4500-CN G-1999, USEPA-CLP 4.1, (NJDEP does not accept CLPILM 04.1 after June, 2003) Addendum for USEPA CLPILM 05.2 Aqueous & Soil/Sediment 08/20/2012 R12	NA	Definitive	Cyanide Soil/Water	NA	N	N
SOP201	GC/MS SEMIVOLATILES, Regluar and Low-Level, BY EPA METHOD 625 AND SW846 METHOD 8270C/8270D 08/20/2012 R22	NA	Definitive	SVOC Water/Soil	GC/MS	N	N
SOP202	GC/MS Volatiles by EPA Method 624 & SW846 Method 8260B Including Appendix IX Compounds 01/08/2013 R26	NA	Definitive	VOC Water/Soil	GC/MS	N	N

Lab SOP Number	Title, Revision Date, and/or Number	Date Last Revisited if not Revised	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM1 (Y/N)	Modified for Project Work (Y/N)
SOP211	Gas Chromatography/Electron Capture Detector (GC/ECD) Organochlorine Pesticides/Polychlorinated Biphenyls (PCB) by EPA Method 608/608.2 or SW846 Method 8081A/8082 or 8081B/8082A 12/17/2012 R26	NA	Definitive	Pesticides and PCBs Water/Soil	GC/ECD	N	N
SOP219	Gas Chromatography/Flame Ionization Detector (GC/FID) Nonhalogenated Volatile Organics and Total Petroleum Hydrocarbons (TPH) by Method 8015B/8015C/TN EPH/GRO R16	NA	Definitive	TPH Water/Soil	GC/FID	N	N
SOP322	Total Petroleum Hydrocarbons (TPH) Aqueous Matrix by USEPA SW846 Method 8015B/C R12	NA	Definitive	TPH Water/Soil	GC/FID	N	N
SOP221	Total Organic Carbon (TOC) by SM5310C, SW846 Method 9060/9060A and Lloyd Kahn Method "Determination of TOC in Sediment" 09/12/2012 R11	NA	Definitive	TOC Water/Soil	TOC	N	N
SOP225	GC/MS Volatile Non-Aqueous Matrix Extraction Using SW-846 Method 5035/5035A for 8260B Analysis 03/06/2012 R10	NA	Preparation	VOC Soil	NA	N	N
SOP300	GC/MS Semi-Volatile BNA-Aqueous Matrix Extraction Using SW-846 Method 3510C for 8270C/625 Analysis 03/20/2012 R20	NA	Preparation	SVOC Water	NA	N	N
SOP302	Pesticide/PCBs Aqueous Matrix Extraction for EPA Method 608/608.2 and SW846 Method 8081/8082 Using SW846 Method 3510C 06/07/2012 R20	NA	Preparation	Pesticides and PCBs Water	NA	N	N
SOP343	BNA & Pesticide/PCBs & TPH Non-Aqueous Matrix (Microwave Extraction) Using SW-846 Method 3546 06/04/2012 R04	NA	Preparation	SVOC, TPH, Pesticides, and PCBs	NA	N	N
SM2520 Salinity	SM 2520B, Empirical SOP Method Copy	NA	Screening	Salinity Water	NA	N	N
SOP145	Determination of Inorganic Anions in water by ION Chromatograph using the Dionex dx-500 Ion Chromatograph with Hydroxide Eluent And Dionex AS18 Column, USEPA Method 300.0/SW846 Method 9056 08/20/2012 R09	NA	Definitive	Anions Soil/Water	IC	N	N

Lab SOP Number	Title, Revision Date, and/or Number	Date Last Revisited if not Revised	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM1 (Y/N)	Modified for Project Work (Y/N)
SOP166	Hexavalent Chromium (Cr+6) Manual Method by SW846-7196A/Standard Methods 3500-Cr D 8/20/2012 R10	NA	Definitive	Hexavalent Chromium Soil/Water	NA	N	N

Notes:

1. Lab Accreditation and Certification requirements and verification for the work of this project are presented on Worksheet #30.

SAP Worksheet #28-1: Laboratory QC Samples Table (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.4)

Matrix: Surface Soil / Surface Sediment

Analytical Group: AVS

Analytical Method/SOP Reference: 821-R-91-100/ Method

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method blank	One per batch of up to 20 samples.	No target compounds should be > 1/2 the QL	Re-extract, re-analyze all samples associated with the MB that do not have concentrations greater than 10X MB concentration. Qualify data is samples cannot be reanalyzed.	Analyst, Laboratory Supervisor	Contamination / Bias	Same as Method/SOP QC Acceptance Limits; If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch..
LCS		80%-120%	If the LCS recoveries are high but the sample results are <LOQ request client approval to qualify and narrate. Otherwise, if sample volume available and <2x holding time, reprep and reanalyze.		Accuracy/Bias	Same as Method/SOP QC Acceptance Limits.
MS/MSD		80%-120% RPD $\leq$ 20%	No action required. Narrate and qualify sample.		Accuracy/ Bias/ Precision	Same as Method/SOP QC Acceptance Limits.

SAP Worksheet #28-2: Limits for Accuracy Table (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.4)

Matrix: Soil / Sediment / Groundwater / Surface Water

Analytical Group: Metals

Analytical Method/SOP Reference: SW846 6010C, 7470A, 7471B / SOP103, SOP104, SOP105

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per prep batch of 20	No analytes detected > ½ LOQ and greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL	Correct the problem. Report sample results that are <LOD or >10x the blank concentration. Re-prepare and reanalyze the method blank and all associated samples with results > LOD and < 10x the contaminated blank result.	Analyst/Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits; If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.
LCS	One per prep batch of 20 or fewer samples of similar matrix	%R must be within DoD QSM limits, allowing for the marginal exceedances presented in DoD QSM Table G-1.	Re-digest and reanalyze all associated samples for affected analyte.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MS	One per prep batch of 20 or fewer samples of similar matrix	%R should be within the DoD QSM limits for LCS, if sample < 4x spike added.	Qualify results for affected analytes for all associated samples with "N."	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSD or Lab duplicate	One per prep batch of 20 or fewer samples of similar matrix	MSD: For matrix evaluation use QC acceptance criteria specified by DoD for LCS. MSD: RPD ≤ 20% Lab Duplicate: Project-specific criteria: If values are ≥ 5x LOQ, RPD should be ≤ 20%. If values are < 5x LOQ, Absolute Difference should be ≤ LOQ.	Flag results for affected analytes for all associated samples.	Analyst/Supervisor/Data Validator	Precision/Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Serial Dilution (ICP only)	One per prep batch of 20 or fewer samples of similar matrix	1:5 dilution must agree within ±10% of the original sample result if result is > 50x LOQ	Perform PDS (ICP).	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Post-digestion spike (PDS) addition (ICP only)	When dilution test fails or analyte concentration in all samples < 50 x LOD.	Recovery within 75-125%	Run associated samples by method of standard addition or flag results	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits

SAP Worksheet #28-3: Laboratory QC Samples Table (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.4)

Matrix: Surface Soil / Surface Sediment

Analytical Group: TOC

Analytical Method/SOP Reference: SW846 9060 or Lloyd Kahn/ SOP221

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	No target compounds should be >1/2 the LOQ.	Investigate source of contamination. Rerun method blank prior to analysis of samples if possible. Evaluate the samples and associated QC: if blank results are above LOQ, report sample results which are < LOQ or > 10X the blank concentration. Reanalyze blank and samples >LOQ and < 10X the blank.	Analyst/Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits; If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.
LCS	One per prep batch of 20 or fewer samples of similar matrix	80-120% Recovery	If the LCS recoveries are high but the sample results are <LOQ request client approval to qualify and narrate. Otherwise, if sample volume available and <2x holding time, reprep and reanalyze.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MS/MSD	One per prep batch of 20 or fewer samples of similar matrix	80-120% Recovery; RPD $\leq$ 20%	Corrective action will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPD indicate obvious extraction/analysis difficulties. Then, if sample volume available and <2x holding time, reprep and reanalyze MS/MSD.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Lab duplicate	Minimum of 10% of lab samples unless MSD performed	RPD $\leq$ 20%	If RPD > 20% and result is >LOQ, sample should be reanalyzed. If still high, result is flagged.	Analyst/Supervisor	Precision	Same as Method/SOP QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits

