CAPE COD PERMEABLE REACTIVE BARRIER
INITIAL HYDROGEOLOGIC SITE CHARACTERIZATION RESULTS AND EVALUATION OF SITE SUITABILITY FOR PERMEABLE REACTIVE BARRIER INSTALLATION

Appendix A

Quality Assurance Project Plan

January 15, 2016

Quality Assurance Project Plan
Site Characterization for Design of Pilot-Scale Permeable Reactive Barriers for Nitrogen Reduction in Groundwater on Cape Cod

Prepared by:
Danna B. Truslow, PG and Samantha Wright
WaterVision LLC

Contract #: EP-BPA-13-W-0001

QA Tracking # RFA 16024

Date: January 15, 2016

For WaterVision LLC	
Project Manager and Hydrogeologist:	Danna B. Truslow, PG
Project Technical Lead	Peter Shanahan, PhD, PE
Project Geologist	Samantha Wright
Project QA/QA Officer:	Emily DiFranco
For USEPA	
EPA New England Project Contracting Officer:	Ray Cody
EPA New England Project Technical Lead	Marcel Belaval
EPA New England Project Outreach and Community Liaison	Karen Simpson Bryan Dore
EPA New England Quality Assurance Reviewer:	Nora Conlon

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1.0 INTRODUCTION

Excessive nitrogen (N) originating primarily from on-site wastewater disposal (both conventional septic systems and innovative/alternative systems), but also runoff, fertilizer application, and landfills has led to significant decreases in the environmental quality of coastal rivers, ponds, and harbors in many communities on Cape Cod. The decline in water quality has led to problems including loss of eelgrass beds, periodic extreme decreases in dissolved oxygen, reduction in benthic animal diversity, and periodic algae blooms (MassDEP, 2007).

In September 2015, EPA approved the Cape Cod Commission's (CCC) final Section 208 Areawide Water Quality Management Plan Update. The 208 Plan Update is a watershed-based approach to restore embayment water quality on Cape Cod. The plan recommends strategies, regulatory reforms and a process for communities to reduce or eliminate excess nitrogen, the primary cause of degraded conditions. The plan considers remediation and restoration approaches, in addition to source reduction. The Plan identifies alternative technologies, tools, policies and approaches that may restore water quality in affected water bodies more quickly and cost effectively than traditional methods. Non-traditional technologies for reducing nitrogen have raised questions about their potential effectiveness, reliability and speed to results.

Among the non-traditional technologies described in the plan are permeable reactive barrier (PRBs). PRBs are a passive technology that act as a barrier to nitrogen transport by fostering geochemical conditions that are conducive to the anaerobic denitrification of nitrate dissolved in flowing groundwater. This is accomplished by the introduction of a carbon source below the water table aligned perpendicular to the direction of groundwater flow.

EPA has undertaken a project to perform hydrogeological site characterizations to support the design of PRBs as pilot technologies for reducing the concentration of nitrogen compounds in groundwater. This work, being done as part of the Southeast New England Program (SNEP) in partnership with the United States Geological Survey (USGS) and the CCC, is intended to foster the effective use of PRBs for reducing nitrogen loads as described in the 208 Plan. The goals of the project are to 1) help identify suitable locations for PRB nitrogen removal pilots, 2) fully characterize one or more sites to support PRB design, and 3) provide an example of the type of site characterization work necessary for a successful PRB installation.

Six pilot sites have been identified for potential PRB site characterization work – two pilot sites are currently proposed in Falmouth, MA one site in Barnstable, Dennis, Mashpee, and Orleans, MA. All sites are located in primarily residential areas and

adjacent to large bodies of surface water. PRBs can be installed using either an injection well or trench method. In the injection well method, the likely method at these sites, the reactive zone is established through subsurface injection of a carbon source. The carbon source injection would be carried out at a series of injection wells installed with appropriate spacing in order to develop a continuous reactive zone between wells. The trench method commonly uses wood chips as a carbon source. In this case a trench is completed perpendicular to groundwater flow to capture and convert inorganic nitrogen-to-nitrogen gas as it passes through the trench.

The long-term goal of this project is to develop criteria for considering and identifying site conditions appropriate for installation and implementation of in-situ remediation approaches such as PRBs and related technologies. The immediate goal of this project is to conduct hydrogeological site-characterization field work to support the design of pilot-scale PRBs for nitrogen reduction in groundwater at several sites on Cape Cod.

2.0 DISTRIBUTION LIST

Table 1 presents a list of people who will receive the approved Quality Assurance Project Plan (QAPP), the QAPP revisions, and any amendments. A project personnel sign-off sheet is not included in this draft. It will be generated upon finalization of the QAPP, and all people related to the project will indicate that they have read the QAPP before completing any analysis work on this project.

Table 1 - QAPP Distribution List

QAPP Recipient Name	Project Role	Organization	Contact Information: Telephone Numbers and email Addresses
Danna B. Truslow	Project Manager	WaterVisionLLC	(603) 766-6670 dtruslow@watervisionllc.com
Peter Shanahan, PhD	Project Technical Lead		(978) 263-1092 pshanahan@watervisionllc.com
Samantha Wright	Project Geologist		(603) 766-6670 swright@watervisionllc.com
Emily DiFranco	Project QA/QC Officer		(603) 343-6311 edifranco@watervisionllc.com
Ray Cody	EPA Project Manager/Contracting Officer	USEPA – Region 1	cody.ray@epa.gov
Karen Simpson	USEPA – SNEP Liaison	USEPA – Region 1	simpson.karen@epa.gov
Bryan Dore	USEPA – SNEP Liaison	USEPA – Region 1	Dore.bryan@epa.gov
Marcel Belaval	USEPA – Technical Lead	USEPA – Region 1	belaval.marcel@epa.gov
Nora Conlon	EPA New England Quality Assurance Reviewer	EPA New England	617-918-8335 Conlon.nora@epa.gov
Mellissa Gulli	Laboratory Project Manager	Alpha Analytical Laboratory	mgulli@alphalab.com and logistics@alphalab.com (bottle orders)
Emily Ngo Schick	Laboratory Contact	UC-Davis Stable Isotope Laboratory	ekngo@ucdavis.edu
Dan Regan	Project Liaison	New England Geotech, Inc.	regan@redox-tech.com

3.0 PROJECT ORGANIZATION

3.1 Project Responsibilities and Communication Pathways

Figure 1 is an organizational chart outlining the parties involved in this investigation and the communication pathways. Danna Truslow is the primary contact and project manager for WaterVision LLC. Ms. Truslow has worked throughout the Northeast and United States as a professional geologist and hydrologist for over 25 years and on the WaterVision LLC team for over four years. Ms. Truslow will work closely with the project team to develop and implement effective initial site characterization evaluations, detailed hydrogeologic characterization, analyses, and reporting to determine several pilot sites for PRBs in Cape Cod communities. Ms. Truslow and WaterVision staff will perform the installation of the monitoring wells and water quality monitoring on the project. Ms. Truslow will also be responsible for assuring that staff on the project has proper training to carry out the sample collection and water quality monitoring described in this plan.

Peter Shanahan, PE, PhD, is the technical lead on the project for WaterVisionLLC. He will work closely with Ms. Truslow and the project team on scope development and technical guidance. Dr. Shanahan will provide final technical review on all analyses and documents for the project as well.

Samantha Wright will be the project geologist for the Cape PRB project. In addition to developing GIS maps for the project and overseeing well installation, Ms. Wright will also coordinate with the analytical laboratory, Alpha Analytical, on laboratory bottle needs, sample bottle pickup and drop off, and reporting requirements.

Emily DiFranco is the PRB Quality Assurance officer. Ms. DiFranco is responsible for maintenance and distribution of the QAPP and will assure that all project team members have the most recent revision of the plan. She will also ensure that data collected throughout the project meet the quality objectives set forth in this QAPP and reporting any problems to the project manager. Throughout the sampling portion of the project, the QA Officer will check, analyze and compile all QA/QC records and documentation. The QA Officer will be responsible for a memorandum to the Project Manager and geologist summarizing any deviations from the procedures in the QA Project Plan, the results of the QA/QC tests, and whether the reported data meets the data quality objectives of the project.

Project Funding and Purpose

This project is being completed under a contract between USEPA Region 1 and WaterVision LLC - #EP-BPA-13-W-0001. Partial funding for this project is made available through a USEPA grant to the Southern New England Program. The following USEPA staff will take on roles as follows. Ray Cody is the Contract Manager for the project and Marcel Belaval is the Technical Lead. Karen Simpson and Bryan Dore will manage community Outreach to the municipalities and to the Cape Cod Commission. Nora Conlon is the EPA New England project QA/QC reviewer for the Project. The EPA project team will review and approve the Quality Assurance Project Plan (QAPP) prior to project commencement.

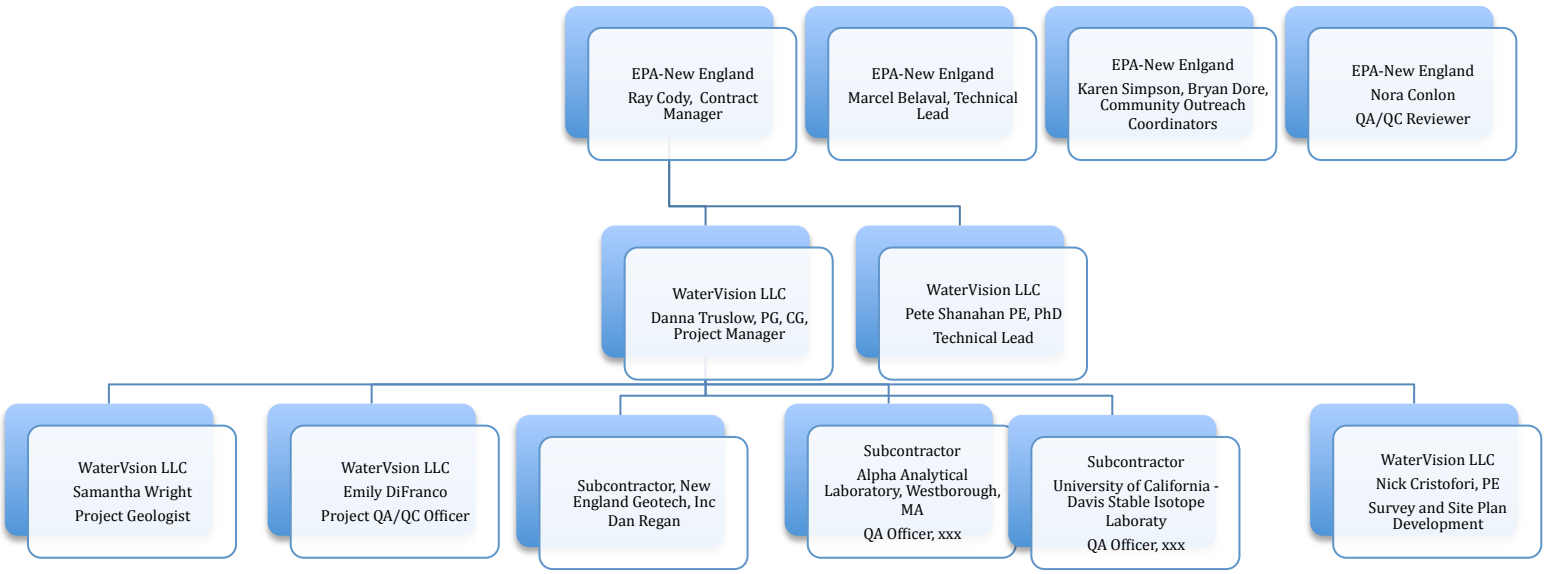
The principal users of the data from this project will be WaterVision LLC, USEPA, and the Cape Cod municipalities that will be collaborating on the project. The results will also be communicated to other stakeholders in the Southern New England region to understand additional options for nutrient reduction from septic systems, wastewater discharge, and other concentrated sources of nutrients that could impact shallow groundwater.

Contract Laboratories

The contract analytical laboratory is Alpha Analytical in Mansfield and Westborough, Massachusetts. Alpha Analytical is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and is also certified for Clean Water Act and Safe Drinking Water Act analyses in Massachusetts. As required by NELAP Accrediting Bodies, Alpha Analytical operates the laboratory in compliance with the National Environmental Laboratory Conference (NELAC) standards.

The University of California at Davis will also provide laboratory analytical services for stable isotopes of nitrogen at finalist sites to identify nitrogen sources

Figure 1: Project Organizational Chart – to be completed as an 11x17 in final document



3.2 Modification to Approved QAPP

The QAPP will be reviewed annually. If the sampling design, sample collection procedures, or data assessment and reporting change significantly, the WaterVision Project Manager will consult with the EPA New England Project Manager to submit modifications to EPA New England for approval.

3.3 Personnel Qualifications and Experience

Table 2 displays the personnel credentials of the PRB team. Responsibilities have been discussed in more detail above.

Table 2: Personnel Qualifications and Experience

Name and Affiliation	Responsibilities	Qualifications
Marcel Belaval, EPA	Technical Lead	Hydrogeologist
Ray Cody, EPA	Contract Officer	
Karen Simpson and Bryan Dore, EPA	Community Outreach Coordinators	
Danna B. Truslow, WaterVision LLC, Consulting Hydrologist	Project Manager and Hydrogeologist	Professional Geologist and Hydrogeologist and Water Quality Specialist
Peter Shanahan, WaterVision LLC	Technical Lead and Review	Professional Engineer and Hydrologist
Samantha Wright, WaterVision LLC	Field Geologist	Geomorphologist and Water Quality Specialist
Emily DiFranco, WaterVision	Project Quality Assurance Officer	Hydrologist and Water Quality Specialist

3.4 Training Requirements/Certification

Table 3 shows the project activities that will require some level of training and the location where the training records will be compiled.

Table 3: Special Personnel Training Requirements Table

Project Function	Description of Training	Training Provided by	Training Provided to	Location of Training Records
Geoprobe boring completion, Ground Water Sampling Point Installation, and Hydraulic Conductivity Testing	Well/Piezometer Installation and Development	Danna Truslow, Peter Shanahan	WaterVision LLC Staff	WaterVision LLC
Nitrate field testing	Hach kit Colorimetric field analysis	Danna Truslow	WaterVision LLC Staff	WaterVision LLC
Water Level Measurement and groundwater Sampling	Well/piezometers purging, groundwater sampling and field analytical procedures	Danna Truslow	WaterVision LLC Staff	WaterVision LLC

3.5 Background

This section documents the project planning, identifies the environmental problem, defines the environmental questions that need to be answered and provides background information. For additional background information, please see Section 1.0, Introduction.

In June 2015, selected municipalities in southern and western Cape Cod were invited to propose sites for hydrogeological site characterizations in support of PRBs as pilot technologies. Interested municipalities were instructed to respond to EPA's Project Solicitation letter by providing a statement of interest along with requisite information on proposed sites. As described in EPA's Project Solicitation letter, EPA sought to increase the likelihood of identifying optimal sites for the project by outlining requirements for providing specific and detailed site data.

A technical team consisting of EPA Region 1, the CCC, and the USGS, with input from MassDEP reviewed the site nomination responses to identify sites that appear to be

suitable locations for PRB nitrogen reduction pilot tests. Selection criteria may be found in EPA's Project Solicitation letter to towns (Appendix A). EPA selected sites for characterization work with input from the technical team based on these criteria.

At each site, preliminary probes will be advanced and groundwater will be sampled at two depths to approximate the depth, location, and concentration of groundwater nitrate plumes. Based on the results of this testing, four shallow, small diameter groundwater monitoring wells will be installed as well as a cluster of ten piezometers. A continuous sediment core will be collected at the location of the piezometer cluster. This initial site characterization will include a description of water quality upgradient and along the proposed PRB orientation, groundwater flow direction, depth to freshwater/saltwater interface, hydraulic gradient, and hydraulic conductivity.

Up to two final sites will be selected to undergo full hydrogeologic assessments, which will include the installation of additional water table and water quality monitoring wells and piezometer clusters to refine the estimate of groundwater flow direction and characterize the spatial variability of groundwater quality. Additionally, two deep core locations will be selected to characterize the spatial variability of aquifer sediments.

3.6 Problem Definition

PRBs have been shown to markedly reduce the concentration of nitrate in groundwater. The PRB design used to treat groundwater will be based on pre-existing groundwater water quality and rate of flow, which will be collected as part of this project plan. Preliminary sampling for the project will define baseline water quality, water levels, hydrogeologic characteristics of the overburden, and vertical and horizontal flow directions.

4.0 PROJECT / TASK DESCRIPTION AND SCHEDULE

4.1 Project Summary

The first year of the project, post verification of EPA site selections (Task 1), will include conducting initial site characterizations of the PRB demonstration areas. During this time the background work for groundwater and surface water sampling will also be conducted. This Year 1 work will include:

- Task 2 – Initial Site Characterization (ISC)
    - Subtask 2A – Determine relative nitrate concentrations, depth to groundwater, hydraulic gradient, and rate and direction of groundwater flow through installation of soil borings and four monitoring wells
    - Subtask 2B – Characterize aquifer sediments through the top 100 feet
    - Subtask 2C - Install piezometer cluster
    - Subtask 2D – Characterize vertical distributions of hydraulic head and measure field water quality parameters
    - Subtask 2E – Collect groundwater samples and perform laboratory analyses on collected water-quality samples
    - Subtask 2F - Decommission monitoring wells, if desired by the municipality
    - Subtask 2G - Prepare ISC summary report.

During Year 2, Full Hydrogeologic Assessments (FHA) will be completed to further refine and characterize spatial variability of aquifer sediments and groundwater quality, as well groundwater flow direction. One or two sites will be selected for FHA assessment.

- Task 3 – Full Hydrogeologic Assessments (FHA)
    - Subtask 3A - Install additional water-table monitoring wells to refine groundwater flow direction
    - Subtask 3B – Collect and log additional sediment cores to characterize the spatial variability of aquifer sediments
    - Subtask 3C - Install additional piezometer clusters to characterize the spatial variability of groundwater quality
    - Subtask 3D - Estimate hydraulic conductivities
    - Subtask 3E - Perform a full round of water level measurements and water quality sampling; including samples for stable isotope analyses
    - Subtask 3F - Analyze and interpret data to estimate the flux of nitrogen through the site
    - Subtask 3G - Decommission monitoring wells, if desired by the municipality
    - Subtask 3H - Prepare final FHA report

The following task numbers are based on the project tasks included in this QAPP.

4.1.1 Task 2 – Initial Site Characterizations

In order to evaluate the six sites selected by the joint EPA, USGS, and CCC site selection program, the project team will complete well installation, subsurface sampling, water level and field water quality measurement, water quality sampling, data analysis, and reporting. The groundwater flow direction, depth to freshwater/salt water interface (FW/SW), hydraulic gradient, hydraulic conductivity, and baseline water quality will be assessed at each site and are detailed in the following subtasks.

Task 2A – Determine depth to groundwater, hydraulic gradient, and rate and direction of groundwater flow

Four 2-inch PVC monitoring wells will be sited, installed, and monitored to evaluate groundwater flow direction and subsurface conditions. Installation will be completed using direct-push drilling (Geoprobe). Prior to well installation a series of four to five borings will be completed along the proposed PRB alignment. The probes will be completed to approximately 20 feet below the water table at each location using the SP-15 method, an in-situ groundwater sample extracted and tested in the field using a Hach colorimetric field test for nitrate-nitrogen. The probe will be retracted to approximately ten feet, then one foot below the water table and a groundwater sample taken and analyzed with the Hach kit like the previous depths. After the nitrate levels are evaluated in the field, well locations along the PRB alignment will be selected. An upgradient or downgradient well off the alignment will also be installed using 2 inch inside diameter PVC. The wells will be completed with a 5 foot slotted PVC screen installed across the water table. Filter sand will be added if necessary around the annulus of each well and sealed with bentonite approximately 1 foot above the well screen. Wells will be grouted at the surface to protect the well from down-hole contamination and completed with a secured flush-mounted road box at each location.

After well installation is complete, well elevations and locations will be surveyed at each well and referenced to known vertical and horizontal datum. Water levels will be measured at each well after completion using a Solinst electric water level meter. The measured groundwater elevations and the estimated values of hydraulic conductivity will then be used to determine the local groundwater flow rate and direction.

Task 2B – Characterize aquifer sediments through the top 100 feet (or to the top of the FW/SW interface)

A full set of nominally continuous sediment cores will be collected for one monitoring location at each ISC site using direct-push drilling as subsurface conditions permit. Cores will be logged using standard soil classifications. Below the water table, electrical conductivity and other field parameters will be logged using a YSI Sonde to further define hydrologic conditions and the depth to the FW/SW interface. Cores will be retained for possible grain size analysis.

Task 2C – Install Piezometer Cluster

Ten adjacent piezometers will be installed at successively shallower depths above the FW/SW interface. Depths will depend on the vertical location of the FW/SW interface, geologic materials, and the water table. Piezometers will be constructed of 1" diameter schedule 40 PVC with 1 foot long screened intervals at the bottom of each well.

Filter sand will be added if necessary around the annulus of each piezometer and sealed with bentonite approximately 1 foot above the well screen. Wells will be grouted at the surface to protect the well from down-hole contamination and completed with a secured flush-mounted road box at each location. Each piezometer location and elevation will be surveyed along with the 2-inch wells installed as part of Task 2A.

Task 2D – Characterize vertical distributions of hydraulic head and water quality parameters

Two rounds of water level measurements will be completed to evaluate vertical and horizontal flow directions. Likewise, two rounds of water quality samples will be taken to establish baseline water quality. After removal of all well caps and equilibration with the atmosphere, a complete round of water levels will be conducted at site wells and piezometers and recorded on field data sheets. Wells will then be purged prior to water quality sampling as further described in Task 2E. If tidal influence is expected or has been documented through the literature

review task, a well may be selected for short-term installation of a water level data logger to record tidal influence between the two sampling events.

Task 2E – Perform field and laboratory analysis on collected water quality samples

Wells and piezometers will be measured and sampled twice approximately one month apart. As each well is purged using either a downhole pump or peristaltic pump depending on water levels, field parameters – pH, dissolved oxygen (DO), oxidation-reduction potential (ORP), and specific conductance – will be measured and recorded at appropriate intervals using a YSI multi-parameter sonde, based on the well volume to be purged and the rate of stabilization of parameters. Dissolved oxygen may also be measured using a CHEMetrics field photometer for concentrations below 1 mg/L DO when these low concentrations are measured in the field. Once the field parameter readings have stabilized and/or three well volumes have been purged, water quality samples will be taken for final field and general chemistry, carbon, and metals/minor element analyses as listed in Table 4 below.

Table 4. Analytes to be evaluated

Name	Type
Dissolved oxygen (DO), Oxidation reduction potential (ORP), pH, Specific conductance	Field
Nitrogen (total), Nitrogen (ammonia), Nitrogen (nitrate), Nitrogen (nitrite), Chloride, Sulfate, Alkalinity, Orthophosphate	General chemistry
Organic carbon (dissolved)	Carbon analyses
Boron (dissolved), Iron (dissolved), Manganese (dissolved), Arsenic (dissolved)	Metals and minor elements

Task 2F – Decommission Monitoring Wells

Decommissioning of wells installed as part of the ISC will be completed according to MassDEP regulations if requested by EPA. All wells will be decommissioned by adding bentonite pellets to the wells or piezometers, removing surface sections of PVC, and then grouting the well to the surface and removing the protective casing.

Task 2G – Prepare ISC Letter Report

A letter report will be prepared that describes hydrogeologic conditions and water quality at all ISC sites as described in the PWS. The field data recorded for each subtask will be summarized in the report and data sheets included in an ISC appendix.

4.1.2 Task 3 – Full Hydrogeologic Assessments

Full Hydrogeologic Assessment (FHAs) will be initiated after the Project Team has reviewed the ISC report and selected up to two final sites for PRB Conceptual Design. The Project Team will evaluate data collected during the ISC, in addition to any pre-existing site data available, in order to identify sites that appear to be good candidates for pilot PRBs. Based on these data, characteristics of sites that may be suitable for pilot PRBs include: measurable nitrate concentrations, generally above 5 mg/L; a relatively clear conceptual understanding of the gradient and direction of groundwater flow; groundwater geochemical conditions that could support injected PRB techniques; and nitrate concentrations that appear consistent between successive ISC sampling rounds. It is expected that ISC data will provide a general picture of site groundwater and nitrogen conditions to address these characteristics. If multiple sites appear to meet these criteria favorable, the sites will be ranked based on other attributes including site access, expected nitrogen removal potential, expected cost of a pilot PRB, etc. The Technical Team (Water Vision, CCC, USGS, and EPA) will make recommendations to EPA for final site selections.

Task 3A – Install additional water table monitoring wells to refine groundwater flow direction

At least three 2-inch PVC wells will be installed and logged near the area of primary interest using direct push drilling. Water levels will be measured at each well after completion as described in Task 2a to determine groundwater elevations and overall groundwater flow directions.

Task 3B – Collect and log additional sediment cores to characterize the spatial variability of aquifer sediments

Two additional deep core locations will be selected along the PRB alignment. Continuous cores will be collected and logged using standard soil/hydrogeologic classifications. Below the water table, electrical conductivity and other field parameters will be logged using a YSI Sonde to further define hydrologic conditions

and determine the depth to FW/SW interface. The depths of the cores will be estimated based on previous site characterization work. Cores will be retained for possible grain size analysis as part of Task 3D.

Task 3C – Install additional piezometer clusters to characterize the spatial variability of groundwater quality

Six adjacent piezometers will be installed at successively shallower depths above the FW/SW interface in two locations (12 piezometers total) to further define subsurface variability in hydraulic head and water quality. Piezometers will be installed at approximately 100-, 85-, 70-, 55-, 40-, and 20-foot depths, but actual depths will depend on the vertical location of the FW/SW interface, geologic materials, and the water table encountered. Each piezometer location and elevation will be surveyed along with the 2-inch wells installed as part of Task 3A.

Task 3D – Estimate hydraulic conductivities

Hydraulic conductivity at wells and at selected core sample intervals will be estimated in this task. Grain size analyses will be completed at approximately 15 locations from cores completed during tasks 2B and 3B and hydraulic conductivity values will be estimated based on the grain size analyses using standard methodologies. Field hydraulic conductivity testing will also be completed at selected wells and piezometers (up to 10) using rising- or falling-head slug testing depending on field conditions using methods described in Task 2a.

Task 3E – Perform a full round of water-level measurements and water-quality sampling

All site wells and piezometers will be measured and sampled once as part of the FHA phase. As each well is purged using either a downhole pump or peristaltic pump depending on water levels, field parameters – pH, dissolved oxygen (DO), oxidation-reduction potential (ORP), and specific conductance – will be measured and recorded at appropriate intervals using a YSI multi-parameter sonde, based on the well volume to be purged and the rate of stabilization of parameters. Once the field parameter readings have stabilized and/or three well volumes have been purged, water quality samples will be taken for final field and general chemistry, carbon, and metals/minor element analyses as listed in Table 4 above.

In addition to the analyses listed above, samples will also be collected for stable isotope analysis for $d^{15}N/d^{14}N$ for NO_3. Analysis will be completed at the UC-Davis Stable Isotope Laboratory. Samples will be collected then frozen as per UC-Davis protocol and shipped overnight to the laboratory for analysis.

Task 3F – Analyze and interpret data to estimate the flux of nitrogen through the site

A full evaluation of site hydrogeology will be made in order to estimate the flux of nitrogen through the plane determined to be suitable for installation of a PRB. Darcy flux calculations using estimated hydraulic conductivity and hydraulic gradient data, nitrogen concentrations, and stable isotope data will be used to estimate the flux of nitrogen through the chosen PRB location. Variability in hydraulic conductivity and in nitrogen concentrations will be incorporated into the analyses.

Task 3G – Decommission Monitoring Wells

Decommissioning of wells installed as part of the FHA will be completed according to MassDEP regulations if requested by EPA. A letter report will be prepared to document the work completed. However, many of the wells may be retained for long-term monitoring as part of PRB effectiveness monitoring.

Task 3H – Prepare FHA Report

WaterVision will prepare a report that describes the work performed and results, and each site evaluated under the FHA task. The field data collected and analyses conducted will be summarized in the report and all data and calculations will be included in the FHA report appendices.

4.2 Project Schedule

The project will be initiated in October 2015, and will be completed by February 2017. The tasks and estimated completion dates are shown in Table 5.

4.3 Summary of Analysis Tasks

Table 6 presents a breakdown of who will be responsible for leading fieldwork and laboratory sample analysis.

Table 5 – Project Schedule and Work Products

Task Description	Completion Date	Responsible Team Member(s)	Work Products
Task 1 - QAPP Development			
QAPP Development	November 2015	Danna Truslow	Draft QAPP
QAPP Approval	December 2015	Danna Truslow/Emily DiFranco/Marcel Belaval	Approved QAPP
Task 2 - Initial Site Characterization (ISCs)			
Project Staff Training	April 2016	Danna Truslow	Training records and verification forms
Install monitoring wells and piezometers at all sites to complete hydraulic conductivity testing, groundwater flow direction, hydraulic gradient, and depth to FW/SW Interface	March 2016	Danna Truslow/Samantha Wright	Summary Report
Complete water quality monitoring and water level measurements for initial subsurface characterization	May 2015	Danna Truslow/Samantha Wright	Summary report
Prepare Initial Site Characterization Letter Report	July 2016	Danna Truslow/Samantha Wright/Pete Shanahan	Final ISC Report
Task 3 – Full Hydrogeologic Assessments (FHAs)			
Install monitoring wells and piezometers at all sites to refine groundwater flow direction, characterize spatial variability of groundwater quality, and estimate hydraulic conductivities	October 2016	Danna Truslow/Samantha Wright	Summary Report
Complete full round of water quality sampling and water level measurements	November 2016	Danna Truslow/Samantha Wright	Summary Report
Prepare Full Hydrogeologic Assessment Report	January 2017	Danna Truslow/Samantha Wright/Peter Shanahan	Final FHA Report

Table 6: Field and Laboratory analytical tasks

Analyte	Responsible Company and Personnel
Field/ Laboratory Analysis	
Subsurface Sampling and Monitoring well Installation	WaterVision LLC – Danna Truslow, Solinst Water Level Meter, Hach Colorimetric Nitrate Test Kit, YSI field parameter Sonde New England Geotechnical Borings, Dan Regan, Geoprobe and well installation materials
Hydraulic Conductivity Testing	WaterVision LLC – Danna Truslow, Solinst Water Level Meter, small diameter slug, peristaltic pump, pressure transducer
Groundwater Analyses Nitrogen (total) Nitrogen (ammonia) Nitrogen (nitrate) Nitrogen (nitrite) Chloride Sulfate Alkalinity Orthophosphate Organic carbon (dissolved) Boron (dissolved) Iron (dissolved) Manganese (dissolved) Arsenic (dissolved)	Alpha Analytical Project Manager Melissa Gulli
Groundwater purging and sampling and real-time Field Parameters: pH DO Temperature Specific Conductivity Oxidation-Reduction Potential	WaterVision LLC – Danna Truslow, Solinst Water Level Meter, Hach Colorimetric Nitrate Test Kit, YSI field parameter Sonde, CHEMetrics field photometer, peristaltic pump, submersible pump, bladder pump, field expendables
Groundwater Level	WaterVision LLC – Danna Truslow, Solinst Water Level Meter

5.0 DATA QUALITY OBJECTIVES FOR MEASUREMENT DATA

5.1 Project Data Quality Objectives (DQOs)

The data quality objective is to produce precise and accurate data, which is representative of true field conditions. Groundwater samples will be collected from the same locations during each sampling round.

5.2 Measurement Performance Criteria for Water Quality Measurements

Field parameters will be duplicated at one well at each project site for each sampling event. One groundwater sample will be duplicated for each round (includes all sampling sites).

The measurement performance criteria that will be used in this study for water samples is listed in Table 7 and explained in more detail below it. The specific performance criteria goals and related information for each analyte/measurement are listed in Table 8.

Table 7: Measurement Performance Criteria Used for Water Quality Measurements

Data Quality Indicators	Measurement Performance Criteria	Reference Value/Criteria Range	QC Sample and/or Activity Used to Assess Measurement Performance
Precision-Overall	Relative Percent Difference (RPD)	RPD ≤ 20%	Sample Duplicates – Field and Laboratory Analyses
Precision-Lab	Alkalinity NH3, NO2, NO3, SO4, Ophos, DOC, and TOC Chloride Metals	RPD <10% RPD< 20% RPD<18% RPD<20%	Laboratory Sample Duplicates
Accuracy / Bias	Metals Alkalinity NH3	LCS- 85-115%, MS-75-125% LCS-90-110%, MS 86-116 % LCS-80-120%, MS 80-120 %	% Recovery measured against

Accuracy / Bias	Ophos, DOC, NO2, NO3 SO4 Chloride	LCS-90-120%, MS 80-120 % LCS-90-110%, MS 60-140 % LCS-90-120%, MS 40-151 %	Laboratory Control Samples (LCS) and Matrix Spikes (MS)
Comparability	Measurements should follow standard methods that are repeatable	NA	All project personnel will review QAPP and receive training / Signed record of such.
Sensitivity	Method Detection Limit	NA	Yearly (at minimum) Method Detectable Limit Calculation
Completeness	Number of samples meeting data quality objectives	90-95%	Data Completeness Check
Contamination	Measures possible field or cross contamination from sampling equipment	< Reporting limits (RL)	Equipment Blanks
Hydraulic Conductivity Testing	Repeatability of Testing	RPD ≤ 20%	Repeated Tests (1 per site)

Precision

Duplicate Samples or Tests: Duplicate samples or tests are collected at least once per sampling event per location in order to document precision. Duplicate samples will account for a minimum of 5% of field samples collected per sampling event per location. The precision resulting from duplicate samples is a function of the variance of the sampling and analytical techniques. Precision goals vary according to specific analyte but should remain within a threshold of 20% variance. The relative percent difference (RPD) will be calculated as follows:

$$RPD = (S_1 - S_2)/((S_1+S_2)/2)$$

Where S_1 is the value for sample 1 and S_2 is the value for sample 2.

RPD will be calculated for each sampling visit.

Equipment blanks will be collected at least once per event and consist of distilled water aliquots that are conveyed through existing sampling equipment contact under field conditions and are analyzed to detect any contamination from sampling methodology using field parameter testing equipment. Specific conductance will be tested. A value of 25 uS/cm or lower will be considered acceptable.

Accuracy

The accuracy of the analytical methods is verified through analysis of the Laboratory Control standards provided by the analytical laboratory. Accuracy for chemical methods for all nutrient parameters is determined by calculating the percent recovery of a standard reference material both as a standard and as a spike (to evaluate matrix effects). Two to three spiked samples are analyzed annually. Spiked standards are a certified reference sample (generally from Ultra Scientific). Measured values are then compared to the certified value to determine accuracy. Spiked samples undergo the same sample preparation as the samples themselves. Accuracy goals are outlined more specifically in the appended contract laboratory SOPs. The expected accuracy may not be obtainable for all samples (due to matrix inference, or other sample issues). Any failure to obtain the required accuracy must be justified by the laboratory.

Representativeness

Representativeness is a measure of the degree to which data accurately and precisely represent a characteristic of a population at a sampling point or for a process condition or environmental condition. Representativeness is achieved through the consistent use of documented procedures for field sampling and handling process and through consistent adherence to laboratory methods.

Comparability

For this project, comparability is ensured through the use of designated sampling procedures, analytical methods, and certified calibration standards, and sample collection at representative locations within the study area as detailed in this QAPP.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system, expressed as a percentage of the number of valid measurements expected to be obtained under normal conditions. For analytical methods, completeness is based on

the number of valid results generated over a specific period compared to the number of results expected.

The quality objective for completeness for analyses performed by the analytical laboratory is 90-95 percent valid data for water. The ability to meet or exceed the completeness objective is dependent on the nature of samples submitted for analysis. Alkalinity, nitrate, and dissolved organic carbon concentrations are critical to this study so may be resampled if the completeness objective is not met. This decision will be site and sample location specific.

Sampling will occur at the same locations for each sampling round but the seasonal variability and site-specific variability cannot be well defined prior to project inception.

Table 8- Laboratory Method Sensitivity and Quantification Limits

Analyte	Analytical Method (Appendix B)	Reporting Limit (mg/L)	Method Detection Limit (mg/L)*
Alkalinity, total	2320B	2	
Nitrate	EPA 353.2 4500NO3-F	0.1	0.0188
Nitrite	EPA 353.2 4500NO3-F	0.05	0.0102
Ammonia Nitrogen	EPA 350.1 4500NH3-BH	0.075 0.1125	0.021
Total N	4500N	0.3	0.3
Chloride	300.0	0.5	0.0541
Sulfate	300.0	1	0.0518
Orthophosphate	4500P-E	0.005	0.00139
Iron, dissolved	EPA 200.7/6010C 3005A**	0.05	0.02
Boron, dissolved	EPA 200.7/6010C 3005A**	0.03	0.007
Manganese, dissolved	EPA 200.7/6010C 3005A**	0.01	0.002
Arsenic, dissolved	EPA 200.7/6010C 3005A**	0.005	0.002
Dissolved Organic Carbon	SM 5310C	1	0.118

* Method detection limit is different than sample detection limit, which will be often, be higher as they are based on sample volume

** Sample preparation method

5.3 Experimental Design and Rationale for Design

The goal of the groundwater monitoring conducted during this phase of the project is to test the shallow groundwater quality to determine if there is enough nitrogen present to justify the installation of a PRB and to characterize overall geochemical characteristics for eventual PRB design. Each site will be unique so no nitrate or total nitrogen concentration target has been set for PRB suitability at this time.

This QAPP outlines our intended sampling strategy and analytical procedures to meet these data quality goals and to evaluate water quality at proposed PRB sites.

5.4 Field Sampling Rationale

The siting evaluation will be based on water quality data from two baseline sampling events and two rounds of water level measurements at each proposed location. Water levels will be measured during each water quality sampling event and is not based on seasonal water level data needs. At each location, at least three monitoring wells and a piezometer cluster will be sampled and measured. After the initial site characterization, two sites will be selected to undergo a full hydrogeologic assessment (FHA). This will include a full round of sampling and water level monitoring at all monitoring wells and piezometer clusters.

Groundwater Measurement Point Installation and Testing

Each of the six proposed sites will be evaluated separately for groundwater flow direction, groundwater velocity, and groundwater quality. Groundwater flow direction can be estimated based on evaluation of water level elevation differences between properly installed monitoring wells. Saturated hydraulic conductivity, estimated through in-situ permeability testing at selected monitoring wells using the slug test method, combined with groundwater table potential head differences (groundwater slope) will be used to estimate groundwater flow direction and velocity.

Groundwater quality will be measured through field parameter and laboratory analytical testing and through comparison of data between sites.

Appendix C includes the methodology that will be used for monitoring well and piezometer cluster installation and documentation and for saturated permeability testing using the slug test method.

Groundwater Quality Evaluation

The task descriptions in Section 5 include the rationale for baseline evaluation of groundwater quality at each proposed PRB site.

Table 9 - Sampling Parameters and Rationale

Analyte	Rationale
Laboratory Analyzed Parameters	
Alkalinity, total	Assess overall alkalinity of water for proper PRB matrix design
Nitrate	Assess pre-existing nitrogen characteristics/content in groundwater for nitrogen flux calculations.
Nitrite	
Ammonia Nitrogen	
Total N (TKN analyzed as part of this measurement)	
Orthophosphate	Assess pre-existing concentrations of inorganic phosphate in groundwater
Chloride	Assess pre-existing concentration of chloride in groundwater
Sulfate	Assess pre-existing concentration of sulfate in groundwater and assess redox conditions
Iron, dissolved	Assess pre-existing dissolved iron content in groundwater for proper PRB matrix design and to understand subsurface geochemistry
Arsenic, dissolved	Assess pre-existing concentration of arsenic in groundwater and to understand subsurface geochemistry
Manganese, dissolved	Assess pre-existing concentration of manganese in groundwater and to understand subsurface geochemistry
Boron, dissolved	Assess presence of boron in groundwater which can serve as a tracer for septic system impacts
Dissolved Organic Carbon	Assess pre-existing dissolved organic carbon in groundwater for proper PRB matrix design and to evaluate seasonal and post-installation changes
d15N NO3	Assess concentration of N stable isotope to estimate age and source of groundwater horizontally and vertically
Field Measured Surface Water and Groundwater Parameters	
Analyte	**Rationale**
Specific Conductivity	Specific Conductivity will provide an insight into existing ionic content of groundwater or surface water and to evaluate seasonal

pH	Influences nutrient availability in sediments and surface water and to evaluate seasonal
Dissolved Oxygen	Dissolved oxygen concentrations will indicate overall redox state in subsurface and determine aerobic vs. anaerobic conditions.
Field Measured Surface Water and Groundwater Parameters	
Analyte	**Rationale**
Temperature	Temperature can be an indicator or subsurface chemical activity and overall groundwater flow system dynamics.
Oxidation/Reduction Potential	Indicates whether subsurface conditions exhibit oxidation or reduction state.

6.0 SAMPLING METHOD PROCEDURE REQUIREMENTS

6.1 Sampling Procedure

The requirements for the type of container used to collect water samples are based on the chemical analysis conducted, and the use of preservative (Table 10).

Table 10 – Laboratory Analytical Procedures, Bottles, Preservatives and Hold times

Analyte	Analytical Method (Appendix A)	Required Bottle Type - Volume (mL)	Preservative	Hold Time	Filtration Y/N	Total number of Samples for ISC
Alkalinity, total	SM 2320B	Plastic 250	Unpreserved w/ no headspace	14 days	N	204
Nitrate	EPA 353.2	Plastic 250	Unpreserved	48 hours	N	204
Nitrite	EPA 353.2	Plastic 250	Unpreserved	48 hours	N	204
Ammonia Nitrogen	EPA 350.1	Plastic 500	H2SO4	28 days	N	204
Total Organic N	4500N	Plastic 500	H2SO4	28 days	N	204
Orthophosphate	4500P-E	Plastic 500	Unpreserved	48 hours	N	204

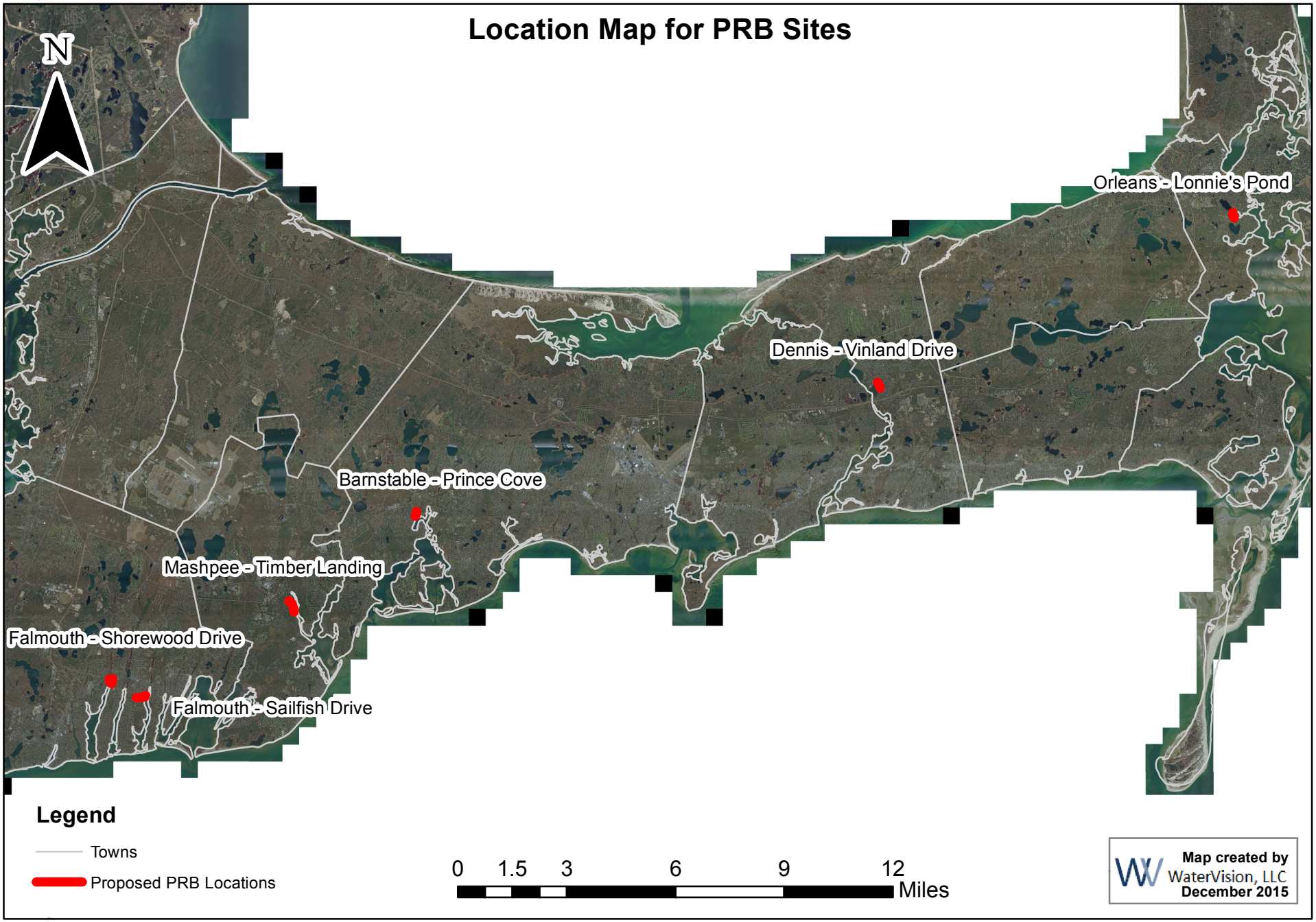
Sulfate	300.0	Plastic 500	Unpreserved	28 days	N	204
Chloride	300.0	Plastic 250	Unpreserved	28 days	N	204
Iron, dissolved	EPA 200.7/6101C	Plastic 500	HNO3	6 mos	Y	204
Dissolved Organic Carbon	SM 5310C	Glass Vial – 2	H2SO4		Y (0.45 micron)	204
Arsenic, dissolved	EPA 200.7/6101C	Plastic 500	HNO3	6 mos	Y (0.45 micron)	204
Boron, dissolved	EPA 200.7/6101C	Plastic 500	HNO3	6 mos	Y (0.45 micron)	204
Manganese, dissolved	EPA 200.7/6101C	Plastic 500	HNO3	6 mos	Y (0.45 micron)	204
d15N NO3	**UCD-SIF-BACT01.1** Bacteria denitrification assay	Plastic 100	Samples frozen after collection	6 mos	Y (0.10 micron)	10

All samples will also have a field preservation method of ice, maintaining a temperature ≤4°C and be delivered to the laboratory within 36 hours of their collection. The d15N samples will be frozen on collection and shipped overnight to the UC-Davis laboratory. Upon their receipt, laboratory personnel preserve and process these samples according to laboratory Standard Operating Procedures found in Appendix B. See Table 10 for method description.

Sampling Locations – Groundwater

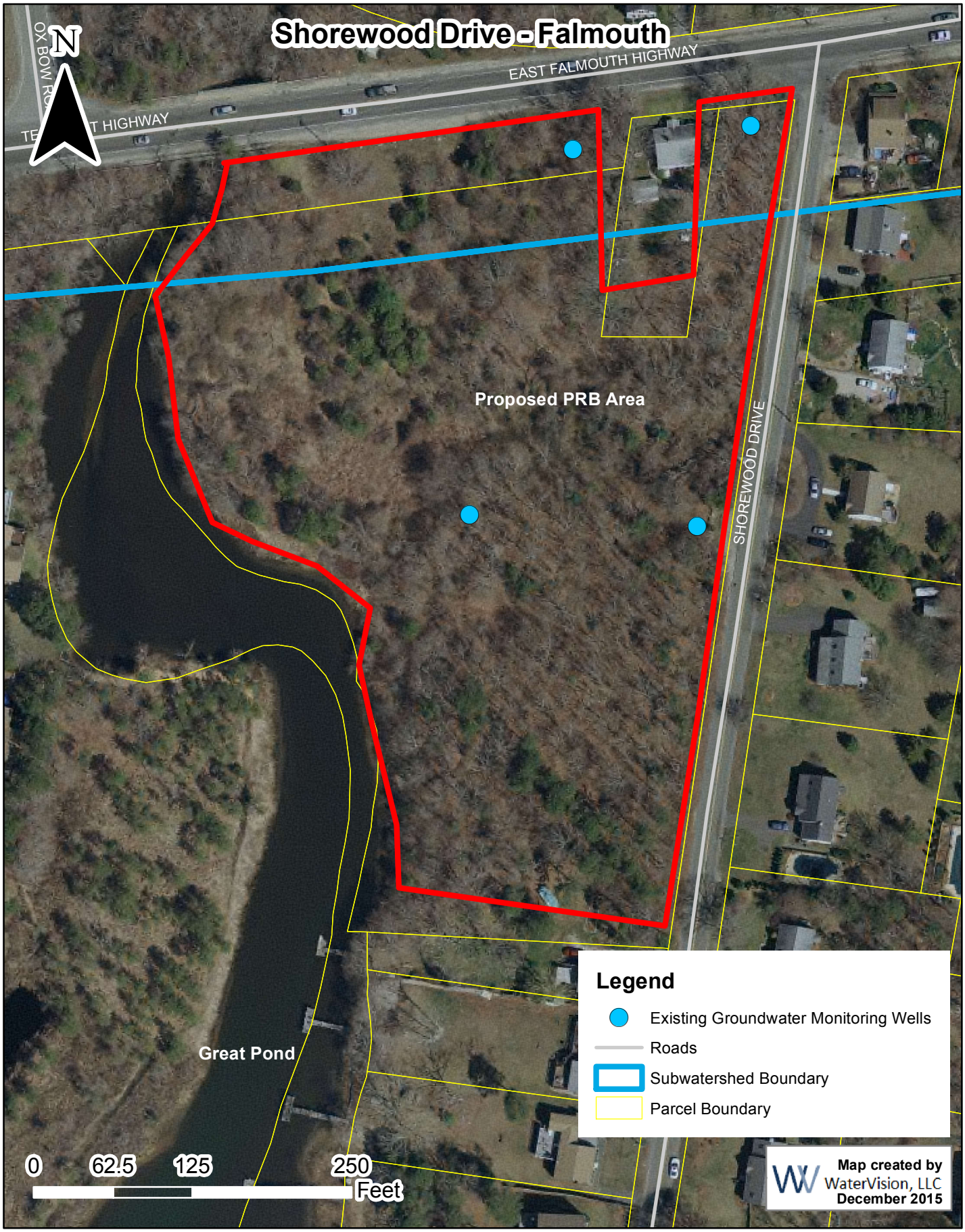
At the proposed PRB sites there will be one upgradient or downgradient groundwater monitoring location and up to six additional monitoring wells located along the PRB alignment and a piezometer cluster. Groundwater sampling protocols are listed in Table 11. Figure 2 contains a location map for the five potential permeable reactive barrier sites to be evaluated during the initial investigation phase. Figure 3a-f illustrates the proposed sampling groundwater sampling locations on individual PRB site maps. The well locations for the Falmouth-Shorewood sites are yet to be determined.

Figure 2



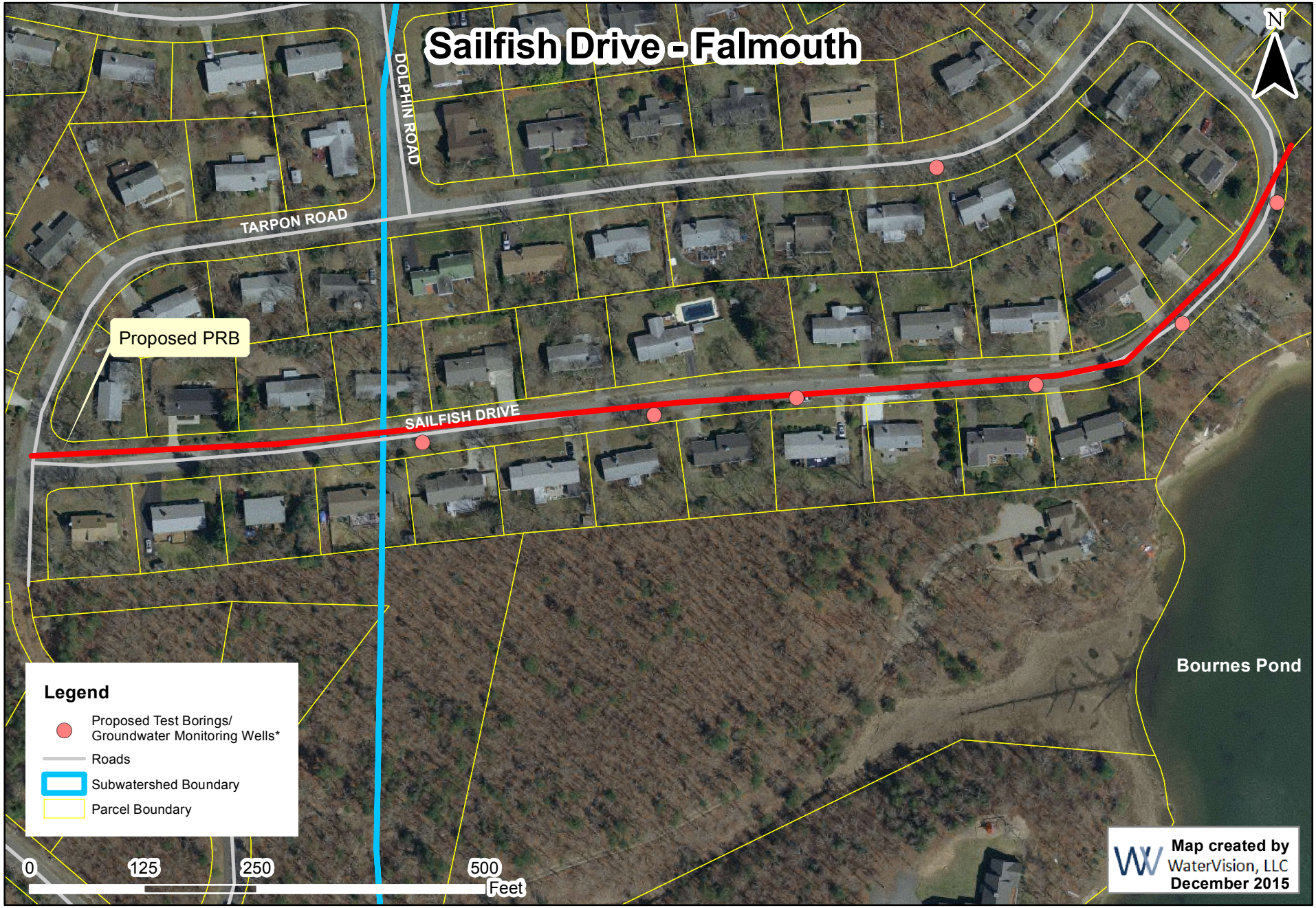
Sources: Aerial photography 2013-2014 and Town boundaries from Mass GIS,

Figure 3a



Sources: Aerial photography 2013-2014 and Roads from Mass GIS, Parcel and Subwatershed Boundaries from Cape Cod Commission, New well locations to be determined.
Boundaries for the proposed PRB Area are approximate.

Figure 3b



Sources: Aerial photography 2013-2014 and Roads from Mass GIS, Parcel and Subwatershed Boundaries from Cape Cod Commission, Proposed PRB and Proposed Test Borings/Groundwater Monitoring Wells locations from WaterVision LLC and locations are approximate.

*not all test boring locations will become completed monitoring wells

Figure 3c

Sources: Aerial photography 2013-2014 and Roads from Mass GIS, Parcel and Subwatershed Boundaries from Cape Cod Commission, Proposed PRB and Proposed Test Borings/Groundwater Monitoring Wells locations from WaterVision LLC and locations are approximate.

*not all test boring locations will become completed monitoring wells

Figure 3d

Sources: Aerial photography 2013-2014 and Roads from Mass GIS, Parcel and Subwatershed Boundaries from Cape Cod Commission, Proposed PRB and Proposed Test Borings/Groundwater Monitoring Wells locations from WaterVision LLC and locations are approximate.

*not all test boring locations will become completed monitoring wells

Figure 3e

Sources: Aerial photography 2013-2014 and Roads from Mass GIS, Parcel Boundaries from Cape Cod Commission, Proposed PRB and Proposed Test Borings/Groundwater Monitoring Wells locations from WaterVision LLC and locations are approximate.

*not all test boring locations will become completed monitoring wells

Figure 3f

Sources: Aerial photography 2013-2014 and Roads from Mass GIS, Parcel and Subwatershed Boundaries from Cape Cod Commission, Proposed PRB and Proposed Test Borings/Groundwater Monitoring Wells locations from WaterVision LLC and locations are approximate.

*not all test boring locations will become completed monitoring wells

Table 11- PRB Project Sampling Protocols - Ground Water

Name	Description
Soil borings	Will include completion of five to six soil borings using a Geoprobe and in-situ sampling of groundwater
Field nitrate testing	Will include field testing of nitrate using a Hach colorimetric analysis at two intervals in each soil boring
Groundwater Monitoring Locations	Will include one upgradient or downgradient location and three locations along the PRB alignment plus a piezometer cluster (See Figure 3a-f)
Monitoring Equipment	Peristaltic pump with dedicated tubing or bladder or submersible pump with dedicated tubing. Cleaned 1-liter glass jar for sample collection and decanting, deionized water and Alconox for cleaning collection equipment.
Sampling Parameters	Dissolved inorganic nitrogen (ammonia, nitrite, nitrite, total N), pH, DOC, Specific Conductance, temperature, dissolved oxygen, DO, oxidation/reduction potential, sulfate, chloride, orthophosphate, dissolved iron, arsenic, manganese and boron
Sample Collection Protocol	Measure pH SC, DO, Temp, and ORP prior to purging well. Measure groundwater level and calculate well volume (including filter pack). Measure field parameters until stable and pump 3 well volumes from the well at low speed using the peristaltic pump or submersible pump. After three well volumes are pumped, fill and rinse DI cleaned glass jar and collect water for each sample. Measure pH, SC, DO, Temp, and ORP after sample collection is complete. Record pre and post field parameters, water level and purged well volume on field data sheets. Samples will be kept chilled at 4C until deliver to the laboratory courier or to the laboratory itself.
Sample Collection Protocol, stable N isotopes	After sample has been collected for other laboratory analyses, a sample will be collected into UC-Davis laboratory provided containers and kept at 4 C. Within 3 hours of collection, the sample will be frozen in a standard freezer then packed in ice or dry ice and shipped next day to UC-Davis for analysis.
Field QA/QC Samples	Duplicate field samples taken once per sampling round at each site.

6.2 Sampling SOP Modifications

The EPA Region 1 SOPs have been reviewed by WaterVision and will be used with no further anticipated changes. However, corrective action in the field may be needed if the sampling strategy needs to be modified (i.e., sampling additional sample locations other than those specified in the QAPP, not enough water sample to meet original

requirements, etc.), or when sampling procedures and/or field analytical procedures require modification, due to equipment failure or unexpected conditions. In general, the field team may identify the need for corrective action on-site.

The field staff, in consultation with the Project Manager, will evaluate and suggest a corrective action. The field team will implement the corrective action. Any modifications/corrective actions will be noted on the field data forms. The QA Officer will be notified as soon as possible and will provide the field team with any additional actions required to maintain quality assurance and control with respect to corrective actions. It will be the responsibility of the Project Manager to ensure the corrective action has been implemented correctly and reported to the project QA Officer and the EPA New England QA Officer. If any of the aforementioned QA Officers have additional actions recommended to maintain quality assurance and control they will be implemented retroactively, if possible, and for any sampling events after the event that triggered the corrective action.

6.3 Cleaning and Decontamination of Equipment / Sample Containers

Prior to use, all field sampling containers and tools will be thoroughly cleaned with a phosphorus free detergent (i.e., Alconox) and rinsed generously with distilled water. Between wells and between sites the samplers will be scrubbed and rinsed three times with distilled water. This will include Geoprobe, water level and water quality sampling equipment that comes into contact with soil and groundwater at the project site.

6.4 Field Equipment Calibration

Field equipment will be calibrated in accordance with the manufacturer calibration directions as listed below and as summarized in Table 12.

Table 12- Field Equipment Calibration Table

Equipment Name	Procedure and SOP Reference	Frequency of Calibration	Acceptance criteria	Correction action	Person Responsible
YSI 556 MPS pH	Manufacturers recommendations	Daily, prior to deployment. Post calibration at the end of the day.	+/- 0.2 units in a pH7 standard and pH 4 standard.	Recalibrate. If problem persists, ensure electrode if appropriately filled with filling solution.	Field Coordinator
YSI 556 MPS Dissolved Oxygen	Manufacturers recommendations	Daily, prior to deployment at each site. Post calibration at the end of the day.	+/- 2% of reading and < 0.5 mg/L when placed in zero dissolved oxygen solution	Recalibrate. If problem persists inspect/replace batteries, membrane and electrolyte	Field Coordinator
YSI 556 MPS Specific Conductivity	Manufacturers recommendations	Daily, prior to deployment. Post calibration at the end of the day.	+/- 5%	Recalibrate. If problem persists, replace filling solution and recalibrate.	Field Coordinator
YSI 556 MPS Temperature	Manufacturers recommendations	Daily, prior to deployment at each site.	+/- 1 degrees F	Purchase or replace with new probe	Field Coordinator
YSI 556 MPS ORP	Manufacturers recommendations	Daily, prior to deployment. Post calibration at the end of the day.	+/- 0.2%	Recalibrate. If problem persists, clean lenses, replace standard solution and recalibrate.	Field Coordinator

6.5 Field Equipment Maintenance, Testing and Inspection Requirements

Field equipment will be maintained, tested, and inspected in accordance with the manufacturer directions as listed below and as summarized in Table 13 when field equipment is not being used for field-testing. For field use refer to Table 12 above.

Table 13- Equipment maintenance schedule and instrument calibration schedule.

Equipment Name	Operation	Frequency
YSI 556 MPS		
General DO probe-	See YSI Operations Manual	
	Cleaning/Sand Electrodes	Monthly
	Replace membrane	Monthly
	Recalibrate	Monthly
pH probe	Clean w/ water and Q-tip around bulb	Monthly
	Recalibrate	Monthly
Oxidation/Reduction	Clean w/ water and Q-tip around bulb	Monthly
Temp and Conductivity	Clean/Brush fluid access ports	Monthly
	Recalibrate	Monthly
Solinst Water Level Meter	Clean w/ water	Monthly

7.0 SAMPLE HANDLING AND CUSTODY

7.1 Sample Collection Documentation

A combination of field log books, field data sheets, and a consistent labeling protocol will help ensure sample authenticity, data integrity and project completion goals.

7.2 Field Notes

The sampling team will complete field data log books and forms on-site at the time of sampling and/or when measurements are made. Field logbooks will provide the means of recording the data collecting activities performed during the investigation. As such, entries will be described in as much detail as possible so that persons going to the site could reconstruct a particular situation without reliance on memory.
The logbooks will contain the following information-

- Date / Time Arrived and Time Left
- Sampling Site ID (w/ Location and Coordinates)
- Full Names of Field Team Member
- Additional Persons Present
- Weather Conditions Throughout Visit
- General Observations
- Equipment Employed and Calibrations Measurements Made
- Photos Taken

7.3 Field Documentation Management System

In addition to the field book notes listed above, a field sheet for each sampling point will be completed (Appendix C). In addition, all laboratory samples will be accompanied by a chain-of-custody form which details-

- Name of person(s) collecting samples
- Date and time of sample
- Sample identification and analyses
- Unique bar code identification numbers that correspond to date, time, and location of each sample
- Names and signatures of all persons handling the samples in the field and in the laboratory.

All samples, whether sent for analytical analysis or frozen for later use (for all analytes other than microorganisms), are processed within 36 hours from time of sample and always maintained at temperatures of at least 4 C. The event-wide custody forms will be utilized to document holding temperature requirements so that the data users can

verify that the samples were stored at the appropriate temperature. Temperature readings will be documented by recording temperature readings from the thermostatically controlled freezer. Samples stored at the incorrect temperature will not be analyzed.

7.4 Sample Handling and Tracking System

Alpha Analytical is using a Laboratory Information Management System (LIMS) for sample tracking and associated laboratory data for the purpose of generating laboratory reports and process management information. Data are entered in this system either by direct entry or imported from instrumentation using spreadsheets. Data are combined, reduced, and formatted for management review and reporting to customers.

The database also includes functionality that logs changes to data and requires user input to document reasons for data changes. The audit log file includes date and time of change, user name, original value, new value and reason for change. Data reduction software maintains automatic log files with track calibration date/time, data files used, integration date/time, manual integration and deletion tracking information.

Procedures other than those specifically described in the QAPP for field monitoring and sample collection are outlined in specific manufactures operation and maintenance manuals (Solinst and YSI). These include procedures for field instrument calibration, and field equipment cleaning, operation and maintenance.

8.0 ANALYTIC METHODS

All laboratory analyses will be performed by Alpha Analytical with the exception of UC-Davis who will be completing stable nitrogen isotope analysis. Laboratory-specific SOPs are included in Appendix B. The analytical measurements that will be made are all based on existing standard methods (Table 10). Maximum sample holding times are listed in Appendix B.

The standard operating procedures (SOPs) for measurements made in the field are included in Appendix C.

Table 14 - Analytical Methods for Field Measurements

Analyte	Matrix	SOP Appendix	Analytical Method Description And Method Citation
Field Measurements			
Temperature	Groundwater	C	YSI 556 MPS Temperature/Conductivity/Dissolved Oxygen/pH/ORP Meter. Instrument Manual Standard Methods.
Conductivity	Groundwater	C	YSI 556 MPS Temperature/Conductivity/Dissolved Oxygen/pH/ORP Meter. Instrument Manual Standard Methods.
Dissolved Oxygen	Groundwater	C	YSI 556 MPS Temperature/Conductivity/Dissolved Oxygen/pH/ORP Meter. Instrument Manual Standard Methods.
pH	Groundwater	C	YSI 556 MPS Temperature/Conductivity/Dissolved Oxygen/pH/ORP Meter. Instrument Manual Standard Methods.
ORP	Groundwater	C	YSI 556 MPS Temperature/Conductivity/Dissolved Oxygen/pH/ORP Meter. Instrument Manual Standard Methods.

9.0 QUALITY CONTROL

Additional field QA/QC samples are submitted along with selected sampling sets to provide independent information on the accuracy and precision of field sampling results. Equipment-rinsed blanks will be submitted with selected sampling sets and consist of distilled water passed through all conventional sampling equipment and into a sample bottle for analysis for nitrate/nitrite and in the field for all field parameters.

Two sub-samples of the same sample are collected in separate containers. The results from duplicate analyses are used to evaluate analytical or measurement precision. The duplicate sample is processed and analyzed in the identical manner as routine samples.

10.0 DOCUMENTATION, RECORDS, AND DATA MANAGEMENT

10.1 Project Documentation and Records

The PRB project team will make daily field notes depicting the conditions at the field location where each sample is taken and other relevant information including as listed in Section 8.2. In addition laboratory reports, well installation logs, and slug test results will be scanned into electronic format and kept in a Google Drive as well as in the USEPA SharePoint for the project. Hard copies will be kept in a project file at the WaterVision LLC office in Portsmouth, NH. The data will be reviewed by the QC manager, then filed and saved for at least five years after project completion.

10.2 Field Analysis Data Package Deliverables

Field analytical measurements will be generated on-site. Measurements will be recorded on field data sheets and then transferred to an electronic spreadsheet (MS Excel) that is a part of the project-specific electronic database system. Entries into the spreadsheet will be compared against the field sheets by a second person as a quality check before it is appended to the project database.

10.3 Data Handling and Management

Alpha Analytical will provide results of laboratory analyses in a digital format. As appropriate, the project geologist will transfer received digital data into Excel Spreadsheets where all relevant graphs and calculations are to be made for each sampling event. Laboratory results from University of California may be received in printed format and will be manually entered into the project spreadsheet. All results are checked for quality control prior to data analysis and/or reporting by the WV project manager and QA officer. A copy of the original records will be archived at WaterVision and backup copies of all electronic files will be made monthly and stored in three separate locations.

11.0 ASSESSMENTS AND RESPONSE ACTIONS

The WV QA Officer is responsible for evaluating the field data, calculations, and laboratory analyses throughout the project. Specifically, this includes the initial training of field and monitoring protocols for the project. QA Officer Emily DiFranco will be responsible for reviewing materials and for observing procedures to determine proper sampling and analysis is undertaken. Unanticipated problems with the procedures will be addressed to avoid difficulties during subsequent sampling efforts.

EPA may implement, at their discretion, various audits or reviews of this project to assess conformance and compliance to the quality assurance project plan.

12.0 PROJECT REPORTS

Progress reports and a final report will be prepared by the project manager and submitted to EPA as listed in the scope of work.

13.0 VERIFICATION AND VALIDATION REQUIREMENTS

Danna Truslow and Emily DiFranco will conduct review of all data generated by this project. The completeness, transcription errors, and compliance with procedures are evaluated by comparison of tabulated results to what has been proposed in the original project proposal and this QAPP. The specific activities include the generation of data, namely, well installation and testing and water quality sampling and analysis. Omissions of data in spreadsheets will trigger a search of raw datasheets, equipment maintenance, or re-sampling and re-analysis. If re-analysis is not possible or if data remain missing, invalid or otherwise affected entries will not be incorporated into the useable data sets.

When results appear to be abnormal, all appropriate project participants will review the available data and discuss the problem in periodic meetings to attempt to identify potential problems in sampling or analysis. Any abnormal results will also be presented and analyzed in the final project report.

14.0 VERIFICATION AND VALIDATION METHODS

The process by which data is verified involves one or more of the following-

1. The project QA officer will verify proper sample preservation and handling for completeness and consistency.
2. At the end of each field session, the QA officer will evaluate whether the data quality objectives of this plan are being met.
3. If discrepancies cannot be resolved, appropriate measures will be taken. These measures could include but are not limited to-
    1. Rejection and exclusion of data from reports with an explanation.
    2. Re-sampling the appropriate station.
    3. Repeat WQ analysis of samples.

15.0 DATA USABILITY/RECONCILIATION WITH PROJECT QUALITY OBJECTIVES

Data is generated based on the quality objectives defined in this plan and verified according to Section 14. Limitations in the data will be clearly defined for potential end users in all reports produced.

References

CCC, 2015. 208 Plan, Cape Cod Area Wide Water Quality Management Plan Update. Cape Cod Commission, Barnstable, Massachusetts. June 2015.

MassDEP, 2007. West Falmouth Harbor Embayment System Total Maximum Daily Loads for Total Nitrogen. Massachusetts Department of Environmental Protection. Report #95-TMDL-1 (Control #243.0), November 2007.

Appendix A

Cape Cod Permeable Reactive Barrier Project

Project Solicitation Letter to Towns

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 1
5 Post Office Square, Suite 100
Boston, MA 02109-3912

June 1, 2015

Dear Cape Cod Communities in Buzzards Bay and the South Coast:

EPA Region 1 would like to make you aware of a new and exciting opportunity to work with EPA and its partners to perform hydrogeological site characterizations. The objective of these site characterizations is for the design of Permeable Reactive Barriers (PRBs) as pilot technologies for reducing the concentration of nitrogen (N) compounds in groundwater. As part of its Southeast New England Program (SNEP), EPA Region 1 will partner with the United States Geological Survey (USGS) and the Cape Cod Commission (CCC) to:

- Help identify suitable locations for PRB nitrogen removal pilots,
- Fully characterize one or more sites to support PRB design, and
- Provide an example of the type of site characterization work necessary for a successful PRB installation.

EPA is undertaking this work directly because of EPA's strong interest in supporting MA Department of Environmental Protection's Cape Cod TMDLs for total nitrogen and the Clean Water Act section 208 water quality plan update developed by the CCC. EPA intends to take the lessons learned from this project to help demonstrate and encourage the priorities set forth by the Southeast New England Program. These priorities include the application of innovative technologies and the reduction of nitrogen pollution throughout southeast New England.

Project Description

Selected municipalities in southern and western Cape Cod are invited to propose sites for hydrogeological site characterizations in support of PRBs as pilot technologies by responding to this solicitation letter. Interested municipalities should refer to information at the bottom of this letter on applying. Pre-application technical assistance is available to assist municipalities with site nominations, as described below.

Once replies are received, a technical team consisting of EPA Region 1, the CCC, and the USGS, will review responses and begin to identify sites that appear to be suitable locations for PRB nitrogen reduction pilot tests. EPA will select sites with input from the technical team. At sites selected through this process, EPA and its partners will perform an Initial Site Characterization that is expected to include: the installation of monitoring wells (and associated elevation surveys); measurements of depth to groundwater; preliminary identification of low hydraulic-conductivity layers in the potential treatment zone; identification of the presence and depth of saltwater interface; the collection and lab analysis of groundwater samples for water-quality constituents; and evaluation of preliminary field and lab data. If a site selected for an Initial Site Characterization has already had some level of site characterization work done, additional data collected at this stage will be used to augment existing data.

Data from the Initial Site Characterizations will then be evaluated for selection of one or more sites for a full-scale hydrogeological assessment that will fill in data gaps and support needs for PRB design. This full-scale assessment will more fully characterize each site and will provide additional data to support

PRB design. Additional details will vary based on the site's characteristics, but the full-scale hydrogeological assessment may include: measurement of horizontal and vertical hydraulic gradients; location of freshwater aquifer boundaries and saltwater interface; determination of hydraulic conductivity, lithologic variability and estimation of groundwater flow rate in the potential treatment zone; concentrations of nitrogen and other water-quality constituents; and installation of additional up- and down-gradient monitoring wells and potentially site specific/regional groundwater modeling for PRB design.

EPA anticipates that initial site characterizations and full-scale hydrogeological assessments will be on municipal, state or federal lots/parcels or easements. Once the full-scale hydrogeological assessment has been completed, a final site report will be generated based on interpretations of field, lab and modeling data. This report may then be used by the municipality as the basis for a pilot PRB at the characterized site.

EPA anticipates entering into a Memorandum of Understanding (MOU) with the selected municipality to work cooperatively to monitor the success of the project, develop an operation and maintenance protocol and schedule (if appropriate), and educate the public and other municipal officials throughout the Cape and from other cities and towns. We anticipate that the entire length of the characterization project for a site that proceeds to a full-scale hydrogeological assessment will be approximately 12 months.

Selection Criteria

The primary factor in selecting sites will be based on a review of the apparent technical feasibility of constructing an effective PRB onsite. EPA may also consider geographic location as a selection criterion in order to ensure regional distribution of SNEP funds. The technical team will make recommendations for site selection to EPA based on the following criteria:

- Favorable watershed condition
    - Areas with high rates of N loading to estuary
    - Areas with proximal dense up-gradient N sources (minimizes uncertainties about origin of N load to be treated)
    - Areas proximal to affected water bodies (minimizes speed of estuarine water-quality improvement)
- Favorable hydrogeological conditions
- Areas that have some level of previous hydrogeologic investigation
    - Areas with shallow groundwater (in order to minimize cost)
    - Areas with high groundwater flow rates associated with either steep hydraulic gradients or higher hydraulic conductivities
    - Areas with geologic characteristics that are representative of southern New England
    - Areas with less than a 50 feet thick saturated potential treatment zone
- Prioritize areas with access
    - Town-owned land
    - Open areas away from structures
    - Road, electric or rail rights-of-way (perpendicular to groundwater flow)
- Prioritize areas that avoid permitting issues (e.g. wetlands)

Communities eligible to apply

Although the Southeast New England Program (SNEP) covers Southern Cape Cod to Pleasant Bay and includes the Islands, for this project EPA plans to partner with a subset of municipalities located

specifically on Cape Cod[1]. Eligible municipalities are those with watersheds that have a hydrological connection (via surface water or groundwater) to either Buzzards Bay or the south coast of Cape Cod. Proposed sites must be located within eligible watersheds that drain to one of these areas. Eligible watersheds are all located east of the Cape Cod Canal and south of Route 6. Municipalities with watersheds in these areas include: a portion of Bourne, Falmouth, a portion of Sandwich, Mashpee, Barnstable, Yarmouth, Dennis, Harwich, and Chatham. Funding constraints, SNEP priorities, and the fact that EPA is supporting the section 208 wastewater management plan necessitate this focus.

How to apply to this solicitation

We are inviting municipalities that are interested in the installation of a PRB for N removal to propose sites for this project. If you are interested, please submit a brief statement of interest (no more than 1-3 pages, exclusive of maps and figures) to Marcel Belaval (belaval.marcel@epa.gov) and Karen Simpson (Simpson.karen@epa.gov) **no later than COB July 1, 2015**. This statement should include the following:

Component	Required	If available
Site must be within the geographic area for eligible communities (Visit the PRB Project Siting Viewer to determine whether or not your site is within this area)	X	
Identify the lot (or portion thereof) easement and/or parcel number, including a point of contact for the property, a street address and/or other information useful to identifying the location (e.g. utility pole #). Describe the site, including the size, and justification for why you selected the site. (Note: the proposed site should not be located on or near soils contaminated or potentially contaminated with oil or hazardous waste.)	X	
Specify your community's interest in this project, willingness to enter into an MOU with EPA, and participate and facilitate in project planning and coordination (as appropriate)	X	
Specify how soon site characterization work could begin	X	
Describe any support or in-kind services your community is willing to provide (Note: there is no match requirement)	X	
Include the name, email, and phone number of a municipal point of contact. If the project is selected, this person will need to be the lead on this project and be willing and able to work with EPA	X	
Verify your willingness to show other municipalities the site and data for the duration of the project and beyond, should a pilot PRB be constructed on the site	X	
Identify where a PRB could be located within the project area , and identify the proposed characterization area		X
Describe the site history and any known prior uses		X
Include existing site-specific hydrogeologic and water-quality information (e.g. nitrogen concentrations, groundwater contours, depth to groundwater, approximate aquifer thickness or target) saturated zone, groundwater travel time, availability of existing borings, monitoring wells, assessments)		X

[1] For a visual representation of eligible municipalities, be sure to turn on the "South-facing Embayments" GIS layer of the PRB Project Siting Viewer which is located at: http://gis-services.capecodcommission.org/apps/JS_Developing/prb/viewer.html

Describe the expected potential for groundwater nitrogen reduction utilizing a PRB; include supporting information used to create this estimate such as estimated PRB size, influent N loads, etc.		X
Describe the location of the lot in relation to nearby water bodies; also include whether those water bodies are impaired (listed under Class 4a or 5 of the MA Integrated List of Waters) or are adversely affected by excessive nitrogen loading (for information on impaired waters, please visit the following link: http://www.mass.gov/eea/agencies/massdep/water/watersheds/total-maximum-daily-loads-tmdls.html)		X
Photos or site plans		X

The technical team will review all submittals and may conduct site visits and/or interviews prior to making a selection. After submissions have been received, the technical team may schedule a visit for the most promising sites to better understand the site and/or collect additional information that may help us in reviewing proposals. EPA will select sites for characterization work with input from the technical team. EPA expects to notify communities within a few weeks once EPA has made its selections. If selected, the municipality will need to provide EPA and its contractor(s) access to the site (via an access agreement) for the length of the project.

Pre-application technical assistance is available for municipalities to assist with responding to this solicitation. CCC has made geographic and hydrologic data available online at: http://gis-services.capecodcommission.org/apps/JS_Developing/prb/viewer.html. In addition, the Watershed Multi-Variant Planner, which can be found at www.watershedmvp.org, may assist you in compiling and assessing data for nominating sites in your town.

Finally, **EPA Region 1, the CCC, and the USGS will hold an open information session for all interested applicants on June 10th at 11:00 AM in the Innovation Room on the Barnstable County Campus** to provide additional information to municipalities interested in responding. To RSVP for this information session, and/or for additional questions or assistance, please contact Marcel Belaval at (617) 918-1239 or Belaval.marcel@epa.gov, or Karen Simpson at (617) 918-1672 or Simpson.karen@epa.gov.

Thank you for your interest in this matter. Please pass this along to community stakeholders who may be interested and eligible. We look forward to hearing from you.

Johanna M. Hunter
Chief, Watershed & Non-Point Source Unit
Office of Ecosystem Protection
US EPA Region 1
5 Post Office Square, Suite 100, Mail Code: OEP06-01
Boston, MA 02109-3912
(617) 918-1041

Appendix B

Cape Cod Permeable Reactive Barrier Project
Laboratory – Standard Operating Procedures

Alpha Analytical, Inc.
University of California Davis – Stable Isotope Laboratory

Sample Custody and Tracking

1. Scope and Application

This procedure is used by the laboratory staff to track sample containers throughout the Laboratory using the Laboratory Management Information System (LIMS). This procedure is critical to ensure full sample container traceability.

2. Summary of Process

Sample containers are stored in predetermined refrigerators, freezers, or shelving units located in the Custody Room and in certain areas of the Laboratory. Utilizing the LIMS, sample containers may be transferred to an Individual's Department, back to Custody, or to Sample Archive. The temperatures of the refrigerators and freezers are checked and recorded on a daily basis to ensure that temperatures are being maintained.

3. Safety

The toxicity or carcinogenicity of each reagent used in this method is not fully established; however, each sample should be treated as a potential health hazard. From this viewpoint, exposure must be reduced to the lowest possible level by whatever means available. A reference file of material data handling sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices, otherwise known as universal precautions, for handling known disease causative agents.

4. Equipment and Supplies

4.1 Refrigerators

4.2 Thermometers and Vials with DI H2O

4.3 Freezers

4.4 Computer with LIMS access

4.5 Infrared Barcode Scanner

4.6 Carts

4.7 VOA Racks

4.8 Data Logger

5. Procedure

5.1 Sample Transfer from Login to Custody

5.1.1 Upon completion of sample Log-in (Sample Receipt and Log-In 1559), the sample containers are designated in the LIMS as being located in "Custody". Containers logged in Mansfield will reflect a location designation beginning with "A2-".

5.1.2 All samples are scanned to a specific custody location, and placed in the appropriate freezers or refrigerators by the Login Staff.

5.1.3 Transfer of samples to Laboratory Custody.

5.1.3.1 Any sample container that is being stored in Custody Room or a Laboratory location must be scanned to a specific Custody location. Refer to section 5.3 for scanning procedure.

Example#1: If Voa vials are received, because these vials are located in the Voa Laboratory they must be scanned from "CUSTODY" out to "VOA CUSTODY" prior to putting the samples away in the Voa Fridges.

Example#2: Any soil jar received that is to be stored in the soil fridges must be scanned to "SOIL CUSTODY".

Example#3: Any water sample for wetchem analysis that is to be stored in the Wet Chemistry fridges must be scanned to "WETCHEM CUSTODY". (see exceptions 5.2.1.2.1)

5.2 Sample Storage

Sample containers are stored in specific freezers, refrigerators, or shelving units within the Custody Room and also in some Laboratory areas. Refer to Table I for Sample Placement / Custody Locations –Westboro.

5.2.1 Aqueous Samples

5.2.1.1 Wet Chemistry

Westboro: Samples for Wet Chemistry analyses are to be scanned to "WETCHEM CUSTODY" and placed in the designated Wet Chemistry refrigerators located in the Custody Room. The shelves within these refrigerators are ordered numerically in ascending order based on the Alpha Analytical Job number.

Mansfield: Samples are placed numerically into a refrigerator in Sample Management.

5.2.1.1.1 Exceptions

Samples to be analyzed for TOC, DOC, OG-1664, TPH-1664 and MCP compliant Hexavalent Chromium have their own separate refrigerators and the shelves are labeled according to the analysis.

5.2.1.2 Metals

Westboro: Samples for Metals analysis are to scanned to "METPREP CUSTODY", and placed on the designated Metals Shelves within the Metals Prep Laboratory and are not refrigerated. These shelves are numbered 0 – 9. These numbers correspond to the last number of the Alpha Job #. Samples should be placed on these shelves in ascending order.

e.g. If the job number is L1401234. x , these samples are placed on Shelf #4.

Mansfield: For the Mansfield facility, samples are placed on the metals shelf in Sample Management.

5.2.1.3 Semi-Volatiles

Westboro: Samples for Semi-Volatile analysis are to be scanned to "OPREP CUSTODY" and placed in the designated Organic Prep refrigerators located in the Organic Prep Laboratory. The shelves within these refrigerators are ordered numerically in ascending order based on the Alpha Analytical Job number.

5.2.1.3.1 Exceptions

Samples to be analyzed for Perchlorates, and EDB/DBCP by 504 or 8011 Methods have their own separate refrigerator and the shelves are labeled according to the analysis. This fridge is located in the Organics Laboratory.

Mansfield: For the Mansfield facility, samples are placed numerically into a refrigerator in Sample Management.

5.2.1.4 Volatiles

Westboro: The VOA vials for Volatiles analysis are to be scanned to "VOA CUSTODY" and placed in numerical order in the appropriately labeled refrigerators. Areas of these refrigerators are further separated by analysis and matrix. For instance there are Soil-8260, Water-8260, Soil-VPH/GRO, Water-VPH/GRO, and Water-624/524 sections. These are further broken down into "A" and "B" sections which should always be stored in separate refrigerators to reduce contamination risk. Into the refrigerator labeled "A" place the first VOA vial of the sample set. Accordingly, into the refrigerator labeled "B", place the second and any subsequent VOA vials of the sample set. All of these refrigerators are located in the Volatiles Laboratory.

Mansfield: For the Mansfield facility, samples are placed into a refrigerator in Volatiles department.

5.2.2 Soil/Solids/Sludges/Oil & Wipe Samples

Westboro: Soil/Solid/Sludges/Oil & Wipe samples are to be scanned to "SOIL CUSTODY" and are placed in the designated Soil Custody refrigerators located in the Custody Room. The shelves within these refrigerators are ordered numerically in ascending order based on the Alpha Analytical Job number. All Sludges and Oil samples should be bagged prior to placing in these fridges.

Mansfield: For the Mansfield facility, samples are placed numerically into a refrigerator in Sample Management.

5.2.2.1 Exceptions:

Westboro:

Unpreserved Large Soil Vials are stored in a separate section of these voa fridges. They are separated into sections labeled 0-9, and these sections

correspond to the last number of the Alpha Job#. They are then further broken down and stored in numerical, ascending order by Alpha Job#.

Encores and DI preserved Low Level Soil Vials are scanned using the "Freezer" button in the Transaction window and stored separately in appropriately labeled freezers. DI preserved Low Vials are always stored laying in a horizontal position initially to ensure that they do no break during freezing.

Voa Vials for Oils, Product, or any voa sample with strong odors should be bagged, scanned to "COURIER FRIDGE CUSTODY" and placed in the door of the Subcontract/Courier refrigerator located in Login Room#2.

Mansfield: For the Mansfield facility, samples are placed numerically into a freezer in Volatiles department.

5.2.3 Subcontracted Samples

Samples to be subcontracted to another Laboratory for analysis are to be scanned to "TRANSFER-SUB" and placed in the designated Subcontract/Courier refrigerator located in Login Room#2. Shelves in this refrigerator are labeled as "Courier", "Shipping", and "Mansfield". Samples should be placed on each shelf based upon shipment method and destination.

5.2.4 Extended Long Term Sample Storage

Westboro: Samples which the Client doesn't want the requested analyses performed until further notice, are stored together with the rest of the Alpha Job# in the appropriate refrigerators. Samples that the client has indicated need extended storage are stored in ambient temperatures on shelving units in Login Room#2.

If a client has requested refrigerated storage, sample containers are scanned to one of the refrigerators specified for long term storage located in the Login Room #2. Voc's which need extended refrigerated storage are stored in a separate HOLD refrigerator located in Login Room#2. All soil vials preserved with reagent water or Encores must be stored in the freezer with the ID F-14.

Mansfield: All samples rec'd on hold in the Mansfield facility are placed into refrigerators/freezers as indicated above for soils/waters.

5.2.5 Air Samples

Whole air samples for volatile analysis are brought directly to the Air Laboratory, located at our Mansfield Facility. These samples are kept at room temperature. Tedlar bags are placed in a covered box or in a dark trash bag, without exposure to light. Samples collected using sorbent media should be stored according to method requirements, and locations are defined by the department conducting the analysis.

5.2.6 Sample Filtrates

Samples filtered in the Laboratory are assigned a new container ID and Label from the LIMS. Sample filtrates are collected in containers appropriate for the analysis requested, and labeled appropriately.

5.2.7 Sample Extracts

5.2.7.1 TCLP Samples

Samples extracted for TCLP analysis are collected in appropriate containers, and are assigned a new container ID and label from the LIMS. The containers have their own separate refrigerator. This fridge is located in the Organics Laboratory.

Exception: Metals extracts are collected in containers appropriate for the analysis requested and labeled appropriately. These extracts are stored in the Metals Prep Laboratory on the appropriate shelves.

5.2.7.2 Organic Samples

Organic sample extracts are transferred to autosampler vials, hand-numbered and stored in refrigerators/freezers located within the analytical laboratory areas. Transfer of the extracts from the Organic Prep Department to the appropriate Analytical Department is recorded in the Prep logbooks.

5.2.7.3 Metals Samples

Metals sample extracts are hand-numbered and stored in the Metals Analytical Laboratory area. Transfer of the extracts from the Metals Prep Department to the Metals Analytical Department is recorded in the Prep logbooks.

5.3 Sample Transfer from Custody to Individual

The LIMS is utilized to transfer a sample container out of the Custody Room.

5.3.1 Using the computer located within the Custody Room, access the LIMS, by clicking on the “Seedpak LIMS” icon located on the Windows desktop screen.

5.3.2 A password screen will open. Type in the Username (CUSTODY) and Password (CUSTODY) and Database (BOWZER). Then click on <Connect> to the Bowzer database.

5.3.3 The main screen will open. From the Main Menu, select <Containers>, and then select <Transfer>. This will open the Container Transaction screen.

Type in the appropriate Username (Each staff member is given a Username from the IT Department to enable access the LIMS) in CAPITAL letters.

5.3.4 Select the appropriate department from the pull down menu where the analysis will be performed or, if returning a sample to Custody, the location the container will be stored:

- Courier Fridge Custody
- Custody
- Dead Room
- Disposal
- Freezer
- F-14 CUSTODY
- F-19 CUSTODY
- F-20 CUSTODY
- GC
- GC/MS
- Login
- Login #2 Custody
- Metals Analysis

- Metals Dead Custody
- Metals Prep
- Metprep Custody
- Organic Prep
- Oprep Custody
- QA Fridge Custody
- R-15 CUSTODY
- R-25 CUSTODY
- R-26 CUSTODY
- R-34 CUSTODY
- R-46 CUSTODY
- R-48 CUSTODY
- R-55 CUSTODY
- R-56 CUSTODY
- Relog
- Return to Client
- Soil Custody
- Transfer-Mansfield
- Transfer-Sub
- Transfer-Westboro
- Voa Custody
- Voa Dead Fridge Custody
- Wet Chemistry
- Wetchem Custody

5.3.5 Click the <Check Out> button.

5.3.6 Scan the barcoded sticker on each sample container to be removed from the Custody Room.

5.3.7 When scanning is complete, click the <Done/Save> button.

5.3.8 Samples are now in the analyst's custody from that department. Samples may be shared with other analysts within this department but must be checked back in to custody by the same department that scanned the sample out of Custody. The LIMS recognizes the location of the sample container(s) has been changed from Custody to the selected Department.

Any samples scanned to a specific Laboratory's Custody location, (ie.. VOA CUSTODY) are to be stored in that location until needed for analysis. At this time the samples should be scanned out to an individual's custody prior to analysis.

5.4 Sample Transfer from Individual to Custody

Once the chemist no longer requires the sample containers, they are returned to the original Custody location that they were taken out of by using the LIMS (as per Sections 5.3.1 – Section 5.3.4).

5.4.1 Click the <Check In> Button.

5.4.2 Choose the appropriate Custody location from the pull down menu located next to the word "CUSTODY". (ie. SOIL CUSTODY)

5.4.3 Scan the barcoded sticker on each sample container to be returned to the Custody Location.

5.4.3.1 If a sample container is empty then it is returned as such. In the Status column, change "Intact" for that particular sample container to "Empty". (Follow RCRA guidelines to determine if container is empty.)

5.4.4 When scanning is complete, click the <Done/Save> button.

5.4.5 The LIMS recognizes the location of the sample container(s) has been changed from the Individual back to a Custody Location.

5.4.6 Sample containers are returned to the appropriate refrigerator, freezer or shelf. (See Table I). Empty containers are placed in a trash receptacle.

5.4.6.1 Exceptions: Bacteria sample containers and TOC vials utilized for sample analysis are placed into respective bins and shelves stored in the Custody Room, and are not refrigerated upon completion of analyses.

5.5 Sample Transfer from Custody to Archive (Dead Room)

After a job is complete and a final report has been sent to the Client, all sample containers are transferred from Custody to the Dead Room.

If the job has not yet been invoiced/reported to the Client, a window will pop up that says "Job has not been invoiced, containers may still be needed by chemists." Click <Reject> button and return samples to appropriate custody refrigerator.

If samples need to be held for extended long term storage, or containers returned to the Client, a window will pop up that says "STOP SCANNING. Disposal question answered with an N." These containers are separated from the rest of the samples so they can be assessed by the Sample Custody staff. They will then be put on the specified shelves or refrigerators for long term storage, or returned to the client. Refer to section (5.2.4).

5.6 Refrigerators and Freezers

The Industrial refrigerators undergo semiannual preventative maintenance/cleaning by an outside vendor to ensure peak performance. If a refrigerator is ever taken out of use and/or requires repairs this information is documented in the Refrigerator Maintenance Logbook located in the Login Department. For the Mansfield facility, any maintenance/issues with the refrigerators are listed on the daily temperature tracking sheet in the comment section.

5.6.1 Temperature Check

Each refrigerator or freezer contains a thermometer or thermocouple for the datalogger. The temperature is checked and recorded on a daily basis to ensure the appropriate temperature. The refrigerators must be at a temperature of $\leq$ 6 degrees Celsius, but $\geq$ 2 degrees Celsius. The temperature is still within acceptable criteria if it drops below 2° and the samples are not frozen. The freezer must be at a temperature of less than -7 degrees Celsius but greater than -20 degrees Celsius. Periodic adjustment to temperature controls are made as necessary.

5.6.1.1 Data Logger – Westboro and Mansfield

The majority of the freezers and refrigerators are connected to the Data Logger by a numbered thermocouple.

Refer to Form No.: 08-104 for a Westboro listing of refrigerators and freezers and the corresponding datalogger input number.

Refer to Form No.: 108-27 for a Mansfield listing of refrigerators and freezers and the corresponding datalogger input number.

The Data Logger is programmed to continuously record the temperature of each refrigerator or freezer. The temperatures recorded from the Data Logger are verified once each day by a Login/Custody Staff member to ensure that temperatures are within acceptance criteria. See Data Logger Operation SOP document #1747.

5.6.1.2 Manual Temperature Check

Westboro
All freezers and Refrigerators in the Westboro facility are connected to the Data Logger. In the case of a new refrigerator/freezer being installed, or issues with the Data Logger, then they would be manually checked on a daily basis by a representative of the department where the fridge is located and recorded in the Refrigerator/Freezer Temperature Logbook (Form No.: 08-05), to ensure that temperatures are within acceptance criteria. Refer to Work Instruction #14006 on instruction on how to use Min/Max Thermometers and record temperatures manually.

Mansfield
Refrigerators or freezers not connected to the Data Logger are manually checked on a daily basis and the temperature recorded on temperature sheets, to ensure that temperatures are within acceptance criteria.