SAP Worksheet #28-4: Laboratory QC Samples Table (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.4)

Matrix: Groundwater / Surface Water

Analytical Group: Cyanide

Analytical Method/SOP Reference: SW846 9012B / SOP164/SOP175

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per prep batch of 20 or fewer samples of similar matrix	No analytes detected > ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results.	Correct the problem. Report sample results that are <LOD or >10x the blank concentration. Re-prepare and reanalyze the method blank and all associated samples with results > LOD and < 10x the contaminated blank result. If no sample volume available, qualify results and narrate.	Analyst/Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits; If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.
LCS	One per prep batch of 20 or fewer samples of similar matrix	80-120% Recovery	Re-digest and reanalyze all associated samples. If no sample volume available, qualify results and narrate.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MS	One per prep batch of 20 or fewer samples of similar matrix	80-120% Recovery	If the matrix spike falls outside of criteria, the method of standard additions shall be used for the analysis.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSD or Lab duplicate	One per preparatory batch per matrix	MSD 80-120% Recovery MSD and Lab Duplicate: RPD $\leq$ 20%	MSD: If the MSD spike falls outside of criteria, the method of standard additions shall be used for the analysis. MSD and Lab Duplicate: Correct problem and reanalyze sample and duplicate. If still high, result is qualified.	Analyst/Supervisor	Precision	Same as Method/SOP QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits

SAP Worksheet #28-5: Laboratory QC Samples Table (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.4)
Matrix: Groundwater / Surface Water

Analytical Group: Sulfide

Analytical Method/SOP Reference: SM4500S2CF/ SOP153

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	No target compounds should be >1/2 the LOQ.	Investigate source of contamination. Rerun method blank prior to analysis of samples if possible. Evaluate the samples and associated QC: if blank results are above LOQ, report sample results which are < LOQ or > 10X the blank concentration. Reanalyze blank and samples >LOQ and < 10X the blank.	Analyst/Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits; If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.
LCS	One per prep batch of 20 or fewer samples of similar matrix	±20%	If the LCS recoveries are high but the sample results are <LOQ request client approval to qualify and narrate. Otherwise, if sample volume available and <2x holding time, reprep and reanalyze.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MS/MSD	One per prep batch of 20 or fewer samples of similar matrix	±25%, RPD≤ 20%	Corrective action will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPD indicate obvious extraction/analysis difficulties. Then, if sample volume available and <2x holding time, reprep and reanalyze MS/MSD.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Lab duplicate	Minimum of 10% of lab samples unless MSD performed	RPD ≤20%	If RPD > 20% and result is >LOQ, sample should be reanalyzed. If still high, result is qualified.	Analyst/Supervisor	Precision	Same as Method/SOP QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits

SAP Worksheet #28-6: Laboratory QC Samples Table (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.4)

Matrix: Soil / Sediment / Groundwater

Analytical Group: VOCs

Analytical Method/SOP Reference: SW846 5030B / 5035A / 8260B / SOP202

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per prep batch of 20 or fewer samples of similar matrix.	No target compounds > ½ LOQ (> LOQ for common laboratory contaminants) and > 1/10 the amount measured in any sample or 1/10 the PAL, whichever is greater. Blank result must not otherwise affect sample results (see DoD QSM Box D-1).	Correct the problem. Report sample results that are <LOD or >10x the blank concentration. Reprepare and reanalyze the method blank and all associated samples with results > LOD and < 10x the contaminated blank result.	Analyst/Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits; If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.
LCS	One per prep batch of 20 or fewer samples of similar matrix.	%R must be within DoD QSM limits, if available; otherwise, within laboratory's statistically-derived QC limits (Refer to Worksheet #28-6a). Allow for the number of marginal exceedances presented in DoD QSM Table G-1.	Correct problem, then reprepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Internal Standards (IS)	Each field and QC sample	Retention times for internal standards must be ± 30 seconds and the responses within -50% to +100% of midpoint ICAL.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Surrogates	Each field and QC sample	Surrogate / Soil / Water 1,2-Dichloroethane-d4: 75-140 / 70-120 Bromofluorobenzene: 85-120 / 75-120 Dibromofluoromethane: 80-125 / 85-115 Toluene-d8: 85-115 / 85-120	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MS	One per prep batch of 20 or fewer samples of similar matrix.	Use LCS recovery acceptance criteria as presented in this table.	Corrective action will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPD indicate obvious extraction/analysis difficulties. Then, if sample volume available and <2x holding time, reprep and reanalyze MS/MSD.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSD	One per prep batch of 20 or fewer samples of similar matrix	Use LCS recovery acceptance criteria as presented in this table; RPD $\leq 30\%$	Corrective action will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPD indicate obvious extraction/analysis difficulties. Then, if sample volume available and <2x holding time, reprep and reanalyze MS/MSD.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits

SAP Worksheet #28-6a: Limits for Accuracy Table

(UFP-QAPP Manual Section 3.4)

Matrix: Soil / Sediment / Groundwater / Surface Water

Analytical Group: VOCs

Analytical Method/ SOP Reference: SW846 5030B / 5035A / 8260B / SOP202

Analyte	CAS Number	Recovery Limits			
		Aqueous		Soil	
		Lower	Upper	Lower	Upper
Methylcyclohexane	108-87-2	60	125	65	135
tert-Butyl alcohol	75-65-0	60	130	70	130

SAP Worksheet #28-7: Laboratory QC Samples Table (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.4)

Matrix: Soil / Sediment / Groundwater / Surface Water

Analytical Group: PAHs plus select SVOCs

Analytical Method/SOP Reference: SW846 8270D Low-Level / SOP201

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per prep batch of 20 or fewer samples of similar matrix.	No target compounds > ½ LOQ (> LOQ for common laboratory contaminants) and > 1/10 the amount measured in any sample or 1/10 the PAL, whichever is greater. Blank result must not otherwise affect sample results (see DoD QSM Box D-1).	Correct the problem. Report sample results that are <LOD or >10 x the blank concentration. Reprepare and reanalyze the method blank and all associated samples with results > LOD and < 10 x the contaminated blank result.	Analyst/Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits; If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.
LCS	One per prep batch of 20 or fewer samples of similar matrix.	%R must be within DoD QSM limits. Allow for the number of marginal exceedances presented in DoD QSM Table G-1	Correct problem, then reprepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Internal Standards (IS)	Each field and QC sample	Retention times for internal standards must be ± 30 seconds and the responses within -50% to +100% of midpoint ICAL standard.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory. If matrix affect demonstrated for a representative sample set, discuss with client for narration.	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits			Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Surrogates	Each field and QC sample	**Analyte**	**Soil**	**Water**	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
		2-Fluorobiphenyl	45-105	50-110				
		Terphenyl-d14	30-125	50-135				
MS	One per prep batch of 20 or fewer samples of similar matrix	Use LCS recovery acceptance criteria as presented in this table.			Corrective action will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPD indicate obvious extraction/analysis difficulties. Then, if sample volume available and <2x holding time, reprep and reanalyze MS/MSD.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MSD	One per prep batch of 20 or fewer samples of similar matrix	Use LCS recovery acceptance criteria as presented in this table; RPD $\leq 30\%$			Corrective action will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPD indicate obvious extraction/analysis difficulties. Then, if sample volume available and <2x holding time, reprep and reanalyze MS/MSD.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.			NA	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits

SAP Worksheet #28-8: Laboratory QC Samples Table (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.4)

Matrix: Soil / Sediment / Groundwater / Surface Water

Analytical Group: SVOCs

Analytical Method/SOP Reference: SW846 8270D / SOP201

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per prep batch of 20 or fewer samples of similar matrix.	No target compounds > ½ LOQ (> LOQ for common laboratory contaminants) and > 1/10 the amount measured in any sample or 1/10 the PAL, whichever is greater. Blank result must not otherwise affect sample results (see DoD QSM Box D-1).	Correct the problem. Report sample results that are <LOD or >10 x the blank concentration. Reprepare and reanalyze the method blank and all associated samples with results > LOD and < 10 x the contaminated blank result.	Analyst/Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits; If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.
LCS	One per prep batch of 20 or fewer samples of similar matrix.	%R must be within DoD QSM limits, if available; otherwise, within laboratory's statistically-derived QC limits (Refer to Worksheet #28-8a). Allow for the number of marginal exceedances presented in DoD QSM Table G-1	Correct problem, then reprepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Internal Standards (IS)	Each field and QC sample	Retention times for internal standards must be ± 30 seconds and the responses within -50% to +100% of midpoint ICAL standard.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory. If matrix affect demonstrated for a representative sample set, discuss with client for narration.	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Surrogates	Each field and QC sample	**Analyte** / **Soil** / **Water** 2,4,6-Tribromophenol: 35 – 125 / 40 – 125 2-Fluorobiphenyl: 45 – 105 / 50 – 110 2-Fluorophenol: 35 – 105 / 20 – 110 Nitrobenzene-D5: 35 - 100 / 40 – 110 Phenol-D6: 40 – 100 / 30 - 115 advisory Terphenyl-D14: 30 – 125 / 50 – 135	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MS	One per prep batch of 20 or fewer samples of similar matrix	Use LCS recovery acceptance criteria as presented in this table.	Corrective action will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPD indicate obvious extraction/analysis difficulties. Then, if sample volume available and <2x holding time, reprep and reanalyze MS/MSD.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MSD	One per prep batch of 20 or fewer samples of similar matrix	Use LCS recovery acceptance criteria as presented in this table; RPD $\leq$ 30%	Corrective action will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPD indicate obvious extraction/analysis difficulties. Then, if sample volume available and <2x holding time, reprep and reanalyze MS/MSD.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits

SAP Worksheet #28-8a: Limits for Accuracy Table

(UFP-QAPP Manual Section 3.4)

Matrix: Soil / Sediment / Groundwater / Surface Water

Analytical Group: SVOCs

Analytical Method/SOP Reference: SW846 8270D / SOP201

Analyte	CAS Number	Recovery Limits			
		Aqueous		Soil	
		Lower	Upper	Lower	Upper
1,1'-Biphenyl	92-52-4	45	135	45	110
2,6-Dichlorophenol (DCP)	87-65-0	30	140	45	110

SAP Worksheet #28-9: Laboratory QC Samples Table (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.4)

Matrix: Soil / Sediment / Groundwater / Surface Water

Analytical Group: Pesticides and PCBs

Analytical Method/SOP Reference: SW846 8081B, 8082A / SOP211

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per prep batch of 20 or fewer samples of similar matrix	No target compounds > ½ LOQ (> LOQ for common laboratory contaminants) and > 1/10 the amount measured in any sample or 1/10 the PAL, whichever is greater. Blank result must not otherwise affect sample results (see DoD QSM Box D-1).	Correct the problem. Report sample results that are <LOD or >10 x the blank concentration. Reprepare and reanalyze the method blank and all associated samples with results > LOD and < 10 x the contaminated blank result.	Analyst/Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits; If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.
LCS	One per prep batch of 20 or fewer samples of similar matrix.	%R must be within DoD QSM limits. Allow for the number of marginal exceedances presented in DoD QSM Table G-1.	Correct problem, then reprepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits			Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Surrogates	Each field and QC sample	Analyte	Soil	Water	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
		Decachlorobiphenyl	60-125	40-135				
		Tetrachloro-m-xylene Advisory for 8082	70-125	25-140				
MS	One per prep batch of 20 or fewer samples of similar matrix	Use LCS recovery acceptance criteria as presented in this table.			Corrective action will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPD indicate obvious extraction/analysis difficulties. Then, if sample volume available and <2x holding time, reprep and reanalyze MS/MSD.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MSD	One per prep batch of 20 or fewer samples of similar matrix	Use LCS recovery acceptance criteria as presented in this table; RPD $\leq$ 30%			Corrective action will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPD indicate obvious extraction/analysis difficulties. Then, if sample volume available and <2x holding time, reprep and reanalyze MS/MSD.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.			NA	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Confirmation column	All positive results must be confirmed.	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD$\leq$ 40%.			NA	Analyst/Supervisor	Accuracy	Apply qualifier if RPD>40%. If RPD >100%, report lower number with "M" qualifier.

SAP Worksheet #28-10: Laboratory QC Samples Table (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.4)

Matrix: Soil / Sediment

Analytical Group: TPH

Analytical Method/SOP Reference: SW846 8015C / SOP219

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	No analytes detected > 1/2LOQ or >1/10 sample concentration or >1/10 regulatory limit. For common laboratory contaminants, no analytes detected >LOQ.	Investigate source of contamination. Rerun method blank prior to analysis of samples if possible. Evaluate the samples and associated QC: if blank results are above LOQ, report sample results which are < LOQ or > 10X the blank concentration. Reanalyze blank and samples >LOQ and < 10X the blank.	Analyst/Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits; If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.
LCS(/LCSD if no MS/MSD volume)	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first.	Recovery 50%-150% RPD 20% (If LCSD)	If the LCS recoveries are high but the sample results are <LOQ request client approval to qualify and narrate. Otherwise, if sample volume available and <2x holding time, reprep and reanalyze.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Surrogates	Each field and QC sample	o-Terphenyl Water 30%-140%/Soil 35%-140%	If sample volume available and within 2x holding time, re-analyze affected samples. If matrix affect demonstrated for a representative sample set, discuss with project chemist.	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS	One per prep batch of 20 or fewer samples of similar matrix	Use LCS recovery acceptance criteria as presented in this table.	Corrective action will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPD indicate obvious extraction/analysis difficulties. Then, if sample volume available and <2x holding time, reprep and reanalyze MS/MSD.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MSD	One per prep batch of 20 or fewer samples of similar matrix	Use LCS recovery acceptance criteria as presented in this table; RPD $\leq$ 20%	Corrective action will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPD indicate obvious extraction/analysis difficulties. Then, if sample volume available and <2x holding time, reprep and reanalyze MS/MSD.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits

SAP Worksheet #28-11: Laboratory QC Samples Table (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.4)

Matrix: Soil / Sediment / Groundwater / Surface Water[1]

Analytical Group: Hexavalent Chromium

Analytical Method/SOP Reference: SW846 7196A SOP166

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per prep batch	No target compounds > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the PAL, whichever is greater. Blank result must not otherwise affect sample results (see DoD QSM Box D-1).	Correct the problem. Report sample results that are <LOD or >10x the blank concentration. Re-prepare and reanalyze the method blank and all associated samples with results > LOD and < 10x the contaminated blank result.	Analyst/Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits; If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.
LCS	One per prep batch	±10% water; ±20% soil	Correct problem, then reprep and reanalyze the LCS and all samples in the associated batch for the failed analyte in all samples in the associated preparatory batch, if sufficient sample material is available (see full explanation in DoD QSM Appendix G).	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MS	One MS per water sample, if sample volume available.	±15%	If check indicates interference, dilute and reanalyze sample; persistent interference indicates the need to use alternative method or analytical conditions, or to use method of standard additions. Verification check ensures lack of reducing condition or interference from matrix. Additional corrective actions are identified in Method 7196A (Sections 7.4 and 7.5).	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSD or sample duplicate	Aqueous matrix: One per every 10 project samples per matrix. Solid matrix: One per preparatory batch per matrix.	Aqueous matrix: RPD ≤ 20% (between MS and MSD or sample and sample duplicate). Solid matrix:RPD ≤ 30%.	Examine project-specific DQOs. Contact the client as to additional measures to be taken.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Pre-digestion matrix spikes (solid matrix samples only, Method 3060)	One soluble and insoluble pre-digestion MS analyzed per preparatory batch prior to analysis.	MS recoveries within 75–125%.	Correct problem and rehomogenize, redigest, and reanalyze samples. If that fails, evaluate against LCS results.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Post Digestion Matrix Spike	One per preparatory batch.	±15%	Correct problem and rehomogenize, redigest, and reanalyze samples. Persistent interference indicates the need to use an alternative method or analytical conditions, or to use method of standard additions.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits

[1] – Hexavalent Chromium samples will be collected for 10% of the samples collected for metals in order to derive total, trivalent, and hexavalent chromium for 10% of the samples.