6. Quality Control and Operational Assessment

6.1 Calibration

6.1.1 Thermometers

The thermometers in each refrigerator or freezer are calibrated prior to use and on an annual basis by the QA Department. Records are maintained on file by the QA Department.

6.1.2 Data Logger

The Data Logger is calibrated by an outside vendor. See Data Logger Operation SOP document #1747.

7. Corrective Actions

7.1 Broken Sample Containers

If at any time a sample container is broken, a Login/Custody Staff member must be notified immediately. The Login/Custody Staff member changes the container status in the LIMS from “Intact” to “Broken” and determines whether the entire sample has been compromised or if any can be saved.

7.1.1 Refer to Cleanup and Disposal of Broken Samples (2691).

7.2 Improper Temperature

If any of the refrigerators or freezer are above or below the required temperature (Section 5.7.1), the doors are checked to ensure they are closed properly. The temperature is checked again within three hours. It is necessary to determine if there is a real problem with the equipment or if doors were recently opened by chemists retrieving or returning samples. If it is determined that there is a problem with the refrigerator or freezer then all samples must be removed from that refrigerator or freezer and placed in another appropriate refrigerator or freezer. This ensures that the integrity of the samples is maintained. An outside vendor is contacted for service.

8. Attachments

Table I: Sample Placement / Custody Locations – Westboro

TABLE I: SAMPLE PLACEMENT / CUSTODY LOCATIONS - Westboro

(VOA CUSTODY) Volatile Laboratory (R-20A, R-23, R-24, R-41, R-49)

8260	VPH-standard & deluxe
624	TPH-GRO
524.2	THM-524.2
8021	TCLP/SPLP-8260

(VOA DEAD CUSTODY) Volatile Laboratory (R-15 & R-20B)

All Voa Vials that have been utilized for sample analysis.

(OPREP CUSTODY) Organic Prep Laboratory (water/liquids) (R-16 & R-27)

8082	625	Phthalates
8081	8270	TPH-8100
608	AEXT	HERB
BNEXT	ETPH	PAH
TPH-DRO	EPH-standard & deluxe	

(R-46 Custody) Organics Laboratory	**(R-47 CUSTODY) Organics Laboratory**
Perc-8330	Organic TCLP Extracts
PERC-332	
504 Vials	
8011 Vials	

(WETCHEM CUSTODY) Custody Room (R-30,R-33,R-37,R38 & R-39)

Water and Liquid samples only.

(R-56 CUSTODY) Custody Room	**(R-34 CUSTODY) Wetchem Laboratory**
TOC Vials	OG-1664
DOC Vials	TPH-1664
Hexcr Soils	

(SOIL CUSTODY) Custody Room (R-28,R-32,R-40, R-48, R-51,R-53,R-54,R-55, R-61)

Includes all soils, sludges, solid materials, oils, wipes, unknown liquids, mixed liquids, solvents, etc. Sludges and Oils must be placed into a ziploc bags.

TABLE I: SAMPLE PLACEMENT / CUSTODY LOCATIONS – Westboro (cont.)

(METPREP CUSTODY) Metals Prep Laboratory (Shelving Units)

Total Metals

Soluble Metals

TCLP Metals (pre-extracted Liquid TCLP)

SPLP Metals (pre-extracted Liquid SPLP)

(METALS DEAD CUSTODY) Custody Room (Shelving Units)

All water and Liquid samples that have been utilized for sample analysis.

(FREEZER) Volatiles Laboratory (F-11 & F-15)

8260 Reagent Water vials

5g/25g Encores

VOA HOLD FREEZER (F-14) Custody Rm

8260 Reagent Water Vials (hold)

5g/25g Encores (hold)

(R-15, R-25, & R-26 CUSTODY) Custody Room (Refrigerated long term sample storage)

All samples that client's have requested be held chilled

for longer than the 21 Day standard disposal period.

(LOGIN #2 CUSTODY and LOGIN #3 CUSTODY) Shelving

All samples requiring extended storage
at ambient temperatures.

VOC Hold Refrigerator –Login #2 (R-15)

All VOCs requiring extended refrigerated storage, with the
Exception of DI H2O preserved Vials and Encores.

VOA HOLD FREEZER (F-14) Custody Room

8260 Reagent Water Vials and 5g/25g Encores requiring extended storage.

Hot Block Digestion

For Aqueous Samples

Reference Methods: **EPA 200.7,** Code of Federal Regulations 40, Part 141 and Part 136, Revision 4.4, May 1994; **EPA 200.8,** Environmental Monitoring Systems Laboratory Office of Research and Development U.S. EPA Cincinnati, OH Rev 5.4; **Method 3005A,** SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA SW-846, Update I, 1992. **EPA 6010B,** SM2340B, Hardness by Calculation, Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF, 18th Edition. 1992; Method **6020** Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA SW-846 Draft Update UVA, May 1998.

1. Scope and Application

Matrices: This method is appropriate for the digestion of all influents, effluents, surface waters, monitoring wells, liquids, drinking waters, furnace metals and soluble metals.

Definitions: See Alpha Laboratories Quality Manual Appendix A.

The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one of the following laboratory personnel before performing the modification: Area Supervisor, Metals Manager, Laboratory Services Manager, Laboratory Director, or Quality Assurance Officer.

This method is restricted to use by or under the supervision of trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

2. Summary of Method

Aqueous samples and appropriate QC samples are poured into 50mL digestion cups. Acid is added to the cup and the samples are reduced at 90-95 °C. The samples are then brought up to a final volume of 50mL, and are ready for analysis by ICP or ICP-MS.

2.1 Method Modifications from Reference

Using 50mL for sample volume and final volume, not 100mL.

3. Reporting Limits

Reporting Limit information may be found in the analytical method SOPs.

4. Interferences

Potential interferences that may be encountered during analysis are discussed in the individual analytical methods.

5. Health and Safety

The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material data handling sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents. This includes wearing personal protective equipment such as a lab coat, safety glasses, gloves and respirator (as necessary).

6. Sample Collection, Preservation, Shipping and Handling

6.1 Sample Collection

Samples are collected in plastic bottles.

6.2 Sample Preservation

If samples are for soluble metals analysis, filtration must take place prior to preservation with 1:1 HNO_3 to a pH < 2. Soluble samples must be held at pH < 2 for at least 24 hours prior to digestion if not preserved at the time of filtration.

Samples for total metals analysis are preserved with 1:1 HNO_3 to a pH < 2. Non-potable water samples must be held at pH <2 for at least 24 hours prior to digestion if not preserved at the time of collection.

6.3 Sample Shipping

No special shipping requirements.

6.4 Sample Handling

Samples are stored at room temperature. Samples for soluble metals analysis should be filtered and preserved within 24 hours of collection.

6.4.1 Sample Filtration for soluble metals: Obtain a 250mL plastic bottle for each sample to be filtered plus one for the filter blank. Put preprinted labels on each bottle and place in glass jars of filtration apparatus. Screw caps on and attach filter funnel. Pour desired amount of sample into filter funnel and turn vacuum on. Filter blank uses DI water. Preserve samples and blank with 1:1HNO3 to a pH<2. Record in Sample Handling logbook.

7. Equipment and Supplies

7.1 Hot Block Apparatus: Calibrated annually by outside vendor to maintain sample temperature of 95°C.

7.2 Digestion cups: 50mL volume, polypropylene

7.3 Watch Glass: Polypropylene to cover the digestion cups during digestion.

7.4 Threaded Caps: To cover digestate following digestion

7.5 Volumetric Glassware: Various sizes of class A volumetric flasks and pipets, as needed

7.6 Whatman 41 Filters

7.7 pH Indicator Strips

7.8 Vacuum Filtration Apparatus: For filtering samples for soluble metals

7.9 0.45um Filter Funnel: 100mL volume

7.10 250mL plastic bottles

8. Reagents and Standards

8.1 Analytical Standards: All standards shall be prepared according to the appropriate method of analysis.

8.2 Trace Nitric Acid ($tHNO_3$)

8.2.1 Trace-grade $tHNO_3$: Store at room temperature in hood. Manufacturer's recommend expiration, if none then no expiration.

8.2.2 1:1$tHNO_3$: 500mL $tHNO_3$ diluted to 1 liter with DI water. Store at room temperature in hood. Manufacturer's recommend expiration, if none then no expiration.

8.3 Trace Hydrochloric Acid (tHCl)

8.3.1 Trace-grade tHCl: Store at room temperature in hood. Manufacturer's recommend expiration, if none then no expiration.

8.4 1:1tHCl: 500mL tHCl diluted to 1 liter with DI water. Store at room temperature in hood. Manufacturer's recommend expiration, if none then no expiration.

8.5 Deionized Water (DI)

8.6 Standard Spiking Solutions

Store at room temperature. Standards expire upon manufacturer's specified date.

8.6.1 IPS: To a 500mL volumetric flask, add 100mL DI water and 25mL of tHNO3. Add 50.0mL of the well-shaken, room temperature, ICP Spike Standard #1 (Section 8.5.5), 25.0mL of 1000ppm Antimony standard, and 2.5mL of 1000ppm Cadmium standard. Bring to volume with DI water.

0.5mL of this solution per 50mL of sample volume will yield the following concentrations in the spiked sample: 2ppm Aluminum, 2ppm Barium, 0.05ppm Beryllium, 0.2ppm Chromium, 0.5ppm Cobalt, 0.25ppm Copper, 1.0ppm Iron, 0.5ppm Manganese, 0.5ppm Nickel, 0.05ppm Silver, 0.5ppm Vanadium, 0.5ppm Zinc.

8.6.2 **FPS**: To a 500mL volumetric flask, add 200mL of DI water and 25mL of tHNO3. Add 3mL of the well-shaken, room temperature ICP Spike Standard #3 (Section 8.5.6) and add 25mL of1000ppm Lead standard. Bring to volume with DI water.

0.5mL of this solution per 50mL of sample volume will yield the following concentrations in the spiked sample: 0.12ppm Arsenic, 0.05ppm Cadmium, 0.12ppm Selenium, 0.12ppm Thallium, and 0.51ppm Lead.

8.6.3 **MIX:** To a 500mL volumetric flask add 50mL of DI water and 25mL of tHNO3. Add50mL of each of the following stock standards: 1000ppm Boron, 10,000ppm Calcium, 10,000ppm Magnesium, 1000ppm Molybdenum, 10,000ppm Potassium, 1000ppm Strontium, 10,000ppm Sodium, 1000ppm Titanium, and 1000ppm Tin. Bring to volume with DI water.

0.5mL of this solution per 50mL of sample volume will yield the following concentrations in the spike sample: 1.0ppm Boron, 10ppm Calcium, 10ppm Magnesium, 1.0ppm Molybdenum, 5ppm Potassium, 1.0ppm Strontium, 10ppm Sodium, 1.0 Titanium.

8.6.4 **1000ppm Standards of individual metals**

8.6.5 ICP Spike Standard #1: Purchased commercially prepared, with a certificate of analysis. Contains the following: 2000ppm Aluminum, 2000ppm Barium, 50ppm Beryllium, 200ppm Chromium, 500ppm Cobalt, 250ppm Copper, 1000ppm Iron, 500ppm Manganese, 500ppm Nickel, 50ppm Silver, 500ppm Vanadium, 500ppm Zinc.

8.6.6 ICP Spike Standard #3: Purchased commercially prepared, with a certificate of analysis. Contains the following 2000ppm Arsenic, 50ppm Cadmium, 500ppm Lead, 2000ppm Selenium, 2000ppm Thallium.

9. Quality Control

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method.

9.1 Blank(s)

A minimum of one blank must be digested for every sample batch of 20 samples or less.

9.2 Laboratory Control Sample (LCS)

Use 50mL of DI water. Add 0.5mL each of IPS Spiking Solution (Section 8.5.1), FPS Spiking Solution (Section 8.5.2), and MIX Spiking Solution (Section 8.5.3). If the desired metal is not included in the spiking solution, add 50uL of desired metal standard stock 1000ppm solution. An LCS must be digested for every sample batch of 20 samples or less.

9.3 Initial Calibration Verification (ICV)

Not applicable to this preparatory method.

9.4 Continuing Calibration Verification (CCV)

Not applicable to this preparatory method.

9.5 Matrix Spike

A matrix spike is performed for each sample matrix. A minimum of one matrix spike must be analyzed for each batch of ten (10) or less wastewater or drinking water samples to be digested for methods 200.7 and 200.8. A minimum of one matrix spike shall be performed for each batch of twenty (20) or less groundwater or monitoring well samples. Add 0.5mL each of IPS Spiking Solution (Section 8.5.1), FPS Spiking Solution (Section 8.5.2), and MIX Spiking Solution (Section 8.5.3). If the desired metal is not included in the spiking solution, add 50uL of desired metal standard stock 1000ppm solution.

9.6 Laboratory Duplicate

Each batch of ten (10) or less wastewater or drinking water samples to be digested for methods 200.7 and 200.8 will include a duplicate sample. A minimum of one sample duplicate shall be performed for each batch of twenty (20) or less groundwater or monitoring well samples.

9.7 Method-specific Quality Control Samples

None.

9.8 Method Sequence

- Determine which samples will be used for batch QC
- Record sample pH for those samples to be analyzed for Methods 200.7 and/or 200.8
- Pour 50mL sample into a digestion cup
- Add spike solution to samples, as appropriate
- Add 1 mL of 1:1 tHNO_3 and 0.5 mL of 1:1 tHCl
- Heat on hot block at 90-95 °C until the volume evaporates down to 45mL and there is no further color change.
- Bring samples to 50mL volume with DI water. Filter any digestates containing sediment.

10. Procedure

10.1 Equipment Set-Up

10.1.1 Inspect all samples and determine QC duplicate (DUP) and matrix spike (MS). This decision is normally based upon client sample content history and analytes requested. The ideal sample for QC is one that has both ample volume and the most requested analytes of all the samples in the batch. Known field blanks or equipment blanks must be avoided for use as QC samples.

10.1.2 One spike and one duplicate must be performed per batch of twenty (20) or less groundwater or monitoring well samples. One spike and one duplicate must be performed for every ten (10) or less samples to be digested for Methods 200.7 and 200.8.

10.1.3 Each batch must have a Prep Blank Water (PBW) and a Laboratory Control Sample Water (LCS).

10.1.4 Sample Preparation for Digestion

10.1.4.1 Obtain one 50mL polypropylene digestion vessel for each sample and QC sample to be digested. Labelling of the the vessels at the time of digestion processing with the last 5 digits of the sample number across the top 1/3 of the cup and below write "T" for total metals, "S" for soluble metals. Additionally, if the sample is being re-prepped, note this on the vessel. All matrix spikes and LCSs get a black line on top of tube to indicate that it will be spiked.

10.1.4.2 Using the Preprinted Hot Block lab notebook, fill in appropriate spaces for date, analyst, products, acid type(s), MS/LCS spiking information. Place a pre-printed label with the lot numbers on the top right hand corner.

10.1.4.2.1 Place all samples on a lab cart, lined up in the order recorded in the logbook. Samples to be analyzed by Methods 200.7 and 200.8 must have the pH verified in the original container as being <2. Using a clean disposable transfer pipet, place a drop of sample onto a pH strip.

The pH results are recoded in the logbook with a mark be those below 2 and "no" for those that are above 2. If the sample pH is >2 preserve the sample in the original bottle with 1:1 HNO3 and hold for 24 hours before continuing with this method digestion.

10.1.4.2.2 Individually label a digestion vessel, shake and pour 50mL of each sample into a vessel. 50mL of DI water is used for the Blank (PBW) and LCS.

Any sample dilutions must be performed based upon initial knowledge of sample concentration or if the sample is soapy, opaque, darkly colored or foamy. Dilutions up to 10x are prepared directly in the digestion cup, utilizing the graduated markings as a guide. Otherwise, for dilutions > 10x, volumetric glassware is used.

10.1.4.2.3 Note the Color and Clarity of each sample in the appropriate columns in the laboratory notebook. Clarity is used to describe any sediment the sample may contain cloudiness or opaqueness.

10.1.4.2.4 Add 1 mL of 1:1 HNO3 and 0.5 mL of 1:1 HCl and place the sample in the digestion block preheated at 90-95 °C.

10.1.4.2.5 Hardness: If samples require Hardness analysis then perform the following:

10.1.4.2.5.1 Determine if there is any sediment in the sample. If there is none, then simply decant the sample into the cup without shaking.

10.1.4.2.5.2 If the sample does contain sediment and the only requested analyte is Hardness, then let the sample settle and decant only the top layer, avoiding the sedimentary layer.

10.1.4.2.5.3 If other analytes are requested on the sample, first decant 50mL off the top layer into a tube marked with the sample number and "Ha" below. Then shake the sample and pour it into a second tube labeled with the sample number. The first tube will be used

for the Hardness analysis, and the second tube will be used for the analysis of the other analytes requested.

10.1.4.2.6 Spike all matrix spikes and LCS samples with 0.5 mL of each IPS, FPS, and MIX spiking solutions. Additionally, 50µL of the any individual 1000ppm metal standard is added if the requested metal is not included in the spiking solutions.

10.1.4.2.7 Heat samples at evaporate the samples down to 45 mL and there is no further color change.

10.1.4.2.8 All Hot Block samples are brought up to a 50mL final volume.

10.2 Initial Calibration

Not applicable to this preparatory method.

10.3 Equipment Operation and Sample Processing

10.3.1 Sample Digestion

10.3.1.1 The sample cups are placed on the hot block set to a temperature of 95 °C. Each cup is covered with a ribbed polypropylene watch glass and remains on the hot block until the volume evaporates down to 45mL and there no further color change. Record in the laboratory notebook the time sample digestion began and the time the samples are taken off the hot block unit. Record the hot block temperature in the logbook.

10.3.1.2 Upon completion of the digestion, the samples are removed from the hot block and allowed to cool to room temperature. For each tube, the ribbed watch glass cover must be rinsed with a small amount of DI water to incorporate any condensate back into the digestate. Samples are then brought up to a final volume of 50mL using DI water.

All digestates that are suspended sediment-free are capped and are ready for instrumental analysis. If any samples contain suspended sediment, they are filtered using a Whatman 41 filter. The sample is then capped and is ready for instrumental analysis.

10.4 Continuing Calibration

Not applicable to this preparatory method.

10.5 Preventative Maintenance

The Hot Block temperature is calibrated on an annual basis by an instrument service company. Certificates are kept on file.

11. Data Evaluation, Calculations and Reporting

Refer to the analytical method SOPs.

12. Contingencies for Handling Out-of-Control Data or Unacceptable Data

Holding time exceedence and improper preservation are noted on the nonconformance report form.

Perform routine preventative maintenance following manufacturer's specification. Record all maintenance in the instrument logbook.

Review of standards, blanks and standard response for acceptable performance occurs for each batch of samples. Record any trends or unusual performance on a nonconformance action form.

If any QC parameter falls outside the designated acceptance range, the laboratory performance for that parameter is judged to be out of control, and the problem must be immediately identified and corrected. Immediate corrective action includes reanalyzing all affected samples by using any retained sample before the expiration of the holding time.

13. Method Performance

13.1 Method Detection Limit Study (MDL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

The laboratory follows the procedure to determine the MDL, LOD, and/or LOQ as outlined in Alpha SOP/1732. These studies performed by the laboratory are maintained on file for review.

13.2 Demonstration of Capability Studies

Refer to Alpha SOP/1739 for further information regarding IDC/DOC Generation.

13.2.1 Initial (IDC)

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method, prior to the processing of any samples.

13.2.2 Continuing (DOC)

The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

14. Pollution Prevention and Waste Management

Refer to Alpha's Chemical Hygiene Plan and Waste Management and Disposal SOP for further pollution prevention and waste management information.

15. Referenced Documents

Chemical Hygiene Plan

SOP #1732 MDL/LOD/LOQ Generation

SOP# 1739 IDC/DOC Generation

SOP# 1728 Waste Management and Disposal

16. Attachments

None.

Inductively Coupled Plasma - Atomic Emission Spectrometry

Reference Method No.: **Method 6010C** SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA SW-846, Update IV, February 2007.

SM 2340B, Hardness by Calculation, Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 21st Edition, 1997.

1. Scope and Application

Matrices: Digestates from all matrices.

Definitions: See Alpha Laboratories Quality Manual Appendix A

Inductively coupled plasma-atomic emission spectrometry (ICP-AES) determines trace elements, including metals, in solution. The method is applicable to all of the elements listed in Table 1. All matrices, excluding filtered groundwater samples but including ground water, aqueous samples, TCLP and EP extracts, industrial and organic wastes, soils, sludge, sediments, and other solid wastes, require digestion prior to analysis. Groundwater samples that have been prefiltered and acidified will not need acid digestion unless chemical interferants are suspected. Samples which are not digested must either use an internal standard or be matrix matched with the standards. Refer to Metals Preparation SOPs for the appropriate digestion procedures.

Table 1 lists the elements for which this method is applicable. Detection limits, sensitivity, and the optimum and linear concentration ranges of the elements can vary with the wavelength, spectrometer, matrix and operating conditions. Table 1 lists the recommended analytical wavelengths for the elements in clean aqueous matrices. Table 3 lists the Reported Detection Limits. The reported detection limit data may be used to estimate instrument and method performance for other sample matrices. Elements other than those listed in Table 1 may be analyzed by this method if performance at the concentration levels of interest (see Section 9) is demonstrated.

Users of the method should state the data quality objectives prior to analysis and must document and have on file the required initial demonstration performance data described in the following sections prior to using the method for analysis.

The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is made by one of the following laboratory personnel before performing the modification: Area Supervisor, Metals Manager, Laboratory Services Manager, Laboratory Director, or Quality Assurance Officer.

Use of this method is restricted to spectroscopists who are knowledgeable in the correction of spectral, chemical, and physical interferences described in this method. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability, analyzing a proficiency test sample and completing the record of training.

After initial demonstration, ongoing demonstration is based on acceptable laboratory performance of at least a quarterly laboratory control sample or acceptable performance from an annual proficiency test sample. A major modification to this procedure requires demonstration of performance. The

identification of major method modification requiring performance demonstration is directed by the QA Officer and Laboratory Director on a case-by-case basis.

2. Summary of Method

Prior to analysis, samples must be solubilized or digested using appropriate Sample Preparation Methods. When analyzing groundwater samples for dissolved constituents, acid digestion is not necessary if the samples are filtered and acid preserved prior to analysis.

This method describes multielemental determinations by ICP-AES using sequential or simultaneous optical systems and axial or radial viewing of the plasma. The instrument measures characteristic emission spectra by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the emission lines are monitored by photosensitive devices. Background correction is required for trace element determination. Background must be measured adjacent to analyte lines on samples during analysis. The position selected for the background-intensity measurement, on either or both sides of the analytical line, will be determined by the complexity of the spectrum adjacent to the analyte line. In one mode of analysis the position used must be as free as possible from spectral interference and must reflect the same change in background intensity as occurs at the analyte wavelength measured. Background correction is not required in cases of line broadening where a background correction measurement would actually degrade the analytical result. The possibility of additional interferences named in Section 4.0 must also be recognized and appropriate corrections made; tests for their presence are described in Section 9.4.4. Alternatively, users may choose multivariate calibration methods. In this case, point selections for background correction are superfluous since whole spectral regions are processed.

This SOP includes the manual calculations for Total Hardness and Calcium Hardness, according to SM 2340B.

2.1 Method Modifications from Reference

None.

3. Reporting Limits

Refer to Table 3 for method Reporting Limits.

4. Interferences

4.1 Spectral

Spectral interferences are caused by background emission from continuous or recombination phenomena, stray light from the line emission of high concentration elements, overlap of a spectral line from another element, or unresolved overlap of molecular band spectra.

4.1.1 Background emission and stray light can usually be compensated for by subtracting the background emission determined by measurements adjacent to the analyte wavelength peak. Spectral scans of samples or single element solutions in the analyte regions may indicate when alternate wavelengths are desirable because of severe spectral interference. These scans will also show whether the most appropriate estimate of the background emission is provided by an interpolation from measurements on both sides

of the wavelength peak or by measured emission on only one side. The locations selected for the measurement of background intensity will be determined by the complexity of the spectrum adjacent to the wavelength peak. The locations used for routine measurement must be free of off-line spectral interference (interelement or molecular) or adequately corrected to reflect the same change in background intensity as occurs at the wavelength peak. For multivariate methods using whole spectral regions, background scans must be included in the correction algorithm. Off-line spectral interferences are handled by including spectra on interfering species in the algorithm.

4.1.2 To determine the appropriate location for off-line background correction, the user must scan the area on either side adjacent to the wavelength and record the apparent emission intensity from all other method analytes. This spectral information must be documented and kept on file. The location selected for background correction must be either free of off-line interelement spectral interference or a computer routine must be used for automatic correction on all determinations. If a wavelength other than the recommended wavelength is used, the analyst must determine and document both the overlapping and nearby spectral interference effects from all method analytes and common elements and provide for their automatic correction on all analyses. Tests to determine spectral interference must be done using analyte concentrations that will adequately describe the interference. Normally, 100 mg/L single element solutions are sufficient; however, for analytes such as iron that may be found at high concentration, a more appropriate test would be to use a concentration near the upper analytical range limit.

4.1.3 Spectral overlaps may be avoided by using an alternate wavelength or can be compensated by equations that correct for interelement contributions. Instruments that use equations for interelement correction require the interfering elements be analyzed at the same time as the element of interest. When operative and uncorrected, interferences will produce false positive determinations and be reported as analyte concentrations. More extensive information on interferant effects at various wavelengths and resolutions is available in reference wavelength tables and books. Users may apply interelement correction equations determined on their instruments with tested concentration ranges to compensate (off line or on line) for the effects of interfering elements. For multivariate methods using whole spectral regions, spectral interferences are handled by including spectra of the interfering elements in the algorithm. The interferences listed are only those that occur between method analytes. Only interferences of a direct overlap nature are listed. These overlaps were observed with a single instrument having a working resolution of 0.035 nm.

4.1.4 When using interelement correction equations, the interference may be expressed as analyte concentration equivalents (i.e. false analyte concentrations) arising from 100 mg/L of the interference element. For example, assume that As is to be determined (at 193.696 nm) in a sample containing approximately 10 mg/L of Al. 100 mg/L of Al would yield a false signal for As equivalent to approximately 1.3 mg/L. Therefore, the presence of 10 mg/L of Al would result in a false signal for As equivalent to approximately 0.13 mg/L. The user is cautioned that each instrument may exhibit somewhat different levels of interference. The interference effects must be evaluated for each individual instrument since the intensities will vary.

Major known interferences are Fe, Al, Ca, Mg, V, Ni, Cu, and Cr. To minimize any of these interferences, every analyte is analyzed on each instrument at or near its linear range and corrected for these interferences. This is done on an annual basis, and data is kept on file.

4.1.5 Interelement corrections will vary for the same emission line among instruments because of differences in resolution, as determined by the grating, the entrance and exit slit widths, and by the order of dispersion. Interelement corrections will also vary depending upon the choice of background correction points. Selecting a background correction point where an interfering emission line may appear must be avoided when practical. Interelement corrections that constitute a major portion of an emission signal may not yield accurate data. Users must not forget that some samples may contain uncommon elements that could contribute spectral interferences.

4.1.6 The interference effects must be evaluated for each individual instrument whether configured as a sequential or simultaneous instrument. For each instrument, intensities will vary not only with optical resolution but also with operating conditions (such as power, viewing height and argon flow rate). When using the recommended wavelengths, the analyst is required to determine and document for each wavelength the effect from referenced interferences as well as any other suspected interferences that may be specific to the instrument or matrix. The analyst is encouraged to utilize a computer routine for automatic correction on all analyses.

4.1.7 The primary wavelength for each analyte is based upon the instrument manufacturer's recommendations. An alternate wavelength is chosen if there is an indication of elevated background or overlap of another spectral wavelength. The wavelength for each analyte must be as free from interferences as possible.

4.1.8 If the correction routine is operating properly, the determined apparent analyte(s) concentration from analysis of each interference solution must fall within a specific concentration range around the calibration blank. The concentration range is calculated by multiplying the concentration of the interfering element by the value of the correction factor being tested and divided by 10. If after the subtraction of the calibration blank the apparent analyte concentration falls outside of this range in either a positive or negative direction, a change in the correction factor of more than 10% should be suspected. The cause of the change must be determined and corrected and the correction factor updated. The interference check solutions must be analyzed more than once to confirm a change has occurred. Adequate rinse time between solutions and before analysis of the calibration blank will assist in the confirmation.

4.1.9 When interelement corrections are applied, their accuracy must be verified, daily, by analyzing spectral interference check solutions. If the correction factor or multivariate correction matrices tested on a daily basis (by running a check solution on each analytical run) are found to be within 20% criteria for 5 consecutive days, analysis may be extended to a weekly basis. Also, if the nature of the samples analyzed is such that they do not contain concentrations of the interfering elements greater than the reported detection limit, daily verification is not required. All interelement spectral correction factors or multivariate correction matrices are verified and updated on an annual basis or when an instrumentation change, such as in the torch, nebulizer, injector, or plasma conditions occurs. The standard solution must be inspected to ensure that there is no contamination that may be perceived as a spectral interference.

4.1.10 When interelement corrections are not used, verification of absence of interferences is required.

4.1.10.1 One method is to use a computer software routine for comparing the determinative data to limits, files for notifying the analyst when an interfering element is detected in the sample at a concentration that will produce either an apparent false positive concentration, (i.e., greater than) the analyte instrument detection limit, or false negative analyte concentration, (i.e., less than the lower control limit of the calibration blank defined for a 99% confidence interval).

4.1.10.2 Another method is to analyze an Interference Check Solution(s) which contains similar concentrations of the major components of the samples (>10 mg/L) on a continuing basis to verify the absence of effects at the wavelengths selected. These data must be kept on file with the sample analysis data. If the check solution confirms an operative interference that is >20% of the analyte concentration, the analyte must be determined using (1) analytical and background correction wavelengths (or spectral regions) free of the interference, (2) by an alternative wavelength, or (3) by another documented test procedure.

4.2 Physical

Physical interferences are effects associated with the sample nebulization and transport processes. Changes in viscosity and surface tension can cause significant inaccuracies, especially in samples containing high dissolved solids or high acid concentrations. If physical interferences are present, they must be reduced by diluting the sample, using a peristaltic pump, use of an internal standard or by using a high solids nebulizer. Another problem that can occur with high dissolved solids is salt buildup at the tip of the nebulizer, affecting aerosol flow rate and causing instrumental drift. The problem can be controlled by wetting the argon prior to nebulization, using a tip washer, using a high solids nebulizer or diluting the sample. Also, it has been reported that better control of the argon flow rate, especially to the nebulizer, improves instrument performance: this may be accomplished with the use of mass flow controllers. The test described in Section 10.3.4.1 will help determine if a physical interference is present.

4.3 Chemical

Chemical interferences include molecular compound formation, ionization effects, and solute vaporization effects. Normally, these effects are not significant with the ICP technique, but if observed, can be minimized by careful selection of operating conditions (incident power, observation position, and so forth), by buffering of the sample, by matrix matching, and by standard addition procedures. Additionally, if filtered samples are found to have an organic or sulfur like odor they are processed by heating after the addition of the acids to matrix match. Chemical interferences are highly dependent on matrix type and the specific analyte element.

4.4 Memory

Memory interferences result when analytes in a previous sample contribute to the signals measured in a new sample. Memory effects can result from sample deposition on the uptake tubing to the nebulizer and from the build up of sample material in the plasma torch and spray chamber. The site where these effects occur is dependent on the element and can be minimized by flushing the system with a rinse blank between samples. The possibility of memory interferences must be recognized within an analytical run and suitable rinse times must be used

to reduce them. The rinse times necessary for a particular element must be estimated prior to analysis. This may be achieved by aspirating a standard containing elements at a concentration ten times the usual amount or at the top of the linear dynamic range. The aspiration time for this sample must be the same as a normal sample analysis period, followed by analysis of the rinse blank at designated intervals. The length of time required to reduce analyte signals to within a factor of two of the method detection limit must be noted. Until the required rinse time is established, this method suggests a rinse period of at least 60 seconds between samples and standards. If a memory interference is suspected, the sample must be reanalyzed after a rinse period of sufficient length. Alternate rinse times may be established by the analyst based upon their DQOs.

4.5 Other Interferences

4.5.1 Users are advised that high salt concentrations can cause analyte signal suppressions and confuse interference tests. If the instrument does not display negative values, fortify the interference check solution with the elements of interest at 0.5 to 1 mg/L and measure the added standard concentration accordingly. Concentrations must be within 20% of the true spiked concentration or dilution of the samples will be necessary. In the absence of measurable analyte, overcorrection could go undetected if a negative value is reported as zero.

5. Health and Safety

The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound must be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material data handling sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

6. Sample Collection, Preservation, Shipping and Handling

6.1 Sample Collection

Samples are collected in plastic bottles.

6.2 Sample Preservation

Samples for Total Metals are preserved with 1:1 Nitric acid to a pH of <2.

If samples are for Soluble Metals, they must not be preserved prior to filtration. They are preserved with 1:1 Nitric acid to a pH of <2 post-filter.

6.3 Sample Shipping

No special shipping requirements.

6.4 Sample Handling

Samples to be analyzed for soluble metals, that have not been filtered, must be filtered and preserved within 24 hours of sample collection.

Preserved samples have a hold time of 6 months, and are stored at ambient temperature.

7. Equipment and Supplies

7.1 Inductively coupled argon plasma emission spectrometer:

- **Thermo Scientific ICAP Duo 6500 (Trace4, Trace5, Trace6)**

7.1.1 Computer-controlled emission spectrometer with background correction.

7.1.2 Radio-frequency generator compliant with FCC regulations.

7.1.3 Optional mass flow controller for argon nebulizer gas supply.

7.1.4 Optional peristaltic pump.

7.1.5 Optional Autosampler.

7.1.6 Argon gas supply - high purity.

7.2 Volumetric flasks of suitable precision and accuracy.

7.3 Volumetric pipets of suitable precision and accuracy.

8. Standards and Reagents

Reagent semiconductor and/or trace grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination. If the purity of a reagent is in question, analyze for contamination. If the concentration of the contamination is less than the MDL then the reagent is acceptable.

8.1 Hydrochloric acid (conc), HCl. Stored at room temperature in acid resistant cabinet. Expiration date if defined by vendor.

8.2 Hydrochloric acid (1:1), HCl. Add 500 mL concentrated HCl to 400 mL DI water and dilute to 1 liter in an appropriately sized beaker. Stored at room temperature in polypropylene bottle, expiration date if defined by vendor..

8.3 Nitric acid (conc), HNO_3. Stored at room temperature in acid resistant cabinet. Expiration date if defined by vendor.

8.4 Nitric acid (1:1), HNO_3. Add 500 mL concentrated HNO_3 to 400 mL DI water and dilute to 1 liter in an appropriately sized beaker. Stored at room temperature in polypropylene bottle, expiration date if defined by vendor..

8.5 Reagent Water. All references to water in the method refer to reagent water unless otherwise specified. Reagent water will be interference free. Refer to Chapter One for a definition of reagent water.

8.6 Standard stock solutions may be purchased or prepared from ultra- high purity grade chemicals or metals (99.99% pure or greater). All stock standards are ordered through ISO and American Association for Lab Accreditation vendors. All standards are in aqueous solutions and are generally at concentrations of 1000ppm and 10,000ppm.

8.7 Mixed calibration standard solutions

Prepare mixed calibration standard solutions by combining appropriate volumes of the stock solutions in volumetric flasks. Add the appropriate types and volumes of acids so that the standards are matrix matched with the sample digestates. Care must be taken when preparing the mixed standards to ensure that the elements are compatible and stable together. Transfer the mixed standard solutions to FEP fluorocarbon or previously unused polyethylene or polypropylene bottles for storage. Fresh mixed standards must be prepared, as needed, with the realization that concentration can change on aging.

NOTE: If the addition of silver to the recommended acid combination results in an initial precipitation, add 15 mL of water and warm the flask until the solution clears. Cool and dilute to 100 mL with water. For this acid combination, the silver concentration must be limited to 2 mg/L. Silver under these conditions is stable in a tap-water matrix for 30 days. Higher concentrations of silver require additional HCl.
Additionally, sulfur standards are stand-alone single element standards and therefore are not to be combined in a mixed calibration standard solution.

8.8 Blanks

Two types of blanks are required for the analysis for samples. The calibration blank is used in establishing the analytical curve, and the method blank is used to identify possible contamination resulting from varying amounts of the acids used in the sample processing.

8.8.1 The calibration blank is prepared by acidifying reagent water to the same concentrations of the acids found in the standards. Prepare a sufficient quantity to flush the system between standards and samples. The calibration blank will also be used for all initial (ICB) and continuing calibration blank (CCB) determinations (see Sections 10.2 and 10.4). Refer to Section 10.4.1.2 for acceptance criteria and/or corrective actions.

8.8.2 The method blank must contain all of the reagents in the same volumes as used in the processing of the samples. The method blank must be carried through the complete procedure and contain the same acid concentration in the final solution as the sample solution used for analysis. Refer to Section 9.1 for acceptance criteria and/or corrective actions.

8.9 The Initial Calibration Verification Standard (ICV) and the Continuing Calibration Verification Standard (CCV)

These ICV is prepared by the analyst by combining compatible elements from a standard source different than that of the calibration standard. The CCV is prepared from the same source as the calibration standards and must be at a concentration near the mid-point of the calibration curve. At the laboratory's discretion, an ICV may be used in lieu of the continuing calibration verifications. If used in this manner, the ICV must be at a concentration near the mid-point of the calibration curve.

8.9.1 Low Level Initial Calibration Verification Standard (LLICV) and the Low Level Continuing Calibration Verification Standard (LLCCV)

These standards are actually a series of standards (typically 3) that are at or below the RL for the respective elements included in the calibration sequence. They are prepared from the same source as the calibration standards but at the laboratory's discretion may be from a second source from the calibration.

8.10 Interference Check Solution

These solutions are prepared to contain known concentrations of interfering elements that will provide an adequate test of the correction factors. Spike the sample with the elements of interest. In the absence of measurable analyte, overcorrection could go undetected because a negative value could be reported as zero. If the particular instrument will display overcorrection as a negative number, this spiking procedure will not be necessary.

8.11 CRI

The CRI is an ICP standard that is analyzed at a concentration of 2 - 5 times each element's RDL. The CRI must be recovered within 70-130% of its true value. If the CRI does not meet these criteria, it is remade and reanalyzed. If the CRI fails a second time, the analysis is terminated, the problem determined and corrected. The instrument is then recalibrated.

CRI solutions are made for each type of instrument.

8.11.1 CRI Stock Standard Solution, for the TJA Trace instruments

To a 500mL volumetric flask, add 200mL DI water and 50mL of 1:1 HNO_3. Add the following volumes of each certified 1000ppm stock standard:

Pb	0.9 mL	Ni	1.6 mL
Se	0.4 mL	Ag	0.4 mL
Sb	2.0 mL	Tl	0.4 mL
As	0.4 mL	V	2.0 mL
Ba	0.8 mL	Zn	0.8 mL
Be	0.2 mL	Al	8.0 mL
Cd	0.2 mL	Ca	8.0 mL
Co	2.0 mL	Mg	8.0 mL
Cr	0.4 mL	B	2.0 mL
Cu	1.0 mL	Sr	0.4 mL
Fe	4.0 mL	Ti	0.4 mL

Mn	0.6 mL	Sn	0.4 mL
Mo	2.0 mL		

And the following volumes of each certified 10000ppm stock standard:

K	10.0 mL
Na	10.0 mL
Si	2.0 mL
S	2.0 mL

Bring to volume of 500mL with DI water. This solution expires 12 months after the date of preparation.

8.11.1.1 CRI Working Standard Solution

To a 1L volumetric flask, add 25mL of CRI Stock Standard Solution (Section 8.11.1). Bring to volume with DI water. This solution will contain elements in the following concentrations:

Pb	0.045 ppm	Ag	0.02 ppm
Se	0.02 ppm	Tl	0.02 ppm
Sb	0.10 ppm	V	0.10 ppm
As	0.02 ppm	Zn	0.04 ppm
Ba	0.04 ppm	Al	0.40 ppm
Be	0.01 ppm	Ca	0.40 ppm
Cd	0.01 ppm	Mg	0.40 ppm
Co	0.10 ppm	B	0.10 ppm
Cr	0.02 ppm	Sr	0.02 ppm
Cu	0.05 ppm	Ti	0.02 ppm
Fe	0.20 ppm	Sn	0.02 ppm
Mn	0.03 ppm	K	5.0 ppm
Mo	0.10 ppm	Na	5.0 ppm
Ni	0.08 ppm	Si	1.0 ppm
S	1.0 ppm		

8.12 Reporting Limit (RL) Verification Standard (LLICV/LLCCV)

The RL standard consists of a series of standards that are analyzed after the initial calibration verification (LLICV) and at the end of each run (LLCCV). Optionally, the LLCCV may be run every 10 samples with the CCV, CCB pair to eliminate the need for excessive reruns when low level instrument stability is questioned. These standards are at or below the RL included in the multi-point calibration sequence. The acceptance criteria are 70-130% to establish the RL for each analyte. The following standards are analyzed.

0.005 mg/L	Ag, As, Be, Cd
0.010 mg/L	B, Ba, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sn, Sr, Ti, Tl, V
0.050 mg/L	Al, Sb, Fe, Zn, Ca, Mg, K, Na

9. Quality Control

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method.

9.1 Blank(s)

Employ a minimum of one method blank per sample batch to determine if contamination or any memory effects are occurring. A method blank is a volume of reagent water carried through the same preparation process as a sample.

The method blank results must be less than the reported detection limit (RDL) for all analytes of concern. If the results of the method blank exceed the RDL for any analyte, perform re-analysis of a new aliquot of the method blank.

If the results continue to exceed the RDL, proceed as follows:

If all of the samples for the analyte are non-detected, and the method blank is at or above the RDL, no action is required.

If one or more associated samples for that analyte have positive results at or above the RDL, those samples must be considered to be out of control, and are re-digested and reanalyzed.

9.2 Laboratory Control Sample (LCS)

Analyze one LCSW/SRM per sample batch. A LCS/SRM sample is a spiked volume of reagent water that is brought through the entire preparation and analytical process. The LCSW must have a % Recovery of ± 20% within the actual value or within vendor control limits (95% confidence limits) for the solid SRM.

If the LCSW or SRM % Recovery is outside the acceptable limits as stated in Table 2, or outside any vendor control limits, the LCS is rerun once. If upon reanalysis the LCS is still out of control, the failed analytes are re-prepped and re-analyzed. Otherwise, a nonconformance report form is raised to document the exact problem and this form is then authorized by the QA/QC Director and/or the Laboratory Manager(s).

9.3 Initial Calibration Verification (ICV)

For all analytes and determinations, the laboratory must analyze an ICV (Section 8.9), and a calibration blank (ICB, Section 8.8.1), immediately following daily calibration. The results of the ICV are to agree within 10% of the expected value; if not, re-analyze once, if still failing terminate the analysis, correct the problem, and recalibrate the instrument.

9.4 Continuing Calibration Verification (CCV)

A calibration blank (CCB, Section 8.8.1) and a calibration verification standard (CCV, Section 8.9) must be analyzed after every tenth sample and at the end of the sample run. Analysis of the calibration verification (CCV) must verify that the instrument is within 10% of the calibration with the relative standard deviation < 5% from replicate (minimum of two) integrations.

Immediate corrective action for a failing CCV/CCB includes reanalyzing the failing standard. If the standard passes the second time then the analysis may be continued. The batch sheet is noted. If the standard fails again, instrument maintenance must be performed and the CCV/CCB standard is reanalyzed. If the standard passes, then all samples run after the last passing CCV/CCB pair must be re-analyzed.

If the standard fails after instrument maintenance, the instrument is recalibrated. A new ICV/ICB is performed, and all previous data after the last passing CCV/CCB is reanalyzed.

9.5 Matrix Spike

Analyze matrix spike samples at a frequency of one per matrix batch. A matrix spike sample is a sample brought through the entire sample preparation and analytical process.

9.5.1 The percent recovery is to be calculated as follows:

$$\% \text{ Recovery} = \frac{MS - S}{C} \times 100$$

where:

MS = Matrix Spike value
S = Sample value.
C = Concentration of the Spiking solution.

9.5.2 If the Matrix Spike falls outside of the limits as stated in Table 2, or outside any historical documentation for analytes of interest a post analytical spike is performed for the failed analytes. The same sample from which the MS/MSD aliquots were prepared should be spiked with a post digestion spike at a minimum level of 10 times and a maximum of 100 times the lower limit of quantitation. The acceptable % Recovery of the post analytical spike is 80-120%. A nonconformance is noted in the LIMS and approved in secondary peer review and/or by the Metals Manager.

9.5.3 If the Post Spike fails the dilution test should be performed**.** If the analyte concentration is sufficiently high (minimally, a factor of 10 above the lower limit of quantitation after dilution), an analysis of a 1:5 dilution should agree within ± 10% of the original determination. If not, then a chemical or physical interference effect should be suspected.

9.6 Laboratory Duplicate

A duplicate sample is analyzed once per matrix batch. This sample is brought through the entire sample preparation and analytical process.

9.6.1 The relative percent difference between duplicate determinations is to be calculated as follows:

$$RPD = \frac{|D_1 - D_2|}{(|D_1 + D_2|)/2} \times 100$$

where:

RPD = relative percent difference.
D_1 = first sample value.
D_2 = second sample value (replicate).

9.6.2 If the Duplicate falls outside of the limits as stated in Table 2, or outside any historical documentation and the concentrations of the failing analytes are less than 5x the RL or a matrix interference is found a nonconformance is noted in the LIMS and approved in secondary peer review and/or by the Metals Manager.

9.7 Method-specific Quality Control Samples

9.7.1 Interference Check Standards

A check solution is analyzed once daily. One solution (ICSA) has only elevated concentrations of Fe, Al, Ca, Mg to ensure no interferences occur. The concentrations of the analytes of interest must have an absolute value of <2X RL. The other check solution (ICSAB) is the same solution spiked with a known amount of each analyte. These solutions are analyzed at the beginning of the first analytical run of the day.

If the analytes of interest in the ICSAB solution falls outside the acceptable limits of 80 – 120% of the true value, the solutions may be rerun once. The high level interferences are not evaluated for recovery just as in the ICSA. If the problem persists take corrective action which may include re-evaluation of the inter-element correction values (IECs). The instrument calibration routine must then be performed and confirmed by the ICV/ICB pair and the ICSA/ICSAB re-analyzed before proceeding with analysis. Otherwise, the nonconformance issue is raised to the Department Supervisor and/or the QA Department.

9.7.2 Reporting Limit (RL) Verification Standard (LLICV/LLCCV)

The RL standards are actually a series of standards that are analyzed at the beginning and at the end of each run. The lowest of the RL standards may be used to evaluate the sensitivity of reportable elements under method 6010C. This may be a low level client-specific analysis, or it may be the standard reporting limits for an aqueous sample or a soil/solid material. The standards must have a percent recovery of 70-130%. If an element fails the acceptance criteria to establish a specific RL, the RL standard may be re-analyzed. If the element failure continues, then either re-calibrate the instrument and rerun the affected samples or analyze the affected samples on another instrument with a passing RL verification standard for the element(s) of interest.

9.8 Method Sequence

- Calibration of instrument
- Initial Calibration Verification Standard
- Initial Calibration Blank
- LLICV
- Interference Check Solution A
- Interference Check Solution AB
- CRI
- Continuing Calibration Verification Standard
- Continuing Calibration Blank
- samples
- Continuing Calibration Verification Standard
- Continuing Calibration Blank
- Samples
- LLCCV
- Continuing Calibration Verification Standard
- Continuing Calibration Blank

10. Procedure

10.1 Equipment Set-up

10.1.1 Sample Preparation

Preliminary treatment of most matrices is necessary because of the complexity and variability of sample matrices. Groundwater samples which have been prefiltered and acidified will not need acid digestion. Samples which are not digested must either use an internal standard or be matrix matched with the standards.

10.1.2 Instrument Set-Up

Set up the instrument with proper operating parameters established as detailed below. The instrument must be allowed to become thermally stable before beginning (usually requiring at least 30 minutes of operation prior to calibration).

Startup Procedures

For iCAP Duo 6500

- Turn on power to the chiller
- Click on ThermoSpec Icon; enter analyst initials in login screen
- Click on Plasma icon to start instrument
- Allow to warm up for 30 minutes
- Enter analytical workgroup number (obtained from LIMS) globally under the Instrument menu by selecting Tools, then Options, then Analyst.
- Click on the Sequence tab and enter the sequence by selecting New Autosampler Table, Add Sequence, Add # of spaces.
- Enter the sample locations and IDs
- Press Run Auto-Session button (►) in menu bar.

10.1.2.1 Specific wavelengths are listed in Table 1. Other wavelengths may be substituted if they can provide the needed sensitivity and are corrected for spectral interference. The instrument and operating conditions utilized for determination must be capable of providing data of acceptable quality to the program and data user.

Operating conditions for axial plasma will vary from 1100 – 1500 watts forward power, 15-19 Liters/min argon coolant flow, 0.5 – 0.7 L/min argon nebulizer flow, 140 – 200 rpm pump rate and a default 1 minute preflush time and 10 second measurement time is recommended for all simultaneous instruments.

10.1.2.2 The plasma operating conditions need to be optimized prior to use of the instrument. This routine is not required on a daily basis, but only when first setting up a new instrument or following a change in operating conditions. The following procedure is recommended or follow manufacturer's recommendations. The purpose of plasma optimization is to provide a maximum signal to background ratio for some of the least sensitive elements in the analytical array.

The use of a mass flow controller to regulate the nebulizer gas flow or source optimization software greatly facilitates the procedure.

10.1.2.2.1 The Thermo ICP's typically use a Meinhard Nebulizer. The nebulizer flow for each instrument is 1.0 +/- 0.2 mL/min.

10.1.2.2.2 The 6500 Duo instruments automatically perform a wavelength check at start up without user interaction.

10.1.2.2.3 The instrument operating condition finally selected as being optimum must provide the lowest reliable instrument detection limits and method detection limits.

10.1.2.2.4 If either the instrument operating conditions, such as incident power or nebulizer gas flow rate are changed, or a new torch injector tube with a different orifice internal diameter is installed, the plasma and argon pressures must be reoptimized.

10.1.2.2.5 After completing the initial optimization of operating conditions, but before analyzing samples, the laboratory must establish and initially verify an interelement spectral interference correction routine to be used during sample analysis. A general description concerning spectral interference and the analytical requirements for background correction in particular are discussed in the section on interferences. Criteria for determining an interelement spectral interference is an apparent positive or negative concentration for the analyte that falls within ± the RDL. The upper control limit is the analyte instrument detection limit. Once established, the entire routine is periodically verified annually. In between that time, IEC's are done on a need be basis per analyte. Only a portion of the correction routine must be verified more frequently or on a daily basis. Initial and periodic verification of the routine must be kept on file. Special cases where continual verification is required are described elsewhere.

10.1.2.3 Sensitivity, instrumental detection limit, precision, linear dynamic range, and interference effects must be established for each individual analyte line on each particular instrument. All measurements must be within the instrument linear range where the correction equations are valid.

10.1.2.3.1 Method detection limits must be established for all wavelengths utilized for each type of matrix commonly analyzed. The matrix used for the MDL calculation must contain analytes of known concentrations within 3-5 times the anticipated detection limit.

10.1.2.3.2 Determination of limits using reagent water MDLs represent a best case situation and do not represent possible matrix effects of real world samples.

10.1.2.3.3 If additional confirmation is desired, reanalyze the seven replicate aliquots on two more non-consecutive days and again calculate the method detection limit values for each day. An average of the three values for each analyte may provide for a more appropriate estimate.

10.1.2.3.4 The upper limit of the linear dynamic range must be established for each wavelength utilized by determining the signal responses from a minimum for three, preferably five, different concentration standards across the range. One of these must be near the upper limit of the range. The ranges which may be used for the analysis of samples must be judged by the analyst from the resulting data. The data, calculations and rationale for the choice of range made must be documented and kept on file. The upper range limit must be an observed signal no more than 10% below the level extrapolated from lower standards. Determined analyte concentrations that are above the upper range limit must be diluted and reanalyzed. The analyst must also be aware that if an interelement correction from an analyte above the linear range exists, a second analyte where the interelement correction has been applied may be inaccurately reported. New dynamic ranges must be determined whenever there is a significant change in instrument response. The linear dynamic range is checked on an annual basis. For those analytes that are known interferences, and are present at above the linear range, the analyst must ensure that the interelement correction has not been inaccurately applied.

NOTE: Many of the alkali and alkaline earth metals have non-linear response curves due to ionization and self- absorption effects. These curves may be used if the instrument allows; however the effective range must be checked and the second order curve fit must have a correlation coefficient of 0.995 or better. Third order fits are not acceptable. These non-linear response curves must be revalidated and recalculated every six months. These curves are much more sensitive to changes in operating conditions than the linear lines and must be checked whenever there have been moderate equipment changes.

10.1.2.4 The analyst must (1) verify that the instrument configuration and operating conditions satisfy the analytical requirements and (2) maintain quality control data confirming instrument performance and analytical results.

10.2 Initial Calibration

Calibrate the instrument according to the instrument manufacturer's recommended procedures, using the typical mixed calibration standard solutions described in Section 8.7. Flush the system with the calibration blank (Section 8.8.1) between each standard or as the manufacturer recommends. (Use the average intensity of multiple exposures for both standardization and sample analysis to reduce random error.) The calibration curve consists of a calibration blank, RL standard and a high level standard. Calibration curve verification is accomplished through the analysis of the ICV, LLICV and CRI standards.

10.3 Equipment Operation and Sample Processing

10.3.1 For all analytes and determinations, the laboratory must analyze an ICV (Section 8.9), and a calibration blank (ICB, Section 8.8.1), immediately following daily calibration.

A calibration blank (CCB, Section 8.8.1) and a calibration verification standard (CCV, Section 8.9) must be analyzed after every tenth sample and at the end of the sample run. Analysis of the calibration verification (CCV) must verify that the instrument is within 10%

of the calibration with the relative standard deviation < 5% from replicate (minimum of three) integrations.

If the calibration cannot be verified within the specified limits, the sample analysis must be discontinued, the cause determined and the instrument recalibrated. All samples following the last acceptable ICB, ICV, CRI, CCV or CCB must be reanalyzed. The analysis data for the calibration blank, check standard, and ICV or CCV must be kept on file with the sample analysis data.

10.3.2 Rinse the system with the calibration blank solution (Section 8.8.1) before the analysis of each sample. The suggested default rinse time is one minute. Each ICP instrument may establish a reduction in this rinse time through a suitable demonstration.

10.3.3 Dilute and reanalyze samples that exceed the linear calibration range or use an alternate, less sensitive line for which quality control data is already established.

10.3.4 If less than acceptable accuracy and precision data are generated a series of tests are performed prior to reporting concentration data for analyte elements. At a minimum, these tests should be performed with each batch of samples prepared/analyzed with corresponding unacceptable data quality results. These tests, as outlined in Sections **10.3.4.1** and 10.3.4.2, will ensure that neither positive nor negative interferences are operating on any of the analyte elements to distort the accuracy of the reported values.

10.3.4.1 Post Digestion Spike Addition: If the matrix spike recoveries are unacceptable an analyte spike added to a portion of a prepared sample, or its dilution, must be run, recovery limits equal to 80% to 120% of the known spike value. The spike addition must produce a minimum level of 10 times and a maximum of 100 times the instrumental detection limit. If the spike is not recovered within the specified limits, a dilution test (10.3.4.2) should be performed. If both the MS/MSD and post spike fail then a matrix effect must be suspected.

10.3.4.2 Dilution Test: If the analyte concentration is sufficiently high (minimally, a factor of 10 above the lower limit of quantitation after dilution), an analysis of a 1:5 dilution must agree within ± 10% of the original determination. If not, a chemical or physical interference effect must be suspected.

10.3.5 CAUTION: If spectral overlap is suspected, use of computerized compensation, an alternate wavelength, or comparison with an alternate method is recommended.

10.4 Continuing Calibration

10.4.1 Check calibration with an ICV following the initial calibration (Section 8.9). Verify calibration with the Continuing Calibration Verification (CCV) Standard (Section 8.9) at the end of the initial calibration sequence (ICV, ICB, ICSA, ICSAB, CRI, project specific RDL standards), after every ten samples, and at the end of an analytical run. At the laboratory's discretion, an ICV may be used in lieu of the continuing calibration verifications. If used in this manner, the ICV must be at a concentration near the mid-point of the calibration curve. Use a calibration blank (Section 8.8.1) immediately following daily calibration, after every 10 samples and at the end of the analytical run.

A CRI (Section 8.11) must be analyzed after the ICSAB. The concentration of the CRI is 2 – 5 times that of each element's RDL. The linearity of the instrument is confirmed on an annual basis by an LDR standard at +/-10% recovery.

10.4.1.1 The results of the ICV are to agree within 10% of the expected value, and CCVs are to agree within 10% of the expected value; if not, terminate the analysis, correct the problem, and recalibrate the instrument.

10.4.1.2 The results of the calibration blank are to agree within three times the IDL. If not, repeat the analysis two more times and average the results. If the average is not within three standard deviations of the background mean, terminate the analysis, correct the problem, recalibrate, and reanalyze the previous 10 samples. If the blank is less than 1/10 the concentration of the action level of interest, and no sample is within ten percent of the action limit, analyses need not be rerun and recalibration need not be performed before continuation of the run.

10.4.1.3 The results of the CRI must be within 30% of the true value. If they are not, correct the problem and recalibrate the instrument. (Any element may be analyzed on a different ICP that has passed the CRI.)

10.4.2 Verify the interelement and background correction factors at the beginning of each analytical run. Do this by analyzing the ICSA/ICSAB (Section 8.10). Results must be within 80 – 120% of the true value for the analytes of interest in the ICSAB.

10.4.3 When low-level sensitivity is required, a check standard at the requested limit of quantitation is analyzed to confirm the reported detection limit (RDL). This is performed on a project-by-project basis.

10.5 Preventive Maintenance

Whenever instrument maintenance is performed, it is noted in the instrument's Maintenance Logbook.

10.5.1 Daily

Inspect the nebulizer pump tubing from the Autosampler to the Nebulizer. Replace if necessary.

10.5.2 Monthly or as needed

Remove the torch, "shot glass", nebulizer and spray chamber. Clean each with 10% Nitric Acid and rinse with tap water. Coat the inside of the spray chamber and shot glass with concentrated Sulfuric Acid and soak for one hour, then rinse well with DI water. Soak the torch and nebulizer in aqua regia overnight, then rinse with DI water.

10.5.3 Every 6 months

Preventive Maintenance is performed by the Vendor or in-house personnel as follows:

- check the cooling system
- flush/refill the chiller with distilled water and antibacterial conditioner
- clean the instrument to regain intensity
- clean/replace air filters.

11. Data Evaluation, Calculations and Reporting

11.1 If dilutions were performed, the appropriate factors must be applied to sample values. All results must be reported with up to three significant figures.

11.2 Soil samples

Soil samples are calculated as follows:

$$\mathbf{A} = \frac{\text{Sample weight (grams)}}{\text{Final Volume (mL)}}$$

$$\mathbf{B}\ (\text{concentration in mg/Kg}) = \frac{\text{Concentration of analyte (mg/L)}}{\mathbf{A}}$$

11.2.1 Dry weight correction

The LIMS calculates the dry weight correction, however it is calculated as follows:

$$\text{Final concentration in mg/Kg dry weight} = \frac{\mathbf{B}}{\%\ \text{Solids}}$$

11.3 Liquid samples

Liquid samples are calculated as follows:

$$\text{Dilution Factor} = \frac{\text{Final Volume (mL)}}{\text{Sample Volume (mL)}}$$

$$\text{Final concentration in mg/L} = \text{Concentration of analyte (mg/L)} \times \text{Dilution Factor}$$

11.4 Calculations for Hardness

The method for determining hardness is to compute it from the results of separate determinations of Calcium and Magnesium on aqueous samples.

11.4.1 Total Hardness

Total Hardness, mg equivalent $CaCO_3$/L = [2.497 (Ca, mg/L)] + [4.118 (Mg, mg/L)]

11.4.2 Calcium Hardness

Calcium Hardness, mg equivalent $CaCO_3$/L = [2.497 (Ca, mg/L)]

12. Contingencies for Handling Out-of-Control Data or Unacceptable Data

Also refer to Section 9 for Quality Control and acceptance criteria.

If the ICSA or ICSAB is outside of the 80 – 120% recovery window, then the standard is reanalyzed. If the standard failure continues, the IECs for the element/elements in question are reviewed and recalculated if necessary.

Immediate corrective action for a failing CCV/CCB includes reanalyzing the failing standard. If the standard passes the second time then the analysis may be continued. The raw data is noted. If the standard fails again, the problem must be found and corrected. The CCV/CCB standard is remade and reanalyzed. If the standard passes, then the data that had failed up to the previous passing standard is reanalyzed.

If the standard fails after instrument maintenance, the instrument is recalibrated. A new ICV/ICB is performed, and all previous data that had failed up to the previous passing CCV/CCB is reanalyzed.

The procedure outline above is also conducted for a failing LCS or Method Blank.

If the Matrix Spike does not meet acceptance criteria, a Post Spike is performed. The recovery must be within 80-120% of the true value for aqueous samples and within 80-120% of the true value for soil samples. If these criteria are met, then the Matrix Spike data is reported, with the post spike narrated on the final report. If the post spike fails the acceptance criteria, the Department Manager is notified to determine what type of matrix interference is present, and whether a serial dilution must be performed.

If sample Duplicates are outside of the acceptance criteria, the analyst examines the sample for homogeneity. If the sample is not homogenous, this is narrated on the final report. Clean, homogenous samples are redistilled and reanalyzed within holding time.

Sample nonconformance regarding a Matrix Spike recovery or a duplicate %RSD is narrated on the final report along with the corrective action(s) taken.

If the ICSA or the ICSAB are outside of the 80-120% window then the standard in question must be re-analyzed. If the standard failure continues, then check the IECs for the element(s) in question and re-calculate and recalibrate the instrument. The instrument is recalibrated, verified with the ICV/ICB and the ICSA/ICSAB are then re-analyzed. If the standard failure repeats, then a fresh standard is prepared and re-analyzed. If failure continues notify the Department Supervisor.

The RL standards must have a % Recovery of 70-130%. If an element fails the acceptance criteria, the RL standards may be re-analyzed if the element must be included in the analytical event. If the element failure continues, then either re-calibrate the instrument and rerun the affected samples or analyze the sample on another instrument.

If the CRI (low level check standard), is recovered outside of the 70-130% window, the standard may be re-analyzed if the element must be included in the analytical event. If the element failure continues, then either re-calibrate the instrument or analyze the sample on another instrument.

13. Method Performance

13.1 Method Detection Limit Study (MDL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

The laboratory follows the procedure to determine the MDL, LOD, and/or LOQ as outlined in Alpha SOP/08-05. These studies performed by the laboratory are maintained on file for review.

13.2 Demonstration of Capability Studies

Refer to Alpha SOP/08-12 for further information regarding IDC/DOC Generation.

13.2.1 Initial (IDC)

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method, prior to the processing of any samples.

13.2.2 Continuing (DOC)

The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

14. Pollution Prevention and Waste Management

Refer to Alpha's Chemical Hygiene Plan and Waste Management and Disposal SOP for further pollution prevention and waste management information.

15. Referenced Documents

Chemical Hygiene Plan

SOP #1732 MDL/LOD/LOQ Generation

SOP# 1739 IDC/DOC Generation

SOP# 1728 Waste Management and Disposal

16. Attachments

TABLE 1: Element Wavelengths

TABLE 2: Precision and Accuracy Acceptance Criteria

TABLE 3: Reporting Limits

TABLE 1
ELEMENT WAVELENGTHS

Element	6500 Duo wavelength (nm)
Pb	220.3
Se	196.0
Sb	206.8
As	189.0
Ba	455.4
Be	313.0
Cd	214.4
Co	228.6
Cu	324.7
Cr	267.7
Fe	259.9
Mn	257.6
Mo	202.0
Ni	231.6
Ag	328.0
Tl	190.8
V	292.4
Zn	206.2
Al	396.1
Ca	315.8
Mg	279.0
B	208.9
Si	212.9
Sn	189.9
Sr	421.5
Ti	334.9
Bi	223.0
Na	589.5
K	766.4
S	180.7

TABLE 2
PRECISION AND ACCURACY ACCEPTANCE CRITERIA

	% Recovery LCS		Aqueous % Recovery MS		Soil % Recovery SRM		Duplicate	
Element	**Lower Control Limit**	**Upper Control Limit**	**Lower Control Limit**	**Upper Control Limit**	**Lower Control Limit**	**Upper Control Limit**	**Aqueous %RPD**	**Soil %RPD**
Aluminum	80	120	75	125	29	171	20	20
Antimony	80	120	75	125	4	196	20	20
Arsenic	80	120	75	125	81	119	20	20
Barium	80	120	75	125	83	118	20	20
Beryllium	80	120	75	125	83	117	20	20
Boron	80	120	75	125	70	129	20	20
Cadmium	80	120	75	125	82	117	20	20
Calcium	80	120	75	125	83	117	20	20
Chromium	80	120	75	125	80	119	20	20
Cobalt	80	120	75	125	83	117	20	20
Copper	80	120	75	125	83	117	20	20
Iron	80	120	75	125	51	150	20	20
Lead	80	120	75	125	80	120	20	20
Magnesium	80	120	75	125	74	126	20	20
Manganese	80	120	75	125	83	117	20	20
Molybdenum	80	120	75	125	81	119	20	20
Nickel	80	120	75	125	82	117	20	20
Potassium	80	120	75	125	74	126	20	20
Sulfur	80	120	75	125	NA	NA	20	20
Selenium	80	120	75	125	80	120	20	20
Silica (SiO_2)	80	120	75	125	NA	NA	20	20
Silver	80	120	75	125	66	134	20	20
Sodium	80	120	75	125	74	127	20	20
Strontium	80	120	75	125	80	120	20	20
Thallium	80	120	75	125	79	120	20	20
Tin	80	120	75	125	69	131	20	20
Titanium	80	120	75	125	82	118	20	20
Vanadium	80	120	75	125	79	121	20	20
Zinc	80	120	75	125	82	119	20	20

TABLE 3
REPORTING LIMITS

Element	Aqueous (mg/L)	Soil (mg/Kg)
ALUMINUM	0.10	4.0
ANTIMONY	0.05	2.0
ARSENIC	0.005	0.40
BARIUM	0.01	0.40
BERYLLIUM	0.005	0.20
BORON	0.03	1.2
CADMIUM	0.005	0.40
CALCIUM	0.10	4.0
CHROMIUM	0.01	0.40
COBALT	0.02	0.80
COPPER	0.01	0.40
IRON	0.05	2.0
LEAD	0.01	2.0
MAGNESIUM	0.10	4.0
MANGANESE	0.01	0.40
MOLYBDENUM	0.05	2.0
NICKEL	0.025	1.0
POTASSIUM	2.5	100
SULFUR	0.25	10
SELENIUM	0.01	0.80
SILICON	0.50	20
SILVER	0.007	0.40
SODIUM	2.0	80
STRONTIUM	0.01	2.0
THALLIUM	0.02	0.80
TIN	0.05	4.0
TITANIUM	0.01	0.40
VANADIUM	0.01	0.40
ZINC	0.05	2.0

Metals by Inductively Coupled Plasma

References: **EPA 200.7,** Inductively Coupled Plasma Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes. Code of Federal Regulations 40, Part 141 and Part 136, Revision 4.4, May 1994.

EPA 200.7, Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma – Atomic Emission Spectrometry. Revision 4.4 EMMC Version.

SM 2340B, Hardness by Calculation, Standard Methods for the Examination of Water and Wastewater, APHAAWWA-WPCF, 21st Edition, 1997.

1. Scope and Application

Matrices: Wastewater, Water, Solids

Definitions: See Alpha Laboratories Quality Manual Appendix A

Regulatory Parameter List 200.7 and 6010B:

Parameter	CAS	Parameter	CAS
Aluminum (Al)	7429-90-5	Manganese (Mn)	7439-96-5
Antimony (Sb)	7440-36-0	Molybdenum (Mo)	7439-98-7
Arsenic (As)	7440-38-2	Nickel (Ni)	7440-02-0
Barium (Ba)	7440-39-3	Phosphorus (P)	7723-14-0
Beryllium (Be)	7440-41-7	Potassium (K)	7440-09-7
Boron (B)	7440-42-8	Selenium (Se)	7782-49-2
Cadmium (Cd)	7440-43-9	Silica (SiO)	7631-86-9
Calcium (Ca)	7440-70-2	Silver (Ag)	7440-22-4
Chromium (Cr)	7440-47-3	Sodium (Na)	7440-23-5
Cobalt (Co)	7440-48-4	Strontium (Sr)	7440-24-6
Copper (Cu)	7440-50-8	Thallium (Tl)	7440-28-0
Iron (Fe)	7439-89-6	Tin (Sn)	7440-31-5
Lead (Pb)	7439-92-1	Titanium (Ti)	7440-32-6
Lithium (Li)	7439-93-2	Vanadium (V)	7440-62-2
Magnesium (Mg)	7439-95-4	Zinc (Zn)	7440-66-6

Inductively coupled plasma-atomic emission spectrometry (ICP-AES) determines metals and some nonmetals in solution. This method is a consolidation of existing methods for water, wastewater, and solid wastes. The parameters listed in this method are regulated under the Safe Drinking Water Action (SDWA), Clean Water Act (CWA) and the Resource Conservation and Recovery Act (RCRA).

This is an inductively coupled argon plasma (ICP) method applicable to the determination of the parameters listed above in drinking water, source water and raw water as provided under 40 CFR Part 141.23, municipal and industrial discharges as provided under 40 CFR Part 136.1. Separate SOPs for the digestion of the sample designate the appropriate acids, matrix and quality control samples for the sample matrix and parameters of interest. The parameter list is extended to add metals commonly requested by clients for water samples such as groundwater, surface water and process waters and for solid waste samples such as soil, sludge and other acid digestible materials.

For the determination of total recoverable parameters in aqueous and solid samples a digestion is required prior to analysis when the parameters are not in solution (e.g., soils, sludges, sediments and aqueous samples that may contain particulate and suspended solids). Aqueous samples containing suspended or particulate material ≥1% (w/v) must be digested as a solid type sample.

For drinking water and soluble metals analysis, the method determines certain metal and metalloid contaminants. Samples are analyzed directly by pneumatic nebulization without acid digestion if the sample has been properly preserved with acid and has a turbidity of <1 NTU at the time of analysis. This determination procedure is referred to as "direct analysis". However, in the determination of some primary drinking water metal contaminants, preconcentration of the sample may be required before analysis in order to meet drinking water acceptance performance criteria.

The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one of the following laboratory personnel before performing the modification: Area Supervisor, Metals Manager, Laboratory Director, or Quality Assurance Officer.

This method is restricted to use by or under the supervision of analysts experienced in the operation of the ICP and in the interpretation of ICP data. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

2. Summary of Method

The analysis described in this method involves multiple parameter determinations by ICP-AES using simultaneous instruments. The instruments measure characteristic atomic-line emission spectra by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Parameter specific emission spectra are produced by radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the line spectra are monitored at specific wavelengths by a photosensitive device. Photocurrents from the photosensitive device are processed and controlled by a computer system. A background correction technique is required to compensate for variable background contribution to the determination of the parameters. Background measurement is adjacent to the parameter wavelength during analysis.

Various sample processing techniques must be considered and addressed appropriately for the parameters of interest including: direct analysis (Section 9.4), total parameters using sample digestion techniques found in other standard operating procedures (SOPs) and control of interferences (Section 4.0). Sample processing includes the accurate weighing or measuring of a sample aliquot of a well mixed, homogeneous aqueous or solid sample.

For the determination of dissolved parameters (soluble metals) a filtered aqueous sample aliquot is analyzed by direct analysis for total recoverable parameters. When the sample turbidity is < 1 NTU in drinking water samples, analyze the samples by the direct analysis for total recoverable parameters. Direct analysis of the sample is by using the appropriate addition of nitric acid, diluting if necessary to a predetermined volume, mixing and analyzing.

For total recoverable parameters of a solid or an aqueous sample containing undissolved material, solubilize the parameters first by gentle refluxing with nitric acid. After cooling, the sample is made up to volume, mixed and analyzed. If solids are present after digestion, the sample is either filtered, centrifuged or allowed to settle overnight before analysis. More rigorous digestion techniques such as the technique for total parameters, use sulfuric, perchloric or other acids in combination to breakdown organic or other metal complexes.

This SOP includes the manual calculations for Total Hardness and Calcium Hardness according to

SM 2340B.

2.1 Method Modifications from Reference

The laboratory reports the % solids at 105°C and not at the 200.7 recommended temperature of 60°C. The percent solids are determined from a separate portion (>20 g) of the sample that is dried to constant weight at 103-105°C. If the data user, program, or laboratory requires that the reported percent solids be determined by drying at 60°C or other temperature, the exception is noted on a nonconformance report and included in the case narrative of the report.

Method 200.7 presents tables listing recoveries for a variety of matrices. These tables are compared to in-house control limits to verify method performance. Routine testing must meet in-house control limits.

Reported Al and Sr wavelengths differ from the reference method. Alpha reports Al at a wavelength of 308.2, except for the Trace 4 Instrument which reports Al at a wavelength of 396.1, and Sr at a wavelength of 421.5.

3. Detection Limits

Detection limits and linear ranges for the parameters will vary with the wavelength selected, the spectrometer, and the matrices. The laboratory follows the procedure found in 40CFR Part 136 to determine the MDL on an annual basis. The method detection limits determined by the laboratory are on file for review.

Table 1 provides estimated instrument detection limits for the listed wavelengths from the reference method and the reported detection limits for the aqueous sample matrix, instrumentation, and selected operating conditions. The reported detection limit for solid samples is calculated from the sample weight and final volume digested.

The reported detection limit is above the laboratory calculated MDL and checked daily by analyzing a standard near the reporting limit concentration. The MDL for a specific solid, wastewater or water matrix may differ from those listed, depending on the nature of the interferences in the sample matrix.

4. Interferences

4.1 Instrumental

4.1.1 Spectral Interferences

Spectral interferences are caused by background emission from continuous or recombination phenomena, stray light from the line emission of high concentration parameters, overlap of a spectral line from another parameter, or unresolved overlap of molecular band spectra.

Background emission and stray light are compensated for by subtracting the background emission determined by measurement(s) adjacent to the parameter wavelength peak. Spectral scans of samples or single parameter solutions in the parameter regions may indicate when alternate wavelengths are desirable because of severe spectral interference. The scans determine whether the most appropriate estimate of the background emission is provided by an interpolation from measurements on both sides of the wavelength peak or by the measured emission on one side or the other. The determination of the location(s) selected for the

measurement of background intensity is by the complexity of the spectrum adjacent to the wavelength peak. The location(s) used for routine measurement must be free of off-line spectral interference (interelement or molecular) or adequately corrected to reflect the same change in background intensity as occurs at the wavelength peak.

Spectral overlaps are avoided by using an alternate wavelength or are compensated for by equations that correct for interelement contributions, which involves measuring the interfering parameters. Some potential on-line spectral interferences observed for the recommended wavelengths are given in Table 2. When operative and uncorrected, these interferences will produce false-positive determinations. The interferences listed are only those that occur between method parameters. Only interferences of a direct overlap nature that were observed with a single instrument having a working resolution of 0.035 nm are listed. More extensive information on interferent effects at various wavelengths and resolutions is available in Boumans' Tables.

Users may apply interelement correction factors determined on their instruments within tested concentration ranges to compensate (off-line or on-line) for the effects of interfering parameters. The analysis of spectral interference check standards (ICS) verifies the accuracy of the interelement corrections. Interelement corrections will vary for the same emission line among instruments because of differences in resolution, as determined by the grating plus the entrance and exit slit widths, and by the order of dispersion. Interelement corrections will also vary depending upon the choice of background correction points. Selecting a background correction point where an interfering emission line appears must be avoided when practical. Interelement corrections that constitute a major portion of an emission signal may not yield accurate data. Users must not forget that some samples may contain uncommon parameters that could contribute spectral interferences.

See Section 10.4 for required spectral interference test criteria. If interelement corrections are not used, document the information and refer to the reference method (Section 4.1.5 Method 200.7) for information. On-going spectral interference check standards must be analyzed to verify the absence of interelement spectral interference or a computer software routine must be employed for comparing the determinative data to limits files for notifying the analyst when an interfering parameter is detected in the sample at a concentration that will produce either an apparent false positive concentration, greater than the parameter IDL, or false negative parameter concentration, less than the 99% lower control limit of the calibration blank. When the interference accounts for 10% or more of the parameter concentration, either an alternate wavelength free of interference or another approved test procedure must be used to complete the analysis.

4.1.2 Physical Interferences

Physical interferences are effects associated with the sample nebulization and transport processes. Changes in viscosity and surface tension can cause significant inaccuracies, especially in samples containing high dissolved solids or high acid concentrations. If physical interferences are present, they must be reduced by such means as a high-solids nebulizer, diluting the sample, using a peristaltic pump, or using an appropriate internal standard element.

Another problem that can occur with high dissolved solids is salt buildup at the tip of the nebulizer, which affects aerosol flow rate and causes instrumental drift. This problem can be controlled by a high-solids nebulizer, wetting the argon prior to nebulization, using a tip washer, or diluting the sample. Also, it has been reported that better control of the argon flow rates, especially for the nebulizer, improves

instrument stability and precision; this is accomplished with the use of mass flow controllers.

ICP-AES determines dissolved parameters in aqueous samples after suitable filtration and acid preservation. To reduce potential interferences, dissolved solids must be < 0.2% (w/v).

4.1.3 Chemical Interferences

Chemical interferences include molecular-compound formation, ionization effects, and solute-vaporization effects. Normally, these effects are not significant with the ICP-AES technique. If observed, they can be minimized by careful selection of operating conditions (such as incident power and observation height), by buffering of the sample, by matrix matching, and by standard-addition procedures. Chemical interferences are highly dependent on matrix type and the specific parameter.

4.1.4 Memory Interferences

Memory interferences result when parameters in a previous sample contribute to the signals measured in a new sample. Memory effects can result from sample deposition on the uptake tubing to the nebulizer, and from the buildup of sample material in the plasma torch and spray chamber. The site where these effects occur is dependent on the parameter and is minimized by flushing the system with a rinse blank between samples. If memory interference is suspected, the sample must be re-analyzed after a long rinse period, using either a peristaltic pump, or an appropriate internal standard element.

Method interferences are the result of contaminants in acids, reagents, glassware, and other sample processing hardware. Running laboratory reagent blanks as described in Section 9.4 and 10.2 demonstrates the system is free of contamination. The analytical system must be free from contamination under the conditions of the analysis.

4.2 Parameters

4.2.1 When determining **boron** and **silica** in aqueous samples, only plastic, PTFE or quartz labware must be used from time of sample collection to completion of analysis. For accurate determination of boron in solid samples only quartz or PTFE beakers must be used during acid extraction with immediate transfer of an extract aliquot to a plastic centrifuge tube following dilution of the extract to volume. When possible, borosilicate glass must be avoided to prevent contamination of these parameters.

4.2.2 **Silver** is only slightly soluble in the presence of chloride unless there is a sufficient chloride concentration to form the soluble chloride complex. Therefore, low recoveries of silver may occur in samples, spiked sample matrices and spiked blanks or as a dissolved parameter or analyzed by "direct analysis". For this reason, samples are digested using the total recoverable mixed acid digestion before the determination of silver. For the analysis of wastewater samples containing higher concentrations of silver, succeeding smaller volume, well mixed aliquots must be prepared until the analysis solution contains <0.1 mg/L silver. The extraction of solid samples containing concentrations of silver >50 mg/kg must be treated in a similar manner.

4.2.3 The digestion of **tin** from solid samples must be prepared using aliquots of <1 g when expected sample concentrations exceed 1%.

4.2.4 The total recoverable sample digestion procedures solubilize and hold in solution only minimal concentrations of **barium** in the presence of free sulfate. For the

analysis of barium in samples having varying and unknown concentrations of sulfate, analysis must be completed as soon as possible after sample preparation.

5. Safety

The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound must be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material data handling sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

Specifically, concentrated nitric and hydrochloric acids present various hazards and are moderately toxic and extremely irritating to skin and mucus membranes. Always use these reagents in a fume hood, and if eye or skin contact occurs, flush with large volumes of water. Always wear safety glasses or a shield for eye protection, protective clothing and observe proper mixing when working with these reagents.

The acidification of samples containing reactive materials may result in the release of toxic gases, such as cyanides or sulfides. Acidification of samples must be done in a fume hood.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

The inductively coupled plasma is only viewed with proper eye protection from the ultraviolet emissions.

6. Sample Collection, Preservation, and Handling

6.1 Sample Collection

Prior to the collection of an aqueous sample, consideration must be taken as to what type of analysis is specified, (i.e. dissolved or total), so that the appropriate pretreatment or preservation steps may be taken.

The laboratory routine practice is to collect a single 1L plastic container for aqueous samples and 250 mL wide mouth jar for soil samples.

6.2 Sample Preservation

6.2.1 Solid samples require no chemical preservation before analysis.

6.2.2 For the determination of <u>total parameters</u>, the sample is preserved with 1:1 HNO_3 to pH < 2, not to exceed 10 ml of 1:1 HNO_3 per liter of sample. Usually 2 ml of 1:1 HNO_3 is sufficient for the preservation of drinking waters.

6.2.3 For the determination of <u>dissolved parameters</u>, an aliquot of the unpreserved sample is filtered through a 0.45μm membrane filter within 24 hours of the collection time, and prior to sample digestion and analysis. The sample is filtered through a nitric acid presoaked glass filtration apparatus. Once a sufficient volume of the filtrate is obtained, the filtrate is preserved with 1:1 Nitric acid (HNO_3) to a pH < 2. A separate SOP lists the sample preparation technique.

6.2.4 For the determination of <u>total recoverable parameters</u> in aqueous samples, samples are not filtered, but acidified with 1:1 Nitric acid to a pH < 2. Usually 3 mL of 1:1 Nitric acid per liter of sample is sufficient for most drinking water samples.

6.3 Sample Handling

6.3.1 Samples require ice or refrigeration from the time of collection until analysis. Cool and maintain the sample temperature between 2 and 6 °C from time of sample receipt until analysis.

6.3.2 Samples are digested and analyzed within 180 days of collection. Sample digestates are maintained at room temperature.

6.3.3 Refer to the Project Information Form (PIF) for client specific sample handling, preservation and collection criteria.

7. Equipment and Supplies

7.1 Inductively coupled argon plasma emission spectrometer:

7.1.1 Computer-controlled emission spectrometer with background correction.

7.1.2 Radio-frequency generator compliant with FCC regulations.

7.1.3 Optional mass flow controller for argon nebulizer gas supply.

7.1.4 Peristaltic pump.

7.1.5 Autosampler.

7.1.6 Argon gas supply - high purity.

7.2 Volumetric pipets: 0.5 mL, 1 mL, 5 mL, 10 mL Class A pipets

7.3 Volumetric flasks: 10 mL, 50 mL, 100 mL, Class A with ground glass stoppers

7.4 Autopipetter: Eppendorf, calibrated.

8. Standards and Reagents

8.1 Reagent water: Reagent water in the metals laboratory is water from the RO water system, passed through a column of Milli-Q deionized water system in the laboratory.

8.2 Nitric acid: Concentrated, ACS grade quality and Trace Metals grade.

8.3 10% (v/v) Nitric acid: 100mL concentrated nitric acid diluted to 1 liter with reagent water.

8.4 5% (v/v) Nitric acid: 50 mL concentrated nitric acid diluted to 1 liter with reagent water.

8.5 1:1 Nitric acid: 500 mL concentrated nitric acid diluted to 1 liter with reagent water.

8.6 Hydrochloric acid: Concentrated, ACS grade quality and Trace Metals grade.

8.7 Stock standard solutions: Certified stock standard solutions in nitric acid. The certification includes the concentration, uncertainty and traceability to NIST if available. Stock standards include calibration standards, calibration verification, laboratory controls and spiking solutions.

Select the certified stock standards containing single parameters or multiple parameters of interest. Record the concentration of the certified stock standards, lot number, supplier, standard name, catalog number, expiration date, date received and receiver's initials in the standards logbook. Record the number of containers prepared and the identifier for the stock standard. Stock standards are initialed and dated upon receipt and certificates are kept in a binder.

Standards are stored in plastic bottles at room temperature.

Standards must be replaced every twelve months, or sooner if comparison with check standards indicates a problem.

8.8 Stock Standards: The stock standards are prepared at concentrations such that the aqueous standards bracket the working range of the analytical system. Prepare the standards using a Class A volumetric pipet, or autopipetter, to transfer the standard (mg/L) into a volumetric flask containing reagent water (mL). Add the appropriate amount of acid to ensure consistent standard and sample acid concentration.

The manufacturer (Inorganic Ventures, Inc.) determines the expiration date of the stock standards. Store stock standards at room temperature.

Other standards may be purchased and prepared. The specific instructions for standard preparation not listed in this SOP are detailed in the standard logbook at the time of preparation.

8.8.1 ICP Calibration Stock #1 (IV-7): Al, Ba, B, Ag, Na at 100 μg/mL; K at 1000 μg/mL; Si at 50 μg/mL

8.8.2 ICP Calibration Stock #2 (IV-19): Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Se, Tl, Ti, V, Zn at 100 μg/mL

8.8.3 ICP Cal Verification #1 (IQC-007): Al, Ba, B, Ag, Na at 100 μg/mL; K at 1000 μg/mL; Si at 50 μg/mL

8.8.4 ICP Cal Verification #2(IQC-019): Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Se, Tl, Ti, V, Zn at 100 μg/mL

8.8.5 ICP Ag Standard: Silver standard at 1000 μg/mL

8.8.6 ICP Al Standard: Aluminum standard at 1000 μg/mL

8.8.7 ICP Ba Standard: Barium standard at 1000 μg/mL

8.8.8 ICP B Standard: Boron standard at 1000 μg/mL

8.8.9 ICP Cd Standard: Cadmium standard at 1000 μg/mL

8.8.10 ICP Fe Standard: Iron standard at 1000 μg/mL

8.8.11 ICP K Standard: Potassium standard at 1000 μg/mL

8.8.12 ICP Li Standard: Lithium standard at 1000 μg/mL

8.8.13 ICP Mg Standard: Magnesium standard at 1000 μg/mL

8.8.14 ICP Mo Standard: Molybdenum standard at 1000 μg/mL

8.8.15 ICP Na Standard: Sodium standard at 1000 μg/mL
8.8.16 ICP P Standard: Phosphorus standard at 1000 μg/mL
8.8.17 ICP Pb Standard: Lead standard at 1000 μg/mL
8.8.18 ICP S Standard: Sulfur standard at 1000 μg/mL
8.8.19 ICP Si Standard: Silicon standard at 1000 μg/mL
8.8.20 ICP Sr Standard: Strontium standard at 1000 μg/mL
8.8.21 ICP Sn Standard: Tin standard at 1000 μg/mL
8.8.22 ICP Ti Standard: Titanium standard at 1000 μg/mL
8.8.23 ICP Se Standard: Selenium standard at 1000 µg/mL
8.8.24 ICP Sb Standard: Antimony standard at 1000 µg/mL
8.8.25 ICP As Standard: Arsenic standard at 1000 µg/mL
8.8.26 ICP Be Standard: Beryllium standard at 1000 µg/mL
8.8.27 ICP Co Standard: Cobalt standard at 1000 µg/mL
8.8.28 ICP Cu Standard: Copper standard at 1000 µg/mL
8.8.29 ICP Cr Standard: Chromium standard at 1000 µg/mL
8.8.30 ICP Mn Standard: Manganese standard at 1000 µg/mL
8.8.31 ICP Ni Standard: Nickel standard at 1000 µg/mL
8.8.32 ICP Tl Standard: Thallium standard at 1000 µg/mL
8.8.33 ICP V Standard: Vanadium standard at 1000 µg/mL
8.8.34 ICP Zn Standard: Zinc standard at 1000 µg/mL
8.8.35 ICP Ca Standard: Calcium standard at 1000 µg/mL

8.9 Working Standards: The working standards are prepared from the stock standards and brought to final volume with 5% nitric acid solution. The working standard solutions expire one month from the date of preparation. The CRI stock solution expires six months from the date of preparation or prior to the manufacturer's expiration date. Working standards are stored at room temperature.

8.9.1 ICP CRI Stock Standard: To a 1L volumetric flask, add 500mL DI water and 50mL concentrated HNO_3. Utilizing the 1000µg/mL individual elemental standards (Section 8.9), and an Eppendorf pipetter (Section 7.4), add the following volumes of standards to the 1L volumetric flask. Bring to volume with DI water.

0.4mL: Be, Cd

0.8mL: As, Ag, Cr, Se, Sn, Tl, Sr, Bi

1.2mL: Mn

1.6mL: Ba, Zn

1.8mL: Pb

2.0mL: Cu

3.2mL: Ni

4.0mL: B, Co, Mo, Sb, V

8.0mL: Fe

16.0mL: Al, Ca, Mg

40.0mL: Si

200mL: Na, K

8.10 Calibration Standards: The instrument calibration standard must include all elements. Other elements may be added or single element standards may be prepared.

Record the stock standard identifier, expiration date for stock standard, acid supplier, log number, preparation date and preparer's initials in the standards logbook. Note any deviations from the routine preparation.

Calibration standards are stored at room temperature and are prepared weekly.

8.10.1 Instrument Cal Std: 10.0 mL IV-7

10.0 mL IV-19

1.0 mL 1000 mg/L Sr, Sn stock standard

Final Volume: 1000 mL

8.11 Interference check standard (ICSA, ICSAB): The routine preparation of the ICS uses the following multielement stock standards. The manufacturer (Absolute Standards, Inc.) sets the expiration date for the stock standards. Store stock standards refrigerated at 4 ± 2°C.

8.11.1 Stock Standards

8.11.1.1 Interference check standard (ICSA) = Al, Ca, Mg at 5000 μg/mL; Fe at 2000 μg/mL.

8.11.1.2 ICP Interference check standard #1 = B at 500 μg/mL, Ti at 1000 μg/mL, Mo at 300 μg/mL and Si at 230 μg/mL

8.11.1.3 ICP Interference check standard #2 = Sb at 1000 μg/mL

8.11.1.4 ICP Interference check standard #3 = K at 20,000 μg/mL; As, Pb, Tl at 1000 μg/mL; Se at 500 μg/mL; Mn at 200 μg/mL; Be at 100 μg/mL; and Ag, Ba, Cd, Cr, Co, Cu, Ni, V, Zn at 300 μg/mL

8.11.1.5 ICP Interference check standard #4 = K at 20,000 μg/mL; Ca at 15,000 μg/mL; Fe at 12,500 μg/mL; Ba, Ni at 300 μg/mL; Mg at 7500 μg/mL; Al at 3000 μg/mL ; Na at 2500 μg/mL

8.11.2 Working Standards

The expiration date for the working solutions is six months from the date of preparation or prior to the manufacturer's expiration date. Store at room temperature.

Record the stock standard identifier, expiration date for the standard, date received, opened date and receiver's initials in the standards logbook. Also note any deviations from the routine preparation.

8.11.2.1 ICSA: For Trace ICP, bring 25.0 mL Interference check standard (ICSA) to a final volume of 500mL with 5% nitric acid solution.

Final concentration: Al, Ca, Mg at 250 μg/mL and Fe at 100 μg/mL

8.11.2.2 ICSAB: For Trace ICP, add 1mL of Interference Check Solutions #1, #2 and #3, 3mL of Interference Check Solution #4 and 1mL of 1000mg/L stocks of Sr, Sn, Bi and Si and bring to a final volume of 1000mL with 5% nitric acid solution.

Final concentration: Sb, As, Pb, Sr, Tl, Sn, Ti at 1.0 mg/L; Be at 0.1mg/L;

Ba, Cd, Cr, Co, Cu, Mo, Ni, Ag, V, Zn, at 0.3 mg/L;

Mn at 0.2mg/L; K at 20mg/L; B, Se at 0.5 mg/L;

Si at 1.23mg/L; al at 9.0mg/L; Ca at 45.0mg/L;

Fe at 37.5mg/L; Mg at 22.5mg/L; and Na at 7.5mg/L

8.12 Calibration verification (CV) standard solution: The CV is also referred to as the initial (ICV) and continuing calibration verification (CCV). This standard is from a different lot number or manufacturer than the calibration standards. Prepare the standard using a Class A volumetric pipet (mL), or Autopipetter, to transfer the stock standard (mg/L) into a volumetric flask containing reagent water (mL).

Record the stock standard identifier, expiration date for the CV standard, preparation date and preparer's initials in the standards logbook. Record the exact steps for preparing the standard and the identifier for the CV standard.

The manufacturer (Ultra Scientific, Inc.) sets the expiration date for the stock standards. Store stock standards at room temperature.

8.12.1 Initial Cal Verification (ICV):

5 mL IQC-007

5 mL IQC-019

9.5 mL 1000 mg/L Na stock standard

0.5 mL 1000 mg/L Sr stock standard

5.0 mL 1000 mg/L Si stock standard

Final Volume: 1000 mL

8.13 Detection Limit Check (CRI): A standard prepared at or near the reporting level is spiked into water at the time of preparation. The standard evaluates the sensitivity of the method. The expiration date for the standard is one month from the preparation date. Store at room temperature.

Record the stock standard identifier, expiration date, preparation date and preparer's initials in the standards logbook. Record the exact steps for preparing the standard and the identifier for the low level LCS. (Note: The term used for the low level check standard is CRI. The term CRI is from the Contract Laboratory Program (CLP) for Contract Required Instrument detection limit. The use of the term is for convention and does not imply CLP protocols.)

8.13.1 CRI standard: To a 1L volumetric flask, add 500mL of DI water and 50mL of concentrated HNO3. Using a calibrated pipetter, add 25mL of the CRI Intermediate standard (Section 8.9.1) and bring to volume with DI water. This standard will have the following concentrations of elements:

1.1 mg/L: Be, Cd

1.2 mg/L: As, Ag, Cr, Se, Sn, Sr, Tl, Ti

1.3 mg/L: Mn

0.04mg/L: Ba, Zn

0.045mg/L: Pb

0.05 mg/L: Cu

0.08 mg/L: Ni

1.1 mg/L: B, Co, Mo, Sb, V

1.2 mg/L: Fe

0.4 mg/L: Al, Ca, Mg

1.0 mg/L: Si

5.0 mg/L: K, Na

8.14 QC check sample (QCS): The reference method requires the analysis of a QCS at least quarterly. The CCV sample is a standard run from a second source and meets the same requirements as the QCS. Whenever a new analyst, new equipment or major method change occurs, the CCV is analyzed in replicate (at least three samples) to verify method performance. Record the stock standard identifier, expiration date for the QCS, preparation date and preparer's initials in the standards logbook. Record the number of containers prepared and the identifier for the standard. Store at room temperature.

9. Procedure

9.1 ICP Set-up and Shut-down

Set-up the instrument with proper operating parameters. (Section 9.4) The instrument must be allowed to become thermally stable before beginning the analysis. Thermal stability requires at least 30 minutes of operation before calibration.

Instrument Start-up steps:

Turn on chiller

Clamp peristaltic pump windings

Start computer (if not currently in operation)

Initialize plasma startup

At the end of each operating day the instrument is shut down. Instrument Shut down steps are:

Flush the instrument for one minute with the rinse solution.

Extinguish plama by either autoshut down at end of sequence or manually

Turn of chiller once shutdown/cooldown process is complete.

Plasma Optimization: The plasma operating conditions need to be optimized prior to use of the instrument. This routine is not required on a daily basis, but when first setting up a new instrument or following a change in operating conditions. Follow the plasma optimization set-up recommended by the instrument manufacturer.

The purpose of plasma optimization is to provide a maximum signal to background ratio for some of the least sensitive elements in the analytical array. The use of a mass flow controller to regulate the nebulizer gas flow or source optimization software greatly facilitates the procedure.

The mass flow controller is set to the recorded optimized flow rate per the manufacturer's suggestions. In order to maintain valid spectral interelement correction routines the nebulizer gas flow rate must be the same (< 2% change) from day to day.

Instrument Profile: The Thermo 6500 series ICP performs an automatic profile optimization each time the software is started which requires no operator interaction.

Interelement Spectral Interference Correction: The laboratory must establish and initially verify an interelement spectral interference correction routine to be used during sample analysis. A general description concerning spectral interference and the analytical requirements for background correction are discussed in the section on interferences. Criteria for determining an interelement spectral interference is an apparent positive or negative concentration for the analyte that falls within ± one reporting limit from zero. The upper control limit is the analyte instrument detection limit. Once established, the entire routine must be verified annually. A portion of the correction routine is verified on a daily basis.

Linear Dynamic Range: The upper limit of the linear dynamic range must be established for each wavelength by determining the signal responses from various different concentration standards across the range. One of the standards is near the upper limit of the range. The data, calculations and rationale for the choice of range is documented and kept on file. The upper range limit is an observed signal no more than 10% below the level extrapolated from lower standards. The linear Dynamic Range is evaluated once per year.

New dynamic ranges are determined whenever there is a significant change in instrument response. For those analytes that periodically approach the upper limit, the range is checked every six months.

NOTE: Many of the alkali and alkaline earth metals have non-linear response curves due to ionization and self absorption effects. These curves may be used if the instrument allows; however the effective range must be checked and the second order curve fit must have a correlation coefficient of 0.995 or better. Third order fits are not acceptable. These non-linear response curves must be revalidated and recalculated every six months. These curves are much more sensitive to changes in operating conditions than the linear lines and must be checked whenever there have been moderate equipment changes.

9.1.1 The essential peak quality control acceptance criteria listed below must be met, otherwise the problem must be found and corrected:

Peak position in terms of wavelength: <1

Peak width at half-height: 10 +/- 10%

Peak intensity : < ½ the intensity since the instrument was last serviced

9.2 Initial Calibration

Assemble and prepare the instrumental system to the same operation conditions as the sample analysis. (Section 9.4)

Calibrate the instrument according to the instrument manufacturer recommended procedures. Calibration is performed when changes to the operating parameters (Section 9.4) are required for improved instrument performance.

Calibration is checked on a daily basis to verify proper operating conditions are maintained by analyzing the calibration standard, calibration verification, interference check standard and low level control sample.

Prepare the calibration standard. Record the calibration standard identifier, concentration, and analyst initials in the instrument analysis logbook.

At the beginning of daily analysis (every 24 hours) a single calibration standard is analyzed after the calibration blank. Flush the system with the calibration blank before and after calibration. The average intensity of three (3) exposures (two exposures for the Trace 4 Instrument) is used for calibration to reduce random error. The % RSD for the three replicates must be $\leq$ 5%. Multiple calibration standards may be analyzed where project specific or client requests require bracketing the working range with daily calibration standards. The concentration of the daily calibration standard is near the mid-point of the working range. All parameters of interest are analyzed in the daily calibration standard.

The calibration blank results are to agree within three standard deviations of the mean blank value. If not, repeat the analysis two more times and average the result. If the average of the three results are not within three standard deviation of the background mean, terminate the analysis and correct the problem.

9.3 Standardization

Prepare the calibration verification standard.

Analyze the calibration verification the same as any sample. (See Section 9.4) The initial calibration verification (ICV) standard is analyzed after the calibration standard and after every ten samples (CCV). Flush the system with the calibration blank before and after every standard and sample. The average intensity of three (3) exposures is used for calibration to reduce random error. The % RSD for the three replicates must be $\leq$ 5%. The initial calibration standard (ICV) must be within $\pm$ 5% of the true value. The continuing calibration standard (CCV) must be recovered within 5% for wastewater analysis and within 10% for drinking water analysis. In order for the analysis to proceed, these acceptance criteria must be met.

Record the calibration verification standard identifier, concentration, analyst initials and any deviations to this procedure in the instrument analysis logbook.

Analyze the calibration blank (CCB) after the calibration verification standard and every ten samples. The absolute value of the calibration blank result must be less than the reporting limit listed in Table 1 for analysis to be acceptable.

9.4 Equipment Operation and Sample Analysis

All glassware must be acid rinsed before use. The glassware is rinsed with 50% hydrochloric acid, then rinsed three times with reagent water, then once with 10% nitric acid solution and then rinsed three times with reagent water.

Changes in acquisition parameters, equipment, and conditions require written authorization from management. Demonstration of method performance based on method modifications must be on file before sample analysis.

Calibration is acceptable if average of three individual runs is %RSD $\leq$ 5% for standards and $\leq$ 25% RSD for samples. Blanks are not controlled on the basis of the %RSD of the three replicates.

The following are the routine instrumental parameters for multielement analysis. Single element analysis or non-routine instrumental parameters are found in the instrument analysis data:

Incident RF power 1100 watts

Reflected RF power <5 watts

Injector tube orifice i.d. 1 mm

Argon supply liquid argon

Argon pressure 100 psi

Sample uptake rate controlled to approximately 1 mL/min.

Rinse time default: 60 seconds

Record the sample number (standard or QC sample identifier), preparation batch identifier, standard solution identifier, dilution, analyst initials, deviations from this procedure and visual observations in the instrument analysis logbook.

Samples digested in a batch must include a method blank (MB), laboratory control sample (LCS), matrix spike and duplicate sample.

Perform a preliminary data review of the sample, standards and blank performance. Note any obvious problems in the instrument analysis logbook. If the absorbance for any parameter exceeds the working range of the system, prepare a dilution of the sample and reanalyze. Record the dilution in the instrument analysis logbook.

9.5 Preventative Maintenance

All preventative maintenance is performed per the manufacturer's instructions for each instrument, and is noted in the instrument's Maintenance Logbook.

9.6 Calculations

When a parameter is detected, the quantitation of that parameter is based on the absorbance from a known concentration compared to the absorbance from the unknown.

Calculate the sample concentration using the linear regression analysis supplied with the instrument software.

Report results in mg/L without correction for blank and recovery data. Record all QC data and report with the sample results as required by client specifications. Reported detection limits must be corrected for the sample dilution factor.

Sample data is reported in units of mg/L for aqueous samples and mg/kg wet weight for solid samples. Solid samples >5% solids are reported as mg/kg dry weight following solids correction in the LIMS.

For dissolved aqueous parameters or samples analyzed by "direct analysis" report the data generated directly from the instrument with allowance for sample dilution. Do not report parameter concentrations below the Reporting Limits (Table 1).

For total recoverable aqueous parameters, multiply solution parameter concentrations by the dilution factor 0.5, when 100 mL aliquot is used to produce the 50 mL final solution, and report data. If a different aliquot volume other than 100 mL is used for sample preparation, adjust the dilution factor accordingly. Also, account for any additional dilution of the prepared sample solution needed to complete the determination of parameters exceeding 90% or more of the LDR upper limit. Do not report data below the determined parameter MDL concentration or below an adjusted detection limit reflecting smaller sample aliquots used in processing or additional dilutions required to complete the analysis.

For parameters with MDLs < 10 μg/L, round the data values to the ones place and report parameter concentrations up to two significant figures. For parameters with MDLs ≥ 10 μg/L round the data values to the ones place and report parameter concentrations up to three

significant figures. Extract concentrations for solids data must be rounded in a similar manner.

For total recoverable parameters in solid samples, round the solution parameter concentrations (mg/L) the same as aqueous samples. Report the data up to three significant figures as mg/kg wet-weight basis unless specified otherwise by the program or data user. Calculate the concentration using the equation below:

$$\textit{Sample Results (mg / Kg)} = \frac{C * V * D}{W}$$

where:

C = Concentration in digestate (μg/L)

V = Volume of digestate (L, 100 mL = 0.1L)

D = Dilution factor (undiluted = 1)

W = Weight of sample aliquot extracted (g x 0.001 = kg)

Do not report parameter data below the estimated solids MDL or an adjusted MDL because of additional dilutions required to complete the analysis.

To report percent solids in solid samples calculate as follows:

$$\%Solids = \frac{DW}{WW}$$

where:

DW = Sample weight (g) dried at 103 - 105°C.

WW = Sample weight (g) before drying

Calculations for Hardness by SM2340B

The method for determining hardness is to compute it from the results of separate determinations of Calcium and Magnesium on aqueous samples.

Total Hardness:

Total Hardness, mg equivalent $CaCO_3$/L = [2.497 (Ca, mg/L)] + [4.118 (Mg, mg/L)]

Calcium Hardness:

Calcium Hardness, mg equivalent $CaCO_3$/L = [2.497 (Ca, mg/L)]

10. Quality Control and Data Assessment

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method. When results of sample spikes

indicate atypical method performance, a calibration verification standard is used to confirm the measurements were performed in an in-control mode of operation.

10.1 Demonstration of Capability

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method. Each time a method modification is made, the analyst is required to repeat the procedure.

When one or more of the parameters tested fail at least one of the acceptance criteria, the analyst must locate and correct the source of the problem and repeat the test for failed parameters of the method.

Repeated failure confirms a general problem with the measurement system or analytical technique of the analyst. If the failure repeats, locate and correct the source of the problem and repeat the test for all parameters listed in the method.

10.2 Blanks

The instrument and method blanks must be less than the absolute value of reporting detection limit

Analyze an acid blank each day to demonstrate that interferences from the instrumental system are under control. The acid blank must contain the same acid concentration as the standards and samples. Do not begin analysis, if parameters are found in the instrument blank at or above the reporting limit.

The possibility of memory interferences must be recognized within an analytical run and suitable rinse times must be used to reduce them. The rinse times necessary for a particular parameter must be estimated prior to analysis. This may be achieved by aspirating a standard containing parameters corresponding to either their LDR or a concentration ten times those usually encountered. The aspiration time must be the same as a normal sample analysis period, followed by analysis of the rinse blank at designated intervals. The length of time required to reduce parameter signals to within a factor of two of the method detection limit, must be noted. Until the required rinse time is established, this method requires a rinse period of at least 60 seconds between samples and standards unless proven otherwise through experimentation.

Analyze a method blank from the same preparation batch as the samples. If parameters are found in the method blank, at less than the reporting limit, report the data without qualification. If the parameter in the method blank is above the reporting limit, note the information on a non-conformance form to determine corrective action for all samples in the batch. Data is only reported with qualification when the method blank indicates possible contamination in the system.

10.3 Calibration Verification and Laboratory Control Samples (LCS)

Demonstrate through the analyses of the initial calibration verification (ICV) standard that the operation of the measurement system is in control. The frequency of the analyses is equivalent to 5% of all samples analyzed. % Recovery of the ICV must be within ± 5% of the true value.

Analyze the CCV to verify the measured concentration for each parameter. The concentration must be recovered within 10% for non-potable wastewater, surface water, domestic water analysis and drinking water analysis.

If the concentration for a parameter does not fall within the range in this second test, instrument maintenance must be performed to determine the cause of the failure. A second CCV standard with all parameters may be analyzed immediately. The second CCV standard must not fail the acceptance criteria for all parameters.

Compare the measured concentration for the digested LCS with in-house performance data. The percent recovery must be within 85-115% for aqueous samples and 80-120% for soil/solid samples. The LCS is prepared with each digestion batch (every 20 samples).

If the recovery of any such parameter falls outside the designated range, the laboratory performance for that parameter is judged to be out of control, and the problem must be immediately identified and corrected, prior to sample analysis. A nonconformance form is completed.

10.4 Interference Check Standards

The ICSA compounds must be less than the Reporting limit for all analytes . The reported values for the ICSAB for any analyte of interest must be within ±20% of the true value; major interferents are not evaluated (Ca, Fe, Mg, K, or Na). If the ICSA or ICSAB fail a nonconformance report must be written. Data is not be reanalyzed, unless approval from the laboratory director is authorized and the data is qualified to the client.

The interference effects must be evaluated for each individual instrument whether configured as a sequential or simultaneous instrument. For each instrument, intensities will vary not only with optical resolution but also with operating conditions (such as power and argon flow rate). The analyst determines and documents for each wavelength in Table 1 the effect from the known interferences given in Table 2, and utilizes a computer routine for their automatic correction on all analyses. To determine the appropriate location for off-line background correction, the user must scan the area on either side adjacent to the wavelength and record the apparent emission intensity from all other method parameters. This spectral information must be documented and kept on file.

The location selected for background correction must be either free of off-line interelement spectral interference or a computer routine must be used for their automatic correction on all determinations. If a wavelength other than the recommended wavelength is used, the user must determine and document both the on-line and off-line spectral interference effect from all method parameters and provide for their automatic correction on all analyses. Tests to determine the spectral interference must be done using parameter concentrations that will adequately describe the interference. Normally, 100 mg/L single parameter solutions are sufficient, however, for parameters such as iron that may be found at high concentration a more appropriate test would be to use a concentration near the upper limit of the linear dynamic range.

10.5 Matrix Spike

Spike and analyze a minimum of 10% of all samples to monitor and evaluate laboratory data quality.

The concentration of the spike should be at one to five times higher than the sample concentration or at the client requested action level.

Calculate the matrix spike recovery. The recovery must be within ±20% or the in-house generated limits for each parameter. If any individual percent recovery falls outside the designated range for recovery (R), that parameter has failed the acceptance criteria. A nonconformance report form is completed to ensure client notification and reporting. A post digestion spike may be performed by adding the same concentration standard to the digested sample. The percent recovery for the post digestion spike is calculated to identify possible sources of the interference. The post digestion spike results are narrated on the final report along with the original failed spike recovery.

10.6 Duplicates

Analyze a duplicate sample or reagent water spike at a minimum of 10% of the samples. The percent RPD is determined. The laboratory generated limits for RPD must be met or documented as to the reasons for deviation.

10.7 Detection Limit Check (CRI) Standard

A CRI Standard is prepared per Section 8.13, and analyzed following the interference check standards, ICSA and ICSB, at the beginning of the analytical sequence. Acceptable recovery is ± 20% from the true value. If this standard fails for any element, refer to Section 12 for corrective actions.

10.8 Control Limits

The laboratory maintains performance records to document the quality of data that is generated. Method accuracy for samples is assessed and records maintained.

Control limits for the method parameters are maintained by the QC staff. The control limits are calculated based on in-house performance data. The limits are compared to the control limits found in the reference method 200.7 Table 4 to 9. The in-house calculated limits must be within the acceptance limits listed in Table 9 of 200.7.

10.9 Analytical Sequence

The analytical sequence is:

Instrument Blank (IB)

Instrument Calibration Standard(s)

Calibration Verification Standard (ICV) - second source different concentration (5% of true)

Calibration Blank (ICB)

Interference check standard A (ICSA) (20% of true)

Interference check standard B (ICSB) (20% of true)

Detection Limit Check (CRI)

Low Level Checks: 2.5, 5.0, 10.0, 50.0 ppb

Continuing calibration verification (CCV) (10% of true)

Continuing calibration blank (CCB)

Sample 1 to 10

(Includes method blank, field blank, sample matrix spike, sample duplicate and spiked blank)

CCV

CCB

Sample 1 to 10

CRI

CCV

CCB

11. Method Performance

The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the value is above zero. The detection limits listed in Table 1 were obtained using reagent water. The MDL actually achieved in a given analysis will vary depending on instrument sensitivity and matrix effects.

The MDL for solid samples is based on the weight and digestion volume. The aqueous MDLs are used to calculate the solid sample Method detection limit. The solid samples Reporting limits are based on the aqueous sample reporting limit (Table 1) multiplied by the solid sample preparation factor. (final volume/sample weight). The reporting limits for solids may be estimated from the reporting limits in Table 1. The typical sample weight is 5 grams with a final volume of 200 mL.

Method performance data is on file in the laboratory QC department. Comparison of method performance data for the laboratory to the reference method criteria occurs when laboratory in-house acceptance limits are generated. In-house generated data must be within the specifications of the reference method or the analysis is not continued until corrective action is completed.

12. Corrective Actions

Holding time exceedence and improper preservation are noted on the nonconformance report form.

Perform routine preventative maintenance following manufacturer's specification. Record all maintenance in the instrument logbook.

Review of standards, blanks and standard response for acceptable performance occurs for each batch of samples. Record any trends or unusual performance on a nonconformance action form.

If the CCV or LCS recovery of any parameter falls outside the designated acceptance range, the laboratory performance for that parameter is judged to be out of control, and the problem must be immediately identified and corrected. The analytical result for that parameter in the unspiked samples is suspect and is only reported for regulatory compliance purposes with the appropriate nonconformance action form. Immediate corrective action includes reanalyzing all affected samples by using any retained sample before the expiration of the holding time.

If the CRI fails (> ± 20% from the true value), then the CRI is re-analyzed. If the failing element is not to be used in the analysis package, then this is noted on the raw data package. If the element(s) is needed in the analysis package, and the re-analysis fails, then the analysis stops and the instrument is recalibrated, and the CRI reanalyzed. If the failure continues, the Inorganics Supervisor is notified to identify and correct the problem.

13. Pollution Prevention

See Chemical Hygiene Plan for pollution prevention operations.

14. Waste Management

See Chemical Hygiene Plan for waste handling and disposal.

15. Attachments

Table 1: Detection Limits
Table 2: Interferent Listing

Table 1 Detection Limits

Parameter	Wavelength	Standard Reported Detection Limits (μg/L)
	Trace	Trace
Aluminum (Al)	308.2	100
Aluminum (Al) Trace 4 Instrument	396.1	100
Antimony (Sb)	206.8	50
Arsenic (As)	189.0	5
Barium (Ba)	493.4	10
Beryllium (Be)	313.0	5
Boron (B)	249.6	30
Cadmium (Cd)	226.5	5
Calcium (Ca)	317.9	100
Chromium (Cr)	267.7	10
Cobalt (Co)	228.6	20
Copper (Cu)	324.7	10
Iron (Fe)	271.4	50
Lead (Pb)	220.3	10
Magnesium (Mg)	279.0	100
Manganese (Mn)	257.6	10
Molybdenum (Mo)	202.0	50
Nickel (Ni)	231.6	25
Potassium (K)	766.4	2500
Selenium (Se)	196.0	10
Silica (SiO_2)	288.2	500
Silver (Ag)	328.0	7
Sodium (Na)	588.9	2000
Strontium (Sr)	421.5	10
Thallium (Tl)	190.8	20
Titanium (Ti)	337.2	10
Vanadium (V)	292.4	10
Zinc (Zn)	213.8	50

Calculated Method Detection Limits are on file in the QC Department.
{Method modification: Al and Sr wavelength differs from reference method}

Table 2 - Interferent Listing

Analyte	Wavelength (nm)	Interferent
Ag	328.068	Ce, Ti, Mn
Al	308.215 / 396.1	V,Mo,Ce,Mn
As	193.759	V,Al,Co,Fe,Ni
B	249.678	None
Ba	493.409	None
Be	313.042	V,Ce
Ca	315.887	Co,Mo,Ce
Cd	226.502	Ni,Ti,Fe,Ce
Ce	413.765	None
Co	228.616	Ti,Ba,Cd,Ni,Cr,Mo,Ce
Cr	205.552	Be,Mo,Ni
Cu	324.754	Mo,Ti
Fe	259.940	None
K	766.491	None
Li	670.784	None
Mg	279.079	Ce
Mn	257.610	Ce
Mo	203.844	Ce
Na	588.995	None
Ni	231.604	Co,Tl
P	214.914	Cu,Mo
Pb	220.353	Co,Al,Ce,Cu,Ni,Ti,Fe
Sb	206.833	Cr,Mo,Sn,Ti,Ce,Fe
Se	196.099	Fe
SiO_2	251.611	None
Sn	189.980	Mo,Ti,Fe,Mn,Si
Sr	421.552	None
Tl	190.864	Ti,Mo,Co,Ce,Al,V,Mn
Ti	334.941	None
V	292.402	Mo,Ti,Cr,Fe,Ce
Zn	213.856	Ni,Cu,Fe

Nitrogen, Ammonia

Reference Methods: **SM4500 NH_3-BH,** Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 21st Edition, 1997.

Method 350.1, Methods for the Chemical Analysis of Water and Wastes, EPA 600/ 4-82-055, Revision 2.0, August 1993.

Method 10-107-06-1-A, Methods for Automated Ion Analyzers, May 20, 1998.

1. Scope and Application

Matrices: Ammonia nitrogen can be determined in potable, surface, and saline waters as well as domestic and industrial wastewaters and in soils.

Definitions: See Alpha Laboratories Quality Manual Appendix A.

The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one of the following laboratory personnel before performing the modification: Area Supervisor, Laboratory Services Manager, Laboratory Director, or Quality Assurance Officer

This method is restricted to use by or under the supervision of analysts experienced in the operation of the Tecator and/or Lachat Instrument and in the interpretation of Lachat data. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

In waters and wastewaters the forms of nitrogen of greatest interest are, in order of decreasing oxidation state: nitrate, nitrite, ammonia, and organic nitrogen. All these forms of nitrogen, as well as nitrogen gas (N_2), are biochemically interconvertible and are components of the nitrogen cycle. They are of interest for many reasons. Organic nitrogen is defined functionally as organically bound nitrogen in the trinegative oxidation state. It does not include all organic nitrogen compounds. Analytically, organic nitrogen and ammonia can be determined together and have been referred to as “kjeldahl nitrogen,” a term that reflects the technique used in their determination. Organic nitrogen includes such natural materials as proteins and peptides, nucleic acids and urea, and numerous synthetic organic materials. Typical organic nitrogen concentrations vary from a few hundred micrograms per liter in some lakes to more than 20mg/L in raw sewage.

Ammonia is present naturally in surface and wastewaters. Its concentration generally is low in groundwaters because it adsorbs to soil particles and clays and is not leached readily from soils. It is produced largely by deamination of organic nitrogen containing compounds and by hydrolysis of urea. At some water treatment plants ammonia is added to react with chlorine to form a combined chlorine residual.

In the chlorination of wastewater effluents containing ammonia, virtually no free residual chlorine is obtained until the ammonia has been oxidized. Rather, the chlorine reacts with ammonia to form mono- and dichloramines. Ammonia concentrations encountered in water vary from less than 10µg ammonia nitrogen/L in some natural surface and groundwaters to more than 30mg/L in some wastewaters.

In this discussion, organic nitrogen is referred to as organic N, nitrate nitrogen as NO_3-N, nitrite nitrogen as NO_2-N, and ammonia nitrogen as NH_3-N.

2. Summary of Method

The sample is buffered at pH 9.5 with a borate buffer to decrease hydrolysis of cyanates and organic nitrogen compounds. It is distilled into a solution of boric acid. The ammonia in the distillate is determined colorimetrically by the phenate method.

The phenate method is base on the Berthelot reaction. Ammonia reacts with alkaline phenol, then with sodium hypochlorite to form indophenol blue. Sodium nitroprusside (nitroferricyanide) is added to enhance sensitivity. The absorbance of the reaction product is measured at 630nm, and is directly proportional to the original ammonia concentration.

2.1 Method Modifications from Reference

Method was modified to include soil sample distillation. Samples are buffered at pH 9.5. pH is checked using pH paper 7.5-14 (not pH meter)

3. Detection Limits

The laboratory follows the procedure found in 40CFR Part 136 to determine the MDL on an annual basis. The method detection limits determined by the laboratory are on file for review.

The RDL is determined to be 0.075mg/L based on a 100mL sample size for waters and 7.5 mg/kg based on 1g of soil material used for distillation.

4. Interferences

Most of the following interferences refer to the direct analysis of a water sample. The distillation steps remove most of these interferences.

4.1 Instrument

Samples with a high concentration of NH_3 may carry-over into the next sample and therefore yield false high results in that next sample. If a sample with a low concentration follows a sample with a high concentration, re-analyze the low sample to ensure results are accurate.

4.2 Parameters

4.2.1 Glycine, urea, glutamic acid, cyanates, and acetamide hydrolyze very slowly in solution on standing but, of these, only urea and cyanates will hydrolyze on distillation at pH of 9.5. Hydrolysis amounts to about 7% at this pH for urea and about 5% for cyanates. Some of the organic compounds that may interfere, such as formaldehyde, may be eliminated by boiling off at a low pH before nesslerization. Remove residual chlorine by sample pretreatment.

4.2.2 Color and turbidity of the sample distillate may interfere with analysis. These interferences are removed by manual filtration of the distillate prior to Lachat analysis, or by dilution of the sample prior to distillation.

5. Safety

The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material data handling sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

Note: Phenol used in this method is hazardous and general laboratory safety practices must be observed.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

6. Sample Collection, Preservation, and Handling

6.1 Sample Collection

The most reliable results are obtained on fresh samples. Use plastic or glass containers.

6.2 Sample Preservation

If prompt analysis is impossible, preserve samples with approximately 0.8mL concentrated H_2SO_4/L sample. The pH of the acid-preserved samples should be <2. (Some wastewaters may require more concentrated H_2SO_4 to achieve this pH.) Store samples at 4ºC.

Soils samples are received without preservation and stored at 4ºC

6.3 Sample Handling

Samples (both waters and soils) are analyzed within 28 days after collection.

7. Equipment and Supplies

7.1 Distillation apparatus: Tecator Instruments Automatic Distillation Unit. Follow the instrument manufacturer's instructions for proper operation.

7.2 pH Strips: Range 7.5 to 14 units.

7.3 250mL Disposable Polypropylene cups with covers.

7.4 Automated Ion Analyzer: Lachat Instruments.

7.5 Helium gas, He: 140kPa (20 lb/in^2).

7.6 Volumetric flasks, various volumes.

7.7 Pipets, various volumes.

7.8 Analytical Balance

7.9 Centrifuge Tubes: 50mL volume.

8. Standards and Reagents

8.1 Borate buffer solution: Add 88mL 0.1N NaOH solution to 500mL of approximately 0.025M sodium tetraborate ($Na_2B_4O_7$) solution (9.5g $Na_2B_4O_7 \cdot 10\ H_2O$/L) and dilute to 1L with DI water. Store at room temperature. Expires one month from date of preparation.

8.2 Sodium thiosulfate (dechlorinating reagent): Dissolve 0.35g $Na_2S_2O_3 \cdot 5H_2O$ in DI water and dilute to 100mL. Prepare fresh daily as needed.

8.3 Neutralization agents: Prepare with DI water:

8.3.1 Sodium hydroxide, NaOH, 6N: In a 1L volumetric flask, carefully mix 240g of NaOH (Section 8.11) pellets with 500mL DI water. Dissolve and bring to volume with DI water. Store at room temperature. Expires one month from date of preparation.

8.3.2 Sulfuric acid, H_2SO_4, 10%: To a 1L volumetric flask, add 500mL DI water. Carefully add 100mL of concentrated Sulfuric Acid (Section 8.12). Bring to volume with DI water. Store at room temperature. Expires one month from date of preparation.

8.4 Sodium Phenolate: CAUTION! Wear gloves. Phenol causes severe burns and is rapidly absorbed into the body through the skin. In a 1L volumetric flask, dissolve 88mL of 88% liquified phenol or 83g crystalline phenol (C_6H_5OH) in approximately 600mL DI water. While stirring, slowly add 32g sodium hydroxide (NaOH). Cool, dilute to the mark, and invert three times. Do **not** degas this reagent. Store at room temperature. Expires one month from date of preparation.

8.5 Sodium Hypochlorite (approximate 2.6%): In a 500mL volumetric flask, dilute 250mL Regular Chlorine bleach [5.25% sodium hypochlorite (NaOCl)] to the mark with DI water. Invert three times to mix. Store at room temperature. Expires one month from date of preparation.

8.6 Sodium Nitroprusside (coloring agent): In a 1L volumetric flask, dissolve 3.50g sodium nitroprusside (Sodium Nitroferricyanide $[Na_2Fe(CN)_5NO_2 \cdot H_2O]$) dilute to the mark with DI water. Degas with helium to prevent bubble formation. Use He at 140kPa (20 lb/in^2) through a helium degassing tube. Bubble He vigorously through the solution for one minute. Store refrigerated at 4 ± 2 °C. Expires one month from date of preparation.

8.7 Boric 1.5% Boric Acid Solution: To a 1000mL volumetric flask add 15g Boric Acid. Dilute to the mark with DI water. Store at room temperature. Expires one month from date of preparation.

8.8 0.2% Boric Acid Solution (Carrier Solution): To a 2L volumetric flask, dissolve 4g Boric Acid (H_3BO_3) in DI water. Degas by bubbling vigorously with Helium for one minute. Store at room temperature. Expires one month from date of preparation.

8.9 Stock Standard, 1000ppm as NH_3 (for calibration and spike solutions): Commercially prepared. Certificate of analysis is required. Store refrigerated at 4 ± 2 °C. Expires upon manufacturer's specified date.

8.9.1 Intermediate Calibration Stock Standard, 100ppm as NH_3: To a 100mL volumetric flask, add 10.0mL of Stock Standard (Section 8.9) and dilute to the mark with 0.2% Boric Acid solution (Section 8.8). Invert three times. Store refrigerated at 4 ± 2 °C. Expires one month from date of preparation.

8.9.1.1 Nine Working Calibration Standards: The following standards are prepared in volumetric flasks fresh each day of use:

8.9.1.1.1 **20.0ppm:** 40mL of 100ppm standard (Section 8.9.1) to 200mL with 0.2% Boric Acid solution (Section 8.8).

8.9.1.1.2 **10.0ppm:** 20mL of 100ppm standard (Section 8.9.1) to 200mL with 0.2% Boric Acid solution (Section 8.8). Prepare fresh each day of use.

8.9.1.1.3 **8.00ppm:** 8mL of 100ppm standard (Section 8.9.1) to 100mL with 0.2% Boric Acid solution (Section 8.8).

8.9.1.1.4 **4.00ppm:** 8mL of 100ppm standard (Section 8.9.1) to 200mL with 0.2% Boric Acid solution (Section 8.8).

8.9.1.1.5 **2.00ppm:** 2mL of 100ppm standard (Section 8.9.1) to 100mL with 0.2% Boric Acid solution (Section 8.8).

8.9.1.1.6 **1.00ppm:** 1mL of 100ppm standard (Section 8.9.1) to 100mL with 0.2% Boric Acid solution (Section 8.8).

8.9.1.1.7 **0.400ppm:** 4mL of 20ppm standard (Section 8.9.1.1.1) to 200mL with 0.2% Boric Acid solution (Section 8.8).

8.9.1.1.8 **0.200ppm:** 1mL of 20ppm standard (Section 8.9.1.1.1) to 100mL with 0.2% Boric Acid solution (Section 8.8). Alternately, this standard may be prepared utilizing autodilution of the 20ppm standard on the autosampler.

8.9.1.1.9 **0.100ppm:** 1mL of 20ppm standard (Section 8.9.1.1.1) to 200mL with 0.2% Boric Acid solution (Section 8.8). Alternately, this standard may be prepared utilizing autodilution of the 20ppm standard on the autosampler.

8.9.1.1.10 **0.050ppm:** 20mL of 0.100ppm standard (Section 8.9.1.1.8) to 40mL with 0.2% Boric Acid solution (Section 8.8). Alternately, this standard may be prepared utilizing autodilution of the 20ppm standard on the autosampler.

8.9.1.2 Continuing Calibration Standards:

8.9.1.2.1 **0.400ppm Low CCV:** 4mL of 20ppm standard (Section 8.9.1.1.1) to 200mL with 0.2% Boric Acid solution (Section 8.8).

8.9.1.2.2 **4.00ppm Hi CCV:** 8mL of 100ppm standard (Section 8.9.1) to 200mL with 0.2% Boric Acid solution (Section 8.8).

8.9.2 Spiking solution, 200ppm as NH_3: To a 100mL volumetric flask add 20mL of 1000ppm Stock Standard (Section 8.9) and dilute to the mark with DI water.

8.10 Stock Standard Solution, 1000ppm as NH_3 (for ICV and LCS): Commercially prepared. Certificate of analysis is required. This must be from a different source than that used for Stock Standard (Section 8.9). Store refrigerated at 4 ± 2 °C. Expires upon manufacturer's specified date.

8.10.1 Initial Calibration Verification Standards (ICV):

8.10.1.1 Hi ICV, 10ppm: To a 100mL volumetric flask add 1mL of 1000ppm standard (Section 8.10). Dilute to the mark with 0.2% Boric Acid Solution (Section 8.8). Expires one month from date of preparation.

8.10.1.2 Hi ICV, 8.0ppm: To a 100mL volumetric flask add 0.8mL of 1000ppm standard (Section 8.10). Dilute to the mark with 0.2% Boric Acid Solution (Section 8.8). Expires one month from date of preparation

8.10.1.3 Low ICV, 1.0ppm: To a 100mL volumetric flask add 10mL of 10ppm ICV (Section 8.10.1.1). Dilute to the mark with 0.2% Boric Acid Solution (Section 8.8). Expires one month from date of preparation.

8.10.2 LCS solution, 200ppm as NH_3: To a 100mL volumetric flask add 20mL of 1000ppm Stock Standard (Section 8.10) and dilute to the mark with DI water. Store refrigerated at 4 ± 2 °C. Expires one month from date of preparation.

8.11 NaOH Pellets: ACS Grade. Store well sealed at room temperature. This salt does not have an expiration date.

8.12 Sulfuric Acid (Concentrated): Store at room temperature. Expires upon manufacturer's specified date. Use extreme caution when handling.

8.13 Ottawa sand: store at room temperature. Expires upon manufacturer's specified date.

9. Procedure

9.1 SET-UP

9.1.1 Prior to analysis, organize samples in order from low to high odor.

9.1.2 Clean 250mL Tecator tubes by rinsing twice with approximately 0.5mL of 6N NaOH solution and 100mL RO water. Rinse twice again with DI water.

9.2 Initial Calibration

Calibrate the Lachat ion analyzer according to manufacturer's instructions.

9.2.1 Calibration

Two boards are used to calibrate the Lachat instrument. Each curve has 7 calibration points. The correlation coefficient of each curve must be $\geq$ 0.995, otherwise re-calibration is necessary. Prepare standard curves by plotting the peak areas of standards processed through the manifold against NH_3-N concentrations in standards.

9.2.1.1 Channel 1 is used to generate a calibration curve on the low range from 0.00 – 2ppm.

9.2.1.2 Channel 2 is used to generate a calibration curve on the high range from 0 – 20ppm.

Alternative method: One board can be used to calibrate the Lachat instrument. !0 point calibration curve will be used with calibration standards 10.0, 8.0, 4.0, 2.0, 1.0,04, 0.2, 0.1, 0.05 mg/l each and blank. The correlation coefficient must be $\geq$ 0.995, otherwise re-calibration is necessary. Prepare standard curves by plotting the peak areas of standards processed through the manifold against NH_3-N concentrations in standards

9.2.2 Initial Calibration Verification (ICV)
Prior to sample analysis, an ICV is analyzed at 1.0ppm to verify the low calibration curve on Channel 1. Another ICV is analyzed at 10ppm to verify the high calibration curve on Channel 2. Both ICVs must yield results ± 10% of their true value, otherwise re-calibration is necessary.

Note: if instrument is calibrated using one board calibration, then both ICV's (Low and High), will be evaluated and high ICV will be 8.0 mg/l ICV standard (Section 8.10.1.2)

9.2.3 Initial Calibration Blank (ICB)
Following the ICV is the analysis of an ICB. The ICB consists of an aliquot of 0.2% Boric Acid (Section 8.8). Results must be less than the Reporting Limit.

9.3 Standardization (Continuing Calibration Verification)

Analyze the following after every 10 samples and at the completion of analysis:

0.400ppm Low CCV, (Section 8.9.1.2.1)

4.0ppm Hi CCV, (Section 8.9.1.2.2)

Blank, 0.2% Boric Acid Solution. (Section 8.8)

9.4 Equipment Operation and Sample Analysis

9.4.1 Sample preparation

9.4.1.1 Sample Aliquots

9.4.1.1.1 Aqueous Samples
Add 100mL dechlorinated sample or a portion diluted to 100mL with DI water, to pre-washed Tecator tubes that are numbered to correspond with the samples.

9.4.1.1.1 Soil Samples
One gram of a well-homogenized sample is weighed out into a centrifuge tube (record weight in notebook). The sample is then transferred into a Tecator tube with 100 mL of DI.

9.4.1.1.2 QC Samples
In a similar manner, prepare the QC samples to be distilled with the batch (refer to Sections 10.2.1, 10.3, 10.5 and 10.8).

9.4.1.2 Add approximately 1.0mL of $Na_2S_2O_3$ to each tube, followed by 5.0mL of Borate Buffer solution.

9.4.1.2.1 Aqueous Samples
Add small amounts of 6N NaOH until the pH is adjusted to 9.5.

9.4.1.2.2 Soil Samples
No pH adjustment is needed.

9.4.2 Distillation

9.4.2.1 Equipment preparation: To clean any prior contamination, first rinse the Tecator distillation unit by running a series of 3 rinse tubes. The first rinse containing 90mL DI and 10mL 6N NaOH. The second and third rinses are with100mL DI and 0.5mL 6N NaOH.

9.4.2.2. Distillation: Begin by distilling rinse tubes, Blank, Low and Hi LCS, and then Samples and QC Samples using the Tecator Instruments Automatic Distillation Unit according to the manufacturer's instructions.

Distillate is collected from the Tecator unit in 250mL disposable polypropylene cups that contain 20mL of 1.5% Boric acid (Section 8.7). Distillation is complete after collection of approximately 140mL. Fill each cup to 150mL with DI water. Cover and store at 1-4º C if Lachat analysis is to be delayed.

9.4.3 Ammonia analysis of distillate: Follow the manufacturer's instructions for the proper operation of the Lachat ion analyzer. The following are specific notes for this analysis.

Sample throughput:	90 samples/hr; 40sec/sample
Pump speed:	35
Cycle period:	40 s
Inject to start of peak period:	25 s
Inject to end of peak period:	63 ± s

9.4.4 System Notes:

9.4.4.1 Allow 15 minutes for heating unit to warm up to 60ºC.

9.4.4.2 System IV GAIN: 175 X 1

9.4.4.3 If standards are not distilled, samples should be multiplied by 1.5 to correct for the increase in volume after the distillation.

9.4.4.4 If baseline drifts, peaks are too wide, or other problems with precision arise, clean the manifold by the following procedure:

9.4.4.4.1 Place all reagent lines in deionized water and pump to clear reagents (2-5 minutes).

9.4.4.4.2 Place reagent lines and carrier in 1M hydrochloric acid (1 volume concentrated HCl added to 11 volumes of deionized water) and pump for several minutes.

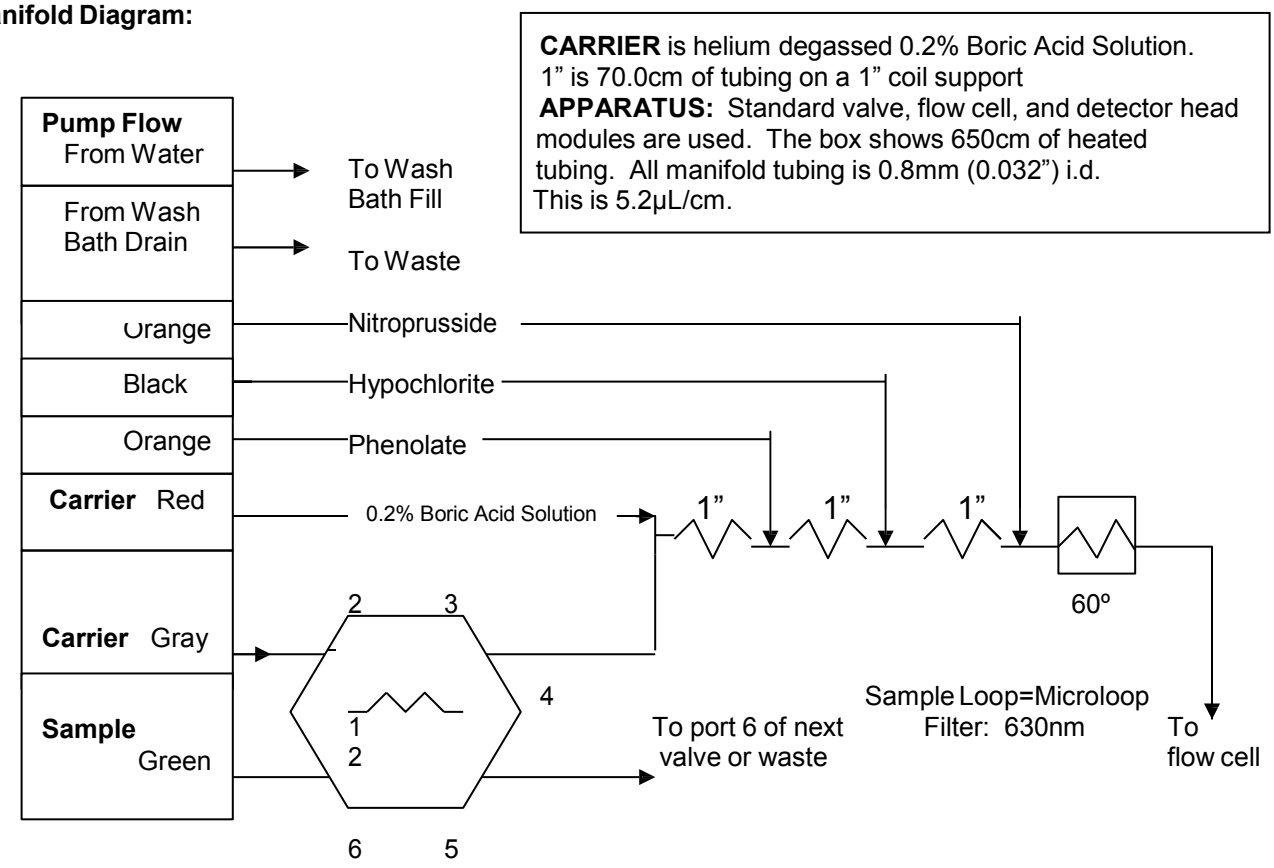
9.4.4.4.3 Place all lines in deionized water and pump until the HCl is thoroughly washed out.

9.4.4.4.4 Resume pumping reagents.

9.4.4.4.5 If sample distillate is colored or turbid, discard the sample distillate and re-distill the original sample at a higher dilution (Sections 9.4.1 and 9.4.2).

If there is not sufficient original sample volume for re-distillation, the colored/turbid distillate may be filtered through a 0.45µm filter and diluted on the Lachat instrument.

Manifold Diagram:



9.5 Preventative Maintenance

9.5.1 All lines are flushed at the end of each run.

9.5.2 All equipment is kept clean.

9.6 Calculations

Compute sample NH_3-N concentration by comparing sample peak areas with standard curve, as determined by the Lachat instrument software.

9.6.1 If the sample has a concentration of less than 2ppm, calculate results by using the low curve generated on Channel 1.

9.6.2 If the sample concentration is greater than 2ppm but less than 20ppm, calculate results by using the high curve generated on Channel 2.

9.6.3 If the concentration is greater than 20ppm, dilute the sample and reanalyze.

NOTE: For soil samples Lachat reading is multiplied by extraction volume (150ml) and divided by sample weight (the exact weight is used as recorded in the laboratory notebook). Calculations are done using Lachat software.

10. Quality Control and Data Assessment

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method. When results of sample spikes indicate atypical method performance, a calibration verification standard is used to confirm the measurements were performed in an in-control mode of operation.

10.1 Demonstration of Capability

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method. Each time a method modification is made, the analyst is required to repeat the procedure.

When one or more of the parameters tested fail at least one of the acceptance criteria, the analyst must locate and correct the source of the problem and repeat the test for failed parameters of the method.

Repeated failure confirms a general problem with the measurement system or analytical technique of the analyst. If the failure repeats, locate and correct the source of the problem and repeat the test for all parameters listed in the method.

10.2 Blank

10.2.1 The Distillation Blank is 100 mL DI for waters or 1g of Ottawa sand for soils. Distill one per batch of 20 samples or less. Results for the Distillation Blank must be less than the Reporting Limit. If results for the Distillation Blank are greater than the reporting limit, and all sample results for the batch are greater than 10x the Blank result, sample results may be reported with a narrative to be included on the final report. Otherwise, all samples must be redistilled and reanalyzed.

10.2.2 The Analytical Blank (ICB) for the Lachat analysis is not distilled and is 0.2% Boric Acid Solution (Section 8.8).

The ICB is run after the initial calibration verification standards (ICV) and another is run after the continuing calibration standards (CCV).

If results for the Analytical Blank are greater than the reporting limit, the ICB is reinjected. If failure continues the instrument must be recalibrated. Samples are not to be analyzed until an acceptable ICB is obtained.

10.3 Laboratory Control Samples (LCS)

10.3.1 Distillation: Distill a Low and a Hi LCS with each batch of 20 samples or less. Recovery of the LCSs must be within Control Chart limits. If recovery is outside of this range, the standard is reanalayzed once. If recovery still fails criteria, the entire sample batch must be redistilled and reanalyzed.

10.3.1.1 Low 2ppm LCS: Add 1mL of 200ppm LCS solution (Section 8.10.2) to 100mL DI for waters or for 1.0g of Ottawa sand for soils. This is used for the Low 0 – 2ppm curve.

10.3.1.2 Hi 20ppm LCS: Add 10mL of 200ppm LCS solution (Section 8.10.2) to 100mL DI for waters or for 1.0g of Ottawa sand for soils. This is used for the Hi 2 – 20ppm curve.

10.4 Initial Calibration Verification Standards

10.4.1 Lachat Analysis: The ICVs are not distilled. Analyze the following Hi and Low ICVs after calibration of the Lachat instrument. Recoveries must be within 10% of the true value. If results are outside of this range, the ICV may be reinjected once. If failure continues, recalibration of the instrument is necessary. Samples are not to be analyzed until acceptable ICV results are obtained.

10.4.1.1 Low ICV, 1.0ppm (Section 8.10.1.2)

10.4.1.2 Hi ICV, 10ppm (Section 8.10.1.1). **HI ICV** will be 8.0 ppm (Section 8.10.1.2) in case of one board calibration.

10.5 Continuing Calibration Verification Standards

10.5.1 Lachat Analysis: The CCVs are not distilled. Analyze the following Low and Hi CCVs after every ten samples and at the completion of analysis. Recoveries must be within 10% of the true value.

If recoveries fall outside of this range, the CCV is reanalyzed. If recovery is acceptable, the analysis may continue. If recovery is again unacceptable, the cause for the failure is determined and corrected, and the instrument is recalibrated. All samples that were analyzed since the last CCV that was within range are reanalyzed.

10.5.1.1 0.4ppm Low CCV (Section 8.9.1.2.1)

10.5.1.2 4.0ppm Hi CCV (Section 8.9.1.2.2)

10.6 Interference Check Standards

None.

10.7 Matrix Spike

One per batch of 20 samples or less. Prior to distillation, use 2mL of 200ppm Intermediate Stock Standard (Section 8.9.2) per 100mL of sample for waters or 1.0g of sample for soils. Recovery of the Matrix Spike must be within Control Chart limts. If the recovery is outside of acceptance criteria, and the LCS is within acceptance criteria, matrix interference may be assumed. The associated data is reported with a narrative to be included on the final report.

10.8 Duplicates

Distill one duplicate sample per batch of 20 samples or less. The %RPD for the duplicate sample must be within Control Chart limits. If results are outside of the acceptance criteria, a narrative to be included on the final report.

10.9 Control Limits

The laboratory maintains performance records to document the quality of data that is generated. Method accuracy for samples is assessed and records maintained.

Control limits for the method parameters are generated. The control limits are calculated based on in-house performance data. The limits are compared to the control limits found in the reference method.

10.10 Analytical Sequences

10.10.1 Distillation Sequence:

3 Rinse tubes
Blank
Low LCS
Hi LCS
Rinse
Samples
Rinse after suspected high samples
Duplicate
Spike
Rinse
Shut-Down

10.10.2 Lachat Analytical Sequence:

Instrument Calibration
CCV: Low, Hi,CCB
Low ICV
Hi ICV
IC Blank
Samples
CCV: Low, Hi, CC Blank every 10 samples and at completion of analysis
Shut-Down

11. Method Performance

11.1 Method Detection Limit Study (MDL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

The laboratory follows the procedure to determine the MDL, LOD, and/or LOQ as outlined in Alpha SOP/1732. These studies performed by the laboratory are maintained on file for review.

11.2 Demonstration of Capability Studies

Refer to Alpha SOP/1734, 1739 for further information regarding IDC/DOC Generation.

11.2.1 Initial (IDC)

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method, prior to the processing of any samples.

11.2.2 Continuing (DOC)

The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

12. Corrective Actions

Holding time exceedence, improper preservation and observed sample headspace are noted on the nonconformance report form.

Perform routine preventative maintenance following manufacturer's specification. Record all maintenance in the instrument logbook.

Review of standards, blanks and standard response for acceptable performance occurs for each batch of samples. Record any trends or unusual performance on a nonconformance action form.

If the CV or LCS recovery of any parameter falls outside the designated acceptance range, the laboratory performance for that parameter is judged to be out of control, and the problem must be immediately identified and corrected. The analytical result for that parameter in the unspiked samples is suspect and is only reported for regulatory compliance purposes with the appropriate nonconformance action form. Immediate corrective action includes reanalyzing all affected samples by using any retained sample before the expiration of the holding time and/or recalibration of the instrument.

13. Pollution Prevention

NOTE: Lachat Phenol waste is hazardous and must be disposed of in "Hazmat" Lachat waste drums.

See Chemical Hygiene Plan for pollution prevention operations.

14. Waste Management

See Chemical Hygiene Plan for waste handling and disposal SOP/1728

Alkalinity, Titration Method

Reference Methods: **Method 2320 B,** Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 21st Edition, 1997.

1. Scope and Application

Matrices: This method is applicable to water matrices.

Definitions: See Alpha Laboratories Quality Manual Appendix A.

The alkalinity of a water is its acid-neutralizing capacity. It is the sum of all the titratable bases. The measured value may vary significantly with the end-point pH used. Alkalinity is a measure of an aggregate property of water and can be interpreted in terms of specific substances only when the chemical composition of the sample is known.

Alkalinity is significant in many uses and treatments of natural waters and wastewaters. Because the alkalinity of many surface waters is primarily a function of carbonate, bicarbonate, and hydroxide content, it is taken as an indication of the concentration of these constituents. The measured values also may include contributions from borates, phosphates, silicates, or other bases if these are present. Alkalinity in excess of alkaline earth metal concentrations is significant in determining the suitability of a water for irrigation. Alkalinity measurements are used in the interpretation and control of water and wastewater treatment processes. Raw domestic wastewater has an alkalinity less than, or only slightly greater than, that of the water supply. Properly operating anaerobic digesters typically have supernatant alkalinities in the range of 2000 to 4000mg calcium carbonate ($CaCO_3$)/L.

The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one of the following laboratory personnel before performing the modification: Area Supervisor, Laboratory Director, or Quality Assurance Officer.

This method is restricted to use by or under the supervision of trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

2. Summary of Method

Hydroxyl ions present in a sample as a result of dissociation or hydrolysis of solutes react with additions of standard acid. Alkalinity thus depends on the end-point pH used, and for total alkalinity a pH of 4.5 is used for the end-point.

When alkalinity is due entirely to carbonate or bicarbonate content, the pH at the equivalence point of the titration is determined by the concentration of carbon dioxide (CO_2) at that stage. Carbon dioxide concentration depends, in turn, on the total carbonate species originally present and any losses that may have occurred during titration. “Phenolphthalein alkalinity” is the term traditionally used for the quantity measured by titration to pH 8.3 irrespective of the colored indicator used in the determination.

The results obtained from the phenolphthalein and total alkalinity determinations offer a means for stoichiometric classification of the three principal forms of alkalinity present in many waters. The classification ascribes the entire alkalinity to bicarbonate, carbonate, and hydroxide, and assumes the absence of other (weak) inorganic or organic acids, such as silicic, phosphoric, and boric acids. It further presupposes the incompatibility of hydroxide and bicarbonate alkalinities. Because the calculations are made on a stoichiometric basis, ion concentrations in the strictest sense are not represented in the results, which may differ significantly from actual concentrations, especially at a pH > 10.

2.1 Method Modifications from Reference

The reporting limit for this method is less than that in the Reference Method.

0.02N NaOH (Sodium Hydroxide) is used for LCS instead of 0.05N Na2CO3 (Potassium Carbonate) for LCS. All reagents are commercially prepped and have certificate of analysis.

3. Detection Limits

The laboratory follows the procedure found in 40CFR Part 136 to determine the MDL on an annual basis. The method detection limits determined by the laboratory are on file for review.

The reported detection limit is 2.0mg/L.

4. Interferences

Soaps, oily matter, suspended solids, or precipitates may coat the glass electrode and cause a sluggish response. Allow additional time between titrant additions to let the electrode come to equilibrium or clean the electrode between samples.

5. Safety

The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material data handling sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

6. Sample Collection, Preservation, and Handling

6.1 Sample Collection

Samples for Alkalinity analysis are collected in exclusive plastic or glass bottles, with Alkalinity as the only analysis from the bottle. The bottles are filled completely, without any headspace, and capped tightly. The sample container is not opened until the time of analysis.

6.2 Sample Preservation

Store at 4 ± 2°C.

6.3 Sample Handling

The sample holding time is 14 days from collection. Initial sample pH measurement is documented during the beginning of alkalinity analysis. The pH results are included on the printout with the Alkalinity data.

7. Equipment and Supplies

7.1 DL58 Mettler Toledo Titrator: With Rhondo 60 autosampler, pH meter and stirplate.

7.2 Combination Electrode: Incorporates measuring and referenced functions; solid, gel-type filling material.

7.3 Computer: with related accessories. LabXLight software, version 1.00.000

7.4 Pipets: Volumetric, various volumes; or Eppendorf pipets, various volumes.

7.5 Flasks: Volumetric, various volumes.

7.6 Kimwipes.

7.7 Plastic Cups: Mettler Toledo brand, 100mL volume.

8. Standards and Reagents

8.1 Standard Sulfuric Acid, 0.1N: A commercially prepared standard solution which has been standardized against a NIST standard. A certificate of analysis is kept on file. Store at room temperature. Expires upon manufacturer's specified date.

8.2 Standard Sulfuric Acid, 0.02N: A commercially prepared standard solution which has been standardized against a NIST standard. A certificate of analysis is kept on file. Store at room temperature. Expires upon manufacturer's specified date.

8.3 Sodium Hydroxide Solution, 0.1N: A commercially prepared solution. A certificate of analysis is kept on file. Store at room temperature. Expires upon manufacturer's specified date.

8.4 Sodium Hydroxide Solution, 0.02N: A commercially prepared solution. A certificate of analysis is kept on file. Store at room temperature. Expires upon manufacturer's specified date.

8.5 Sodium Hydroxide Solution, 0.5N: A commercially prepared solution. A certificate of analysis is kept on file. Store at room temperature. Expires upon manufacturer's specified date.

8.6 pH Buffer Solutions: pH 4 and pH 10; two sources/Lot numbers of pH 7. Use to calibrate pH meter. Store at room temperature. Expires upon manufacturer's specified date.

9. Procedure

9.1 SET-UP

Calibrate the pH meter of the Mettler/Toledo Titrator each day prior to use. Follow the manufacturer's instructions for calibration, using pH 4, pH 7, and pH 10. Buffer solutions. Validate the calibration by using a second source pH 7 Buffer. The results must be within ± 0.05 pH units, otherwise recalibration is necessary.

9.2 Equipment Operation and Sample Analysis

9.2.1 Shake sample and pour 50mL into a plastic Mettler-Toledo cup. Place cups into the Rhondo autosampler.

9.2.2 Ensure that the Autotitrator is in "Remote Control" mode and that the rinse bottle is full of DI water and titrant bottle is full of standard acid (one from Section 8.1 – 8.2).

9.2.3 Open LabX software package. Click "Open View" on the Titrator. Choose appropriate method:

9.2.3.1 Meth .3" – Total Alkalinity for Total Alkalinity determination

9.2.3.2 Meth .4" – 2 Step Alkalinity for other types of alkalinity determinations.

9.2.4 Purge the buret of any air bubbles present.

9.2.5 With a right click on the computer mouse, select "New Sample Series". Type series ID and the sample ID to be analyzed. Click on the "Save" button.

9.2.6 The Series ID will appear in the "Samples" column. Click on that Series ID and using a right mouse-click, select "Run" from the drop-down menu.

9.2.7 After the Run is complete, check for printout results. The initial sample pH results are included on the data printout and are available upon request.

9.2.8 NOTE: Only 30mL of titrant may be used. If samples use more than 30mL of titrant, sample dilution and reanalysis are necessary. Dilutions are prepared by using a known amount of standard acid and then titrating a smaller volume of sample.

9.3 Preventative Maintenance

9.3.1 The pH electrode is replaced as necessary.

9.3.2 Prior to each analytical run, the Autotitrator buret is checked and purged of any air bubbles present.

9.3.3 Autotitrator buret is checked quarterly by the QA department to ensure accuracy.

9.4 Calculations

9.4.1 Alkalinity, mg $CaCO_3$/L = $\frac{\mathbf{A} \times \mathbf{N} \times 50{,}000}{\text{mL sample}}$

where:

A = mL of the standard acid titrated
N = normality of the standard acid

9.4.2 Calculation of Alkalinity Relationships: The mathematical conversion of the results is shown in Table 1.

9.4.2.1 Carbonate (CO_3) Alkalinity is present when phenolphthalein alkalinity is not zero but is less than total alkalinity.

9.4.2.2 Hydroxide (OH) Alkalinity is present if phenolphthalein alkalinity is more than half the total alkalinity.

9.4.2.3 Bicarbonate (HCO_3) Alkalinity is present if phenolphthalein alkalinity is less than half the total alkalinity.

9.4.2.4 Carbon Dioxide (CO_2)

9.4.2.4.1 Free CO_2 is present if the total Alkalinity of a water is due almost entirely to hydroxides, carbonates or bicarbonates, and Total Dissolved Solids is not greater than 500mg/L.

mg Free CO_2/L = $2.0 \times B \times 10^{(6-pH)}$

Where:

B = Bicarbonate alkalinity, mg $CaCO_3$/L

9.4.2.4.2 Total CO_2 is calculated from the Free CO_2, bicarbonate alkalinity and carbonate alkalinity.

mg Total CO_2/L = $[A + 0.44 (2B + C)]$

Where:

A = mg free CO_2/L (Section 9.4.2.4.1) B

= Bicarbonate alkalinity, mg $CaCO_3$/L C

= Carbonate alkalinity, mg $CaCO_3$/L

Table 1: Alkalinity Relationships

Result of Titration	Hydroxide Alkalinity as $CaCO_3$	Carbonate Alkalinity as $CaCO_3$	Bicarbonate Concentration as $CaCO_3$
P = 0	0	0	T
P < ½ T	0	2P	T – 2P
P = ½ T	0	2P	0
P > ½ T	2P – T	2 (T – P)	0
P = T	T	0	0

Key: P = Phenolphthalein Alkalinity

T = Total Alkalinity

10. Quality Control and Data Assessment

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method. When results of sample spikes indicate atypical method performance, a calibration verification standard is used to confirm the measurements were performed in an in-control mode of operation.

10.1 Demonstration of Capability

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method. Each time a method modification is made, the analyst is required to repeat the procedure.

When the parameter tested fails at least one of the acceptance criteria, the analyst must locate and correct the source of the problem and repeat the test.

Repeated failure confirms a general problem with the measurement system or analytical technique of the analyst. If the failure repeats, locate and correct the source of the problem and repeat the test.

10.2 Blank

Analyze one Blank per batch of 20 samples or less. The Blank consists of 50mL of DI water. Blank results must be less than the reported detection limit. No samples may be analyzed until an acceptable Blank is obtained.

10.3 Laboratory Control Samples (LCS)

Analyze one LCS per batch of 20 samples or less.

A 100ppm LCS is prepared by adding 5mL of 0.02N Sodium Hydroxide solution (Section 8.4) to 45mL of DI water. The LCS must be recovered within control limits generated by QA. If the LCS falls outside of acceptance criteria, it is reprepared and reanalyzed. If failure continues, the titrator is rinsed and the LCS analyzed again. No samples may be analyzed until an acceptable LCS recovery is obtained.

10.4 Matrix Spike

Analyze one matrix spike per batch of 20 samples or less.

A 100mg/L spike is prepared by adding 1.0mL of 0.1 N Sodium Hydroxide solution (Section 8.3) to 50mL of sample. The MS recovery must be within control limits. If the MS is outside of acceptance criteria, the sample and its spike are reanalyzed. If failure continues, report the data with a narrative to be included on the final report.

10.5 Duplicates

Analyze one sample in duplicate per batch of 20 samples or less.

The %RPD between the sample and its duplicate must within control limits. If %RPD is outside of acceptance criteria the sample and its duplicate are reanalyzed. If failure continues, report the data with a narrative to be included on the final report.

10.6 Continuing Calibration

A Continuing Calibration Verification (CCV) (equivalent to the LCS) and a Continuing Calibration Blank (CCB) pair is analyzed at the end of each analytical run to ensure that calibration is still valid.

Acceptance criteria for the CCV are 90-110% of the true value. If the CCV fails these criteria, all samples in the associated batch are reanalyzed.

The CCB must be less than the RL of 2.0mg/L. If the CCB fails these criteria but the associated sample concentrations are non-detect, the sample results are reported with a narrative. If the CCB fails these criteria but the associated sample concentrations are greater than 10x the Reporting Limit, the sample results are reported with a narrative. Otherwise, if the CCB fails, all samples in the associated batch are reanalyzed.

10.7 Control Limits

The laboratory maintains performance records to document the quality of data that is generated. Method accuracy for samples is assessed and records maintained.

Control limits for the method parameters are generated by the QC staff. The control limits are calculated based on in-house performance data. The limits are compared to the control limits found in the reference method.

10.8 Analytical Sequence

- Calibrate the pH meter and verify calibration with second source standard.
- Measure the sample and QC sample aliquots.
- Titrate to the pH endpoint on the autotitrator.
- Calculate the results.

11. Method Performance

The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the value is above zero.

Method performance data is on file in the laboratory QC department. Comparison of method performance data for the laboratory to the reference method criteria occurs when laboratory in-house acceptance limits are generated. In-house generated data must be within the specifications of the reference method or the analysis is not continued until corrective action is completed.

12. Corrective Actions

Holding time exceedence and improper preservation are noted on the nonconformance report form.

Review of LCSs, blanks, spikes and duplicates occur for each batch of samples. Record any trends or unusual performance on a nonconformance action form.

If the LCS recovery falls outside the designated acceptance range, the laboratory performance is judged to be out of control, and the problem must be immediately identified and corrected. The analytical result in the unspiked samples is suspect and is only reported for regulatory compliance purposes with the appropriate nonconformance action form. Immediate corrective action includes reanalyzing all affected samples by using any retained sample before the expiration of the holding time.

13. Pollution Prevention

See Chemical Hygiene Plan for pollution prevention operations.

14. Waste Management

See Chemical Hygiene Plan for waste handling and disposal.

Determination of Inorganic Anions by Ion Chromatography

Reference Methods: **EPA 300.0,** Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August, 1993.

Method 9056, SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA SW-846, Update III, 1997.

1. Scope and Application

Matrices: Drinking water, surface water, mixed domestic and industrial wastewaters, groundwater, reagent waters, solids (after extraction) leachates (when no acetic acid is used).

Definitions: See Alpha Laboratories Quality Manual Appendix A.

Regulatory Parameter List:

Parameter
Bromide
Chloride
Fluoride
Nitrate – N
Sulfate

The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one of the following laboratory personnel before performing the modification: Area Supervisor, Laboratory Services Manager, Laboratory Director, or Quality Assurance Officer.

This method is restricted to use by or under the supervision of analysts experienced in use of ion chromatography and in the interpretation of ion chromatograms. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

2. Summary of Method

A small volume of sample is introduced into an ion chromatograph. The anions are separated and measured, using a system comprised of a guard column, analytical column, suppressor device, and conductivity detector.

2.1 Method Modifications from Reference

Use of other eluents that improve method performance are minor modifications of the method and are considered by the method to be acceptable.

3. Detection Limits

The laboratory follows the procedure found in 40CFR Part 136 to determine the MDL on a semi-annual basis. The method detection limits determined by the laboratory are on file for review.

4. Interferences

4.1 Interferences can be caused by substances with retention times that are similar to and overlap those of the anion of interest. Large amounts of an anion can interfere with the peak resolution of an adjacent anion. Sample dilution and/or fortification can be used to solve most interference problems associated with retention times.

4.2 Method interferences may be caused by contaminants in the reagent water, reagents, glassware, and other sample processing apparatus that lead to discrete artifacts or elevated baseline in ion chromatograms.

4.3 Samples that contain particles larger than 0.45 microns and reagent solutions that contain particles larger than 0.20 microns require filtration to prevent damage to instrument columns and flow systems.

4.4 Any anion that is not retained by the column or only slightly retained will elute in the area of fluoride and interfere. Known coelution is caused by carbonate and other small organic anions. At concentrations of fluoride above 1.5mg/L, this interference may not be significant, however, it is the responsibility of the user to generate precision and accuracy information in each sample matrix.

4.5 The acetate anion elutes early during the chromatographic run. The retention times of the anions also seem to differ when large amounts of acetate are present. Therefore, this method is not recommended for leachates of solid samples when acetic acid is used for pH adjustment.

4.6 The quantitation of unretained peaks should be avoided, such as low molecular weight organic acids (formate, acetate, propionate, etc.) which are conductive and coelute with or near fluoride and would bias the fluoride quantitation in some drinking and most waste waters.

4.7 Any residual chlorine dioxide present in the sample will result in the formation of additional chlorite prior to analysis. If any concentration of chlorine dioxide is suspected in the sample, purge the sample with an inert gas (argon or nitrogen) for about five minutes or until not chlorine dioxide remains.

5. Safety

The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material data handling sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

Sulfuric acid used in this method has the potential to be highly toxic or hazardous.

6. Sample Collection, Preservation, and Handling

6.1 Sample Collection

Samples are collected in glass or plastic bottles of sufficient volume to allow replicate analyses of the anions of interest.

6.2 Sample Preservation

Samples are refrigerated at 4°C.

6.3 Sample Handling

The sample holding time is 48 hours for the following anions: Nitrate –N.

The sample holding time is 28 days for the following anions: Bromide, Chloride, Fluoride, and Sulfate.

7. Equipment and Supplies

7.1 Balance: Analytical, capable of weighing to 0.0001g.

7.2 Ion Chromatograph: Analytical system (Dionex ICS-2000) complete with ion chromatograph and all required accessories including syringes, autosampler, analytical columns, compressed gasses and detectors.

7.2.1 Anion guard column: AG-18 (Dionex PN 060551) A protector of the separator column. If omitted from the system the retention times will be shorter. Usually packed with a substrate the same as that in the separator column.

7.2.2 Anion analytical column: AS-18 (Dionex PN 060549). This column produces the separation shown in Figure 1.

7.2.3 Anion supressor: ASRS Ultra II 4mm (PN 061561). The supressor column is packed with a high capacity cation exchange resin that is capable of converting the eluent and separated anions to their respective acid forms.

7.2.4 Detector: DS6 (PN 057985) Temperature controlled, heated conductivity cell

7.2.5 Eluent Generator: EG40 (Dionex PN 058900) Prepares the eluent electronically, controlled by the software; equipped with KOH cartridge.

7.3 Software: The Dionex IC Instrument uses Chromeleon Software.

7.4 0.45µm Membrane Filter Syringes.

7.5 Volumetric Flasks: Various volumes.

7.6 Volumetric Pipets: Various volumes.

7.7 0.5mL Vials with Caps: Dionex PN 038142.

8. Standards and Reagents

Note: All analytical standards used for calibration and calibration verification must be traceable to NIST. Each standard is recorded in a Logbook and unique ID is assigned to each standard. The unique IDs must also be included in all analytical sequences.

8.1 Reagent Water: Deionized water, free of the anions of interest. Water should contain particles no larger than 0.20 microns.

8.2 Eluent Solution: 32mM KOH, Prepared by the Eluent Generator.

8.3 Stock Calibration / ICV Standard Solutions, 1000mg/L (1mg/mL): Stock standards for all analytes are usually purchased as certified solutions. Certificates of analysis are kept on file.

However, if it is necessary, the Stock Solutions may be prepared from ACS reagent grade materials (dried at 105°C for 30 minutes) as listed below. The ICV Standards must be prepared from a different source than the calibration standards.

NOTE: Stock calibration/ ICV standards are stable for at least six months when stored at 4°C. Dilute working standards are prepared weekly.

8.3.1 Standard 1: Fluoride Stock Standard, 1000mg F^-/L

In a 250mL volumetric flask, dissolve 0.5526g of sodium fluoride (NaF, CASRN 7681-49-4) in about 200mL reagent water. Dilute to the mark with reagent water, and invert to mix.

8.3.2 Standard 2: Fluoride Stock Standard, 100mg F^-/L

In a 250mL volumetric flask, pipet 25mL of Standard 1, dilute to the mark with reagent water, and invert to mix.

8.3.3 Standard 3: Chloride Stock Standard, 1000mg Cl^-/L

In a 250mL volumetric flask, dissolve 0.4121g of sodium chloride (NaCl, CASRN 7647-14-5) in about 200mL reagent water. Dilute to the mark with reagent water, and invert to mix.

8.3.4 Standard 4: Bromide Stock Standard, 1000mg Br^-/L

In a 250mL volumetric flask, dissolve 0.3219g of sodium bromide (NaBr, CASRN 7647-15-6) in about 200mL reagent water. Dilute to the mark with reagent water, and invert to mix.

8.3.5 Standard 5: Bromide Stock Standard, 100mg Br^-/L

In a 250mL volumetric flask, pipet 25mL of Standard 4, dilute to the mark with reagent water, and invert to mix.

8.3.6 Standard 8: Nitrate Stock Standard, 1000mg NO_3^--N /L

In a 250mL volumetric flask, dissolve 1.5170 g of sodium nitrate ($NaNO_3$, CASRN 7631-99-4) in about 200mL reagent water. Dilute to the mark with reagent water, and invert to mix.

8.3.7 Standard 9: Nitrate Stock Standard, 100mg NO_3^--N /L

In a 250mL volumetric flask, pipet 25mL of Standard 8, dilute to the mark with reagent water, and invert to mix.

8.3.8 Standard 12: Sulfate Stock Standard, 1000mg SO_4^{2-} /L

In a 250mL volumetric flask, dissolve 0.4535 g of anhydrous dibasic, potassium sulfate (K_2SO_4, CASRN 7778-80-5) in about 200mL reagent water. Dilute to the mark with reagent water, and invert to mix.

8.3.9 Stock Bromide Standard, 1000ppm

Commercially available. Certificate of analysis required and kept on file. Use separate sources for the ICV and Calibration standards listed below.

8.3.9.1 ICV Bromide Standard, 100ppm

In a 100mL volumetric flask, add 1mL of Stock 1000ppm Bromide standard (Section 8.4.13). Bring to volume with reagent water.

8.4 Working Mixed Stock Standard A (Calibration Stock)

In a 200mL volumetric flask, transfer using volumetric pipets, 2mL each of Standards Bromide 1000ppm and Nitrate 1000ppm; 20mL of Chloride 1000ppm and Fluoride 100ppm (Section 8.3). Dilute to the mark with reagent water and invert to mix. Store at 4 ± 2°C for up to one month.

This makes Standard A containing F^-, Cl^-, NO_2^--N, Br^-, NO_3^--N and SO_4^{2-} at the concentrations of 10, 100, 10, 10 and 200ppm respectively.

8.4.1 Analyte Matrix Spike Solution

Volumetrically prepare the spike solution by bringing 1.0 mL of the calibration stock standard (Section 8.4) up to a 25mL final volume with the sample.

8.5 Working Mixed Standards B through G (Calibration Curve)

Working mixed standards B through F are prepared by diluting Standard A as summarized in the following Table. These are prepared fresh as needed for calibration.

Std.	Std. A (mL)	Final Vol. (mL)	F^-	Cl^-	Br	NO_3^--N	SO_4^{2-}
B	5	10	5.0	50.0	5.0	5.0	100.0
C	5.0	25	2.0	20.0	2.0	2.0	40.0
D	1.25	25	0.5	5.0	0.5	0.5	10.0
E	0.5	25	0.2	2.0	0.2	0.2	4.0
F	1 of Std D	10	0.05	0.5	0.05	0.05	1.0
G	0.5 of Std D	10	0.025	0.25	0.025	0.025	0.5

Example: To make up Standard B, take 25mL of Standard A in a 10mL volumetric flask and dilute to the mark with reagent water.

Note: The dynamic range for the method is two orders of magnitude. The concentrations for the standards could be changed to bracket the concentrations of the samples to be analyzed.

8.6 ICV Stock Standard (Second Source Verification)

To a 200mL volumetric flask add 20mL of the following standards: Chloride 1000ppm and Sulfate 1000ppm, and 2mL of Fluoride 1000ppm, Bromide 1000ppm and Nitrate 1000ppm (Section 8.3). Dilute to volume with reagent water.

8.6.1 ICV Working Standard / LCS Solution

In a 25mL volumetric flask, add 2mL of the ICV Stock Standard. Bring to volume with reagent water. Store at 4 ± 2°C. Prepare weekly.

ICV working standard will have the following concentrations: 0.8 mg/L for Fluoride, Nitrate and Bromide; 8.0 mg/L for Chloride and Sulfate.

8.7 CCV Working Solution

The CCV Working Solution is made by diluting 2.5 ml of Mixed Stock Standard A up to 25 ml of DI Section 8.4. Final concentrations are: 1.0 mg/L for Fluoride, Nitrate and Bromide; 10.0 mg/L for Chloride and 20.0mg/l for Sulfate. Store at 4 ± 2°C. Prepare weekly.

9. Procedure

9.1 SET-UP

9.1.1 Determination of Linear Calibration Range (LCR)

The LCR must be determined initially and verified every six months or whenever a significant change in instrument response is observed or expected. The initial demonstration of linearity must use sufficient standards to ensure that the resulting curve is linear. The verification of linearity must use a minimum of a blank and three standards. If any verification data exceeds the initial values by ± 10%, linearity must be reestablished. If any portion of the range is shown to be nonlinear, sufficient standards must be used to clearly define the nonlinear portion.

9.1.2 **Prime Pump:** The pump must be primed prior to analysis, to ensure that there is no gas entering the column.

9.1.3 **Monitor Baseline:** From the main Panel screen, press the “Startup” Button. This will turn on, in order, the pump, the eluent generator, and the conductance cell. Allow the instrument to warm up for 10 – 20 minutes to ensure the baseline is stable and flat.

9.1.4 While the baseline stabilizes, the sample sequence can be written and the autosampler may be loaded.

9.1.5 When the baseline is stabilized, the sample sequence may be loaded into the analytical run, and started from the Chromeleon software.

9.1.6 **Operating Conditions: Dionex IC Instrument**

Eluent Concentration: 32mM KOH

Flow rate: 1.0mL / minute

Injection volume: 100µL

ASRS: ON

Conductivity Cell Temperature: 30 °C

9.1.7 **Monitor instrument stability:** Prior to QC sample and sample analysis, analyze a DI water blank to ensure the instrument is stable.

9.1.8 **Sample filtration:** Autosampler vials are equipped with a filter. If additional filtration is necessary, samples may be filtered through a 0.45µm membrane filter attached to

a syringe. **NOTE:** If samples require filtration, all associated batch QC samples must also be filtered.

9.1.9 **Extraction of solid materials :** Add a volume of reagent water equal to 10 times the weight of dry solid material taken as a sample. This slurry is mixed for 10 minutes using a magnetic stirring device. Filter the resulting slurry before injecting using a 0.45µ membrane filter attached to a syringe. Care should be taken to show that good recovery and identification of peaks is obtained with the user's matrix through the use of matrix spikes (Section 10.5).

9.2 Calibration Curve Generation

For each analyte of interest, prepare calibration standards at a minimum of three concentration levels and a blank by adding accurately measured volumes of one or more stock standards (Section 8.5) to a volumetric flask and diluting to volume with reagent water. If a sample analyte concentration exceeds the calibration range, the sample may be diluted to fall within the range.

Using injections of 100µL of each calibration standard, tabulate peak height or area responses against the concentration. The results are used to prepare a calibration curve for each analyte. During this procedure, retention times must be recorded.

The calibration curve for each analyte is prepared by plotting instrument response against the standard concentration. A correlation coefficient of 0.995 or greater is considered acceptable for all analytes.

9.2.1 **Initial Calibration Verification (ICV/LCS):** The calibration curve must be verified on each working day, and after every 20 samples. The ICV/LCS sample is prepared from a different source than that used for the calibration standards (Section 8.6). If the response or retention time for any analyte varies from the expected values by more than ± 10%, the analysis must be repeated, using fresh calibration standards. If the results are still more than ± 10%, a new calibration curve must be prepared for that analyte.

9.3 Standardization (Continuing Calibration Verification)

This standard (Standard D: Section 8.5) is prepared weekly. The CCV is analyzed at the beginning of each run, after every tenth sample, and at the end of the sample run. The % Recovery of this standard must be within ± 10% of the calibration standard. Refer to Section 10.3 if % Recovery falls outside of the acceptance range.

9.4 Equipment Operation and Sample Analysis

9.4.1 An automated constant volume injection system is used. Load and inject a fixed amount of well-mixed sample. Flush injection loop thoroughly, using each new sample. Use the same size loop for standards and samples. Record the resulting peak size in area or peak height units.

9.4.2 The width of the retention time window used to make identifications should be based upon measurements of actual retention time variations of standards over the course of a day. Three times the standard deviation of a retention time can be used to calculate a suggested window size for each analyte. However, the experience of the analyst should weigh heavily in the interpretation of chromatograms.

9.4.3 If the response for the peak exceeds the working range of the system, dilute the sample with an appropriate amount of reagent water and reanalyze.

9.4.4 If the resulting chromatogram fails to produce adequate resolution, or if identification of specific anions is questionable, fortify the sample with an appropriate amount of standard and reanalyze.

Note: Retention time is inversely proportional to concentration. Nitrate and sulfate exhibit the greatest amount of change, although all anions are affected to some degree. In some cases this peak migration may produce poor resolution or identification.

9.5 Preventative Maintenance

Follow the Preventative Maintenance Schedule as outlined on the Dionex ICS-2000 CDROM.

As Needed

- Check the eluent reservoir to see if it needs to be refilled.

Daily

- Check the ICS-2000 component mounting panel for leaks or spills. Wipe up spills. Isolate and repair leaks. Rinse off any dried eluent with reagent water.
- Check the waste container daily and empty when needed.

Weekly

- Once a week, check fluid lines for crimping or discoloration. Relocate any pinched lines. Replace damaged lines.
- Check the junctions between the pump heads and the pump casting for evidence of liquid leaks. If piston seal wash tubing is not connected, check the drain tubes at the rear of the pump heads for evidence of moisture. Normal friction and wear may gradually result in small liquid leaks around the piston seal. If unchecked, these leaks can gradually contaminate the piston housing, causing the pump to operate poorly. If leaks occur, replace the piston seals.

- Check the end-line filter (PN 045987) and change if needed. When new, end-lline filters are pure white. If the system is in continuous operation, change the end-line filter weekly, or whenever it becomes discolored. Replace the filter more often if bacterial buildup is visible or if the eluent does not contain solvent.

  NOTE: It is especially important to regularly replace end-line filters when using aqueous eluents, which may contaminate the filter with bacteria or algae. The bacterial buildup may not be visible.

Yearly (performed by Dionex technician)

- Calibrate the cell.
- Calibrate the vacuum degas assembly
- Replace the pump piston rinse seals and piston seals.

9.6 Calculations

9.6.1 Compute the sample concentration by comparing sample response with the standard curve. Multiply the result by the appropriate dilution factor.

9.6.2 Report only those values that fall between the lowest and the highest calibration standards. Samples exceeding the highest standard should be diluted and reanalyzed.

10. Quality Control and Data Assessment

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method. When results of sample spikes indicate atypical method performance, a calibration verification standard is used to confirm the measurements were performed in an in-control mode of operation.

10.1 Demonstration of Capability

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method. Each time a method modification is made, the analyst is required to repeat the procedure.

When one or more of the parameters tested fail at least one of the acceptance criteria, the analyst must locate and correct the source of the problem and repeat the test for failed parameters of the method.

Repeated failure confirms a general problem with the measurement system or analytical technique of the analyst. If the failure repeats, locate and correct the source of the problem and repeat the test for all parameters listed in the method.

10.2 Method Blank

One Method Blank consisting of an aliquot of reagent water is analyzed with each batch of 20 samples or less. Data produced are used to assess contamination from the laboratory environment. Method Blank results must be less than the Reporting Limit (RL) for the analyte.

Note: If samples have to be filtered prior to analysis, all associated batch QC must also be filtered.

10.3 Continuing Calibration Verification (CCV) Standard

The CCV Standard is the equivalent of Standard D in Section 8.5. Store at 4 ± 2°C. Prepare weekly. The CCV is analyzed at the beginning of each run, after every tenth sample, and at the end of the sample run. The % Recovery of this standard must be within ± 10% of the calibration standard.

10.4 Initial Calibration Verification (ICV) Standard / Laboratory Control Sample (LCS)

The ICV/LCS is analyzed at the beginning of each run, but after the CCV standard. This standard is prepared from a different source than that used to prepare the calibration standards (Section 8.6). The % Recovery of this standard must be within ± 10% of the calibration standard.

10.5 Matrix Spike

Prepare and analyze one spiked sample per batch of 20 samples or less (Section 8.4.1). Recovery of the Matrix Spike must be within the Laboratory defined control limits (Section 10.7).

10.6 Duplicates

Prepare and analyze one duplicate sample per batch of 20 samples or less. The RPD for the duplicate measurements must be within the Laboratory defined control limits (Section 10.7).

10.7 Control Limits

The laboratory maintains performance records to document the quality of data that is generated. Method accuracy for samples is assessed and records maintained. After the analysis of 20 spiked samples, and 20 laboratory control samples, calculate the average percent recovery (R) and the standard deviation of the percent recovery (S).

Control limits for the method parameters are generated by the QC staff and distributed to the analysts. The control limits are calculated based on in-house performance data. The limits are compared to the control limits found in the reference method.

10.8 Analytical Sequence

- Instrument calibration
- DI Blank
- CCV
- ICV
- Ten samples
- CCV
- Blank
- Shut-down

11. Method Performance

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

MDL's must be established for all analytes, using reagent water (blank) fortified at a concentration of two to three times the estimated calculated detection limit.

Method performance data is on file in the laboratory QC department. Comparison of method performance data for the laboratory to the reference method criteria occurs when laboratory in-house acceptance limits are generated. In-house generated data must be within the specifications of the reference method or the analysis is not continued until corrective action is completed.

12. Corrective Actions

If the Method Blank result exceeds the Reporting Limit (RL) for the analyte, the Blank is reanalyzed. If the second result remains > RL, notify the Laboratory Manager to ensure maintenance is performed on the water filtration system and seek an alternate reagent water source within the laboratory. If the alternate reagent water source is acceptable, this source must be utilized for all blanks, standards and sample dilutions for the sample batch. If the second source reagent water also fails, the Laboratory Manager is notified.

If the Continuing Calibration cannot be verified within the specified limits, reanalyze the CCV solution. Record the reason for re-injection. If the second analysis of the CCV solution confirms calibration to be outside the limits, sample analysis must be discontinued, the cause determined and/or in the case of drift, the instrument recalibrated. All samples following the last acceptable CCV solution must be reanalyzed. The analysis data of the calibration blank and CCV solution must be kept on file with the sample analyses data.

If the ICV/LCS acceptance criterion cannot be met, reanalyze the standard. If failure continues, the instrument is recalibrated.

If the Matrix Spike acceptance criteria is not met, the spiked sample is reanalyzed (if possible). If failure continues and if all other QC performance criteria are met, the data is reported and a narrative is included with the final report.

If the RPD for the Duplicate measurements falls outside the Laboratory defined control limits (Section 10.7), the sample is reanalyzed (if possible). If failure continues, and if all other QC performance criteria are met, the data is reported and a narrative is included with the final report.

Holding time exceedence and improper preservation are noted on the nonconformance report form.

Perform routine preventative maintenance following manufacturer's specification. Record all maintenance in the instrument logbook.

Review of standards, blanks and standard response for acceptable performance occurs for each batch of samples. Record any trends or unusual performance on a nonconformance action form.

If the CCV or LCS recovery of any parameter falls outside the designated acceptance range, the laboratory performance for that parameter is judged to be out of control, and the problem must be immediately identified and corrected. The analytical result for that parameter in the unspiked samples is suspect and is only reported for regulatory compliance purposes with the appropriate nonconformance action form. Immediate corrective action includes reanalyzing all affected samples by using any retained sample before the expiration of the holding time.

13. Pollution Prevention

See Chemical Hygiene Plan for pollution prevention operations.

14. Waste Management

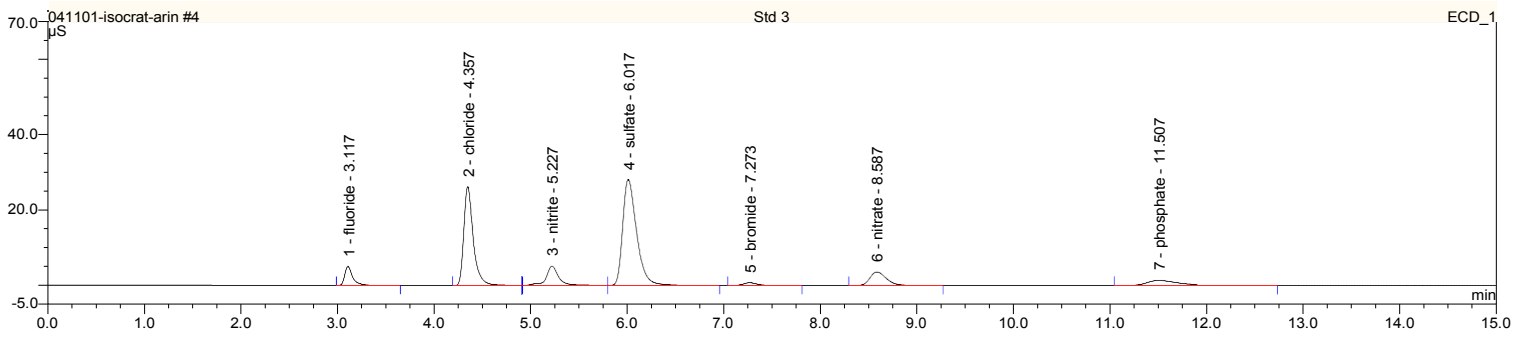
See Chemical Hygiene Plan for waste handling and disposal.

15. Attachments

Figure 1: Isocratic Anion Standard Separation

Figure 1

Isocratic Anion Standard Separation



Total Organic Carbon (TOC)
Dissolved Organic Carbon (DOC)
Total Inorganic Carbon (TIC)

Persulfate – Ultraviolet Oxidation Method

References: **SM Method 5310 C,** Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 21st Edition, 2000.

EPA Method 9060 A, SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA SW-846, Update III, 1997.

1. Scope and Application

Matrices: This method may be applied to water and wastewater samples containing minimum amounts of particulates and phase-separated organics.

Definitions: See Alpha Laboratories Quality Manual Appendix A

The organic carbon in water and wastewater is composed of a variety of organic compounds in various oxidation states. Some of these carbon compounds can be oxidized further by biological or chemical processes, and the bio-chemical oxygen demand (BOD) and chemical oxygen demand (COD) may be used to characterize these fractions. The presence of organic carbon that does not respond to either the BOD or COD test makes these methods unsuitable for the measurement of total organic carbon. Total organic carbon (TOC) is a more convenient and direct expression of total organic content than either BOD or COD, but does not provide the same kind of information. If a repeatable empirical relationship is established between TOC and BOD or COD, then TOC can be used to estimate the accompanying BOD or COD. This relationship must be established independently for each set of matrix conditions, such as various points in a treatment process. Unlike BOD or COD, TOC is independent of the oxidation state of the organic matter and does not measure other organically bound elements, such as nitrogen and hydrogen, and inorganics that can contribute to the oxygen demand measured by BOD and COD. TOC measurement does not replace BOD and COD testing.

To determine the quantity of organically bound carbon, the organic molecules must be broken down to single carbon units and converted to a single molecular form that can be measured quantitatively. TOC methods utilize heat and oxygen, ultraviolet irradiation, chemical oxidants, or combinations of these oxidants to convert organic carbon to carbon dioxide (CO_2). Within this method, the CO_2 is measured directly by a nondispersive infrared analyzer.

The methods and instruments used in measuring TOC analyze fractions of total carbon (TC) and measure TOC by two or more determinations. These fractions of total carbon are defined as:

- Inorganic carbon (IC) - the carbonate, bicarbonate, and dissolved CO_2 total organic carbon (TOC) - all carbon atoms covalently bonded in organic molecules.
- Dissolved organic carbon (DOC) - the fraction of TOC that passes through a 0.45µm filter.
- Particulate organic carbon (POC) – also referred to as nondissolved organic carbon, the fraction of TOC retained by a glass fiber filter.

- Volatile organic carbon (VOC) also referred to as purgeable organic carbon, the fraction of TOC removed from an aqueous solution by gas stripping under specified conditions.
- Nonpurgeable organic carbon (NPOC) the fraction of TOC not removed by gas stripping.

In most water samples, the IC fraction is many times greater than the TOC fraction. Eliminating or compensating for IC interferences requires multiple determinations to measure true TOC. IC interference can be eliminated by acidifying samples to pH 2 or less to convert IC species to CO_2. Subsequently, purging the sample with a purified gas removes the CO_2 by volatilization. Sample purging also removes POC so that the organic carbon measurement made after eliminating IC interferences is actually an NPOC determination; determine VOC to measure true TOC. In many surface and ground waters, the VOC contribution to TOC is negligible. Therefore, in practice, the NPOC determination is substituted for TOC.

Alternatively, IC interferences may be compensated for by separately measuring total carbon (TC) and inorganic carbon. The difference between TC and IC is TOC.

The purgeable fraction of TOC is a function of the specific conditions and equipment employed. Sample temperature and salinity, gas-flow rate, type of gas diffuser, purging-vessel dimensions, volume purged, and purging time affect the division of TOC into purgeable and nonpurgeable fractions. When separately measuring VOC and NPOC on the same sample, use identical conditions for purging during the VOC measurement as in purging to prepare the NPOC portion for analysis. Consider the conditions of purging when comparing VOC or NPOC data from different laboratories or different instruments.

Many instruments utilizing persulfate oxidation of organic carbon are available. They depend on ultraviolet irradiation activation of the reagents. The persulfate-ultraviolet oxidation method is a rapid, precise method for the measurement of trace levels of organic carbon in water and is of particular interest to the electronic, pharmaceutical, and steam-power generation industries where even trace concentrations of organic compounds may degrade ion-exchange capacity, serve as a nutrient source for biological growth, or be detrimental to the process for which the water is being utilized.

The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one of the following laboratory personnel before performing the modification: Area Supervisor, Laboratory Director, or Quality Assurance Officer.

This method is restricted to use by or under the supervision of analysts experienced in the operation of the TOC Analyzer and in the interpretation of TOC data. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

2. Summary of Method

Organic carbon is oxidized to carbon dioxide, CO_2 by persulfate in the presence of ultraviolet light. The CO_2 produced may be measured by a nondispersive infrared analyzer.

The TOC Analyzer utilizes an ultraviolet lamp submerged in a continuously gas-purged reactor that is filled with a constant-feed persulfate solution. The samples are introduced serially into the reactor by an autosampler. The CO_2 produced is sparged continuously from the solution and is carried in the gas stream to an infrared analyzer that is specifically tuned to the absorptive wavelength of CO_2. The instrument's microprocessor calculates the area of the peaks produced by the analyzer, compares them to the peak area of the calibration standard stored in its memory, and prints out a calibrated organic carbon value in milligrams per liter.

2.1 Method Modifications from Reference

2.1.1 Method 9060 requires that samples be analyzed in quadruplicate. Alpha analyzes samples in duplicate with a %RSD required to be ≤10%.

2.1.2 Method 9060 requires a duplicate and spike to be analyzed after every 10 samples. Alpha analyzes a duplicate and spike after every 10 samples per matrix for method 9060 and for every 20 samples for method 5310 C. A CCV/CCB pair is analyzed after every 10 samples.

3. Detection Limits

The Reported Detection Limit for TOC is 0.5mg / L and for DOC is 1.0mg/L.

4. Interferences

4.1 Instrumental

The intensity of the ultraviolet light reaching the sample matrix may be reduced by highly turbid samples or with aging of the ultraviolet source, resulting in sluggish or incomplete oxidation. Large organic particles or very large or complex organic molecules such as tannins, lignins, and humic aid may be oxidized slowly because persulfate oxidation is rate-limited.

4.2 Parameters

Excessive acidification of sample, producing a reduction in pH of the persulfate solution to 1 or less, can result in sluggish and incomplete oxidation of organic carbon.

Persulfate oxidation of organic molecules is slowed in samples containing significant concentrations of chloride by the preferential oxidation of chloride; at a concentration of 0.1% chloride, oxidation of organic matter may be inhibited completely.

With any organic carbon measurement, contamination during sample handling and treatment is a likely source of interference. This is especially true of trace analysis. Take extreme care in sampling, handling, and analysis of samples with TOC below 1mg/L.

Removal of carbonate and bicarbonate by acidification and purging with purified gas results in the loss of volatile organic substances. The volatiles also can be lost during sample blending, particularly if the temperature is allowed to rise. Another important loss can occur if large carbon-containing particles fail to enter the needle used for injection. Filtration, although necessary to eliminate particulate organic matter when only DOC is to be determined, can result in loss or gain of DOC, depending on the physical properties of the carbon-containing compounds and the adsorption of carbonaceous material on the filter, or its desorption from it. Check filters for their contribution to DOC by analyzing a filtered blank. Note that any contact with organic material may contaminate a sample. Avoid contaminated glassware, plastic containers, and rubber tubing. Method Blanks are analyzed with each batch to verify a clean system.
The presence of large amounts of particulate material will cause problems with the determination of carbon. The Phoenix 8000 TOC analyzer is not equipped for the analysis of samples with large amounts of particulate matter. Small amounts may be compensated for by dilution (refer to Section 11.2.2).

5. Safety

The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material data handling sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

6. Sample Collection, Preservation, Shipping and Handling

6.1 Sample Collection

Collect samples in two 40mL amber vials with Teflon septa. Minimum headspace is desirable.

6.2 Sample Preservation

6.2.1 If samples are to be analyzed for Dissolved Organic Carbon (DOC), they must be filtered prior to preservation. Refer to Section 10.1.1 for filtration procedure.

6.2.2 Within two hours of sampling, the samples are preserved with 1:1 H_2SO_4 to a pH $\leq$2, and refrigerated at 4 $\pm$ 2 ºC until analysis.

6.3 Sample Shipping

No special shipping requirements.

6.4 Sample Handling

Samples to be filtered by the laboratory for DOC analysis, must be filtered upon receipt at the laboratory.

Preserved samples must be analyzed within a 28-day holding time.

7. Equipment and Supplies

7.1 AAL: "TOC-1": Phoenix 8000 Total Organic Carbon Analyzer: with autosampler.

7.1.1 Computer and related accessories capable of running associated software: TOC Talk ver. 3. c1998 by Tekmar-Dohrmann

7.2 Filtering Apparatus.

7.3 0.45 µm Filters.