SAP Worksheet #28-12: Laboratory QC Samples Table (NCBC Davisville OU10)

(UFP-QAPP Manual Section 3.4)

Matrix: Groundwater

Analytical Group: Anions (Sulfate, Chloride, Bicarbonate, Carbonate)

Analytical Method/SOP Reference: SW846 9056A SOP145/145A

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per prep batch of 20 or fewer samples of similar matrix.	No target compounds > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the PAL, whichever is greater. Blank result must not otherwise affect sample results (see DoD QSM Box D-1).	Correct the problem. Report sample results that are <LOD or >10x the blank concentration. Re-prepare and reanalyze the method blank and all associated samples with results > LOD and < 10x the contaminated blank result.	Analyst/Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits; If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.
LCS	One per prep batch of 20 or fewer samples of similar matrix	± 20%	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G).	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MS	One per prep batch of 20 or fewer samples of similar matrix	Use LCS recovery acceptance criteria as presented in this table.	If analyte level > 4x spiking level, % recovery cannot be evaluated and no corrective action. If not, sample data qualified.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MSD	One per prep batch of 20 or fewer samples of similar matrix	Use LCS recovery acceptance criteria as presented in this table; RPD ≤ 15%	If analyte level > 4x spiking level, % recovery cannot be evaluated and no corrective action. If not, sample data qualified.	Analyst/Supervisor	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits

QC Sample	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Lab duplicate	One per every 10 samples.	%D ≤ 10%	Correct problem and reanalyze sample and duplicate.	Analyst/Supervisor	Precision	Same as Method/SOP QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits

SAP Worksheets #34-36: Data Verification and Validation (Steps I and IIa/IIb) Process Table (NCBC Davisville OU10)

(UFP-QAPP Manual Section 5.2.1), (UFP-QAPP Manual Section 5.2.2), (Figure 37 UFP-QAPP Manual), (Table 9 UFP-QAPP Manual)

Data Review Input	Description	Responsible for Verification (name, organization)	Internal/ External
Verification (step I):			
Review of CoC forms Sample Login/Receipt	The laboratory sample custodians will review the sample shipment for completeness, integrity, and sign accepting the shipment. All sample labels will be checked against the chain-of-custody form, and any discrepancies will be identified, investigated, and corrected. The samples will be logged in at every storage area and work station required by the designated analyses. Individual analysts will verify the completeness and accuracy of the data recorded on the forms.	Lab QA Manager Empirical Laboratories	Internal
Analytical Data Package	All analytical data packages will be verified for completeness and compliance with the SAP requirements prior to client submittal.	Lab QA Manager Empirical Laboratories	Internal
Review of field procedures	Determine whether field procedures are performed in accordance with this SAP and prescribed procedures.	Field Team Leader	External
Review of field notes	Determine whether field procedures are performed in accordance with this SAP and prescribed procedures. Notes allow reconstruction of activities and identification of sampling locations.	Field Team Leader	External
Review of field instrument calibration sheets	Determine whether the field measurements occurred in accordance with manufacturer's instructions.	Field Team Leader	External
Review of CoC forms Sample Login/Receipt	Determine whether samples are labeled and handled in accordance with this SAP and prescribed procedures, and the correct analysis is selected.	Project chemist or data validators, Resolution Consultants	External
Sample Completeness	Verify that results for all samples submitted to the laboratory have been provided.	Project chemist or data validators, Resolution Consultants	External
Analytical Methods	Verify that analytical methods specified in this SAP were used for the analyses.	Project chemist or data validators, Resolution Consultants	External
Analyte Lists	Determine whether all analytes specified in Worksheet #15 were analyzed and reported by the laboratory.	Project chemist or data validators, Resolution Consultants	External
Limits of Quantitation	Verify that the results were reported at or below the project specific limits of quantitation listed in Worksheet #15.	Project chemist or data validators, Resolution Consultants	External
Case Narrative	Case narrative is reviewed to ensure all method deviations, corrective actions, reanalysis, data qualification, and laboratory qualifiers are adequately documented.	Project chemist or data validators, Resolution Consultants	External
Data Package Completeness	Verify that all relevant laboratory internal QC data have been provided.	Project chemist or data validators, Resolution Consultants	External
Sample condition upon receipt	Sample receipt condition is reviewed for sample temperatures and preservation, evidence of CoC, and integrity of samples.	Project chemist or data validators, Resolution Consultants	External
Analysis and extraction dates and times	Analysis and extraction are examined to determine if samples were analyzed within holding times.	Project chemist or data validators, Resolution Consultants	External

Data Review Input	Description	Responsible for Verification (name, organization)	Internal/ External
Surrogate recoveries	Surrogate recoveries are compared to criteria in Worksheet #28.	Project chemist or data validators, Resolution Consultants	External
QC sample results	QC sample frequency and results (laboratory control samples, method blanks, and matrix spike sample results) are compared to criteria in Worksheet #28.	Project chemist or data validators, Resolution Consultants	External
Equipment and trip blanks	Blank collection frequency is compared to frequency requirement in Worksheet #12.	Project chemist or data validators, Resolution Consultants	External
Field Duplicates	Field duplicate frequency and RPD are compared to criteria in Worksheet #12.	Project chemist or data validators, Resolution Consultants	External
Laboratory Electronic Deliverables	Determine whether electronic and hard copy data upon receipt are comparable and contain the proper reporting format. The assessment will consist of reviewing both types of data to verify that data were delivered in proper fields and that all required fields are populated correctly.	Project chemist or data validators, Resolution Consultants	External

<table>
<tr><th colspan="4">Compliance and Comparison (Steps IIa and IIb)</th></tr>
<tr><td>Assignment of qualifiers</td><td>For the fixed-laboratory data for all analyses except for grain size, USEPA Region 1 Tier II validation will be performed using criteria for the methods listed in Worksheet #'s 12, 15, and 28, the DoD QSM v 4.2, laboratory work order, and laboratory SOPs. If not addressed in the worksheets or DoD QSM, the logic outlined in the Region I, USEPA-New England Data Validation Functional Guidelines For Evaluating Environmental Analyses (December 1996), USEPA National Functional Guidelines for Superfund Organic Methods Data Review (June 2008), and USEPA National Functional Guidelines for Inorganic Methods Data Review (January 2010) will be used as applicable to apply qualifiers to data.
Assign qualifiers as necessary using the referenced guidance. The following qualifiers shall be used to indicate QC deficiencies:
<table><tr><th>Qualifier</th><th>Definition</th></tr><tr><td>J</td><td>The concentration is an estimated quantity</td></tr><tr><td>U</td><td>Compound was analyzed for but not detected</td></tr><tr><td>UJ</td><td>The sample quantitation limit is an estimated quantity</td></tr><tr><td>EB</td><td>As a qualifier for soil/sediment samples: Compound is also detected in the equipment blank</td></tr><tr><td>TB</td><td>As a qualifier for soil/sediment samples: Compound is also detected in the trip blank</td></tr><tr><td>R</td><td>The data are rejected and unusable</td></tr></table>
Data qualifiers will be provided on summary results forms in the validation report for each data package. Data qualifiers will also be added to the EQuIS database.</td><td>Project chemist or data validators, Resolution Consultants</td><td>External</td></tr>
<tr><td>Sample chronology (instrument and extraction logs)</td><td>Sample chronology is reviewed for consistency with reported data and that samples were extracted and analyzed I appropriately sized QC batches with method specified QC samples.</td><td>Project chemist or data validators, Resolution Consultants</td><td>External</td></tr>
<tr><td>Instrument specific information (GC-MS tunes)</td><td>Instrument specific information is evaluated against method specific requirements.</td><td>Project chemist or data validators, Resolution Consultants</td><td>External</td></tr>
<tr><td>Initial Calibrations</td><td>Initial calibrations are evaluated for compliance with method specific requirements.</td><td>Project chemist or data validators, Resolution Consultants</td><td>External</td></tr>
<tr><td>Initial and continuing calibration verifications</td><td>Initial and continuing calibration verifications are evaluated for compliance with method specific requirements.</td><td>Project chemist or data validators, Resolution Consultants</td><td>External</td></tr>
<tr><td>Initial and continuing calibration blanks</td><td>Initial and continuing calibration blanks are evaluated for compliance with method specific requirements.</td><td>Project chemist or data validators, Resolution Consultants</td><td>External</td></tr>
<tr><td>Internal standards</td><td>Internal standards are evaluated for compliance with method specific requirements.</td><td>Project chemist or data validators, Resolution Consultants</td><td>External</td></tr>
</table>

Notes: 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]

Matrix	Analytical Group
Soil	Volatile Organic Compounds
	Semivolatile Organic Compounds
	Polycyclic Aromatic Hydrocarbons
	Organochlorine Pesticides
	Polychlorinated Biphenyls (Aroclors)
	TPH
	Metals
	Mercury
	Hexavalent Chromium
	Grain Size
	TOC
	Acid Volatile Sulfide/Simultaneously Extracted Metals
	pH
Groundwater	Volatile Organic Compounds
	Semivolatile Organic Compounds
	Polycyclic Aromatic Hydrocarbons
	Organochlorine Pesticides
	Polychlorinated Biphenyls (Aroclors)
	Metals
	Mercury
	Hexavalent Chromium
	Cyanide
	Sulfide
	Salinity
	TDS
	Anions (Sulfate, Chloride, Bicarbonate, Carbonate)
Surface Water	Semivolatile Organic Compounds
	Polycyclic Aromatic Hydrocarbons
	Organochlorine Pesticides
	Polychlorinated Biphenyls (Aroclors)
	Total and Dissolved Metals
	Mercury
	Hexavalent Chromium
	Cyanide
	Sulfide
Sediment	Volatile Organic Compounds
	Semivolatile Organic Compounds
	Polycyclic Aromatic Hydrocarbons
	Organochlorine Pesticides

Matrix	Analytical Group
Sediment (Continued)	Polychlorinated Biphenyls (Aroclors)
	TPH
	Metals
	Mercury
	Hexavalent Chromium
	Grain Size
	TOC
	Acid Volatile Sulfide/Simultaneously Extracted Metals

SAP Worksheet #37: Usability Assessment (NCBC Davisville OU10)

(UFP-QAPP Manual Section 5.2.3)

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used

Resolution Consultant's data validation staff will validate all laboratory data in accordance with the protocols described in Worksheets #34-36. These procedures are consistent with USEPA National and Regional Data Validation Functional Guidelines. The Project Chemist, in conjunction with the project team, will determine whether the analytical data meet the requirements to support the RI. The results of laboratory measurements will be compared to the data quality objectives described in Worksheet #11.

Describe the evaluative procedures used to assess overall measurement error associated with the project

During the data validation process the validator will use information confirming sample identification, sample preparation, analysis within holding time, instrument calibration data, and results of QC samples designed to assess blank contamination, analytical precision, and accuracy to identify any limitations in data use and, if known, data bias. The validator will apply qualifiers as needed to reflect any limitations on the use of specific data points and prepare a report detailing the information reviewed, data limitations, and overall usability. Patterns of data use limitations or anomalies which become apparent during the validation process or during use will be reviewed with the Project Chemist and the appropriate laboratory. Data that do not meet the quality acceptance limits of Worksheet #28, or quality levels of Worksheet #15, or analytical performance criteria specified in Worksheet #12 will be clearly identified in the database so data users are aware of any limitations associated with data usability. Details of the problems identified during data validation and the bias in the data will be provided in the associated validation memorandum.

Identify the personnel responsible for performing the usability assessment

Data validation will be performed by Resolution's data validation staff under the supervision of the Data Validation Coordinator and Project Chemist.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies

The documentation generated during data validation will include a comprehensive memorandum that describes the information reviewed, the results of this review, and provides a recommendation

on overall data usability and limitations on specific data points. The memorandum and associated validation worksheets provide information on the samples included in the review and the date they were collected, the condition of samples when received at the laboratory and any discrepancies noted during the receiving process, verification of sample preparation and analysis within the method specified holding time, instrument calibration information, review of associated QC analyses including blanks, LCSs, MSs, and field and/or laboratory duplicates, and verification of selected reported values from raw data. As a result of this review standard qualifiers are entered into the database so that data users can readily identify any limitations associated with a specific data point. The data validation memorandums will be included in an Appendix of the RI report. A data usability section will also be included in the text of the RI report.

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Figures

RESOLUTION CONSULTANTS

Drawn:	SB	1/18/2013
Approved:	BS	1/18/2013
Project #:	60273164	

Map Location

N

0 0.5 1 1.5

Miles

FIGURE 10-1
REGIONAL LOCATION

QDC OUTFALL 001 RI, NCBC DAVISVILLE
NORTH KINGSTOWN, RI

G\Projects\Navy CLEAN AECOM-EnSafe JV\Davisville\GIS\QDC Outfall 001 Wetland SAP\Projects\Sample_Locs.mxd

Former plugged culvert

Former CED Area (buildings no longer present)

Copyright:© 2013 ESRI, i-cubed, GeoEye

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Drawn:	SB	1/18/2013
Approved:	BS	1/18/2013
Project #:	60273164	

Map Location

QDC Outfall 001 Wetland

Drainage Ditch

QDC Outfall 001*

*Approximate

N

0 125 250 500

Feet

FIGURE 10-2
FORMER CED AREA AND QDC OUTFALL 001

QDC OUTFALL 001 RI, NCBC DAVISVILLE NORTH KINGSTOWN, RI

\\uswtf1fp001\govt\Govt\Projects\Navy CLEAN AECOM-EnSafe JV\Davisville\GIS\QDC Outfall 001 Wetland SAP\Projects\10_2_CED_Outfall.mxd

Existing groundwater well pair
(PGU-Z3-03D, PGU-Z3-03S)

Former Nike Battery PR-58 Site soil
and porewater sample location
(PW-17, PWS-17)

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

RESOLUTION CONSULTANTS

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Approved:	BS	1/18/2013
Project #:	60273164	

Map Location

- QDC Outfall 001 wetland
- Drainage Ditch
- QDC Outfall 001*
- 2008 excavation area*
- CED area drainline*
- Areas subject to inundation by 100 yr flood event (FEMA 2010)
- Areas subject to inundation by 500 yr flood event (FEMA 2010)
- Assumed surface water flow direction
- Assumed groundwater flow direction
- Former plugged culvert

N

0 25 50 100
Feet

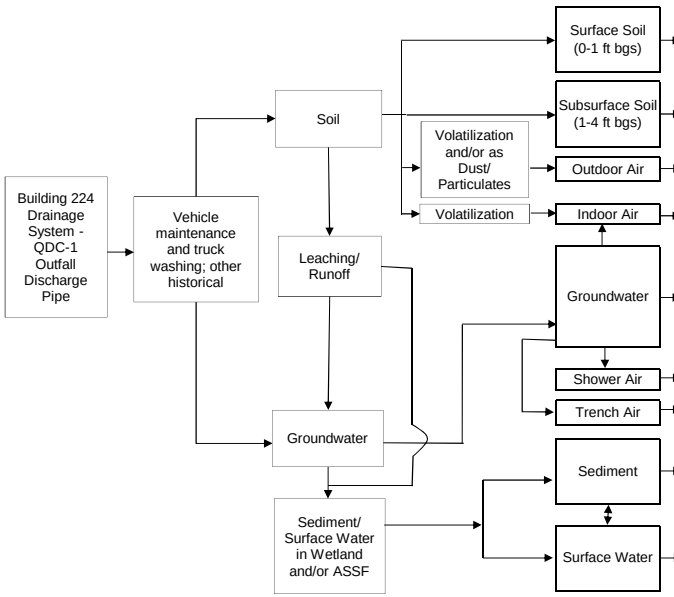
*Approximate

FIGURE 10-3
QDC OUTFALL 001 WETLAND AND ASSF

QDC OUTFALL 001 RI, NCBC DAVISVILLE
NORTH KINGSTOWN, RI

\\uswtf1fp001\govt\Govt\Projects\Navy CLEAN AECOM-EnSafe JV\Davisville\GIS\QDC Outfall 001 Wetland SAP\Projects\10_3_Wetland.mxd

Figure 10-4
Potential Exposure Pathways
QDC Outfall 001 RI, NCBC Davisville
North Kingstown, RI