7.4 40mL Amber Glass Vials: with Teflon septa.

7.5 Glass Syringes: 50µL, 200µL and 1mL volumes.

7.6 Pipetter: 1-5mL, with disposable tips.

7.7 AAL: "TOC-3": Shimadzu TOC-V wp Total Organic Carbon Analyzer with autosampler.

7.7.1 Computer and related accessories capable of running associated software: TOC-Control V ver. 1.07.00. c2000-2004 by Shimadzu Corp.

8. Standards and Reagents

8.1 Reagent Water: Deionized water (DI).

8.2 10% Persulfate + 5% Phosphoric Acid Reagent Mixture: Measure 50g 98^{+}% sodium persulfate ($Na_2S_2O_8$) into a rinsed bottle. Add 18mL of 85% phosphoric acid (H_3PO_4). Add 426mL of reagent water (DI). Mix well. This mixture must be prepared monthly. Label bottle with date made, date of expiration, reagent lot number, and store at room temperature.

8.3 21% Acid Reagent: Measure 74mL of 85% phosphoric acid (H_3PO_4) into a rinsed bottle. Add 376mL of reagent water (DI). Mix well. This mixture must be prepared monthly. Label bottle with date made, date of expiration, and reagent lot number and store at room temperature.

8.4 2000ppm Organic Carbon Stock Calibration Standard: In a 1L volumetric flask, add 4.25g of Potassium Hydrogen Phthalate (KHP) and 1mL H_3PO_4. Bring to volume with DI and agitate to mix well. Transfer to a 1L Amber glass bottle. Prepare every six months. Label bottle with standard lot number, date made, and date of expiration. Store at 4 $\pm$ 2 °C.

8.4.1 50ppm Calibration Standard: To a 100mL volumetric flask, add 2.5mL of 2000ppm stock standard (Section 8.4) and bring to volume with DI. Prepare fresh for each calibration curve generated.

8.4.2 10ppm Calibration Standard: To a 100mL volumetric flask, add 0.5mL of 2000ppm stock standard (Section 8.4) and bring to volume with DI. Prepare fresh for each calibration curve generated.

8.4.3 5.0ppm Calibration Standard: To a 100mL volumetric flask, add 10mL of 50ppm calibration standard (Section 8.4.1) and bring to volume with DI. Prepare fresh for each calibration curve generated.

8.4.4 2.0ppm Calibration Standard: To a 100mL volumetric flask, add 4mL of 50ppm calibration standard (Section 8.4.1) and bring to volume with DI. Prepare fresh for each calibration curve generated.

8.4.5 1.0ppm Calibration Standard: To a 100mL volumetric flask, add 2mL of 50ppm calibration standard (Section 8.4.1) and bring to volume with DI. Prepare fresh for each calibration curve generated.

8.4.6 0.5ppm Calibration Standard: To a 100mL volumetric flask, add 1mL of 50ppm calibration standard (Section 8.4.1) and bring to volume with DI. Prepare fresh for each calibration curve generated.

8.4.7 0.2ppm Calibration Standard: To a 100mL volumetric flask, add 2.0mL of 10ppm calibration standard (Section 8.4.2) and bring to volume with DI. Prepare fresh for each calibration curve generated.

8.5 2000ppm Organic Carbon Stock Check Standard:

In a 1L volumetric flask, add 4.25g of Potassium Hydrogen Phthalate (KHP) and 1mL H_3PO_4. Bring to volume with DI and agitate to mix well. Transfer to a 1L Amber glass bottle. Prepare every six months. Label bottle with standard lot number, date made, and date of expiration. Store at 4 ± 2 °C.

The KHP used for this solution must be from a different source and lot number than that used in Section 8.4.

8.5.1 Calibration Verification Standard

2.0ppm ICV/CCV: To a 100mL volumetric flask, add 100µL of 2000ppm stock check standard (Section 8.5) and bring to volume with DI. Prepare fresh on each day of use.

8.5.1.1 In the case of DOC, the 2.0ppm ICV/CCV is prepared as above (Section 8.5.1) using DI that has been filtered through a 0.45µm filter (Section 7.3).

8.6 400ppm TOC IC Stock Standard:

To a 100mL volumetric flask, add 0.3545g sodium carbonate (Na2CO3) anhydrous powder. Bring to volume with DI water. Store at 4 ± 2°C. Prepare annually or as needed.

8.6.1 10ppm TOC IC Working Check Standard (Negative LCS): Into a 100mL volumetric flask, add 2.5mL of 400ppm TOC IC Stock Standard. Bring to volume with DI water. Store at room temperature. Prepare weekly or as needed.

8.6.1.1 2ppm TIC Working Check Standard: Into a 100ml volumetric flask, add 20ml of 10ppm TOC IC Working Check Standard. Bring to volume with DI water. Store at room temperature. Prepare as needed. Note: Also referred to as the 10ppm "IC CK STD" (Inorganic Check Standard).

8.7 Purging / Carrier Gas:

Nitrogen, ultra-high purity.

9. Quality Control

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method.

9.1 Blank(s)

9.1.1 Method Blank or Initial Calibration Blank (ICB)

One ICB is analyzed per batch of 10 samples or less. The ICB consists of 40mL of DI. The DI must be from the same source as was used to prepare the Calibration Verification samples. Results must be < 0.5mg/L, but preferably ≤ 0.2mg/L. If this criterion is not met, the instrument must be internally cleaned again (Refer to Section 10.1.4) in order to ensure that the system is clean prior to sample analysis.

In the case of DOC, the ICB consists of DI that was filtered through a 0.45µm filter (Section 7.3). Results must be <1.0mg/L. If this criterion is not met, the instrument

must be internally cleaned again (Refer to Section 10.1.4) in order to ensure that the system is clean prior to sample analysis.

9.2 Laboratory Control Sample (LCS)

9.2.1 The 2.0ppm ICV is reported as the LCS for each batch of 20 or less samples (per instrument and per day). Therefore, a new ICV should be analyzed for each additional batch of 20 or less samples, when multiple batches are run on the same instrument and daily analytical sequence. Refer to Section 9.3

9.2.2 **Negative LCS Standard (LCSN):** A negative LCS (LCSN) is analyzed following the Calibration Blank (ICB) to demonstrate that there is no Inorganic Carbon contribution to the Organic Carbon analysis. The analysis of the 10ppm LCSN (8.6.1) must yield a result of < 0.5mg/L.

If the LCSN fails this criteria, the data is inspected to determine the cause of the failure. The standard is reanalyzed. If failure continues, the standard is remade and reanalyzed. If failure continues, there is a system malfunction and sample analysis cannot take place. The following instrument parameters are investigated: UV Lamp function, sparger function and acid delivery to the sparger. If the problem persists, contact the Department Supervisor. Analysis cannot begin until the 10ppm LCSN is within acceptance criteria.

Note: Also referred to as the 10ppm "IC CK STD" (Inorganic Check Standard).

9.3 Initial Calibration Verification (ICV)

An ICV is analyzed at the beginning of the analytical sequence, at a concentration of 2.0ppm. (For preparation instructions, refer to Section 8.5.1.)

The ICV must be recovered within ± 10% of the true value. If this criterion is not met, the system must be cleaned again, and the Blank and ICV must be re-analyzed. If failure continues, remake the ICV (Section 8.5.1) and/or generate a new calibration curve (Section 10.1.6). Sample analysis cannot proceed until an acceptable ICV/LCS is obtained.

9.4 Continuing Calibration Verification (CCV)

9.4.1 A Continuing Calibration Verification standard is analyzed after every 10 or less samples (inclusive of the duplicate and matrix spike samples). This CCV is at a concentration of 2.0ppm TOC (Section 8.5.1), and must be recovered within ±10% of the true value. If the CCV fails this criterion, it is re-made and re-analyzed. If failure continues, all samples analyzed since the last valid CCV, are considered invalid and must be re-analyzed. However, prior to re-analysis, a new calibration curve must be generated. (Refer to Section 10.1.6.)

If all of the samples analyzed since the last acceptable CCV have results that are below the reporting limit, the data may be reported and a narrative submitted for inclusion on the final report.

9.4.2 Continuing Calibration Blank (CCB)

A Continuing Calibration Blank is analyzed after every 10 samples (inclusive of the duplicate and matrix spike samples). This CCB consists of 40mL DI water and must be recovered below the detection limit. If the CCB fails this criterion, it is re-

poured and re-analyzed. If failure continues, all samples analyzed since the last valid CCB, are considered invalid and must be re-analyzed. However, prior to re-analysis, a new calibration curve must be generated. (Refer to Section 10.1.6.)

If all of the samples analyzed since the last acceptable CCB have results that are below the reporting limit, the data may be reported and a narrative submitted for inclusion on the final report.

9.5 Matrix Spike

One Matrix Spike (MS) is analyzed per batch of 20 samples or less (per batch of 10 samples or less for TOC-9060). Measure 40mL of the well-homogenized sample to be spiked into a 40mL amber glass vial with Teflon cap. Using a glass syringe, add 80µL of the 2000ppm Stock Check Standard (Section 8.5). Invert to mix. The true value of the spike prepared accordingly, is 4ppm. The matrix spike must be recovered within 80 – 120% of the true value.

If the matrix spike recovery is outside of acceptance criteria, the sample and its MS are reanalyzed upon dilution with DI water for TOC analysis, or with filtered DI water for DOC analysis. If failure repeats, the data is reported and a narrative submitted for inclusion on the Client report.

9.6 Laboratory Duplicate

One Duplicate sample is analyzed per batch of 20 samples or less (per batch of 10 samples or less for TOC-9060). Samples are routinely collected in two 40mL amber glass vials; therefore the second vial may be used as the sample duplicate. It must, however, be analyzed as if it were a separate sample. The %RPD between the sample and its duplicate must be <20%.

If the % RPD is outside of acceptance criteria, the duplicate is reanalyzed. If failure repeats, the data is reported and a narrative submitted for inclusion on the Client report.

9.7 Method-specific Quality Control Samples

Refer to Section 9.2.2.

9.8 Method Sequence

- TOC-1 only: Prime System TOC-3 only: Rinse water
- TOC-1 only: Cleaning Procedure
- TOC-1 & TOC-3:
- Calibration curve generation (if necessary)
- DI water
- 10ppm Negative LCS (IC CK STD)
- 2.0ppm ICV
- ICB
- Samples 1-10
- 2.0ppm CCV
- CCB

If Method 5310, then proceed with samples 11-20 (dup/spk required per 20 samples)

- 2.0ppm CCV
- CCB
- Duplicate
- Matrix Spike 4ppm
- 2.0ppm CCV
- CCB
- Shut down

If Method 9060, then proceed with dup and spk (dup/spk required per 10 samples)
Duplicate
Matrix Spike 4ppm

- 2.0ppm CCV
- CCB
- Shut down

10. Procedure

10.1 Equipment Set-up

10.1.1 Sample Preparation for Dissolved Organic Carbon (DOC) Analysis

Prior to preservation, samples to be analyzed for dissolved organic carbon (DOC) are filtered through a 0.45µm filter (Section 7.3) as follows:

- Prior to filtration of the sample, filter 500mL of DI through a 0.45µm filter and discard.
- Filter 100mL of sample through the same 0.45µm filter.
- Transfer filtered sample to two 40mL amber vials and preserve accordingly.
- Prepare a DOC method blank following the same procedure listed above. Filter enough to fill a 40mL amber vial and extra to allow for possible sample dilutions.

Another method of filtration of DOC samples can be the following: Use 0.45 µm filtering discs with a 10 or 20mL disposable syringe. Record necessary information in the filtration logbook (sample ID, date and time of filtration, analyst's initials, the lot number of the vials used, and the preservative used).

10.1.2 Instrument Set-Up

Follow the manufacturer's instructions for proper instrument set-up procedures. For TOC-3 instrument, refer to Table A.

10.1.3 Reagent Preparation

10.1.3.1 Verify that the reagents (Sections 8.2 and 8.3) have not expired and that there is adequate Nitrogen gas supply. If necessary, prepare reagents and/or change gas cylinder.

10.1.3.2 Ensure that the DI supply to the instrument is fresh for each day of analysis.

10.1.3.3 Prepare the 2.0ppm ICV/CCV standard (Section 8.5.1) each day of analysis.

10.1.4 Instrument Preparation

10.1.4.1 (TOC-1)

Prior to analysis of either standards or samples, program the instrument to perform the following:

- Prime System: 1 Rep
- Cleaning Procedure: 2 Reps

10.1.4.2 (TOC-3)

Set instrument to analysis 1 vial of DI water, entitled "Rinse water" to ensure system is stable and clean before analyses.

Proceed to section 10.1.5

10.1.5 If a valid calibration curve is already in place, proceed to Section 10.2.

10.1.6 Calibration Curve Generation

A new calibration curve is generated every six months. However, if there has been a major change to the system, a new calibration curve must be generated following the change and prior to sample analysis.

Prepare six calibration standards per Section 8.4.2 through Section 8.4.7 and two DI water blanks.

Analyze the six calibration standards and blanks:

(TOC-1) with the TOC Talk Software range set at "0.1 – 10ppm TOC", per the manufacturer's instructions and the TOC Talk Software instructions.

(TOC-3) with the TOC Shimadzu TOC-V wp software program, Set the range at 0.1 – 10ppm for TOC.

After analysis, the TOC Talk Software for TOC-1, or the software program for TOC-3, will allow the user to select the calibration standards and blank desired to include in the calibration curve calculation. All of the standards must be chosen, and also the second blank (the first blank is considered a rinse). The correlation coefficient (r) must be $\geq$ 0.995. If this criterion is not met, the calibration standards are re-made and the calibration curve is re-analyzed.

Samples and QC samples may not be analyzed until a valid Calibration Curve is obtained.

10.2 Initial Calibration

10.2a Before any analyses, verify that the system is clean.

10.2b Run one DI sample to check for system stability. (Note: Only at initial instrument startup. This also acts as a TOC water screen to ensure the lab water being used is acceptable (resulting value is below the reporting limit of 0.5ppm for TOC and 1.0ppm for DOC) prior to use).

Per the manufacturer's instructions, set up the autosampler to analyze the following:

- TOC-1= DI water, TOC-3= Rinse water (DI)

10.2.1 Negative LCS Standard (LCSN): Prior to sample analysis and following the ICV and ICB, a negative LCS (LCSN) is analyzed to demonstrate that there is no Inorganic Carbon contribution to the Organic Carbon analysis. The analysis of the 10ppm LCSN (8.6.1) must yield a result of < 0.5mg/L.

If the LCSN fails this criteria, the data is inspected to determine the cause of the failure. The standard is reanalyzed. If failure continues, the standard is remade and

reanalyzed. If failure continues, there is a system malfunction and sample analysis cannot take place. The following instrument parameters are investigated: UV Lamp function, sparger function and acid delivery to the sparger. If the problem persists, contact the Department Supervisor. Analysis cannot begin until the 10ppm LCSN is within acceptance criteria.

10.2.2 Initial Calibration Verification (ICV) and Initial Calibration Blank (ICB)

Prior to sample analysis, the calibration curve must be verified.

Analyze an ICV and an ICB to confirm stability and cleanliness.

* 2.0ppm ICV (Section 8.5.1)
- ICB (DI water)

The ICV must have a % Recovery ± 10% of the true value. The results for the ICB must be less than 0.5mg/L, but preferably less than or equal to 0.2mg/L. If these criteria are not met, the system must be cleaned again (Section 10.1.4) and the ICV and ICB must be re-analyzed. If failure continues, remake the ICV (Section 8.5.1) and/or generate a new calibration curve (Section 10.1.6).

10.3 Equipment Operation and Sample Processing

10.3.1 Samples and QC samples are analyzed according to the manufacturer's instructions and the TOC Talk Software (TOC-1), or TOC Shimadzu TOC-V wp software program (TOC-3) instructions, using the valid calibration curve in the TOC Talk Software or TOC Shimadzu TOC-V wp software program range of "0.1 – 20ppm TOC". (As generated in Section 10.1.6).

10.3.1.1 Dissolved Organic Carbon: If samples are to be analyzed for DOC, the same procedure is followed as for TOC. However, while setting up the batch in TOC Talk, the analyst must include "DOC" in the Sample ID field.

10.3.1.2 Total Inorganic Carbon: (Applies only to TOC-1 instrument): If samples are to be analyzed for TIC (logged in under SPECWC product), the procedure is as follows:

10.3.1.2.1 Switch the ultraviolet lamp to standby mode.

10.3.1.2.2 Below the ultraviolet protection hood of the instrument, unplug the small tubing attached to the top of the mix/sparge glass tube. (It may make a slight "pop" sound when doing so). After doing this, switch the ultraviolet lamp back to ready mode to begin sample analysis.

10.3.1.2.3 Create a 2ppm ICV/CCV working standard by using 20ml of the 10ppm working TIC standard (refer to section 8.6) and filling this to 100ml DI in a clean 100ml volumetric flask.

10.3.1.2.4 Analyze all samples in the same manner as is followed for TOC/DOC. However, the acceptable range for ICV/CCV/Duplicate % recovery is within 20%. There is no matrix Spike analysis.

10.3.1.2.5 When all sample analysis for TIC has been completed, switch the ultraviolet lamp back to standby mode, CAREFULLY & GENTLY (it is easily breakable!) replug the small tubing to the top of the mix/sparge glass tube. When the red stopper on the small tubing is halfway back into the top of the mix/sparge glass tube, the

system should be secure. Switch the ultraviolet lamp back to ready mode.

10.3.1.2.6 Analyze two vials of DI as if they are regular TOC samples to clean the system following its use for TIC analysis before shutdown.

10.3.1.2.7 (Important note: It is highly recommended (whenever possible) that TIC analysis be done at the end of the day's run, to enable the red stopper to dry and remain secure in the system. It has been determined that too much TOC analysis right after TIC analysis causes the small tubing to pop back out and therefore disrupt TOC analysis).

10.3.2 The samples to be analyzed must have a minimum amount of sediment. Initial dilution of samples with sediment may be necessary to facilitate analysis. by either instrument. Dilutions are prepared volumetrically with DI water. However, prior to dilution, consider the history of the samples and the detection limit requirements of the client. If questions arise due to sample matrix, consult with the Department Supervisor and/or the Laboratory Director before proceeding with analysis.

10.3.3 Samples are to be analyzed with 2 Reps each. The TOC Software will calculate the standard deviation, the %RSD, and the mean. The %RSD must be $\leq$ 10%. If this criterion is not met, the sample must be re-analyzed with 2 Reps. If failure continues, consult with the Department Supervisor and/or the Laboratory Director before proceeding.

10.3.4 Similarly, a duplicate sample and a matrix spike sample are to be analyzed in replicate. Prepare the duplicate and matrix spike samples according to Sections 9.6 and 9.5.

10.3.4.1 For Method 5310, a duplicate and matrix spike is required for every **20** samples or less in a batch.

10.3.4.2 For Method 9060, a dupldate and matrix spike is required for every **10** samples or less in a batch.

10.3.5 If the sample results are above 10mg/L TOC, they are above the high end of the calibration curve. In this instance, the sample must be manually diluted volumetrically with DI water and re-analyzed. A timeout message or baseline drift might also necessitate a dilution of the sample even if the sample is < 10mg/L.

While setting up the diluted sample in the batch, the analyst must include the dilution factor in the Sample ID field.

10.4 Continuing Calibration

10.4.1 Continuing Calibration Verification (CCV) and Continuing Calibration Blank (CCB)

A Continuing Calibration Verification standard and a Continuing Calibration Blank pair are analyzed after every 10 samples (inclusive of the duplicate and matrix spike samples).

10.4.1.1 The CCV is at a concentration of 2.0ppm TOC (Section 8.5.1), and must be recovered within ±10% of the true value. If the CCV fails this criterion, it is re-made and re-analyzed. If failure continues, all samples analyzed since the last valid CCV, are considered invalid and must be re-analyzed. However, prior to re-analysis, a new calibration curve must be generated. (Refer to Section 10.1.6.)

10.4.1.1.1 If all of the samples analyzed since the last acceptable CCV have results that are below the reporting limit, the data may be reported and a narrative submitted for inclusion on the final report.

10.4.1.2 The results for the CCB must be less than 0.5mg/L, but preferably less than or equal to 0.2mg/L. If the CCB fails this criterion, it is reanalyzed. If failure continues, all samples analyzed since the last valid CCB, are considered invalid and must be re-analyzed. However, prior to re-analysis, a new calibration curve must be generated. (Refer to Section 10.1.6.)

10.4.1.2.1 If all of the samples analyzed since the last acceptable CCB have results that are below the reporting limit, the data may be reported and a narrative submitted for inclusion on the final report.

10.5 Preventive Maintenance

The instrument is primed and cleaned internally prior to analysis. Tubing, copper/tin scrubber, and autosampler syringe are inspected routinely to ensure they are in proper working order. The external autosampler is kept clean and free of dust. Extra parts are kept on hand in the event they are necessary. All instrument maintenance is recorded in the Instrument Maintenance Logbook.

If continual bubbling in the gas/liquid separator tube occurs during analysis, lift the back, right cover of the instrument body (carefully so as not to disturb any connected fan wiring), and gently tap the line from the separator tube until all the bubbles are released. Any sample currently running may need reanalysis due to failed detection. (i.e. instrument message “no sample detected”.)

11. Data Evaluation, Calculations and Reporting

The TOC Talk Software (TOC-1) or TOC Shimadzu TOC-V wp software program calculates the area of the peaks produced by the analyzer, compares them to the peak area of the calibration standard stored in its memory, and calculates a mean TOC value in mg/L.

If the sample was manually diluted prior to analysis, the calculated mean must be manually multiplied by the dilution factor. The Reported Detection Limit is also multiplied by the same dilution factor.

If the sample result is <0.5mg/L for TOC, it is reported as ND (Not Detected). Likewise, if the sample result is <1.0mg/L for DOC, it is reported as ND (Not Detected).

12. Contingencies for Handling Out-of-Control Data or Unacceptable Data

Refer to Section 9 for corrective actions.

13. Method Performance

13.1 Method Detection Limit Study (MDL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

The laboratory follows the procedure to determine the MDL, LOD, and/or LOQ as outlined in Alpha SOP/1732. These studies performed by the laboratory are maintained on file for review.

13.2 Demonstration of Capability Studies

Refer to Alpha SOP/1739 for further information regarding IDC/DOC Generation.

13.2.1 Initial (IDC)

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method, prior to the processing of any samples.

13.2.2 Continuing (DOC)

The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

14. Pollution Prevention and Waste Management

Refer to Alpha's Chemical Hygiene Plan and Waste Management and Disposal SOP for further pollution prevention and waste management information.

15. Referenced Documents

Chemical Hygiene Plan

SOP/1732 MDL/LOD/LOQ Generation

SOP/1739 IDC/DOC Generation

SOP/1728 Waste Management and Disposal SOP

16. Attachments

Table A: TOC-VW (TOC 3 INSTRUMENT)

Table A:
TOC-VW (TOC 3 INSTRUMENT)

STARTING THE INSTRUMENT:

Turn on nitrogen ultra pure nitrogen gas tank.

Push the on/off button on the bottom right front of the instrument to on (green light will be visible).

With the computer on, use the mouse to double click on the TOC-CONTROL V icon on the desktop.

Double click on “Sample Table Editor”

Enter user’s initials, hit OK

At Sample Table page:

Go to File “New”

Double click on “Sample Run”

Select System “TOC-VW”, hit OK

At Save As page:

For File name, overwrite existing to say current date as month/day/year (00/00/0000), hit SAVE

At Dated Run page:

Click on yellow lightning bolt icon @ top to connect to system

At Parameter Confirmation Dialog page:

Click on “Use Settings on PC”

At Sequence Box page:

Wait for system to initialize (page box will disappear once initialized)

Once initialized, click on white square box @ top (just left of yellow lightning bolt), to see Background Monitor

Wait for NDIR: baseline pos., baseline fluc., and baseline noise -> all 3 items should have a green checkmark before instrument can run analyses.

When all 3 items are green, close this box by clicking on the “X” on the top right of the box.

At the Dated Run page again:

Adjust columns to include: Analysis//Sample Name//Result//Status//Date/Time//Vial

NOTE: Prior to analyzing samples, generate a new Calibration Curve according to the Instrument's User Manual,

TO SET UP AN ANALYSIS RUN:

At top of Dated Run page:

Go to Insert, Autogenerate

Sample group wizard (page 1): sample source:

Bullet calibration curve, push rectangular button w/ dots within it

Next to file name, type toc3curve120211a

Select current dated curve from choices below

Hit OPEN

Then hit NEXT

Sample group wizard (page 2):

Number of samples = enter number of samples to analyze

Start vial = vial number to begin analyzing

Erase sample name/leave blank, hit NEXT

Page 3: hit NEXT

Page 4: hit NEXT

Page 5: hit FINISH

Sparging/acid addition with autosampler pie display, hit OK

Back at Dated Run page:

Type in information for each sample name in the appropriate column

TO BEGIN ANALYSIS:

Click on the green stoplight icon at top of screen:

Standby box should have "keep running" bullet

Hit Standby button

Then hit OK on sparging/acid addition autosampler pie display page

Then @ start ASI measurement box, UNCHECK the external acid addition box, hit START

TO TURN OFF INSTRUMENT AFTER ANALYSIS IS COMPLETED:

At the end of the run, hit the round clock icon at the top of the screen

Mare sure “shut down instrument” is bulleted

Hit “standby”

Turn off instrument power button so that the green light is now off.

Turn off gas tank.

TO PRINT ANALYSIS PAPERWORK:

File, Print, sample report

Close all pages on screen by hitting the “X” at the top right of each page.

Nitrate, Nitrite and Nitrate/Nitrite Nitrogen

Automated Cadmium Reduction Method

References: **Methods 353.2:** Methods for the Determination of Inorganic Substances in Environmental Samples, EPA 600/ R-93/ 100. August, 1993.

Methods 4500NO_3-F, 4500NO_2-B: Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 21st Edition, 2000.

Method 10-107-04-1, Lachat Instruments, 6645 West Mill Road, Milwaukee, WI 53218, 1992.

1. Scope and Application

Matrices: This method is limited to optically clear water samples with a total concentration of nitrite and nitrate below 8mg N/L.

Definitions: See Alpha Laboratories Quality Manual Appendix A

In waters and wastewaters, the forms of nitrogen of greatest interest are, in order of decreasing oxidation state, nitrate, nitrite, ammonia, and organic nitrogen. All these forms of nitrogen, as well as nitrogen gas (N_2), are biochemically interconvertible and are components of the nitrogen cycle. They are of interest for many reasons.

Organic nitrogen is defined functionally as organically bound nitrogen in the trinegative oxidation state. It does not include all organic nitrogen compounds. Analytically, organic nitrogen and ammonia can be determined together and have been referred to as “kjeldahl nitrogen,” a term that reflects the technique used in their determination. Organic nitrogen includes such natural materials as proteins and peptides, nucleic acids and urea. Numerous concentrations vary from a few hundred micrograms per liter in some lakes to more than 20mg/L in raw sewage.

Total oxidized nitrogen is the sum of nitrate and nitrite nitrogen. Nitrate generally occurs in trace quantities in surface water but many attain high levels in some groundwater. In excessive amounts, it contributes to the illness known as methemoglobinemia in infants. A limit of 10mg nitrate as nitrogen/L has been imposed on drinking water to prevent this disorder. Nitrate is found only in small amounts in fresh domestic wastewater but in the effluent of nitrifying biological treatment plants, nitrate may be found in concentrations of up to 30mg nitrate as nitrogen/L. It is an essential nutrient for many photosynthetic autotrophs and has been identified as a growth-limiting nutrient.

Nitrite is an intermediate oxidation state of nitrogen, both in the oxidation of ammonia to nitrate and in the reduction of nitrate. Such oxidation and reduction may occur in wastewater treatment plants, water distribution systems, and natural waters. Nitrite can enter a water supply system through its use as a corrosion inhibitor in industrial process water. Nitrite is the actual etiologic agent of methemoglobinemia. Nitrous acid, which is formed from nitrite in acidic solution, can react with secondary amines (RR’NH) to form nitrosamines (RR’N-NO), many of which are known to be carcinogens. The toxicologic significance of nitrosation reactions in vivo and in the natural environment is the subject of much current concern and research.

Within this SOP, organic nitrogen is referred to as organic N, nitrate nitrogen as NO_3 -N, and nitrite nitrogen as NO_2 -N.

The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the

laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one of the following laboratory personnel before performing the modification: Area Supervisor, Laboratory Director, or Quality Assurance Officer.

This method is restricted to use by or under the supervision of analysts experienced in the operation of the Lachat Analyzer and in the interpretation of Lachat data. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

2. Summary of Method

Nitrate is quantitatively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl)ethylenediamine dihydrochloride. The resulting water-soluble dye has a magenta color, which is read at 520nm. Nitrite alone can be determined by removing the cadmium column. The nitrate is calculated as the difference between the reduced and non-reduced sample.

2.1 Method Modifications from Reference

Soils can be analyzed using 1:10 ratio soil to water extraction, following filtration.

3. Detection Limits

This method has an analytical range of 0.1 to 8.0mg N/L in the form of nitrate, and 0.05 to 8.0mg N/L in the form of nitrite.

The Reporting Limit is 0.1mg/L for Nitrate and 0.05 mg/L for Nitrite. Reporting limit is 1.0 mg/kg for soils.

4. Interferences

4.1 Suspended matter in the column will restrict sample flow.

4.2 For turbid samples, filter through 0.45µm membrane filter prior to analysis.

4.3 Low results would be obtained for samples that contain high concentrations of iron, copper or other metals. In this method, EDTA is added to the buffer to reduce this interference.

4.4 Samples that contain large concentrations of oil and grease will coat the surface of the cadmium. In this case, only the water phase of the sample is used for analysis and a narrative is submitted with the data. Dilutions are performed as necessary.

4.5 Residual chlorine can interfere by oxidizing the Cd column, reducing its efficiency. Prior to analysis, check wastewater and drinking water samples for residual chlorine and record results in the Laboratory Notebook. If residual chlorine is present, and the samples are preserved with H_2SO_4, the sample may be analyzed for NO_3/NO_2 determination. However, NO_2 must be performed by a manual method. If it is not possible to analyze NO_2 by a manual method, the result is reported as NA and a narrative is submitted.

4.6 Sample color interferes if it is absorbed at about 540nm.

5. Safety

The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material data handling sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

6. Sample Collection, Preservation, and Handling

6.1 Sample Collection

Samples are collected in glass or plastic bottles; 250mL minimum volume. Soils can be collected in plastic or glass containers.

6.2 Sample Preservation

Refrigerate samples at 4 ± 2 °C.

For Nitrate/Nitrite analysis, the samples are preserved with 1:1 H_2SO_4.

6.3 Sample Handling

Begin NO_3 and/or NO_2 determinations promptly after sampling. If storage is necessary, store for up to 48 hours at 4 ± 2 °C.

NOTE: If the 48-hour hold time cannot be met, the sample is to be handled as follows, only in an emergency situation. These instructions are not to be used on a regular basis.

Prior to the expiration of the 48-hour hold time, the following three steps are executed:

1. A manually colored Nitrite test is performed by Method 354.2. Results are recorded in the Laboratory Notebook.
2. A 50mL aliquot of the sample is preserved to a pH of <2 with concentrated H_2SO_4. Preservation is recorded in the Laboratory Notebook.

Prior to analysis, within 14 days of preservation, the preserved sample is neutralized using 6N NaOH. The sample is analyzed using only the Lachat Instrument.

CAUTION! Samples must NOT be preserved with mercuric chloride or thiosulfate because this will degrade the cadmium column.

7. Equipment and Supplies

7.1 Lachat 8000 Automated Ion Analyzer or Lachat QuickChem 8500 Automated Ion Analyzer

7.2 Nitrate+Nitrite Lachat Board

7.3 Nitrite Lachat Board

7.4 Pre-packed Cadmium Columns: Available from Lachat.

7.5 Ottawa sand.

7.6 Disposable Culture Tubes 13x100 ml

7.7 Disposable pipettes.

8. Standards and Reagents

8.1 Stock Nitrate Standard, 1000mg N/L as NO_3 : Purchased commercially prepared with certificate of analysis. Expires upon manufacturer's expiration date. There must be different manufacturers for calibration stock and ICV/LCS stock.

8.1.1 Stock Nitrate Standard, 200.0mg N/L as NO_3 : Pipet 50mL of 1000ppm standard (Section 8.1) into 250mL volumetric flask and bring to volume with DI.

Alternately, in a 1L volumetric flask, dissolve 1.444g potassium nitrate (KNO_3) in about 600mL DI. Add 2mL chloroform. Dilute to the mark with DI and invert to mix. Refrigerate at 4±2°C. This solution is stable for six months.

8.2 Stock Nitrite Standard, 1000mg N/L as NO_2 : Purchased commercially prepared with certificate of analysis. Expires upon manufacturer's expiration date. There must be different manufacturers for calibration stock and ICV/LCS stock.

8.2.1 Stock Nitrite Standard, 200.0mg N/L as NO_2 : Pipet 50mL of 1000ppm standard (Section 8.2) into 250mL volumetric flask and bring to volume with DI.

Alternately, in a 1L volumetric flask, dissolve 0.986g sodium nitrite ($NaNO_2$) or 1.214g potassium nitrite (KNO_2) in approximately 800mL DI. Add 2mL chloroform. Dilute to the mark with DI and invert to mix. Refrigerate at 4±2°C. This solution is stable for six months.

8.3 Intermediate Nitrate Working Standard, 20 mg N/L as Nitrate: To a 250mL volumetric flask, add 25.0mL of the 200mg N/L NO_3 stock standard. Dilute to the mark with DI and invert to mix. These solutions are stable for two weeks. Refrigerate at 4±2°C.

8.4 Intermediate Nitrite Working Standard, 20 mg N/L as Nitrite: To a 250mL volumetric flask, add 25.0mL of the 200mg N/L NO_2 stock standard. Dilute to the mark with DI and invert to mix. These solutions are stable for two weeks. Refrigerate at 4±2°C.

8.5 Set of Six Calibration NO_3 Standards, 8.0, 4.0, 1.00, 0.40, 0.20 and 0.1mg N/L as Nitrate: These standards are stable for 2 weeks. Refrigerate at 4±2°C.

To four 200mL volumetric flasks, add respectively: 8.0, 4.0, 1.0 and 0.4mL of the 200mg N/L NO_3 stock standard. Bring to volume with DI water.

To two 200mL volumetric flasks, add respectively: 2.0 and 1.0mL of the 20mg N/L NO_3 intermediate standard. Bring to volume with DI water.

Alternatively, an autodiluter can be used to make the standards during calibration, in which case only 8.0ppm and 1.0 ppm need to be manually prepared. If an autodiluter is used then it must be checked in an analytical tray by autodiluting 8.0mg N/L as Nitrite. The recovery for NO2 must be within 10% of the true value.

8.6 Set of Six Calibration NO_2 Standards, 8.0, 4.0, 1.00, 0.40, 0.10 and 0.05mg N/L as Nitrite: These standards are stable for 2 weeks. Refrigerate at 4±2°C.

To three 200mL volumetric flasks, add respectively: 8.0, 4.0 and 1.0 of the 200mg N/L NO_2 stock standard. Bring to volume with DI water.

To three 200mL volumetric flasks, add respectively:4.0, 1.0mL and 0.5mL of the 20mg N/L NO_2 intermediate standard. Bring to volume with DI water.

Alternatively, an autodiluter can be used to make the standards during calibration, in which case only 8.0ppm and 1.0 ppm need to be manually prepared.

8.7 Ammonium Chloride Buffer, pH 8.5: In a 2L volumetric flask, dissolve 170g ammonium chloride (NH_4Cl) and 2.0g disodium ethylenediamine tetraacetic acid dihydrate ($Na_2EDTA•2H_2O$) in about 800mL water. Dilute to the mark with DI water and invert to mix. Adjust the pH to 8.5 with concentrated ammonium hydroxide. This solution is prepared monthly and stored at room temperature.

8.8 Sulfanilamide Color Reagent: To a 2L volumetric flask add about 1200mL water. Then add 200mL of 85% phosphoric acid (H_3PO_4), 80.0g sulfanilamide, and 2.0g N (1-naphthyl)ethylenediamine dihydrochloride (NED). Shake to wet, and stir to dissolve for 30 minutes. Dilute to the mark with DI water and invert to mix. Store in a dark bottle. This solution is stable for one month. Store at room temperature.

8.9 200ppm Nitrate Stock Standard, (for ICV/LCS): Pipet 50mL of 1000ppm standard (Section 8.1) into 250mL volumetric flask and bring to volume with DI. Store refrigerated at 4±2°C. Expires six months from preparation or upon manufacturer's expiration date.

8.10 200ppm Nitrite Stock Standard: Pipet 50mL of 1000ppm standard (Section 8.2) into 250mL volumetric flask and bring to volume with DI. Store refrigerated at 4±2°C. Expires six months from preparation or upon manufacturer's expiration date.

8.11 Initial Calibration Verification Standard (ICV)/Laboratory Control Sample (LCS): Store refrigerated at 4±2°C. Expiration is 2 weeks from date of preparation.

8.11.1 Nitrate LCS, 5.0ppm: Pipet 5.0mL of 200ppm stock (Section 8.9) into a 200mL volumetric flask and bring to volume with DI.

8.11.2 Nitrate ICV, 0.5ppm: Pipet 10.0mL of 5.0ppm standard (Section 8.11.1) into a 100mL volumetric flask and bring to volume with DI.

8.11.3 Nitrite LCS, 5.0ppm: Pipet 5.0mL of 200ppm stock (Section 8.9) into a 200mL volumetric flask and bring to volume with DI.

8.11.4 Nitrite ICV, 0.5ppm: Pipet 10.0mL of 5.0ppm standard (Section 8.11.3) into a 100mL volumetric flask and bring to volume with DI.

8.12 DPD Free Chlorine Reagent Powder Pillows: HACH brand, for 25mL sample. Store at room temperature. Expires upon manufacturer's expiration date.

8.13 1N Hydrochloric acid (HCL): To a 1L volumetric flask add about 600mL DI. Then add 83mL of concentrated hydrochloric acid (HCL) Stir to dissolve. Dilute to the mark with DI water and invert to mix. This solution is stable for six month. Store at room temperature.

8.14 1N Sodium Hydroxide (NaOH): To a 1L volumetric flask add about 600mL DI. Then add 40 g of sodium Hydroxide. Stir to dissolve. Dilute to the mark with DI water and invert to mix. This solution is stable for six month. Store at room temperature

9. Procedure

9.1 SET-UP

9.1.1 Preparation

9.1.1.1 Place the Nitrate+Nitrite board (containing the cadmium column) in Channel 1. Place the Nitrite board in Channel 2. Make sure the valve to the cadmium column is closed prior to starting to pump the reagents.

9.1.1.2 Commence pumping of reagents.

9.1.1.3 Once the lines are full of reagent and free of gas bubbles, open the valve to allow reagent to flow through the cadmium column.

NOTE: Be sure to switch the valve back before rinsing the manifold with DI water at the completion of the run.

NOTE: DO NOT LET AIR ENTER THE CADMIUM COLUMN.

9.1.2 Column Efficiency Procedure

9.1.2.1 Visually inspect the column. Check for air bubbles in the column or lines, gaps in the column or any change in the cadmium surface characteristics, (cadmium granules should be dark gray). If air bubbles are present in column, connect the column into the manifold, turn the pump on maximum and tap firmly with a screwdriver handle, being careful not to break the column, working up the column until all air is removed. If air cannot be removed, the column should be repacked. Cadmium columns should be stored filled with buffer. If air enters the column, efficiency will decrease. Check the flow efficiency by disconnecting the cadmium column from the manifold and reconnecting to a green pump tube. Pump buffer through the packed column and collect in a graduated cylinder. The flow rate with the column connected should be greater than 4.0 mL/minute.

9.1.2.2 **Column Efficiency – Slope Ratio Method:** Calibrate with the mid-range NO_3–N standards. Calibrate with a matching concentration range of NO_2–N standards. The column efficiency is determined by the equation:

$$E = \frac{S_{NO3\text{-}N}}{S_{NO2\text{-}N}} \times 100$$

where:

$S_{NO3\text{-}N}$ = slope of NO_3 calibration
$S_{NO2\text{-}N}$ = slope of NO_2 calibration
E = % efficiency

9.1.2.3 Column Efficiency – Concentration Ratio Method: Calibrate with the mid-range NO_2-N and NO_3-N standards. Run a known concentration NO_2-N standard. Run a matching concentration NO_3-N standard. The column efficiency is determined by the following equation:

$$E = \frac{C_{NO3\text{-}N}}{C_{NO2\text{-}N}} \times 100$$

where:

$C_{NO3\text{-}N}$ = concentration of NO_3 standard
$C_{NO2\text{-}N}$ = concentration of NO_2 standard
E = % efficiency

9.1.2.4 Column Efficiency Result: If the efficiency is <75%, the column is repacked. All results are recorded and maintained on file in the QC department.

9.1.3 Residual Chlorine Screening

Check all wastewater and drinking water samples for residual chlorine prior to analysis.

9.1.3.1 Add 1 DPD Free Chlorine powder pillow (Section 8.12) to 25mL of sample in a centrifuge tube. An immediate color change to pink indicates residual chlorine is present. If residual chlorine is present, add a small amount of ascorbic acid to a sample aliquot (record this in logbook) and check for residual chlorine presence again. If residual chlorine remains, notify the Department Manager and/or the Laboratory Director. Results will be reported as Not Applicable (N/A).

If residual chlorine is not present, continue with sample analysis.

9.2 Initial Calibration

Calibrate the Lachat ion analyzer according to manufacturer's instructions.

9.2.1 Calibration

Two boards are used to calibrate the Lachat instrument. Each curve has seven calibration points. The correlation coefficient of each curve must be $\geq$0.995, otherwise recalibration is necessary. Prepare standard curves by plotting the peak areas of standards processed through the manifold against NO_3+NO_2 as N and NO_2 as N concentrations in standards.

9.2.1.1 Channel 1 is used to generate a calibration curve for Nitrate/Nitrite ranging from 0 to 8.0ppm.

9.2.1.2 Channel 2 is used to generate a calibration curve for Nitrite ranging from 0 to 8.0ppm.

Note: Instrument is calibrated daily, fixed calibration range is used; linearity is verified daily; three standards are used for linear calibration verification (low ICV (0.5 mg/l), High ICV (5.0 mg/l) and CCV (1.0 mg/l)). All standards must be within 10% of true value

9.2.2 Initial Calibration Verification (ICV)

9.2.2.1 Prior to sample analysis, the following ICVs must be analyzed to verify both calibration curves.

9.2.2.1.1 Nitrate ICV, 0.5ppm (Section 8.12.2)

9.2.2.1.2 Nitrate ICV, 5.0ppm (Section 8.12.1)
9.2.2.1.3 Nitrite ICV, 0.5ppm (Section 8.12.4)

9.2.2.1.4 Nitrite ICV, 5.0ppm (Section 8.12.3)

9.2.2.2 The results must be within ±10% of the true value, otherwise re-calibration is required.

9.3 Continuing Calibration Verification

9.3.1 Continuing Calibration Verification, (CCV) and Continuing Calibration Blank, (CCB)

9.3.1.1 At the beginning of the first tray, after every ten samples and at the end of every analytical sequence, a CCV and a CCB pair must be analyzed to verify both calibration curves.

9.3.1.1.1 1.0ppm Nitrate CCV (Section 8.5)

9.3.1.1.2 1.0ppm Nitrite ICV (Section 8.6)

9.3.1.1.3 Calibration Blank (DI)

9.3.1.2 The results of the CCVs must be within ±10% of the true value, otherwise re-calibration is required.

9.3.1.3 The results of the CCBs must be less than our standard limit of detection, otherwise the analysis is stopped and the problem corrected.

9.4 Equipment Operation and Sample Analysis

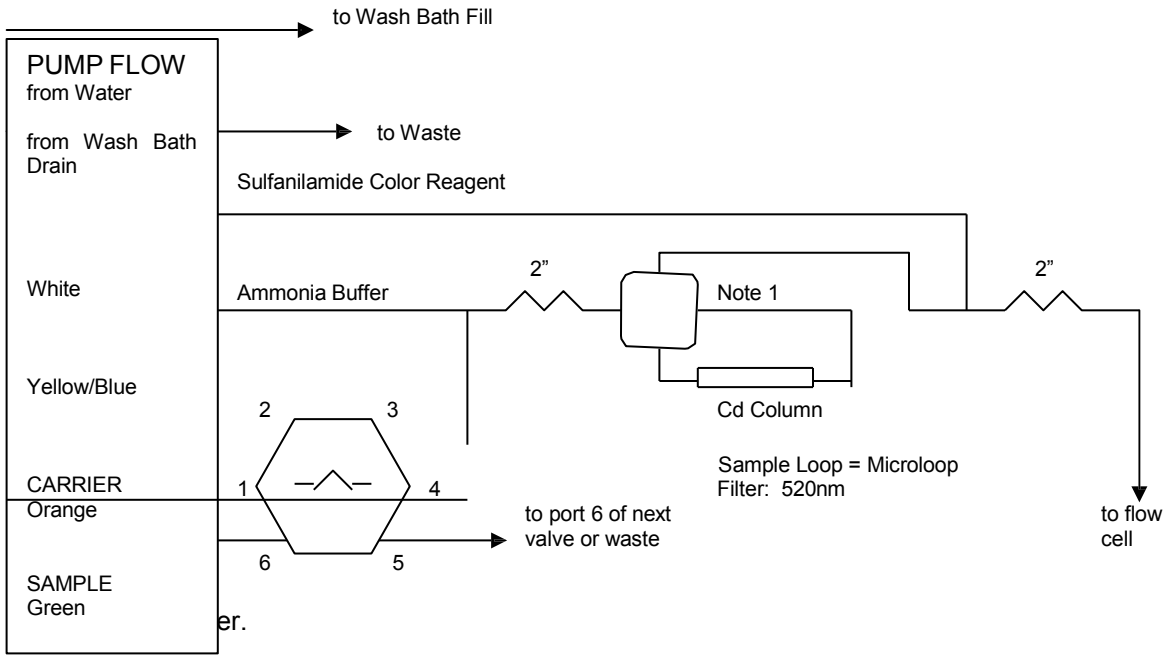
Follow the manufacturer's directions for the operation of the Lachat 8000.

All samples have to be inspected prior to analysis. Samples that are turbid or have sediment have to be filtered prior to analysis.
Check pH of the samples. If pH is less then 5 or greater then 9, then adjust pH using 1N Hydrochloric Acid (HCl) (8.13) or 1N Sodium Hydroxide (NaOH) (8.14). Record pH adjustment in the log book.

For soils: extract soils samples prior to analysis: take 5g of sample, add 50 ml of DI, extract for 30 min, then filter thorough 0.45 nm filter. Record all weights for calculations.

Note: if samples are filtered, then Method blank also have to be filtered

The Manifold Diagram follows:

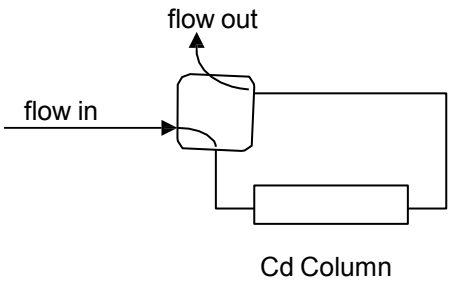


2" is 135cm of tubing on a 2-inch coil support.
APPARATUS: Standard valve, flow cell, and detector head modules are used.

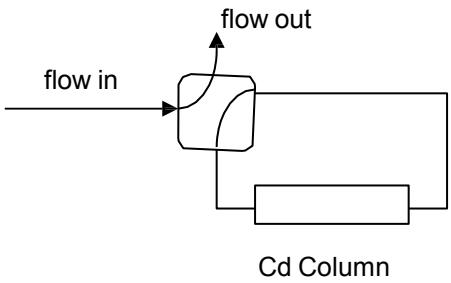
All manifold tubing is 0.8mm (0.032") i.d. This is 5.2µL/cm.

NOTE 1: This is a two-state switching valve used to place the cadmium column in line with the manifold.

State 1: Nitrate + Nitrite



State 2: Nitrite Only



9.5 Preventative Maintenance

Tubing is changed monthly or as needed.

At the end of each analytical sequence, the valve to the column is closed. DI is rinsed through the Lachat for five minutes followed by five minutes of air.

All maintenance is documented in the Instrument Maintenance Logbook.

9.6 Calculations

9.6.1 **Nitrate/Nitrite:** When the software is set up according to the manufacturer's recommendations, the concentration of nitrate plus nitrite in mg NO_3/NO_2-N/L is reported directly when the Cd column is included in the sample train in Channel 1.

9.6.2 **Nitrite:** When the software is set up according to the manufacturer's recommendations, the concentration nitrite in mg NO_2-N/L is reported directly when the Cd is not included in the sample train in Channel 2.

9.6.3 **Nitrate:** The concentration of nitrate is determined by the subtraction of the nitrite concentration, (Section 9.6.2 above), from the nitrate-nitrite concentration, (Section 9.6.1 above).

9.6.3.1 If the sample was preserved initially as described in Section 6.3, subtract the Nitrite value generated manually from the Nitrate/Nitrite value generated by the Lachat Instrument. This value is reported as the Nitrate result.

When the sample is preserved initially as described in Section 6.3, the value generated by the Lachat instrument for Nitrite is invalid and therefore disregarded.

9.6.4 If any sample exceeds a concentration of 8.0 mg/L, the sample must be diluted and re-analyzed. All sample concentrations must fall within the calibration curve.

10. Quality Control and Data Assessment

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method. When results of sample spikes indicate atypical method performance, a calibration verification standard is used to confirm the measurements were performed in an in-control mode of operation.

10.1 Demonstration of Capability

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method. Each time a method modification is made, the analyst is required to repeat the procedure.

When one or more of the parameters tested fail at least one of the acceptance criteria, the analyst must locate and correct the source of the problem and repeat the test for failed parameters of the method.

Repeated failure confirms a general problem with the measurement system or analytical technique of the analyst. If the failure repeats, locate and correct the source of the problem and repeat the test for all parameters listed in the method.

10.2 Method Blank

One Method Blank is analyzed per batch of 20 samples or less The Method Blank consists of DI.

For soils: 5g of Ottawa sand extracted with 50 ml of DI. Results must be < 0.1mg/L. If this criterion is not met, the blank is re-analyzed. If there is still failure, the problem must be found and corrected prior to any sample analysis.

10.3 Calibration Verification and Laboratory Control Samples (LCS)

Two ICVs are analyzed at the beginning of the analytical sequence. One is at a concentration of 0.5ppm, and the other is at a concentration of 5.0ppm.

Both must be recovered within ± 10% of the true value. If these criteria are not met, the ICVs must be re-analyzed. If failure continues, the ICVs are to be re-made and/or a new calibration curve is to be generated.

The 5ppm ICV is reported as the LCS for the batch.

For soil LCS: 5g of Ottawa sand extracted with 0.25 ml of 1000 mg/l nitrate (8.1) (or 1000 mg/l Nitrite standard (8.2)) and 50 ml DI. The nitrate standard is used for spikes for Nitrate-N as well as Nitrate/Nitrite-N. LCS recoveries must be recovered within ± 10% of the true value. If these criteria are not met, LCS's must be re-analyzed. If failure continues, the batch has to be re-extracted and re-analyzed.

10.4 Matrix Spike

One Matrix Spike is analyzed per batch of 20 samples or less. Separate spikes are performed for Nitrate and Nitrite. In a 25mL volumetric flask, 0.5mL of 200ppm stock calibration standard (Section 8.1 or 8.2) is added to the sample. The final concentration of the matrix spike is 4.0ppm. The nitrate standard is used for spikes for Nitrate-N as well as Nitrate/Nitrite-N. The nitrite standard is used for spikes for Nitrite-N.

For soils: weigh 5.0 g of sample, add 2.0 ml of 200 mg/l Nitrate or Nitrite standard and 48 ml of DI. The final concentration of the matrix spike is 80.0 mg/kg. The nitrate standard is used for spikes for Nitrate-N as well as Nitrate/Nitrite-N. The nitrite standard is used for spikes for Nitrite-N.

% Recovery for the Matrix Spike must be within in-house control limits. If acceptance criteria are not met, the Matrix Spike is reanalyzed. If failure continues, a narrative is included with the data for inclusion on the Client report.

Note: For samples, analyzed by method **353.2** (NO2-353 and NO3-353) maximum batch size is 10 samples; every 10 samples required separate matrix spike (MS) to be analyzed.
% Recovery for the Matrix Spike must be within +/- 10% of true value. If acceptance criteria are not met, the Matrix Spike is reanalyzed. If failure continues, a narrative is included with the data for inclusion on the Client report.

10.5 Duplicates

One Duplicate sample is analyzed per batch of 20 samples or less. A separate aliquot of the sample is analyzed for this purpose.

% RPD for the Duplicate must be within in-house control limits. If acceptance criteria are not met, the Duplicate is reanalyzed. If failure continues, a narrative is included with the data for inclusion on the Client report.

10.6 Control Limits

The laboratory maintains performance records to document the quality of data that is generated. Method accuracy for samples is assessed and records maintained.

Control limits for the method parameters are generated by the QC staff. The control limits are calculated based on in-house performance data. The limits are compared to the control limits found in the reference method.

10.7 Analytical Sequence

- Calibration
- ICV/LCS – both levels
- Sample analysis
- CCV – every ten samples and at the end of the analytical sequence

11. Method Performance

11.1 Method Detection Limit Study (MDL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

The laboratory follows the procedure to determine the MDL, LOD, and/or LOQ as outlined in Alpha SOP/1732. These studies performed by the laboratory are maintained on file for review.

11.2 Demonstration of Capability Studies

Refer to Alpha SOP/1734 and 1739 for further information regarding IDC/DOC Generation.

11.2.1 Initial (IDC)

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method, prior to the processing of any samples.

11.2.2 Continuing (DOC)

The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

12. Corrective Actions

Holding time exceedence and improper preservation are noted on the nonconformance report form.

Perform routine preventative maintenance following manufacturer's specification. Record all maintenance in the instrument logbook.

Review of standards, blanks and standard response for acceptable performance occurs for each batch of samples. Record any trends or unusual performance on a nonconformance action form.

If the CV or LCS recovery of any parameter falls outside the designated acceptance range, the laboratory performance for that parameter is judged to be out of control, and the problem must be immediately identified and corrected. The analytical result for that parameter in the unspiked samples is suspect and is only reported for regulatory compliance purposes with the appropriate nonconformance action form. Immediate corrective action includes reanalyzing all affected samples by using any retained sample before the expiration of the holding time.

13. Pollution Prevention

See Chemical Hygiene Plan for pollution prevention operations.

14. Waste Management

See Chemical Hygiene Plan for waste management and disposal.

Orthophosphate

Colorimetric,Combined Reagent

References: **SM 4500P-E,** Standard Methods for the Examination of Water and Wastewater, 21st Edition (1999).

1. Scope and Application

Matrices: Water and wastewater samples.

Definitions: See Alpha Laboratories Quality Manual Appendix A

Phosphorus occurs in natural waters and in wastewaters almost solely as phosphates. These are classified as orthophosphates, condensed phosphates (pyro-, meta-, and other polyphosphates), and organically bound phosphates. They occur in solution, in particles or detritus, or in the bodies of aquatic organisms.

These forms of phosphate arise from a variety of sources. Small amounts of certain condensed phosphates are added to some water supplies during treatment. Larger quantities of the same compounds may be added when the water is used for laundering or other cleaning, because these materials are major constituents of many commercial cleaning preparations. Phosphates are used extensively in the treatment of boiler waters. Orthophosphates applied to agricultural or residential cultivated land as fertilizers are carried into surface waters with storm run-off and to a lesser extent with melting snow. Organic phosphates are formed primarily by biological processes. They are contributed to sewage by body wastes and food residues, and also may be formed from orthophosphates in biological treatment processes or by receiving water biota.

Phosphorus is essential to the growth of organisms and can be the nutrient that limits the primary productivity of a body of water. In instances where phosphate is a growth-limiting nutrient, the discharge of raw or treated wastewater, agricultural drainage, or certain industrial wastes to that water may stimulate the growth of photosynthetic aquatic micro- and macro-organisms in nuisance quantities.

Phosphates also occur in bottom sediments and in biological sludges, both as precipitated inorganic forms and incorporated into organic compounds.

Phosphorus analyses embody two general procedural steps: (a) conversion of the phosphorus form of interest to dissolved orthophosphate, and (b) colorimetric determination of dissolved orthophosphate. The separation of phosphorus into its various forms is defined analytically but the analytical differentiations have been selected so that they may be used for interpretive purposes.

Filtration through a 0.45-µm-pore-diameter membrane filter separates dissolved from suspended forms of phosphorus. No claim is made that filtration through 0.45-µm filters is a true separation of suspended and dissolved forms of phosphorus; it is merely a convenient and replicable analytical technique designed to make a gross separation.

Phosphates that respond to colorimetric tests without preliminary hydrolysis or oxidative digestion of the sample are termed “reactive phosphorus.” While reactive phosphorus is largely a measure of orthophosphate, a small fraction of any condensed phosphate present usually is hydrolyzed unavoidably in the procedure. Reactive phosphorus occurs in both dissolved and suspended forms.

The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one of the following laboratory personnel

before performing the modification: Area Supervisor, Laboratory Director, or Quality Assurance Officer.

This method is restricted to use by or under the supervision of trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

2. Summary of Method

The ascorbic acid method is used for the determination of orthophosphate in environmental samples. Ammonium molybdate and potassium antimonyl tartrates react in acid medium with orthophosphate to form a heteropoly acid-phosphomolybdic acid that is reduced to intensely colored molybdenum blue by ascorbic acid. Samples are analyzed at 880nm using a spectrophotometer.

2.1 Method Modifications from Reference

None.

3. Detection Limits

The Reporting Limit is 0.005mg/L.

4. Interferences

Correction for Turbidity or Interfering Color: The natural color of water generally does not interfere at the high wavelength used. For highly colored or turbid waters, prepare a blank by adding all reagents except ascorbic acid and potassium antimonyl tartrate to the sample. Subtract the blank absorbance from the absorbance of each sample.

In some cases, the background color or turbidity can be eliminated by a dilution, but this will raise the reporting limit.

5. Safety

The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material data handling sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

6. Sample Collection, Preservation, and Handling

6.1 Sample Collection

Samples are collected in 250mL plastic containers.

6.2 Sample Preservation

Samples are not preserved. Do not add either acid or $CHCl_3$ as a preservative.

6.3 Sample Handling

Samples are stored under refrigeration at 4 ±2 °C. Analysis must be performed within 48 hours of collection.

7. Equipment and Supplies

7.1 Spectrophotometer, with infrared phototube for use at 880nm, providing a light path of 2.5cm.

7.2 Acid-washed Glassware: Use acid-washed glassware for determining low concentration of phosphorus. Phosphate contamination is common because of its absorption on glass surfaces. Avoid using commercial detergents containing phosphate. Clean all glassware with 1:1 HCl and rinse well with distilled water. The glassware should only be used for phosphate determination.

7.3 Centrifuge Tubes: 50mL volume. (Must be new and disposable.)

7.4 0.45µm Acrodisc filters with disposable syringes

7.5 Pipets or Pipettor: Various sizes, new and disposable or acid-rinsed glass

8. Standards and Reagents

8.1 Stock Phosphate Standard: 1000 mgP/L This stock solution is certified and purchased commercially prepared. Store at room temperature. Expires upon manufacturer's specified date.

8.2 Intermediate Phosphate Standard: 50 mgP/L Dilute 50.0mL stock phosphate solution to 1000mL with DI water, 1.00mL = 2.50µg P. Store refrigerated at 4 ±2 °C. Expires 6 months from date of preparation.

8.3 Working Standard: 1.0 mgP/L Add 2mL of 50 mgP/L intermediate standard (Section 8.2) to 100mL volumetric flask and dilute to volume with DI water. Prepare fresh on each day of use.

8.4 Calibration Standards: Follow table below for preparation instructions. Prepare fresh on each day of use. Use a calibrated pipettor and bring up to 25mL with DI.

Volume of 1.0 mg/L Working Standard (Section 8.3)	Final Volume (mL)	Calibration Standard Final Concentration (mgP/L)
0	25	0.0
0.125 mL	25	0.005
0.250 mL	25	0.01
1.250 mL	25	0.05
2.50 mL	25	0.10
12.5 mL	25	0.50
25 mL	25	1.00

8.5 ICV-LCS-CCV Stock Standard: 1000 mgP/L Second source standard than that used in Section 8.1.

8.6 ICV-LCS-CCV Intermediate Standard: 25 mgP/L Add 5mL of 1000 mgP/L stock standard (Section 8.5) to 200mL volumetric flask and dilute to volume with DI water. Store refrigerated at 4 ±2 °C. Expires 6 months from date of preparation.

8.7 ICV-LCS-CCV Working Standards: Prepare fresh on each day of use.

8.7.1 0.5 mgP/L: Add 0.25mL of 50 mg/L intermediate standard (Section 8.6) to 25mL volumetric flask and dilute to volume with DI water.

8.8 Matrix Spike Solution: Intermediate Phosphate Standard (Section 8.2) is utilized for matrix spike solution. 0.25mL of the 50 mgP/L standard added to 25mL of sample will afford a 0.5mgP/l matrix spike concentration.

8.9 Sulfuric Acid, H2SO4, 5N: Dilute 70mL concentrated sulfuric acid to 500mL with DI. Store at room temperature. Expires 6 months from date of preparation. Alternatively, 1L of 5N H2SO4 can be made: dilute140 ml of concentrated sulfuric acid to 1000mL with DI. Expires 6 months from date of preparation.

8.10 Potassium Antimonyl Tartrate Solution: Dissolve 1.3715g K(SbO) $C_4H_4O_6 \cdot ½H_2O$ in 400mL DI water in a 500mL volumetric flask and dilute to volume. Store in a glass-stoppered bottle at room temperature. Expires one month from date of preparation.

8.11 Ammonium Molybdate Solution: Dissolve 20g $(NH_4)_6Mo_7O_{24} \cdot 4H_2O$ in 500mL DI water. Store in a glass-stoppered bottle at room temperature. Expires one month from date of preparation.

8.12 Ascorbic Acid, 0.1M: Dissolve 3.52g ascorbic acid in 200mL DI water. The solution is stable for about 1 week at 4 ±2ºC. Alternatively, 100 ml of Ascorbic Acid can be made: Dissolve 1.76g ascorbic acid in 100mL DI water. The solution is stable for 1 week at 4 ±2ºC.

8.13 Combined Reagent: Mix the above reagents in the following proportions for 100mL of the combined reagent: 50mL 5N H_2SO_4 (Section 8.9), 5mL potassium antimonyl tartrate solution (Section 8.10), 15mL ammonium molybdate solution (Section 8.11), and 30mL ascorbic acid solution (section 8.12). Mix after addition of each reagent. Let all reagents reach room temperature before they are mixed and mix in the order given. If turbidity forms in the combined reagent, shake and let stand for a few minutes until turbidity disappears before proceeding. The reagent is stable for 4 hours. Discard reagent if it turns blue or black in color.

9. Procedure

9.1 SET-UP

9.1.1 **Preparation of calibration curve:** Prepare individual calibration curve from a series of six standards and DI (0.005 mgP/L to 1.0 mgP/L) on a daily basis when samples are to be analyzed. Use a DI water blank to zero the instrument before taking photometric readings for the calibration curve. Plot a curve of absorbance vs. phosphate concentration. The curve is acceptable if the calibration coefficient is $\geq$ 0.995. The calibration curve is prepared fresh each day of analysis.

9.2 Equipment Operation and Sample Analysis

9.2.1 Filter samples and QC samples through 0.45µm Acrodisc filters. 1 µm Acrodisc filter may be used to prefilter hard-to-filter samples.

9.2.2 Pour 25mL of each clear filtered sample, a duplicate and matrix spike sample into a corresponding new (never used) centrifuge tube.

9.2.3 Add 4.0mL combined reagent to all 25mL samples and QC sample aliquots and mix thoroughly.

9.2.4 After at least 10 minutes but no more than 30 minutes, measure absorbance of each sample at 880nm with a 2.5cm cell. Follow the procedure described in the Wet Chemistry Electronic Notebook Work Instructions (WI/11-01).

9.2.5 Compare with a standard curve prepared from a range of standards and carried through this procedure. Sample concentration must fall within the range of the calibration curve.

9.2.6 If the sample concentration is greater than the highest calibration standard concentration, dilute the original sample with DI water and recolor and reanalyze as outlined above (Section 9.2.1 – 9.2.5).

9.3 Preventative Maintenance

The Spectrophotometers are calibrated on a semi-annual basis by an instrument service company. Certificates are kept on file.

9.4 Calculations

mg P/L = mg P (from calibration curve) x dilution

10. Quality Control and Data Assessment

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method. When results of sample spikes indicate atypical method performance, a calibration verification standard is used to confirm the measurements were performed in an in-control mode of operation.

10.1 Demonstration of Capability

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method. Each time a method modification is made, the analyst is required to repeat the procedure.

When the parameter tested fails at least one of the acceptance criteria, the analyst must locate and correct the source of the problem and repeat the test.

Repeated failure confirms a general problem with the measurement system or analytical technique of the analyst. If the failure repeats, locate and correct the source of the problem and repeat the test.

10.2 Blanks

10.2.1 ICB or Method Blank - One method blank, which consists of 25mL DI water filtered through a 0.45 micron Acrodisc filter, must be analyzed per batch of 20 samples or less. The method blank result must be less than the Reporting Limit.

10.2.2 Continuing Calibration Blank – The ICB should be re-read after every 10 samples (thus becoming the CCB) and at the end of the batch The CCB result must be less than the Reporting Limit. If the CCB is greater than the RL, all samples analyzed since the last passing CCB must be recolored and reanalyzed.

10.3 Calibration Verification and Laboratory Control Samples (ICV-LCS-CCV)

Analyze one per batch of 20 samples or less. The calibration curve must be verified by a second source standard prior to performing any sample analysis. The ICV/LCS or CCV must be recovered at 90 – 110% of the true value.

If the ICV/LCS or CCV fails, re-analyze. If failure remains, stop analysis, correct problem and perform re-calibration.
The ICV must be re-read every 10 samples (thus becoming the CCV) and at the end of the batch.

10.4 Matrix Spike

Analyze one per batch of 20 samples or less. Concentration is 0.5 mg P /L. The matrix spike must be recovered at 80 – 120% of the true value. If the MS recovery is outside of acceptance limits, the sample and its spike are reanalyzed. If the MS failure continues, a narrative is submitted with the data for inclusion on the Client report.

10.5 Duplicates

Analyze one sample in duplicate, per batch of 20 samples or less. The RPD must be $\leq$ 20%. If the RPD is outside of acceptance limits, the sample and its duplicate are reanalyzed. If the RPD failure continues, a narrative is submitted with the data for inclusion on the Client report.

10.6 Control Limits

The laboratory maintains performance records to document the quality of data that is generated. Method accuracy for samples is assessed and records maintained.

Control limits are generated. The control limits are calculated based on in-house performance data. The limits are compared to the control limits found in the reference method.

10.7 Analytical Sequence

- Calibration curve generation or verification of existing curve.
- Acid-rinsing of glassware
- Sample filtration including blank.
- Add sample aliquot to a new centrifuge tube.
- Add combined reagent to samples
- Read sample absorbance after 10-30 minutes.
- Analyze CCV and CCB after every 10 samples to verify curve.
- End sequence with CCV and CCB.
- Calculate results.

11. Method Performance

11.1 Method Detection Limit Study (MDL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

The laboratory follows the procedure to determine the MDL, LOD, and/or LOQ as outlined in Alpha SOP/1732. These studies performed by the laboratory are maintained on file for review.

11.2 Demonstration of Capability Studies

Refer to Alpha SOP/1734,1739 for further information regarding IDC/DOC Generation.

11.2.1 Initial (IDC)

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method, prior to the processing of any samples.

11.2.2 Continuing (DOC)

The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

12. Corrective Actions

Holding time exceedences or improper preservation are noted on the nonconformance report form.

Perform routine preventative maintenance following manufacturer's specification. Record all maintenance in the instrument logbook.

Review of standards, blanks and standard response for acceptable performance occurs for each batch of samples. Record any trends or unusual performance on a nonconformance action form.

If the CV or LCS recovery of any parameter falls outside the designated acceptance range, the laboratory performance for that parameter is judged to be out of control, and the problem must be immediately identified and corrected. The analytical result for that parameter in the unspiked samples is suspect and is only reported for regulatory compliance purposes with the appropriate nonconformance action form. Immediate corrective action includes reanalyzing all affected samples by using any retained sample before the expiration of the holding time.

13. Pollution Prevention

See Chemical Hygiene Plan for pollution prevention operations.

14. Waste Management

See Chemical Hygiene Plan for waste handling and disposal.

Stable Isotope Facility
Department of Plant Sciences
University of California, Davis

Standard Operating Procedure UCD-SIF-BACT01.1

Overview of the Bacteria Denitrification Assay for Nitrate in Water

Author: _____
Name Date

Approved: _____
Joy Matthews, Director Date

The following laboratory staff members have read this SOP # UCD-SIF-BACT01.1. A current signature indicates completion of training.

Signature	Date	Signature	Date

TABLE OF CONTENTS

A. SCOPE AND APPLICABILITY

This SOP provides an overview of the entire bacteria denitrification assay, from sample preparation to data analysis.

B. SUMMARY OF METHOD

Stable isotope ratios of nitrogen and oxygen are measured by continuous flow isotope ratio mass spectrometry (Delta V Plus mass spectrometer, ThermoFinnigan, Bremen, Germany) interfaced to a trace gas concentration system. Gas samples are purged from vials through a double-needle sampler into a helium carrier stream (20 mL/min). N_2O is quantitatively trapped and concentrated in 2 liquid nitrogen cryo-traps operated in series such that the N_2O is held in the first trap until the non-condensing portion of the sample gas has been replaced by helium carrier, then passed to the second, smaller trap. Finally the second trap is warmed to ambient temperature, and the N_2O is carried by helium to the IRMS via a Poroplot Q GC column (25 m x 0.53 mm, 25 °C, 1.8 mL/min). This column separates N_2O from residual CO_2. A reference N_2O peak is used to calculate provisional isotope ratios of the sample N_2O peak.

Final delta ^{15}N values are calculated by adjusting the provisional values such that correct delta ^{15}N and ^{18}O values for working standards are obtained. The calibration of the N_2O is problematic since there are no suitable international standards. Thus, we calibrated ^{15}N and ^{18}O by reacting the N_2O with glassy carbon at 1400 °C to convert N_2O to N_2 + CO. The resulting N_2 was calibrated against the Oztech N_2 standard, and the CO was calibrated against an Oztech CO_2 standard (after converting CO_2 to CO in a similar manner).

C. DEFINITIONS

CO	carbon monoxide
CO_2	carbon dioxide
GC	gas chromatograph
IRMS	isotope-ratio mass spectrometer
LN_2	liquid nitrogen
m	meter
min	minute
mL	milliliter
mm	millimeter
Multi	Nickname for the multicollector, which is a ThermoFinnigan GasBench + PreCon trace gas concentration system interfaced to a ThermoScientific Delta V Plus isotope-ratio mass spectrometer (Bremen, Germany)
N_2	nitrogen gas
NaOH	sodium hydroxide
NIST	National Institute of Standards and Technology
NO_3	nitrate
N_2O	nitrous oxide
PA	*Pseudomonas aureofaciens* bacteria

PES	Plant and Environmental Sciences building
PP	polypropylene
QA/QC	quality assurance/quality control
SIF	Stable Isotope Facility
SOP	standard operating procedure
UCD	University of California, Davis
UV	ultraviolet
µm	micrometer
>	greater than
%	percent
°C	degree Celsius

D. HEALTH & SAFETY WARNINGS

1. The sample preparation and preconcentration systems contain toxic and corrosive chemicals. Use proper protective clothing (gloves, eye protection) during sample preparation and disposal, as well as during system maintenance.

E. CAUTIONS

1. Prepared bacteria sample vials may contain concentrated NaOH.
2. Vials may become pressurized. Puncture by a syringe needle may cause rapid venting and/or spraying of bacteria plus NaOH. Dropped vials may explode and disperse glass shards in a large radius.
3. Wear gloves, goggles, face shields, and lab coats when actively handling the vials.
4. Multiple needles are used in this procedure. Wear gloves and only reshield needles using the one handed method. Review Safety Net # 62 at http://safetyservices.ucdavis.edu/snfn/safetynets/snml/sn62/SN62pdf.
5. When transferring items into or out of the acid bath (10 % HCl), face shield, lab coat, and long butyl gloves are *required*.

F. INTERFERENCES

1. Water samples of acidic or basic pH may affect bacteria activity. Water samples should be neutral (within the range of 6-8 pH is acceptable).
2. Poisons and preservatives will affect bacteria activity. Water samples should be filtered with a 0.4 µm pore (or smaller) filter and frozen.
3. Unrefrigerated and unfiltered samples may have biological activity that will affect the NO_3 in the sample.
4. Inaccurate NO_3 concentrations and high enrichment (>5 atom %) may saturate the analyzer and/or require re-preparation and reanalysis of samples.
5. The bacteria denitrifier assay does not distinguish between nitrate-N and nitrite-N. Customers should treat samples to remove nitrite prior to submission to SIF.

G. PERSONNEL QUALIFICATIONS / RESPONSIBILITIES

1. SIF staff members must be properly trained and supervised for each task associated with the bacteria denitrifier. Experience with proper lab procedures and working in aseptic conditions is a requirement. Full knowledge of the entire bacteria denitrifier procedure is not necessary.
2. Additional safety training and certification is required for the portions of the procedure that involve the autoclave and liquid nitrogen.

H. APPARATUS & EQUIPMENT

1. Beckman centrifuge with JA-10 rotor and 500 mL centrifuge bottles
2. Flushing rig with N_2 gas tank
3. "Multi" gas analyzer with 54 hole autosampler rack

I. PROCEDURE

1. BACTERIA PREPARATION

   i. Revive Freeze Dried Cultures (SOP SIF-BACT07.1)
   ii. Prepare Agar Plates (SOP SIF-BACT08.1)
   iii. Plate Bacteria (SOP SIF-BACT09.1)
   iv. Prepare Soy Broth (SOP SIF-BACT05.1)
   v. Inoculate Soy Broth (SOP SIF-BACT06.1)
   vi. Prepare Bacteria Headspace Vials (SOP SIF-BACT10.1)

2. SAMPLE PREPARATION

   i. Clients are instructed to supply filtered, frozen water samples (10 mL minimum, >20 mL preferred), shipped with refrigerant in insulated packaging. Polypropylene (PP) sample containers are preferred.
   ii. Samples are not to contain antibiologicals of any type.
   iii. Sample lists accompanying the water samples shall identify samples as natural abundance or enriched, provide nitrate concentration data and pH, provide sample source information, and include unique sample identifiers.
   iv. Store water samples in the freezer until the samples are ready to be injected into the bacteria sample vials.

3. STANDARDS PREPARATION

   i. Solid standards are stored in the first desiccator in 2251 PES (bottom shelf).
   ii. When preparing standard solutions, use ultrapure water from the Synergy UV Millipore filter in room 2247 PES and new brown Nalgene square bottles.
   iii. Unopened standards may be stored in the freezer in room 2251 PES for up to six months.

iv. Opened standards may be stored in the refrigerator in room 2247 PES for up to one month.

4. ANALYTICAL EQUIPMENT PREPARATION

i. All major components of the "Multi" Trace Gas IRMS system described below must be fully functional and quality tested before client samples are analyzed.

1. ThermoFinnigan GasBench + PreCon trace gas concentration system
    a. Autosampler & PAL arm
        i. Prior to loading the autosampler, the tray must be locked into position.
        ii. The needle should be checked and cleared of debris. Wipe or flush needle with methanol as necessary.
    b. CO_2/water traps
        i. Inspect the condition of the CO_2 and water trap. Replace with fresh magnesium perchlorate and Carbo-Sorb, if necessary.
    c. Carrier gas and GC flow rate
        i. Check and record flow using flow meter. Flow should be between 23-24 mL/min carrier flow.
        ii. If flow dramatically changes, inspect autosampler needle, chemical traps, and helium supply for potential issues. Report any unresolved issues to your immediate supervisor.
    d. Liquid nitrogen (LN_2)
        i. Empty the dewar of any <u>room</u> temperature water condensation if the dewar has been sitting empty of LN_2 for an extended period of time. Condensation can block the traps from entering the dewar. DO NOT dump LN_2 down the sink.
        ii. When adding LN_2 to an empty dewar, wear goggles and add small amounts of LN_2 slowly. CAUTION: splash hazard.
        iii. Verify the LN_2 dewar contains enough liquid to last throughout the batch. One dewar filled to the top should last approximately 16 hours, depending on room temperature and humidity.
        iv. If an autofill unit exists, make sure the autofill unit is on and program the timer for automated shutoff.

2. ThermoScientific Delta V Plus isotope-ratio mass spectrometer (Bremen, Germany)
    a. System Check – working in Multi_Acquisition

i. MS window: Peak shape tuning for 45/44 and 46/44 shall be performed prior to each batch.
ii. Focus Delta: Focus tuning shall be performed immediately after peak centering.
iii. Instrumental conditions will be measured and matched to the Multi Instrument Log.xls.

5. SAMPLE ANALYSIS

Gas samples are purged from vials through a double-needle sampler into a helium carrier stream (25 mL/min). The gas sample passes through a CO_2 scrubber (Carbo-Sorb) and N_2O is trapped and concentrated in 2 liquid nitrogen cryo-traps operated in series such that the N_2O is held in the first trap until the non-condensing portion of the sample gas has been replaced by helium carrier, then passed to the second, smaller trap. Finally the second trap is warmed to ambient and the N_2O is carried by helium to the IRMS via a Poroplot Q GC column (25 m x 0.53 mm, 25 °C, 1.8 mL/min).This column separates N_2O from residual CO_2. A reference N_2O peak is used to calculate provisional isotope ratios of the sample N_2O peak.

6. POST-ANALYSIS PROCEDURE, CLEAN-UP & DISPOSAL

i. Mid-run checks: Verify that all samples have been loaded, and add samples as space becomes available. Top-up LN_2 as necessary.
ii. When the run is complete, the Acquisition window will say “Time Event List Finished” at the bottom of the status bar. Samples may now be removed from the autosampler and placed in the collection buckets for disposal.

7. DATA ANALYSIS, CALCULATIONS & DELIVERY

i. Open and review chromatograms in Isodat Workspace. Check that sample peaks are properly integrated and that standards are correctly identified.
ii. Calculations. Use Excel file: “NO3-Denitrifier” to fully calibrate the data.
iii. This includes:
    1. Blank correction
        a. Apply blank correction if one or more blanks are above detection limit.
    2. Drift correction
        a. Apply a linear drift correction using the 4-6 drift standards.
    3. Linearity (“size”) correction
        a. Apply a linear size correction.
    4. Headspace correction
        a. Apply a linear headspace correction using the headspace and drift standards.
    5. Scale expansion/compression

a. Apply two-point scaling factor from selected scaling standards. If samples contain enriched nitrate, apply three-point scaling factor instead.

6. Shift to known
    a. Perform a final shift to known.

iv. Send both the raw and corrected data files and accompanying data report to your supervisor for approval. Await approval or instruction for changes.
v. Deliver the data report to client.

J. DATA & RECORDS MANAGEMENT

1. Upon completion of sample analysis, data processing, and billing, client paperwork is filed at the SIF in room 2251 PES.
2. The paperwork will be stored for a minimum of 3 years.
3. The electronic data file(s) will be stored in both S:\AffiliateData\SIF\SIFShared\Trace Gas\Bacteria Data and S:\FacultyData\HARRIS\HARRISShared\MSDATA for a minimum of 6 months and archived to the external drive for at least 3 years.

K. QUALITY ASSURANCE & QUALITY CONTROL

1. PHYSICAL QA/QC CHECKS

i. Communication. If uncertain, communicate with the client regarding sample nitrate concentration, $^{15}N/^{18}O$ enrichment, or sample preparation. Ensure that full sample details and sample lists are provided both in electronic and hard copy, and verify correspondence between client paperwork and shipment upon receipt.
ii. Inspection. Inspect sample containers for cracks or leakage. Inspect water samples for particulate matter. Organic matter must be filtered out. Precipitation due to freezing can often be decanted off. Samples must be homogeneous; resuspend salts and dissolve frozen water by gentle agitation if necessary.
iii. Sample vials. Check for bubbles remaining in solution, especially with saline samples. Allow the sample vials to rest for additional days until the bubbles are no longer in solution.

2. ANALYTICAL QA/QC CHECKS

i. Laboratory Reference. The laboratory standards are potassium nitrates and sodium nitrates calibrated against NIST 8568 & 8569. Blank, linearity, size, headspace, scale compression, and check standards are analyzed with each batch. Drift standards are analyzed with every 15 samples.

3. HOW TO REPORT QC DATA

i. Check standard results are recorded in "H-Strem.xlsx" in S:\AffiliateData\SIF\SIFShared\Trace Gas\Bacteria Data.

L. REFERENCES

1. UCD-SIF-BACT07 1 - Revive Freeze Dried Cultures
2. UCD-SIF-BACT08.1 - Prepare Agar Plates
3. UCD-SIF-BACT09 1 - Plate Bacteria
4. UCD-SIF-BACT05 1 - Prepare Soy Broth
5. UCD-SIF-BACT06 1 - Inoculate Soy Broth
6. UCD-SIF-BACT10 1 - Prepare Bacteria Headspace Vials
7. UCD-SIF-BACT11 1 - Sample Storage and Disposal Protocol

8. D. M. Sigman, K. L. Casciotti, M. Andreani, C. Barford, M. Galanter, and J. K. Böhlke. 2001. A Bacterial Method for the Nitrogen Isotopic Analysis of Nitrate in Seawater and Freshwater. Anal. Chem. 73: 4145 -4153.

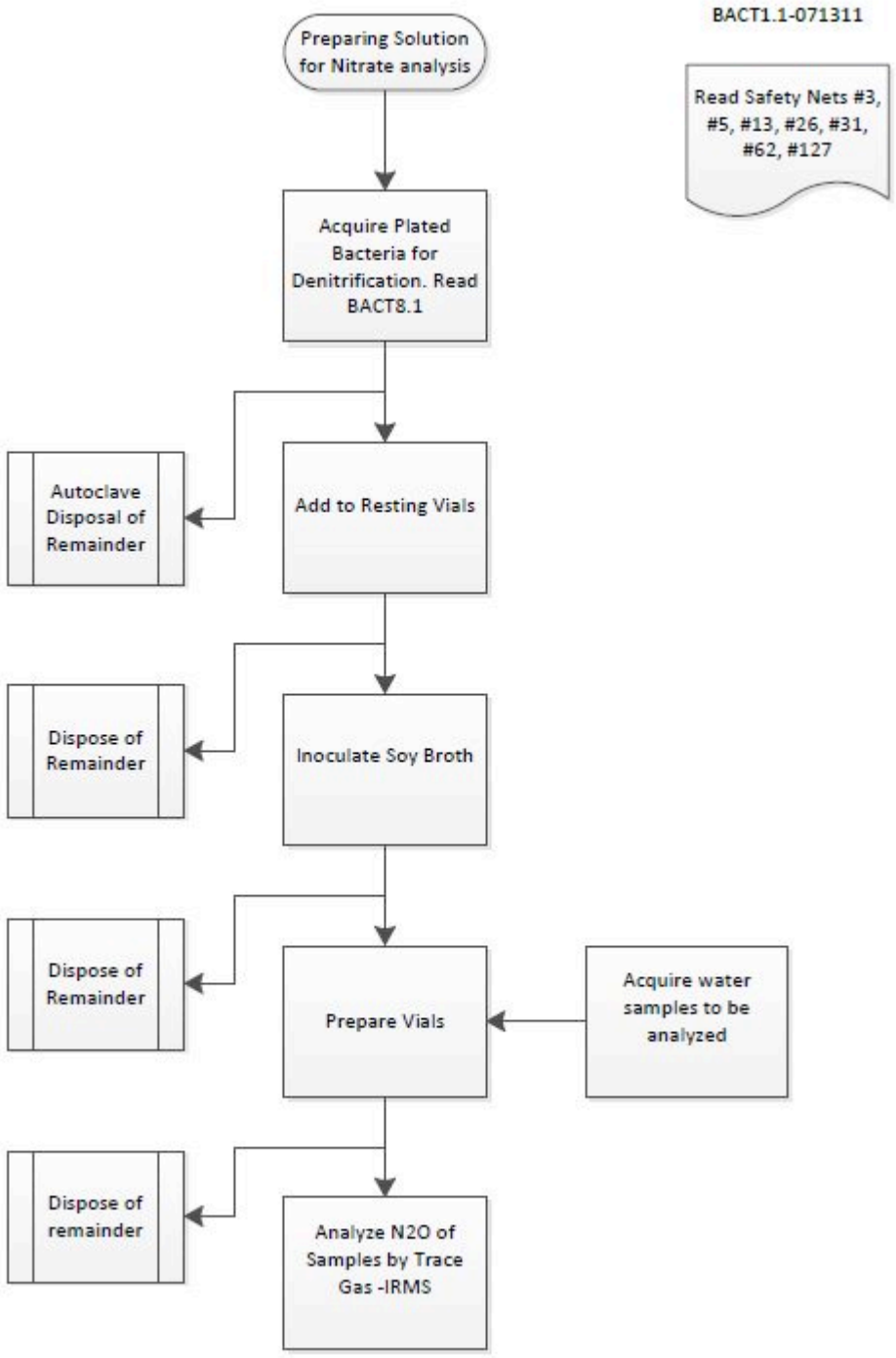
9. K. L. Casciotti, D. M. Sigman, M. Galanter Hastings, J. K. Böhlke, and A. Hilkert. Measurement of the Oxygen Isotopic Composition of Nitrate in Seawater and Freshwater Using the Denitrifier Method. 2002. Anal. Chem. 74: 4905 -4912.

10. J. Granger and D.M. Sigman 2009. Removal of nitrite with sulfamic acid for nitrate N and O isotope analysis with the denitrifier method. Rapid Comm. Mass Spectrom. 23: 3753-3762.

11. SafetyNet #62 - Needle and Syringe Safety, http://safetyservices.ucdavis.edu/snfn/safetynets/snml/sn62/SN62pdf

M. ATTACHMENTS, CHECKLISTS, AND FLOWCHARTS

1. Preparing Solution for Nitrate Analysis:



N. TROUBLESHOOTING APPENDIX

1. No sample peak (peak 7) in Acquisition during a sample run
    i. Verify this is not a Blank sample vial. No peak 7 is a good thing on Blank samples.
    ii. Verify there is sufficient LN_2 in the dewar. Add LN_2 if necessary.

iii. Verify the needle is not blocked due to debris. Stop run and clean or change needle as necessary. Perform leak test prior to continuing sample run.

Appendix C

Cape Cod Permeable Reactive Barrier Project
Field Work – Standard Operating Procedures

1- Standard Operating Procedure for Groundwater Monitoring Well Installation Using the Geoprobe
2- Standard Operating Procedure for Soil Core Sampling Using the Geoprobe
3- Standard Operating Procedure for Geoprobe Advancement and Field Water Quality Testing
4- Standard Operating Procedure for Well and Piezometer Installation and Documentation
5- Standard Operating Procedure for Slug (Hydraulic Conductivity) Testing
6- Standard Operating Procedure for Groundwater Field Sampling/Parameter Analysis, Laboratory Sample Collection, Field Sampling Sheets, and Sample Handling
7- Standard Operating Procedure for Groundwater Level Measurement
8- Standard Operating Procedure for Nitrate Hach Kit Testing
9- Standard Operating Procedure for General Field Equipment, Cleaning, Preparation, and Decontamination

STANDARD OPERATING PROCEDURE:

GROUNDWATER MONITORING WELL INSTALLATION USING THE GEOPROBE

VERSION AUTHORED / DATE REVIEWED – USEPA 11/16/10

REVIEWED BY / DATE – D. Truslow, WaterVision LLC and Truslow Resource Consulting LLC, 12/7/15

Total Pages: 12

Introduction:

Geoprobe operation will be conducted by New England Geotech, Inc. with oversight by WaterVision LLC. Throughout the document, USEPA is noted as the owners and operators of the Geoprobe, however, for this project New England Geotech, Inc. owns the Geoprobe and will operate.

Notes: Where SOP for Groundwater Sampling and SOP for Sample and Evidence Management are mentioned throughout the document, the information from these SOPs can be found in SOP 6 Groundwater Field Sampling/Parameter Analysis, Laboratory Sample Collection, Field Sampling Sheets, and Sample Handling.

STANDARD OPERATING PROCEDURES FOR GROUNDWATER MONITORING WELL INSTALLATION USING THE GEOPROBE®

The Office of Environmental Measurement and Evaluation
EPA New England - Region 1
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North Chelmsford, MA 01863

Prepared by:	Lisa Thuot – Env. Scientist	11/16/10 Date
Reviewed by:	Jerry Keefe - EIA Team Leader	11/16/10 Date
Approved by:	Ernest Waterman - EIA Branch Chief	11/17/2010 Date

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The effective date is considered to be the last approved date.

Revision Page

Date	Rev#	Summary of Changes	Sections
6/8/02	0	Initial draft submitted for review	
6/11/02	1	Revisions completed for approval	
1/28/08	2	Revision Signature Page 1	
1/28/08	3	Formatting Revisions	Page 3, 7, 9
6/05/08	4	Header title & date changes	
6/05/08	4	Changes to incorporate the new track-mounted Geoprobe® machine purchased in 2007.	2.1, 4.2, 4.4-4.6, 6.2, 7.1, 7.2, 8.3, 8.4
6/05/08	4	Removed sampling instructions and add reference to the groundwater sampling SOP	9.0
11/16/10	5	Updates to: website, PPE, health & safety training, info, HASP, new sampling pump, supplies and decon SOP reference, Geoprobe® fuel requirements, positioning the Geoprobe®, reference SOP for Sample and Evidence management, reference SOP for Records Management, QA objectives, IDW reference	4.1, 4.4, 6.1, 6.3, 7.12, 7.13, 7.20, 8.3, 8.4, 10.3, 11.1, 11.2, 12.1, 13.1

Table of Contents

1.0 Scope & Application:

1.1 This Standard Operating Procedure (SOP) is applicable to the installation of permanent groundwater monitoring wells using Geoprobe® machines.

1.2 A separate SOP applies to soil core sampling using the Geoprobe® machines.

2.0 Summary of Method:

2.1 The method employed utilizes Geoprobe® machines, owned by the EPA New England Regional Laboratory (NERL), to hydraulically drive probing equipment into the subsurface so monitoring wells can be installed for groundwater sampling. The machines drive steel probe rods (with inner diameter openings) into the ground, which collectively serve as a protective casing through which well screens and risers are installed. The sampler uses the correct number of probe rods based on the desired well depth for a groundwater sampling event. Next, the sampler carefully inserts pre-connected PVC screens/risers, or another monitoring well device, into the inner opening of the probe rods, (ensuring the well riser will be sufficiently above ground when the well casing is removed). After retracting the probe rods and grouting the surrounding hole, the sampler may use the well for groundwater monitoring purposes. NERL currently owns two Geoprobe® machines: (1) a gasoline-powered, wheel-mounted machine with an associated power unit that can be pulled or pushed by EPA staff; and (2) a diesel-powered, track-mounted machine that is driven by an authorized EPA staff person (as determined by the Sampling Leader).

3.0 Definitions:

3.1 Geoprobe®: The brand name of a hydraulically-powered machine which utilizes static force and percussion to drive small diameter sampling tools into the subsurface for the purpose of sample collection, such as groundwater. Also referred to as "direct push" machines, they rely on the compression of soil and rearrangement of soil particles, (rather than traditional drilling methods), for subsurface penetration of sampling tools.
(Note: The Geoprobe brand name is a registered trademark of Kejr, Inc., Salina, Kansas).

3.2 Probe Rod: Constructed of steel, they are used as outer casings through which PVC or other types of wells are installed. They are removed during the well installation process, once the well screen/risers have been positioned in the probe hole.

3.3 Grout: A binding material with low permeability, such as bentonite, used for sealing probe holes (such as surrounding a groundwater monitoring well). This prevents

contamination of the subsurface and ensures groundwater sampling integrity.

3.4 Trip Blanks: A sample of the proper preservative from the laboratory, in the appropriate sample container, taken out to the field, and returned to the laboratory for analysis without being opened. Trip blanks are generally for volatile organic compounds, low level metals, and gasoline range hydrocarbon samples and are used to assess potential contamination introduced during sample transport.

3.5 Laboratory Quality Samples: Additional samples will be collected for the laboratory's quality control: matrix spike, matrix spike duplicate, laboratory duplicates, etc.

4.0 Health and Safety Warnings:

4.1 Prior to initiating any Geoprobe® work in Massachusetts, Maine, New Hampshire, Rhode Island, or Vermont, EPA staff is required to notify the Dig Safe System, Inc. at the following number: 1-888-Dig-Safe (1-888-344-7233). Additional information is available on their website, http://www.digsafe.com/. In Connecticut, EPA staff is required to notify 'Call Before You Dig' (CBYD) at 1-800-922-4455 at least two days prior to the proposed work. Additional information is available on their website: http://www.cbyd.com/

4.2 Prior to using any Geoprobe® machine on a site, scan the proposed probing area with EPA New England's hand-held metal detector device in advance, to avoid any metal or electrical interference which could damage the machine or cause injury to samplers.

4.3 When working with potentially hazardous materials or situations, follow EPA, OSHA, and specific health or safety procedures. Please refer to Section 6.0 - Personnel Qualifications for additional information. The site-specific sampling and analysis plan (SAP) and/or health and safety plan (HASP) should identify potential hazards.

4.4 All proper personal protective equipment (PPE) must be worn at all times when operating Geoprobe® machines, including: eye protection (e.g. safety glasses), ear protection, hard hat, steel-toed work boots, and durable work gloves. If working in areas with potential soil or groundwater contamination, Tyvek or similar clothing protection should be worn.

4.5 When handling the steel probe rods, the use of durable gloves (leather, canvas, or thick rubber) is required due to small burrs on rods which could cause injury to unprotected skin.

4.6 If using the track-mounted Geoprobe® machine: An authorized EPA employee will drive the unit into or out of the trailer (as determined by the Sampling Leader). All other staff should stay clear of both the trailer and the towing vehicle during the loading and unloading process. *Note*: A hard hat must be worn by staff moving the track-mounted machine into or out of the trailer.

If using the wheel-mounted Geoprobe® machine: At least two field personnel should collectively remove the machine and the associated power unit from the trailer. This will help to control any sudden acceleration of the unit's wheels when moved down the inclined trailer ramp and avoid injury to staff or observers.

4.7 Samples which contain chemical hazards should be handled with suitable protection to skin, eyes, etc. and established decontamination procedures should be followed for both work and personal protection equipment clean-up.

5.0 Interferences:

5.1 Geoprobe® units should not be operated during thunderstorms or other potentially dangerous weather events.

5.2 During the well installation process a subsurface boulder(s) may impede the path of the probe rods in a desired well location. It is recommended that one first perform a test probe of 4' to 8' into the subsurface. Therefore, prior to driving in well casing rods, one can ensure the path is clear of interferences.

5.3 If groundwater monitoring wells must be installed on private property, EPA field staff or Office of Site Remediation and Restoration (OSRR) Staff or OSRR site contractors must ensure permission for access is granted prior to initiating work.

6.0 Personnel Qualifications:

6.1 All field samplers working at Superfund sites are required to take the 40-hour OSHA HAZWOPER training course, the yearly OSHA 8-hour refresher training course prior to engaging in any field activities. In addition, field staff may be required to take other training or measures as determined by the OEME or Regional Health and Safety Officers, such as CPR/AED, first aid, and/or appropriate vaccinations [i.e. tetanus, hepatitis, etc.]

6.2 All field staff should be properly trained by experienced staff before operating the Geoprobe® units. Only authorized personnel, as designated by the Sampling Leader, should remove the track-mounted unit from the trailer.

6.3 All personnel shall be responsible with complying with the project/site-specific sampling and analysis plan (SAP), quality assurance project plan (QAPP), and/or health and safety plan (HASP).

7.0 Equipment and Supplies:

7.1 Geoprobe® Machines (owned by EPA NERL, described in section 2.1).

7.2 Mobile dual circuit power unit, with electric start engine operating on unleaded gasoline (applicable to the wheel-mounted machine only).

7.3 Hand-held metal detector device.

7.4 Probe Rods - [Large]: diameter: 2.125", length: 48"; [Small]: diameter: 1"; length: 48"

7.5 Expendable Drive Points, and Expendable Point Holder (48").

7.6 Drive Cap and Puller Cap.

7.7 Rod Grip Pull System with detachable handle, (for retracting probe rods).

7.8 Well screens - 5 ft. each, Well risers - 5 ft. each (PVC or other material); and PVC top caps, or other plastic type screws.

7.9 Sampling tubing (small diameter for low-flow groundwater pumping)

7.10 Tape measure, electrical/duct tape, cutting tools

7.11 Water level sounder (to measure groundwater levels).

7.12 Geotech "Geopump 2" peristaltic pump, bladder pump, or similar including a battery power source.

7.13 Groundwater sampling containers

7.14 Sampling Preservative (if necessary)

7.15 Coolers with ice or laboratory-approved ice packs

7.16 Site logbook, custody seals, and chain of custody form

7.17 Cleaning brushes of assorted sizes, including: small nylon bristle brushes (for scrubbing rod threads) and long-handle brushes (for cleaning rod interiors).

7.18 Soap for cleaning probing tools, (should be environmentally safe for on-site disposal).

7.19 EPA-approved plastic gasoline refill containers (use separate containers for diesel and gasoline).

7.20 Decontamination equipment and reagents:
Pump sprayers, plastic bins, brushes (see section 7.17)
Soapy water, tap water, de-ionized water.
Hexane or isopropanol (as necessary, depending on expected site contaminants)
Transport sleds (to dry equipment after decon)
Larger plastic bags for storing contaminated work boots, gloves, etc

Please refer to the Investigations Team SOP for General Field Equipment - Cleaning, Preparation, and Decontamination for decontamination procedures.

7.21 Photo Ionization Detector (PID) or Flame Ionization Detector (FID), if applicable.

7.22 Miscellaneous: Zip lock plastic bags, paper towels, permanent or waterproof pen/markers for labeling purposes.

8.0 Groundwater Monitoring Well Installation:

8.1. Identify the proposed location of the monitoring well. Perform a brief site survey, which includes using a metal detector to scan the proposed probe location for any metal obstacles or electrical hazards.

8.2 Determine the desired depth of the proposed monitoring well, and the corresponding number of probe rods which will be needed to meet the criteria.

8.3 Remove the Geoprobe® machine using caution when moving down the trailer ramp. Fill the gas tank or oil reserve as needed. [Note: the track mounted unit requires diesel fuel, and the mobile power unit requires gasoline].

8.4 Position the Geoprobe® machine at the proposed monitoring well location. After connecting the power cables (applies to wheel-mounted machine only), unfold the probe, place in the proper probing position, and level the machine to avoid sloping. Please also see Owner's Manual for specific instructions.

8.5 Lay out all Geoprobe® accessory equipment near the work site beforehand, such as probe rods, caps, etc. that will be used.

8.6 Perform an initial test probe*. Attach a 1" drive point to the threaded end of a point holder. Add a drive cap to the holder, and place under the probe hammer in the driving position (see Owner's Manual), and turn on the Geoprobe® machine. Drive the point holder into the ground, until the drive cap is a few inches above the surface. Remove the drive cap, thread a 1" probe rod onto the holder, and drive once again. Thread successive rods in a similar manner until reaching desired well depth.
[*Note: Each Geoprobe operator must wear the required personal protection gear before operating the machine. Please refer to Health and Safety Warnings, Section 4.0, for details].

8.7 Remove the probe rods using the Rod Grip Puller, attaching a puller cap to the top probe rod, retracting upward with the machine, and detaching each successive rod.

8.8 Attach a 2.125" expendable drive point to the threaded end of a 2.125" point holder. Add a drive cap to the holder, and place under the probe hammer in the driving position. Drive the point holder into the ground, until the drive cap is a few inches above the surface. Remove the drive cap, and thread successive 2.125" probe rods in the same manner as described in step 8.6 above. Make sure that your probe rod assembly is straight as its being driven into the ground. After reaching the desired well depth, the well can now be installed.

8.9 For PVC Caps: Attach a cap to the end of a screen(s). Thread one or two 5 ft. risers to the top of screen assembly. With the assistance of a second person, firmly grasp and lower the assembly through the circular opening in the top probe rod, without releasing and dropping the assembly to the well bottom. Attach additional 5 ft. riser sections until the assembly reaches the bottom of the probe rods (the well bottom). [Note: at least one foot of riser should extend past the top probe rod above the ground surface].

8.10 To retract the probe rods surrounding the monitoring well, reposition the probe machine so the Rod Grip Puller can be attached to the lower portion of the top probe rod. One person should operate the Geoprobe® machine while a second person grasps and firmly presses down on the PVC screen/riser assembly. Observe whether the risers stay in place or move up with the rods. If risers stay in place, stable formation conditions are present. Continue retracting and detaching each successive probe rod. If risers move up with the probe rods, the drive point is likely located in heavy sands. If they continue to rise, place a piece of spare PVC riser over the top of the well riser, and carefully hammer the assembly back into the ground as rods are retracted. (Do not hammer directly on the well riser; this could damage or contaminate the opening).

8.11 Create a sand barrier around the well screen by pouring special "well screen sand" into the opening around the well riser to the top of the well screen. (Note: some sand may already be present due to collapse of the natural formations). The sand forms a barrier which prevents the grout from penetrating into the screened portion of the well.

8.12 Next, grout the well. EPA NERL uses medium-sized bentonite chips (such as Pure Gold™) which are poured on the top of the sand layer surrounding the riser. Sufficiently hydrate the bentonite by pouring tap water on top of it, which initiates the sealing process.

8.13 If not immediately sampling from the well, label the riser with permanent ink, add a surface cover (preferably water resistant) and secure cover with electrical/duct tape.

8.14 If necessary, thoroughly clean and scrub all Geoprobe® equipment (probe rods, caps, etc.) with soap and water. Then complete a final rinse of equipment with distilled water. Be sure to wear thick rubber gloves while cleaning equipment.

9.0 Groundwater Sampling Procedure

9.1 Please refer to the separate Investigations Team SOP for Groundwater Sampling.

10.0 Handling, Preservation, and Storage:

10.1 After retrieving groundwater samples from the monitoring well(s), deliver to the assigned on-site preserver (if applicable). Label the sampling container(s) with sampling details and custody information. Record all pertinent data in the site logbook and on the field data sheet.

10.2 Preserve the sample with the appropriate preservative (unless using approved pre-preserved sample vials) and cap the containers. Load all samples into a cooler(s), ensuring that the bottles are in the ice but *not* totally immersed in water.

10.3 For sampling handling and custody procedures, please refer to the OEME SOP for Sample and Evidence Management.

11.0 Data and Records Management:

11.1 Project data, including sampling information, field measurements, observations, etc. should be managed accordance with the SOP for Sample and Evidence Management.

11.2 Please refer to the Investigations Team SOP for Records Management for general guidelines on records retention, project file maintenance, etc. Additional project-specific or site-specific instructions may apply for records retention (i.e. for legal purposes); please consult with the Project Officer for additional information.

12.0 Quality Control and Quality Assurance:

12.1 The Sampling Leader will evaluate the site specific conditions to assure samples will be representative and meet project objectives.

12.2 All sampling equipment must be decontaminated prior to use and after each sample and/or location, as applicable. Please refer to the Investigations Team SOP for General Field Equipment - Cleaning, Preparation, and Decontamination.

12.3 Field QC samples requirements defined in the project-specific Sampling & Analysis Plan (SAP) must be followed. These may include trip blanks, equipment blanks, field duplicates, performance evaluation (PE) samples, and/or collection of extra sample volume for laboratory quality control purposes.

13.0 Waste Management and Pollution Prevention:

13.1 During field sampling and analysis events there may be hazardous waste produced from the sample collection, commonly referred to as investigation-derived waste (IDW). The IDW must be handled and disposed of in accordance with federal, state, and municipal regulations. Dispose of the IDW produced at the site where the work was performed, if the operating site has proper disposal available. If there is no disposal that meets regulatory requirements, the IDW must be transported back to EPA NERL and transferred to the hazardous waste manager for disposal.

14.0 References:

14.1 U.S. Environmental Protection Agency, (EPA) 1997. Expedited Site Assessment Tools For Underground Storage Tank Sites: A Guide for Regulators. (EPA 510-B-97-001). March, 1997.

14.2 Geoprobe Systems, 1997. 1998-99 Tools and Equipment Catalog

14.3 American Society for Testing and Materials (ASTM), 1992. ASTM D 5092 Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers: *1993 Annual Book of ASTM Standards, Vol. 0408.* Philadelphia, PA.

STANDARD OPERATING PROCEDURE:

SOIL CORE SAMPLING USING THE GEOPROBE

VERSION AUTHORED / DATE REVIEWED – USEPA 1/9/03

REVIEWED BY / DATE – D. Truslow, WaterVision LLC and Truslow Resource Consulting LLC, 12/7/15

Total Pages: 11

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Geoprobe operation will be conducted by New England Geotech, Inc. with oversight by WaterVision LLC. Throughout the document, USEPA is noted as the owners and operators of the Geoprobe, however, for this project New England Geotech, Inc. owns the Geoprobe and will operate.

STANDARD OPERATING PROCEDURES FOR SOIL CORE SAMPLING USING THE GEOPROBE®

The Office of Environmental Measurement and Evaluation
EPA New England - Region 1
11 Technology Dr
North Chelmsford, MA 01863

Prepared by: _____ _____
Lisa Thuot, EPA Intern Date

Reviewed by: _____ _____
Jerry Keefe, EIA Team Leader Date

Approved by: _____ _____
Robert Maxfield, EIA Branch Chief Date

Revision Page

Date	Rev#	Summary of Changes	Sections
1/9/03	**1**	**Initial Approval**	

Table of Contents

1.0 Scope & Application:

1.1 This Standard Operating Procedure (SOP) applies to soil core sampling using the Geoprobe® machine and the accompanying Macro-Core® Soil Sampler.

1.2 A separate SOP applies to groundwater monitoring well installation and sampling using the Geoprobe® machine.

2.0 Definitions:

2.1 **Geoprobe®: The brand name of a hydraulically-powered machine which utilizes static force and percussion to drive small diameter sampling tools into the subsurface for the purpose of sample collection, such as soil cores. Also referred to as "direct push" machines, they rely on the compression of soil and rearrangement of soil particles, rather than traditional drilling methods,** for subsurface penetration of sampling tools.
(Note: Geoprobe is a registered trademark of Kejr, Inc., Salina, Kansas).

2.2 Macro-Core® Soil Sampler: A solid barrel, direct push device for collecting continuous core samples of unconsolidated materials at depth. A removable, thin-walled tube called a "liner" is inserted into the Macro-Core sample tube for the purpose of containing and storing soil during the coring process. [EPA-EIA is currently using PVC liners, however other types are available].
(Note: Macro-Core is a registered trademark of Kejr, Inc., Salina, Kansas).

2.3 Trip Blanks: A sample of the proper preservative from the laboratory, in the appropriate sample container, taken out to the field, and returned to the laboratory for analysis without being opened. Trip blanks are generally for volatile organic compounds, low level metals, and gasoline range hydrocarbon samples. Used to assess contamination introduced during sample transport.

2.4 Laboratory Quality Samples: Additional samples will be collected for the laboratory's quality control: matrix spike, matrix spike duplicate, laboratory duplicates, etc.

3.0 Summary of Method:

3.1 In this method, a Geoprobe soil probing machine (owned by EPA New England) is used to drive and retrieve an assembled "open-tube" Macro-Core Soil Sampler. Coring starts at the surface, and continues to a desired sampling interval, such as 0-4 ft. into the subsurface, as controlled by the machine operator/sampler. An enclosed liner, which contains the soil core, is then removed from the sampling tube and placed on a cutter holder. After cutting open the liner, soil samples can then be dispensed into containers for laboratory analysis. Additional sampling intervals, such as 4-8 ft., can be completed by driving the Macro-Core Soil Sampler (with extension rods) further down into the existing probe hole.

4.0 Health and Safety Warnings:

4.1 Prior to initiating any Geoprobe work in Massachusetts, Maine, New Hampshire, Rhode Island, or Vermont, EPA staff is required to notify the Dig Safe System, Inc. at the following number: 1-888-Dig-Safe (1-888-344-7233). Additional information is available on their website, http://www.digsafe.com/. In Connecticut, EPA staff is required to notify 'Call Before You Dig' (CBYD) at 1-800-922-4455 at least two days prior to the proposed work. Additional information is available on their website: http://www.occ.state.ct.us/Consumerinformation/cbyd.htm

4.2 Prior to using Geoprobe equipment on a site, scan the proposed probing area with EPA New England's hand-held metal detector device in advance, to avoid any metal or electrical interference which could damage the machine or cause injury to samplers.

4.3 When working with potentially hazardous materials or situations, follow EPA, OSHA, and specific health or safety procedures. Please refer to Section 6.0 - Personnel Qualifications, of this SOP for additional information.

4.4 All proper personal protection gear must be worn when operating the Geoprobe machine, including: eye protection (e.g. safety goggles), ear protection, hard hat, steel-toed work boots, and durable work gloves.

4.5 When handling the steel probe rods, the use of durable gloves (leather or canvas) is recommended due to small burrs on rods which could cause injury to unprotected skin.

4.6 At least two field personnel should collectively remove the Geoprobe machine from the trailer. This will help to control any sudden acceleration of the machine's wheels when moved down the inclined trailer ramp.

4.7 Samples which contain chemical hazards should be handled with suitable protection to skin, eyes, etc. and established decontamination procedures should be followed for both work and personal protection equipment clean-up.

5.0 Interferences:

5.1 Professional judgement should be used when operating Geoprobe equipment during precipitation (e.g. rain, snow, hail). Work must stop if lighting and/or thunderstorms, and any other unfavorable weather events begin to occur.

5.2 If soil sampling must be conducted on private property, EPA sampling staff must ensure permission for access is granted prior to initiating work.

5.3 The Macro-Core soil sampler is not designed to penetrate or collect samples of bedrock or consolidated formations, such as granites, limestone, slates, etc. In addition, some compacted glacial tills or alluvial sediments containing large boulders, cobbles, or coarse gravel may limit penetration, sampling success, and recovery.

6.0 Personnel Qualifications:

6.1 All field samplers working at Superfund sites are required to take a 40-hour OSHA health and safety training course, and a yearly 8-hour refresher course, prior to engaging in any field activities.

6.2 The field sampler should be properly trained by experienced staff before operating the Geoprobe machine.

6.3 All personnel shall be responsible for complying with all quality assurance/quality control requirements that pertain to their organizational/technical function.

7.0 Equipment and Supplies:

7.1 Geoprobe Soil Probing Machine (purchased by EPA New England)

7.2 Mobile dual circuit power unit, with electric start engine operating on unleaded gasoline.

7.3 Hand-held metal detector device.

7.4 Geoprobe Macro-Core (MC) Soil Sampler, which includes:
- MC Sample Tube (steel; length: 48")
- MC Drive Head and Drive Cap
- MC Cutting Shoe
- MC Spacer Rings
- MC Liners (PVC or other type; length: 48")
- MC Combination Wrench
- MC Liner Cutter, and Cutter Holder

7.5 Extension Probe Rods (length: 48")

7.6 Drive Cap and Pull Cap (for 1.25" rods)

7.7 Tape measure, rubber gloves.

7.8 Sampling tools: spoon, syringe, etc.

7.9 Soil sampling containers.

7.10 Sample preservatives (if necessary)

7.11 Coolers with ice or laboratory-approved ice packs

7.12 field logbook, custody seals, and chain of custody form

7.13 Cleaning brushes of assorted sizes, including: small nylon bristle (for scrubbing rod threads) and a long-handle brush (for cleaning rod interiors).

7.14 Soap for cleaning Geoprobe tools, (should be environmentally safe for on-site disposal).

7.15 EPA-approved plastic gasoline refill container

7.16 Decontamination equipment and reagents:
- Decon sprayers with attached pump: distilled water; (soapy) de-ionized water
- Decon transport sled
- Larger plastic bags (for storing contaminated work boots, gloves, etc.)
- Bucket, brushes

7.17 PID - Photo Ionization Detector/Analyzer (if appicable)

7.18 Miscellaneous: Zip lock bags, plastic containers of tap water and distilled water, paper towels, and permanent or waterproof pens for labeling purposes.

8.0 Soil Core Sampling:

8.1. Identify the location for the proposed soil core sampling. Perform a brief site survey, which includes using a metal detector to scan the proposed probe location for any metal obstacles, or electrical hazards.

8.2 Remove the Geoprobe machine and accompanying mobile power unit from the trailer, using caution when moving it down the ramp. Fill the gas tank if needed.

8.3 Assemble the MC Open-Tube Sampler as follows:

- Push the base of an MC spacer ring onto the threaded end of an MC cutting shoe until it snaps into place.
- Thread the cutting shoe into one end of a MC sample tube. Tighten shoe with an MC combination wrench.
- Insert a liner into the opposite end of the sample tube.
- Thread an drive head into the top of the sample tube, and securely tighten with the combination wrench. (Use a vise to hold the sample tube in place if necessary).

8.4 Thread a drive cap onto the drive head of the assembled open-tube sampler

8.5 Move the Geoprobe machine into position over the proposed sampling location, and connect the power cables*. Unfold the probe, and move into the driving position (see Owner's Manual for instruction). Raise the probe hammer unit assembly to its highest position, by fully extending the probe cylinder.

[*Note: Each Geoprobe operator must wear the required personal protection gear before operating the machine. Please refer to Health and Safety Warnings, Section 4.2, for details].

8.6 Place the MC sampler directly under the hammer with the cutting shoe centered between the "toes" of the Geoprobe's "foot". The sampler will now be parallel to the probe's derrick. Step back from the unit and visually check the sampler alignment.

8.7 Advance the sampler until the drive head reaches the ground surface. Activate the hammer percussion when collecting the soil core. (Percussion helps to shear the soil at the leading end of the sampler, so it moves into the sample tube for increased recovery).

8.8 To retract sampler: Raise the hammer assembly a few inches to provide access to the top of the sampler. Remove the drive cap, and thread a pull cap onto the sampler drive head.

Lower the hammer assembly and hook the hammer latch over the pull cap. Raise the hammer assembly to pull the sampler completely out of the ground.

8.9 Remove the cutting shoe from the sampler and pull out the liner, which contains the soil core. (Use the combination wrench to loosen the cutting shoe if needed).

8.10 Place the liner on the cutter holder. Use the MC liner cutter to make two vertical cuts running the length of the liner, thus splitting it to halves and allowing access to the soil core. (Be sure to wear durable work gloves during the cutting process)

8.11 Using rubber gloves, carefully place soil from the liner into a sample container, using a syringe or sampling spoon. Securely cap container(s) after sampling. [Note: Soil samples may also be collected from the cutting shoe and attached spacer ring].

8.12 To obtain additional soil cores at depth in the same probe hole: Assemble a second MC open-tube sampler (Step 8.3). Attach an extension probe rod to the drive head, and thread a drive cap onto the opposite end of the extension rod. Repeat steps 8.6 - 8.11.

8.13 After all sampling is completed, place unused soil back into the probe hole and discard used liner(s).

8.14 If necessary, thoroughly clean and scrub all Geoprobe and MC sampling equipment (sample tube, caps, extension rods, cutter shoe, etc.) with soap and water. Then complete a final rinse of equipment with distilled water. Be sure to wear thick rubber gloves while cleaning.

9.0 Handling, Preservation, and Storage:

9.1 Deliver soil samples to the preserver on-site (if applicable). Label sampling container(s) with sampling details and custody information.

9.2 Add the appropriate preservative to the sample, (unless using approved pre-preserved sample vials).

9.3 Cap the containers, and use a custody seal if sample is for enforcement.

9.4 Load all samples into a cooler(s), ensuring that the bottles are in the ice but *not* totally immersed in water.

9.5 Record all pertinent data in the site logbook and on the field data sheet.

9.6 Complete the chain of custody form. Attach the custody seals to the cooler prior to delivering to the EPA regional laboratory.

9.7 Upon arriving at the EPA regional laboratory, contact assigned Chemistry staff to log in the samples. If after hours, place in the samples in designated secured refrigerated storage area.

10.0 Data and Records Management:

10.1 All data and information is to follow the Field Data Management SOP.

10.2 The chain of custody form is signed over to the laboratory. A copy is kept with the sampling records.

10.3 The sampling data is to be stored at US EPA - NE, 11 Technology Dr, North Chelmsford, MA for at least 3 years.

11.0 Quality Control and Quality Assurance:

11.1 Representative samples are required. The sampler will evaluate the site specific conditions to assure the sample will be representative.

11.2 All sampling equipment must be decontaminated prior to use and after each discrete sample following the General Field Equipment - Cleaning, Preparation, and Decontamination SOP.

11.3 All field QC samples requirements in the SAP or QAPP must be followed. These may involve trip blanks, equipment blanks, field duplicates and the collection of extra samples for the laboratory's quality control.

12.0 Waste Management and Pollution Prevention:

12.1 During field sampling and analysis events there may be hazardous waste produced from the sample collection. The waste must be handled and disposed of in accordance with federal, state, and municipal regulations. Dispose of the hazardous waste produced at the site where the work was performed, if the operating site has proper disposal available. If there is no disposal that meets regulatory requirements, the waste must be transported back to EPA-NE and transferred to the hazardous waste manager for disposal. The sample volume should be minimized to reduce unnecessary waste.

13.0 References:

13.1 U.S. Environmental Protection Agency, (EPA) 1997. Expedited Site Assessment Tools For Underground Storage Tank Sites: A Guide for Regulators. (EPA 510-B-97-001). March, 1997.

13.2 Geoprobe Systems, 1997. "1998-99 Tools and Equipment Catalog**"**

13.3 Geoprobe Systems, 1998. "Macro-Core Soil Sampler, Standard Operating Procedure" (Technical Bulletin No. 95-8500).

STANDARD OPERATING PROCEDURE:

GEOPROBE ADVANCEMENT AND FIELD WATER QUALITY TESTING

VERSION AUTHORED / DATE REVIEWED – Geoprobe Systems 11/07

REVIEWED BY / DATE – D. Truslow, WaterVision LLC and Truslow Resource Consulting LLC, 12/7/15

Total Pages: 15

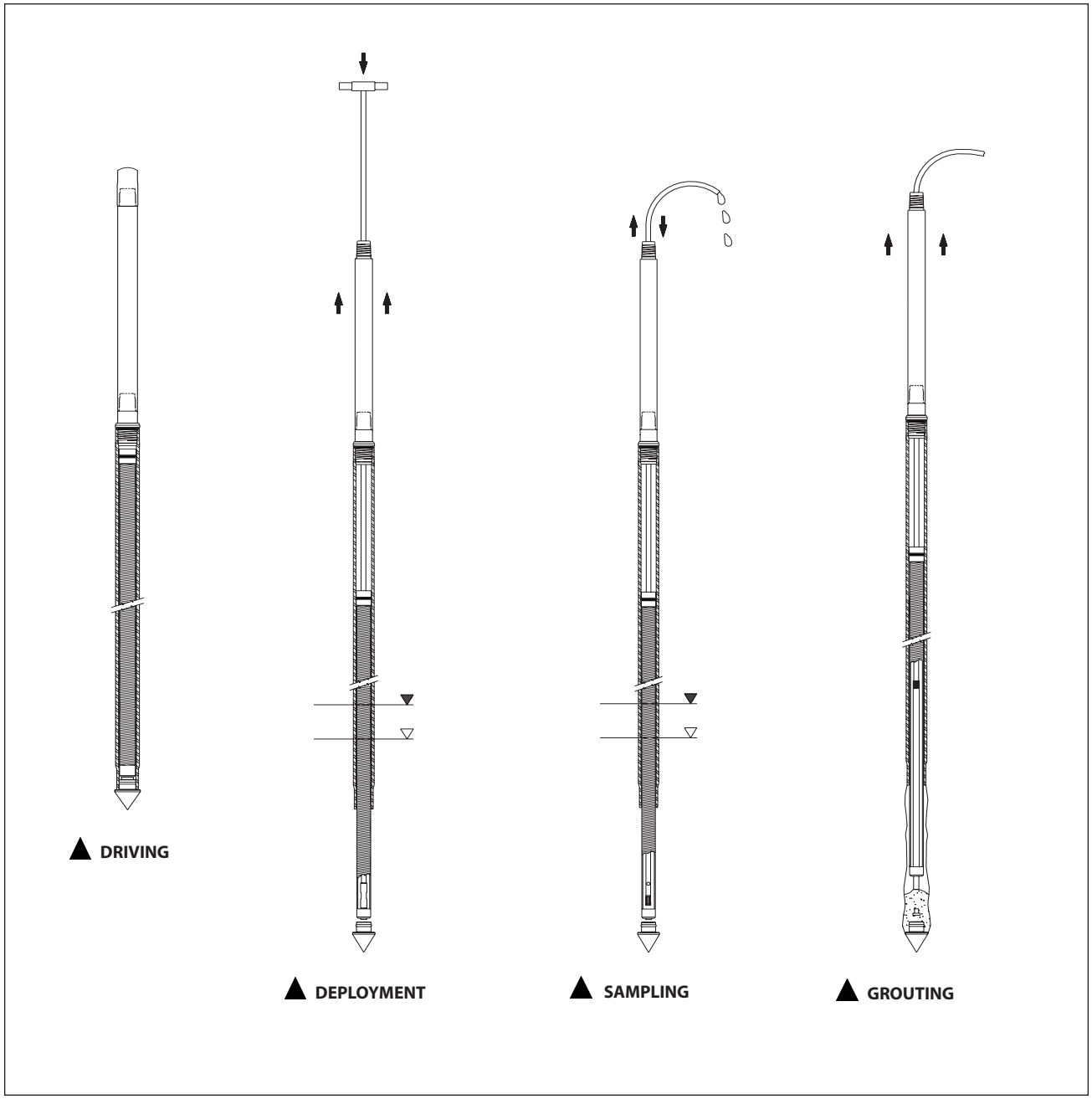
GEOPROBE® SCREEN POINT 15 GROUNDWATER SAMPLER

STANDARD OPERATING PROCEDURE

Technical Bulletin No. MK3141

PREPARED: October, 1995

REVISED: November, 2007



GEOPROBE® SCREEN POINT 15 GROUNDWATER SAMPLER

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Screen Point 15 Groundwater Sampler is manufactured under U.S. Patent 5,612,498

1.0 OBJECTIVE

The objective of this procedure is to drive a sealed stainless steel or PVC screen to depth, deploy the screen, obtain a representative water sample from the screen interval, and grout the probe hole during abandonment. The Screen Point 15 Groundwater Sampler enables the operator to conduct abandonment grouting that meets American Society for Testing and Materials (ASTM) Method D 5299 requirements for decommissioning wells and borings for environmental activities (ASTM 1993).

2.0 BACKGROUND

2.1 Definitions

Geoprobe®: A brand name of high quality, hydraulically powered machines that utilize both static force and percussion to advance sampling and logging tools into the subsurface. The Geoprobe® brand name refers to both machines and tools manufactured by Geoprobe Systems®, Salina, Kansas. Geoprobe® tools are used to perform soil core and soil gas sampling, groundwater sampling and monitoring, soil conductivity and contaminant logging, grouting, and materials injection.

Screen Point 15 (SP15) Groundwater Sampler: A direct push device consisting of a PVC or stainless steel screen that is driven to depth within a sealed, steel sheath and then deployed for the collection of representative groundwater samples. The assembled SP15 Sampler is approximately 50.5 inches (1283 mm) long with an OD of 1.5 inches (38 mm). Upon deployment, up to 41 inches (1041 mm) of screen can be exposed to the formation. The Screen Point 15 Groundwater Sampler is used primarily with 1.25-inch probe rods and machines equipped with a GH40 Series (GH40, GH41, or GH42) Hydraulic Hammer.

Rod Grip Pull System: An attachment mounted on the hydraulic hammer of a direct push machine which makes it possible to retract the tool string with extension rods or flexible tubing protruding from the top of the probe rods. The Rod Grip Pull System includes a pull block with rod grip jaws and two support straps that are bolted directly to the machine. A removable handle assembly straddles the tool string while hooking onto the pull block to effectively grip the probe rods as the hammer is raised. A separate handle assembly is required for each probe rod diameter.

2.2 Discussion

In this procedure, the assembled Screen Point 15 Groundwater Sampler (Fig. 2.1A) is threaded onto the leading end of a Geoprobe® probe rod and advanced into the subsurface with a Geoprobe® direct push machine. Additional probe rods are added incrementally and advanced until the desired sampling interval is reached. While the sampler is advanced to depth, O-ring seals at each rod joint, the drive head, and the expendable drive point provide a watertight system. This system eliminates the threat of formation fluids entering the screen before deployment and assures sample integrity.

Once at the desired sampling interval, extension rods are sent downhole until the leading rod contacts the bottom of the sampler screen. The tool string is then retracted approximately 44 inches (1118 mm) while the screen is held in place with the extension rods (Fig. 2.1B). As the tool string is retracted, the expendable point is released from the sampler sheath. The tool string and sheath may be retracted the full length of the screen or as little as a few inches if a small sampling interval is desired.

There are three types of screens that can be used in the Screen Point 15 Groundwater Sampler. Two of the these, a stainless steel screen with a standard slot size of 0.004 inches (0.10 mm) and a PVC screen with a standard slot size of 0.010 inches (0.25 mm), are recovered with the tool string after sampling. The third screen is also manufactured from PVC with a standard slot size of 0.010 inches (0.25 mm), but is designed to be left downhole when sampling is complete. This disposable screen has an exposed screen length of approximately 43 inches (1092 mm). The two screens that are recovered with the sampler both have an exposed screen length of approximately 41 inches (1041 mm).

(continued on following page)

An O-ring on the head of the stainless steel screens maintains a seal at the top of the screen. As a result, any liquid entering the sampler during screen deployment must first pass through the screen. PVC screens do not require an O-ring because the tolerance between the screen head and sampler sheath is near that of the screen slot size.

The screens are constructed such that flexible tubing, a mini-bailer, or a small-diameter bladder pump can be inserted into the screen cavity. This makes direct sampling possible from anywhere within the saturated zone. A removable plug in the lower end of the screens allows the user to grout as the sampler is extracted for further use.

Groundwater samples can be obtained in a number of ways. A common method utilizes polyethylene (TB25L) or Teflon® (TB25T) tubing and a Check Valve Assembly (GW4210). The check valve (with check ball) is attached to one end of the tubing and inserted down the casing until it is immersed in groundwater. Water is pumped through the tubing and to the ground surface by oscillating the tubing up and down.

An alternative means of collecting groundwater samples is to attach a peristaltic or vacuum pump to the tubing. This method is limited in that water can be pumped to the surface from a maximum depth of approximately 26 feet (8 m). Another technique for groundwater sampling is to use a stainless steel Mini-Bailer Assembly (GW41). The mini-bailer is lowered down the inside of the casing below the water level where it fills with water and is then retrieved from the casing.

The latest option for collecting groundwater from the SP15 sampler is to utilize a Geoprobe® MB470 Series Mechanical Bladder Pump (MBP)*. The MBP may be used to meet requirements of the low-flow sampling protocol (Puls and Barcelona 1996, ASTM 2003). Through participation in a U.S. EPA Environmental Technology Verification study, it was confirmed that the MB470 can provide representative samples (EPA 2003).

**The Mechanical Bladder Pump is manufactured under U.S. Patent No. 6,877,965 issued April 12, 2005.*

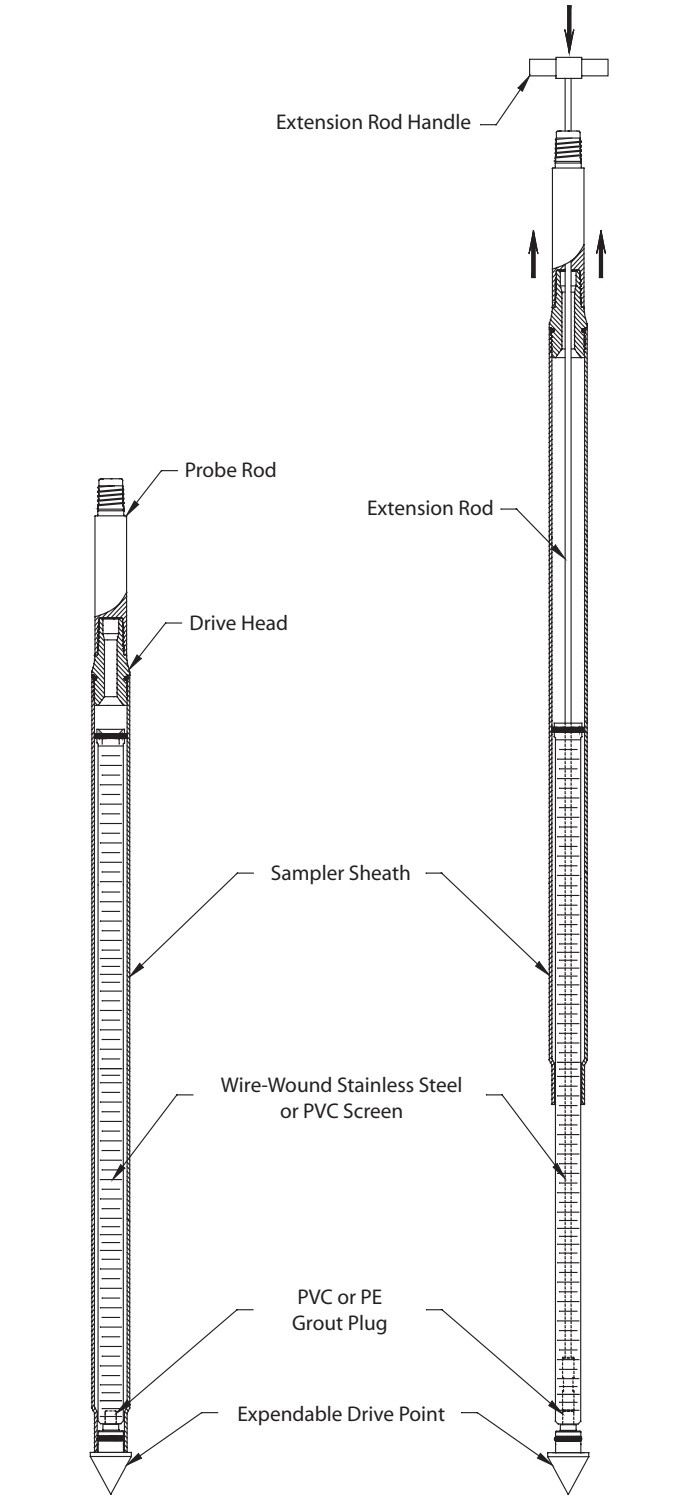


FIGURE 2.1
Screen Point 15Groundwater Sampler

3.0 TOOLS AND EQUIPMENT

The following tools and equipment can be used to successfully recover representative groundwater samples with the Geoprobe® Screen Point 15 Groundwater Sampler. Refer to Figures 3.1 and 3.2 for identification of the specified parts. Tools are listed below for the most common SP15 / 1.25-inch probe rod configuration. Additional parts for optional rod sizes and accessories are listed in Appendix A.

SP15 Sampler Parts	**Part Number**
SP15 Sampler Sheath	GW1510
SP15 Drive Head, 0.625-inch bore, 1.25-inch rods*	GW1512
Screen, Wire-Wound Stainless Steel, 4-Slot*	GW1520
SP15 O-ring Service Kit, 1.25-inch rods *(includes 4 each of the O-ring packets below)*	GW1505K
O-rings for Top of SP15 Drive Head, 1.25-inch rods only (Pkt. of 25)	*AT1250R*
O-rings for Bottom of SP15 Drive Head (Pkt. of 25)	*GW1516R*
O-rings for GW1520 Screen Head (Pkt. of 25)	*GW1520R*
O-rings for SP15 Expendable Drive Point (Pkt. of 25)	*GW1555R*
Grout Plugs, PE (Pkg. of 25)	GW1552K
Expendable Drive Points, steel, 1.625-inch OD (Pkg. of 25)*	GW1555K
Screen Point 15 Groundwater Sampler Kit, 1.25-inch Probe Rods *(includes 1 each of: GW1505K, GW1510, GW1513, GW1520, GW1535, GW1540, GW1552K, and GW1555K)*	GW1512K

Probe Rods and Probe Rod Accessories	**Part Number**
Drive Cap, 1.25-inch probe rods, (for GH40 Series Hammer)	AT1200
Pull Cap, 1.25-inch probe rods	AT1204
Probe Rod, 1.25-inch x 48-inch*	AT1248
Rod Grip Pull System, 1.0-/1.25-inch probe rods (for GH40 Series Hammer)	GH1250K

Extension Rods and Extension Rod Accessories	**Part Number**
Screen Push Adapter	GW1535
Grout Plug Push Adapter	GW1540
Extension Rod, 48-inch*	AT671
Extension Rod Coupler	AT68
Extension Rod Jig	AT690
Extension Rod Quick Link Coupler, pin	AT695
Extension Rod Quick Link Coupler, box	AT696

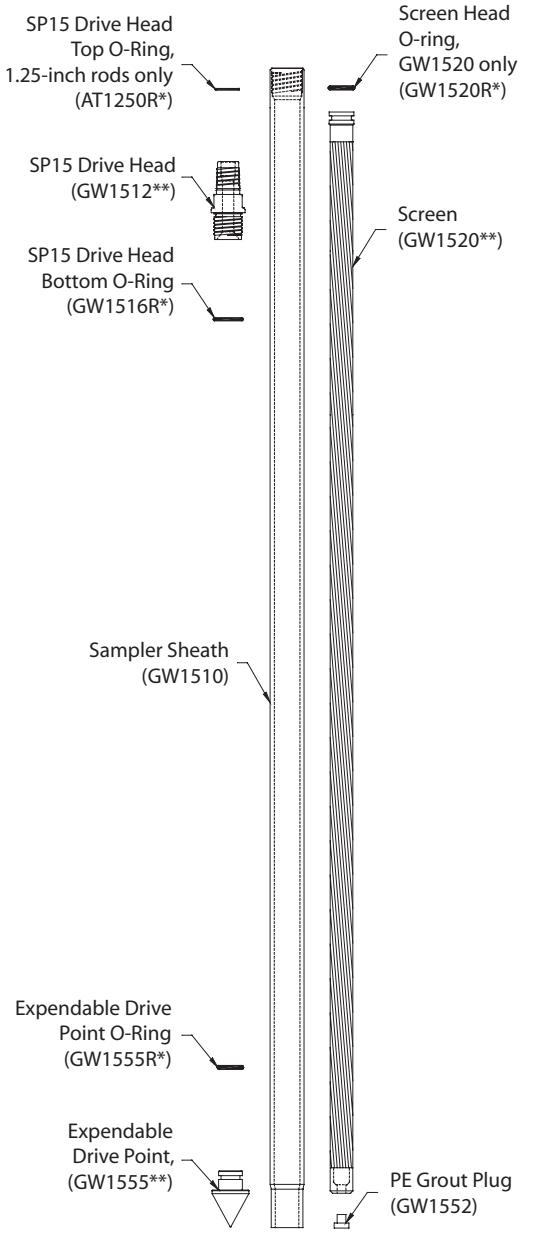
Grout Accessories	**Part Number**
Grout Nozzle, for 0.375-inch OD tubing	GW1545
High-Pressure Nylon Tubing, 0.375-inch OD / 0.25-inch ID, 100-ft. (30 m)	11633
Grout Machine, self-contained*	GS1000
Grout System Accessories Package, 1.25-inch rods	GS1012

Groundwater Purging and Sampling Accessories	**Part Number**
Polyethylene Tubing, 0.375-inch OD, 500 ft.*	TB25L
Check Valve Assembly, 0.375-inch OD Tubing*	GW4210
Water Level Meter, 0.438-inch OD Probe, 100 ft. cable*	GW2000
Mechanical Bladder Pump**	MB470
Mini Bailer Assembly, stainless steel	GW41

Additional Tools	**Part Number**
Adjustable Wrench, 6.0-inch	FA200
Adjustable Wrench, 10.0-inch	FA201
Pipe Wrenches	NA

* See Appendix A for additional tooling options.

** Refer to the Standard Operating Procedure (SOP) for the Mechanical Bladder Pump (Technical Bulletin No. MK3013) for additional tooling needs.



* Included in the SP15 O-ring Service Kit (GW1505K)
** Part numbers show most common tool configuration. See Appendix A for alternative parts.

FIGURE 3.1
SP15 Sampler Parts

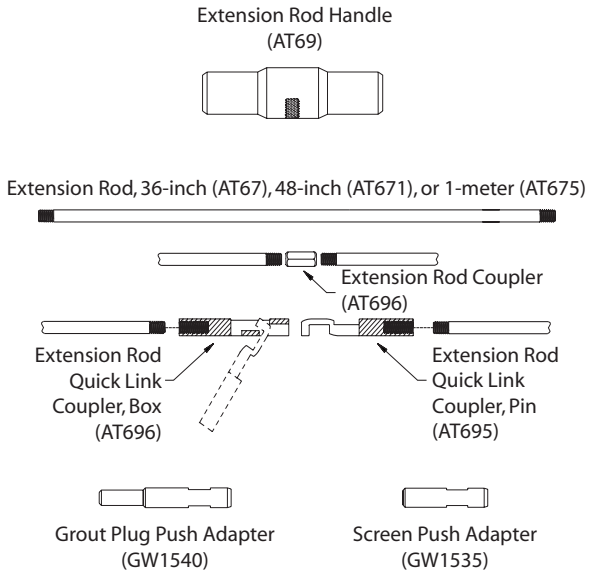


FIGURE 3.2
Geoprobe® Extension Rods and Accessories

4.0 OPERATION

4.1 Basic Operation

The SP15 sampler utilizes a stainless steel or PVC screen which is encased in an alloy steel sampler sheath. An expendable drive point is placed in the lower end of the sheath while a drive head is attached to the top. O-rings on the drive head and expendable point provide a watertight sheath which keeps contaminants out of the system as the sampler is driven to depth.

Once the sampling interval is reached, extension rods equipped with a screen push adapter are inserted down the ID of the probe rods. The tool string is then retracted up to 44 inches (1118 mm) while the screen is held in place with the extension rods. The system is now ready for groundwater sampling. When sampling is complete, a removable plug in the bottom of the screen allows for grouting below the sampler as the tool string is retrieved.

4.2 Sampler Options

The Screen Point 15 and Screen Point 16 Groundwater samplers are nearly identical. Subtle differences in the design of the SP16 sampler makes it more durable than the earlier SP15 system. Operators of GH60-equipped machines should always utilize SP16 tooling. Operators of machines equipped with GH40 Series hammers may also choose SP16 tooling when sampling in difficult probing conditions.

A 1.75-inch OD Expendable Drive Point (17066K) and Disposable PVC Screen (16089) provide two useful options for the SP15 sampler. The 1.75-inch drive point may be used when soil conditions make it difficult to remove the sampler after driving to depth. The disposable PVC screen may be left downhole after sampling (when regulations permit) to eliminate the time required for screen decontamination.

4.3 Decontamination

In order to collect representative groundwater samples, all sampler parts must be thoroughly cleaned before and after each use. Scrub all metal parts using a stiff brush and a nonphosphate soap solution. Steam cleaning may be substituted for hand-washing if available. Rinse with distilled water and allow to air-dry before assembly.

4.4 SP15 Sampler Assembly (Figure 4.1)

Part numbers are listed for a standard SP15 sampler using 1.25-inch probe rods. Refer to Page 6 for screen and drive head alternatives.

1. Place an O-ring on a Steel Expendable Drive Point (GW1555). Firmly seat the expendable point in the necked end of a Sampler Sheath (GW1510).

2. Install a PE Grout Plug (GW1552) in the lower end of a Wire-wound Stainless Steel Screen (GW1520). Place a GW1520R O-ring in the groove on the upper end of the screen.

3. Slide the screen inside the sampler sheath with the grout plug toward the bottom of the sheath. Lubricate the O-ring with distilled water if needed. Ensure that the expendable point is not displaced by the screen.

4. Install a bottom O-ring (GW1516R) on a Drive Head (GW1512). Thread the drive head into the sampler sheath using an adjustable wrench if necessary to ensure complete engagement of the threads. Attach a Drive Cap (AT1200) to the top of the drive head.

Sampler assembly is complete

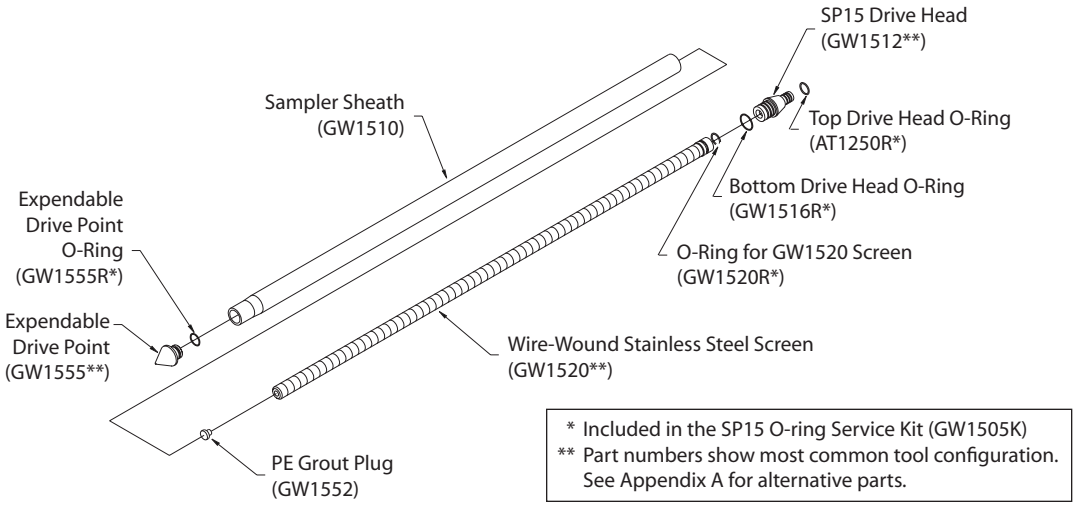


FIGURE 4.1
Screen Point 15 Groundwater Sampler Assembly

4.5 Advancing the SP15 Sampler

To provide adequate room for screen deployment with the Rod Grip Pull System, the probe derrick should be extended a little over halfway out of the carrier vehicle when positioning for operation.

1. Begin by placing the assembled sampler (Fig. 2.1.A) in the driving position beneath the hydraulic hammer of the direct push machine as shown in Figure 4.2.

2. Advance the sampler with the throttle control at slow speed for the first few feet to ensure that the sampler is aligned properly. Switch to fast speed for the remainder of the probe stroke.

3. Completely raise the hammer assembly. Remove the drive cap and place an O-ring in the top groove of the drive head. Distilled water may be used to lubricate the O-ring if needed.

Add a probe rod (length to be determined by operator) and reattach the drive cap to the rod string. Drive the sampler the entire length of the new rod with the throttle control at fast speed.

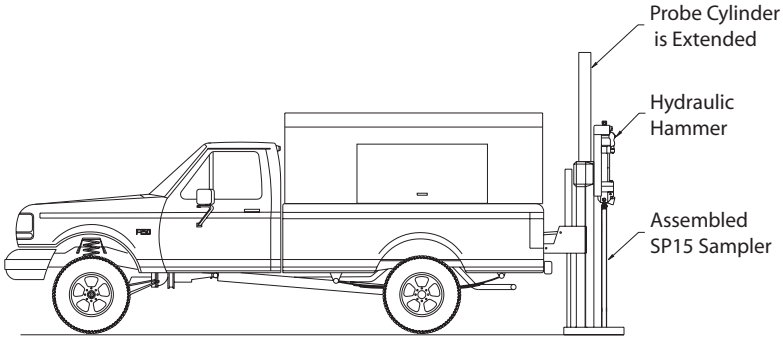


FIGURE 4.2
Screen Point 15 Groundwater Sampler in Driving Position

4. Repeat Step 3 until the desired sampling interval is reached. Approximately 12 inches (305 mm) of the last probe rod must extend above the ground surface to allow attachment of the puller assembly. A 12-inch (305 mm) rod may be added if the tool string is over-driven.

5. Remove the drive cap and retract the probe derrick away from the tool string.

4.6 Screen Deployment

1. Thread a Screen Push Adapter (GW1535) onto an extension rod of suitable length (AT67, AT671, or AT675). Attach a threaded coupler (AT68) to the other end of the extension rod. Lower the extension rod inside the tool string taking care not to drop it downhole.

2. Add extension rods until the adapter contacts the bottom of the screen. To speed up this step, it is recommended that Extension Rod Quick Links (AT695 and AT696) are used at every other rod joint.

3. Ensure that at least 48 inches (1219 mm) of extension rod protrudes from the probe rod. Thread an extension rod handle (AT69) on the top extension rod.

4. Maneuver the probe assembly into position for pulling.

5. Raise (pull) the tool string while physically holding the screen in place with the extension rods (Fig. 4.3.B). A slight knock with the extension rod string will help to dislodge the expendable point and start the screen moving inside the sheath.

   Raise the hammer and tool string about 44 inches (1118 mm) if using a GW1520 or GW1530 screen. At this point the screen head will contact the necked portion of the sampler sheath (Fig. 4.3.C.) and the extension rods will rise with the probe rods. Use care when deploying a PVC screen so as not to break the screen when it contacts the bottom of the sampler sheath.

   The Disposable Screen (16089) will extend completely out of the sheath if the tool string is raised more than 45 inches (1143 mm). Measure and mark this distance on the top extension rod to avoid losing the screen during deployment.

6. Remove the rod grip handle, lower the hammer assembly, and retract the probe derrick. Remove the top extension rod (with handle) and top probe rod. Finally, extract all extension rods.

7. Groundwater samples can now be collected with a mini-bailer, peristaltic or vacuum pump, check valve assembly, mechanical bladder pump, or other acceptable small diameter sampling device.

   When inserting tubing or a bladder pump down the rod string, ensure that it enters the screen interval. The leading end of the tubing or bladder pump will sometimes catch at the screen head giving the illusion that the bottom of the screen has been reached. An up-and-down motion combined with rotation helps move the tubing or bladder pump past the lip and into the screen.

4.7 Abandonment Grouting for GW1520 and GW1530 Screens

The SP15 Groundwater Sampler can meet ASTM D 5299 requirements for abandoning environmental wells or borings when grouting is conducted properly. A removable grout plug makes it possible to deploy tubing through the bottom of GW1520 and GW1530 screens. A GS500 or GS1000 Grout Machine is then used to pump grout into the open probe hole as the sampler is withdrawn. The following procedure is presented as an example only and should be modified to satisfy local abandonment grouting regulations.

1. Maneuver the probe assembly into position for pulling. Attach the rod grip puller to the top probe rod. Raise the tool string approximately 4 to 6 inches (102 to 152 mm) to allow removal of the grout plug.

2. Thread the Grout Plug Push Adapter (GW1540) onto an extension rod. Insert the adapter and extension rod inside the probe rod string. Add extension rods until the adapter contacts the grout plug at the bottom of the screen. Attach the handle to the top extension rod. When the extension rods are slightly raised and lowered, a relatively soft rebound should be felt as the adapter contacts the grout plug. This is especially true when using a PVC screen.

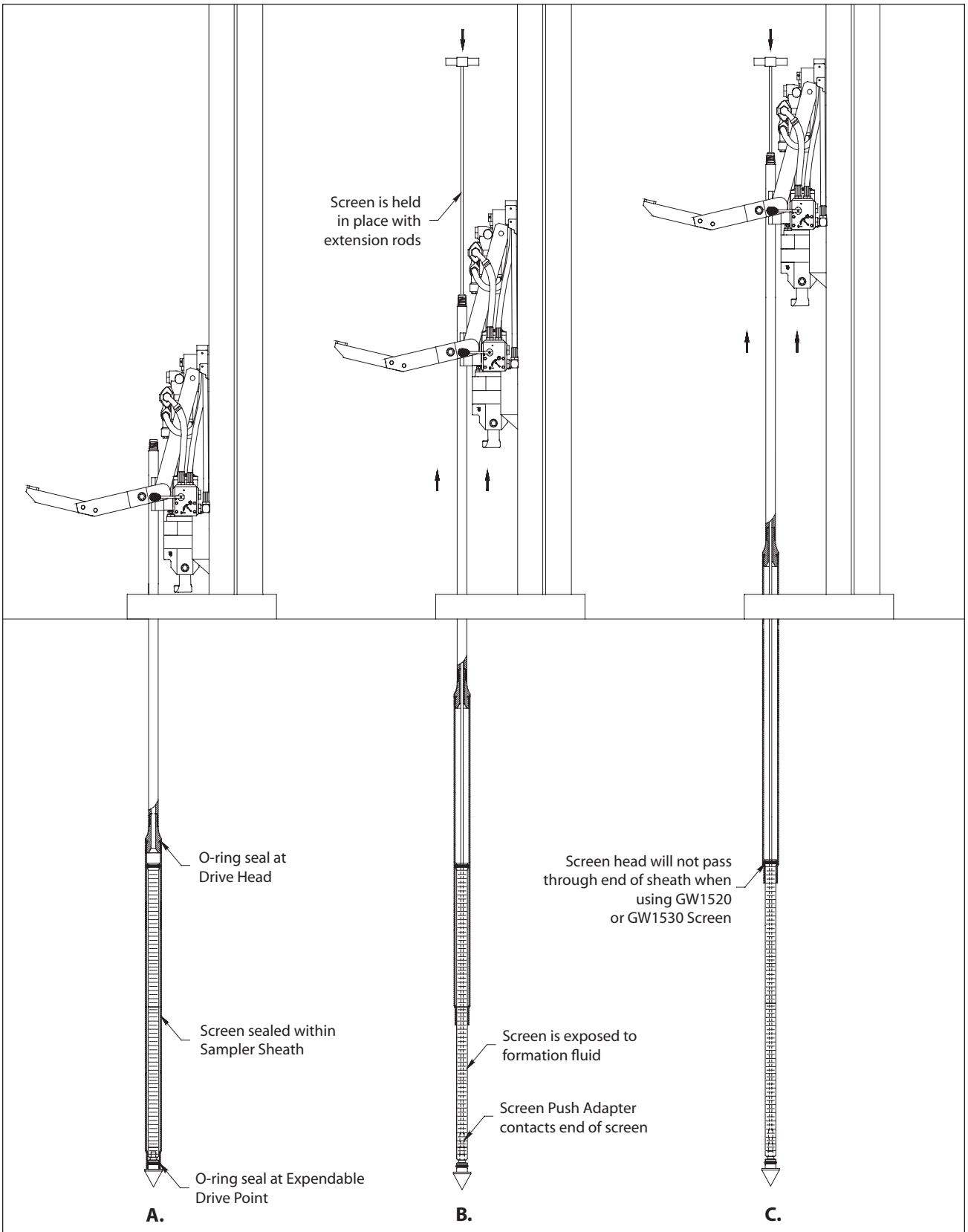


FIGURE 4.3
Screen Deployment for SP15 Sampler

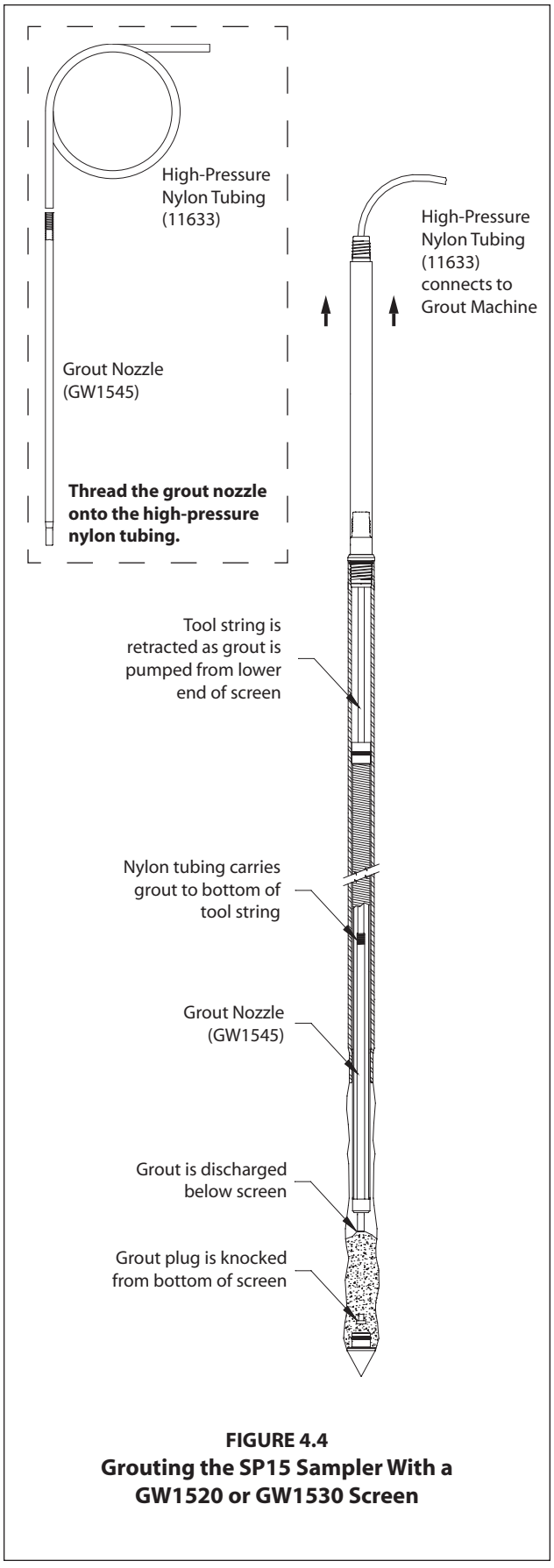


FIGURE 4.4
Grouting the SP15 Sampler With a GW1520 or GW1530 Screen

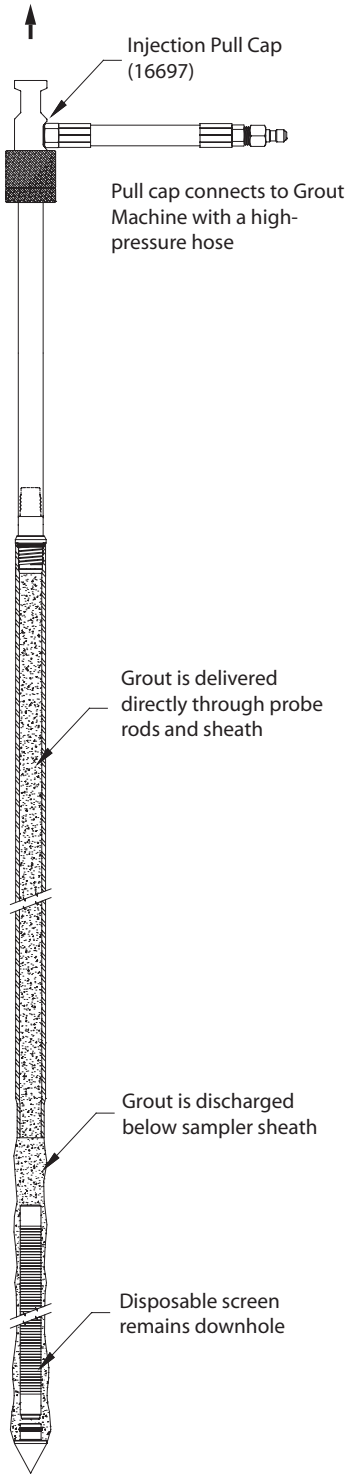


FIGURE 4.5
Grouting the SP15 Sampler With a 16089 Disposable Screen

3. Place a mark on the extension rod even with the top of the probe rod. Apply downward pressure on the extension rods and push the grout plug out of the screen. The mark placed on the extension rod should now be below the top of the probe rod. Remove all extension rods.

   Note: When working with a stainless steel screen, it may be necessary to raise and quickly lower the extension rods to jar the grout plug free. When the plug is successfully removed, a metal-on-metal sensation may be noted as the extension rods are gently "bounced" within the probe rods.

4. A Grout Nozzle (GW1545) is now connected to High-Pressure Nylon Tubing (11633) and inserted down through the probe rods to the bottom of the screen (Fig. 4.4). It may be necessary to pump a small amount of clean water through the tubing during deployment to jet out sediments that settled in the bottom of the screen. Resistance will sometimes be felt as the grout nozzle passes through the drive head. Rotate the tubing while moving it up-and-down to ensure that the nozzle has reached the bottom of the screen and is not hung up on the drive head.

   Note: *All probe rods remain strung on the tubing as the tool string is pulled. Provide extra tubing length to allow sufficient room to lay the rods on the ground as they are removed. An additional 20 feet is generally enough.*

5. Operate the grout pump while pulling the first rod with the rod grip pull system. Coordinate pumping and pulling rates so that grout fills the void left by the sampler. After pulling the first rod, release the rod grip handle, fully lower the hammer, and regrip the tool string. Unthread the top probe and slide it over the tubing placing it on the ground near the end of the tubing.

6. Repeat Step 5 until the sampler is retrieved. Do not bend or kink the tubing when pulling and laying out the probe rods. Sharp bends create weak spots in the tubing which may burst when pumping grout. Remember to operate the grout pump only when pulling the rod string. The probe hole is thus filled with grout from the bottom up as the rods are extracted.

7. Promptly clean all probe rods and sampler parts before the grout sets up and clogs the equipment.

4.8 Abandonment Grouting for the 16089 Disposable Screen

ASTM D 5299 requirements can also be met for the SP15 sampler when using the 16089 disposable screen. Because the screen remains downhole after sampling, the operator may choose either to deliver grout to the bottom of the tool string with nylon tubing or pump grout directly through the probe rods using an Injection Pull Cap (16697). A GS500 or GS1000 Grout Machine is needed to pump grout into the open probe hole as the sampler is withdrawn. The following procedure is presented as an example only and should be modified to satisfy local abandonment grouting regulations.

1. Maneuver the probe assembly into position for pulling with the rod grip puller.

2. Thread the screen push adapter onto an extension rod. Insert the adapter and extension rod inside the probe rod string. Add extension rods until the adapter contacts the bottom of the screen. Attach the handle to the top extension rod.

3. The disposable screen must be extended at least 46 inches (1168 mm) to clear the bottom of the sampler sheath. Considering the length of screen deployed in Section 4.6, determine the remaining distance required to fully extend the screen from the sheath. Mark this distance on the top extension rod.

4. Pull the tool string up to the mark on the top extension rod while holding the disposable screen in place.

   The screen is now fully deployed and the sampler is ready for abandonment grouting. Apply grout to the bottom of the tool string during retrieval using either flexible tubing (as described in Section 4.7) or an injection pull cap (Fig. 4.5). This section continues with a description of grouting with a pull cap.

5. Remove the rod grip handle and maneuver the probe assembly directly over the tool string. Thread an Injection Pull Cap (16697) onto the top probe rod and close the hammer pull latch over the top of the pull cap.

6. Connect the pull cap to a Geoprobe® grout machine using a high-pressure grout hose.

7. Operate the pump to fill the entire tool string with grout. When a sufficient volume has been pumped to fill the tool string, begin pulling the rods and sampler while continuing to operate the grout pump. Considering the known pump volume and sampler cross-section, time tooling withdrawal to slightly "overpump" grout into the subsurface. This will ensure that all voids are filled during sampler retrieval.

   The grouting process can lubricate the probe hole sufficiently to cause the tool string to slide back downhole when disconnected from the pull cap. Prevent this by withdrawing the tool string with the rod grip puller while maintaining a connection to the grout machine with the pull cap.

4.9 Retrieving the Screen Point 15 Sampler

If grouting is not required, the Screen Point 15 Sampler can be retrieved by pulling the probe rods as with most other Geoprobe® applications. The Rod Grip Pull System should be used for this process as it allows the operator to remove rods without completely releasing the tool string. This avoids having the probe rods fall back downhole when released during the pulling procedure. A standard Pull Cap (AT1204) may still be used if preferred. Refer to the Owner's Manual for your Geoprobe® direct push machine for specific instructions on pulling the tool string.

5.0 REFERENCES

American Society of Testing and Materials (ASTM), 2003. D6771-02 Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations. ASTM, West Conshocken, PA. (www.astm.org)

American Society of Testing and Materials (ASTM), 1993. ASTM 5299 *Standard Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.* ASTM West Conshohocken, PA. (www.astm.org)

Geoprobe Systems®, 2003, *Tools Catalog, V.6.*

Geoprobe Systems®, 2006, *Model MB470 Mechanical Bladder Pump Standard Operating Procedure (SOP), Technical Bulletin No. MK3013.*

Puls, Robert W., and Michael J. Barcelona, 1996. Ground Water Issue: Low-Flow (Minimal Drawdown) Ground Water Sampling Procedures. EPA/540/S-95/504. April.

U.S. Environmental Protection Agency (EPA), 2003. Environmental Technology Verification Report: Geoprobe Inc., Mechanical Bladder Pump Model MB470. Office of Research and Development, Washington, D.C. EPA/600R-03/086. August.

Appendix A
ALTERNATIVE PARTS

The following parts are available to meet unique soil conditions. See section 3.0 for a complete listing of the common tool configurations for the Geoprobe® Screen Point 15 Groundwater Samplers.

SP15 Sampler Parts and Accessories	**Part Number**
SP15 Drive Head, 0.5-inch bore, 1.25-inch rods	GW1513
SP15 Drive Head, 0.625-inch bore, 1.5-inch rods	14998
SP15 Drive Head, 1.0-inch rods	GW1515
Expendable Drive Points, aluminum, 1.625-inch OD (Pkg. of 25)	GW1555ALK
Expendable Drive Points, steel, 1.75-inch OD (Pkg. of 25)	17066K
Screen, PVC, 10-Slot	GW1530
Screen, Disposable, PVC, 10-Slot	16089

Groundwater Purging and Sampling Accessories	**Part Number**
Polyethylene Tubing, 0.25-inch OD, 500 ft	TB17L
Polyethylene Tubing, 0.5-inch OD, 500 ft	TB37L
Check Valve Assembly, 0.25-inch OD Tubing	GW4240
Check Valve Assembly, 0.5-inch OD Tubing	GW4220
Check Valve Assembly, 0.625-inch OD Tubing	GW4230
Water Level Meter, 0.375-inch OD Probe, 100-ft. cable	GW2001
Water Level Meter, 0.438-inch OD Probe, 200-ft. cable	GW2002
Water Level Meter, 0.375-inch OD Probe, 200-ft. cable	GW2003
Water Level Meter, 0.438-inch OD Probe, 30-m cable	GW2005
Water Level Meter, 0.438-inch OD Probe, 60-m cable	GW2007
Water Level Meter, 0.375-inch OD Probe, 60-m cable	GW2008

Grouting Accessories	**Part Number**
Grout Machine, auxiliary-powered	GS500

Probe Rods, Extension Rods, and Accessories	**Part Number**
Probe Rod, 1.25-inch x 36-inch	AT1236
Probe Rod, 1.25-inch x 1-meter	AT1239
Probe Rod, 1.5-inch x 1-meter	17899
Probe Rod, 1.5-inch x 48-inch	13359
Drive Cap, 1.5-inch rods (for GH40 Series Hammer)	15590
Rod Grip Pull Handle, 1.5-inch Probe Rods (for GH40 Series Hammer)	GH1555
Extension Rod, 36-inch	AT67
Extension Rod, 1-meter	AT675

Equipment and tool specifications, including weights, dimensions, materials, and operating specifications included in this brochure are subject to change without notice. Where specifications are critical to your application, please consult Geoprobe Systems®.

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STANDARD OPERATING PROCEDURE:

WELL AND PIEZOMETER INSTALLATION AND DOCUMENTATION

VERSION AUTHORED / DATE REVIEWED – Truslow Resource Consulting LLC, 12/1/15

REVIEWED BY / DATE – D. Truslow, WaterVision LLC and Truslow Resource Consulting LLC, 12/7/15

Total Pages: 5

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OPERATING PROCEDURE

WELLS & PIEZOMETER INSTALLATION AND DOCUMENTATION

1. PURPOSE

Piezometers are small-diameter observation wells, installed for the purpose of obtaining water level measurements in a discrete subsurface formation. The hydraulic information obtained from multiple piezometers allows evaluation of horizontal and vertical components of groundwater flow (flow direction and gradients). Piezometers can be installed as individual, stand-alone wells, arranged in a lateral array to monitor one hydrogeologic unit, zone, or formation. They can also be installed in clusters or nests in one location.

2. EQUIPMENT & SUPPLIES

The following materials are required for well and piezometer installation:

- Personal protective equipment
- Cleaning equipment (SOP 9)
- Weighted tape
- Water level indicator
- Sturdy nylon cable
- Pocket knife
- Digital camera
- Field notebook
- WaterVision LLC Well / Piezometer Installation Report
- 1-inch, 1.25-inch, or 2-inch inside diameter (ID) schedule 40 PVC with 0.010 inch factory-slotted screen. Screen segments should be a maximum of 5 feet long. Screen and riser should be O-ring sealed, flush-threaded, PVC. No glues or solvents should be used to assemble the well casing.
- Well sand pack and seal materials
    - U.S. Silica #1, #0, or #00N, or equivalent
    - Bentonite powder, chips, or pellets
    - Protective cover (roadway box, secured pipe guard)

3. PROCEDURE

Decontaminate equipment, if necessary, by thoroughly cleaning and scrubbing all Geoprobe equipment (probe rods, caps, etc.) with soap and water. Then complete a

final rinse of equipment with distilled water. Be sure to wear thick rubber gloves while cleaning equipment.

Please refer to WaterVision SOP 6 for groundwater sampling procedure.

3.1 Pre-Sampling Observations and Required Data Entries

A number of field measurements and observations should be made in the field when sampling groundwater. This information is listed below and will be recorded on a Well/Piezometer Installation Report. The following list of measurements and observations represents a minimum requirement for groundwater samples.

- Well Number/ID
- Date Installed
- Contractor
- Driller(s)
- Depth profile of Soil/Rock Conditions
- Piezometer construction details
- Elevation (if known)
- Photograph details (i.e. Picture number, orientation, subject matter, etc.)
- Latitude/Longitude (using GPS, collect Waypoint as well).
- Observable Physical Characteristics - Odor, Color, Cloudiness.
- Evidence of Stressed Vegetation, Wildlife, or Dumping.
- Ambient Weather Conditions during Sampling - Air Temperature, Atmospheric Conditions, Recent Precipitation or Drought.
- Samples Collected (enter all sample numbers collected at this location)
- Sample Depths

3.2 Single Well or Piezometer Installation Procedure

Please refer to SOP 1 Groundwater Monitoring Well Installation Using the Geoprobe.

1. Don personal protection equipment
2. Sample locations and analyses will be selected with respect to specific site conditions.
3. Identify sampling location in field notebook along with other appropriate information.

4. At the sample location, use GPS to collect Latitude/Longitude information.
5. Install the direct-push borehole, per subcontractor's standard practices and SOP 1.
6. Install screen and riser sections to the target depth.
7. Place sand pack material to 1 to 2 feet above the top of the screen section.
8. Place bentonite to form a 1- to 2-foot thick seal above the sand.
9. Hydrate the bentonite if sufficient groundwater is not present in the borehole.
10. Place clean backfill soil, additional bentonite, or grout to create final seal around the riser to ground surface.
11. Install protective cover and secure.
12. Install a surface seal of concrete around protective cover.
13. Notch and mark top of PVC riser, all water level measurements to be taken relative to this point.
14. Fill out Well/Piezometer Installation Report.

Concrete surface seals and protective casing installations (i.e. road box or protective stick up casing) may be required in accordance with site-specific conditions.

3.3 Piezometer Nest Installation Procedure

1. Don personal protection equipment.
2. Sample locations and analyses will be selected with respect to specific site conditions.
3. Identify sampling location in field notebook along with other appropriate information.
4. At the sample location, use GPS to collect Latitude/Longitude information as a 'Waypoint.'
5. Install a 6-inch to 10-inch (4 1/4-inch to 6 1/4-inch ID hollow-stem augers or casing) borehole per subcontractor's standard practices. Drill to depth of deepest piezometer.
6. Install the deepest piezometer to the base of the borehole, or to the target depth. (Note: if the bottom depth of the exploration is greater than 1 foot below the bottom depth of the deepest piezometer fill with sand to desired depth)
7. Place sand pack around the deepest piezometer screen to 1 to 2 feet above the top of the screen.

8. Install a minimum 2-foot thick bentonite seal on top of the sand pack (hydrate if necessary based on water level measurements obtained).
9. Install a minimum 6 inches of sand on top of the bentonite seal before placing the next screen. If gap exists between Piezometers depths, fill space with bentonite or grout dependent on length of gap.
10. Install the next-deepest piezometer to the desired depth.
11. Fill and seal around second piezometer as above.
12. Continue the above procedures for each multi-level piezometer installed.
13. Piezometer installation and seal placement should be performed as the augers or casing is withdrawn from the borehole. Do not install piezometers in an uncased hole, as this presents the possibility of caving and mixture of formation material with sandpack and seal materials, which will compromise the quality of the installation and therefore the data obtained.
14. Label each individual piezometer casings appropriately to prevent confusion regarding depth intervals measured.
15. Fill out a Well/Piezometer Installation Report for each piezometer.

Glossary

ID – Inside Diameter of well
PVC – Polyvinyl Chloride (i.e. composition of well pipe)

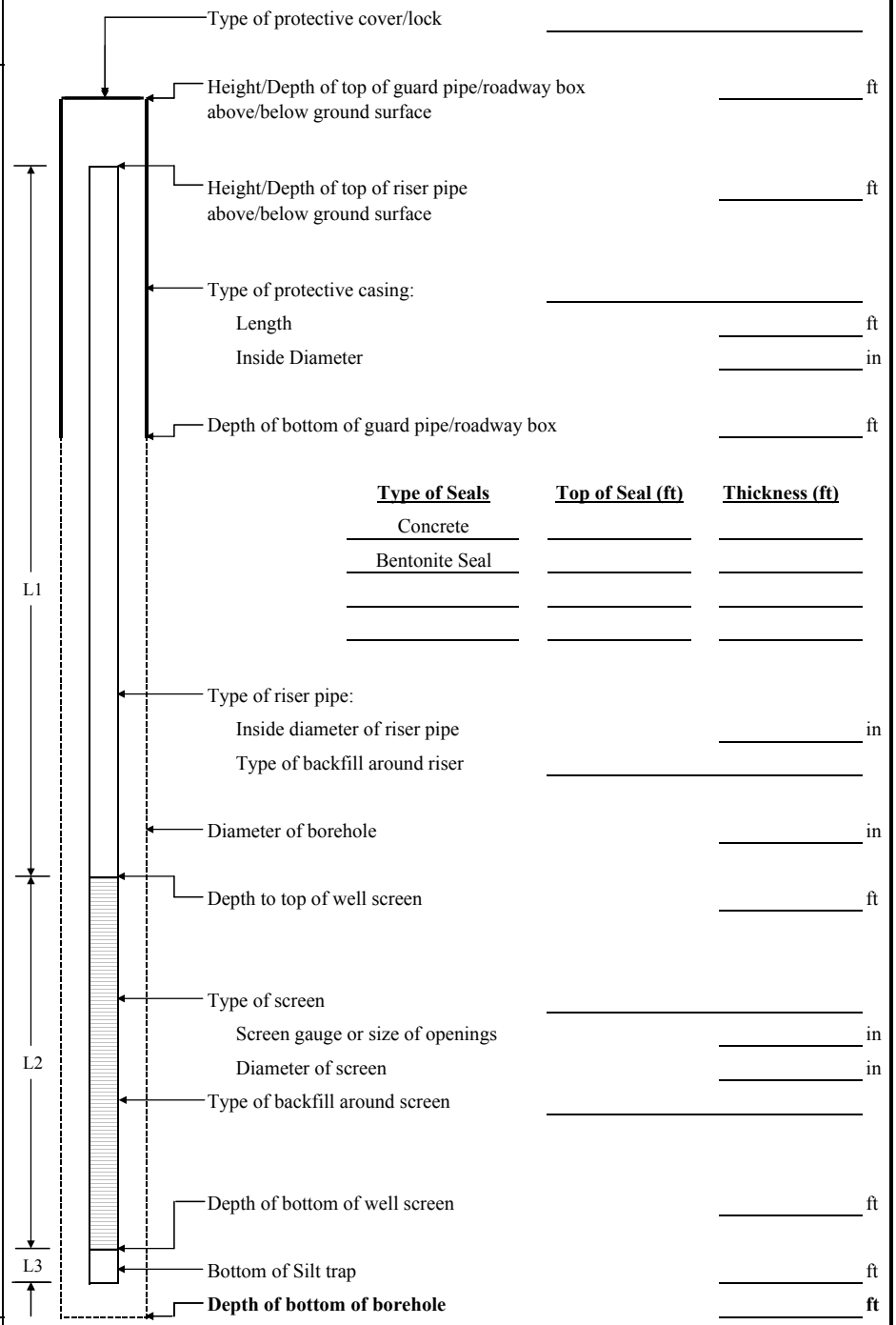
WWELL / PIEZOMETER INSTALLATION REPORT

Piezometer No.	
Boring No.	

PROJECT		**FILE NO.**	
LOCATION		**PROJECT MGR.**	
CLIENT		**FIELD REP. DATE**	
CONTRACTOR		**INSTALLED**	
DRILLER			

Ground El. ____ ft **El. Datum** ____	**Location** ____	☐ **Guard Pipe** ☐ **Roadway Box**

SOIL/ROCK CONDITIONS	**BOREHOLE BACKFILL**



Type of protective cover/lock ____

Height/Depth of top of guard pipe/roadway box above/below ground surface ____ ft

Height/Depth of top of riser pipe above/below ground surface ____ ft

Type of protective casing: ____

Length ____ ft

Inside Diameter ____ in

Depth of bottom of guard pipe/roadway box ____ ft

Type of Seals	**Top of Seal (ft)**	**Thickness (ft)**
Concrete		
Bentonite Seal		

Type of riser pipe: ____

Inside diameter of riser pipe ____ in

Type of backfill around riser ____

Diameter of borehole ____ in

Depth to top of well screen ____ ft

Type of screen ____

Screen gauge or size of openings ____ in

Diameter of screen ____ in

Type of backfill around screen ____

Depth of bottom of well screen ____ ft

Bottom of Silt trap ____ ft

Depth of bottom of borehole ____ **ft**

(Bottom of Exlporation)
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

ft	+	ft	+	ft	=	ft
Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length

COMMENTS: ____

STANDARD OPERATING PROCEDURE:
SLUG (HYDRAULIC CONDUCTIVITY) TESTING

VERSION AUTHORED / DATE REVIEWED – Truslow Resource Consulting LLC, 12/7/15

REVIEWED BY / DATE – D. Truslow, WaterVision LLC and Truslow Resource Consulting LLC, 12/7/15

Total Pages: 9

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OPERATING PROCEDURE:

SLUG TESTS

1. PURPOSE

1.1 Introduction

This operating procedure (OP) describes the protocol for performing slug tests (in-situ hydraulic conductivity tests, rising-head tests, falling-head tests) including preparation, collection of valid field data, and preliminary evaluation of the data.

A slug test is performed to assess the horizontal hydraulic conductivity of a water-bearing zone. Slug tests are accomplished by stressing the screened water-bearing zone through an "instantaneous" displacement of water (with a slug) or removal of water (with a bailer) and subsequently measuring the water level response in the well over time. A very rapid change in the water level in a well can be created using one of these field methods:

- Inserting and rapidly withdrawing a solid dense object (a.k.a. a slug). Solid slugs are the preferred option;
- Removing water using a bailer. Bailers should be used to remove water only if using a slug is not possible;
- Changing the air pressure in a well causing displacement of well fluids (pneumatic displacement method)

The method chosen will depend on project needs, equipment availability, water disposal/treatment options, pertinent laws and regulations, and operator experience.

The protocols that follow assume that field staff can effectively perform one of these methods for rapidly changing the water level in a well at the start of a slug test, and can then use either a manual or automatic procedure for measuring water level response over time. When practical strive to measure slug test response with automatic datalogger devices.

This OP provides only a guideline for performing slug tests. There are many factors that go into performing slug tests in the field and just as many factors that can affect the quality of the data collected. An experienced hydrogeologist or groundwater specialist should be consulted before preparing a slug test program or performing a slug test.

1.2 Considerations

Certain conditions or activities should be avoided when performing slug tests. In general, a person should **not** conduct any type of slug tests in a well if:

- The well contains a pipe, tube, or other obstruction in the depth range where the water level is anticipated to change
- The casing diameter in a well varies in the depth range where the water level is anticipated to change
- The water level in a well has not yet recovered to nearly static conditions (i.e., 90% or more) after a prior disturbance, (e.g., drilling, purging, development, previous well tests, etc.)
- Non-aqueous phase liquid (NAPL) is present in a well
- The water level in the well cannot be appreciably changed due to minimal slug size or volume, large well casing diameter, etc.

A ***rising-head*** test should generally **not** be conducted:

- If the slug or amount of water to be removed cannot be removed nearly instantaneously (i.e., if removal takes over 5% of the "90%-recovery" time)
- By pumping to remove water, unless the amount of water to be removed by the pump can be removed nearly instantaneously and any back-flush can be eliminated;
- By using bailers. If a bailer must be used, avoid:
  - using a bailer that has a leaky check valve
  - bailing multiple times instead of creating an instantaneous water level change
  - using a bailer with a diameter so close to that of the casing that groundwater is suctioned into the well while the bailer is raised.

Falling-head tests are generally not recommended due to inherent problems associated with reproducibility, the introduction of fluids, and general application restrictions. They are recommended in circumstances when no other option is available. Consult with the Project Manager or an experienced hydrogeologist before undertaking a falling-head test program.

2. EQUIPMENT & SUPPLIES

- A battery-operated water level measurement probe, marked in 0.01-foot increments
- Field books, appropriate field forms, clipboards, rulers, graph paper, calculator, etc.
- Site maps (property lines, wells, topography, etc.), as needed
- Site-access and well-cap keys, as needed
- A clean bailer or a solid or sealed slug
- Clean rope or string for raising and lowering a bailer or slug
- Appropriate container for withdrawn groundwater and/or decontamination fluids
- Tools necessary for well access (shovel, bolt-cutters, etc.)
- For flowing artesian wells: duct tape, couplings, and extra casing of appropriate diameter for increasing casing height so as to enable measurement of a SWL. (NOTE: Tests on artesian wells are identical to other testing if the casing can be raised to a level above the well's static water level surface. If not, alternative methods such as measurement of pressure may be performed. Appropriate literature or methodologies should be consulted when performing such alternative testing.)
- Data logger and laptop computer with fully charged battery (if required)
- Pressure transducer of appropriate pressure range for the depths of water to be tested, if needed
- Clamps, tape, cable ties, or rope to secure the transducer cable to the well casing

3. PROCEDURE

3.1 Pre-testing Preparatory Activities

There are a number of preliminary steps that should be taken prior to conducting slug tests. These include, at a minimum, the following:

- Clear all necessary access issues (permission, physical access, permits, etc.).

- Gather all necessary equipment, materials, and tools necessary to adequately perform the tests.
- Identify the monitoring wells, piezometers, or other monitoring points to be used in tests.
- Gather all necessary installation information on the well to be tested and all monitoring.
- Decontaminate all necessary equipment before entering the site or performing tests in accordance with the Work Plan, if required. As necessary or required, decontaminate all impacted equipment prior to tests, between test locations, and after testing is completed. If decontamination cannot or will not be performed and dedicated equipment will not be used then proceed with testing from the least contaminated to most contaminated locations to minimize cross-contamination.
- Determine the most appropriate method to dispose of decontamination water in accordance with the Work Plan, if required. If potentially contaminated, the water should be containerized for subsequent characterization and proper disposal or treatment in accordance with applicable regulations.
- Synchronize all time devices including watches, computer clocks, datalogger and transducer clocks, etc.

Other information potentially needed for proper slug test data interpretation includes:

- Depth-interval of screen or open section in well
- Sandpack porosity (if water levels intersect screen)
- Sandpack diameter (if water levels intersect screen)
- Stratigraphic horizon materials and elevations
- Hydraulic conductivity of bounding low-hydraulic conductivity units, if present
- Ground-surface elevation
- Typical or historical groundwater elevations or depths-to-water

3.2 Procedure

The steps for conducting a slug test are as follows. An attempt to utilize dataloggers to collect water level measurements should be made if at all possible. Manual measurements should only be used if absolutely necessary or to collect back-up data.

1. Follow all required “Pre-Test Preparatory Activities”, as warranted.
2. Measure and record the Static Water Level (SWL) of the well to be tested, in accordance with **SOP 7 - Groundwater Level Measurement**

3. Test the pressure transducer and data logger, and obtain well-bottom pressures/water column heights and SWL pressures, using the following steps. **NOTE**: attention must be paid to the maximum allowable immersion depth (i.e., the manufacturer specifications for acceptable pressure range of the transducer, where 1 psi = 2.311 feet of water):

   - Place the pressure transducer at least several feet below the top of water as well as below the projected depth of the lowest part of the bailer or slug to be used.
   - Make pressure readings until three uniform values are read consecutively.
   - Raise the datalogger one (1) foot from its original position. View the pressure reading to confirm that the change in position was accurately reported by the transducer.
   - Lower the pressure transducer to the base of the well, and measure and record the pressure/height of water column. Again, refer to note above regarding maximum allowable immersion depth.
   - Return the transducer to its original position and secure the suspension cable to the well casing. Again, make pressure readings until three uniform values are read consecutively. Compare with the original readings to make sure no drift occurs.

4. Perform the following pre-test activities for a ***rising-head*** test:

   - Allow the slug (or bailer) that will be used to move down into the groundwater. (Fully immerse the bailer if possible. If there is not enough water in the well for the bailer to be fully immersed, then let the bottom of the bailer gently come to rest on the well bottom, or a few inches above the well bottom. Prevent agitation of sediment on the bottom of the well, as sediment in the bailer may keep the check valve from properly sealing.) I don't see how it can ever get to the bottom if the transducer is supposed to be below it
   - Measure falling pressures during recovery using the pressure transducer until the water level in the well re-equilibrates. IMPORTANT: the water level in the well should be allowed to return to near-static conditions (within 0.02 feet) before initiating test.

5. Start the slug test by creating a nearly instantaneous displacement in water level:

   - Pull the bailer or slug rapidly upwards, either removing it from the well or securing/suspending it within the well several feet above the SWL.
   - Simultaneously pull bailer and to displacing the water, initiate the datalogger, beginning the measuring/recording of rising water levels in the well at the predetermined time frequencies (a logarithmic time scale is usually employed).

- If a bailer is used, listen for cascading water while the bailer is being raised or is suspended. This is a sign of check-valve failure. If failure occurs, clean and repair the valve and start over.

- If a bailer is used, measure the volume of water removed by the bailer after retrieval.

6. Continue measuring the water levels as they change over time until the water in the well rises or falls to the limit specified in the Project Work Plan (usually 90% recovery or one hour, whichever comes first). A pre-set logarithmic sampling interval, with increasing intervals of time, is ideal, usually predetermined by the datalogger's default setup.
7. Compare the volume of groundwater recovered in the bailer, if one is used, with the volume of groundwater estimated to have been removed from the well (V) based on the initial recorded water-level displacement (H) and borehole radius (r), (e.g., $V=H\pi r2$). If, for a rising-head test, the static water level lies within the screened section of the well, then the sandpack porosity (n) and radius (R) should be accounted for also in the volume calculation, (e.g., $V=H\pi r2 + nH\pi(R-r)2$). A similar comparison can be performed if a slug is used in a falling-head test. If the volume recovered and the calculated volume does not reasonably correlate, based on site-specific conditions, the test should be performed again.
8. Record all general and pertinent test data in a field book or on appropriate forms.
9. Decontaminate all necessary equipment in accordance with the Work Plan.
10. Properly containerize and label spent decontamination fluids or groundwater removed from the well in accordance with the Work Plan or other considerations.
11. Lock all well caps and secure the site as needed.
12. Submit the slug-test data to a qualified scientist or engineer assigned by the Project Manager for interpretation. The data should be interpreted by an experienced hydrogeologist. Calculations should be based on an appropriate model for the known hydrogeologic conditions in the field.

Any variations from these procedures should first be approved by the Project Manager.

3.3 Field Documentation

The following data should be obtained prior to heading into the field and/or in the field during slug tests and recorded appropriately (either on appropriate forms, in a field book, and/or onto an electronic form coped to computer disk):

- Client name
- Site name and location
- Test company, if applicable

- Name of field staff performing the test
- Test date and time
- Well ID
- Well location
- Well casing, screen and borehole diameter
- Well screen or open-hole section diameter
- Total depth of well
- Any unusual well, weather, or hydrologic features or conditions
- Height (measured distance) of well riser or reference point above or below grade
- Test procedure used (solid slug or pneumatic)
- Storage, transport, and disposal methods for any water removed
- Well drilling method (hollow-stem auger, mud rotary, etc.)
- Decontamination procedures
- Problems and solutions to problems encountered during testing
- Static water level
- Slug volume

REFERENCES

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STANDARD OPERATING PROCEDURE:

GROUNDWATER FIELD SAMPLING/ PARAMETER ANALYSIS, LABORATORY SAMPLE COLLECTION, FIELD SAMPLING SHEETS, AND SAMPLE HANDLING

VERSION AUTHORED / DATE REVIEWED – Truslow Resource Consulting LLC, 12/1/15

REVIEWED BY / DATE – D. Truslow, WaterVision LLC and Truslow Resource Consulting LLC, 12/7/15

Total Pages: 7

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OPERATING PROCEDURE

GROUND WATER QUALITY SAMPLING

1. PURPOSE

Collect verifiable field water quality data and water samples for laboratory analyses. The information obtained will be used to evaluate baseline and subsequent groundwater quality.

2. EQUIPMENT & SUPPLIES

The following materials are required for surface water quality sampling:

- Personal protective equipment (nitrile sampling gloves)
- Cleaning equipment (de-ionized water (DI), Alconox
- Laboratory provided sample bottles with labels
- 30 mL polyethylene or polycarbonate sample bottles for stable isotope analysis
- 0.1 micron in-line filters
- Cooler with ice
- Chain of custody form
- YSI 556 Multi-parameter meter (or comparable YSI meter) and calibration standards
- YSI Flow Cell
- Solinst Peristaltic Pump (or comparable peristaltic pump) with extra batteries and flexible silicon tubing
- Solinst Micro Water Level (or comparable water level)
- Other tubing for piezometers as needed
- 1-liter glass jar for sample collection and decanting
- 5-gallon bucket
- plastic milk crate (or similar to raise peristaltic pump to height of 5-gallon bucket)
- Digital Camera
- GPS
- Field notebook, field sampling data sheets, and writing implements

3. PROCEDURE

3.1 Preparing for a Sampling Round

At least two days before a sampling event contact the laboratory to request sampling bottles, cooler, and de-ionized water. In addition, provide the laboratory with sample identification numbers and summary of laboratory analyses requested. Gather, charge and test (if applicable) all equipment and supplies listed above. No more than 24 hours before a sampling round, calibrate sampling instrument(s) per the

manufacturer's specifications[1]. Check to make sure ample standard is available and that all standards are within expiration date.

When bottles are picked up from the laboratory, before leaving the lab, check bottles provided and labeling against the sampling plan to assure all bottles have been provided and are properly labeled. Check chain of custody form for accuracy as well. Request additional blank COC forms in case of damage during sampling. Check for other requested materials such as extra bottles and de-ionized water. Record results of calibration and date of standard expiration in project field book.

3.2 Calibration of Field Sampling Instruments – Sampling Event

1. Fill out field sampling sheet with date, weather, sampler, and other relevant field observations. Record all calibration checks on field sheet.
2. Calibration
    - Calibrate dissolved oxygen, pH, conductivity and oxidation/reduction potential (ORP) the day before the sampling day according to the YSI Manual.
    - Check the pH, conductivity and oxidation/reduction potential (ORP) against a known standard prior to the first measurement of the day and recalibrate if necessary.
3. End of the Day Meter Checks
    - Re-check and record a reading of the dissolved oxygen, pH, conductivity and ORP against a known standard at the conclusion of each sampling day to document any drift in instrument readings.

3.3 Pre-sampling Protocol, Observations, and Required Data Entries

Label laboratory provided bottles before the sample is taken while the sample bottle is still completely dry. The laboratory will provide pre-labeled bottles with sample location and analysis, but spaces are provided for time (military time), date and sampler's initials.

A number of field measurements and observations should be made in the field when sampling groundwater. This information is listed below and will be recorded in the field book. The following list of measurements and observations represents a minimum requirement for groundwater samples. Ensure that all information below has been recorded in the field notebook prior to leaving the site. Samples to be collected in the various rounds are included in the body of the associated QAPP.

■ Sample location/ID

■ Date/Time sample collected

■ Water Level before, after, and throughout purging

■ Calculation of amount of water to be purged (3 well volumes) before sampling

■ Volume of water purged throughout process

■ Elevation (if known)

■ Photograph details (i.e. Picture number, orientation, subject matter, etc.)

■ Latitude/Longitude (using GPS, collect Waypoint as well).

■ Observable Physical Water Characteristics - Odor, Color, Cloudiness.

■ Evidence of Stressed Vegetation, Wildlife, or Dumping at sampling site.

■ Ambient Weather Conditions during Sampling - Air Temperature, Atmospheric Conditions, Recent Precipitation or Drought.

■ Samples Collected (enter all sample numbers collected at this location)

Clean the YSI Flow Cell

Prior to use and after use the YSI Flow Cell should be cleaned using the following instructions:

1. Remove the probe from the flow cell
2. Take apart the flow cell by releasing the two locking arms on either side
3. Remove the clear tube from the bottom part of the flow cell that each part can be cleaned and rinsed. Use a mild detergent and water to clean the flow cell parts.

3.4 Sampling Protocol

Groundwater samples will be collected from all monitoring wells and piezometers at each location as detailed in the Sampling Plan.

The up gradient well will be sampled first, followed by the down gradient wells. If it is determined after the first round of sampling that the up gradient well is not the least contaminated, then the next round of sampling will start with whichever well is the least contaminated.