Exposure Media	Potential Exposure Route	Potential Human Receptors/Exposure Pathways: Current/Future Recreational/Trespasser (Adult and Child)	Future Construction/Utility Worker	Hypothetical Future Off-Site Resident	Potential Ecological Receptors/Exposure Pathways: Terrestrial Plant Community	Soil Invertebrate Community	Aquatic Invertebrate Community	Wetland Plant Community	Wetland/ Benthic Invertebrate Community	Avian and Mammalian Communities
Surface Soil (0-1 ft bgs)	Incidental Ingestion	●	●	○	○	○	○	○	○	●(a)
	Dermal / Direct Contact	●	●	○	●	●	○	○	○	○
Subsurface Soil (1-4 ft bgs)	Incidental Ingestion	○	●	○	○	○	○	○	○	○
	Dermal / Direct Contact	○	●	○	○	○	○	○	○	○
Outdoor Air	Inhalation	●	●	○	○	○	○	○	○	○
Indoor Air	Inhalation	○	○	○	○	○	○	○	○	○
Groundwater	Ingestion as Drinking Water	○	○	●	○	○	○	○	○	○
	Dermal / Direct Contact	○	●	●	○	○	○	○	○	○
	Incidental Ingestion	○	●	○	○	○	○	○	○	○
Shower Air	Inhalation	○	○	●	○	○	○	○	○	○
Trench Air	Inhalation	○	●	○	○	○	○	○	○	○
Sediment	Incidental Ingestion	●	●	○	○	○	○	○	●	●(a)
	Dermal / Direct Contact	●	●	○	○	○	○	●	●	○
Surface Water	Incidental Ingestion	●	●	○	○	○	●	○	○	●
	Dermal / Direct Contact	●	●	○	○	○	●	○	○	○

Notes:
● Potentially complete pathway.
○ Pathway considered to be incomplete or insignificant.
ft bgs - feet below ground surface.
(a) Bioaccumulation pathway also expected to be a potentially complete.

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

RESOLUTION CONSULTANTS

Drawn:	SB	1/18/2013
Approved:	BS	1/18/2013
Project #:	60273164	

Map Location

QDC Outfall 001 wetland

Drainage Ditch

QDC Outfall 001*

2008 excavation area*

CED area drainline*

Former plugged culvert

Proposed Sample Locations**

- Sediment boring

*Approximate

**Proposed locations only; actual locations may change based on field conditions

N

0 25 50 100

Scale in Feet

FIGURE 10-5
PROPOSED SEDIMENT SAMPLE LOCATIONS

QDC OUTFALL 001 RI, NCBC DAVISVILLE NORTH KINGSTOWN, RI

\\uswtf1fp001\govt\Govt\Projects\Navy CLEAN AECOM-EnSafe JV\Davisville\GIS\QDC Outfall 001 Wetland SAP\Projects\SampleLocs_sed.mxd

Proposed soil boring adjacent to abandonded outfall pipe

Proposed soil boring to be located approximately 50' downgradient of catch basin CB-03 (not shown)

Former CED area

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

RESOLUTION CONSULTANTS

Drawn:	SB	1/18/2013
Approved:	BS	1/18/2013
Project #:	60273164	

Map Location

QDC Outfall 001 wetland

Drainage Ditch

QDC Outfall 001*

2008 excavation area*

CED area drainline*

Former plugged culvert

Proposed Sample Locations**

- Soil boring

*Approximate

**Proposed locations only; actual locations may change based on field conditions

N

0 25 50 100

Scale in Feet

FIGURE 10-6
PROPOSED SOIL SAMPLE LOCATIONS

QDC OUTFALL 001 RI, NCBC DAVISVILLE NORTH KINGSTOWN, RI

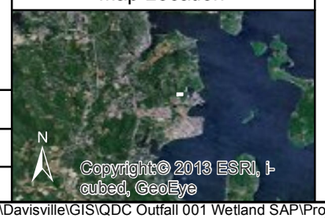
\\uswtf1fp001\govt\Govt\Projects\Navy CLEAN AECOM-EnSafe JV\Davisville\GIS\QDC Outfall 001 Wetland SAP\Projects\SampleLocs_soilv2.mxd

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

RESOLUTION CONSULTANTS

Drawn:	SB	1/18/2013
Approved:	BS	1/18/2013
Project #:	60273164	

Map Location



QDC Outfall 001 wetland

Drainage Ditch

QDC Outfall 001*

2008 excavation area*

CED area drainline*

Former plugged culvert

Proposed Sample Locations**

Surface water

*Approximate

**Proposed locations only; actual locations may change based on field conditions

N

0 25 50 100

Scale in Feet

FIGURE 10-7
PROPOSED SURFACE WATER SAMPLE LOCATIONS

QDC OUTFALL 001 RI, NCBC DAVISVILLE NORTH KINGSTOWN, RI

G\Projects\Navy CLEAN AECOM-EnSafe JV\Davisville\GIS\QDC Outfall 001 Wetland SAP\Projects\SampleLocs_sw.mxd

Existing groundwater well pair
(PGU-Z3-03D, PGU-Z3-03S)

Proposed grab groundwater sample to be located approximately 50' downgradient of catch basin CB-03 (not shown)

Upgradient well

Former CED area

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

RESOLUTION CONSULTANTS

Drawn:	SB	1/18/2013
Approved:	BS	1/18/2013
Project #:	60273164	

Map Location

QDC Outfall 001 wetland

Drainage Ditch

QDC Outfall 001*

2008 excavation area*

CED area drainline*

Former plugged culvert

Proposed Sample Locations**

Grab groundwater

Groundwater well pair
(one shallow and one intermediate)

*Approximate

**Proposed locations only; actual locations may change based on field conditions

N

0 25 50 100

Scale in Feet

FIGURE 10-8
PROPOSED GROUNDWATER SAMPLE LOCATIONS

QDC OUTFALL 001 RI, NCBC DAVISVILLE NORTH KINGSTOWN, RI

\\uswtf1fp001\govt\Govt\Projects\Navy CLEAN AECOM-EnSafe JV\Davisville\GIS\QDC Outfall 001 Wetland SAP\Projects\SampleLocs_gw.mxd

Attachment B

Wetlands Functions and Values Assessment, Resolution Consultants, March 2013

WETLAND FUNCTION AND VALUES ASSESSMENT
Naval Construction Battalion Center Davisville
North Kingstown, Rhode Island

Prepared for:

Department of the Navy
Naval Facilities Engineering Command, Mid-Atlantic
9742 Maryland Ave.
Norfolk, VA 23511-3095

Comprehensive Long-Term Environmental Action Navy
Contract Number N62470-11-D-8013

Prepared by:

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A Joint Venture of AECOM & EnSafe
1500 Wells Fargo Building
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Norfolk, VA 23510

March 2013

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Appendices

1.0 INTRODUCTION

The Former Naval Construction Battalion Center (NCBC) Davisville is located 18 miles south of Providence in North Kingstown, Rhode Island (Figure 1 in Appendix A). The site, approximately 900 acres, served as a military installation since 1942, its primary mission was to provide mobilization support to naval construction forces. Much of the site is contiguous with Narragansett Bay and consists of four areas, including the Main Center, the West Davisville storage area, Allen Harbor area, and the Pier Support area. The NCBC was primarily used for training the Navy Construction Battalion "Seabees" in construction operations. The area also served as freight yards and storage areas for construction materials.

During Quonset Development Corporation's (QDC) storm water outfall maintenance activities, in the summer of 2008, QDC excavated soil that had accumulated downstream of the drain pipeline outfall. QDC Outfall 001 is located in the central portion of the Former NCBC Davisville facility, to the west of Allen Harbor and drains to wetland habitat to the northeast (QDC Outfall 001, Figure 2 in Appendix A). During this excavation, QDC observed stained soils as well as olfactory evidence of contamination. The soil was stockpiled adjacent to the outfall and Navy was contacted. The soil was later sampled and analytical results indicated the presence of total petroleum hydro (TPH) (exceeding 10,000 milligrams per kilogram [mg/kg]), volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and metals. In December 2008, the soil stockpile was removed from the Outfall 001 area.

Based on a review of historical "as-built" drawings of the drainage systems at the former NCBC, QDC Outfall 001 is the discharge point for an underground drainage pipeline that originates from the former Building 224. Building 224, part of the Construction Equipment Department (CED) Area, was located approximately 1,000 feet southwest of the outfall. The former Building 224 is the presumed source of contamination present in the outfall area (including the receiving undeveloped wetland to the northeast). The building was used by the Navy as a vehicle-maintenance and truck-washing facility. Contaminants associated with materials used in these activities or in other historical activities conducted at the CED Area may have been disposed/released in the Building 224 drainage system and discharged at QDC Outfall 001 and to the receiving wetland. For the purposes of this report the receiving wetland will be referred to as Wetland 001. The presumed groundwater flow direction in the outfall area is toward the east, based on groundwater elevation data from numerous sites surrounding the area.

The drainage pipe from Building 224 has been inactive since at least 2006, when Building 224 was demolished. Contaminants migrated with the flow of surface water downstream, toward Wetland 001, and either accumulated in the wetland and/or transported into Allen Harbor. In addition, evidence from historic photographs illustrate Wetland 001 as well as adjacent wetlands were previously one larger pond portions of which were presumed filled sometime between 1939 and 1951.

This report focuses on Wetland 001, an approximate 50-foot buffer around the Wetland, and observations of the surrounding area,Study Area (Figure 2 in Appendix A). The report has been prepared by AECOM Environment to evaluate and document functions and values associated with the wetland system, Wetland 001, impacted by the NCBC and historic activities associated with Building 224. Wetland functional assessments and wildlife habitat evaluations were conducted; (1) for the purposes of inventorying and planning, (2) to qualitatively describe biological condition and integrity of wetland resource area and wildlife habitat, and (3) to assist in the selection of assessment and measurement endpoints for a baseline ecological risk assessment that will be part of a Remedial Investigation.

On August 24, 2012 AECOM conducted field evaluations of Wetland 001 and surrounding areas and this report presents the findings of the wetland Functions and Values assessment (FVA) conducted and includes a description of the Study Area, wetland resources, technical approach, and findings, and is supported by field data sheets, photographical representation of Wetland 001 and soil evaluation.

2.0 SURVEY PROCEDURES

To complete a wetland FVA for this Study Area, the consensus-based assessment method known as the "Highway Methodology" (USACOE, 1993) was employed in combination with similar procedures set forth in the R.I. Administrative Procedures Act, R.I. Gen Laws Chapter 46-35 (46-23-6, as amended) and the "Rules and Regulations Governing the Protection and Management of Freshwater Wetlands in the Vicinity of the Coast." These methods are considered to be suitable for use in regulatory permit applications and decision-making processes within state and federal agencies.

The Highway Methodology was originally designed to assess wetlands in connection with planning and permitting of highway and other large infrastructure projects in the Northeast. This method does not provide quantitative results or use a "high, medium, low" style rating to assess functions and values. It is designed, however, to document the rationale for the assessment results in a transparent manner, and it includes components which assess whether a wetland is likely to provide selected functions and values.

Through the use of the Highway Methodology analyses, the wetland evaluated was determined to provide or not provide each of the 13 functions and values described under this system and coincide with those functions and values identified in Rhode Island Coastal Resources Management Council (RICRMC) Rules and Regulations (Rule 10.00). Further, the analysis aids in determining whether or not any of the functions and values are *principal* to the wetland analyzed. Wetlands are noted to have a principal function or value if "they are an important physical component of a wetland ecosystem (functions), and/or are considered of special value to society, from a local, regional, and/or national perspective" (USACOE, 1999).

Use of the Highway Methodology is subjective, in that it must be completed by a qualified wetland scientist capable of determining the degree to which any wetland may provide a certain function or value. This exercise is aided, however, through the use of the *Highway Methodology Workbook Supplement* (USACOE, 1999) which provides example criteria lending to positive or negative determinations of whether a wetland provides certain functions or values. Results of this assessment are provided in Section 4.3.

3.0 STUDY AREA

The extent of the wetland FVA (i.e. Wetland 001 and associated Study Area) is limited to a relatively small area that encompasses the 2 acres of Wetland 001 and approximately 2 acres of adjacent uplands, including the 50-foot buffer zone and the surrounding areas. Resource areas present within the Study Area, as defined in the Fresh Water Wetlands Act, R.I. General Laws § 2-1-18 et seq. Chapter 46-23 and defined by Rule 5.00 for resources within the vicinity of the coast include:

- Forested Wetland (less than 3 acres);
- Emergent Wetland/Marsh (less than 1 acre);
- Area Subject to Flooding (ASF);
- Area Subject to Storm Flowage (ASSF); and
- Area of Land within Fifty Feet (50' buffer zone).

The Study Area extends from QDC Outfall 001 to approximately 300 feet north and northeast to the Quonset Point Bike Path. Wetland 001 includes seasonally to permanently flooded palustrine emergent marsh habitat (PEM) surrounded by palustrine forested wetland (PFO) habitat. An adjacent wetland, situated northeast of the Wetland 001, receives overflow from Wetland 001 via a swale, an ASSF, and through a culvert located at its southern border. A band of upland forest separates Wetland 001 from this adjacent wetland area. The Study Area and Wetland 001 are situated just southeast of a public parking area associated with the Quonset Point Bike Path and Marine Road. The bike path is an actively utilized recreational path that runs west-east and north-south (Figure 2).

4.0 RESULTS OF FIELD INVESTIGATION

The results of the assessment are discussed herein, and are quantified on the *Wetland Function-Value Evaluation Form* that is provided in Appendix B. Representative photographs of the wetland and habitat features are presented in Appendix C. This section provides an overview of the findings and discusses the functions and values exhibited by Wetland 001, with an emphasis on principal functions and values. A brief discussion of the resource areas observed and mapped within the Study Area is provided. This discussion is based on field observations, inspection of USGS topographic plans, aerial photographs, and Soil Survey Geographic (SSURGO) Database soils maps. In addition, the wetland has been classified following the U.S. Fish & Wildlife Service's Cowardin classification system (Cowardin, 1979).

4.1 The Study Area

The Study Area including Wetland 001 is currently undeveloped with the exception of the Quonset Point Bike Path and Marine Road to the west and north and a building to the south east. Open fields occupy areas to the north and southwest while forested uplands and wetlands surround a much wider perimeter of the Study Area. Based on historic photographs most of the Study Area was ponded but appears to have been cleared and filled sometime between 1939 and 1951; the drainage system was also installed sometime after 1939.

Though somewhat fragmented by Marine Road and the bike path, upland forests surrounding Wetland 001 provide important connectivity to adjacent wetlands as well as the tidally influenced habitat of Allen Harbor. However, areas of recent disturbance are present and include small debris piles of construction material, dirt mounds, and remnant pavement within these woodlands particularly along the northern boundary near the bike path. Often times earth work such as clearing and grading provide opportunities for invasive plants to colonize and in this instance dense patches of autumn olive (*Elaeagnus umbellata*), assiatic bittersweet (*Celastrus orbiculatus*) as well as the common reed found in Wetland 001 are present. These plants were observed particularly along the forest edge near the bike path. Dominant plants found within the upland forest of the Study Area include red maple (*Acer rubrum*), northern red oak (*Quercus rubra*), white pine (*Pinus strobus*), red cedar (*Juniperus virginiana*), black locust (*Robinia pseudoacacia*) not listed as an invasive species in RI, highbush blueberry (*Vaccinium corymbosum*), silky dogwood (*Cornus amomum*), Japanese barberry (*Berberis thunbergii*) also not listed as an invasive species in RI, poison ivy (*Toxicodendron radicans*), grape (*Vitis* sp.), and greenbrier (*Smilax sp.*).

4.2 Wetland 001

Wetland 001 is a state jurisdictional wetland pursuant to the RI Freshwater Wetlands Act, however due to its small size, less than 3-acres and less than 1-acre of marsh, it does not include a jurisdictional 50-foot Perimeter Wetland (Rule 4.00 of the RI Freshwater Wetlands Act). Wetland 001 is approximately 2-acres in sizes and situated just north and east of QDC Outfall 001 and is the primarily focus of this assessment. Much of this wetland can be described as PEM habitat surrounded by PFO habitat. The emergent portion appears to be permanently flooded and dominated by dense stands of common reed (*Phragmites australis*). The forested portion appears to be seasonally flood and is dominated by a canopy of red maple (*Acer rubrum*), willow (*Salix* spp.), and green ash (*Fraxinus pennsylvanica*) with an understory of highbush blueberry (*Vaccinium corymbosum*), arrowwood (*Viburnum dentatum*), silky dogwood (*Cornus amomum*), cinnamon fern (*Osmunda cinnamomea*), royal fern (*Osmunda regalis*), skunk cabbage (*Symplocarpus foetidus*), and poison ivy (*Toxicodendron radicans*).