1. Complete meter calibration and record on field sheet.
2. Open all wells and piezometers and record the baseline water levels at each. Allow ample time for water levels to equilibrate to atmospheric pressure (five or more minutes). See SOP 7 for additional detail as needed.
3. Calculate the volume of water that needs to be purged at each well prior to taking a sample using the borehole diameter so that formation water is sampled. (3 well volumes)
4. Start at the up gradient well and set up the peristaltic pump or submersible pump, per the manufacturer's instructions.
5. Begin to purge the well using the peristaltic pump per the manufacturer's instructions. Observe if there is any sediment in the purged groundwater. Once groundwater is fairly clear TURN OFF the pump and attach the YSI Flow Cell using the following instructions:
    a. Turn off the peristaltic or submersible pump so that no water is flowing through the tubing
    b. Put on nitrile gloves
    c. Remove the probe guard or calibration cup from the YSI probe body so the sensors are exposed. Rinse the sensors with DI water.

d. Make sure that the threads and the o-rings of both the probe body and the flow cell are clean and free of any particles such as sand or grit.

e. Insert the probe body into the top of the flow cell being careful not to bump or scrape the sensors on the sides of the flow cell.

f. Screw the probe into the flow cell by turning the probe clockwise until it is firmly tightened into place.

g. Install the Quick Connect tube fittings on the flow cell by inserting them into the Quick Connect coupling body. They should snap into place.

h. Connect the tubing on the Quick Connect tube fittings, making sure that the tubing is pushed securely onto the fittings.

6. Record (on field data sheet) field parameters (pH, specific conductance, temperature, dissolved oxygen, and oxidation/reduction potential.

   In addition, describe and record color, odor, and cloudiness of sample.

7. Continue to purge the well recording field parameters at 2- liter intervals intervals. *If water levels are dropping too rapidly, slow or stop the pumping rate to allow water level to recover. Record any time when this is done.

8. Once 3 well volumes have been purged AND field parameters in the water samples have stabilized (< +/- 10% change), fill water sample bottles to be analyzed in the laboratory.

9. Fill all labeled sample bottles for laboratory analysis. Be careful not to overtop the bottles when filling them, particularly bottles containing preservative, as overtopping them could flush out the acid preservative.

10. Record on the data sheet and on the bottle label, the date and time that each sample was collected

11. Place all filled water sample bottles on ice in the cooler as soon as possible after collection and ensure the top of the cooler is tightly closed and keep at approximately 4C until delivery to the laboratory.

12. Collect and field analyze duplicate field sample (1 duplicate field sample will be collected per sampling event)

13. Record final water level and close well.

14. Pump deionized water (DI) through the flow cell to prevent cross-contamination between wells.

15. Fill out chain of custody form and field sampling form at each station.

16. Check chain of custody form at the end of the sampling day for completeness and accuracy.

17. Deliver samples to laboratory. Sign chain of custody form and obtain a laboratory executed copy for QA/QC.

18. After completion of sampling, copy and scan field data sheets, field book notes, chain of custody and any other pertinent materials and place into project notebook and into computer project file. Send email to co-project managers with attached data sheets.

19. Based on field observations/conditions, recommend changes to sampling locations, specifications as needed.

3.4.1 Sampling, Handling, and Shipping Protocol for N Stable Isotope Sample Collection

1. At time of sampling, place a 0.1 micron in-line filter onto the pump tubing and fill a 30mL polyethylene or polycarbonate bottle (and a duplicate) leaving enough space at the top to allow for expansion during freezing.
2. Place samples in cooler with ice at a temperature of about 4 degrees Celsius while in the field.
3. After returning from the field, chill the samples for the first 12-24 hours prior to freezing.
4. After 24 hours freeze samples until time to ship.
5. When shipping samples adhere to the following instructions:
    - carefully pack small sets of samples in ziplock bags
    - pack these sets in a larger hard-walled cooler, wrapped in bubble wrap, or Styrofoam insulated shipping kit
    - place interior cooler into a larger hard-walled exterior cooler; make sure samples are well cushioned on all sides
    - add blue ice blocks, cold packs, or ice blankets for packages sent by Overnight or 1-day delivery
    - Dry ice is advisable for delivery times exceeding 2 days. Pack about 15-20 pounds of dry ice for the first 24 hours of transit, plus an additional 5-10 pounds of dry ice for each additional day of transit.
    - fill any remaining ‘air space’ in the cooler with newspaper or other filler to slow sublimation and protect against damage

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Field Sampling Sheet

USEPA Region 1
Permeable Reactive Barrier Site Evaluation Project
Groundwater Sampling Field Data Sheet

Site ID: _____ Well ID: _____ Well Volume to be Purged:
Sampler(s): _____ Date: _____ Start Time: _____ End Time: _____
Weather Conditions (air temperature, atmospheric conditions, precipitation): Static WL: _____ Post-Sampling WL: _____

Initial Meter Check Values (only need to record once per site)
Conductivity: _____ Time:_____
pH: _____ Time: _____
DO: _____ Time: _____
ORP: _____ Time: _____

End of Day Meter Check Values (only need to record at end of day)
Conductivity: _____ Time:_____
pH: _____ Time: _____
DO: _____ Time: _____
ORP: _____ Time: _____

Volume Purged (gallons)	Time Sampled	Temp. °C	pH	Dissolved Oxygen (% sat)	Dissolved Oxygen (mg/L)	Specific Conductance (uS)	Oxidation/Reduction Potential (mV)	Observable Physical Characteristics (odor, color, cloudiness

Laboratory Samples:				
Volume Purged (gallons)	**Water Level (m)**	**Time Sampled**	**# of Bottles**	**Parameters:**

STANDARD OPERATING PROCEDURE:

GROUNDWATER LEVEL MEASUREMENT

VERSION AUTHORED / DATE REVIEWED – Truslow Resource Consulting LLC, 12/1/15

REVIEWED BY / DATE – D. Truslow, WaterVision LLC and Truslow Resource Consulting LLC, 12/7/15

Total Pages: 1

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OPERATING PROCEDURE
GROUNDWATER LEVEL MEASUREMENT

1. PURPOSE

Collect groundwater level measurements during purging of groundwater monitoring wells and piezometers and sampling for water quality. The information obtained will be used to adjust the purging rate of groundwater monitoring wells and to supplement groundwater quality data.

2. EQUIPMENT & SUPPLIES

The following materials are required for measuring groundwater levels:

- Cleaning equipment (de-ionized water (DI), Alconox)
- Solinst Micro Water Level (or comparable water level)
- Field notebook, field sampling data sheets, and writing implements

3. PROCEDURE

1. Open well cap and allow groundwater levels to equilibrate for 5 minutes before taking a water level measurement.
2. Turn on the water level meter and press the TEST button to ensure that you can hear the tone made when water is encountered by the probe. If you cannot hear the tone, turn the dial to increase the volume.
3. Rinse the water level probe with deionized water and/or alconox prior to taking the first measurement at each well to prevent cross-contamination.
4. Lower the probe into the well slowly until you hear a solid tone. Slowly pull up the probe until the exact point where the tone stops. Read the probe measurement tape and record onto appropriate field sheet
5. Remember to rinse the water level probe with deionized water and/or alconox before moving to a new well.

STANDARD OPERATING PROCEDURE:

NITRATE HACH KIT TESTING

VERSION AUTHORED / DATE REVIEWED – USEPA, 4/16/14

REVIEWED BY / DATE – D. Truslow, WaterVision LLC and Truslow Resource Consulting LLC, 12/7/15

Total Pages: 13

Standard Operation Procedure for Measuring
Ammonia using Ammonia0 – 6.0mg/L (Nitrogen) Hach® 0 – 6.0mg/L Test Kit
colorpHast® Indicator Strips pH 0-14
Total Chlorine using Total and Free Chlorine 0 – 10.0 mg/L Hach® Test Kit
Free Chlorine using Total and Free Chlorine 0 – 10.0 mg/L Hach® Test Kit
Nitrate using Nitrate 0 – 50 mg/L Nitrite 0 – 3.0 mg/L Hach® Test Kit
Nitrite using Nitrate 0 – 50 mg/L Nitrite 0 – 3.0 mg/L Hach® Test Kit
Phosphate using Phosphate 0 – 50 mg/L Hach® Test Kit
Total Chlorine using Total Chlorine Micro Check™ HF Scientific, Inc.

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Prepared by: _____ 4/16/14
Erin Trainor – Environmental Engineer Date

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Revision Page

Date	Rev#	Summary of Changes	Sections
4/20/12	0	Initial Approval	
4/16/14	1	Add information for Total Chlorine Micro Check™ test strips	2.0, 6.0, 7.0

Table of Contents

1.0 Scope & Application:

1.1 This Standard Operating Procedure is applicable to the screening of water (and liquid) samples for ammonia, pH, total chlorine, free chlorine, nitrate, nitrite, and phosphate using test strips. Ammonia is a product of microbiological decay of plant and animal protein. Its presence in raw surface waters may indicate domestic or agricultural pollution. pH is a characteristic of how acidic or basic a water sample is. It helps to determine the solubility of chemical constituents in water. Chlorine exists in water as free chlorine or total chlorine. It is used for disinfecting as well as sanitizing water. Nitrates and nitrites combine with various organic and inorganic compounds. The greatest use of nitrates is as a fertilizer. Once taken into the body, nitrates are converted to nitrites. Phosphates may enter water from agricultural run-off and as biological and industrial wastes. Too much phosphate in water can contribute to eutrophication. Determining the concentration of ammonia, hydrogen ions, total chlorine, free chlorine, nitrate, nitrite, and phosphate in surface water is useful in understanding water quality. In the field, technicians can test many samples in only a few minutes, and make immediate evaluations on-site.

2.0 Summary of Method[1]:

2.1 The Ammonia Hach® test strips react with reagents on the test strip to produce a color, where an increasing color intensity represent a different concentration of ammonia. The color steps provided with the test strips represent 0, 0.25, 0.5, 1, 3, and 6 parts per million (ppm).

2.2 The pH indicator strips react with reagents on the test strip to produce a color on four different squares. The color steps provided with the test strips represent a pH value of 0 through 14.

2.3 The Total and Free Chlorine Hach® test strips react with reagents on the test strip to produce a color, where an increasing color intensity represent a different concentration of both free and total chlorine. The color steps provided with the test strips represent 0, 0.5, 1.0, 2.0, 4.0 and 10.0 ppm.

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[1] The use of trade names or commercial products does not constitute endorsement by the U.S. EPA.

2.4 The Nitrate and Nitrite Hach® test strips react with reagents on the test strip to produce a color, where an increasing color intensity represent a different concentration of both nitrate and nitrite. The color steps provided with the test strips represent 0, 1, 2, 5, 10, 20, 50 ppm of nitrate and 0, 0.15, 0.3, 1.0, 1.5, 3.0 ppm of nitrite.

2.5 The Phosphate Hach® test strips react with reagents on the test strip to produce a color, where an increasing color intensity represent a different concentration of phosphate. The color steps provided with the test strips represent 0, 5, 15, 30, 30 ppm.

2.6 The Phosphate Hach® test strips react with reagents on the test strip to produce a color, where an increasing color intensity represent a different concentration of phosphate. The color steps provided with the test strips represent 0, 5, 15, 30, 30 ppm.

2.7 The Total Chlorine Micro Check™ test strip react with reagents on the test strip to produce a color, where an increasing color intensity represent a different concentration of total chlorine. The color steps provided with the Total Chlorine Micro Check™ test strips have the option to be used to determine low range concentrations: 0.0, 0.05, 0.1, 0.15, 0.2, 0.5, and 1.0 ppm or higher range concentrations: 0.0, 0.1, 0.2, 0.5, 0.8, 4.0, and 10.0 ppm.

3.0 Health and Safety Warnings:

3.1 When working with potentially hazardous materials or situations, follow EPA, OSHA, and specific health or safety procedures.

3.2 All proper personal protection clothing and equipment including nitrile or latex gloves and eye protection are to be worn.

3.3 When sampling lagoons or surface impoundments containing known or suspected hazardous substances, take adequate precautions. The sampling team member collecting the sample should not get too close of the edge of the impoundment, where bank failure may cause them to lose their balance.

3.4 Some samples may contain biological and chemical hazards. These samples should be handled with suitable protection to skin, eyes, etc.

4.0 Interferences:

4.1 Interference may result from using contaminated equipment, solvents, reagents, sample container, or sampling in a disturbed area. See specific user manual/instruction on specific interference. Any suspected interference should be noted in logbook or field datasheet.

4.2 Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment and proper PPE. If this is not possible or practical, then decontamination of the sampling equipment is necessary.

4.3 All sampling equipment must be routinely demonstrated to be free from contaminants under the conditions of the analysis by running equipment blanks.

4.4 Concentrations may be dependent on the characteristics of the water, and many variables such as salinity, organic load, temperature, pH, and sunlight may impact the concentration detected by the test strip. For example, saline waters usually contain an appreciable chlorine demand, due in part to oxidation of carbon and nitrogen-containing compounds. For most accurate results it is necessary to conduct test strip analysis as early as possible after retrieving the sample and not exceeding 15 minutes after sample collection.

5.0 Personnel Qualifications:

5.1 All full time EPA field samplers working at Superfund sites are required to take a 40 hour health and safety training course and a refresher course prior to engaging in any field activities. Other non superfund sites may require more or less H&S requirements. EPA Interns are required to attend H&S training provided by the agency H&S officer or his/her representative.

5.2 The field sampler should be trained and evaluated by an experienced sampler before initiating the procedure.

5.3 All personnel shall be responsible for complying with all necessary quality assurance/quality control requirements that pertain to their organizational/technical function.

CAPE COD PERMEABLE REACTIVE BARRIER
INITIAL HYDROGEOLOGIC SITE CHARACTERIZATION RESULTS AND EVALUATION OF SITE SUITABILITY FOR PERMEABLE REACTIVE BARRIER INSTALLATION

Appendix B

Well Construction, Location and Continuous Core Logs

- Well/ piezometer construction details tables
- Establishment of Cape Code PRB Initial Site Characterization Benchmark Elevations
- List of Latitude and Longitude of Wells and Piezometers at ISC Sites
- Summary of unique hydrogeologic units at ISC sites
- Detailed piezometer locations maps
- Well construction diagrams for water table wells
- Combined piezometer continuous core log, screens, with selected water quality data

Well/Piezometer Construction Details - Barnstable Well Installation - January 2016							
Well designation	**Date of installation**	**Total Depth of boring/ core (ft)**	**Surveyed land surface elevation (ft msl)***	**Total depth of well (ft)**	**Top of screen (feet bls)****	**Bottom of screen (feet bls)**	**Elevation of bottom of screened interval (ft msl)**
PC-1	1/19/20	25	12.09	15	10	15	-2.9
PC-2	1/21/20	25	7.71	13	8	13	-5.3
PC-4	1/20/20	90	12.78	13	8	13	-0.2
PCZ-13	1/21/20	13	12.19	13	12	13	-0.8
PCZ-23	1/21/20	23	12.30	23	22	23	-10.7
PCZ-30	1/21/20	30	12.38	30	29	30	-17.6
PCZ-35	1/21/20	35	12.54	35	34	35	-22.5
PCZ-43	1/21/20	43	12.64	43	42	43	-30.4
PCZ-50	1/21/20	50	12.78	50	49	50	-37.2
PCZ-60	1/20/20	60	12.70	60	59	60	-47.3
PCZ-70	1/20/20	70	12.58	70	69	70	-57.4
PCZ-80	1/20/20	80	12.48	80	79	80	-67.5
PCZ-88.5	1/20/20	90	12.35	88.5	87.5	88.5	-76.2
PC-6	1/21/20	25	11.28	11	11	16	-4.7
PC-7	1/19/20	25	13.30	14	9	14	-0.7

* field surveyed to NAVD 88 by CEI - March 2016

** bls - below land surface

Well/Piezometer Construction Details - Dennis-Vinland Well Installation -February 2016									
Well Designation	**Date of installation**	**Top of PVC Casing (ft msl)**	**Total Depth of boring/ core (ft)**	**Total depth of well (ft)**	**Top of screen (ft bls)****	**Bottom of screen (feet bls)**	**Depth to top of shallow clay layer**	**Elevation of top of screen (ft msl)**	**Elevation of bottom of screen (ft msl)**
VL-1	2/19/16	40.03	50	40	35	40	46.8	5.0	0.0
VL-2	2/19/16	44.68	46	46	41	46	48.5	3.7	-1.3
VL-3	2/20/16	44.01	50	44	39	44	45.2/46.7	5.0	0.0
VL-4	2/17/16	43.16	50	43	38	43	45.6	5.2	0.2
VL-5	2/17/16	40.22	50	40	35	40	45	5.2	0.2
VL-6	2/19/16	43.41	50	35	40	40	47.2	3.4	3.4
VLZ-44	2/18/16	44.70	44	44	43	44		1.7	0.7
VLZ-48	2/18/16	44.71	48	48	47	48		-2.3	-3.3
VLZ-52	2/18/16	44.67	52	52	51	52		-6.3	-7.3
VLZ-56	2/18/16	44.63	56	56	55	56		-10.4	-11.4
VLZ-61	2/18/16	44.62	61	61	60	61		-15.4	-16.4
VLZ-66	2/18/16	44.72	66	66	65	66		-20.3	-21.3
Piezometers installed adjacent to VL-2									
VLZ-core	2/18/16		80				48.5		
* benchmark elevation estimated based on CCC 2' contours									
** bls- below land surface									

Well/Piezometer Construction Details - Sailfish Well Installation - January and February 2016

Well Designation	Date of installation	Top of PVC Casing (ft. msl)*	Total Depth of boring/ core (ft)	Total depth of well (ft)	Top of screen (feet bls)**	Bottom of screen (feet bls)	Elevation - Top of Screen (ft. msl)	Elevation - Bottom of Screen (ft. msl)
SF-1	2/1/16	19.32	35	22	17	22	2.32	-2.68
SF-2	2/2/16	17.84	78	21	16	22	1.84	-4.16
SF-3	2/4/16	23.62	26	26	21	26	2.62	-2.38
SF-4	2/4/16	23.04	27	27	22	27	1.04	-3.96
SF-5	2/4/16	26.11	30	17	23	28	3.11	-1.89
SF-5D	2/11/16	26.42	41	41	36	41	-9.58	-14.58
SF-6	2/1/16	26.97	40	29	24	29	2.97	-2.03
SFZ-19	2/10/16	18.50	19	19	18	19	0.50	-0.50
SFZ-24	2/10/16	18.39	26	26	25	26	-6.61	-7.61
SFZ-30	2/10/16	18.26	33	33	32	33	-13.74	-14.74
SFZ-36	2/10/16	18.19	40	40	39	40	-20.81	-21.81
SFZ-42	2/10/16	18.10	45	45	44	45	-25.90	-26.90
SFZ-48	2/10/16	18.04	50	50	49	50	-30.96	-31.96
SFZ-54	2/10/16	18.05	57	57	56	57	-37.95	-38.95
SFZ-67	2/3/16	18.07	67	67	66	67	-47.93	-48.93
SFZ-77	2/3/16	17.95	78	77.5	76.5	77.5	-58.55	-59.55

* Surveyed to NAVD88 by CEI	
** bls- below land surface	

Well/Piezometer Construction Details - Mashpee Well Installation - January and February 2016									
Well Designation	**Date of installation**	**Total Depth of boring/ core (ft)**	**Well Diameter (inches)**	**Approximate land surface elevation (ft msl)***	**Total depth of well (ft)**	**Top of screen (feet bls)****	**Bottom of screen (feet bls)**	**Elevation-Top of Screen (ft. msl)**	**Elevation - Bottom of Screen (ft. msl)**
TL-1	1/26/16	35	2	19.27	23	18	23	1.7	-3.3
TL-2	1/26/16	40	2	25.17	27	22	27	3.4	-1.6
TL-3	1/27/16	25	2	10.96	14	9	14	2.1	-2.9
TL-4	1/27/16	100	2	12.43	16	11	16	1.6	-3.4
TL-5	1/27/16	30	2	13.64	17	12	17	1.9	-3.2
TL-6	1/27/16	20	2	6.23	10	5	10	1.4	-3.6
TL-7	2/11/16	45	2	31.33	33	28	33	3.7	-1.3
Piezometers installed adjacent to TL-4									
TLZ-14	2/11/16	14	1	12.57	14	13	14	-0.5	-1.5
TLZ-22	2/11/16	22	1	12.38	22	21	22	-8.5	-9.5
TLZ-31	2/11/16	31	1	12.36	31	30	31	-17.5	-18.5
TLZ-40	2/11/16	40	1	12.51	40	39	40	-26.4	-27.4
TLZ-50	1/28/16	50	1	12.64	50	49	50	-39.2	-40.2
TLZ-60	1/28/16	60	1	12.94	60	59	60	-46.1	-47.1
TLZ-70	1/28/16	70	1	13.10	70	69	70	-56.0	-57.0
TLZ-80	1/28/16	80	1	13.25	80	79	80	-65.9	-66.9
TLZ-90	1/28/16	90	1	13.47	90	89	88.5	-75.8	-76.8
TLZ-100	2/11/16	100	1	13.31	100	99	100	-85.8	-86.8

* Wells surveyed by CEI, Benchmark elevation estimated from CCC-provided 2-foot contour data

** bls - below land surface

Well/Piezometer Construction Details - Lonnies Pond, Orleans Well Installation - January and February 2016

Well Designation	Date of installation	Top of PVC Casing (ft. msl)*	Total Depth of boring/ core (ft)	Total depth of well (ft)	Top of screen (feet bls)**	Bottom of screen (feet bls)	Elevation - Top of Screen (ft. msl)	Elevation - Bottom of Screen (ft. msl)
LP-2	2/25/16	22.13	35	18	13	18	9.1	4.1
LP-3	2/25/16	15.08	35	15	10	15	5.1	0.1
LP-4	2/25/16	11.09	27	11	6	11	5.1	0.1
LP-5	2/25/16	8.00	25	10	5	10	3.0	-2.0
LP-6	2/26/16	32.05	40	30	25	30	7.1	2.1
LPZ-10	2/25/16	11.27		10	9	10	2.3	1.3
LPZ-15	2/24/16	11.49		15	14	15	-2.5	-3.5
LPZ-21	2/24/16	11.59		21	20	21	-8.4	-9.4
LPZ-29	2/24/16	11.61		29	28	29	-16.4	-17.4
LPZ-39	2/24/16	11.57		39	38	39	-26.4	-27.4
LPZ-53	2/26/16	9.87		53	52	53	-42.1	-43.1
LPZ-61	2/26/16	9.99		61	60	60	-50.0	-50.0
LPZ-71	2/26/16	9.90		71	70	71	-60.1	-61.1
LPZ-80	2/26/16	9.95		80	79	80	-69.1	-70.1
LPZ-90	2/24/16	10.92		90	89	90	-78.1	-79.1
LP-4 Core	2/23/16 to 2/24/2016		90					

* Surveyed by CEI, benchmark elevation based on Cape Cod Commission two-foot elevation contours for the project area.

** bls- below land surface

Establishment of Cape Cod PRB Initial Site Characterization Benchmark Elevations

The source of the benchmark elevations are explained below. Comprehensive Environmental Inc completed the survey and used NAVD benchmarks where available. Where unavailable, WaterVision LLC applied an estimated elevation to the benchmark to closely match Cape Cod Commission GIS 2' elevation contour elevations for the site.

Barnstable – Prince Avenue

All elevations derived by the surveyor at this site were from a Benchmark Elevation of 12.46', taken on the top of the well box for PCZ-30. The elevation of the well box was surveyed by the Town of Barnstable DPW to NAVD 88 and the remaining elevations were derived from the benchmark by a level survey performed by Comprehensive Environmental Inc.

Mashpee – Timber Landing Road

All elevations derived by the surveyor at this site were from an assumed Benchmark Elevation of 100.00', taken at the center of the Northern most catch basin in the cul-sac on Amos Landing Road. At this point in time the Town of Mashpee has not provided a surveyed elevation for that catch basin, therefore based on the 2' surface elevation contours provided by the Cape Cod Commission and the approximate location of the catch basin, assumed Benchmark Elevation is 15 feet above mean sea level.

Falmouth – Sailfish Drive

All elevations derived by the surveyor at this site were from a Benchmark Elevation of 21.85', taken on the top nut of the hydrant in front of #83 Sailfish Drive. The elevation of the hydrant surveyed by the Falmouth Engineering Department was taken in NGVD 29 datum, then converted to NAVD 88 datum based on geographical location. The remaining elevations were derived from the benchmark by a level survey performed by Comprehensive Environmental Inc.

Dennis- Vinland Road

All elevations derived by the surveyor at this site were from an assumed Benchmark Elevation of 100.00', taken on the top nut of the hydrant located on the west side of Vinland Drive near the intersection of Vinland Drive and Thorwald Drive. At this point in time the Town of Dennis has not provided a surveyed elevation for that hydrant, therefore based on the 2' surface elevation contours provided by the Cape Cod Commission and the approximate location and height (2' to top nut) of the hydrant, the assumed Benchmark Elevation is 48 feet above mean sea level.

Orleans – Lonnie's Pond

All elevations derived by the surveyor at this site were from an assumed Benchmark Elevation of 100.00', taken on the top nut of the hydrant located on the south side of the road at the intersection of Herring Brook Way and the connection road between Herring Brook Way and Monument Road. At this point in time the Town of Orleans has not provided a surveyed elevation for that hydrant, therefore based on the 2' surface elevation contours provided by the Cape Cod Commission and the approximate location and height (2' to top nut) of the hydrant, the assumed Benchmark Elevation is feet above mean sea level.

List of Latitude and Longitude of Wells and Piezometers at ISC Sites

List of Latitude and Longitude for Wells and Piezometers - Prince Cove, Barnstable, MA

Well ID	Latitude	Longitude
PC1	41.64503837	-70.41240313
PC2	41.64558667	-70.41217124
PC6	41.64705075	-70.41165157
PC7	41.64778356	-70.4128313
PCZ13	41.64658836	-70.41162083
PCZ23	41.64658107	-70.41162165
PCZ30	41.64657124	-70.41162442
PCZ35	41.6465604	-70.4116268
PCZ43	41.64655157	-70.4116309
PCZ50	41.64653918	-70.41163847
PCZ60	41.64649679	-70.41165635
PCZ70	41.64648151	-70.4116655
PCZ80	41.64647148	-70.41167877
PCZ88.5	41.64646108	-70.41168765

List of Latitude and Longitude for Wells and Piezometers – Timber Landing Road, Mashpee, MA

Well ID	Latitude	Longitude
TL-1	41.60709813	-70.47614508
TL-2	41.60761972	-70.47639987
TL-3	41.60849487	-70.47533454
TL-4	41.60864394	-70.47666032
TL-5	41.60905628	-70.47702208
TL-6	41.60947008	-70.47732143
TL-7	41.6107747	-70.47957367
TLZ14	41.6086539	-70.476688
TLZ22	41.60865991	-70.47670619
TLZ31	41.60867868	-70.47671492
TLZ40	41.60869421	-70.47672414
TLZ50	41.60870939	-70.47673363
TLZ60	41.60871543	-70.4767407
TLZ70	41.60872127	-70.47674571
TLZ80	41.60874841	-70.47676699
TLZ90	41.60875702	-70.47677309
TLZ100	41.6087632	-70.47677504

List of Latitude and Longitude for Wells and Piezometers – Sailfish Drive, Falmouth, MA

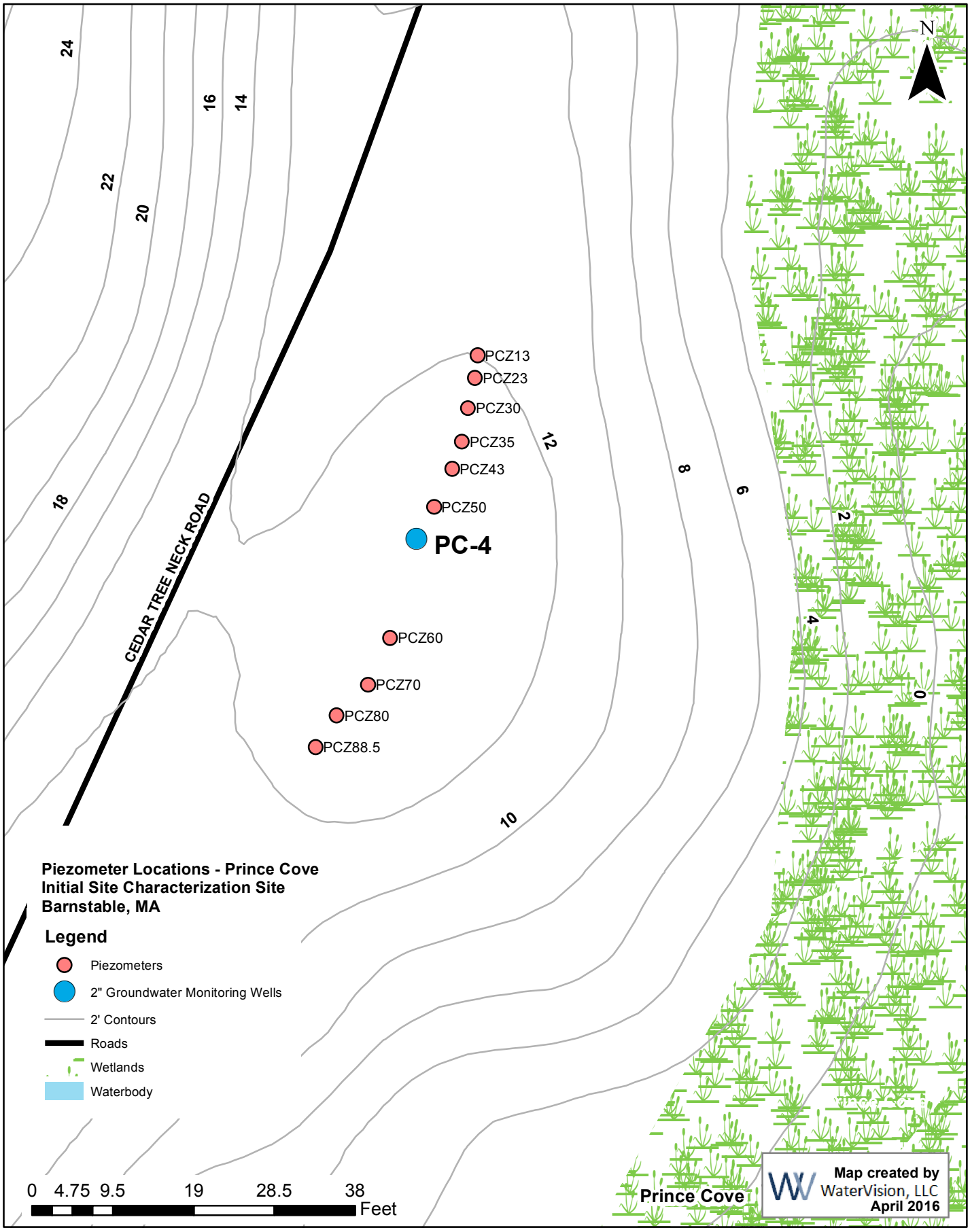
Well ID	Latitude	Longitude
SF-1	41.57166228	-70.55414763
SF-2	41.57145615	-70.55438317
SF-3	41.57115153	-70.55511187
SF-4	41.57114007	-70.5557909
SF-5d	41.57098364	-70.55723975
SF-5S	41.57098449	-70.55725943
SF-6	41.57188932	-70.55558026
SFZ19	41.57140114	-70.5544509
SFZ26	41.57140747	-70.55444313
SFZ33	41.57141286	-70.55443567
SFZ40	41.57141892	-70.55442834
SFZ45	41.5714222	-70.55442115
SFZ50	41.57142699	-70.55441308
SFZ57	41.57143689	-70.55440779
SFZ67	41.57144279	-70.55440106
SFZ77	41.57145252	-70.55438661

List of Latitude and Longitude for Wells and Piezometers – Vinland Road, Dennis, MA

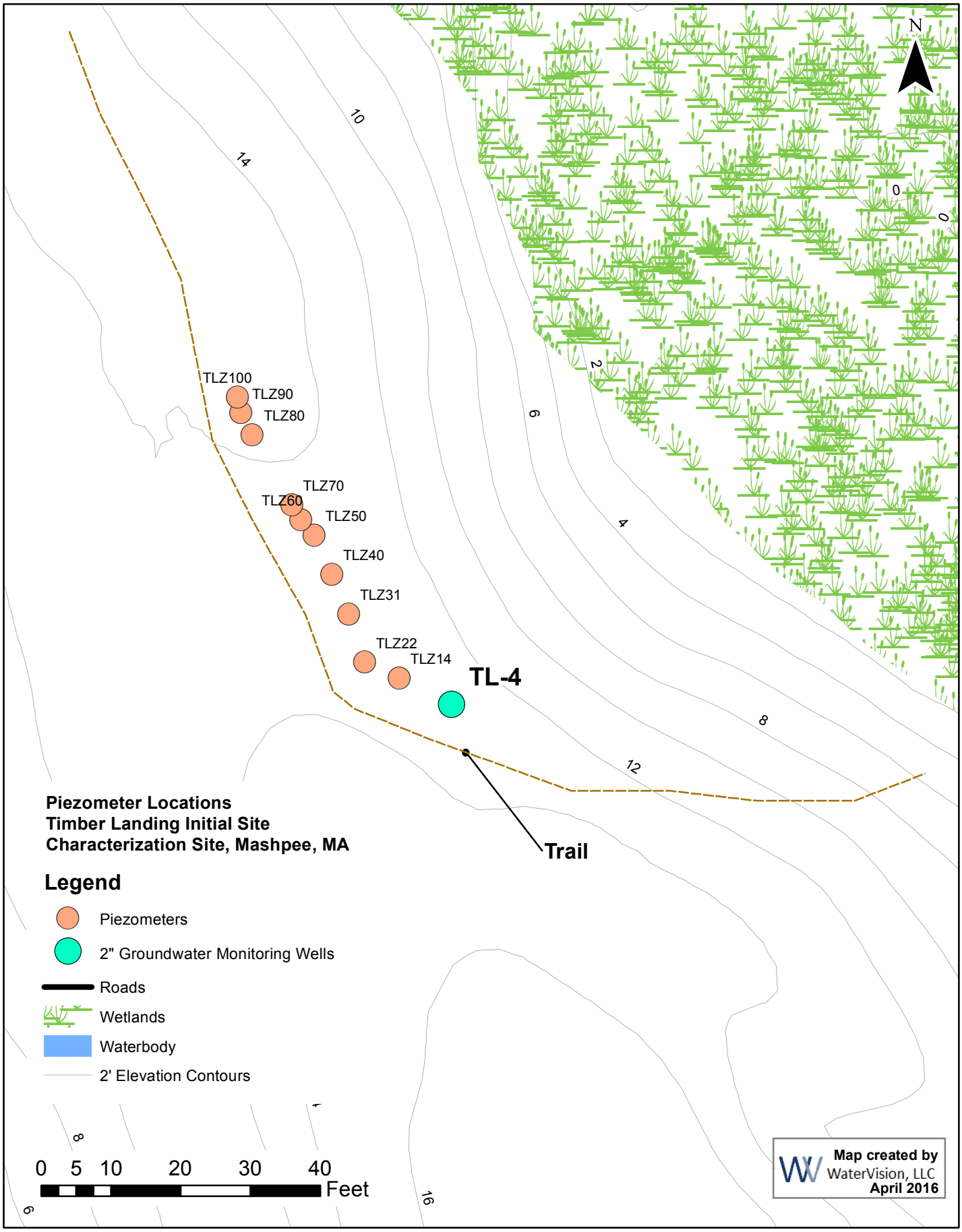
Well ID	Latitude	Longitude
VL1	41.69940731	-70.1659657
VL2	41.69995446	-70.16633039
VL3	41.70025283	-70.16653371
VL4	41.70062771	-70.16678207
VL5	41.70086306	-70.1669409
VL6	41.70057249	-70.1654966
VLZ44	41.69994762	-70.16632441
VLZ48	41.69994078	-70.16631943
VLZ52	41.69993352	-70.16631394
VLZ56	41.69992652	-70.16630852
VLZ61	41.69992072	-70.16630311
VLZ66	41.69991453	-70.16629795

List of Latitude and Longitude for Wells and Piezometers – Lonnies Pond, Orleans, MA		
Well ID	**Latitude**	**Longitude**
LP2	41.77084421	-69.97889587
LP3	41.77053428	-69.97886989
LP4	41.77007041	-69.97882569
LP5	41.76965368	-69.97862965
LP6	41.77006957	-69.97968346
LPZ10	41.77006797	-69.978834
LPZ15	41.77007314	-69.97883835
LPZ21	41.77007846	-69.9788402
LPZ29	41.77008428	-69.97884256
LPZ39	41.77008914	-69.97884464
LPZ53	41.76994317	-69.97877857
LPZ61	41.7699493	-69.97878139
LPZ71	41.76995701	-69.97878506
LPZ80	41.76996284	-69.97878771
LPZ90	41.7700636	-69.97882344

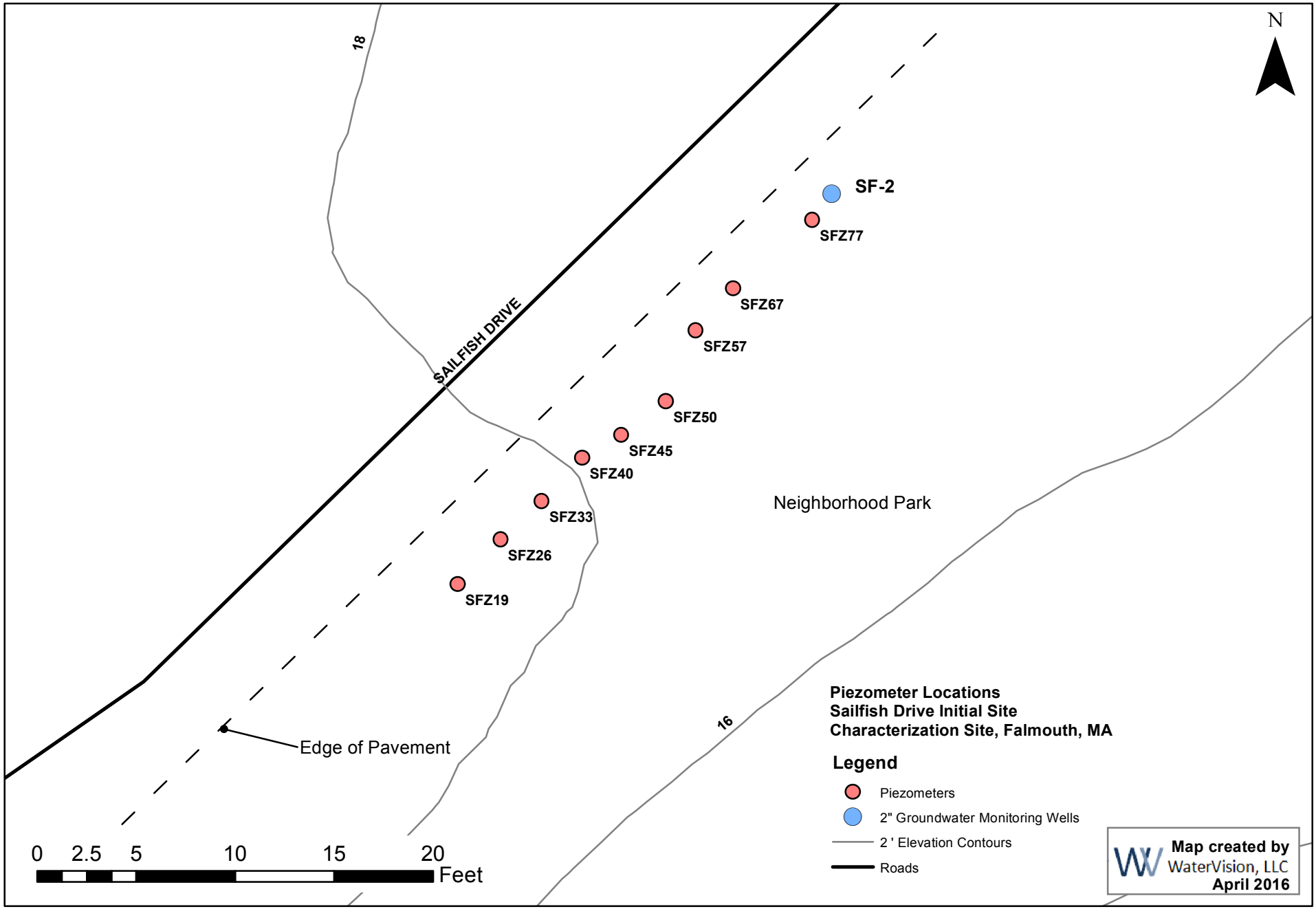
Appendix B-1



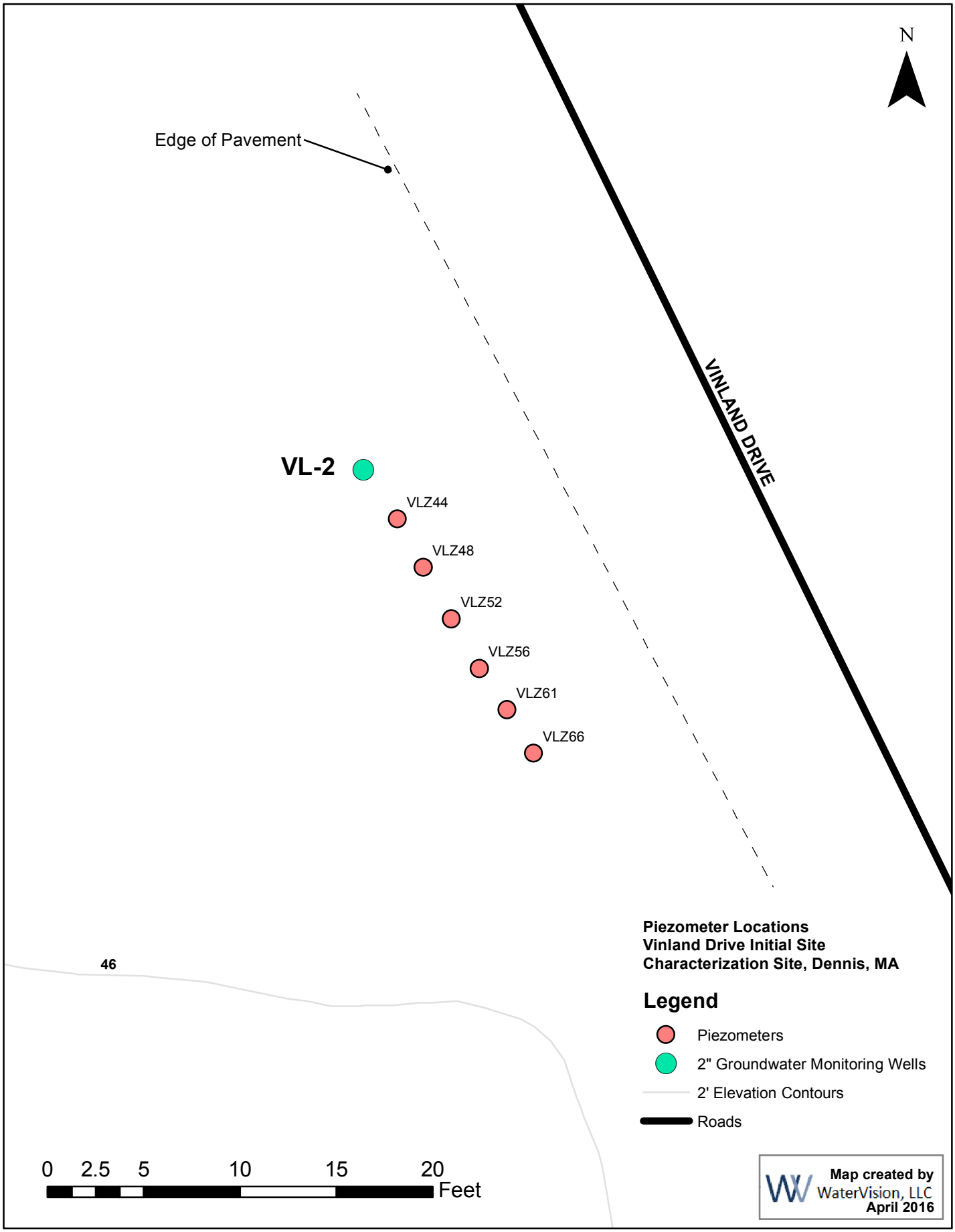
Sources: Roads from Mass GIS. Surveyed Groundwater Monitoring Well and Piezometer Cluster locations from WaterVision LLC. Wetlands and waterbodies from MassDEP.
2' elevation contours from Cape Cod Commission.



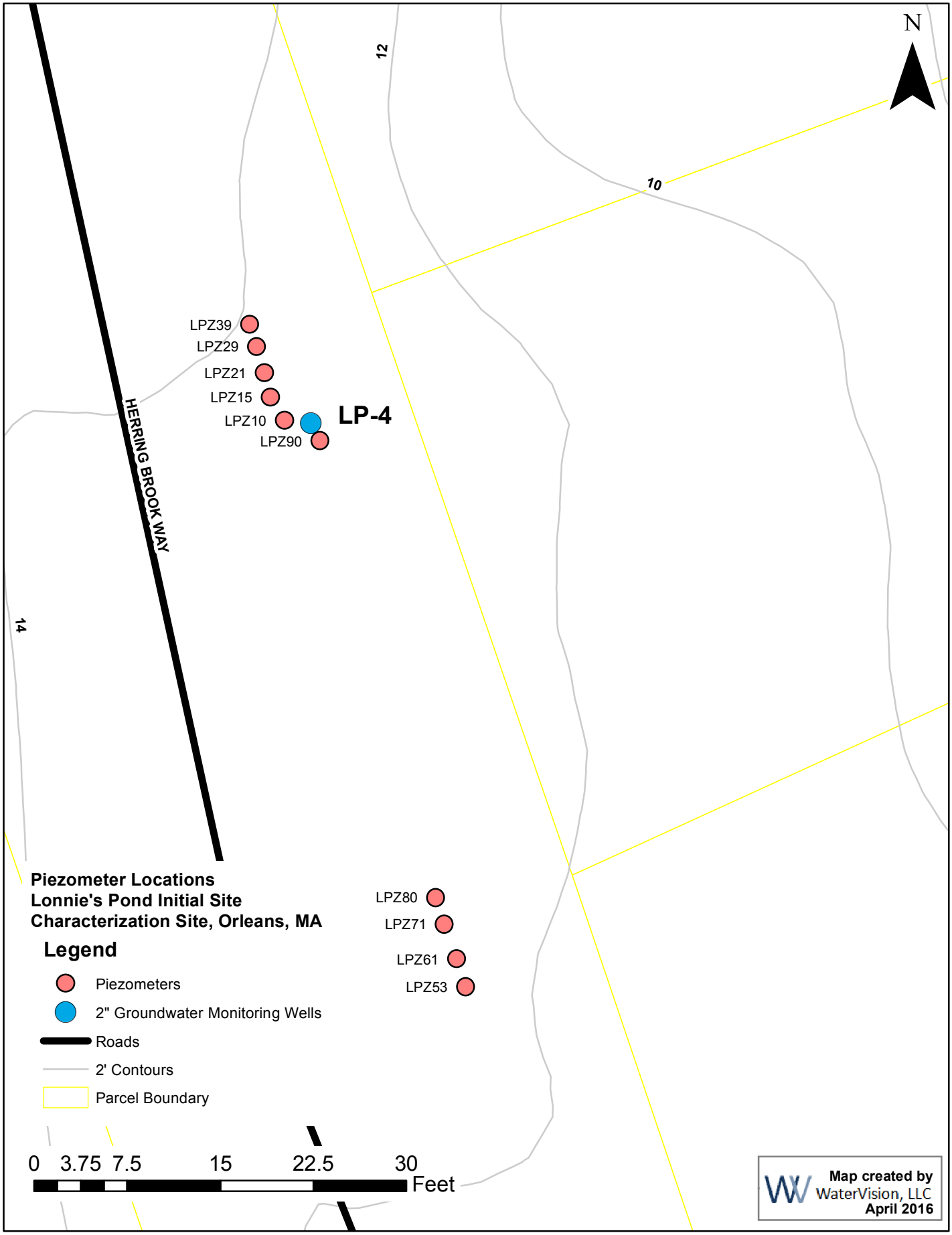
Sources: Roads from Mass GIS. Surveyed Groundwater Monitoring Well and Piezometer Cluster locations from WaterVision LLC. Wetlands and waterbodies from MassDEP. 2' surface elevation contours from Cape Cod Commission.



Sources: Roads from Mass GIS, Surveyed Groundwater Monitoring Well and Piezometer locations and groundwater table elevations from WaterVision LLC. Parcel boundaries and 2' elevation contours from the Cape Cod Commission.



Sources: Roads from Mass GIS, 2' elevation contours from Cape Cod Commission,
Surveyed Groundwater Monitoring Well and Piezometer locations from WaterVision LLC.



Sources: Roads from Mass GIS, 2' elevation contours from Cape Cod Commission,
Surveyed Groundwater Monitoring Well and Piezomenter
locations from WaterVision LLC.

PC-1
PC-2
PC-4
PC-6
PC-7

WaterVision, LLC
454 Court Street, Suite 304, Portsmouth, NH 03801
tel: 603-766-6670
www.watervisionllc.com

WELL / BORING PC-1

Project: EPA Cape Cod PRB Project, Barnstable, MA - WV-1009
Location: Prince Cove - see Well ID Map
Driller: New England Geotech, LLC
WV Staff: Danna Truslow/ Samantha Wright
Date: 1/18/2016

NOTES:

Top of PVC Casing (ft above msl): 11.63
Surface Elevation (ft above msl): 12.09

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
9	4	0 - 5'	3.9	0-1.1' A- surface organics, soil, fill 1.1-13' B- medium to coarse sand (tan)		top of bentonite at 2'
6	8	5 - 10'	4.1			top of filter pack at 7'
3						top of screen at 9'
0	12	10 - 15'	4.8			water level at 9.5'
				13-18.4' I- medium to coarse sand (orange, brown/tan, red)		
-3	16	15 - 20'	3.4			bottom of well at 14'
-6						
-9	20					bottom of boring at 20'
-12	24					
-15	28					

WaterVision, LLC	454 Court Street, Suite 304, Portsmouth, NH 03801 tel: 603-766-6670 www.watervisionllc.com	WELL / BORING PC-2

Project: EPA Cape Cod PRB Project, Barnstable, MA - WV-1009
Location: Prince Cove - see Well ID Map
Driller: New England Geotech, LLC
WV Staff: Danna Truslow
Date: 1/21/2016

NOTES:
Top of PVC Casing (ft above msl): 7.12
Surface Elevation (ft above msl): 7.71

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
6		0 - 5'	3.4	0-1.55' A- surface organics, soil, fill		
				1.55-12.9' C- fine to coarse sand (tan/brown) with gravel, organics, and silt		top of bentonite at 2'
	4					water level at 3.5'
3		5 - 10'	5			
						top of filter pack at 6'
0	8					top of screen at 8'
		10 - 15'	2.9			
-3						
	12					bottom of well at 13'
-6						
		15 - 20'	2.7	15-16.4' G- fine to coarse sand (grey) with silt		
	16			16.4-22.9' I- medium to coarse sand (orange, brown/tan, red)		
-9						
-12	20	20 - 25'	2.9			
-15						
	24					bottom of boring at 25'
-18						
	28					
-21						

WaterVision, LLC	454 Court Street, Suite 304, Portsmouth, NH 03801 tel: 603-766-6670 www.watervisionllc.com	WELL / BORING PC-4

Project: EPA Cape Cod PRB Project, Barnstable, MA - WV-1009
Location: Prince Cove - see Well ID Map
Driller: New England Geotech, LLC
WV Staff: Danna Truslow/ Samantha Wright
Date: 1/19/2016

NOTES:
Top of PVC Casing (ft above msl): 12.46
Surface Elevation (ft above msl): 12.90

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
12		0 - 5'	3.65	0-0.6' A- surface organics, soil, fill 0.6-13.6' B- medium to coarse sand (tan)		
	4					top of bentonite at 2'
9		5 - 10'	4			
						top of filter pack at 6'
6	8					top of screen at 8'
3		10 - 15'	6.2			water level at 9.4'
	12					
0				13.6-19.8' E- fine to medium sand (tan)		bottom of well at 13'
		15 - 20'	3.6			
-3	16			16.4- 16.8' H- bands of coarse sand (red) at 16.4', 16.6', 16.8'		
-6						
	20	20 - 25'	3.9	20-33.8' J- fine to medium sand (grey)		
-9						
	24					
-12		25 - 30'	3.8			
-15	28					

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
		25 - 30'	3.8			
		30 - 35'	3.8	20-33.8' J- fine to medium sand (grey)		
-18	32					
-21						
		35 - 40'	3.9	35-57.3' K- medium to coarse sand (grey); red and orange zones		
	36					
-24						
-27	40	40 - 45'	2.5			
-30						
	44					
		45 - 50'	2.8			
-33						
	48					
-36						
		50 - 55'	2.2			
-39	52					
-42						
		55 - 60'	3.1			
	56					
-45				57.3-61.1' L- very fine to medium silty sand (grey/brown) with minor clay and organics		
	60					
		60 - 65'	3.1			
-48				61.1-63.1' M- medium sand (orange and grey) with minor silt		

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
-51	64	60 - 65'	3.1			
		65 - 70'	3.5	65-76.85' J- fine to medium sand (grey)		
-54	68					
-57		70 - 75'	3.3			
	72					
-60						
		75 - 80'	1.85			
-63	76					
-66						
	80	80 - 85'	1.6	80-87.3' K- medium to coarse sand (grey); red and orange zones		
-69						
	84					
-72		85 - 90'	2.3			
-75	88					
						bottom of boring at 90'
-78	92					
-81						
	96					
-84						

WaterVision, LLC
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WELL / BORING PC-6

Project: EPA Cape Cod PRB Project, Barnstable, MA - WV-1009
Location: Prince Cove - see Well ID Map
Driller: New England Geotech, LLC
WV Staff: Danna Truslow/ Samantha Wright
Date: 1/21/2016

NOTES:

Top of PVC Casing (ft above msl): 10.87
Surface Elevation (ft above msl): 11.28

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
9	4	0 - 5'	3.5	0-0.7' A- surface organics, soil, fill 0.7-8.6' B- medium to coarse sand (tan)		top of bentonite at 4'
6		5 - 10'	3.6			water level at 6.2'
3	8					top of filter pack at 9'
0		10 - 15'	3.7	10-12.4' D- fine to coarse sand (grey/ brown and orange/red) and silty clay		top of screen at 11'
	12			12.4-23.4' J- fine to medium sand (grey)		
-3		15 - 20'	3			
-6	16					bottom of well at 16'
-9	20	20 - 25'	3.4			
-12	24					bottom of boring at 25'
-15						
	28					

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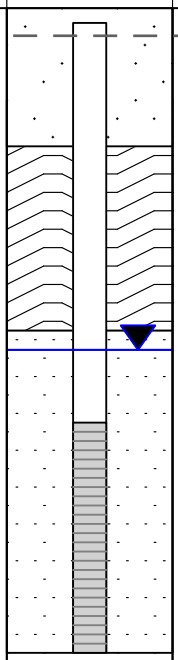
WELL / BORING PC-7

Project: EPA Cape Cod PRB Project, Barnstable, MA - WV-1009
Location: Prince Cove - see Well ID Map
Driller: New England Geotech, LLC
WV Staff: Danna Truslow/ Samantha Wright
Date: 1/18/2016

NOTES:

Top of PVC Casing (ft above msl): 12.98
Surface Elevation (ft above msl): 13.30

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
12		0 - 5'	3.1	0-0.6' A- surface organics, soil, fill 0.6-13.2' B- medium to coarse sand (tan)		top of bentonite at 2'
9	4					
		5 - 10'	4.3			
6						top of filter pack at 7'
	8			2" in wide oxidized bands of fine sand at 8.2-9.3' (red)		water level at 7.1'
						top of screen at 9'
3		10 - 15'	3.2			
	12					
0						bottom of well at 14'
		15 - 20'	4.1	15-24.2' F- fine to medium sand (tan) with layers of wide red banding		
-3	16					
-6						
	20	20 - 25'	4.2			
-9						
	24					
-12						bottom of boring at 25'
	28					
-15						

PCZ-ALL

Cape Cod Permeable Reactive Barrier Characterization Project

Project Number - WV-1009
Combined Description Piezometer Well Logs for Prince Cove Site- Barnstable, MA

PCZ-13
PCZ-23
PCZ-30
PCZ-35
PCZ-43
PCZ-50
PCZ-60
PCZ-70
PCZ-80
PCZ-88.5

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Project: EPA Cape Cod PRB Project, Barnstable, MA - WV-1009
Location: Prince Cove - see Well ID Map
Driller: New England Geotech, LLC
WV Staff: Danna Truslow/ Samantha Wright
Date: 1/19/2016

NOTES:
Top of PVC Casing (ft above msl): 12.46
Surface Elevation (ft above msl): 12.90

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient (ft/ft) 3/7/16	Nitrate-Nitrogen (mg/L) 3/7/16	ORP (mV) 4/18/16	DO (mg/L) 3/7/16
12		0 - 5'	3.65	0-0.6' A- surface organics, soil, fill - Top Soil 0.6-13.6' B- medium to coarse sand (tan)						
9	4									
		5 - 10'	4							
6	8									
3		10 - 15'	6.2			water level at 9.4'				
0	12					PCZ-13		1.40	253	7.95
				13.6-19.8' E- fine to medium sand (tan)						
-3	16	15 - 20'	3.6							
				16.4- 16.8' H- bands of coarse sand (red) at 16.4', 16.6', 16.8'						
-6										
	20			20-33.8' J- fine to medium sand (grey)						
-9		20 - 25'	3.9							
	24					PCZ-23	0.001	2.30	258	6.26
-12		25 - 30'	3.8							

*Vertical Gradient Between Adjacent Piezometers

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WELL / BORING PCZ-ALL

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient* (ft/ft) 3/7/16	Nitrate-Nitrogen (mg/L) 3/7/16	ORP (mV) 4/18/16	DO (mg/L) 3/7/16
-15	28	25 - 30'	3.8	20-33.8' J- fine to medium sand (grey)						
		30 - 35'	3.8			PCZ-30	0.106	2.20	250	6.63
-18	32									
-21										
		35 - 40'	3.9	35-57.3' K- medium to coarse sand (grey); red and orange zones		PCZ-35	0.016	2.30	258	6.35
-24	36									
-27	40	40 - 45'	2.5							
-30						PCZ-43	0.051	2.30	208	7.71
	44	45 - 50'	2.8							
-33										
	48									
-36										
		50 - 55'	2.2			PCZ-50	-0.027	2.00	210	4.21
-39	52									
-42										
	56	55 - 60'	3.1							
-45				57.3-61.1' L- very fine to medium silty sand (grey/brown) with minor clay and organics						

*Vertical Gradient Between Adjacent Piezometers

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WELL / BORING PCZ-ALL

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient (ft/ft) 3/7/16	Nitrate-Nitrogen (mg/L) 3/7/16	ORP (mV) 4/18/16	DO (mg/L) 3/7/16
	60	55 - 60'	3.1							
-48		60 - 65'	3.1	61.1-63.1' M- medium sand (orange and grey) with minor silt		PCZ-60	0.010	0.02	-19	0.92
-51	64									
		65 - 70'	3.5	65-76.85' J- fine to medium sand (grey)						
-54	68									
-57		70 - 75'	3.3			PCZ-70	-0.100	0.02	-60	0.14
-60	72									
		75 - 80'	1.85							
-63	76									
-66										
	80	80 - 85'	1.6	80-87.3' K- medium to coarse sand (grey); red and orange zones		PCZ-80	-0.052	0.06	-28	0.84
-69										
-72	84									
		85 - 90'	2.3							
-75	88					PCZ-88.5	0.018	0.03	8	0.29
-78						bottom of boring at 90'				

*Vertical Gradient Between Adjacent Piezometers

TL-1
TL-2
TL-3
TL-4
TL-5
TL-6
TL-7

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WELL / BORING TL-1

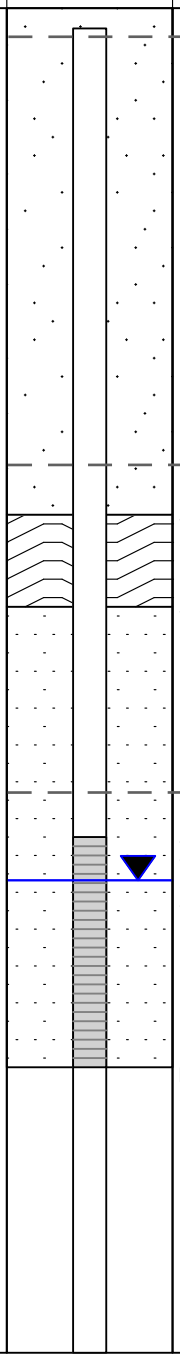
Project: EPA Cape Cod PRB Project, Mashpee, MA
Location: Timber Landing Road- see Well ID Map
Driller: New England Geotech
WV Staff: Samantha Wright
Date: 1/26/2016

NOTES:

Top of PVC Casing (ft above msl): 19.27
Surface Elevation (ft above msl): 19.71

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications
18 / 4	0	0 - 5'	3.4	0-0.5' A- surface organics/ soil 0.5-8.2' B- medium sand (tan and orange) with minor gravel
15 / 8	5	5 - 10'	3.2	
12 / 12	10	10 - 15'	3.7	10-16.5' C- fine to medium sand (tan and some grey)
9 / 16	15	15 - 20'	3.4	
6 / 20	20	20 - 25'	4.1	16.5-32.9' F- medium sand (tan)
3 / 24	25	25 - 30'	2.9	
0 / 28	30			
-3				
-6				
-9				



Remarks

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
		25 - 30'	2.9	16.5-32.9' F- medium sand (tan)		
		30 - 35'	2.9			
-12	32					
-15						bottom of boring at 35'
	36					
-18						
	40					
-21						
-24	44					
-27						
	48					
-30						
	52					
-33						
-36	56					
-39						
	60					
-42						

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WELL / BORING TL-2

Project: EPA Cape Cod PRB Project, Mashpee, MA
Location: Timber Landing Road- see Well ID Map
Driller: New England Geotech
WV Staff: Samantha Wright
Date: 1/26/2016

NOTES:

Top of PVC Casing (ft above msl): 25.17
Surface Elevation (ft above msl): 25.38

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
24		0 - 5'	3.4	0-0.4' A- surface organics/ soil 0.4-3.4' B- medium sand (tan and orange) with minor gravel		
21	4	5 - 10'	3.4	5-22.4' C- fine to medium sand (tan and some grey)		
18	8					
15		10 - 15'	4			
12	12					
9	16	15 - 20'	4.1			top of bentonite at 15'
6						top of filter pack at 17'
3	20	20 - 25'	3.3	22.4-36.8' H- medium to coarse sand (alternating grey and tan)		top of screen at 22' water level at 22.7'
0	24	25 - 30'	2.5			
-3	28					bottom of well at 27'

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
		25 - 30'	2.5			
		30 - 35'	1.9	22.4-36.8' H- medium to coarse sand (alternating grey and tan)		
-6	32					
-9		35 - 40'	1.8			
	36					
-12						
	40					bottom of boring at 40'
-15						
-18	44					
-21						
	48					
-24						
-27	52					
-30						
	56					
-33						
	60					
-36						

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WELL / BORING TL-3

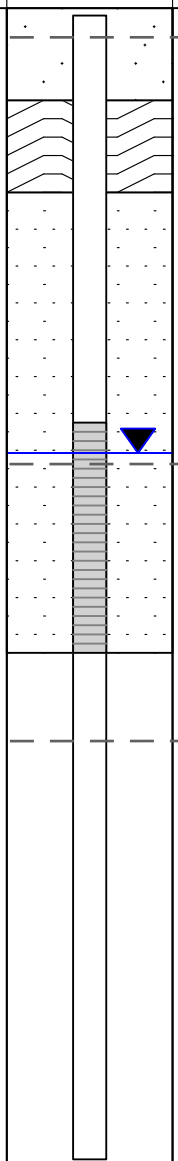
Project: EPA Cape Cod PRB Project, Mashpee, MA
Location: Timber Landing Road- see Well ID Map
Driller: New England Geotech
WV Staff: Samantha Wright
Date: 1/27/2016

NOTES:

Top of PVC Casing (ft above msl): 10.96
Surface Elevation (ft above msl): 11.12

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications
9	4	0 - 5'	3.2	0-0.5' A- surface organics/ soil 0.5-8.0' C- fine to medium sand (tan and some grey)
6		5 - 10'	3.1	
3	8			
0		10 - 15'	3.1	10-16' D- medium to coarse sand (tan and orange)
-3	12			
-6	16	15 - 20'	2.4	16-23' I- fine to medium sand (alternating grey/tan and dark orange)
-9	20	20 - 25'	3	
-12	24			
-15	28			



Well Constr. Remarks

top of bentonite at 2'
top of filter pack at 4'
top of screen at 9'
water level at 9.5'
bottom of well at 14'
bottom of boring at 25'

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Project: EPA Cape Cod PRB Project, Mashpee, MA
Location: Timber Landing Road- see Well ID Map
Driller: New England Geotech
WV Staff: Samantha Wright
Date: 1/27/2016

NOTES:
Top of PVC Casing (ft above msl): 12.43
Surface Elevation (ft above msl): 12.64

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
12		0 - 5'	3.9	0-0.2' A- surface organics/ soil 0.2-10.8' C- fine to medium sand (tan and some grey)		
9	4					
		5 - 10'	3.2			
6	8					top of bentonite at 7'
3						top of filter pack at 9'
		10 - 15'	3.8			
	12			10.8-17.3' D- medium to coarse sand (tan and orange)		water level at 11.75'
0						
						top of screen at 14'
-3	16	15 - 20'	2.3			
-6						bottom of well at 19'
	20	20 - 25'	2.2	20-32.2' H- medium to coarse sand (alternating grey and tan)		
-9						
	24					
-12		25 - 30'	1.8			
-15	28					

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WELL / BORING TL-4

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
-18	32	25 - 30'	1.8	20-32.2' H- medium to coarse sand (alternating grey and tan)		
-21		30 - 35'	2.2			
-24	36	35 - 40'	2	35-46.1' D- medium to coarse sand (tan and orange)		
-27	40	40 - 45'	1.7			
-30	44					
-33		45 - 50'	2.4	46.1-51.9' I- fine to medium sand (alternating grey/tan and dark orange)		
-36	48					
-39	52	50 - 55'	2.8	51.9-58.5' J- fine sand (grey) and silt		
-42						
-45	56	55 - 60'	3.5			
-48	60	60 - 65'	2.6	60-76.9' K- fine to medium sand (tan/brown and orange)		

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WELL / BORING TL-4

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
-51	64	60 - 65'	2.6	60-76.9' K- fine to medium sand (tan/brown and orange)		
		65 - 70'	2.1			
-54	68					
-57		70 - 75'	2.2			
	72					
-60						
		75 - 80'	1.9			
-63	76					
-66						
	80	80 - 85'	1.8	80-95.3' L- fine to medium sand (tan/grey) with cobbles and gravel		
-69						
	84					
-72		85 - 90'	2.1			
-75	88					
		90 - 95'	1.5			
-78	92					
-81						
		95 - 100'	0.3			
	96					
-84						

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
		95 - 100'	0.3			
-87	100					bottom of boring at 100'
-90	104					
-93						
-96	108					
-99	112					
-102						
-105	116					
-108	120					
-111	124					
-114						
-117	128					

TLZ-ALL

Cape Cod Permeable Reactive Barrier Characterization Project

Project Number - WV-1009
Combined Description Piezometer Well Logs for Timber Landing Road Site- Mashpee, MA

TLZ-14
TLZ-22
TLZ-31
TLZ-40
TLZ-50
TLZ-60
TLZ-70
TLZ-80
TLZ-90
TLZ-100

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WELL / BORING TLZ-ALL

Project: EPA Cape Cod PRB Project, Mashpee, MA
Location: Timber Landing Road- see Well ID Map
Driller: New England Geotech
WV Staff: Samantha Wright
Date: 1/27/2016

NOTES:

Top of PVC Casing (ft above msl): 12.43
Surface Elevation (ft above msl): 12.64

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient (ft/ft) 3/14/16	Nitrate-Nitrogen (mg/L) 3/14/16	ORP (mV) 3/14/16	DO (mg/L) 3/14/16
12		0 - 5'	3.9	0-0.2' A- organics/soil 0.2-10.8' B- fine to medium sand (tan and some grey)						
9	4									
		5 - 10'	3.2							
6	8									
3		10 - 15'	3.8	10.8-17.3' C- medium to coarse sand (tan and orange)		water level at 11.75'				
0	12					TLZ-14		0.17	-136	1.17
-3	16	15 - 20'	2.3							
-6										
-9	20	20 - 25'	2.2	20-32.2' D- medium to coarse sand (alternating grey and tan)		TLZ-22	0.001	0.05	-182	0.23
-12	24									
		25 - 30'	1.8							

*Vertical Gradient Between Adjacent Piezometers

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient* (ft/ft) 3/14/16	Nitrate-Nitrogen (mg/L) 3/14/16	ORP (mV) 3/14/16	DO (mg/L) 3/14/16
-15	28	25 - 30'	1.8	20-32.2' D- medium to coarse sand (alternating grey and tan)						
-18		30 - 35'	2.2			TLZ-31	0.027	2.10	139	4.27
-21	32									
-24	36	35 - 40'	2	35-46.1' C- medium to coarse sand (tan and orange)						
-27	40	40 - 45'	1.7			TLZ-40	-0.006	2.70	124	5.61
-30	44									
-33		45 - 50'	2.4	46.1-51.9' E- fine to medium sand (alternating grey/tan and dark orange)						
-36	48					TLZ-50	-0.024	0.62	44	2.14
-39	52	50 - 55'	2.8	51.9-58.5' F- fine sand (grey) and silt						
-42		55 - 60'	3.5							
-45	56									

*Vertical Gradient Between Adjacent Piezometers

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient* (ft/ft) 3/14/16	Nitrate-Nitrogen (mg/L) 3/14/16	ORP (mV) 3/14/16	DO (mg/L) 3/14/16
-48	60	55 - 60'	3.5	60-76.9' G- fine to medium sand (tan/brown and orange)		TLZ-60	-0.017	0.48	56	2.27
		60 - 65'	2.6							
-51	64									
		65 - 70'	2.1							
-54	68									
-57						TLZ-70	0.296	0.80	-94	1.80
		70 - 75'	2.2							
-60	72									
		75 - 80'	1.9							
-63	76									
-66										
	80	80 - 85'	1.8	80-95.3' H- fine to medium sand (tan/grey) with cobbles and gravel		TLZ-80	-0.003	0.99	74	1.37
-69										
-72	84									
		85 - 90'	2.1							
-75	88									
						TLZ-90	0.127	0.36	-53	4.67
-78		90 - 95'	1.5							

*Vertical Gradient Between Adjacent Piezometers

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WELL / BORING TLZ-ALL

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient* (ft/ft) 3/14/16	Nitrate-Nitrogen (mg/L) 3/14/16	ORP (mV) 3/14/16	DO (mg/L) 3/14/16
	92	90 - 95'	1.5	80-95.3' H- fine to medium sand (tan/grey) with cobbles and gravel						
-81										
	96	95 - 100'	0.3							
-84										
-87						TLZ-100	-0.105	0.03	91	0.40
	100					bottom of boring at 100'				
-90										
	104									
-93										
	108									
-96										
-99										
	112									
-102										
	116									
-105										
	120									
-108										

*Vertical Gradient Between Adjacent Piezometers

SF-1
SF-2
SF-3
SF-4
SF-5S
SF-5D
SF-6

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WELL / BORING SF-1

Project: EPA Cape Cod PRB Project, Falmouth, MA
Location: Sailfish Drive - see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/1/2016

NOTES:

Top of PVC Casing (ft above msl): 19.32
Surface Elevation (ft above msl): 19.65

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
18	4	0 - 5'	3.6	0-0.7' A- surface organics/ soil 0.7-23.9' B- fine to coarse sand (brown, grey, tan, tan-grey) with some fine gravel, cobbles, and silt		
15		5 - 10'	4.2			
12	8					
9	12	10 - 15'	4.3			top of bentonite at 10'
6						top of filter pack at 12'
3	16	15 - 20'	4.6			
0	20	20 - 25'	3.9			top of screen at 17' water level at 18.6'
-3	24					bottom of well at 22'
-6		25 - 30'	4.4	25-33.6' E- silty fine to medium sand (tan); several zones of oxidation, gravel, and some clay		
-9	28					

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WELL / BORING SF-1

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
		25 - 30'	4.4	25-33.6' E- silty fine to medium sand (tan); several zones of oxidation, gravel, and some clay		
		30 - 35'	3.6			
-12	32					
-15						bottom of boring at 35'
	36					
-18						
	40					
-21						
-24	44					
-27						
	48					
-30						
	52					
-33						
-36	56					
-39						
	60					
-42						

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WELL / BORING SF-2

Project: EPA Cape Cod PRB Project, Falmouth, MA
Location: Sailfish Drive - see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/2/2016

NOTES:

Top of PVC Casing (ft above msl): 17.84
Surface Elevation (ft above msl): 18.12

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
15	4	0 - 5'	3.7	0-0.2' A- surface organics/ soil 0.2-21.1' D- medium to coarse sand (orange-tan, brown, grey, tan, tan-grey) with some fine gravel		
12	8	5 - 10'	5			
9						top of bentonite at 9'
6	12	10 - 15'	4.3			top of filter pack at 11'
3	16	15 - 20'	4.5			top of screen at 16'
0						water level at 17.4'
-3	20	20 - 25'	3.3	21.1-36.6' E- silty fine to medium sand (tan); several zones of oxidation, gravel, and some clay		bottom of well at 21'
-6	24	25 - 30'	4.2			
-9	28					

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
-12		25 - 30'	4.2			
		30 - 35'	4	21.1-36.6' E- silty fine to medium sand (tan); several zones of oxidation, gravel, and some clay		
	32					
-15						
		35 - 40'	3.9			
-18	36					
-21						
	40					
		40 - 45'	1.6	40-61.9' F- fine to coarse sand (grey-tan and grey) with cobbles and fine gravel; some oxidation		
-24						
	44					
-27		45 - 50'	2.25			
-30	48					
		50 - 55'	2.6			
-33						
	52					
-36						
		55 - 60'	2.6			
	56					
-39						
-42	60	60 - 65'	3.2			
				61.9-63.4' G- fine to coarse sand (red-brown/ red tan)		

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WELL / BORING SF-2

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
	64	60 - 65'	3.2	61.9-63.4' G- fine to coarse sand (red-brown/ red tan)		
-48		65 - 70'	3.4	65-75.4' F- fine to coarse sand (grey-tan and grey) with cobbles and fine gravel; some oxidation		
	68					
-51						
		70 - 75'	2.8			
-54	72					
-57		75 - 80'	3.1	75.4-77' H- banded coarse sand and gravel (dark red with light red orange layers)		
	76					
-60						
	80	80 - 85'	2			bottom of boring at 80'
-63						
-66	84					
-69						
	88					
-72						
	92					
-75						
-78	96					

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WELL / BORING SF-3

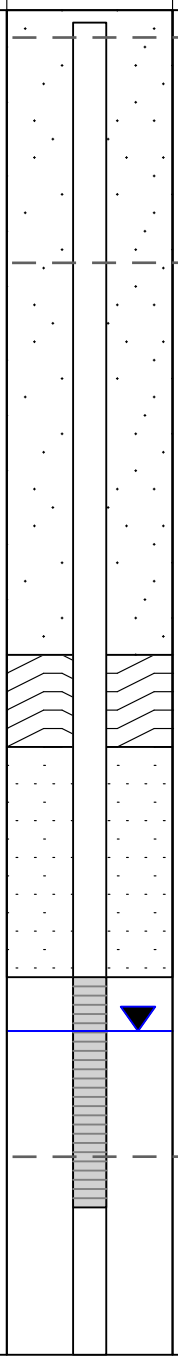
Project: EPA Cape Cod PRB Project, Falmouth, MA
Location: Sailfish Drive - see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/2/2016

NOTES:

Top of PVC Casing (ft above msl): 23.62
Surface Elevation (ft above msl): 23.89

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications
21	4	0 - 5'	3.8	0-0.6' A- surface organics/ soil 0.6-5.6' B- fine to coarse sand (brown, grey, tan, tan-grey) with some fine gravel, cobbles, and silt
18	8	5 - 10'	4.5	5.6-24.0' D- medium to coarse sand (orange-tan, brown, grey, tan, tan-grey) with some fine gravel
15	12	10 - 15'	5	
12	16	15 - 20'	4.8	
9	20	20 - 25'	4	
6	24	25 - 30'	2.5	25-32.6' F- fine to coarse sand (grey-tan and grey) with cobbles and fine gravel; some oxidation
3	28			
0				
-3				



Well Constr. / Remarks:
- top of bentonite at 14'
- top of filter pack at 16'
- top of screen at 21'
- water level at 21.9'
- bottom of well at 26'

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
-6		25 - 30'	2.5	25-32.6' F- fine to coarse sand (grey-tan and grey) with cobbles and fine gravel; some oxidation		
		30 - 35'	2.6			
	32					
-9						
						bottom of boring at 35'
-12	36					
-15						
	40					
-18						
	44					
-21						
-24	48					
-27						
	52					
-30						
	56					
-33						
-36	60					
-39						

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WELL / BORING SF-4

Project: EPA Cape Cod PRB Project, Falmouth, MA
Location: Sailfish Drive - see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/4/2016

NOTES:

Top of PVC Casing (ft above msl): 23.04
Surface Elevation (ft above msl): 23.39

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
21	4	0 - 5'	3.8	0-0.6' A- surface organics/ soil 0.6-5.6' B- fine to coarse sand (brown, grey, tan, tan-grey) with some fine gravel, cobbles, and silt		
18		5 - 10'	4.5	5.6-24.0' D- medium to coarse sand (orange-tan, brown, grey, tan, tan-grey) with some fine gravel		
15	8					
12	12	10 - 15'	5			
9						top of bentonite at 14'
	16	15 - 20'	4.8			top of filter pack at 16'
6						
3	20	20 - 25'	4			top of screen at 21'
						water level at 21.9'
0	24					
		25 - 30'	2.5	25-27.5' F- fine to coarse sand (grey-tan and grey) with cobbles and fine gravel; some oxidation		
-3						bottom of well at 26'
	28					

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WELL / BORING SF-5S

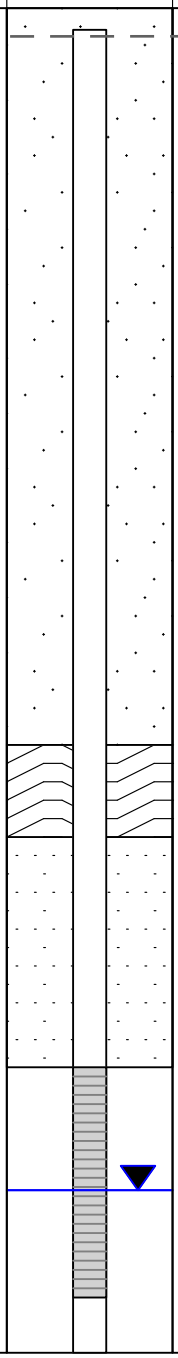
Project: EPA Cape Cod PRB Project, Falmouth, MA
Location: Sailfish Drive - see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/4/2016

NOTES:

Top of PVC Casing (ft above msl): 26.11
Surface Elevation (ft above msl): 26.58

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications
24	4	0 - 5'	3.6	0-0.7' A- surface organics/ soil 0.7-37' D- medium to coarse sand (orange-tan, brown, grey, tan, tan-grey) with some fine gravel
21	8	5 - 10'	3.9	
18	12	10 - 15'	5	
15	16	15 - 20'	4.1	
12	20	20 - 25'	4.1	
9	24	25 - 30'	3.5	
6	28			
3				
0				



Well Constr. | Remarks

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
-3		25 - 30'	3.5	0.7-37' D- medium to coarse sand (orange-tan, brown, grey, tan, tan-grey) with some fine gravel		
		30 - 35'	2.4			
-6	32					
		35 - 40'	2			
-9	36					
-12						
	40					bottom of boring at 40'
-15						
	44					
-18						
-21	48					
-24						
	52					
-27						
	56					
-30						
-33	60					
-36						

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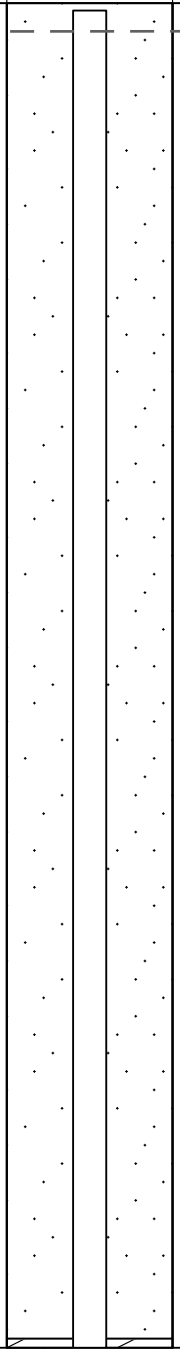
WELL / BORING SF-5D

Project: EPA Cape Cod PRB Project, Falmouth, MA
Location: Sailfish Drive - see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/10/2016

NOTES:

Top of PVC Casing (ft above msl): 26.42
Surface Elevation (ft above msl): 26.58

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
24	4	0 - 5'	3.6	0-0.7' A- surface organics/ soil 0.7-37' D- medium to coarse sand (orange-tan, brown, grey, tan, tan-grey) with some fine gravel		
21	8	5 - 10'	3.9			
18						
15	12	10 - 15'	5			
12						
9	16	15 - 20'	4.1			
6	20	20 - 25'	4.1			
3	24	25 - 30'	3.5			
0	28					

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
-3		25 - 30'	3.5			top of bentonite at 29'
		30 - 35'	2.4	0.7-37' D- medium to coarse sand (orange-tan, brown, grey, tan, tan-grey) with some fine gravel		
-6	32					top of filter pack at 31'
-9		35 - 40'	2			
	36					top of screen at 36'
-12						
	40					bottom of well at 41'
-15						
	44					
-18						
-21	48					
-24						
	52					
-27						
	56					
-30						
-33	60					
-36						

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WELL / BORING SF-6

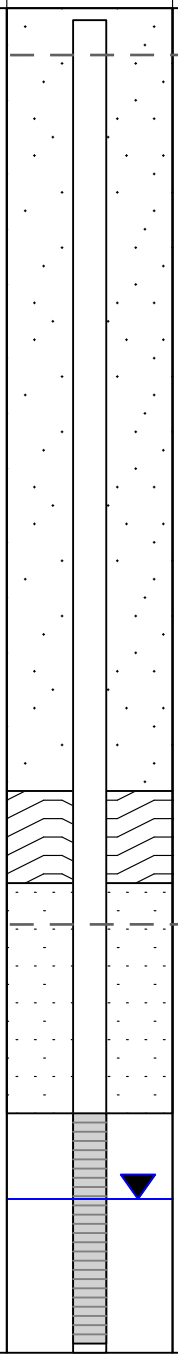
Project: EPA Cape Cod PRB Project, Falmouth, MA
Location: Sailfish Drive - see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/1/2016

NOTES:

Top of PVC Casing (ft above msl): 26.97
Surface Elevation (ft above msl): 27.23

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
24	4	0 - 5'	3.7	0-1.1' A- surface organics/ soil 1.1-19.7' C- fine to medium sand (medium tan and medium grey) with organic layers		
21	8	5 - 10'	4.3			
18						
15	12	10 - 15'	4.6			
12	16	15 - 20'	4.7			top of bentonite at 17'
9						top of filter pack at 19'
20						
6		20 - 25'	3.35	20-32.8' D- medium to coarse sand (orange-tan, brown, grey, tan, tan-grey) with some fine gravel		
3	24					top of screen at 24'
		25 - 30'	2.8			water level at 25.6'
0	28					



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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
-3		25 - 30'	2.8			bottom of well at 29'
		30 - 35'	2.9	20-32.8' D- medium to coarse sand (orange-tan, brown, grey, tan, tan-grey) with some fine gravel		
	32					
-6						
		35 - 40'	2.8			bottom of boring at 35'
-9	36					
-12						
	40					
-15						
	44					
-18						
-21	48					
-24						
	52					
-27						
	56					
-30						
-33	60					

SFZ-ALL

Cape Cod Permeable Reactive Barrier Characterization Project

Project Number - WV-1009
Combined Description Piezometer Well Logs for Salifish Drive Site- Falmouth, MA

SFZ-19
SFZ-26
SFZ-33
SFZ-40
SFZ-45
SFZ-50
SFZ-57
SFZ-67
SFZ-77

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WELL / BORING SFZ-ALL

Project: EPA Cape Cod PRB Project, Falmouth, MA
Location: Sailfish Drive - see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/2/2016

NOTES:

Top of PVC Casing (ft above msl): 17.84
Surface Elevation (ft above msl): 18.12

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient (ft/ft) 3/22/16	Nitrate-Nitrogen (mg/L) 3/22/16	ORP (mV) 5/5/16	DO (mg/L) 3/22/16
15	4	0 - 5'	3.7	0-0.2' A- surface organics/ soil 0.2-21.1' D- medium to coarse sand (orange-tan, brown, grey, tan, tan-grey) with some fine gravel						
12	8	5 - 10'	5							
9	12	10 - 15'	4.3							
6	16	15 - 20'	4.5			water level at 17.4'				
3	20	20 - 25'	3.3			SFZ-19		0.72	212	7.16
0	24	25 - 30'	4.2	21.1-36.6' E- silty fine to medium sand (tan); several zones of oxidation, gravel, and some clay		SFZ-26	0.001	8.90	206	6.50
-3										
-6										

*Vertical Gradient Between Adjacent Piezometers

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WELL / BORING SFZ-ALL

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient* (ft/ft) 3/22/16	Nitrate-Nitrogen (mg/L) 3/22/16	ORP (mV) 5/5/16	DO (mg/L) 3/22/16
	28	25 - 30'	4.2	21.1-36.6' E- silty fine to medium sand (tan); several zones of oxidation, gravel, and some clay						
-12		30 - 35'	4							
	32									
-15						SFZ-33	-0.003	4.30	164	7.53
		35 - 40'	3.9							
-18	36									
-21										
	40	40 - 45'	1.6	40-61.9' F- fine to coarse sand (grey-tan and grey) with cobbles and fine gravel; some oxidation		SFZ-40	0.004	2.40	280	8.89
-24										
	44									
-27		45 - 50'	2.25			SFZ-45	0.002	3.00	160	7.22
-30	48									
		50 - 55'	2.6			SFZ-50	0.010	1.70	267	7.76
-33	52									
-36										
		55 - 60'	2.6							
	56									
-39						SFZ-57	0.007	2.60	157	9.02

*Vertical Gradient Between Adjacent Piezometers

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WELL / BORING SFZ-ALL

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient* (ft/ft) 3/22/16	Nitrate-Nitrogen (mg/L) 3/22/16	ORP (mV) 5/5/16	DO (mg/L) 3/22/16
-42	60	55 - 60'	2.6	40-61.9' F- fine to coarse sand (grey-tan and grey) with cobbles and fine gravel; some oxidation						
		60 - 65'	3.2							
-45	64			61.9-63.4' G- fine to coarse sand (red-brown/ red tan)						
-48		65 - 70'	3.4	65-75.4' F- fine to coarse sand (grey-tan and grey) with cobbles and fine gravel; some oxidation		SFZ-67	-0.001	2.90	218	8.69
	68									
-51										
		70 - 75'	2.8							
-54	72									
-57		75 - 80'	3.1	75.4-77' H- banded coarse sand and gravel (dark red with light red orange layers)		SFZ-77	-0.149	1.70	43	6.55
	76									
-60										
	80	80 - 85'	2			bottom of boring at 80'				
-63										
-66	84									
-69										
	88									
-72										

*Vertical Gradient Between Adjacent Piezometers

VL-1
VL-2
VL-3
VL-4
VL-5
VL-6

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WELL / BORING VL-1

Project: EPA Cape Cod PRB Project, Dennis, MA
Location: Vinland Drive -see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/19/2016

NOTES:

Top of PVC Casing (ft above msl): 40.03
Surface Elevation (ft above msl): 40.49

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
39		0 - 5'	3.9	0-0.35' A- surface organics/ soil 0.35-7.8' C- fine to coarse sand (orange tan) and gravel		
	4					
36		5 - 10'	3.9			
33	8			7.8-8.9' F- uniform medium sand (grey)		
30		10 - 15'	1.7	10-20.7' I- medium to coarse sand (grey)		
	12					
27						
		15 - 20'	4.8			
24	16					
21						
	20	20 - 25'	3.6	coarse oxidized sand at 20.7-23.6' (red)		
18						
	24					
15		25 - 30'	2.6	25-36.2' G- medium to coarse sand (grey); some orange and oxidation; some gravel		
	28					
12						top of bentonite at 28'

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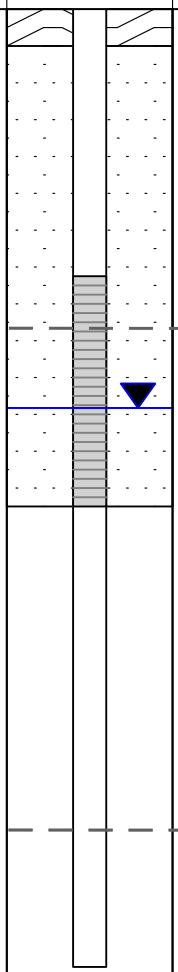
Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
9	32	25 - 30'	2.6	25-36.2' G- medium to coarse sand (grey); some orange and oxidation; some gravel		top of filter pack at 30'
		30 - 35'	3.6			
6		35 - 40'	3.8			top of screen at 35'
3	36			36.2-46.45' K- medium to coarse sand and gravel (banding of orange/tan or red with grey)		water level at 37.4'
0	40	40 - 45'	4.3			bottom of well at 40'
-3	44					
-6		45 - 50'	4.3	46.45-48.3' P- clay (grey) with some silt and sand		
	48					
-9						bottom of boring at 50'
-12	52					
-15	56					
-18						
-21	60					

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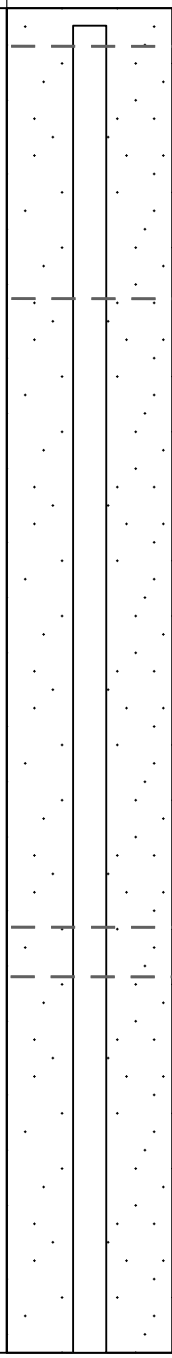
WELL / BORING VL-2

Project: EPA Cape Cod PRB Project, Dennis, MA
Location: Vinland Drive -see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/18/2016

NOTES:

Top of PVC Casing (ft above msl): 44.68
Surface Elevation (ft above msl): 45.06

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
42	4	0 - 5'	4.4	0-0.9' A- surface organics/ soil 0.9-6.4' E- medium to coarse sand (orange/ tan)		
39	8	5 - 10'	4.45	6.4-19.55' G- medium to coarse sand (grey); some orange and oxidation; some gravel		
36						
33	12	10 - 15'	4.25			
30	16	15 - 20'	4.55			
27						
24	20	20 - 25'	4.25	20-21.1' H- medium to coarse sand (tan) and organics 21.1-42.1' I- medium to coarse sand (grey)		
21	24	25 - 30'	4.85			
18	28					

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
15		25 - 30'	4.85			
		30 - 35'	4.3	21.1-42.1' I- medium to coarse sand (grey)		
	32					
12						
		35 - 40'	4.9			top of bentonite at 34'
9	36					top of filter pack at 36'
6						
	40	40 - 45'	5			top of screen at 41'
3				42.1-48.55' K- medium to coarse sand and gravel (banding of orange/tan or red with grey)		water level at 42.3'
	44					
0		45 - 50'	5			bottom of well at 46'
-3	48			48.55-51.5' P- clay (grey) with some silt and sand		
		50 - 55'	2.6			
-6				51.5-66.2' Q- banding of medium and coarse sand (grey)		
	52					
-9						
		55 - 60'	2.6			
	56					
-12						
-15	60	60 - 65'	2.5			

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
	64	60 - 65'	2.5	51.5-66.2' Q- banding of medium and coarse sand (grey)		
-21		65 - 70'	3.2	66.2-79.2' R- clay (grey)		
	68					
-24						
		70 - 75'	4.4			
-27	72					
-30		75 - 80'	4.2			
	76					
-33						
	80					bottom of boring at 80'
-36						
-39	84					
-42						
	88					
-45						
	92					
-48						
-51	96					

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WELL / BORING VL-3

Project: EPA Cape Cod PRB Project, Dennis, MA
Location: Vinland Drive -see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/22/2016

NOTES:

Top of PVC Casing (ft above msl): 44.01
Surface Elevation (ft above msl): 44.29

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
42	4	0 - 5'	3.6	0-1.35' A- surface organics/ soil 1.35-3.6' E- medium to coarse sand (orange/ tan)		
39		5 - 10'	4.2	5-14.4' G- medium to coarse sand (grey); some orange and oxidation; some gravel		
36	8					
33		10 - 15'	4.4			
30	12					
		15 - 20'	4.3	15-15.8' H-medium to coarse sand (tan) and organic 15.8-37.8 I- medium to coarse sand (grey)		
27	16					
24	20	20 - 25'	3.7			
21	24					
		25 - 30'	4			
18	28					

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
12	32	25 - 30'	4	15.8-37.8 I- medium to coarse sand (grey)		top of bentonite at 31'
		30 - 35'	3.5			
9	36	35 - 40'	3.5			top of filter pack at 34'
6				37.8-46.7' K- medium to coarse sand and gravel (banding of orange/tan or red with grey)		top of screen at 39'
	40	40 - 45'	3.1			water level at 40.3'
3						
0	44					bottom of well at 44'
		45 - 50'	2.3			
-3	48			46.7-47.3' P- clay (grey) with some silt and sand		
-6						bottom of boring at 50'
	52					
-9						
-12	56					
-15	60					
-18						

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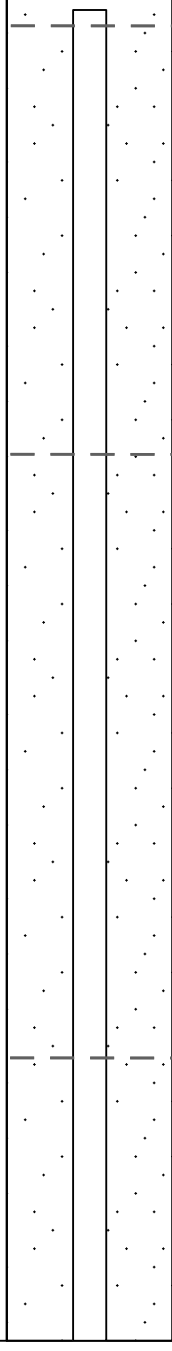
WELL / BORING VL-4

Project: EPA Cape Cod PRB Project, Dennis, MA
Location: Vinland Drive -see Well ID Map
Driller: New England Geotech
WV Staff: Samantha Wright
Date: 2/17/2016

NOTES:

Top of PVC Casing (ft above msl): 43.16
Surface Elevation (ft above msl): 43.46

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
42	4	0 - 5'	3.2	0-0.5' A- surface organics/ soil 0.5-6.3' D- fine to medium sand (grey)		
39						
		5 - 10'	1.3			
36	8					
33		10 - 15'	4.3	10-23.1' K- medium to coarse sand and gravel (banding of orange/tan or red with grey)		
	12					
30						
		15 - 20'	3.9			
27	16					
24						
	20	20 - 25'	5			
21				23.1-32.8' D- fine to medium sand (grey)		
	24					
18		25 - 30'	4.5			
	28					
15						

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
12	32	25 - 30'	4.5			
		30 - 33'	3	23.1-32.8' D- fine to medium sand (grey)		top of bentonite at 30'
9		33 - 35'	2	32.8-45.4' K- medium to coarse sand and gravel (banding of orange/tan or red with grey)		top of filter pack at 33'
6	36	35 - 40'	4.4			top of screen at 38'
3	40	40 - 45'	4.1			water level at 39'
0	44	45 - 50'	3.2	45.4-48.2' P- clay (grey) with some silt and sand		bottom of well at 43'
-3	48					
-6						bottom of boring at 50'
-9	52					
-12	56					
-15						
-18	60					

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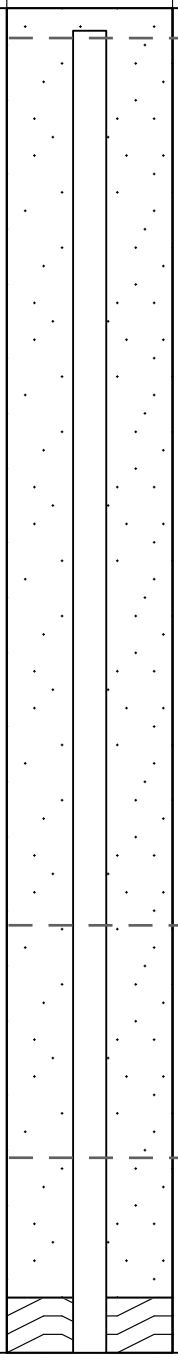
WELL / BORING VL-5

Project: EPA Cape Cod PRB Project, Dennis, MA
Location: Vinland Drive -see Well ID Map
Driller: New England Geotech
WV Staff: Samantha Wright
Date: 2/17/2016

NOTES:

Top of PVC Casing (ft above msl): 40.22
Surface Elevation (ft above msl): 40.71

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
39	4	0 - 5'	3.7	0-0.3' A- surface organics/ soil 0.3-20' B- fine to coarse sand (tan) and cobbles		
36		5 - 10'	3.2			
33	8					
30		10 - 15'	5			
27	12					
24		15 - 20'	5			
21	16					
18	20	20 - 25'	5	20-25' E- medium to coarse sand (orange/ tan)		
15	24					
12	28	25 - 30'	5	25-30' B- fine to coarse sand (tan) and cobbles oxidized bands at 26.7' (red) oxidized bands at 28.2' (red)		top of bentonite at 28'

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
		25 - 30'	5			
		30 - 35'	5	30-40' L- medium sand (tan)		top of filter pack at 30'
9	32					
6		35 - 40'	0	(rock blocked sediment recovery)		top of screen at 35'
	36					water level at 36.3'
3						
	40	40 - 45'	1.5	40-41.5' Q- banding of medium and coarse sand (grey) oxidized bands at 40.7' (red) oxidized bands at 41.3' (red)		bottom of well at 40'
0						
-3	44					
		45 - 50'	2.7	45-47.1' P- clay (grey) with some silt and sand		
-6						
	48					
-9						bottom of boring at 50'
	52					
-12						
-15	56					
-18						
	60					
-21						

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WELL / BORING VL-6

Project: EPA Cape Cod PRB Project, Dennis, MA
Location: Vinland Drive -see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/19/2016

NOTES:

Top of PVC Casing (ft above msl): 43.41
Surface Elevation (ft above msl): 43.94

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
42	4	0 - 5'	3	0-0.6' A- surface organics/ soil 0.6-9.0' E- medium to coarse sand (orange/ tan)		
39		5 - 10'	4			
36	8					
33		10 - 15'	4	10-12.1' G- medium to coarse sand (grey); some orange and oxidation; some gravel		
30	12			12.1-14.0' D- fine to medium sand (grey)		
27	16	15 - 20'	3.6	15-24.8' G- medium to coarse sand (grey); some orange and oxidation; some gravel		
24	20	20 - 25'	4.8			
21	24					
18		25 - 30'	4.7	25-29.7' K- medium to coarse sand and gravel (banding of orange/tan or red with grey)		
15	28					top of bentonite at 28'

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
		25 - 30'	4.7			
		30 - 35'	3.9	30-37.1' G- medium to coarse sand (grey); some orange and oxidation; some gravel		top of filter pack at 30'
12	32					
9		35 - 40'	3.2			top of screen at 35'
	36			coarse oxidized sand at 37.1-37.15' (orange red)		water level at 36.95'
6				37.15-38.2' O- mixture of fine to coarse sand (grey-tan) with silt and clay		
	40	40 - 45'	2.7	40-45.65' G- medium to coarse sand (grey); some orange and oxidation; some gravel		bottom of well at 40'
3						
0	44					
		45 - 50'	3	45.65-47.2' E- medium to coarse sand (orange/ tan)		
-3						
	48			47.2-48' P- clay (grey) with some silt and sand		
-6						bottom of boring at 50'
	52					
-9						
-12	56					
-15						
	60					
-18						

VLZ-ALL

Cape Cod Permeable Reactive Barrier Characterization Project

Project Number - WV-1009
Combined Description Piezometer Well Logs for Vinland Drive Site- Dennis, MA

VLZ-44
VLZ-48
VLZ-52
VLZ-56
VLZ-61
VLZ-66

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WELL / BORING VLZ-ALL

Project: EPA Cape Cod PRB Project, Dennis, MA
Location: Vinland Drive -see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/18/2016

NOTES:

Top of PVC Casing (ft above msl): 44.68
Surface Elevation (ft above msl): 45.06

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient (ft/ft) 3/31/16	Nitrate-Nitrogen (mg/L) 4/1/16	ORP (mV) 4/1/16	DO (mg/L) 4/1/16
42	4	0 - 5'	4.4	0-0.9' A- surface organics/ soil 0.9-6.4' E- medium to coarse sand (orange/tan)						
39	8	5 - 10'	4.45	6.4-19.55' G- medium to coarse sand (grey); some orange and oxidation; some gravel						
36										
33	12	10 - 15'	4.25							
30	16	15 - 20'	4.55							
27										
24	20	20 - 25'	4.25	20-21.1' H- medium to coarse sand (tan) and organics 21.1-42.1' I- medium to coarse sand (grey)						
21	24	25 - 30'	4.85							

*Vertical Gradient Between Adjacent Piezometers

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient (ft/ft) 3/31/16	Nitrate-Nitrogen (mg/L) 4/1/16	ORP (mV) 4/1/16	DO (mg/L) 4/1/16
	28	25 - 30'	4.85	21.1-42.1' I- medium to coarse sand (grey)						
15										
	32	30 - 35'	4.3							
12										
		35 - 40'	4.9							
9	36									
6										
	40	40 - 45'	5							
3				42.1-48.55' K- medium to coarse sand and gravel (banding of orange/tan or red with grey)		water level at 42.3'				
	44					VLZ-44		4.30	301	7.10
0		45 - 50'	5							
-3	48					VLZ-48	0.015	2.40	127	4.20
				48.55-51.5' P- clay (grey) with some silt and sand						
-6		50 - 55'	2.6							
	52			51.5-66.2' Q- banding of medium and coarse sand (grey)		VLZ-52	0.625	4.00	220	6.30
-9										
		55 - 60'	2.6							
	56					VLZ-56	0.033	4.20	212	6.50
-12										

*Vertical Gradient Between Adjacent Piezometers

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WELL / BORING VLZ-ALL

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient (ft/ft) 3/31/16	Nitrate-Nitrogen (mg/L) 4/1/16	ORP (mV) 4/1/16	DO (mg/L) 4/1/16
-15	60	55 - 60'	2.6	51.5-66.2' Q- banding of medium and coarse sand (grey)						
		60 - 65'	2.5			VLZ-61	0.000	2.80	212	7.20
-18	64									
		65 - 70'	3.2							
-21				66.2-79.2' R- clay (grey)		VLZ-66	0.000	3.20	234	6.50
	68									
-24										
		70 - 75'	4.4							
-27	72									
-30		75 - 80'	4.2							
	76									
-33										
	80					bottom of boring at 80'				
-36										
-39	84									
-42										
	88									
-45										

*Vertical Gradient Between Adjacent Piezometers

LP-2
LP-3
LP-4
LP-5
LP-6

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WELL / BORING LP-2

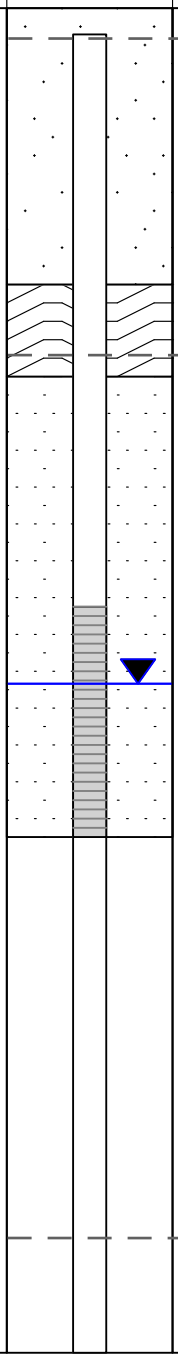
Project: EPA Cape Cod PRB Project, Orleans, MA
Location: Herring Brook Way -see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/25/2016

NOTES:

Top of PVC Casing (ft above msl): 22.13
Surface Elevation (ft above msl): 22.70

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications
21	4	0 - 5'	3.8	0-0.25' A- surface organics/ soil 0.25-7.6' C- silty fine to medium sand (tan/brown) with zones of coarser sand and gravel
18		5 - 10'	4.6	
15	8			7.6-26.8' E- fine to coarse sand (tan, brown, grey) with silt and clay; many zones of oxidation (orange, dark red, red) and organics
12	12	10 - 15'	5	
9				
6	16	15 - 20'	5	
3	20	20 - 25'	4.6	
0	24			
-3		25 - 30'	4.1	
-6	28			26.8-29.1' I- very fine to medium silty clayey sand (blue grey)



Well Constr. / Remarks:
- top of bentonite at 6'
- top of filter pack at 8'
- top of screen at 13'
- water level at 14.1'
- bottom of well at 18'

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
		25 - 30'	4.1			
		30 - 35'	3.8			
-9	32			30.8-33.8' E- fine to medium silty sand (grey) with zones of gravel and clay		
-12	36					bottom of boring at 35'
-15						
-18	40					
-21	44					
-24						
-27	48					
-30	52					
-33						
-36	56					
-39	60					

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WELL / BORING LP-3

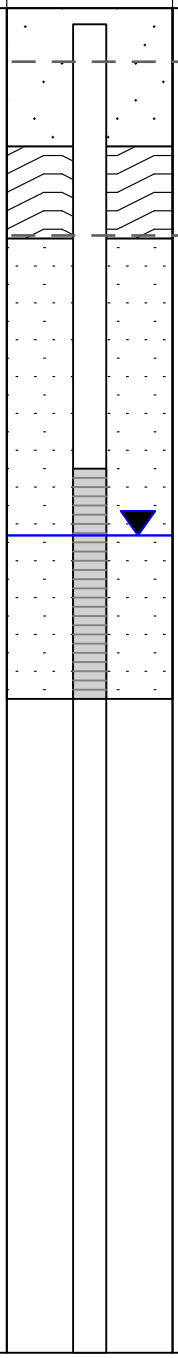
Project: EPA Cape Cod PRB Project, Orleans, MA
Location: Herring Brook Way -see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/25/2016

NOTES:

Top of PVC Casing (ft above msl): 15.08
Surface Elevation (ft above msl): 15.43

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications
15		0 - 5'	3.2	0-1.2' A- surface organics/ soil 1.2-3.2' C- silty fine to medium sand (tan/brown) with zones of coarser sand and gravel
12	4			
		5 - 10'	4.2	5-30.3' D- silty clayey soft very fine to fine to medium sand (brown, grey, orange) with many areas of oxidation
9				
	8			
6				
		10 - 15'	3.2	
3	12			
0		15 - 20'	2.9	
	16			
-3				
	20	20 - 25'	4.2	
-6				
	24			
-9				
		25 - 30'	0	
-12	28			



Well Constr.