During the site visit areas of standing water were observed in its southern portions while saturated soils were observed throughout the emergent portions. Based on topographic mapping and site observations it appears the wetland is primarily isolated though flows north during periods of high water or heavy storm events. The swale or ASSF, observed at the northeast corner of the wetland, directs flow to a culvert that drains into a larger adjacent wetland to the north previously mentioned in Section 4.1. This wetland is contiguous with Allen Harbor, situated further north and northeast of the Study Area. Photographs of the swale (ASSF) and culvert connecting the two wetlands are provided in Appendix C.

Due its small size Wetland 001 is included within the broadly mapped soil unit Quonset gravelly sandy loam series (NRCS; Washington County region) (Soil map is provide in Appendix A). These are very deep, excessively drained soils that are formed from metamorphic and sedimentary rock. They are typically nearly level to 15 percent slopes soils on eskers, outwash plains, terraces, and outwash terraces. Actual soil conditions within the wetland observed during the site assessment were similar to deep organic/mucky soils typically found in wetlands (see attached photograph in Appendix C). For example, nearby Sandyhook muck peat, which is very poorly drained organic soils formed from sandy marine deposits in depressions or on level areas with frequent flooding. The inconsistency with the NRCS soil survey can most likely be attributed to the historic activities, including filling of wetlands and ponds in this area.

4.3 Functions and Values of Wetland 001

Wetland 001 provides three (3) principal functions: Sediment/Toxicant Retention, Nutrient Removal, and Wildlife Habitat (see Data Form in Appendix B). Evidence of siltation and contaminants are present within the wetland and its soils. The wetland's depressional characteristic helps to retain water volumes for long enough duration to trap sediments and toxicants. In addition, dense stands of common reed also slow flow velocity and trap sediment and nutrients. However, the wetland is small in size and a swale located at its northeast corner allows some amounts of water to flow north ward.

Wetland 001 and associated upland areas provide Wildlife Habitat value. Dense shrub thickets within the surrounding uplands provide structure for shrub nesting and foraging birds including yellow warbler (*Dendroica petechia*), common yellowthroat (*Geothlypis trichas*), swamp sparrow (*Melospiza georgiana*), song sparrow (*Melospiza melodia*), important escape cover for fledgling birds in the spring that cannot yet fly, and perching sites for hunting birds. The emergent marsh habitat also provides suitable conditions for insects which are preyed upon by birds, small mammals as well as bat species.

Dead tree snags and logs present in the wetland provide additional habitat and structure for insects, important foraging habitats for all the woodpecker species (i.e. hairy, downy, red-bellied, red-head, and pileated woodpeckers [*Dryocopus pileatus]*) and perching sites for birds of prey. Cavities created by these species may also provide summer roosting sites for bats such as the big brown bat (*Eptesicus fuscus*), little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis*). Soft mast producing shrub species such as highbush blueberry, arrowwood, and silky dogwood found in the forested portion of the wetland and adjacent uplands provide important food sources for a wide variety of migratory birds.

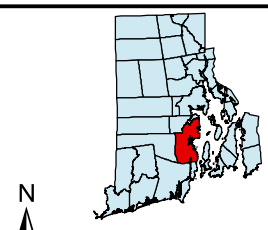
Evidence of wildlife was observed during the site visit and included a small mammal burrow adjacent to the wetland, scat from medium size mammal such as a coyote, abandoned bird nests, and deer. Observed birds include crows (*Corvus* sp.), gray catbird (*Dumetella carolinensis*), chimney swift (*Chaetura pelagica*), northern cardinal (*Cardinalis cardinalis*), and osprey (*Pandion haliaetus*). Gulls, such as the herring (*Larus argentatus*) and ring billed (*Larus delawarensis*), were also observed in the vicinity of Wetland 001.

Other values such as Recreation, Aesthetics, Uniqueness, Economy or Production Export were not selected as functions of this wetland primarily because of its location and historic impacts including alterations to the wetland and contaminant releases associated with naval base activities. Even

though the wetland provides toxicant retention and nutrient removal its small size and location within the watershed provides little opportunity for floodflow alternation value. Since the wetland is isolated from contiguous flowing water, it likely does not function as fish and shellfish habitat.

Appendix A

Figures



N

1 inch = 2,000 feet

Site Locus

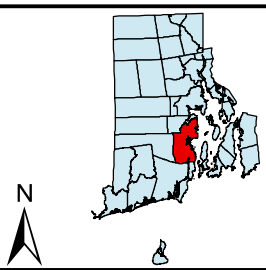
Former Naval Construction Battalion Center Davisville
Marine Road
North Kingstwon, RI

SCALE	DATE	PROJECT NO.
1:24,000	9/2012	60273164

RESOLUTION CONSULTANTS

Figure Number

1



N

1 inch = 300 feet

Former Naval Construction Battalion Center Davisville
Marine Road
North Kingstwon, RI

SCALE	DATE	PROJECT NO.
1:24,000	9/2012	60273164

RESOLUTION CONSULTANTS

Figure Number

2

Appendix B

Wetland Function – Value Evaluation Form

Wetland Function-Value Evaluation Form

QDC Outfall 001

Wetland I.D. Receiving Wetland

Total area of wetland 2 Acres Human made? Yes Is wetland part of a wildlife corridor? Yes or a "habitat island"?

Latitude 41.619 Longitude -71.421

Adjacent land use Forested/Inactive Naval Base Distance to nearest roadway or other development 200'

Prepared by: JS Date 8/24/2012

Dominant wetland systems present PFO/PEM Contiguous undeveloped buffer zone present Yes

Wetland Impact:
Type Area

Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? Low

Evaluation based on:
Office X Field X

How many tributaries contribute to the wetland? Wildlife & vegetation diversity/abundance (see attached list)

Corps manual wetland delineation completed? Y N X

Function/Value	Suitability Y	Suitability N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge	X		4,5,10,15		Groundwater discharge and supplies ponded areas with hydrology on a permanent bases, contaminated water quality.
Floodflow Alteration	X		5,7,8,9,15,18		Portions in 500-yr floodplain and has the ability to reduce flood damage by water retention with organic soils.
Fish and Shellfish Habitat		X			Wetland is not associated with a watercourse or estuary.
Sediment/Toxicant Retention	X		2,3,4,5	X	Known sources of toxicants are present, sediment trapping occurs, fine grain mineral soils present, and long duration of water retention time present.
Nutrient Removal	X		3,5,6,7,8,9,10	X	Wetland saturated most of the season, ponded water present, slowly drained fine grained mineral soil present, and dense vegetation present.
Production Export		X	2,4,7		Snags are present in wetland though wildlife food sources are limited an emergent portion of wetland is dominated by a monoculture of dense stands of common reed.
Sediment/Shoreline Stabilization		X	1,2		Wetland is not associated with streambanks, ponds or shorelines.
Wildlife Habitat	X		3,4,5,6,7,8,11,13,16, 17,18,19,20,21,23	X	A variety of birds were seen in trees and shrubs at wetland perimeter. An animal borrow and standing dead tree snags and evidence of deer was observed.
Recreation		X	12		Although wetland is located a short distance from a public parking lot and bike path it is difficult to access and not available for public use.
Educational/Scientific Value		X	7,8,12		Although wetland contains wildlife the contaminants present make it unsuitable for educational and scientific purposes.
Uniqueness/Heritage		X	2		Although wetland contains wildlife historic impacts and filling have created little opportunity for uniqueness.
Visual Quality/Aesthetics		X			Wetland is difficult to get to and stands of common reed as well as historic impacts provide little scenic value.
ES Endangered Species Habitat		X			There are no threatened or endangered species associated with this wetland or adjcen areas.
Other					

Notes: *Reference The Highway Methodology Workbook (USACOE, 1993)

* Refer to backup list of numbered considerations.

Appendix C

Representative Photographs

View south of QDC Outfall 001.

View north of downstream of QDC Outfall 001.

View northeast of southern portion of Wetland 001

Wetland 001 soil (8-20inches below the soil surface)

View southwest of upland forest habitat and swale (ASSF) located at northeast corner of Wetland 001

View north of culvert connecting to adjacent wetland located northeast of Wetland 001.

View north of ponded adjacent wetland.

View north of autumn olive (*Elaeagnus umbellata*) north side of Quonset Point Bike Path.

View north of Allen Harbor (north of Study Area)