Remarks

top of bentonite at 3'

top of filter pack at 5'

top of screen at 10'

water level at 11.1'

bottom of well at 15'

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WELL / BORING LP-3

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
-15	32	25 - 30'	0	5-30.3' D- silty clayey soft very fine to fine to medium sand (brown, grey, orange) with many areas of oxidation		
-18		30 - 35'	0.3			
-21	36					bottom of boring at 35'
-24	40					
-27	44					
-30	48					
-33						
-36	52					
-39	56					
-42						
-45	60					

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WELL / BORING LP-4

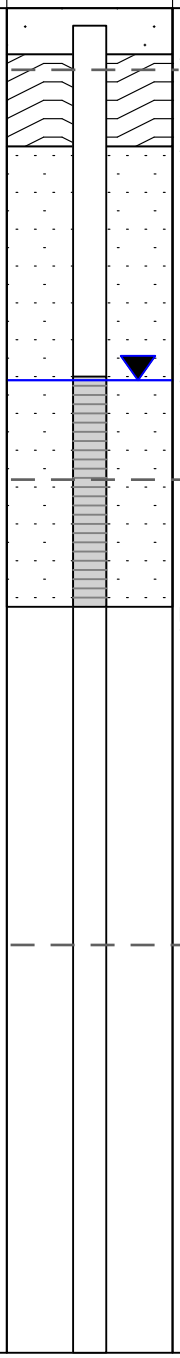
Project: EPA Cape Cod PRB Project, Orleans, MA
Location: Herring Brook Way -see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/25/2016

NOTES:

Top of PVC Casing (ft above msl): 11.09
Surface Elevation (ft above msl): 11.47

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
9	4	0 - 5'	3.7	0-1.4' A- surface organics/ soil		
				1.4-10.3' C- silty fine to medium sand (tan/brown) with zones of coarser sand and gravel		top of bentonite at 1'
6		5 - 10'	4.1			top of filter pack at 3'
3	8					water level at 7.7'
						top of screen at 8'
0	12	10 - 15'	4	10.3-20.45' E- fine to coarse sand (tan, brown, grey) with silt and clay; many zones of oxidation (orange, dark red, red) and organics		
-3		15 - 20'	4			bottom of well at 13'
-6	16					
-9	20	20 - 25'	3.9	20.45-39.2' G- silty fine to medium sand (grey and tan) with distinct coarse orange, red, or tan zones		
-12	24					
-15		25 - 30'	4.1			
	28					



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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
-18		25 - 30'	4.1			
		30 - 35'	3.5	20.45-39.2' G- silty fine to medium sand (grey and tan) with distinct coarse orange, red, or tan zones		
-21	32					
-24		35 - 40'	4.2			
	36					
-27						
	40					
		40 - 45'	4.5	40-47.75' J- fine to medium silty sand (grey) with zones of gravel and clay		
-30						
-33	44					
		45 - 50'	3.9			
-36				47.75-51.6' K- interlayered silt/sand/clay/and coarse sand (grey)		
	48					
-39		50 - 55'	4.2			
				51.6-55.5' J- fine to medium silty sand (grey) with zones of gravel and clay		
	52					
-42						
		55 - 60'	3.4	55.5-60.2' L- silty clay (blue grey), clayey sand (grey-brown), and very fine silty sand with organics		
-45	56					
-48						
	60					
		60 - 65'	2.1	60.2-62.1' J- fine to medium silty sand (grey) with zones of gravel and clay		
-51						

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Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
	64	60 - 65'	2.1	60.2-62.1' J- fine to medium silty sand (grey) with zones of gravel and clay		
-54		65 - 70'	not recorded			
	68					
-57						
		70 - 75'	2.4	70-76.5' M- medium sand (blue grey)		
-60	72					
-63						
		75 - 80'	2.5			
	76			76.5-77.6' N- very fine to fine silty sand (grey blue); with some clay		
-66				77.6-86.8' M- medium sand (blue grey)		
	80					
-69		80 - 85'	2.21			
-72	84					
		85 - 90'	2.8			
-75						
	88					
-78						bottom of boring at 90'
	92					
-81						
-84	96					

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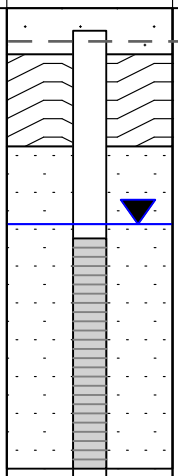
WELL / BORING LP-5

Project: EPA Cape Cod PRB Project, Orleans, MA
Location: Herring Brook Way -see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/25/2016

NOTES:

Top of PVC Casing (ft above msl): 8.00
Surface Elevation (ft above msl): 8.49

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
6	4	0 - 5'	4.2	0-0.8' A- surface organics/ soil 0.8-15.2' E- fine to coarse sand (tan, brown, grey) with silt and clay; many zones of oxidation (orange, dark red, red) and organics		top of bentonite at 1' top of filter pack at 3' water level at 3.5'
3	8	5 - 10'	4.4			top of screen at 5'
0	12	10 - 15'	2.8			bottom of well at 10'
-3	16	15 - 20'	2.6	15.2-21.85' F- fine to coarse sand (grey, orange, brown) with organics and some clay		
-6	20	20 - 25'	3.1			
-9	24			21.85-23.1' G- silty fine to medium sand (grey and tan) with distinct coarse orange, red, or tan zones		bottom of boring at 25'
-12	28					
-15						
-18						

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454 Court Street, Suite 304, Portsmouth, NH 03801
tel: 603-766-6670
www.watervisionllc.com

WELL / BORING LP-6

Project: EPA Cape Cod PRB Project, Orleans, MA
Location: Herring Brook Way -see Well ID Map
Driller: New England Geotech
WV Staff: Samantha Wright
Date: 2/26/2016

NOTES:

Top of PVC Casing (ft above msl): 32.05
Surface Elevation (ft above msl): 32.46

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)
30	4	0 - 5'	3.1
27	8	5 - 10'	1
24	12	10 - 15'	4
21	16	15 - 20'	3.6
18	20	20 - 25'	3.2
15	24	25 - 30'	4
12	28		
9			
6			

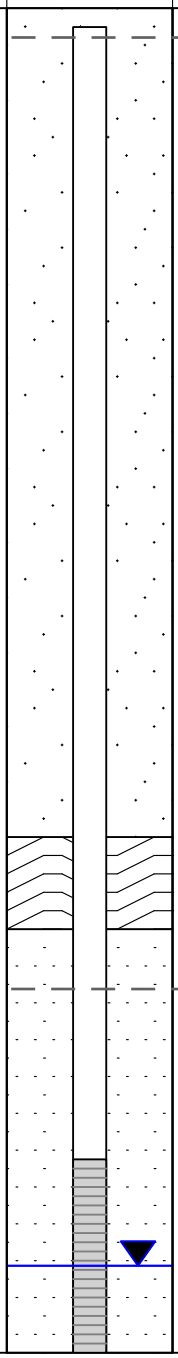
Sample Descriptions and Classifications

0-0.5' A- surface organics/ soil

0.5-21.4' B- medium sand grading to very coarse sand with depth (tan) with cobbles and gravel

21.4-38.9' H- fine silty sand (grey and grey/tan) layered with denser coarser fine to medium sand (tan/orange red)

Well Constr.



Remarks

top of bentonite at 18'

top of filter pack at 20'

top of screen at 25'

water level at 26.9'

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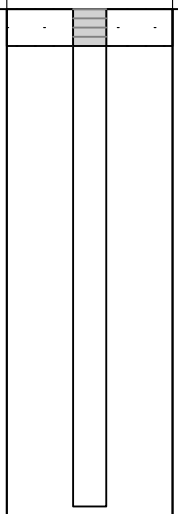
WELL / BORING LP-6

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions and Classifications	Well Constr.	Remarks
3		25 - 30'	4			
		30 - 35'	3.3	21.4-38.9' H- fine silty sand (grey and grey/tan) layered with denser coarser fine to medium sand (tan/orange red)		bottom of well at 30'
0	32					
-3		35 - 40'	3.9			
	36					
-6						
	40					bottom of boring at 40'
-9						
-12	44					
-15	48					
-18						
	52					
-21						
	56					
-24						
-27	60					
-30						

LPZ-ALL

Cape Cod Permeable Reactive Barrier Characterization Project

Project Number - WV-1009
Combined Description Piezometer Well Logs for Herring Brook Way Site- Orleans, MA

LPZ-10
LPZ-15
LPZ-21
LPZ-29
LPZ-39
LPZ-53
LPZ-61
LPZ-71
LPZ-80
LPZ-90

WaterVision, LLC	454 Court Street, Suite 304, Portsmouth, NH 03801 tel: 603-766-6670 www.watervisionll.com	WELL / BORING LPZ-ALL

Project: EPA Cape Cod PRB Project, Orleans, MA
Location: Herring Brook Way -see Well ID Map
Driller: New England Geotech
WV Staff: Danna Truslow
Date: 2/25/2016

NOTES:
Top of PVC Casing (ft above msl): 11.09
Surface Elevation (ft above msl): 11.47

(1) Geoprobe Installation
(2) well constructed of 2" PVC
(3) well protected with road box

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient (ft/ft) 3/31/16	Nitrate-Nitrogen (mg/L) 3/30/16	ORP (mV) 3/30/16	DO (mg/L) 3/30/16
9	4	0 - 5'	3.7	0-1.4' A- surface organics/ soil 1.4-10.3' C- silty fine to medium sand (tan/brown) with zones of coarser sand and gravel						
6		5 - 10'	4.1							
3	8					water level at 7.7'				
						LPZ-10		1.60	55	7.91
0	12	10 - 15'	4	10.3-20.45' E- fine to coarse sand (tan, brown, grey) with silt and clay; many zones of oxidation (orange, dark red, red) and organics						
-3		15 - 20'	4			LPZ-15	0.076	0.48	181	4.23
-6	16									
-9	20	20 - 25'	3.9	20.45-39.2' G- silty fine to medium sand (grey and tan) with distinct coarse orange, red, or tan zones		LPZ-21	0.055	1.30	227	3.74
-12	24									
-15		25 - 30'	4.1							

*Vertical Gradient Between Adjacent Piezometers

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WELL / BORING LPZ-ALL

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient* (ft/ft) 3/31/16	Nitrate-Nitrogen (mg/L) 3/30/16	ORP (mV) 3/30/16	DO (mg/L) 3/30/16
-18	28	25 - 30'	4.1	20.45-39.2' G- silty fine to medium sand (grey and tan) with distinct coarse orange, red, or tan zones		LPZ-29	0.064	1.80	150	5.90
-21	32	30 - 35'	3.5							
-24	36	35 - 40'	4.2							
-27						LPZ-39	-0.143	0.44	41	0.93
-30	40	40 - 45'	4.5	40-47.75' J- fine to medium silty sand (grey) with zones of gravel and clay						
-33	44									
-36		45 - 50'	3.9							
-39	48	50 - 55'	4.2	47.75-51.6' K- interlayered silt/sand/clay/and coarse sand (grey)						
-42	52			51.6-55.5' J- fine to medium silty sand (grey) with zones of gravel and clay		LPZ-53	0.121	1.80	83	3.96
-45	56	55 - 60'	3.4	55.5-60.2' L- silty clay (blue grey), clayey sand (grey-brown), and very fine silty sand with organics						

*Vertical Gradient Between Adjacent Piezometers

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WELL / BORING LPZ-ALL

Elevation (ft above msl)	Depth (ft bls)	Sample Interval	Recovery (ft.)	Sample Descriptions	Well Construction	Remarks	Vertical Gradient* (ft/ft) 3/31/16	Nitrate-Nitrogen (mg/L) 3/30/16	ORP (mV) 3/30/16	DO (mg/L) 3/30/16
-48	60	55 - 60'	3.4							
		60 - 65'	2.1	60.2-62.1' J- fine to medium silty sand (grey) with zones of gravel and clay		LPZ-61	-0.170	1.00	-225	2.18
-51	64									
-54		65 - 70'	not recorded							
	68									
-57										
		70 - 75'	2.4	70-76.5' M- medium sand (blue grey)		LPZ-71	0.161	0.11	-137	0.65
-60	72									
-63										
		75 - 80'	2.5							
	76			76.5-77.6' N- very fine to fine silty sand (grey blue); with some clay						
-66				77.6-86.8' M- medium sand (blue grey)						
	80									
-69		80 - 85'	2.21			LPZ-80	0.011	0.07	-198	0.23
-72	84									
		85 - 90'	2.8							
-75										
	88									
-78						LPZ-90 bottom of boring at 90'	0.004	0.05	-185	0.22

*Vertical Gradient Between Adjacent Piezometers

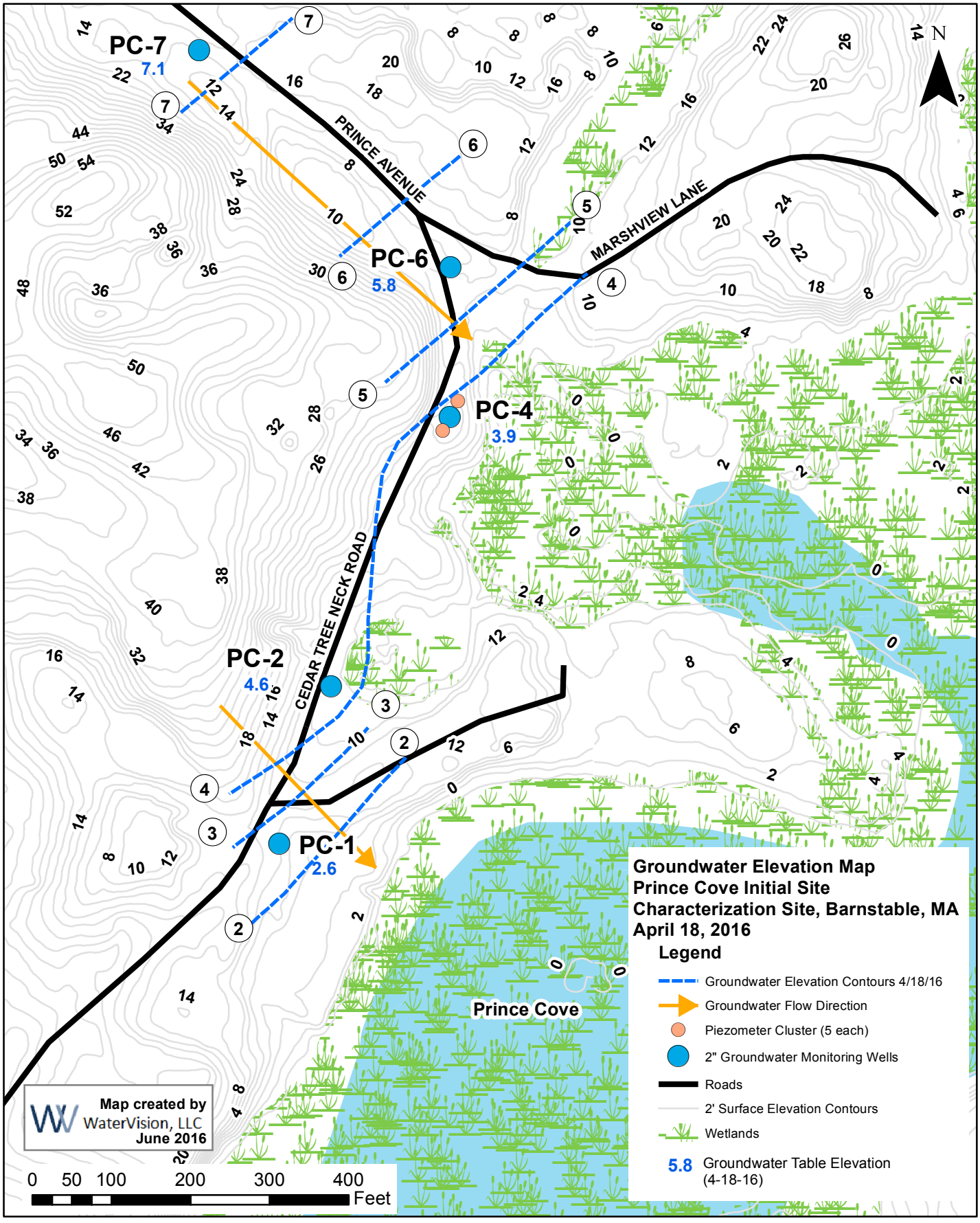
CAPE COD PERMEABLE REACTIVE BARRIER
INITIAL HYDROGEOLOGIC SITE CHARACTERIZATION RESULTS AND EVALUATION OF SITE SUITABILITY FOR PERMEABLE REACTIVE BARRIER INSTALLATION

Appendix C

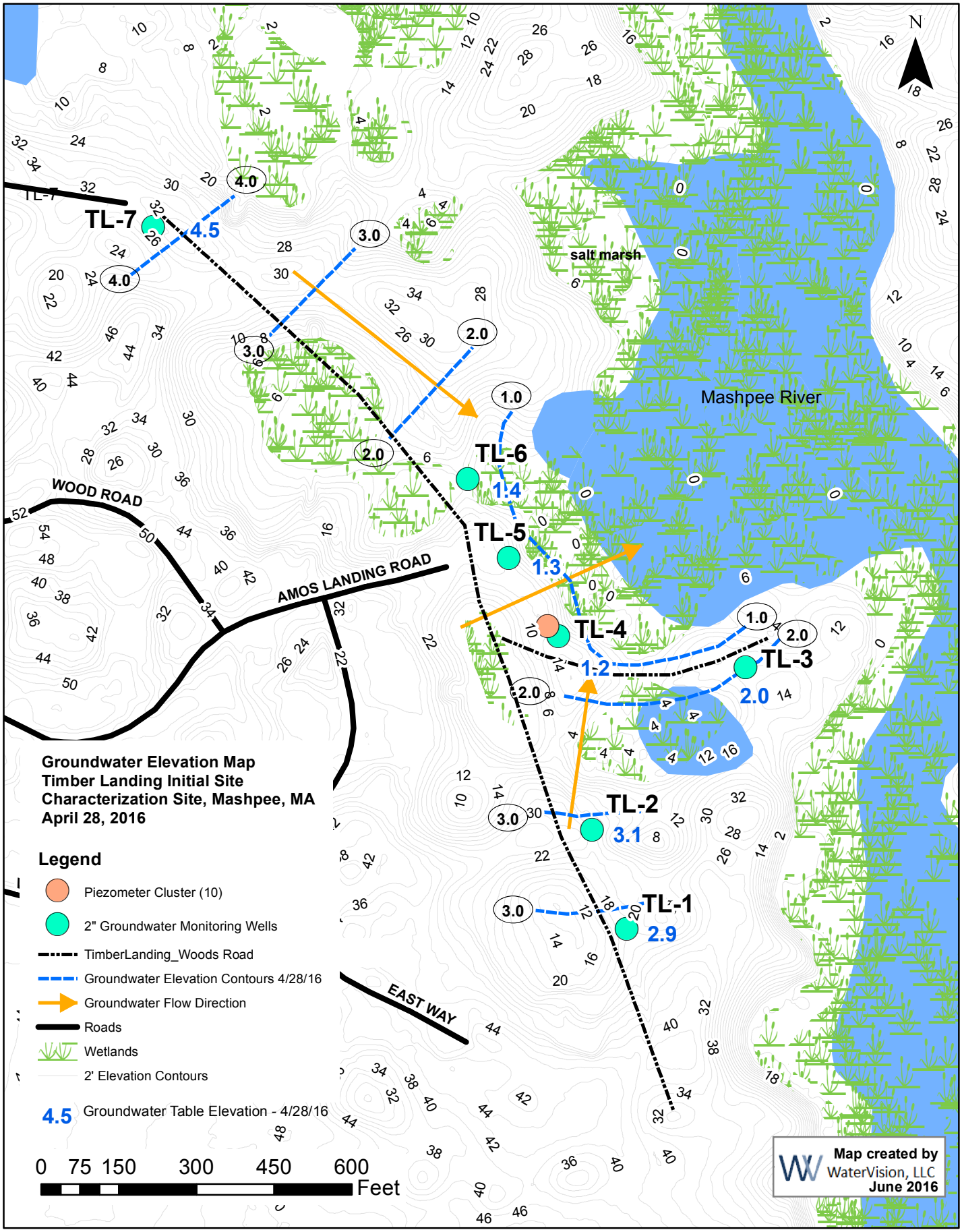
ISC Round 2 Groundwater Elevation Maps

Appendix C - Cape Cod PRB - ISC Round 2 Groundwater Elevation Maps

Appendix C-1

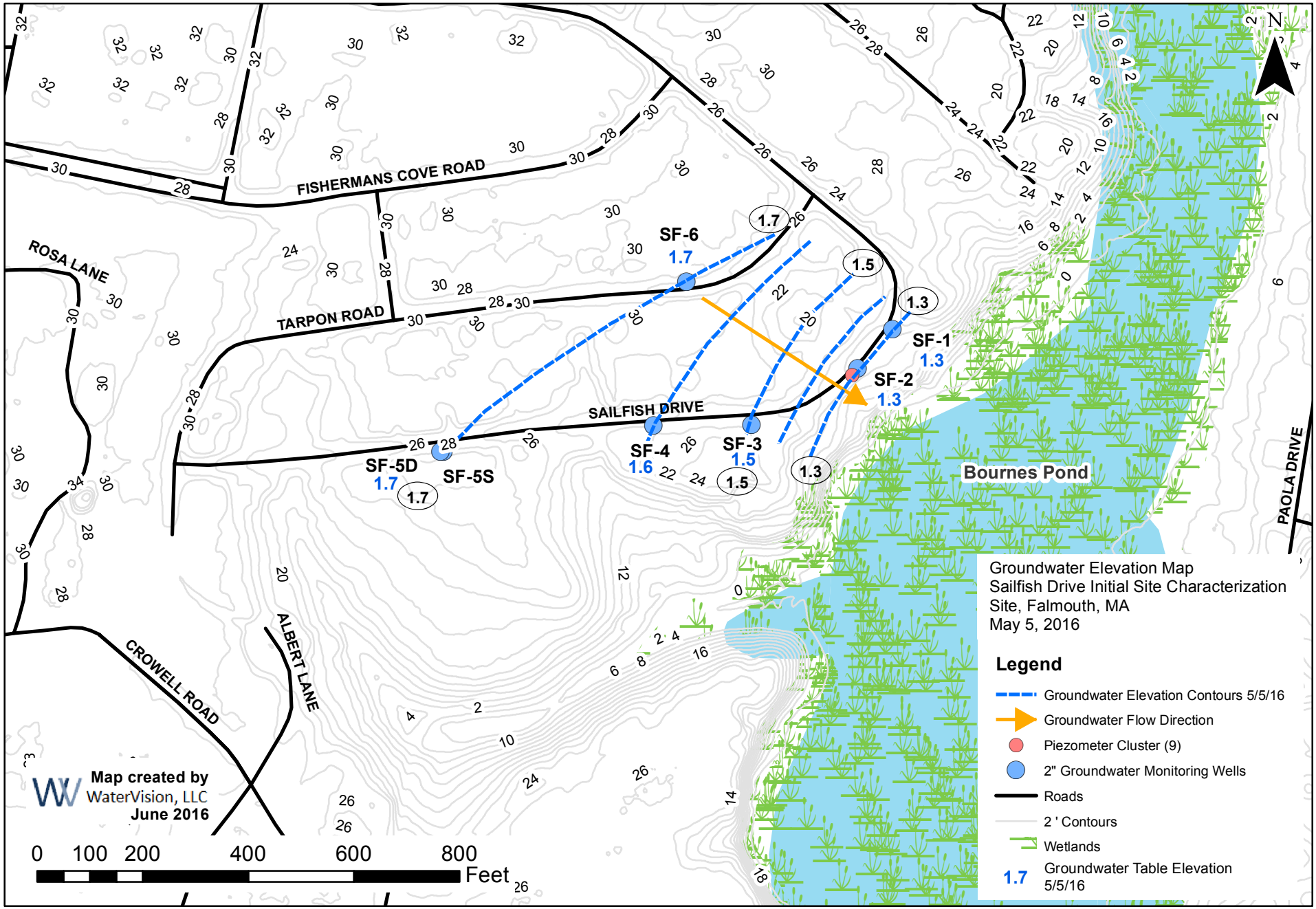


Sources: Roads from Mass GIS. Surveyed Groundwater Monitoring Well and Piezometer Cluster locations and groundwater table elevations and contours from WaterVision LLC. Wetlands and waterbodies from MassDEP. 2 foot surface elevation contours from Cape Cod Commission.

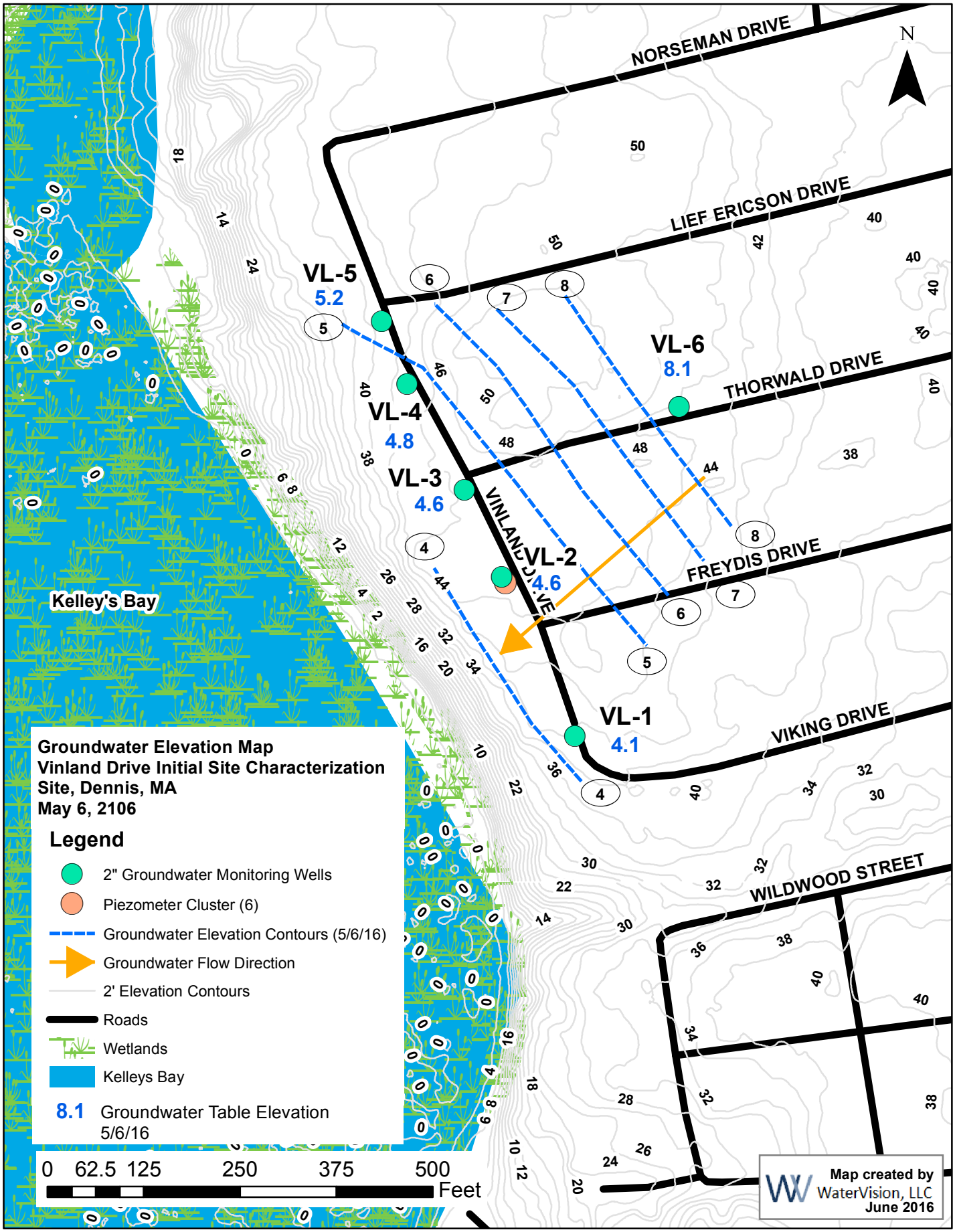


Sources: Roads from Mass GIS, surveyed Groundwater Monitoring Well and Piezometer Cluster locations from WaterVision LLC. Wetlands and waterbodies from MassDEP. 2' surface elevation contours from Cape Cod Commission.

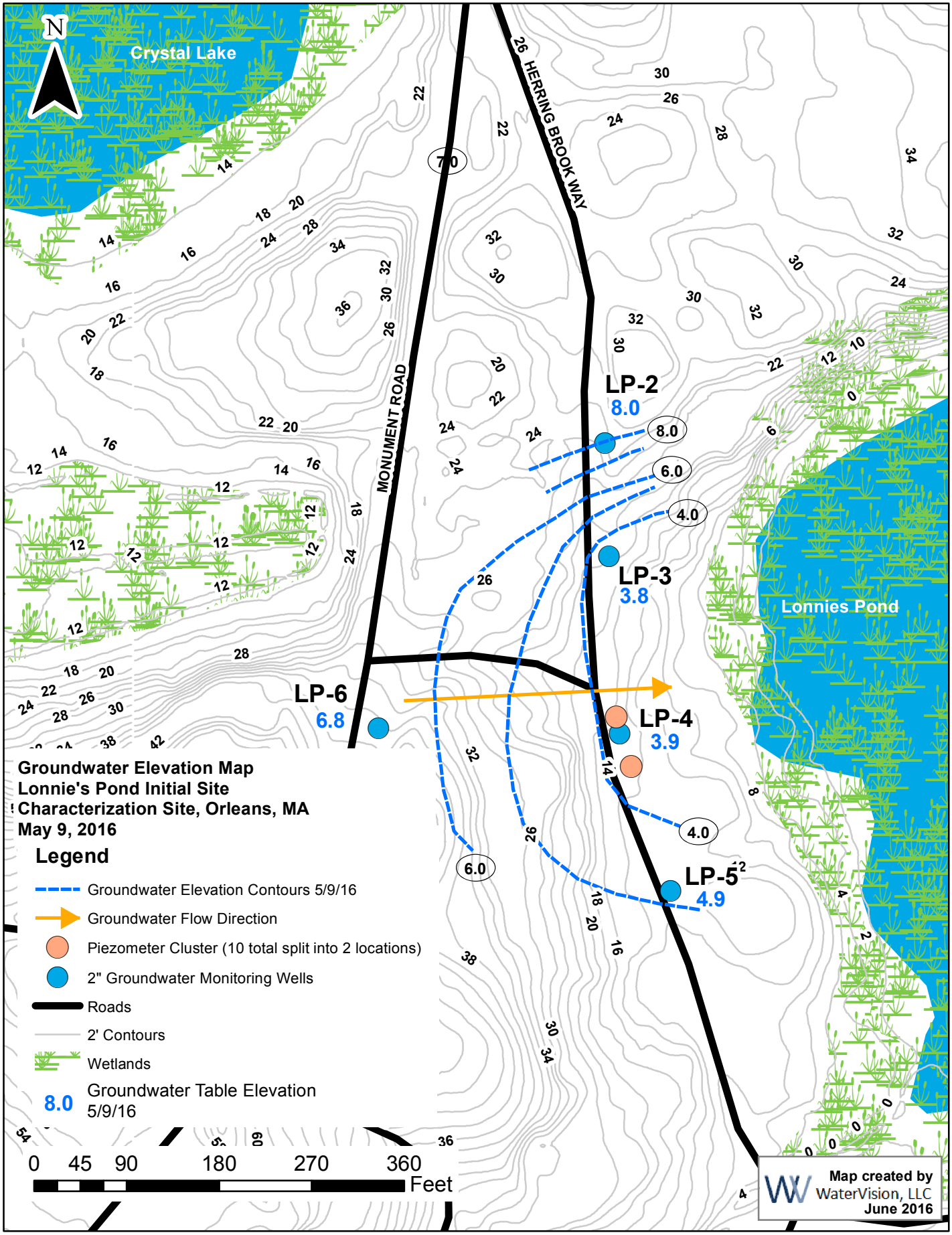
Appendix C-3



Sources: Roads from Mass GIS, Surveyed Groundwater Monitoring Well and Piezometer locations and groundwater table elevations from WaterVision LLC. 2 foot surface elevation contours from the Cape Cod Commission. Wetlands and waterbodies from MassDEP.



Sources: Roads from Mass GIS, 2 foot surface elevation contours from Cape Cod Commission,
Surveyed Groundwater Monitoring Well and Piezometer locations from WaterVision LLC.
Wetlands and waterbodies from MassDEP.



Sources: Roads from Mass GIS, 2 foot surface elevation contours from Cape Cod Commission,
Surveyed Groundwater Monitoring Well and Piezomenter
locations from WaterVision LLC. Wetlands and waterbodies from MassDEP.

CAPE COD PERMEABLE REACTIVE BARRIER
INITIAL HYDROGEOLOGIC SITE CHARACTERIZATION RESULTS AND EVALUATION OF SITE SUITABILITY FOR PERMEABLE REACTIVE BARRIER INSTALLATION

Appendix D

Water Quality

- Field-measured parameters and Hach kit nitrate-nitrogen concentrations
- Alpha Analytical laboratory reports
- Summary of Water Quality Sampling at ISC sites
- Summary of QA/QC data reviews

Field Measured Parameters - Barnstable Well Installation - January 2016			
Well Location	**Sample Type**	**Sample Interval (feet below land surface).**	**Hach Kit Result - Nitrate-Nitrogen (mg/L as N)**
PC-1	SP-15	9	2
	SP-15	15	4
	SP-15	25	1
PC-2	SP-15	11	0
	SP-15	15	0
	SP-15	25	1.5
PC-4	SP-15	10	2
	SP-15	25	4
	SP-15	30	2
	SP-15	35	4
	SP-15	40	2
	SP-15	50	2.5
	PCZ-60	60	0
	PCZ-70	70	0
	PCZ-80	80	0
	PCZ-88.5	88.5	0
PC-6	SP-15	10	dry
	PC-6	well	2
	SP-15	15	4
	SP-15	25	2
PC-7	SP-15	10	0
	SP-15	15	1
	SP-15	25	1.5

Field Measured Parameters during Mashpee Well Installation - January and Feburary 2016

Well Location	Sample Type	Sample Interval (feet below land surface).	Hach Test Kit Estimate - Nitrate-Nitrogen (mg/L)
TL-1	SP-15	19	0
	SP-15	34	1.5
TL-2	SP-15	23	1
	SP-15	38	0.5
TL-3	SP-15	10	0
	SP-15	25	1
TL-4	SP-15	12	dry
	SP-15	15	1
	SP-15	20	2
	SP-15	25	2
	SP-15	27	1.5
	SP-15	30	2
	SP-15	35	1.5
	SP-15	40	0.5
	SP-15	45	1
	SP-15	50	1
TL-5	SP-15	13	1.5
	SP-15	28	1.5
TL-6	SP-15	6	0
	SP-15	20	1.5
TL-7	SP-15 not completed - WL too deep		
	SP-15 not completed - WL too deep		

Field Measured Parameters and Nitrate during Falmouth-Sailfish Well Installation Feburary 2016			
Well Location	**Sample Type**	**Sample Interval (feet below land surface).**	**Hach Kit Result - Nitrate-Nitrogen (mg/L)**
SF-1	well	16-21	2
	SP-15	30	5
SF-2	well	16-21	0
	SP-15	20	1
	SP-15	30	7
	SP-15	35	2
	SP-15	40	0.5
	SP-15	45	1.5
	SP-15	50	1.5
	SP-15	60	NA
	SP-15	70	NA
	SFZ-67	67	3
	SFZ-77	77	1
SF-3	SP-15	25	7
	SP-15	35	10
SF-4	SP-15	25	0.5
	SP-15	35	4
SF-5	SP-15	13	1.5
	SP-15	28	1.5
SF-6	SP-15	30	5
	SP-15	40	1

Well Installation Field Measured Parameters and Nitrate - Dennis-Vinland Well Installation Feburary 2016					
Well Location	**Sample Type**	**Sample Interval (feet below land surface).**	**Specific Conductance (uS/cm)**	**pH**	**Hach Test Kit Estimate - Nitrate-Nitrogen (mg/L)**
VL-1	SP-15	40	363	6.40	4
	SP-15	46	310	6.50	4
VL-2	Did not complete SP-15				
VL-3	SP-15	40	NA	NA	NA
	SP-15	46	452	6.90	4
VL-4	Did not complete SP-15				
VL-5	SP-15	40	233	6.60	0
VL-5	SP-15	47	276	6.70	1
VL-6	SP-15	41	382	6.10	1
	SP-15	46	388	6.10	2

Field Measured Parameters -Lonnies Pond, Orleans, MA Well Installation Feburary 2016			
Well Location	**Sample Type**	**Sample Interval (feet below land surface).**	**Hach Test Kit Estimate - Nitrate-Nitrogen (mg/L)**
LP-2	well		
	SP-15	NS	NS
LP-3	well	10-15	1.5
	SP-15	20	too much silt to read
	SP-15	35	too much silt to read
LP-4	well	6-11	5
	LPZ-10	10	4
	LPZ-15	15	1
	LPZ-21	21	2
	LPZ-29	29	4
	LPZ-39	39	0
	LPZ-53	53	2
	LPZ-61	61	0
	LPZ-71	71	0
	LPZ-80	80	0
	LPZ-90	90	0
LP-5	well	5-10	0.5
	SP-15	10	1.5
	SP-15	20	0.5
LP-6	SP-15	32	1.5
	SP-15	42	1.5
NS - Not Sampled			

ANALYTICAL REPORT

Lab Number:	L1606572
Client:	Watervision, LLC 454 Court Stree Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	BARNSTABLE PRB
Project Number:	WV-1009
Report Date:	03/15/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1606572-01	PC-6	WATER	BARNSTABLE, MA	03/08/16 12:45	03/08/16
L1606572-02	PCZ-13	WATER	BARNSTABLE, MA	03/08/16 12:25	03/08/16
L1606572-03	PCZ-60	WATER	BARNSTABLE, MA	03/08/16 11:20	03/08/16
L1606572-04	PCZ-35	WATER	BARNSTABLE, MA	03/08/16 09:00	03/08/16
L1606572-05	PCZ-23	WATER	BARNSTABLE, MA	03/08/16 10:55	03/08/16
L1606572-06	PCZ-70	WATER	BARNSTABLE, MA	03/08/16 09:45	03/08/16
L1606572-07	PCZ-30	WATER	BARNSTABLE, MA	03/08/16 10:05	03/08/16
L1606572-08	PC-5	WATER	BARNSTABLE, MA	03/08/16 10:55	03/08/16
L1606572-09	PC-7	WATER	BARNSTABLE, MA	03/08/16 13:50	03/08/16
L1606572-10	PC-4	WATER	BARNSTABLE, MA	03/07/16 12:40	03/08/16
L1606572-11	PC-3	WATER	BARNSTABLE, MA	03/07/16 16:15	03/08/16
L1606572-12	PCZ-43	WATER	BARNSTABLE, MA	03/07/16 16:15	03/08/16
L1606572-13	PCZ-50	WATER	BARNSTABLE, MA	03/07/16 15:00	03/08/16
L1606572-14	PCZ-80	WATER	BARNSTABLE, MA	03/07/16 15:10	03/08/16
L1606572-15	PC-1	WATER	BARNSTABLE, MA	03/07/16 11:10	03/08/16
L1606572-16	PC-2	WATER	BARNSTABLE, MA	03/07/16 12:30	03/08/16
L1606572-17	PCZ-88.5	WATER	BARNSTABLE, MA	03/07/16 14:55	03/08/16

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: BARNSTABLE PRB **Lab Number:** L1606572
Project Number: WV-1009 **Report Date:** 03/15/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

L1606572-01 through -08, and -10 through -17: The samples were field filtered for Dissolved Metals and Dissolved Organic Carbon.

Nitrogen, Nitrite

L1606572-14, -16, and -17: The sample has an elevated detection limit due to the dilution required by the sample matrix.

L1606572-15 was analyzed with the method required holding time exceeded.

The WG872228-4 MS recovery, performed on L1606572-10, is outside the acceptance criteria (80%); however, the associated LCS recovery is within overall method allowances. No further action was required.

Nitrogen, Nitrate

L1606572-10 through -14, -16, and -17: The samples were analyzed for Nitrite within the method required holding time. An aliquot of sample was then preserved and analyzed for Nitrate.

L1606572-15 was analyzed with the method required holding time exceeded.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

Nitrogen, Ammonia

The WG873670-4 MS recovery (42%), performed on L1606572-04, is outside the acceptance criteria; however, the associated LCS recovery is within criteria. No further action was taken.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Lura L Troy

Title: Technical Director/Representative Date: 03/15/16

METALS

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-01
Client ID: PC-6
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/08/16 12:45
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0027	J	mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 03:13	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0159	J	mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 03:13	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.15		mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 03:13	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0135		mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 03:13	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-02
Client ID: PCZ-13
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/08/16 12:25
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0025	J	mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 03:17	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0115	J	mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 03:17	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.021	J	mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 03:17	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0052	J	mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 03:17	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-03
Client ID: PCZ-60
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/08/16 11:20
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0045	J	mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 03:21	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0169	J	mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 03:21	EPA 3005A	1,6010C	FB
Iron, Dissolved	8.0		mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 03:21	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.197		mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 03:21	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-04
Client ID: PCZ-35
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/08/16 09:00
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0027	J	mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 03:43	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0269	J	mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 03:43	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.10		mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 03:43	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0098	J	mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 03:43	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-05
Client ID: PCZ-23
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/08/16 10:55
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 03:47	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0304		mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 03:47	EPA 3005A	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 03:47	EPA 3005A	1,6010C	FB
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 03:47	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-06
Client ID: PCZ-70
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/08/16 09:45
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0061		mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 03:52	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0081	J	mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 03:52	EPA 3005A	1,6010C	FB
Iron, Dissolved	6.3		mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 03:52	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.158		mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 03:52	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-07
Client ID: PCZ-30
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/08/16 10:05
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0028	J	mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 03:56	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0226	J	mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 03:56	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.046	J	mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 03:56	EPA 3005A	1,6010C	FB
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 03:56	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-08
Client ID: PC-5
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/08/16 10:55
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 04:00	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0289	J	mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 04:00	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.028	J	mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 04:00	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0023	J	mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 04:00	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-09
Client ID: PC-7
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/08/16 13:50
Date Received: 03/08/16
Field Prep: None

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/14/16 12:40	03/15/16 15:23	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0180	J	mg/l	0.0300	0.0070	1	03/14/16 12:40	03/15/16 15:23	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/14/16 12:40	03/15/16 15:23	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.248		mg/l	0.0100	0.0020	1	03/14/16 12:40	03/15/16 15:23	EPA 3005A	1,6010C	PS

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-10
Client ID: PC-4
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/07/16 12:40
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0026	J	mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 04:05	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0207	J	mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 04:05	EPA 3005A	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 04:05	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0151		mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 04:05	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-11
Client ID: PC-3
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/07/16 16:15
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 04:09	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0289	J	mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 04:09	EPA 3005A	1,6010C	FB
Iron, Dissolved	1.5		mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 04:09	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0351		mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 04:09	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-12
Client ID: PCZ-43
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/07/16 16:15
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0031	J	mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 04:13	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0283	J	mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 04:13	EPA 3005A	1,6010C	FB
Iron, Dissolved	1.5		mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 04:13	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0348		mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 04:13	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-13
Client ID: PCZ-50
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/07/16 15:00
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0042	J	mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 04:35	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0211	J	mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 04:35	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.64		mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 04:35	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0702		mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 04:35	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-14
Client ID: PCZ-80
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/07/16 15:10
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0101		mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 04:39	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0085	J	mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 04:39	EPA 3005A	1,6010C	FB
Iron, Dissolved	11.		mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 04:39	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.245		mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 04:39	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-15
Client ID: PC-1
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/07/16 11:10
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0022	J	mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 04:44	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0446		mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 04:44	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.075		mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 04:44	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0991		mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 04:44	EPA 3005A	1,6010C	FB

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-16
Client ID: PC-2
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/07/16 12:30
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/14/16 12:40	03/15/16 14:37	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0175	J	mg/l	0.0300	0.0070	1	03/14/16 12:40	03/15/16 14:37	EPA 3005A	1,6010C	PS
Iron, Dissolved	1.3		mg/l	0.050	0.020	1	03/14/16 12:40	03/15/16 14:37	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.133		mg/l	0.0100	0.0020	1	03/14/16 12:40	03/15/16 14:37	EPA 3005A	1,6010C	PS

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-17
Client ID: PCZ-88.5
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/07/16 14:55
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/14/16 12:40	03/15/16 15:00	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0106	J	mg/l	0.0300	0.0070	1	03/14/16 12:40	03/15/16 15:00	EPA 3005A	1,6010C	PS
Iron, Dissolved	7.6		mg/l	0.050	0.020	1	03/14/16 12:40	03/15/16 15:00	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.105		mg/l	0.0100	0.0020	1	03/14/16 12:40	03/15/16 15:00	EPA 3005A	1,6010C	PS

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-08,10-15 Batch: WG872553-1										
Arsenic, Dissolved	0.0028	J	mg/l	0.0050	0.0020	1	03/10/16 13:15	03/11/16 01:59	1,6010C	FB
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	03/10/16 13:15	03/11/16 01:59	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/10/16 13:15	03/11/16 01:59	1,6010C	FB
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	03/10/16 13:15	03/11/16 01:59	1,6010C	FB

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 09 Batch: WG873557-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/14/16 12:40	03/15/16 15:13	1,6010C	PS
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	03/14/16 12:40	03/15/16 15:13	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/14/16 12:40	03/15/16 15:13	1,6010C	PS
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	03/14/16 12:40	03/15/16 15:13	1,6010C	PS

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 16-17 Batch: WG873559-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/14/16 12:40	03/15/16 14:18	1,6010C	PS
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	03/14/16 12:40	03/15/16 14:18	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/14/16 12:40	03/15/16 14:18	1,6010C	PS
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	03/14/16 12:40	03/15/16 14:18	1,6010C	PS

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: BARNSTABLE PRB

Project Number: WV-1009

Lab Number: L1606572

Report Date: 03/15/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-08,10-15 Batch: WG872553-2								
Arsenic, Dissolved	109		-		80-120	-		
Boron, Dissolved	106		-		80-120	-		
Iron, Dissolved	91		-		80-120	-		
Manganese, Dissolved	101		-		80-120	-		
Dissolved Metals - Westborough Lab Associated sample(s): 09 Batch: WG873557-2								
Arsenic, Dissolved	105		-		80-120	-		
Boron, Dissolved	114		-		80-120	-		
Iron, Dissolved	91		-		80-120	-		
Manganese, Dissolved	98		-		80-120	-		
Dissolved Metals - Westborough Lab Associated sample(s): 16-17 Batch: WG873559-2								
Arsenic, Dissolved	106		-		80-120	-		
Boron, Dissolved	113		-		80-120	-		
Iron, Dissolved	88		-		80-120	-		
Manganese, Dissolved	96		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-08,10-15 QC Batch ID: WG872553-4 QC Sample: L1606316-06 Client ID: MS Sample												
Arsenic, Dissolved	0.0104	0.12	0.137	106		-	-		75-125	-		20
Boron, Dissolved	0.072	1	1.14	107		-	-		75-125	-		20
Iron, Dissolved	34.	1	34	**0**	Q	-	-		75-125	-		20
Manganese, Dissolved	1.09	0.5	1.55	92		-	-		75-125	-		20
Dissolved Metals - Westborough Lab Associated sample(s): 09 QC Batch ID: WG873557-4 QC Sample: L1606572-09 Client ID: PC-7												
Arsenic, Dissolved	ND	0.12	0.124	103		-	-		75-125	-		20
Boron, Dissolved	0.0180J	1	1.15	115		-	-		75-125	-		20
Iron, Dissolved	ND	1	0.87	87		-	-		75-125	-		20
Manganese, Dissolved	0.248	0.5	0.720	94		-	-		75-125	-		20
Dissolved Metals - Westborough Lab Associated sample(s): 16-17 QC Batch ID: WG873559-4 QC Sample: L1606572-16 Client ID: PC-2												
Arsenic, Dissolved	ND	0.12	0.127	106		-	-		75-125	-		20
Boron, Dissolved	0.0175J	1	1.15	115		-	-		75-125	-		20
Iron, Dissolved	1.3	1	2.2	90		-	-		75-125	-		20
Manganese, Dissolved	0.133	0.5	0.608	95		-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-08,10-15 QC Batch ID: WG872553-3 QC Sample: L1606316-06 Client ID: DUP Sample						
Arsenic, Dissolved	0.0104	0.0104	mg/l	0		20
Dissolved Metals - Westborough Lab Associated sample(s): 09 QC Batch ID: WG873557-3 QC Sample: L1606572-09 Client ID: PC-7						
Arsenic, Dissolved	ND	ND	mg/l	NC		20
Boron, Dissolved	0.0180J	0.0174J	mg/l	NC		20
Iron, Dissolved	ND	ND	mg/l	NC		20
Manganese, Dissolved	0.248	0.249	mg/l	0		20
Dissolved Metals - Westborough Lab Associated sample(s): 16-17 QC Batch ID: WG873559-3 QC Sample: L1606572-16 Client ID: PC-2						
Arsenic, Dissolved	ND	ND	mg/l	NC		20
Boron, Dissolved	0.0175J	0.0173J	mg/l	NC		20
Iron, Dissolved	1.3	1.4	mg/l	7		20
Manganese, Dissolved	0.133	0.138	mg/l	4		20

INORGANICS
&
MISCELLANEOUS

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-01
Client ID: PC-6
Sample Location: BARNSTABLE, MA
Matrix: Water

Date Collected: 03/08/16 12:45
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.60		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	5.7		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	0.043	J	mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:05	44,350.1	AT
Nitrogen, Nitrite	0.012	J	mg/l	0.050	0.010	1	-	03/09/16 20:14	44,353.2	MR
Nitrogen, Nitrate	2.5		mg/l	0.10	0.019	1	-	03/09/16 20:14	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.5		mg/l	0.10	0.019	1	-	03/09/16 20:14	44,353.2	MR
Total Nitrogen	2.5		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	0.230	J	mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:19	30,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	03/09/16 02:35	30,4500P-E	LH
Dissolved Organic Carbon	0.90	J	mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	20.6		mg/l	0.500	0.054	1	-	03/09/16 18:46	44,300.0	AU
Sulfate	10.1		mg/l	1.00	0.051	1	-	03/09/16 18:46	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-02
Client ID: PCZ-13
Sample Location: BARNSTABLE, MA
Matrix: Water

Date Collected: 03/08/16 12:25
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.50		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	5.8		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	0.022	J	mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:09	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/09/16 20:20	44,353.2	MR
Nitrogen, Nitrate	1.4		mg/l	0.10	0.019	1	-	03/09/16 20:20	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.4		mg/l	0.10	0.019	1	-	03/09/16 20:20	44,353.2	MR
Total Nitrogen	1.4		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	0.170	J	mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:22	30,4500N-C	AT
Phosphorus, Orthophosphate	0.013		mg/l	0.005	0.001	1	-	03/09/16 02:35	30,4500P-E	LH
Dissolved Organic Carbon	0.46	J	mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	14.6		mg/l	0.500	0.054	1	-	03/09/16 18:58	44,300.0	AU
Sulfate	5.23		mg/l	1.00	0.051	1	-	03/09/16 18:58	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-03
Client ID: PCZ-60
Sample Location: BARNSTABLE, MA
Matrix: Water

Date Collected: 03/08/16 11:20
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	18.1		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	6.1		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	0.043	J	mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:09	44,350.1	AT
Nitrogen, Nitrite	0.014	J	mg/l	0.050	0.010	1	-	03/09/16 20:25	44,353.2	MR
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	03/09/16 20:25	44,353.2	MR
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	03/09/16 20:25	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	0.261	J	mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:23	30,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/09/16 02:35	30,4500P-E	LH
Dissolved Organic Carbon	1.1		mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	17.6		mg/l	0.500	0.054	1	-	03/09/16 19:10	44,300.0	AU
Sulfate	13.6		mg/l	1.00	0.051	1	-	03/09/16 19:10	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-04
Client ID: PCZ-35
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/08/16 09:00
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	9.30		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	5.7		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:10	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/09/16 20:27	44,353.2	MR
Nitrogen, Nitrate	2.3		mg/l	0.10	0.019	1	-	03/09/16 20:27	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.3		mg/l	0.10	0.019	1	-	03/09/16 20:27	44,353.2	MR
Total Nitrogen	2.3		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	0.113	J	mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:23	30,4500N-C	AT
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	03/09/16 02:36	30,4500P-E	LH
Dissolved Organic Carbon	0.89	J	mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.8		mg/l	0.500	0.054	1	-	03/09/16 19:22	44,300.0	AU
Sulfate	4.31		mg/l	1.00	0.051	1	-	03/09/16 19:22	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-05
Client ID: PCZ-23
Sample Location: BARNSTABLE, MA
Matrix: Water

Date Collected: 03/08/16 10:55
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	9.50		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	5.8		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	0.061	J	mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:13	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/09/16 20:28	44,353.2	MR
Nitrogen, Nitrate	2.3		mg/l	0.10	0.019	1	-	03/09/16 20:28	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.3		mg/l	0.10	0.019	1	-	03/09/16 20:28	44,353.2	MR
Total Nitrogen	2.3		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	0.127	J	mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:24	30,4500N-C	AT
Phosphorus, Orthophosphate	0.012		mg/l	0.005	0.001	1	-	03/09/16 02:36	30,4500P-E	LH
Dissolved Organic Carbon	0.56	J	mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.9		mg/l	0.500	0.054	1	-	03/09/16 19:34	44,300.0	AU
Sulfate	4.52		mg/l	1.00	0.051	1	-	03/09/16 19:34	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-06
Client ID: PCZ-70
Sample Location: BARNSTABLE, MA
Matrix: Water

Date Collected: 03/08/16 09:45
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	15.8		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	6.2		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	0.066	J	mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:14	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/09/16 20:29	44,353.2	MR
Nitrogen, Nitrate	0.021	J	mg/l	0.10	0.019	1	-	03/09/16 20:29	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.021	J	mg/l	0.10	0.019	1	-	03/09/16 20:29	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	0.135	J	mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:28	30,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/09/16 02:36	30,4500P-E	LH
Dissolved Organic Carbon	0.43	J	mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	11.7		mg/l	0.500	0.054	1	-	03/09/16 19:46	44,300.0	AU
Sulfate	9.53		mg/l	1.00	0.051	1	-	03/09/16 19:46	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-07
Client ID: PCZ-30
Sample Location: BARNSTABLE, MA
Matrix: Water

Date Collected: 03/08/16 10:05
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.80		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	5.8		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	0.066	J	mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:15	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/09/16 20:31	44,353.2	MR
Nitrogen, Nitrate	2.2		mg/l	0.10	0.019	1	-	03/09/16 20:31	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.2		mg/l	0.10	0.019	1	-	03/09/16 20:31	44,353.2	MR
Total Nitrogen	2.2		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	0.142	J	mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:29	30,4500N-C	AT
Phosphorus, Orthophosphate	0.011		mg/l	0.005	0.001	1	-	03/09/16 02:37	30,4500P-E	LH
Dissolved Organic Carbon	0.65	J	mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.9		mg/l	0.500	0.054	1	-	03/09/16 20:22	44,300.0	AU
Sulfate	4.29		mg/l	1.00	0.051	1	-	03/09/16 20:22	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-08
Client ID: PC-5
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/08/16 10:55
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	9.30		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	5.8		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:15	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/09/16 20:32	44,353.2	MR
Nitrogen, Nitrate	2.3		mg/l	0.10	0.019	1	-	03/09/16 20:32	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.3		mg/l	0.10	0.019	1	-	03/09/16 20:32	44,353.2	MR
Total Nitrogen	2.3		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:29	30,4500N-C	AT
Phosphorus, Orthophosphate	0.017		mg/l	0.005	0.001	1	-	03/09/16 02:37	30,4500P-E	LH
Dissolved Organic Carbon	0.52	J	mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.8		mg/l	0.500	0.054	1	-	03/09/16 20:34	44,300.0	AU
Sulfate	4.41		mg/l	1.00	0.051	1	-	03/09/16 20:34	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-09
Client ID: PC-7
Sample Location: BARNSTABLE, MA
Matrix: Water

Date Collected: 03/08/16 13:50
Date Received: 03/08/16
Field Prep: None

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	14.4		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	5.7		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	0.045	J	mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:16	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/09/16 20:33	44,353.2	MR
Nitrogen, Nitrate	1.7		mg/l	0.10	0.019	1	-	03/09/16 20:33	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.7		mg/l	0.10	0.019	1	-	03/09/16 20:33	44,353.2	MR
Total Nitrogen	1.7		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	0.151	J	mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:30	30,4500N-C	AT
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	03/09/16 02:37	30,4500P-E	LH
Dissolved Organic Carbon	2.2		mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	46.5		mg/l	5.00	0.541	10	-	03/10/16 00:58	44,300.0	AU
Sulfate	8.52		mg/l	1.00	0.051	1	-	03/09/16 20:46	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-10
Client ID: PC-4
Sample Location: BARNSTABLE, MA
Matrix: Water

Date Collected: 03/07/16 12:40
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.40		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	6.0		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:20	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.020	0.001	1	-	03/09/16 12:19	30,4500NO2-B	JO
Nitrogen, Nitrate	1.4		mg/l	0.10	0.019	1	-	03/09/16 20:34	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.4		mg/l	0.10	0.019	1	-	03/09/16 20:34	44,353.2	MR
Total Nitrogen	1.4		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:31	30,4500N-C	AT
Phosphorus, Orthophosphate	0.009		mg/l	0.005	0.001	1	-	03/09/16 02:38	30,4500P-E	LH
Dissolved Organic Carbon	1.0		mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	20.2		mg/l	0.500	0.054	1	-	03/09/16 20:58	44,300.0	AU
Sulfate	8.38		mg/l	1.00	0.051	1	-	03/09/16 20:58	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-11
Client ID: PC-3
Sample Location: BARNSTABLE, MA
Matrix: Water

Date Collected: 03/07/16 16:15
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	12.2		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	6.1		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	0.022	J	mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:21	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.020	0.001	1	-	03/09/16 12:19	30,4500NO2-B	JO
Nitrogen, Nitrate	2.2		mg/l	0.10	0.019	1	-	03/09/16 20:42	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.2		mg/l	0.10	0.019	1	-	03/09/16 20:42	44,353.2	MR
Total Nitrogen	2.2		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:32	30,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	03/09/16 02:40	30,4500P-E	LH
Dissolved Organic Carbon	0.46	J	mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.9		mg/l	0.500	0.054	1	-	03/09/16 21:10	44,300.0	AU
Sulfate	4.94		mg/l	1.00	0.051	1	-	03/09/16 21:10	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-12
Client ID: PCZ-43
Sample Location: BARNSTABLE, MA
Matrix: Water

Date Collected: 03/07/16 16:15
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	12.4		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	6.1		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	0.025	J	mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:21	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.020	0.001	1	-	03/09/16 12:19	30,4500NO2-B	JO
Nitrogen, Nitrate	2.3		mg/l	0.10	0.019	1	-	03/09/16 20:44	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.3		mg/l	0.10	0.019	1	-	03/09/16 20:44	44,353.2	MR
Total Nitrogen	2.3		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	0.095	J	mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:33	30,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	03/09/16 02:40	30,4500P-E	LH
Dissolved Organic Carbon	0.52	J	mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.9		mg/l	0.500	0.054	1	-	03/09/16 21:22	44,300.0	AU
Sulfate	4.94		mg/l	1.00	0.051	1	-	03/09/16 21:22	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-13
Client ID: PCZ-50
Sample Location: BARNSTABLE, MA
Matrix: Water

Date Collected: 03/07/16 15:00
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	14.5		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	6.3		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:22	44,350.1	AT
Nitrogen, Nitrite	0.020		mg/l	0.020	0.001	1	-	03/09/16 12:20	30,4500NO2-B	JO
Nitrogen, Nitrate	2.0		mg/l	0.10	0.019	1	-	03/09/16 20:45	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.0		mg/l	0.10	0.019	1	-	03/09/16 20:45	44,353.2	MR
Total Nitrogen	2.0		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:34	30,4500N-C	AT
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	03/09/16 02:40	30,4500P-E	LH
Dissolved Organic Carbon	1.2		mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.7		mg/l	0.500	0.054	1	-	03/09/16 21:34	44,300.0	AU
Sulfate	6.20		mg/l	1.00	0.051	1	-	03/09/16 21:34	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-14
Client ID: PCZ-80
Sample Location: BARNSTABLE, MA
Matrix: Water

Date Collected: 03/07/16 15:10
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	17.4		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	6.5		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	0.063	J	mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:23	44,350.1	AT
Nitrogen, Nitrite	0.030	J	mg/l	0.100	0.006	5	-	03/09/16 12:26	30,4500NO2-B	JO
Nitrogen, Nitrate	0.058	J	mg/l	0.10	0.019	1	-	03/09/16 20:46	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.058	J	mg/l	0.10	0.019	1	-	03/09/16 20:46	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	0.182	J	mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:35	30,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	03/09/16 02:41	30,4500P-E	LH
Dissolved Organic Carbon	3.2		mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	10.7		mg/l	0.500	0.054	1	-	03/09/16 21:46	44,300.0	AU
Sulfate	9.41		mg/l	1.00	0.051	1	-	03/09/16 21:46	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-15
Client ID: PC-1
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/07/16 11:10
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	10.6		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	6.0		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	0.067	J	mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:24	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.020	0.001	1	-	03/09/16 12:21	30,4500NO2-B	JO
Nitrogen, Nitrate	0.64		mg/l	0.10	0.019	1	-	03/09/16 20:47	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.64		mg/l	0.10	0.019	1	-	03/09/16 20:47	44,353.2	MR
Total Nitrogen	0.64		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	0.160	J	mg/l	0.300	0.093	1	03/08/16 20:30	03/09/16 23:35	30,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/09/16 02:41	30,4500P-E	LH
Dissolved Organic Carbon	1.2		mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	23.4		mg/l	0.500	0.054	1	-	03/09/16 21:58	44,300.0	AU
Sulfate	10.7		mg/l	1.00	0.051	1	-	03/09/16 21:58	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-16
Client ID: PC-2
Sample Location: BARNSTABLE, MA
Matrix: Water
Date Collected: 03/07/16 12:30
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.40		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	5.5		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:25	44,350.1	AT
Nitrogen, Nitrite	0.010	J	mg/l	0.040	0.002	2	-	03/09/16 12:22	30,4500NO2-B	JO
Nitrogen, Nitrate	0.10		mg/l	0.10	0.019	1	-	03/09/16 20:49	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.10		mg/l	0.10	0.019	1	-	03/09/16 20:49	44,353.2	MR
Total Nitrogen	0.52		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	0.423		mg/l	0.300	0.093	1	03/09/16 07:52	03/10/16 23:29	30,4500N-C	AT
Phosphorus, Orthophosphate	0.003	J	mg/l	0.005	0.001	1	-	03/09/16 02:41	30,4500P-E	LH
Dissolved Organic Carbon	1.6		mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	28.7		mg/l	0.500	0.054	1	-	03/09/16 22:58	44,300.0	AU
Sulfate	16.1		mg/l	1.00	0.051	1	-	03/09/16 22:58	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

SAMPLE RESULTS

Lab ID: L1606572-17
Client ID: PCZ-88.5
Sample Location: BARNSTABLE, MA
Matrix: Water

Date Collected: 03/07/16 14:55
Date Received: 03/08/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	13.4		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
pH (H)	6.4		SU	-	NA	1	-	03/09/16 19:00	30,4500H+-B	AS
Nitrogen, Ammonia	0.025	J	mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:26	44,350.1	AT
Nitrogen, Nitrite	0.030	J	mg/l	0.100	0.006	5	-	03/09/16 12:26	30,4500NO2-B	JO
Nitrogen, Nitrate	0.025	J	mg/l	0.10	0.019	1	-	03/09/16 20:50	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.025	J	mg/l	0.10	0.019	1	-	03/09/16 20:50	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	03/11/16 11:53	41,-	JO
Nitrogen, Total Kjeldahl	0.204	J	mg/l	0.300	0.093	1	03/09/16 07:52	03/10/16 23:32	30,4500N-C	AT
Phosphorus, Orthophosphate	0.009		mg/l	0.005	0.001	1	-	03/09/16 02:42	30,4500P-E	LH
Dissolved Organic Carbon	0.46	J	mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	10.2		mg/l	0.500	0.054	1	-	03/09/16 23:10	44,300.0	AU
Sulfate	9.84		mg/l	1.00	0.051	1	-	03/09/16 23:10	44,300.0	AU

Project Name: BARNSTABLE PRB
Project Number: WV-1009
Lab Number: L1606572
Report Date: 03/15/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-15 Batch: WG871844-1										
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.031	1	03/08/16 20:30	03/09/16 23:17	30,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 01-17 Batch: WG871885-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	03/09/16 02:34	30,4500P-E	LH
General Chemistry - Westborough Lab for sample(s): 16-17 Batch: WG871985-1										
Nitrogen, Total Kjeldahl	0.153	J	mg/l	0.300	0.031	1	03/09/16 07:52	03/10/16 23:22	30,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG872196-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	03/09/16 19:43	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 10-17 Batch: WG872197-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	03/09/16 19:52	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG872198-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/09/16 19:45	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 10-17 Batch: WG872228-1										
Nitrogen, Nitrite	ND		mg/l	0.020	0.001	1	-	03/09/16 12:17	30,4500NO2-B	JO
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG872280-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	03/09/16 19:43	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 10-17 Batch: WG872281-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	03/09/16 19:52	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-17 Batch: WG872501-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	03/10/16 17:03	03/10/16 17:03	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-17 Batch: WG872696-1										
Chloride	ND		mg/l	0.500	0.054	1	-	03/09/16 17:58	44,300.0	AU
Sulfate	0.143	J	mg/l	1.00	0.051	1	-	03/09/16 17:58	44,300.0	AU
General Chemistry - Westborough Lab for sample(s): 01-17 Batch: WG873386-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	03/13/16 11:46	30,2320B	SG
General Chemistry - Westborough Lab for sample(s): 01-17 Batch: WG873670-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/08/16 22:00	03/09/16 22:00	44,350.1	AT

Lab Control Sample Analysis

Batch Quality Control

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-15 Batch: WG871844-2								
Nitrogen, Total Kjeldahl	98		-		78-122	-		
General Chemistry - Westborough Lab Associated sample(s): 01-17 Batch: WG871885-2								
Phosphorus, Orthophosphate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 16-17 Batch: WG871985-2								
Nitrogen, Total Kjeldahl	95		-		78-122	-		
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG872196-2								
Nitrogen, Nitrate	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 10-17 Batch: WG872197-2								
Nitrogen, Nitrate	94		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG872198-2								
Nitrogen, Nitrite	102		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 10-17 Batch: WG872228-2								
Nitrogen, Nitrite	94		-		90-110	-		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-17 Batch: WG872252-1					
pH	100	-	99-101	-	5
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG872280-2					
Nitrogen, Nitrate/Nitrite	96	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 10-17 Batch: WG872281-2					
Nitrogen, Nitrate/Nitrite	94	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-17 Batch: WG872501-2					
Dissolved Organic Carbon	102	-	90-110	-	
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-17 Batch: WG872696-2					
Chloride	98	-	90-110	-	
Sulfate	98	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-17 Batch: WG873386-3					
Alkalinity, Total	102	-	90-110	-	10
General Chemistry - Westborough Lab Associated sample(s): 01-17 Batch: WG873670-2					
Nitrogen, Ammonia	97	-	80-120	-	20

Matrix Spike Analysis
Batch Quality Control

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-15 QC Batch ID: WG871844-4 QC Sample: L1606572-01 Client ID: PC-6												
Nitrogen, Total Kjeldahl	0.230J	8	6.74	84		-	-		77-111	-		24
General Chemistry - Westborough Lab Associated sample(s): 01-17 QC Batch ID: WG871885-4 QC Sample: L1606572-17 Client ID: PCZ-88.5												
Phosphorus, Orthophosphate	0.009	0.5	0.521	102		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 16-17 QC Batch ID: WG871985-4 QC Sample: L1606432-02 Client ID: MS Sample												
Nitrogen, Total Kjeldahl	0.987	8	7.81	85		-	-		77-111	-		24
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG872196-4 QC Sample: L1606572-01 Client ID: PC-6												
Nitrogen, Nitrate	2.5	4	6.2	92		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 10-17 QC Batch ID: WG872197-4 QC Sample: L1606572-10 Client ID: PC-4												
Nitrogen, Nitrate	1.4	4	5.1	92		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG872198-4 QC Sample: L1606572-01 Client ID: PC-6												
Nitrogen, Nitrite	0.012J	4	4.1	102		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 10-17 QC Batch ID: WG872228-4 QC Sample: L1606572-10 Client ID: PC-4												
Nitrogen, Nitrite	ND	0.1	0.080	**80**	Q	-	-		85-115	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG872280-4 QC Sample: L1606572-01 Client ID: PC-6												
Nitrogen, Nitrate/Nitrite	2.5	4	6.2	92		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 10-17 QC Batch ID: WG872281-4 QC Sample: L1606572-10 Client ID: PC-4												
Nitrogen, Nitrate/Nitrite	1.4	4	5.1	92		-	-		80-120	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery		MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-17 QC Batch ID: WG872501-4 QC Sample: L1606572-13 Client ID: PCZ-50										
Dissolved Organic Carbon	1.2	4	4.6	84		-	-	80-120	-	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-17 QC Batch ID: WG872696-3 QC Sample: L1606572-06 Client ID: PCZ-70										
Chloride	11.7	4	15.4	92		-	-	40-151	-	18
Sulfate	9.53	8	17.6	101		-	-	60-140	-	20
General Chemistry - Westborough Lab Associated sample(s): 01-17 QC Batch ID: WG873386-4 QC Sample: L1606572-02 Client ID: PCZ-13										
Alkalinity, Total	8.50	100	110	102		-	-	86-116	-	10
General Chemistry - Westborough Lab Associated sample(s): 01-17 QC Batch ID: WG873670-4 QC Sample: L1606572-04 Client ID: PCZ-35										
Nitrogen, Ammonia	ND	4	1.67	**42**	Q	-	-	80-120	-	20

Lab Duplicate Analysis
Batch Quality Control

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-15 QC Batch ID: WG871844-3 QC Sample: L1606572-01 Client ID: PC-6						
Nitrogen, Total Kjeldahl	0.230J	0.144J	mg/l	NC		24
General Chemistry - Westborough Lab Associated sample(s): 01-17 QC Batch ID: WG871885-3 QC Sample: L1606572-10 Client ID: PC-4						
Phosphorus, Orthophosphate	0.009	0.009	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 16-17 QC Batch ID: WG871985-3 QC Sample: L1606432-02 Client ID: DUP Sample						
Nitrogen, Total Kjeldahl	0.987	1.11	mg/l	12		24
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG872196-3 QC Sample: L1606572-01 Client ID: PC-6						
Nitrogen, Nitrate	2.5	2.5	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 10-17 QC Batch ID: WG872197-3 QC Sample: L1606572-10 Client ID: PC-4						
Nitrogen, Nitrate	1.4	1.4	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG872198-3 QC Sample: L1606572-01 Client ID: PC-6						
Nitrogen, Nitrite	0.012J	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 10-17 QC Batch ID: WG872228-3 QC Sample: L1606572-13 Client ID: PCZ-50						
Nitrogen, Nitrite	0.020	0.020	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-17 QC Batch ID: WG872252-2 QC Sample: L1606572-01 Client ID: PC-6						
pH (H)	5.7	5.6	SU	2		5
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG872280-3 QC Sample: L1606572-01 Client ID: PC-6						
Nitrogen, Nitrate/Nitrite	2.5	2.5	mg/l	0		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 10-17 QC Batch ID: WG872281-3 QC Sample: L1606572-10 Client ID: PC-4					
Nitrogen, Nitrate/Nitrite	1.4	1.4	mg/l	0	20
General Chemistry - Westborough Lab Associated sample(s): 01-17 QC Batch ID: WG872501-3 QC Sample: L1606572-10 Client ID: PC-4					
Dissolved Organic Carbon	1.0	0.93J	mg/l	NC	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-17 QC Batch ID: WG872696-4 QC Sample: L1606572-06 Client ID: PCZ-70					
Chloride	11.7	11.5	mg/l	2	18
Sulfate	9.53	9.41	mg/l	1	20
General Chemistry - Westborough Lab Associated sample(s): 01-17 QC Batch ID: WG873386-2 QC Sample: L1606572-01 Client ID: PC-6					
Alkalinity, Total	8.60	8.60	mg CaCO3/L	0	10
General Chemistry - Westborough Lab Associated sample(s): 01-17 QC Batch ID: WG873670-3 QC Sample: L1606572-04 Client ID: PCZ-35					
Nitrogen, Ammonia	ND	0.022J	mg/l	NC	20

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent
B	Absent
C	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1606572-01A	Vial H2SO4 preserved	A	N/A	5.3	Y	Absent	DOC-5310(28)
L1606572-01B	Vial H2SO4 preserved	A	N/A	5.3	Y	Absent	DOC-5310(28)
L1606572-01C	Plastic 500ml H2SO4 preserved	A	<2	5.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-01D	Plastic 500ml H2SO4 preserved	A	<2	5.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-01E	Plastic 250ml unpreserved	A	7	5.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1606572-01F	Plastic 250ml unpreserved w/No H	A	N/A	5.3	Y	Absent	ALK-T-2320(14)
L1606572-01G	Plastic 250ml HNO3 preserved	A	<2	5.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-02A	Vial H2SO4 preserved	B	N/A	5.0	Y	Absent	DOC-5310(28)
L1606572-02B	Vial H2SO4 preserved	B	N/A	5.0	Y	Absent	DOC-5310(28)
L1606572-02C	Plastic 500ml H2SO4 preserved	B	<2	5.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-02D	Plastic 500ml H2SO4 preserved	B	<2	5.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-02E	Plastic 250ml unpreserved	B	7	5.0	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1606572-02F	Plastic 250ml unpreserved w/No H	B	N/A	5.0	Y	Absent	ALK-T-2320(14)
L1606572-02G	Plastic 250ml HNO3 preserved	B	<2	5.0	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-03A	Vial H2SO4 preserved	B	N/A	5.0	Y	Absent	DOC-5310(28)
L1606572-03B	Vial H2SO4 preserved	B	N/A	5.0	Y	Absent	DOC-5310(28)
L1606572-03C	Plastic 500ml H2SO4 preserved	B	<2	5.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-03D	Plastic 500ml H2SO4 preserved	B	<2	5.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-03E	Plastic 250ml unpreserved	B	7	5.0	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1606572-03F	Plastic 250ml unpreserved w/No H	B	N/A	5.0	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1606572-03G	Plastic 250ml HNO3 preserved	B	<2	5.0	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-04A	Vial H2SO4 preserved	B	N/A	5.0	Y	Absent	DOC-5310(28)
L1606572-04B	Vial H2SO4 preserved	B	N/A	5.0	Y	Absent	DOC-5310(28)
L1606572-04C	Plastic 500ml H2SO4 preserved	B	<2	5.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-04D	Plastic 500ml H2SO4 preserved	B	<2	5.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-04E	Plastic 250ml unpreserved	B	7	5.0	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1606572-04F	Plastic 250ml unpreserved w/No H	B	N/A	5.0	Y	Absent	ALK-T-2320(14)
L1606572-04G	Plastic 250ml HNO3 preserved	B	<2	5.0	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-05A	Vial H2SO4 preserved	A	N/A	5.3	Y	Absent	DOC-5310(28)
L1606572-05B	Vial H2SO4 preserved	A	N/A	5.3	Y	Absent	DOC-5310(28)
L1606572-05C	Plastic 500ml H2SO4 preserved	A	<2	5.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-05D	Plastic 500ml H2SO4 preserved	A	<2	5.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-05E	Plastic 250ml unpreserved	A	7	5.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1606572-05F	Plastic 250ml unpreserved w/No H	A	N/A	5.3	Y	Absent	ALK-T-2320(14)
L1606572-05G	Plastic 250ml HNO3 preserved	A	<2	5.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-06A	Vial H2SO4 preserved	B	N/A	5.0	Y	Absent	DOC-5310(28)
L1606572-06B	Vial H2SO4 preserved	B	N/A	5.0	Y	Absent	DOC-5310(28)
L1606572-06C	Plastic 500ml H2SO4 preserved	B	<2	5.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-06D	Plastic 500ml H2SO4 preserved	B	<2	5.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-06E	Plastic 250ml unpreserved	B	7	5.0	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1606572-06F	Plastic 250ml unpreserved w/No H	B	N/A	5.0	Y	Absent	ALK-T-2320(14)
L1606572-06G	Plastic 250ml HNO3 preserved	B	<2	5.0	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-07A	Vial H2SO4 preserved	A	N/A	5.3	Y	Absent	DOC-5310(28)
L1606572-07B	Vial H2SO4 preserved	A	N/A	5.3	Y	Absent	DOC-5310(28)
L1606572-07C	Plastic 500ml H2SO4 preserved	A	<2	5.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-07D	Plastic 500ml H2SO4 preserved	A	<2	5.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-07E	Plastic 250ml unpreserved	A	7	5.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)

*Values in parentheses indicate holding time in days

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1606572-07F	Plastic 250ml unpreserved w/No H	A	N/A	5.3	Y	Absent	ALK-T-2320(14)
L1606572-07G	Plastic 250ml HNO3 preserved	A	<2	5.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-08A	Vial H2SO4 preserved	A	N/A	5.3	Y	Absent	DOC-5310(28)
L1606572-08B	Vial H2SO4 preserved	A	N/A	5.3	Y	Absent	DOC-5310(28)
L1606572-08C	Plastic 500ml H2SO4 preserved	A	<2	5.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-08D	Plastic 500ml H2SO4 preserved	A	<2	5.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-08E	Plastic 250ml unpreserved	A	7	5.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1606572-08F	Plastic 250ml unpreserved w/No H	A	N/A	5.3	Y	Absent	ALK-T-2320(14)
L1606572-08G	Plastic 250ml HNO3 preserved	A	<2	5.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-09A	Vial H2SO4 preserved	A	N/A	5.3	Y	Absent	DOC-5310(28)
L1606572-09B	Vial H2SO4 preserved	A	N/A	5.3	Y	Absent	DOC-5310(28)
L1606572-09C	Plastic 500ml H2SO4 preserved	A	<2	5.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-09D	Plastic 500ml H2SO4 preserved	A	<2	5.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-09E	Plastic 250ml unpreserved	A	7	5.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1606572-09F	Plastic 250ml unpreserved w/No H	A	N/A	5.3	Y	Absent	ALK-T-2320(14)
L1606572-09G	Plastic 250ml unpreserved	A	<2	5.3	Y	Absent	-
L1606572-09X	Plastic 120ml HNO3 preserved spl	A	7	5.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-10A	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-10B	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-10C	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-10D	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-10E	Plastic 250ml unpreserved	C	7	4.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-4500NO2(2),NO3-353(2),PH-4500(.01)
L1606572-10F	Plastic 250ml unpreserved w/No H	C	N/A	4.3	Y	Absent	ALK-T-2320(14)
L1606572-10G	Plastic 250ml HNO3 preserved	C	<2	4.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-11A	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-11B	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-11C	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)

*Values in parentheses indicate holding time in days

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1606572-11D	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-11E	Plastic 250ml unpreserved	C	7	4.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-4500NO2(2),NO3-353(2),PH-4500(.01)
L1606572-11F	Plastic 250ml unpreserved w/No H	C	N/A	4.3	Y	Absent	ALK-T-2320(14)
L1606572-11G	Plastic 250ml HNO3 preserved	C	<2	4.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-12A	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-12B	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-12C	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-12D	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-12E	Plastic 250ml unpreserved	C	7	4.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-4500NO2(2),NO3-353(2),PH-4500(.01)
L1606572-12F	Plastic 250ml unpreserved w/No H	C	N/A	4.3	Y	Absent	ALK-T-2320(14)
L1606572-12G	Plastic 250ml HNO3 preserved	C	<2	4.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-13A	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-13B	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-13C	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-13D	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-13E	Plastic 250ml unpreserved	C	7	4.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-4500NO2(2),NO3-353(2),PH-4500(.01)
L1606572-13F	Plastic 250ml unpreserved w/No H	C	N/A	4.3	Y	Absent	ALK-T-2320(14)
L1606572-13G	Plastic 250ml HNO3 preserved	C	<2	4.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-14A	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-14B	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-14C	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-14D	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-14E	Plastic 250ml unpreserved	C	7	4.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-4500NO2(2),NO3-353(2),PH-4500(.01)
L1606572-14F	Plastic 250ml unpreserved w/No H	C	N/A	4.3	Y	Absent	ALK-T-2320(14)
L1606572-14G	Plastic 250ml HNO3 preserved	C	<2	4.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1606572-15A	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-15B	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-15C	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-15D	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-15E	Plastic 250ml unpreserved	C	7	4.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-4500NO2(2),NO3-353(2),PH-4500(.01)
L1606572-15F	Plastic 250ml unpreserved w/No H	C	N/A	4.3	Y	Absent	ALK-T-2320(14)
L1606572-15G	Plastic 250ml HNO3 preserved	C	<2	4.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-16A	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-16B	Vial H2SO4 preserved	C	N/A	4.3	Y	Absent	DOC-5310(28)
L1606572-16C	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-16D	Plastic 500ml H2SO4 preserved	C	<2	4.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-16E	Plastic 250ml unpreserved	C	7	4.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-4500NO2(2),NO3-353(2),PH-4500(.01)
L1606572-16F	Plastic 250ml unpreserved w/No H	C	N/A	4.3	Y	Absent	ALK-T-2320(14)
L1606572-16G	Plastic 250ml HNO3 preserved	C	<2	4.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1606572-17A	Vial H2SO4 preserved	A	N/A	5.3	Y	Absent	DOC-5310(28)
L1606572-17B	Vial H2SO4 preserved	A	N/A	5.3	Y	Absent	DOC-5310(28)
L1606572-17C	Plastic 500ml H2SO4 preserved	A	<2	5.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-17D	Plastic 500ml H2SO4 preserved	A	<2	5.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1606572-17E	Plastic 250ml unpreserved	A	7	5.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-4500NO2(2),NO3-353(2),PH-4500(.01)
L1606572-17F	Plastic 250ml unpreserved w/No H	A	N/A	5.3	Y	Absent	ALK-T-2320(14)
L1606572-17G	Plastic 250ml HNO3 preserved	A	<2	5.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

Container Comments

L1606572-14C

L1606572-15D

L1606572-16D

*Values in parentheses indicate holding time in days

Project Name: BARNSTABLE PRB
Project Number: WV-1009

Lab Number: L1606572
Report Date: 03/15/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)

Container Comments

L1606572-17D

*Values in parentheses indicate holding time in days

Project Name:	BARNSTABLE PRB	**Lab Number:**	L1606572
Project Number:	WV-1009	**Report Date:**	03/15/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	BARNSTABLE PRB	**Lab Number:**	L1606572
Project Number:	WV-1009	**Report Date:**	03/15/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name:	BARNSTABLE PRB	**Lab Number:**	L1606572
Project Number:	WV-1009	**Report Date:**	03/15/16

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.

41 Alpha Analytical Labs Internally-developed Performance-based Method.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

Serial_No:03151617:39

CHAIN OF CUSTODY

PAGE ____ OF ____

ALPHA ANALYTICAL — World Class Chemistry

8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Date Rec'd in Lab: 3/8/16

ALPHA Job #: L1606572

Client Information

Client: WATERVISION, LLC
Address: 481 Great Road, St.3, Acton, MA 01720
Phone: 603-498-2916
Email: dtruslow@watervisionllc.com

Project Information

Project Name: BARNSTABLE PCB
Project Location: BARNSTABLE, MA
Project #: WV-1009
Project Manager: Danna Truslow
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH *(only confirmed if pre-approved!)*

Date Due:

Report Information - Data Deliverables

☐ ADEx ☐ EMAIL

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program ____ Criteria ____

Additional Project Information:

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; Total N, NO3, NO2; NH3, TKN; SO4, Cl, orthophosphate; Total Alkalinity; Dissolved Org Carbon; Dissolved Fe, Mn, As, B; DOC metals

SAMPLE INFO — Filtration: ☒ Field ☐ Lab to do; Preservation: ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	Total N, NO3, NO2	NH3, TKN	SO4, Cl, orthophosphate	Total Alkalinity	Dissolved Org Carbon	Sample Comments
06572-01	PC-6	3/8/16	12:45	Water	DT	X	X	X	X	X	
02	PCZ-13	3/8/16	12:25	Water	SW	X	X	X	X	X	
03	PCZ-60	3/8/16	11:20	Water	DT	X	X	X	X	X	
04	PCZ-35	3/8/16	9:00	Water	SW	X	X	X	X	X	
05	PCZ-23	3/8/16	10:55	Water	SW	X	X	X	X	X	
06	PCZ-70	3/8/16	9:45	Water	DT	X	X	X	X	X	
07	PCZ-30	3/8/16	10:05	Water	SW	X	X	X	X	X	
08	PC-5	3/8/16	10:55	Water	SW	X	X	X	X	X	
09	PC-7	3/8/16	13:50	Water	SW	X	X	X	X	X	Note metals not field filtered. Preserv. rinsed from bottle before sampling at PC-7

Container Type:
Preservative:

Container Type: P= Plastic, A= Amber glass, V= Vial, G= Glass, B= Bacteria cup, C= Cube, O= Other, E= Encore, D= BOD Bottle

Preservative: A= None, B= HCl, C= HNO_3, D= H_2SO_4, E= NaOH, F= MeOH, G= $NaHSO_4$, H = $Na_2S_2O_3$, I= Ascorbic Acid, J = NH_4Cl, K= Zn Acetate, O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Danna Truslow	3/8 14:15	Samantha Wright	3/8 14:15
Samantha Wright	3/8 16:23	Richard S[illegible]	3/8/16 16:2[illegible]

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

CHAIN OF CUSTODY

PAGE _____ OF _____

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Date Rec'd in Lab: 3/8/16

ALPHA Job #: L1606572

Project Information
- Project Name: Barnstable PRB
- Project Location: Barnstable, MA
- Project #: WV-1009
- Project Manager: Donna Truslow
- ALPHA Quote #:

Report Information - Data Deliverables
☐ ADEx ☐ EMAIL

Billing Information
☐ Same as Client info PO #:

Client Information
- Client: WaterVision LLC
- Address: 481 Great Road, St. 3, Acton, MA 01720
- Phone: 603-498-2916
- Email: dtruslow@watervisionllc.com

Turn-Around Time
☑ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due:

Regulatory Requirements & Project Information Requirements
☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

Additional Project Information:

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC: ☐ 8260 ☐ 624 ☐ 524.2	SVOC: ☐ ABN ☐ PAH	METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15	METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13	EPH: ☐ Ranges & Targets ☐ Ranges Only	VPH: ☐ Ranges & Targets ☐ Ranges Only	☐ PCB ☐ PEST	TPH: ☐ Quant Only ☐ Fingerprint	Total CN, NO3, NO2, NH3, TKN	soy, Cl, orthoPhos	Total Mn	Dissolved Organic Carbon	Dissolved Fe, Mn, As, Ba	SAMPLE INFO: Filtration ☑ Field ☐ Lab to do; Preservation ☐ Lab to do	Sample Comments	TOTAL # BOTTLES
06572-10	PC-4	3/7/16	12:40	Water	SW									X	X	X	X	X		Doc & metals field filtered	
11	PC-3	3/7/16	16:15	Water	SW									X	X	X	X	X		"	
12	PCZ-43	3/7/16	16:15	Water	SW									X	X	X	X	X		"	
13	PCZ-50	3/7/16	15:00	Water	SW									X	X	X	X	X		"	
14	PCZ-80	3/7/16	15:10	Water	DT									X	X	X	X	X		"	
15	PC-1	3/7/16	11:10	Water	DT									X	X	X	X	X		"	
16	PC-2	3/7/16	12:30	Water	DT									X	X	X	X	X		"	
17	PCZ-88.5	3/7/16	14:55	Water	DT									X	X	X	X	X		"	

Container Type																	
Preservative																	

Container Type
P= Plastic, A= Amber glass, V= Vial, G= Glass, B= Bacteria cup, C= Cube, O= Other, E= Encore, D= BOD Bottle

Preservative
A= None, B= HCl, C= HNO_3, D= H_2SO_4, E= NaOH, F= MeOH, G= $NaHSO_4$, H = $Na_2S_2O_3$, I= Ascorbic Acid, J = NH_4Cl, K= Zn Acetate, O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Donna Truslow	14:15 3/8/16	Samantha Wright	14:15 3/8/16
Samantha Wright	16:23 3/8/16	Richard Lott	16:23

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L1611374
Client:	Watervision, LLC 454 Court Street Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA-PRB
Project Number:	WV-1009
Report Date:	04/25/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1611374-01	PC-1	WATER	BARNSTABLE-PRINCE COVE	04/18/16 11:35	04/18/16
L1611374-02	PC-2	WATER	BARNSTABLE-PRINCE COVE	04/18/16 12:35	04/18/16
L1611374-03	PC-4	WATER	BARNSTABLE-PRINCE COVE	04/18/16 13:25	04/18/16
L1611374-04	PC-6	WATER	BARNSTABLE-PRINCE COVE	04/18/16 14:08	04/18/16
L1611374-05	PC-7	WATER	BARNSTABLE-PRINCE COVE	04/18/16 15:05	04/18/16
L1611374-06	PC-2 DUP	WATER	BARNSTABLE-PRINCE COVE	04/18/16 12:37	04/18/16

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Lura L Troy

Title: Technical Director/Representative Date: 04/25/16

METALS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611374
Report Date: 04/25/16

SAMPLE RESULTS

Lab ID: L1611374-01
Client ID: PC-1
Sample Location: BARNSTABLE-PRINCE COVE
Matrix: Water
Date Collected: 04/18/16 11:35
Date Received: 04/18/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 10:23	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0464		mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 10:23	EPA 3005A	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 10:23	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0331		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 10:23	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611374
Report Date: 04/25/16

SAMPLE RESULTS

Lab ID: L1611374-02
Client ID: PC-2
Sample Location: BARNSTABLE-PRINCE COVE
Matrix: Water
Date Collected: 04/18/16 12:35
Date Received: 04/18/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 09:57	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0162	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 09:57	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.89		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 09:57	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.138		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 09:57	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611374
Report Date: 04/25/16

SAMPLE RESULTS

Lab ID: L1611374-03
Client ID: PC-4
Sample Location: BARNSTABLE-PRINCE COVE
Matrix: Water
Date Collected: 04/18/16 13:25
Date Received: 04/18/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 10:40	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0256	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 10:40	EPA 3005A	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 10:40	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0106		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 10:40	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611374
Report Date: 04/25/16

SAMPLE RESULTS

Lab ID: L1611374-04
Client ID: PC-6
Sample Location: BARNSTABLE-PRINCE COVE
Matrix: Water
Date Collected: 04/18/16 14:08
Date Received: 04/18/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 10:44	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0194	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 10:44	EPA 3005A	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 10:44	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0155		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 10:44	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611374
Report Date: 04/25/16

SAMPLE RESULTS

Lab ID: L1611374-05
Client ID: PC-7
Sample Location: BARNSTABLE-PRINCE COVE
Matrix: Water
Date Collected: 04/18/16 15:05
Date Received: 04/18/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0023	J	mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 15:38	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0156	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 15:38	EPA 3005A	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 15:38	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0294		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 15:38	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611374
Report Date: 04/25/16

SAMPLE RESULTS

Lab ID: L1611374-06
Client ID: PC-2 DUP
Sample Location: BARNSTABLE-PRINCE COVE
Matrix: Water
Date Collected: 04/18/16 12:37
Date Received: 04/18/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0024	J	mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 15:42	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0149	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 15:42	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.63		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 15:42	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.144		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 15:42	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-06 Batch: WG885568-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 10:14	1,6010C	FB
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 10:14	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 10:14	1,6010C	FB
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 10:14	1,6010C	FB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-06 Batch: WG885568-2								
Arsenic, Dissolved	108		-		80-120	-		
Boron, Dissolved	116		-		80-120	-		
Iron, Dissolved	87		-		80-120	-		
Manganese, Dissolved	101		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885568-4 QC Sample: L1611374-01 Client ID: PC-1												
Arsenic, Dissolved	ND	0.12	0.130	108		-	-		75-125	-		20
Boron, Dissolved	0.0464	1	1.22	117		-	-		75-125	-		20
Iron, Dissolved	ND	1	0.89	89		-	-		75-125	-		20
Manganese, Dissolved	0.0331	0.5	0.537	101		-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885568-3 QC Sample: L1611374-01 Client ID: PC-1						
Arsenic, Dissolved	ND	ND	mg/l	NC		20
Boron, Dissolved	0.0464	0.0427	mg/l	8		20
Iron, Dissolved	ND	ND	mg/l	NC		20
Manganese, Dissolved	0.0331	0.0323	mg/l	2		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

SAMPLE RESULTS

Lab ID: L1611374-01
Client ID: PC-1
Sample Location: BARNSTABLE-PRINCE COVE
Matrix: Water

Date Collected: 04/18/16 11:35
Date Received: 04/18/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	9.90		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	6.1		SU	-	NA	1	-	04/19/16 03:13	121,4500H+-B	VM
Nitrogen, Ammonia	0.030	J	mg/l	0.075	0.028	1	04/19/16 11:49	04/19/16 22:32	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 22:01	44,353.2	MR
Nitrogen, Nitrate	0.97		mg/l	0.10	0.019	1	-	04/19/16 22:01	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.97		mg/l	0.10	0.019	1	-	04/19/16 22:01	44,353.2	MR
Total Nitrogen	0.97		mg/l	0.30	0.30	1	-	04/21/16 12:22	107,-	JO
Nitrogen, Total Kjeldahl	0.123	J	mg/l	0.300	0.066	1	04/19/16 11:17	04/19/16 20:54	121,4500N-C	AT
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	04/19/16 02:08	121,4500P-E	TA
Dissolved Organic Carbon	1.3		mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	20.5		mg/l	0.500	0.054	1	-	04/19/16 18:19	44,300.0	AU
Sulfate	7.66		mg/l	1.00	0.150	1	-	04/19/16 18:19	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

SAMPLE RESULTS

Lab ID: L1611374-02
Client ID: PC-2
Sample Location: BARNSTABLE-PRINCE COVE
Matrix: Water

Date Collected: 04/18/16 12:35
Date Received: 04/18/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.70		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	5.5		SU	-	NA	1	-	04/19/16 03:13	121,4500H+-B	VM
Nitrogen, Ammonia	0.045	J	mg/l	0.075	0.028	1	04/19/16 11:49	04/19/16 22:33	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 22:08	44,353.2	MR
Nitrogen, Nitrate	0.086	J	mg/l	0.10	0.019	1	-	04/19/16 22:08	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.086	J	mg/l	0.10	0.019	1	-	04/19/16 22:08	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	04/21/16 12:22	107,-	JO
Nitrogen, Total Kjeldahl	0.127	J	mg/l	0.300	0.066	1	04/19/16 11:17	04/19/16 20:57	121,4500N-C	AT
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	04/19/16 02:10	121,4500P-E	TA
Dissolved Organic Carbon	1.2		mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	32.2		mg/l	0.500	0.054	1	-	04/19/16 18:31	44,300.0	AU
Sulfate	16.0		mg/l	1.00	0.150	1	-	04/19/16 18:31	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

SAMPLE RESULTS

Lab ID: L1611374-03
Client ID: PC-4
Sample Location: BARNSTABLE-PRINCE COVE
Matrix: Water

Date Collected: 04/18/16 13:25
Date Received: 04/18/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.80		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	6.0		SU	-	NA	1	-	04/19/16 03:13	121,4500H+-B	VM
Nitrogen, Ammonia	0.040	J	mg/l	0.075	0.028	1	04/19/16 11:49	04/19/16 22:33	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 22:09	44,353.2	MR
Nitrogen, Nitrate	1.6		mg/l	0.10	0.019	1	-	04/19/16 22:09	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.6		mg/l	0.10	0.019	1	-	04/19/16 22:09	44,353.2	MR
Total Nitrogen	1.6		mg/l	0.30	0.30	1	-	04/21/16 12:22	107,-	JO
Nitrogen, Total Kjeldahl	0.089	J	mg/l	0.300	0.066	1	04/19/16 11:17	04/19/16 20:58	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	04/19/16 02:12	121,4500P-E	TA
Dissolved Organic Carbon	0.77	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.2		mg/l	0.500	0.054	1	-	04/19/16 18:43	44,300.0	AU
Sulfate	8.80		mg/l	1.00	0.150	1	-	04/19/16 18:43	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

SAMPLE RESULTS

Lab ID: L1611374-04
Client ID: PC-6
Sample Location: BARNSTABLE-PRINCE COVE
Matrix: Water

Date Collected: 04/18/16 14:08
Date Received: 04/18/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.60		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	5.9		SU	-	NA	1	-	04/19/16 03:13	121,4500H+-B	VM
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/19/16 11:49	04/19/16 22:34	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 22:10	44,353.2	MR
Nitrogen, Nitrate	2.6		mg/l	0.10	0.019	1	-	04/19/16 22:10	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.6		mg/l	0.10	0.019	1	-	04/19/16 22:10	44,353.2	MR
Total Nitrogen	2.6		mg/l	0.30	0.30	1	-	04/21/16 12:22	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/19/16 11:17	04/19/16 20:59	121,4500N-C	AT
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	04/19/16 02:12	121,4500P-E	TA
Dissolved Organic Carbon	0.70	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	28.9		mg/l	0.500	0.054	1	-	04/19/16 18:55	44,300.0	AU
Sulfate	10.7		mg/l	1.00	0.150	1	-	04/19/16 18:55	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

SAMPLE RESULTS

Lab ID: L1611374-05
Client ID: PC-7
Sample Location: BARNSTABLE-PRINCE COVE
Matrix: Water

Date Collected: 04/18/16 15:05
Date Received: 04/18/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	13.8		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	6.0		SU	-	NA	1	-	04/19/16 03:13	121,4500H+-B	VM
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/19/16 11:49	04/19/16 22:35	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 22:12	44,353.2	MR
Nitrogen, Nitrate	1.8		mg/l	0.10	0.019	1	-	04/19/16 22:12	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.8		mg/l	0.10	0.019	1	-	04/19/16 22:12	44,353.2	MR
Total Nitrogen	1.8		mg/l	0.30	0.30	1	-	04/21/16 12:22	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/19/16 11:17	04/19/16 20:59	121,4500N-C	AT
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	04/19/16 02:12	121,4500P-E	TA
Dissolved Organic Carbon	0.77	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	51.8		mg/l	5.00	0.541	10	-	04/19/16 23:07	44,300.0	AU
Sulfate	8.92		mg/l	1.00	0.150	1	-	04/19/16 19:07	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

SAMPLE RESULTS

Lab ID: L1611374-06
Client ID: PC-2 DUP
Sample Location: BARNSTABLE-PRINCE COVE
Matrix: Water

Date Collected: 04/18/16 12:37
Date Received: 04/18/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.90		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	5.5		SU	-	NA	1	-	04/19/16 03:13	121,4500H+-B	VM
Nitrogen, Ammonia	0.031	J	mg/l	0.075	0.028	1	04/19/16 11:49	04/19/16 22:36	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 22:13	44,353.2	MR
Nitrogen, Nitrate	0.086	J	mg/l	0.10	0.019	1	-	04/19/16 22:13	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.086	J	mg/l	0.10	0.019	1	-	04/19/16 22:13	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	04/21/16 12:22	107,-	JO
Nitrogen, Total Kjeldahl	0.197	J	mg/l	0.300	0.066	1	04/19/16 11:17	04/19/16 21:00	121,4500N-C	AT
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	04/19/16 02:13	121,4500P-E	TA
Dissolved Organic Carbon	1.3		mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	33.7		mg/l	0.500	0.054	1	-	04/19/16 19:19	44,300.0	AU
Sulfate	15.6		mg/l	1.00	0.150	1	-	04/19/16 19:19	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-06 Batch: WG884849-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	04/19/16 02:08	121,4500P-E	TA
General Chemistry - Westborough Lab for sample(s): 01-06 Batch: WG884911-1										
Nitrogen, Total Kjeldahl	0.075	J	mg/l	0.300	0.022	1	04/19/16 11:17	04/19/16 20:44	121,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 01-06 Batch: WG885082-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/19/16 11:49	04/19/16 22:21	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01-06 Batch: WG885238-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	04/19/16 21:19	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-06 Batch: WG885239-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 21:21	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-06 Batch: WG885240-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	04/19/16 21:19	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-06 Batch: WG885416-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-06 Batch: WG885599-1										
Chloride	ND		mg/l	0.500	0.054	1	-	04/19/16 17:55	44,300.0	AU
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-06 Batch: WG885599-1										
Sulfate	0.236	J	mg/l	1.00	0.150	1	-	04/19/16 17:55	44,300.0	AU
General Chemistry - Westborough Lab for sample(s): 01-06 Batch: WG885952-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-06 Batch: WG884849-2								
Phosphorus, Orthophosphate	98		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-06 Batch: WG884869-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01-06 Batch: WG884911-2								
Nitrogen, Total Kjeldahl	102		-		78-122	-		
General Chemistry - Westborough Lab Associated sample(s): 01-06 Batch: WG885082-2								
Nitrogen, Ammonia	99		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-06 Batch: WG885238-2								
Nitrogen, Nitrate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-06 Batch: WG885239-2								
Nitrogen, Nitrite	100		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-06 Batch: WG885240-2								
Nitrogen, Nitrate/Nitrite	100		-		90-110	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-06 Batch: WG885416-2					
Alkalinity, Total	101	-	90-110	-	10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-06 Batch: WG885599-2					
Chloride	98	-	90-110	-	
Sulfate	106	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-06 Batch: WG885952-2					
Dissolved Organic Carbon	100	-	90-110	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG884849-4 QC Sample: L1611374-02 Client ID: PC-2												
Phosphorus, Orthophosphate	ND	0.5	0.498	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG884911-4 QC Sample: L1611374-01 Client ID: PC-1												
Nitrogen, Total Kjeldahl	0.123J	8	7.41	93		-	-		77-111	-		24
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885082-4 QC Sample: L1611374-06 Client ID: PC-2 DUP												
Nitrogen, Ammonia	0.031J	4	3.82	96		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885238-4 QC Sample: L1611374-01 Client ID: PC-1												
Nitrogen, Nitrate	0.97	4	4.9	98		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885239-4 QC Sample: L1611374-01 Client ID: PC-1												
Nitrogen, Nitrite	ND	4	4.1	102		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885240-4 QC Sample: L1611374-01 Client ID: PC-1												
Nitrogen, Nitrate/Nitrite	0.97	4	4.9	98		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885416-4 QC Sample: L1611374-03 Client ID: PC-4												
Alkalinity, Total	8.80	100	114	105		-	-		86-116	-		10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885599-3 QC Sample: L1611374-03 Client ID: PC-4												
Chloride	19.2	4	22.6	83		-	-		40-151	-		18
Sulfate	8.80	8	16.5	96		-	-		60-140	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885952-4 QC Sample: L1611554-08 Client ID: MS Sample												
Dissolved Organic Carbon	0.49J	4	4.2	104		-	-		80-120	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG884849-3 QC Sample: L1611374-01 Client ID: PC-1						
Phosphorus, Orthophosphate	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG884869-2 QC Sample: L1611384-01 Client ID: DUP Sample						
pH	8.3	8.4	SU	1		5
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG884911-3 QC Sample: L1611374-01 Client ID: PC-1						
Nitrogen, Total Kjeldahl	0.123J	0.155J	mg/l	NC		24
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885082-3 QC Sample: L1611374-06 Client ID: PC-2 DUP						
Nitrogen, Ammonia	0.031J	0.041J	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885238-3 QC Sample: L1611374-01 Client ID: PC-1						
Nitrogen, Nitrate	0.97	0.97	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885239-3 QC Sample: L1611374-01 Client ID: PC-1						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885240-3 QC Sample: L1611374-01 Client ID: PC-1						
Nitrogen, Nitrate/Nitrite	0.97	0.97	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885416-3 QC Sample: L1611374-03 Client ID: PC-4						
Alkalinity, Total	8.80	8.40	mg CaCO3/L	5		10

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885599-4 QC Sample: L1611374-03 Client ID: PC-4					
Chloride	19.2	19.3	mg/l	1	18
Sulfate	8.80	8.68	mg/l	1	20
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG885952-3 QC Sample: L1611554-07 Client ID: DUP Sample					
Dissolved Organic Carbon	0.44J	0.41J	mg/l	NC	20

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1611374-01A	Vial H2SO4 preserved	A	N/A	3.2	Y	Absent	DOC-5310(28)
L1611374-01B	Vial H2SO4 preserved	A	N/A	3.2	Y	Absent	DOC-5310(28)
L1611374-01C	Plastic 250ml HNO3 preserved	A	<2	3.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611374-01D	Plastic 500ml unpreserved	A	7	3.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611374-01E	Plastic 500ml H2SO4 preserved	A	<2	3.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611374-01F	Plastic 250ml unpreserved w/No H	A	N/A	3.2	Y	Absent	ALK-T-2320(14)
L1611374-02A	Vial H2SO4 preserved	A	N/A	3.2	Y	Absent	DOC-5310(28)
L1611374-02B	Vial H2SO4 preserved	A	N/A	3.2	Y	Absent	DOC-5310(28)
L1611374-02C	Plastic 250ml HNO3 preserved	A	<2	3.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611374-02D	Plastic 500ml unpreserved	A	7	3.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611374-02E	Plastic 500ml H2SO4 preserved	A	<2	3.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611374-02F	Plastic 250ml unpreserved w/No H	A	N/A	3.2	Y	Absent	ALK-T-2320(14)
L1611374-03A	Vial H2SO4 preserved	A	N/A	3.2	Y	Absent	DOC-5310(28)
L1611374-03B	Vial H2SO4 preserved	A	N/A	3.2	Y	Absent	DOC-5310(28)
L1611374-03C	Plastic 250ml HNO3 preserved	A	<2	3.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611374-03D	Plastic 500ml unpreserved	A	7	3.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611374-03E	Plastic 500ml H2SO4 preserved	A	<2	3.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611374-03F	Plastic 250ml unpreserved w/No H	A	N/A	3.2	Y	Absent	ALK-T-2320(14)
L1611374-04A	Vial H2SO4 preserved	A	N/A	3.2	Y	Absent	DOC-5310(28)
L1611374-04B	Vial H2SO4 preserved	A	N/A	3.2	Y	Absent	DOC-5310(28)
L1611374-04C	Plastic 250ml HNO3 preserved	A	<2	3.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611374
Report Date: 04/25/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1611374-04D	Plastic 500ml unpreserved	A	7	3.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611374-04E	Plastic 500ml H2SO4 preserved	A	<2	3.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611374-04F	Plastic 250ml unpreserved w/No H	A	N/A	3.2	Y	Absent	ALK-T-2320(14)
L1611374-05A	Vial H2SO4 preserved	A	N/A	3.2	Y	Absent	DOC-5310(28)
L1611374-05B	Vial H2SO4 preserved	A	N/A	3.2	Y	Absent	DOC-5310(28)
L1611374-05C	Plastic 250ml HNO3 preserved	A	<2	3.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611374-05D	Plastic 500ml unpreserved	A	7	3.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611374-05E	Plastic 500ml H2SO4 preserved	A	<2	3.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611374-05F	Plastic 250ml unpreserved w/No H	A	N/A	3.2	Y	Absent	ALK-T-2320(14)
L1611374-06A	Vial H2SO4 preserved	A	N/A	3.2	Y	Absent	DOC-5310(28)
L1611374-06B	Vial H2SO4 preserved	A	N/A	3.2	Y	Absent	DOC-5310(28)
L1611374-06C	Plastic 250ml HNO3 preserved	A	<2	3.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611374-06D	Plastic 500ml unpreserved	A	7	3.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611374-06E	Plastic 500ml H2SO4 preserved	A	<2	3.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611374-06F	Plastic 250ml unpreserved w/No H	A	N/A	3.2	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name:	EPA-PRB	**Lab Number:**	L1611374
Project Number:	WV-1009	**Report Date:**	04/25/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-PRB	**Lab Number:**	L1611374
Project Number:	WV-1009	**Report Date:**	04/25/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-PRB	**Lab Number:**	L1611374
Project Number:	WV-1009	**Report Date:**	04/25/16

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE _____ OF _____

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Date Rec'd in Lab: 4/18/16

ALPHA Job #: L1611374

Client Information

Client: Water Vision LLC
Address: 481 Great Rd.
Acton, MA 01720
Phone: 603-498-2916
Email: dtruslow@watervision llc.com

Project Information

Project Name: EPA-PRB
Project Location: Barnstable-Prince Cove
Project #: WV-1009
Project Manager: Danna Truslow
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorga)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Target
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

Additional Project Information:

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC: ☐ 8260 ☐ 624 ☐ 524.2	SVOC: ☐ ABN ☐ PAH	METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15	METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13	EPH: ☐ Ranges & Targets ☐ Ranges Only	VPH: ☐ Ranges & Targets ☐ Ranges Only	☐ PCB ☐ PEST	TPH: ☐ Quant Only ☐ Fingerprint	pH	SO4, Cl, NO3, NO2, Ortho Diss As, Fe, B, Mn*	Total N, NH3-N	Total Alk	DOC*	Sample Comments	TOTAL # BOTTLES
11374-01	PC-1	4/18/16	11:35	water	SW									✓	✓	✓	✓	✓		
02	PC-2		12:35											✓	✓	✓	✓	✓		
03	PC-4		13:25											✓	✓	✓	✓	✓		
04	PC-6		14:08											✓	✓	✓	✓	✓		
05	PC-7		15:05											✓	✓	✓	✓	✓		
06	PC-2 DUP	4/18/16	12:37											✓	✓	✓	✓	✓		

SAMPLE INFO
Filtration ☒ Field* ☐ Lab to do
Preservation ☐ Lab to do

Container Type																			
Preservative																			

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Samantha Wright	4/18/16 3:30pm		4/18/16 1530
	4/18/16 1700		4/18/16 1700

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L1611554
Client:	Watervision, LLC 454 Court Street Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA-PRB
Project Number:	WV-1009
Report Date:	04/26/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1611554-01	PCZ-13	WATER	BARNSTABLE- PRINCE COVE	04/18/16 17:28	04/19/16
L1611554-02	PCZ-23	WATER	BARNSTABLE- PRINCE COVE	04/18/16 17:50	04/19/16
L1611554-03	PCZ-30	WATER	BARNSTABLE- PRINCE COVE	04/18/16 18:25	04/19/16
L1611554-04	PCZ-35	WATER	BARNSTABLE- PRINCE COVE	04/18/16 19:10	04/19/16
L1611554-05	PCZ-43	WATER	BARNSTABLE- PRINCE COVE	04/19/16 09:50	04/19/16
L1611554-06	PCZ-50	WATER	BARNSTABLE- PRINCE COVE	04/19/16 10:55	04/19/16
L1611554-07	PCZ-50 DUP	WATER	BARNSTABLE- PRINCE COVE	04/19/16 10:57	04/19/16
L1611554-08	PCZ-60	WATER	BARNSTABLE- PRINCE COVE	04/19/16 12:28	04/19/16
L1611554-09	PCZ-70	WATER	BARNSTABLE- PRINCE COVE	04/19/16 13:42	04/19/16
L1611554-10	PCZ-80	WATER	BARNSTABLE- PRINCE COVE	04/19/16 13:10	04/19/16
L1611554-11	PCZ-88.5	WATER	BARNSTABLE- PRINCE COVE	04/19/16 11:15	04/19/16

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611554
Report Date: 04/26/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

L1611554-05 through -11: The samples were received at the laboratory above the required temperature range. The samples were transported to the laboratory in a cooler with ice. The client was notified of the exceedance, and all requested analyses were performed.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Lura L Troy

Title: Technical Director/Representative Date: 04/26/16

METALS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-01
Client ID: PCZ-13
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water
Date Collected: 04/18/16 17:28
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0020	J	mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 15:47	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0110	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 15:47	EPA 3005A	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 15:47	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0027	J	mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 15:47	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Lab Number: L1611554
Project Number: WV-1009
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-02
Client ID: PCZ-23
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water
Date Collected: 04/18/16 17:50
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0020	J	mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 15:51	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0318		mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 15:51	EPA 3005A	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 15:51	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0024	J	mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 15:51	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-03
Client ID: PCZ-30
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water
Date Collected: 04/18/16 18:25
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0023	J	mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 14:00	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0206	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 14:00	EPA 3005A	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 14:00	EPA 3005A	1,6010C	FB
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 14:00	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-04
Client ID: PCZ-35
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water
Date Collected: 04/18/16 19:10
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 14:04	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0248	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 14:04	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.044	J	mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 14:04	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0026	J	mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 14:04	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-05
Client ID: PCZ-43
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water
Date Collected: 04/19/16 09:50
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0031	J	mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 14:09	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0286	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 14:09	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.078		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 14:09	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0057	J	mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 14:09	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-06
Client ID: PCZ-50
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water
Date Collected: 04/19/16 10:55
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0020	J	mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 14:13	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0253	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 14:13	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.090		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 14:13	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0158		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 14:13	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-07
Client ID: PCZ-50 DUP
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water
Date Collected: 04/19/16 10:57
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 16:22	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0253	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 16:22	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.10		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 16:22	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0179		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 16:22	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-08
Client ID: PCZ-60
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water
Date Collected: 04/19/16 12:28
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0037	J	mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 16:26	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0147	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 16:26	EPA 3005A	1,6010C	FB
Iron, Dissolved	7.1		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 16:26	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.149		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 16:26	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-09
Client ID: PCZ-70
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water
Date Collected: 04/19/16 13:42
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0063		mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 16:30	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0080	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 16:30	EPA 3005A	1,6010C	FB
Iron, Dissolved	7.0		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 16:30	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.162		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 16:30	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-10
Client ID: PCZ-80
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water
Date Collected: 04/19/16 13:10
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0053		mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 16:35	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0074	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 16:35	EPA 3005A	1,6010C	FB
Iron, Dissolved	4.8		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 16:35	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.122		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 16:35	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-11
Client ID: PCZ-88.5
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water
Date Collected: 04/19/16 11:15
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0030	J	mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 16:39	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0077	J	mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 16:39	EPA 3005A	1,6010C	FB
Iron, Dissolved	3.2		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 16:39	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0501		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 16:39	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-11 Batch: WG885568-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/20/16 17:00	04/21/16 10:14	1,6010C	FB
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	04/20/16 17:00	04/21/16 10:14	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	04/20/16 17:00	04/21/16 10:14	1,6010C	FB
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	04/20/16 17:00	04/21/16 10:14	1,6010C	FB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-11 Batch: WG885568-2								
Arsenic, Dissolved	108		-		80-120	-		
Boron, Dissolved	116		-		80-120	-		
Iron, Dissolved	87		-		80-120	-		
Manganese, Dissolved	101		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885568-4 QC Sample: L1611374-01 Client ID: MS Sample												
Arsenic, Dissolved	ND	0.12	0.130	108		-	-		75-125	-		20
Boron, Dissolved	0.0464	1	1.22	117		-	-		75-125	-		20
Iron, Dissolved	ND	1	0.89	89		-	-		75-125	-		20
Manganese, Dissolved	0.0331	0.5	0.537	101		-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885568-3 QC Sample: L1611374-01 Client ID: DUP Sample						
Arsenic, Dissolved	ND	ND	mg/l	NC		20
Boron, Dissolved	0.0464	0.0427	mg/l	8		20
Iron, Dissolved	ND	ND	mg/l	NC		20
Manganese, Dissolved	0.0331	0.0323	mg/l	2		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-01
Client ID: PCZ-13
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water

Date Collected: 04/18/16 17:28
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.50		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	5.9		SU	-	NA	1	-	04/19/16 21:21	121,4500H+-B	JC
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/20/16 20:00	04/21/16 22:27	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 23:08	44,353.2	MR
Nitrogen, Nitrate	1.3		mg/l	0.10	0.019	1	-	04/19/16 23:08	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.3		mg/l	0.10	0.019	1	-	04/19/16 23:08	44,353.2	MR
Total Nitrogen	1.3		mg/l	0.30	0.30	1	-	04/25/16 21:35	107,-	AT
Nitrogen, Total Kjeldahl	0.131	J	mg/l	0.300	0.066	1	04/20/16 08:28	04/20/16 22:06	121,4500N-C	AT
Phosphorus, Orthophosphate	0.013		mg/l	0.005	0.001	1	-	04/19/16 23:27	121,4500P-E	MR
Dissolved Organic Carbon	0.96	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	14.6		mg/l	0.500	0.054	1	-	04/20/16 18:08	44,300.0	AU
Sulfate	5.73		mg/l	1.00	0.150	1	-	04/20/16 18:08	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-02
Client ID: PCZ-23
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water

Date Collected: 04/18/16 17:50
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	9.30		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	5.8		SU	-	NA	1	-	04/19/16 21:21	121,4500H+-B	JC
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/20/16 20:00	04/21/16 22:28	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 23:15	44,353.2	MR
Nitrogen, Nitrate	2.4		mg/l	0.10	0.019	1	-	04/19/16 23:15	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.4		mg/l	0.10	0.019	1	-	04/19/16 23:15	44,353.2	MR
Total Nitrogen	2.4		mg/l	0.30	0.30	1	-	04/25/16 21:35	107,-	AT
Nitrogen, Total Kjeldahl	0.076	J	mg/l	0.300	0.066	1	04/20/16 08:28	04/20/16 22:12	121,4500N-C	AT
Phosphorus, Orthophosphate	0.010		mg/l	0.005	0.001	1	-	04/19/16 23:28	121,4500P-E	MR
Dissolved Organic Carbon	0.58	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.0		mg/l	0.500	0.054	1	-	04/20/16 18:20	44,300.0	AU
Sulfate	5.16		mg/l	1.00	0.150	1	-	04/20/16 18:20	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-03
Client ID: PCZ-30
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water

Date Collected: 04/18/16 18:25
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.70		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	5.8		SU	-	NA	1	-	04/19/16 21:21	121,4500H+-B	JC
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/20/16 20:00	04/21/16 22:31	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 23:16	44,353.2	MR
Nitrogen, Nitrate	2.2		mg/l	0.10	0.019	1	-	04/19/16 23:16	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.2		mg/l	0.10	0.019	1	-	04/19/16 23:16	44,353.2	MR
Total Nitrogen	2.2		mg/l	0.30	0.30	1	-	04/25/16 21:35	107,-	AT
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/20/16 08:28	04/20/16 22:12	121,4500N-C	AT
Phosphorus, Orthophosphate	0.009		mg/l	0.005	0.001	1	-	04/19/16 23:28	121,4500P-E	MR
Dissolved Organic Carbon	0.55	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	20.7		mg/l	0.500	0.054	1	-	04/20/16 18:32	44,300.0	AU
Sulfate	4.86		mg/l	1.00	0.150	1	-	04/20/16 18:32	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-04
Client ID: PCZ-35
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water

Date Collected: 04/18/16 19:10
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.70		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	5.8		SU	-	NA	1	-	04/19/16 21:21	121,4500H+-B	JC
Nitrogen, Ammonia	0.066	J	mg/l	0.075	0.028	1	04/20/16 20:00	04/21/16 22:31	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 23:17	44,353.2	MR
Nitrogen, Nitrate	2.4		mg/l	0.10	0.019	1	-	04/19/16 23:17	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.4		mg/l	0.10	0.019	1	-	04/19/16 23:17	44,353.2	MR
Total Nitrogen	2.4		mg/l	0.30	0.30	1	-	04/25/16 21:35	107,-	AT
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/20/16 08:28	04/20/16 22:13	121,4500N-C	AT
Phosphorus, Orthophosphate	0.007		mg/l	0.005	0.001	1	-	04/19/16 23:29	121,4500P-E	MR
Dissolved Organic Carbon	0.53	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.4		mg/l	0.500	0.054	1	-	04/20/16 18:44	44,300.0	AU
Sulfate	4.81		mg/l	1.00	0.150	1	-	04/20/16 18:44	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-05
Client ID: PCZ-43
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water

Date Collected: 04/19/16 09:50
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	9.90		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	5.8		SU	-	NA	1	-	04/19/16 21:21	121,4500H+-B	JC
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/20/16 20:00	04/21/16 22:32	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 23:19	44,353.2	MR
Nitrogen, Nitrate	2.6		mg/l	0.10	0.019	1	-	04/19/16 23:19	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.6		mg/l	0.10	0.019	1	-	04/19/16 23:19	44,353.2	MR
Total Nitrogen	2.6		mg/l	0.30	0.30	1	-	04/25/16 21:35	107,-	AT
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/20/16 08:28	04/20/16 22:14	121,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	04/19/16 23:29	121,4500P-E	MR
Dissolved Organic Carbon	0.54	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	18.7		mg/l	0.500	0.054	1	-	04/20/16 18:56	44,300.0	AU
Sulfate	5.69		mg/l	1.00	0.150	1	-	04/20/16 18:56	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-06
Client ID: PCZ-50
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water

Date Collected: 04/19/16 10:55
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	11.6		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	6.0		SU	-	NA	1	-	04/19/16 21:21	121,4500H+-B	JC
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/20/16 20:00	04/21/16 22:36	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 23:20	44,353.2	MR
Nitrogen, Nitrate	2.8		mg/l	0.10	0.019	1	-	04/19/16 23:20	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.8		mg/l	0.10	0.019	1	-	04/19/16 23:20	44,353.2	MR
Total Nitrogen	2.8		mg/l	0.30	0.30	1	-	04/25/16 21:35	107,-	AT
Nitrogen, Total Kjeldahl	0.086	J	mg/l	0.300	0.066	1	04/20/16 08:28	04/20/16 22:15	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	04/19/16 23:29	121,4500P-E	MR
Dissolved Organic Carbon	0.45	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.7		mg/l	0.500	0.054	1	-	04/20/16 19:08	44,300.0	AU
Sulfate	6.28		mg/l	1.00	0.150	1	-	04/20/16 19:08	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-07
Client ID: PCZ-50 DUP
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water

Date Collected: 04/19/16 10:57
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	17.2		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	6.1		SU	-	NA	1	-	04/19/16 21:21	121,4500H+-B	JC
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/20/16 20:00	04/21/16 22:37	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 23:25	44,353.2	MR
Nitrogen, Nitrate	2.8		mg/l	0.10	0.019	1	-	04/19/16 23:25	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.8		mg/l	0.10	0.019	1	-	04/19/16 23:25	44,353.2	MR
Total Nitrogen	2.8		mg/l	0.30	0.30	1	-	04/25/16 21:35	107,-	AT
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/20/16 08:28	04/20/16 22:16	121,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	04/19/16 23:29	121,4500P-E	MR
Dissolved Organic Carbon	0.44	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.7		mg/l	0.500	0.054	1	-	04/20/16 19:20	44,300.0	AU
Sulfate	6.16		mg/l	1.00	0.150	1	-	04/20/16 19:20	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-08
Client ID: PCZ-60
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water

Date Collected: 04/19/16 12:28
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	23.4		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	6.6		SU	-	NA	1	-	04/19/16 21:21	121,4500H+-B	JC
Nitrogen, Ammonia	0.042	J	mg/l	0.075	0.028	1	04/20/16 20:00	04/21/16 22:37	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 23:27	44,353.2	MR
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	04/19/16 23:27	44,353.2	MR
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	04/19/16 23:27	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	04/25/16 21:35	107,-	AT
Nitrogen, Total Kjeldahl	0.140	J	mg/l	0.300	0.066	1	04/20/16 08:28	04/20/16 22:17	121,4500N-C	AT
Phosphorus, Orthophosphate	0.140		mg/l	0.005	0.001	1	-	04/19/16 23:30	121,4500P-E	MR
Dissolved Organic Carbon	0.49	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	16.7		mg/l	0.500	0.054	1	-	04/20/16 20:20	44,300.0	AU
Sulfate	14.2		mg/l	1.00	0.150	1	-	04/20/16 20:20	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-09
Client ID: PCZ-70
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water

Date Collected: 04/19/16 13:42
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	24.8		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	6.8		SU	-	NA	1	-	04/19/16 21:21	121,4500H+-B	JC
Nitrogen, Ammonia	0.054	J	mg/l	0.075	0.028	1	04/20/16 20:00	04/21/16 22:38	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 23:28	44,353.2	MR
Nitrogen, Nitrate	0.028	J	mg/l	0.10	0.019	1	-	04/19/16 23:28	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.028	J	mg/l	0.10	0.019	1	-	04/19/16 23:28	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	04/25/16 21:35	107,-	AT
Nitrogen, Total Kjeldahl	0.156	J	mg/l	0.300	0.066	1	04/20/16 08:28	04/20/16 22:18	121,4500N-C	AT
Phosphorus, Orthophosphate	0.138		mg/l	0.005	0.001	1	-	04/19/16 23:30	121,4500P-E	MR
Dissolved Organic Carbon	0.52	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	13.1		mg/l	0.500	0.054	1	-	04/20/16 20:32	44,300.0	AU
Sulfate	11.1		mg/l	1.00	0.150	1	-	04/20/16 20:32	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-10
Client ID: PCZ-80
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water

Date Collected: 04/19/16 13:10
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	20.3		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	6.8		SU	-	NA	1	-	04/19/16 21:21	121,4500H+-B	JC
Nitrogen, Ammonia	0.053	J	mg/l	0.075	0.028	1	04/20/16 20:00	04/21/16 22:39	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 23:29	44,353.2	MR
Nitrogen, Nitrate	0.020	J	mg/l	0.10	0.019	1	-	04/19/16 23:29	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.020	J	mg/l	0.10	0.019	1	-	04/19/16 23:29	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	04/25/16 21:35	107,-	AT
Nitrogen, Total Kjeldahl	0.146	J	mg/l	0.300	0.066	1	04/20/16 08:28	04/20/16 22:18	121,4500N-C	AT
Phosphorus, Orthophosphate	0.065		mg/l	0.005	0.001	1	-	04/19/16 23:30	121,4500P-E	MR
Dissolved Organic Carbon	0.82	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	10.3		mg/l	0.500	0.054	1	-	04/20/16 20:44	44,300.0	AU
Sulfate	9.66		mg/l	1.00	0.150	1	-	04/20/16 20:44	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

SAMPLE RESULTS

Lab ID: L1611554-11
Client ID: PCZ-88.5
Sample Location: BARNSTABLE- PRINCE COVE
Matrix: Water

Date Collected: 04/19/16 11:15
Date Received: 04/19/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	15.7		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
pH (H)	6.6		SU	-	NA	1	-	04/19/16 21:21	121,4500H+-B	JC
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/20/16 20:00	04/21/16 22:40	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 23:30	44,353.2	MR
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	04/19/16 23:30	44,353.2	MR
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	04/19/16 23:30	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	04/25/16 21:35	107,-	AT
Nitrogen, Total Kjeldahl	0.085	J	mg/l	0.300	0.066	1	04/20/16 08:28	04/20/16 22:19	121,4500N-C	AT
Phosphorus, Orthophosphate	0.050		mg/l	0.005	0.001	1	-	04/19/16 23:33	121,4500P-E	MR
Dissolved Organic Carbon	0.46	J	mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	9.98		mg/l	0.500	0.054	1	-	04/20/16 20:56	44,300.0	AU
Sulfate	10.2		mg/l	1.00	0.150	1	-	04/20/16 20:56	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 11 Batch: WG885241-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	04/19/16 21:28	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 11 Batch: WG885242-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 21:30	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 11 Batch: WG885246-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	04/20/16 00:11	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG885253-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	04/19/16 21:35	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG885254-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/19/16 21:38	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG885258-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	04/19/16 21:35	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-11 Batch: WG885283-1										
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	04/19/16 23:27	121,4500P-E	MR
General Chemistry - Westborough Lab for sample(s): 01-11 Batch: WG885358-1										
Nitrogen, Total Kjeldahl	0.177	J	mg/l	0.300	0.022	1	04/20/16 08:28	04/20/16 22:00	121,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 01-11 Batch: WG885416-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	04/20/16 10:53	121,2320B	AW
General Chemistry - Westborough Lab for sample(s): 01-11 Batch: WG885638-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/20/16 20:00	04/21/16 22:13	44,350.1	AT
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-11 Batch: WG885685-1										
Chloride	ND		mg/l	0.500	0.054	1	-	04/20/16 17:44	44,300.0	AU
Sulfate	0.162	J	mg/l	1.00	0.150	1	-	04/20/16 17:44	44,300.0	AU
General Chemistry - Westborough Lab for sample(s): 01-11 Batch: WG885952-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	04/21/16 19:44	04/21/16 19:44	121,5310C	ML

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 11 Batch: WG885241-2								
Nitrogen, Nitrate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 11 Batch: WG885242-2								
Nitrogen, Nitrite	102		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 11 Batch: WG885246-2								
Nitrogen, Nitrate/Nitrite	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG885253-2								
Nitrogen, Nitrate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG885254-2								
Nitrogen, Nitrite	102		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG885258-2								
Nitrogen, Nitrate/Nitrite	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-11 Batch: WG885273-1								
pH	100		-		99-101	-		5

Lab Control Sample Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-11 Batch: WG885283-2					
Phosphorus, Orthophosphate	106	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-11 Batch: WG885358-2					
Nitrogen, Total Kjeldahl	91	-	78-122	-	
General Chemistry - Westborough Lab Associated sample(s): 01-11 Batch: WG885416-2					
Alkalinity, Total	101	-	90-110	-	10
General Chemistry - Westborough Lab Associated sample(s): 01-11 Batch: WG885638-2					
Nitrogen, Ammonia	96	-	80-120	-	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-11 Batch: WG885685-2					
Chloride	98	-	90-110	-	
Sulfate	102	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-11 Batch: WG885952-2					
Dissolved Organic Carbon	100	-	90-110	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 11 QC Batch ID: WG885241-4 QC Sample: L1611410-01 Client ID: MS Sample												
Nitrogen, Nitrate	3.1	4	7.0	98		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 11 QC Batch ID: WG885242-4 QC Sample: L1611410-01 Client ID: MS Sample												
Nitrogen, Nitrite	0.19	4	4.2	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 11 QC Batch ID: WG885246-4 QC Sample: L1611412-03 Client ID: MS Sample												
Nitrogen, Nitrate/Nitrite	3.6	4	7.6	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG885253-4 QC Sample: L1611554-01 Client ID: PCZ-13												
Nitrogen, Nitrate	1.3	4	5.1	95		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG885254-4 QC Sample: L1611554-01 Client ID: PCZ-13												
Nitrogen, Nitrite	ND	4	4.0	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG885258-4 QC Sample: L1611554-01 Client ID: PCZ-13												
Nitrogen, Nitrate/Nitrite	1.3	4	5.1	95		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885283-4 QC Sample: L1611554-01 Client ID: PCZ-13												
Phosphorus, Orthophosphate	0.013	0.5	0.509	99		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885358-4 QC Sample: L1611554-01 Client ID: PCZ-13												
Nitrogen, Total Kjeldahl	0.131J	8	7.44	93		-	-		77-111	-		24
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885416-4 QC Sample: L1611374-03 Client ID: MS Sample												
Alkalinity, Total	8.80	100	114	105		-	-		86-116	-		10

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885638-4 QC Sample: L1611554-02 Client ID: PCZ-23									
Nitrogen, Ammonia	ND	4	3.34	84	-	-	80-120	-	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885685-3 QC Sample: L1611554-01 Client ID: PCZ-13									
Chloride	14.6	4	18.2	90	-	-	40-151	-	18
Sulfate	5.73	8	14.2	106	-	-	60-140	-	20
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885952-4 QC Sample: L1611554-08 Client ID: PCZ-60									
Dissolved Organic Carbon	0.49J	4	4.2	104	-	-	80-120	-	20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 11 QC Batch ID: WG885241-3 QC Sample: L1611410-01 Client ID: DUP Sample						
Nitrogen, Nitrate	3.1	3.2	mg/l	3		6
General Chemistry - Westborough Lab Associated sample(s): 11 QC Batch ID: WG885242-3 QC Sample: L1611410-01 Client ID: DUP Sample						
Nitrogen, Nitrite	0.19	0.18	mg/l	5		20
General Chemistry - Westborough Lab Associated sample(s): 11 QC Batch ID: WG885246-3 QC Sample: L1611412-03 Client ID: DUP Sample						
Nitrogen, Nitrate/Nitrite	3.6	3.6	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG885253-3 QC Sample: L1611554-01 Client ID: PCZ-13						
Nitrogen, Nitrate	1.3	1.3	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG885254-3 QC Sample: L1611554-01 Client ID: PCZ-13						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG885258-3 QC Sample: L1611554-01 Client ID: PCZ-13						
Nitrogen, Nitrate/Nitrite	1.3	1.3	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885273-2 QC Sample: L1611554-01 Client ID: PCZ-13						
pH (H)	5.9	5.8	SU	2		5
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885283-3 QC Sample: L1611554-10 Client ID: PCZ-80						
Phosphorus, Orthophosphate	0.065	0.065	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885358-3 QC Sample: L1611554-01 Client ID: PCZ-13						
Nitrogen, Total Kjeldahl	0.131J	0.104J	mg/l	NC		24

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885416-3 QC Sample: L1611374-03 Client ID: DUP Sample					
Alkalinity, Total	8.80	8.40	mg CaCO3/L	5	10
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885638-3 QC Sample: L1611554-02 Client ID: PCZ-23					
Nitrogen, Ammonia	ND	ND	mg/l	NC	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885685-4 QC Sample: L1611554-01 Client ID: PCZ-13					
Chloride	14.6	14.6	mg/l	0	18
Sulfate	5.73	5.60	mg/l	2	20
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG885952-3 QC Sample: L1611554-07 Client ID: PCZ-50 DUP					
Dissolved Organic Carbon	0.44J	0.41J	mg/l	NC	20

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent
B	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1611554-01A	Vial H2SO4 preserved	A	N/A	6.1	Y	Absent	DOC-5310(28)
L1611554-01B	Vial H2SO4 preserved	A	N/A	6.1	Y	Absent	DOC-5310(28)
L1611554-01C	Plastic 250ml HNO3 preserved	A	<2	6.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611554-01D	Plastic 500ml unpreserved	A	7	6.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611554-01E	Plastic 500ml H2SO4 preserved	A	<2	6.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611554-01F	Plastic 250ml unpreserved w/No H	A	N/A	6.1	Y	Absent	ALK-T-2320(14)
L1611554-02A	Vial H2SO4 preserved	A	N/A	6.1	Y	Absent	DOC-5310(28)
L1611554-02B	Vial H2SO4 preserved	A	N/A	6.1	Y	Absent	DOC-5310(28)
L1611554-02C	Plastic 250ml HNO3 preserved	A	<2	6.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611554-02D	Plastic 500ml unpreserved	A	7	6.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611554-02E	Plastic 500ml H2SO4 preserved	A	<2	6.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611554-02F	Plastic 250ml unpreserved w/No H	A	N/A	6.1	Y	Absent	ALK-T-2320(14)
L1611554-03A	Vial H2SO4 preserved	A	N/A	6.1	Y	Absent	DOC-5310(28)
L1611554-03B	Vial H2SO4 preserved	A	N/A	6.1	Y	Absent	DOC-5310(28)
L1611554-03C	Plastic 250ml HNO3 preserved	A	<2	6.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611554-03D	Plastic 500ml unpreserved	A	7	6.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611554-03E	Plastic 500ml H2SO4 preserved	A	<2	6.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611554-03F	Plastic 250ml unpreserved w/No H	A	N/A	6.1	Y	Absent	ALK-T-2320(14)
L1611554-04A	Vial H2SO4 preserved	A	N/A	6.1	Y	Absent	DOC-5310(28)
L1611554-04B	Vial H2SO4 preserved	A	N/A	6.1	Y	Absent	DOC-5310(28)
L1611554-04C	Plastic 250ml HNO3 preserved	A	<2	6.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1611554-04D	Plastic 500ml unpreserved	A	7	6.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611554-04E	Plastic 500ml H2SO4 preserved	A	<2	6.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611554-04F	Plastic 250ml unpreserved w/No H	A	N/A	6.1	Y	Absent	ALK-T-2320(14)
L1611554-05A	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-05B	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-05C	Plastic 250ml HNO3 preserved	B	<2	8.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611554-05D	Plastic 500ml unpreserved	B	7	8.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611554-05E	Plastic 500ml H2SO4 preserved	B	<2	8.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611554-05F	Plastic 250ml unpreserved w/No H	B	N/A	8.8	Y	Absent	ALK-T-2320(14)
L1611554-06A	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-06B	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-06C	Plastic 250ml HNO3 preserved	B	<2	8.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611554-06D	Plastic 500ml unpreserved	B	7	8.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611554-06E	Plastic 500ml H2SO4 preserved	B	<2	8.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611554-06F	Plastic 250ml unpreserved w/No H	B	N/A	8.8	Y	Absent	ALK-T-2320(14)
L1611554-07A	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-07B	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-07C	Plastic 250ml HNO3 preserved	B	<2	8.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611554-07D	Plastic 500ml unpreserved	B	7	8.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611554-07E	Plastic 500ml H2SO4 preserved	B	<2	8.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611554-07F	Plastic 250ml unpreserved w/No H	B	N/A	8.8	Y	Absent	ALK-T-2320(14)
L1611554-08A	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-08B	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-08C	Plastic 250ml HNO3 preserved	B	<2	8.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611554-08D	Plastic 500ml unpreserved	B	7	8.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1611554
Report Date: 04/26/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1611554-08E	Plastic 500ml H2SO4 preserved	B	<2	8.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611554-08F	Plastic 250ml unpreserved w/No H	B	N/A	8.8	Y	Absent	ALK-T-2320(14)
L1611554-09A	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-09B	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-09C	Plastic 250ml HNO3 preserved	B	<2	8.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611554-09D	Plastic 500ml unpreserved	B	7	8.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611554-09E	Plastic 500ml H2SO4 preserved	B	<2	8.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611554-09F	Plastic 250ml unpreserved w/No H	B	N/A	8.8	Y	Absent	ALK-T-2320(14)
L1611554-10A	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-10B	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-10C	Plastic 250ml HNO3 preserved	B	<2	8.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611554-10D	Plastic 500ml unpreserved	B	7	8.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611554-10E	Plastic 500ml H2SO4 preserved	B	<2	8.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611554-10F	Plastic 250ml unpreserved w/No H	B	N/A	8.8	Y	Absent	ALK-T-2320(14)
L1611554-11A	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-11B	Vial H2SO4 preserved	B	N/A	8.8	Y	Absent	DOC-5310(28)
L1611554-11C	Plastic 250ml HNO3 preserved	B	<2	8.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1611554-11D	Plastic 500ml unpreserved	B	7	8.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1611554-11E	Plastic 500ml H2SO4 preserved	B	<2	8.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1611554-11F	Plastic 250ml unpreserved w/No H	B	N/A	8.8	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name:	EPA-PRB	**Lab Number:**	L1611554
Project Number:	WV-1009	**Report Date:**	04/26/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-PRB	**Lab Number:**	L1611554
Project Number:	WV-1009	**Report Date:**	04/26/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-PRB	**Lab Number:**	L1611554
Project Number:	WV-1009	**Report Date:**	04/26/16

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 2

ALPHA ANALYTICAL

8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220

320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

Date Rec'd in Lab: 4/19/16

ALPHA Job #: L161 1554

Client Information

Client: Water Vision LLC

Address: 481 Great Rd.
Acton, MA 01720

Phone: 603-498-291

Email: dtruslow@watervisionllc.com

Additional Project Information:

Project Information

Project Name: EPA-PRB

Project Location: Barnstable - Prince Cove

Project #: WV-1009

Project Manager: Danna Truslow

ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH *(only confirmed if pre-approved!)*

Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorga...)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targe...)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program ____________ Criteria ________

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2
SVOC: ☐ ABN ☐ PAH
METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15
METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13
EPH: ☐ Ranges & Targets ☐ Ranges Only
VPH: ☐ Ranges & Targets ☐ Ranges Only
☐ PCB ☐ PEST
TPH: ☐ Quant Only ☐ Fingerprint

Handwritten analyses: pH, SO4, Cl, NO3, NO2, Ophos; diss As, Fe, B, MN*; Total N, NH3-N; Total Alk; DOC*

SAMPLE INFO
Filtration
☒ Field *
☐ Lab to do
Preservation
☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	pH, SO_4, Cl, NO_3, NO_2, Ophos	diss As, Fe, B, MN*	Total N, NH_3-N	Total Alk	DOC*	Sample Comments	TOTAL # BOTTLES
11554-01	PCZ-13	4/18/16	17:28	Water	SW	✓	✓	✓	✓	✓		
02	PCZ-23	4/18/16	17:50	↓	↓	✓	✓	✓	✓	✓		
03	PCZ-30	4/18/16	18:25			✓	✓	✓	✓	✓		
04	PCZ-35	4/18/16	19:10			✓	✓	✓	✓	✓		
05	PCZ-43	4/19/16	9:50			✓	✓	✓	✓	✓		
06	PCZ-50	4/19/16	10:55			✓	✓	✓	✓	✓		
07	PCZ-50 DUP	4/19/16	10:57			✓	✓	✓	✓	✓		
08	PCZ-60	4/19/16	12:28			✓	✓	✓	✓	✓		
09	PCZ-70	4/19/16	13:42			✓	✓	✓	✓	✓		
10	PCZ-80	4/19/16	13:10	↓	↓	✓	✓	✓	✓	✓		

Container Type
Preservative

Container Type	Preservative
P= Plastic	A= None
A= Amber glass	B= HCl
V= Vial	C= HNO_3
G= Glass	D= H_2SO_4
B= Bacteria cup	E= NaOH
C= Cube	F= MeOH
O= Other	G= $NaHSO_4$
E= Encore	H = $Na_2S_2O_3$
D= BOD Bottle	I= Ascorbic Acid
	J = NH_4Cl
	K= Zn Acetate
	O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Samantha Wright	4/19/16 17:05	[signature]	4/19/16 17:05

FORM NO: 01-01 (rev. 12-Mar-2012)

CHAIN OF CUSTODY

PAGE 2 OF 2

Date Rec'd in Lab: 4/19/16

ALPHA Job #: L1611554

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: WaterVision LLC
Address: 481 Great Rd.
Acton, MA 01720
Phone: 603-498-291
Email: chrisbw@watervisionllc.com

Additional Project Information:

Project Information

Project Name: EPA-PRB
Project Location: Barnstable - Prince Cove
Project #: WV-1009
Project Manager: Donna Truslow
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorga
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targe
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program ____ Criteria ____

ANALYSIS

- VOC: ☐ 8260 ☐ 624 ☐ 524.2
- SVOC: ☐ ABN ☐ PAH
- METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15
- METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13
- EPH: ☐ Ranges & Targets ☐ Ranges Only
- VPH: ☐ Ranges & Targets ☐ Ranges Only
- ☐ PCB ☐ PEST
- TPH: ☐ Quant Only ☐ Fingerprint
- pH, SO_4, Cl, NO_3, NO_2, Ortho
- diss As, Fe, Mn*
- Total N, NH_3-N
- Total Alk
- DOC*

SAMPLE INFO

Filtration
☒ Field *
☐ Lab to do

Preservation
☐ Lab to do

Sample Comments

TOTAL # BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	pH	diss As	Total N	Total Alk	DOC*	TOTAL # BOTTLES
1554-11	PCZ-88.5	4/19/16	11:15	water	SW	✓	✓	✓	✓	✓	

Container Type	
Preservative	

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Samantha Wright	4/19/16 17:05	[illegible]	4/19/16 1705

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO. 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L1607269
Client:	Watervision, LLC 454 Court Stree Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA-PRB
Project Number:	WV-1009
Report Date:	03/23/16

Certifications & Approvals: NY (11627), CT (PH-0141), NH (2206), NJ NELAP (MA015), RI (LAO00299), ME (MA00030), PA (68-02089), VA (460194), LA NELAP (03090), FL (E87814), TX (T104704419), WA (C954), USFWS (Permit #LE2069641), USDA (Permit #P330-11-00109), US Army Corps of Engineers.

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1607269-01	TLZ-100	WATER	MASHPEE	03/14/16 10:50	03/14/16
L1607269-02	TLZ-90	WATER	MASHPEE	03/14/16 12:00	03/14/16
L1607269-03	TLZ-80	WATER	MASHPEE	03/14/16 12:40	03/14/16
L1607269-04	TLZ-70	WATER	MASHPEE	03/14/16 13:55	03/14/16
L1607269-05	TLZ-60	WATER	MASHPEE	03/14/16 14:15	03/14/16
L1607269-06	TLZ-50	WATER	MASHPEE	03/14/16 15:25	03/14/16
L1607269-07	TL-4	WATER	MASHPEE	03/14/16 14:55	03/14/16
L1607269-08	TLZ-101	WATER	MASHPEE	03/14/16 14:20	03/14/16
L1607269-09	TLZ-22	WATER	MASHPEE	03/14/16 16:50	03/15/16
L1607269-10	TLZ-31	WATER	MASHPEE	03/14/16 17:20	03/15/16
L1607269-11	TL-5	WATER	MASHPEE	03/14/16 18:05	03/15/16
L1607269-12	TL-3	WATER	MASHPEE	03/14/16 17:55	03/15/16
L1607269-13	TLZ-40	WATER	MASHPEE	03/14/16 16:35	03/15/16
L1607269-14	TLZ-14	WATER	MASHPEE	03/14/16 15:50	03/15/16
L1607269-15	TL-6	WATER	MASHPEE	03/15/16 10:15	03/15/16
L1607269-16	TL-7	WATER	MASHPEE	03/15/16 11:05	03/15/16
L1607269-17	TL-2	WATER	MASHPEE	03/15/16 11:35	03/15/16
L1607269-18	TL-2A	WATER	MASHPEE	03/15/16 11:35	03/15/16
L1607269-19	TL-1	WATER	MASHPEE	03/15/16 10:12	03/15/16

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

The WG874430-4 MS recovery, performed on L1607269-12 (128%), is outside the acceptance criteria; however, the associated LCS recovery is within criteria. No further action was taken.

The WG875167-4 MS recovery, performed on L1607269-02 (124%), is outside the acceptance criteria; however, the associated LCS recovery is within criteria. No further action was taken.

The WG874430-3 Laboratory Duplicate RPD (108%), performed on L1607269-11, is outside the acceptance criteria. The elevated RPD has been attributed to the non-homogeneous nature of the native sample.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Cristin Walker

Title: Technical Director/Representative Date: 03/23/16

METALS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-01
Client ID: TLZ-100
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 10:50
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 18:57	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0123	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 18:57	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.41		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 18:57	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.230		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 18:57	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-02
Client ID: TLZ-90
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 12:00
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 19:44	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0096	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 19:44	EPA 3005A	1,6010C	FB
Iron, Dissolved	3.1		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 19:44	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.369		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 19:44	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-03
Client ID: TLZ-80
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 12:40
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 19:49	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0104	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 19:49	EPA 3005A	1,6010C	FB
Iron, Dissolved	2.4		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 19:49	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.973		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 19:49	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-04
Client ID: TLZ-70
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 13:55
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 19:53	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0125	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 19:53	EPA 3005A	1,6010C	FB
Iron, Dissolved	1.4		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 19:53	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.110		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 19:53	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-05
Client ID: TLZ-60
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 14:15
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 19:58	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0108	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 19:58	EPA 3005A	1,6010C	FB
Iron, Dissolved	2.8		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 19:58	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.395		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 19:58	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-06
Client ID: TLZ-50
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 15:25
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 20:02	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0104	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 20:02	EPA 3005A	1,6010C	FB
Iron, Dissolved	2.6		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 20:02	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.595		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 20:02	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-07
Client ID: TL-4
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 14:55
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 20:07	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0369		mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 20:07	EPA 3005A	1,6010C	FB
Iron, Dissolved	1.0		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 20:07	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0631		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 20:07	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-08
Client ID: TLZ-101
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 14:20
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 20:11	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0108	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 20:11	EPA 3005A	1,6010C	FB
Iron, Dissolved	2.5		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 20:11	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.347		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 20:11	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-09
Client ID: TLZ-22
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 16:50
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 20:28	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0332		mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 20:28	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.13		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 20:28	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0197		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 20:28	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-10
Client ID: TLZ-31
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 17:20
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 20:32	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0103	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 20:32	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.030	J	mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 20:32	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0052	J	mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 20:32	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-11
Client ID: TL-5
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 18:05
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 20:37	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0158	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 20:37	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.14		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 20:37	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.135		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 20:37	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-12
Client ID: TL-3
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 17:55
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 20:41	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0270	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 20:41	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.081		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 20:41	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0381		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 20:41	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-13
Client ID: TLZ-40
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 16:35
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 20:46	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0099	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 20:46	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.060		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 20:46	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.214		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 20:46	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-14
Client ID: TLZ-14
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/14/16 15:50
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 20:51	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0214	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 20:51	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.22		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 20:51	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.0492		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 20:51	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-15
Client ID: TL-6
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/15/16 10:15
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 20:55	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0191	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 20:55	EPA 3005A	1,6010C	FB
Iron, Dissolved	2.6		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 20:55	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.106		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 20:55	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-16
Client ID: TL-7
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/15/16 11:05
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0027	J	mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 21:00	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0218	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 21:00	EPA 3005A	1,6010C	FB
Iron, Dissolved	14.		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 21:00	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.508		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 21:00	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-17
Client ID: TL-2
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/15/16 11:35
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 21:04	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0123	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 21:04	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.29		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 21:04	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.285		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 21:04	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-18
Client ID: TL-2A
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/15/16 11:35
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 21:09	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0121	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 21:09	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.29		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 21:09	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.298		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 21:09	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-19
Client ID: TL-1
Sample Location: MASHPEE
Matrix: Water
Date Collected: 03/15/16 10:12
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 22:03	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0100	J	mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 22:03	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.18		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 22:03	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.165		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 22:03	EPA 3005A	1,6010C	FB

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-19 Batch: WG875500-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/19/16 17:26	03/22/16 18:25	1,6010C	FB
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	03/19/16 17:26	03/22/16 18:25	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/19/16 17:26	03/22/16 18:25	1,6010C	FB
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	03/19/16 17:26	03/22/16 18:25	1,6010C	FB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-19 Batch: WG875500-2								
Arsenic, Dissolved	94		-		80-120	-		
Boron, Dissolved	104		-		80-120	-		
Iron, Dissolved	98		-		80-120	-		
Manganese, Dissolved	108		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-19 QC Batch ID: WG875500-4 QC Sample: L1607269-01 Client ID: TLZ-100												
Arsenic, Dissolved	ND	0.12	0.108	90		-	-		75-125	-		20
Boron, Dissolved	0.0123J	1	1.05	105		-	-		75-125	-		20
Iron, Dissolved	0.41	1	1.4	99		-	-		75-125	-		20
Manganese, Dissolved	0.230	0.5	0.756	105		-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-19 QC Batch ID: WG875500-3 QC Sample: L1607269-01 Client ID: TLZ-100						
Arsenic, Dissolved	ND	ND	mg/l	NC		20
Boron, Dissolved	0.0123J	0.0089J	mg/l	NC		20
Iron, Dissolved	0.41	0.41	mg/l	0		20
Manganese, Dissolved	0.230	0.234	mg/l	2		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-01
Client ID: TLZ-100
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 10:50
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	15.0		mg CaCO3/L	2.00	NA	1	-	03/15/16 09:45	30,2320B	SG
pH (H)	7.2		SU	-	NA	1	-	03/15/16 03:30	30,4500H+-B	LH
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/15/16 12:01	03/15/16 23:44	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/15/16 21:46	44,353.2	MR
Nitrogen, Nitrate	0.027	J	mg/l	0.10	0.019	1	-	03/15/16 21:46	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.027	J	mg/l	0.10	0.019	1	-	03/15/16 21:46	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.196	J	mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:20	30,4500N-C	AT
Phosphorus, Orthophosphate	0.009		mg/l	0.005	0.001	1	-	03/16/16 01:11	30,4500P-E	LH
Dissolved Organic Carbon	0.94	J	mg/l	1.0	0.12	1	03/15/16 00:30	03/16/16 08:32	30,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	14.2		mg/l	0.500	0.054	1	-	03/15/16 17:55	44,300.0	AU
Sulfate	14.8		mg/l	1.00	0.051	1	-	03/15/16 17:55	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-02
Client ID: TLZ-90
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 12:00
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	25.4		mg CaCO3/L	2.00	NA	1	-	03/15/16 09:45	30,2320B	SG
pH (H)	6.9		SU	-	NA	1	-	03/15/16 03:30	30,4500H+-B	LH
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/17/16 21:30	03/21/16 22:56	44,350.1	AT
Nitrogen, Nitrite	0.016	J	mg/l	0.050	0.010	1	-	03/15/16 21:57	44,353.2	MR
Nitrogen, Nitrate	0.36		mg/l	0.10	0.019	1	-	03/15/16 21:57	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.36		mg/l	0.10	0.019	1	-	03/15/16 21:57	44,353.2	MR
Total Nitrogen	0.36		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.132	J	mg/l	0.300	0.093	1	03/17/16 20:30	03/21/16 22:37	30,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/16/16 01:11	30,4500P-E	LH
Dissolved Organic Carbon	0.73	J	mg/l	1.0	0.12	1	03/15/16 00:30	03/16/16 08:32	30,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	14.1		mg/l	0.500	0.054	1	-	03/15/16 18:07	44,300.0	AU
Sulfate	15.3		mg/l	1.00	0.051	1	-	03/15/16 18:07	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-03
Client ID: TLZ-80
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 12:40
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	18.8		mg CaCO3/L	2.00	NA	1	-	03/15/16 09:45	30,2320B	SG
pH (H)	6.7		SU	-	NA	1	-	03/15/16 03:30	30,4500H+-B	LH
Nitrogen, Ammonia	0.024	J	mg/l	0.075	0.021	1	03/17/16 21:30	03/21/16 22:56	44,350.1	AT
Nitrogen, Nitrite	0.014	J	mg/l	0.050	0.010	1	-	03/15/16 21:58	44,353.2	MR
Nitrogen, Nitrate	0.99		mg/l	0.10	0.019	1	-	03/15/16 21:58	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.99		mg/l	0.10	0.019	1	-	03/15/16 21:58	44,353.2	MR
Total Nitrogen	0.99		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.093	J	mg/l	0.300	0.093	1	03/17/16 20:30	03/21/16 22:40	30,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/16/16 01:12	30,4500P-E	LH
Dissolved Organic Carbon	0.57	J	mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	17.2		mg/l	0.500	0.054	1	-	03/15/16 18:19	44,300.0	AU
Sulfate	11.4		mg/l	1.00	0.051	1	-	03/15/16 18:19	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-04
Client ID: TLZ-70
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 13:55
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	13.9		mg CaCO3/L	2.00	NA	1	-	03/15/16 09:45	30,2320B	SG
pH (H)	6.5		SU	-	NA	1	-	03/15/16 03:30	30,4500H+-B	LH
Nitrogen, Ammonia	0.033	J	mg/l	0.075	0.021	1	03/15/16 12:01	03/15/16 23:47	44,350.1	AT
Nitrogen, Nitrite	0.014	J	mg/l	0.050	0.010	1	-	03/15/16 21:59	44,353.2	MR
Nitrogen, Nitrate	0.80		mg/l	0.10	0.019	1	-	03/15/16 21:59	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.80		mg/l	0.10	0.019	1	-	03/15/16 21:59	44,353.2	MR
Total Nitrogen	0.80		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.096	J	mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:21	30,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	03/16/16 01:12	30,4500P-E	LH
Dissolved Organic Carbon	0.43	J	mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	24.3		mg/l	0.500	0.054	1	-	03/15/16 18:31	44,300.0	AU
Sulfate	8.58		mg/l	1.00	0.051	1	-	03/15/16 18:31	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-05
Client ID: TLZ-60
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 14:15
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	16.4		mg CaCO3/L	2.00	NA	1	-	03/15/16 09:45	30,2320B	SG
pH (H)	6.5		SU	-	NA	1	-	03/15/16 03:30	30,4500H+-B	LH
Nitrogen, Ammonia	0.024	J	mg/l	0.075	0.021	1	03/15/16 12:01	03/15/16 23:47	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/15/16 22:01	44,353.2	MR
Nitrogen, Nitrate	0.48		mg/l	0.10	0.019	1	-	03/15/16 22:01	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.48		mg/l	0.10	0.019	1	-	03/15/16 22:01	44,353.2	MR
Total Nitrogen	0.48		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.127	J	mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:22	30,4500N-C	AT
Phosphorus, Orthophosphate	0.003	J	mg/l	0.005	0.001	1	-	03/16/16 01:13	30,4500P-E	LH
Dissolved Organic Carbon	0.94	J	mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	23.5		mg/l	0.500	0.054	1	-	03/15/16 18:43	44,300.0	AU
Sulfate	7.52		mg/l	1.00	0.051	1	-	03/15/16 18:43	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-06
Client ID: TLZ-50
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 15:25
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	18.6		mg CaCO3/L	2.00	NA	1	-	03/15/16 09:45	30,2320B	SG
pH (H)	6.4		SU	-	NA	1	-	03/15/16 03:30	30,4500H+-B	LH
Nitrogen, Ammonia	0.028	J	mg/l	0.075	0.021	1	03/15/16 12:01	03/15/16 23:48	44,350.1	AT
Nitrogen, Nitrite	0.023	J	mg/l	0.050	0.010	1	-	03/15/16 22:02	44,353.2	MR
Nitrogen, Nitrate	0.62		mg/l	0.10	0.019	1	-	03/15/16 22:02	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.62		mg/l	0.10	0.019	1	-	03/15/16 22:02	44,353.2	MR
Total Nitrogen	0.62		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.134	J	mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:23	30,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/16/16 01:13	30,4500P-E	LH
Dissolved Organic Carbon	0.59	J	mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	24.7		mg/l	0.500	0.054	1	-	03/15/16 18:55	44,300.0	AU
Sulfate	8.95		mg/l	1.00	0.051	1	-	03/15/16 18:55	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-07
Client ID: TL-4
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 14:55
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	9.40		mg CaCO3/L	2.00	NA	1	-	03/15/16 09:45	30,2320B	SG
pH (H)	6.0		SU	-	NA	1	-	03/15/16 03:30	30,4500H+-B	LH
Nitrogen, Ammonia	0.029	J	mg/l	0.075	0.021	1	03/15/16 12:01	03/15/16 23:49	44,350.1	AT
Nitrogen, Nitrite	0.020	J	mg/l	0.050	0.010	1	-	03/15/16 22:03	44,353.2	MR
Nitrogen, Nitrate	1.0		mg/l	0.10	0.019	1	-	03/15/16 22:03	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.0		mg/l	0.10	0.019	1	-	03/15/16 22:03	44,353.2	MR
Total Nitrogen	1.0		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.105	J	mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:24	30,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/16/16 01:13	30,4500P-E	LH
Dissolved Organic Carbon	1.5		mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	23.8		mg/l	0.500	0.054	1	-	03/15/16 19:07	44,300.0	AU
Sulfate	8.03		mg/l	1.00	0.051	1	-	03/15/16 19:07	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-08
Client ID: TLZ-101
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 14:20
Date Received: 03/14/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	16.6		mg CaCO3/L	2.00	NA	1	-	03/15/16 09:45	30,2320B	SG
pH (H)	6.2		SU	-	NA	1	-	03/15/16 03:30	30,4500H+-B	LH
Nitrogen, Ammonia	0.059	J	mg/l	0.075	0.021	1	03/15/16 12:01	03/15/16 23:50	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/15/16 22:05	44,353.2	MR
Nitrogen, Nitrate	0.49		mg/l	0.10	0.019	1	-	03/15/16 22:05	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.49		mg/l	0.10	0.019	1	-	03/15/16 22:05	44,353.2	MR
Total Nitrogen	0.49		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.108	J	mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:25	30,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	03/16/16 01:13	30,4500P-E	LH
Dissolved Organic Carbon	0.48	J	mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	23.4		mg/l	0.500	0.054	1	-	03/15/16 19:19	44,300.0	AU
Sulfate	7.49		mg/l	1.00	0.051	1	-	03/15/16 19:19	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-09
Client ID: TLZ-22
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 16:50
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	10.0		mg CaCO3/L	2.00	NA	1	-	03/20/16 11:36	30,2320B	SG
pH (H)	6.0		SU	-	NA	1	-	03/15/16 21:05	30,4500H+-B	MR
Nitrogen, Ammonia	0.036	J	mg/l	0.075	0.021	1	03/16/16 21:00	03/18/16 23:45	44,350.1	AT
Nitrogen, Nitrite	0.014	J	mg/l	0.050	0.010	1	-	03/15/16 22:33	44,353.2	MR
Nitrogen, Nitrate	0.052	J	mg/l	0.10	0.019	1	-	03/15/16 22:33	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.052	J	mg/l	0.10	0.019	1	-	03/15/16 22:33	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.174	J	mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:28	30,4500N-C	AT
Phosphorus, Orthophosphate	0.007		mg/l	0.005	0.001	1	-	03/16/16 01:14	30,4500P-E	LH
Dissolved Organic Carbon	1.4		mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	27.3		mg/l	0.500	0.054	1	-	03/16/16 21:06	44,300.0	AU
Sulfate	14.7		mg/l	1.00	0.051	1	-	03/16/16 21:06	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-10
Client ID: TLZ-31
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 17:20
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	10.7		mg CaCO3/L	2.00	NA	1	-	03/20/16 11:36	30,2320B	SG
pH (H)	6.0		SU	-	NA	1	-	03/15/16 21:05	30,4500H+-B	MR
Nitrogen, Ammonia	0.039	J	mg/l	0.075	0.021	1	03/16/16 21:00	03/18/16 23:47	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/15/16 22:34	44,353.2	MR
Nitrogen, Nitrate	2.1		mg/l	0.10	0.019	1	-	03/15/16 22:34	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.1		mg/l	0.10	0.019	1	-	03/15/16 22:34	44,353.2	MR
Total Nitrogen	2.1		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:29	30,4500N-C	AT
Phosphorus, Orthophosphate	0.003	J	mg/l	0.005	0.001	1	-	03/16/16 01:14	30,4500P-E	LH
Dissolved Organic Carbon	0.52	J	mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	33.1		mg/l	0.500	0.054	1	-	03/16/16 21:42	44,300.0	AU
Sulfate	6.59		mg/l	1.00	0.051	1	-	03/16/16 21:42	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-11
Client ID: TL-5
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 18:05
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.60		mg CaCO3/L	2.00	NA	1	-	03/20/16 11:36	30,2320B	SG
pH (H)	3.6		SU	-	NA	1	-	03/15/16 21:05	30,4500H+-B	MR
Nitrogen, Ammonia	0.030	J	mg/l	0.075	0.021	1	03/16/16 21:00	03/18/16 23:48	44,350.1	AT
Nitrogen, Nitrite	0.014	J	mg/l	0.050	0.010	1	-	03/16/16 00:04	44,353.2	A1
Nitrogen, Nitrate	1.2		mg/l	0.10	0.019	1	-	03/16/16 00:04	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.2		mg/l	0.10	0.019	1	-	03/16/16 00:04	44,353.2	MR
Total Nitrogen	1.2		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.215	J	mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:30	30,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	03/16/16 01:16	30,4500P-E	LH
Dissolved Organic Carbon	4.0		mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.7		mg/l	0.500	0.054	1	-	03/16/16 21:54	44,300.0	AU
Sulfate	35.4		mg/l	1.00	0.051	1	-	03/16/16 21:54	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-12
Client ID: TL-3
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 17:55
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	5.80		mg CaCO3/L	2.00	NA	1	-	03/20/16 11:36	30,2320B	SG
pH (H)	5.3		SU	-	NA	1	-	03/15/16 21:05	30,4500H+-B	MR
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/16/16 21:00	03/18/16 23:49	44,350.1	AT
Nitrogen, Nitrite	0.018	J	mg/l	0.050	0.010	1	-	03/16/16 00:11	44,353.2	A1
Nitrogen, Nitrate	2.4		mg/l	0.10	0.019	1	-	03/16/16 00:11	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.4		mg/l	0.10	0.019	1	-	03/16/16 00:11	44,353.2	MR
Total Nitrogen	2.4		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:31	30,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/16/16 01:16	30,4500P-E	LH
Dissolved Organic Carbon	0.92	J	mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	26.2		mg/l	0.500	0.054	1	-	03/16/16 22:06	44,300.0	AU
Sulfate	8.58		mg/l	1.00	0.051	1	-	03/16/16 22:06	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-13
Client ID: TLZ-40
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 16:35
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	9.70		mg CaCO3/L	2.00	NA	1	-	03/20/16 11:36	30,2320B	SG
pH (H)	5.7		SU	-	NA	1	-	03/15/16 21:05	30,4500H+-B	MR
Nitrogen, Ammonia	0.031	J	mg/l	0.075	0.021	1	03/16/16 21:00	03/18/16 23:50	44,350.1	AT
Nitrogen, Nitrite	0.021	J	mg/l	0.050	0.010	1	-	03/16/16 00:16	44,353.2	A1
Nitrogen, Nitrate	2.7		mg/l	0.10	0.019	1	-	03/16/16 00:16	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.7		mg/l	0.10	0.019	1	-	03/16/16 00:16	44,353.2	MR
Total Nitrogen	2.7		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:33	30,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/16/16 01:17	30,4500P-E	LH
Dissolved Organic Carbon	5.5		mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	42.8		mg/l	0.500	0.054	1	-	03/16/16 22:18	44,300.0	AU
Sulfate	4.52		mg/l	1.00	0.051	1	-	03/16/16 22:18	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-14
Client ID: TLZ-14
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/14/16 15:50
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	5.20		mg CaCO3/L	2.00	NA	1	-	03/20/16 11:36	30,2320B	SG
pH (H)	5.5		SU	-	NA	1	-	03/15/16 21:05	30,4500H+-B	MR
Nitrogen, Ammonia	0.026	J	mg/l	0.075	0.021	1	03/16/16 21:00	03/18/16 23:53	44,350.1	AT
Nitrogen, Nitrite	0.012	J	mg/l	0.050	0.010	1	-	03/16/16 00:17	44,353.2	A1
Nitrogen, Nitrate	0.17		mg/l	0.10	0.019	1	-	03/16/16 00:17	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.17		mg/l	0.10	0.019	1	-	03/16/16 00:17	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.193	J	mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:34	30,4500N-C	AT
Phosphorus, Orthophosphate	0.003	J	mg/l	0.005	0.001	1	-	03/16/16 01:17	30,4500P-E	LH
Dissolved Organic Carbon	2.0		mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	16.8		mg/l	0.500	0.054	1	-	03/16/16 22:30	44,300.0	AU
Sulfate	7.47		mg/l	1.00	0.051	1	-	03/16/16 22:30	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-15
Client ID: TL-6
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/15/16 10:15
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.90		mg CaCO3/L	2.00	NA	1	-	03/20/16 11:36	30,2320B	SG
pH (H)	5.5		SU	-	NA	1	-	03/15/16 21:05	30,4500H+-B	MR
Nitrogen, Ammonia	0.053	J	mg/l	0.075	0.021	1	03/16/16 21:00	03/18/16 23:54	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/16/16 00:19	44,353.2	A1
Nitrogen, Nitrate	0.021	J	mg/l	0.10	0.019	1	-	03/16/16 00:19	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.021	J	mg/l	0.10	0.019	1	-	03/16/16 00:19	44,353.2	MR
Total Nitrogen	0.36		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.364		mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:35	30,4500N-C	AT
Phosphorus, Orthophosphate	0.009		mg/l	0.005	0.001	1	-	03/16/16 01:17	30,4500P-E	LH
Dissolved Organic Carbon	5.7		mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	15.3		mg/l	0.500	0.054	1	-	03/16/16 22:42	44,300.0	AU
Sulfate	5.69		mg/l	1.00	0.051	1	-	03/16/16 22:42	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-16
Client ID: TL-7
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/15/16 11:05
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	5.40		mg CaCO3/L	2.00	NA	1	-	03/20/16 11:36	30,2320B	SG
pH (H)	5.6		SU	-	NA	1	-	03/15/16 21:05	30,4500H+-B	MR
Nitrogen, Ammonia	0.029	J	mg/l	0.075	0.021	1	03/16/16 21:00	03/18/16 23:55	44,350.1	AT
Nitrogen, Nitrite	0.014	J	mg/l	0.050	0.010	1	-	03/16/16 00:20	44,353.2	A1
Nitrogen, Nitrate	1.2		mg/l	0.10	0.019	1	-	03/16/16 00:20	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.2		mg/l	0.10	0.019	1	-	03/16/16 00:20	44,353.2	MR
Total Nitrogen	2.1		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.904		mg/l	0.300	0.093	1	03/16/16 19:00	03/18/16 23:36	30,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/16/16 01:17	30,4500P-E	LH
Dissolved Organic Carbon	2.5		mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	18.8		mg/l	0.500	0.054	1	-	03/16/16 22:54	44,300.0	AU
Sulfate	14.3		mg/l	1.00	0.051	1	-	03/16/16 22:54	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-17
Client ID: TL-2
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/15/16 11:35
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.80		mg CaCO3/L	2.00	NA	1	-	03/20/16 11:36	30,2320B	SG
pH (H)	5.2		SU	-	NA	1	-	03/15/16 21:05	30,4500H+-B	MR
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/16/16 21:00	03/18/16 23:56	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/16/16 00:21	44,353.2	A1
Nitrogen, Nitrate	0.16		mg/l	0.10	0.019	1	-	03/16/16 00:21	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.16		mg/l	0.10	0.019	1	-	03/16/16 00:21	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.204	J	mg/l	0.300	0.093	1	03/17/16 20:30	03/21/16 22:40	30,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/16/16 01:18	30,4500P-E	LH
Dissolved Organic Carbon	1.1		mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	16.4		mg/l	0.500	0.054	1	-	03/16/16 23:06	44,300.0	AU
Sulfate	9.41		mg/l	1.00	0.051	1	-	03/16/16 23:06	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-18
Client ID: TL-2A
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/15/16 11:35
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.90		mg CaCO3/L	2.00	NA	1	-	03/20/16 11:36	30,2320B	SG
pH (H)	5.2		SU	-	NA	1	-	03/15/16 21:05	30,4500H+-B	MR
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/16/16 21:00	03/18/16 23:57	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/16/16 00:22	44,353.2	A1
Nitrogen, Nitrate	0.16		mg/l	0.10	0.019	1	-	03/16/16 00:22	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.16		mg/l	0.10	0.019	1	-	03/16/16 00:22	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.140	J	mg/l	0.300	0.093	1	03/17/16 20:30	03/21/16 22:41	30,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/16/16 01:18	30,4500P-E	LH
Dissolved Organic Carbon	1.1		mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	16.4		mg/l	0.500	0.054	1	-	03/16/16 23:18	44,300.0	AU
Sulfate	9.32		mg/l	1.00	0.051	1	-	03/16/16 23:18	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

SAMPLE RESULTS

Lab ID: L1607269-19
Client ID: TL-1
Sample Location: MASHPEE
Matrix: Water

Date Collected: 03/15/16 10:12
Date Received: 03/15/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.20		mg CaCO3/L	2.00	NA	1	-	03/20/16 11:36	30,2320B	SG
pH (H)	5.1		SU	-	NA	1	-	03/15/16 21:05	30,4500H+-B	MR
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/16/16 21:00	03/18/16 23:57	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/16/16 00:24	44,353.2	A1
Nitrogen, Nitrate	0.11		mg/l	0.10	0.019	1	-	03/16/16 00:24	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.11		mg/l	0.10	0.019	1	-	03/16/16 00:24	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	03/22/16 09:23	41,-	JO
Nitrogen, Total Kjeldahl	0.166	J	mg/l	0.300	0.093	1	03/17/16 20:30	03/21/16 22:45	30,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/16/16 01:18	30,4500P-E	LH
Dissolved Organic Carbon	1.2		mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	17.8		mg/l	0.500	0.054	1	-	03/16/16 23:30	44,300.0	AU
Sulfate	11.2		mg/l	1.00	0.051	1	-	03/16/16 23:30	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG873851-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	03/15/16 09:45	30,2320B	SG
General Chemistry - Westborough Lab for sample(s): 01-02,04-08 Batch: WG873944-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/15/16 12:01	03/15/16 23:32	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG874066-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	03/15/16 20:42	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG874067-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/15/16 20:48	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG874069-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	03/15/16 20:42	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 11-19 Batch: WG874070-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	03/16/16 00:50	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 11-19 Batch: WG874071-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/16/16 00:02	44,353.2	A1
General Chemistry - Westborough Lab for sample(s): 11-19 Batch: WG874072-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	03/16/16 00:50	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-19 Batch: WG874151-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	03/16/16 01:11	30,4500P-E	LH
General Chemistry - Westborough Lab for sample(s): 03-19 Batch: WG874430-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	03/16/16 17:13	03/16/16 17:13	30,5310C	ML
General Chemistry - Westborough Lab for sample(s): 01,04-16 Batch: WG874501-1										
Nitrogen, Total Kjeldahl	0.102	J	mg/l	0.300	0.031	1	03/16/16 19:00	03/18/16 23:17	30,4500N-C	AT
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-08 Batch: WG874530-1										
Chloride	ND		mg/l	0.500	0.054	1	-	03/15/16 16:55	44,300.0	AU
Sulfate	0.101	J	mg/l	1.00	0.051	1	-	03/15/16 16:55	44,300.0	AU
General Chemistry - Westborough Lab for sample(s): 09-19 Batch: WG874541-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/16/16 21:00	03/18/16 23:42	44,350.1	AT
Anions by Ion Chromatography - Westborough Lab for sample(s): 09-19 Batch: WG874924-1										
Sulfate	0.231	J	mg/l	1.00	0.051	1	-	03/16/16 17:06	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Anions by Ion Chromatography - Westborough Lab for sample(s): 09-19 Batch: WG874924-1										
Chloride	ND		mg/l	0.500	0.054	1	-	03/16/16 17:06	44,300.0	AU
General Chemistry - Westborough Lab for sample(s): 02-03,17-19 Batch: WG874940-1										
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.031	1	03/17/16 20:30	03/21/16 22:25	30,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 02-03 Batch: WG874950-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/17/16 21:30	03/21/16 22:53	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG875167-1										
Dissolved Organic Carbon	0.52	J	mg/l	1.0	0.12	1	03/15/16 00:30	03/16/16 08:32	30,5310C	DW
General Chemistry - Westborough Lab for sample(s): 09-19 Batch: WG875652-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	03/20/16 11:36	30,2320B	SG

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG873758-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG873851-3								
Alkalinity, Total	104		-		90-110	-		10
General Chemistry - Westborough Lab Associated sample(s): 01-02,04-08 Batch: WG873944-2								
Nitrogen, Ammonia	92		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG874066-2								
Nitrogen, Nitrate	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG874067-2								
Nitrogen, Nitrite	100		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG874069-2								
Nitrogen, Nitrate/Nitrite	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 11-19 Batch: WG874070-2								
Nitrogen, Nitrate	96		-		90-110	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 11-19 Batch: WG874071-2					
Nitrogen, Nitrite	100	-	90-110	-	20
General Chemistry - Westborough Lab Associated sample(s): 11-19 Batch: WG874072-2					
Nitrogen, Nitrate/Nitrite	96	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 09-19 Batch: WG874122-1					
pH	100	-	99-101	-	5
General Chemistry - Westborough Lab Associated sample(s): 01-19 Batch: WG874151-2					
Phosphorus, Orthophosphate	100	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 03-19 Batch: WG874430-2					
Dissolved Organic Carbon	98	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01,04-16 Batch: WG874501-2					
Nitrogen, Total Kjeldahl	96	-	78-122	-	
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-08 Batch: WG874530-2					
Chloride	103	-	90-110	-	
Sulfate	104	-	90-110	-	

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 09-19 Batch: WG874541-2					
Nitrogen, Ammonia	104	-	80-120	-	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 09-19 Batch: WG874924-2					
Chloride	104	-	90-110	-	
Sulfate	109	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 02-03,17-19 Batch: WG874940-2					
Nitrogen, Total Kjeldahl	99	-	78-122	-	
General Chemistry - Westborough Lab Associated sample(s): 02-03 Batch: WG874950-2					
Nitrogen, Ammonia	100	-	80-120	-	20
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG875167-2					
Dissolved Organic Carbon	98	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 09-19 Batch: WG875652-3					
Alkalinity, Total	104	-	90-110	-	10

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG873851-4 QC Sample: L1606927-01 Client ID: MS Sample												
Alkalinity, Total	9.60	100	113	103		-	-		86-116	-		10
General Chemistry - Westborough Lab Associated sample(s): 01-02,04-08 QC Batch ID: WG873944-4 QC Sample: L1606927-03 Client ID: MS Sample												
Nitrogen, Ammonia	0.027J	4	3.70	92		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG874066-4 QC Sample: L1607269-01 Client ID: TLZ-100												
Nitrogen, Nitrate	0.027J	4	3.9	98		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG874067-4 QC Sample: L1607269-01 Client ID: TLZ-100												
Nitrogen, Nitrite	ND	4	4.1	102		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG874069-4 QC Sample: L1607269-01 Client ID: TLZ-100												
Nitrogen, Nitrate/Nitrite	0.027J	4	3.9	98		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 11-19 QC Batch ID: WG874070-4 QC Sample: L1607269-11 Client ID: TL-5												
Nitrogen, Nitrate	1.2	4	5.0	95		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 11-19 QC Batch ID: WG874071-4 QC Sample: L1607269-11 Client ID: TL-5												
Nitrogen, Nitrite	0.014J	4	3.8	95		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 11-19 QC Batch ID: WG874072-4 QC Sample: L1607269-11 Client ID: TL-5												
Nitrogen, Nitrate/Nitrite	1.2	4	5.0	95		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-19 QC Batch ID: WG874151-4 QC Sample: L1607269-12 Client ID: TL-3												
Phosphorus, Orthophosphate	0.002J	0.5	0.517	103		-	-		80-120	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery		MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 03-19 QC Batch ID: WG874430-4 QC Sample: L1607269-12 Client ID: TL-3										
Dissolved Organic Carbon	0.92J	4	5.1	**128**	Q	-	-	80-120	-	20
General Chemistry - Westborough Lab Associated sample(s): 01,04-16 QC Batch ID: WG874501-4 QC Sample: L1607269-12 Client ID: TL-3										
Nitrogen, Total Kjeldahl	ND	8	7.20	90		-	-	77-111	-	24
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG874530-3 QC Sample: L1607317-06 Client ID: MS Sample										
Chloride	0.061J	4	4.23	106		-	-	40-151	-	18
Sulfate	ND	8	8.75	109		-	-	60-140	-	20
General Chemistry - Westborough Lab Associated sample(s): 09-19 QC Batch ID: WG874541-4 QC Sample: L1607269-09 Client ID: TLZ-22										
Nitrogen, Ammonia	0.036J	4	3.63	91		-	-	80-120	-	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 09-19 QC Batch ID: WG874924-3 QC Sample: L1607269-09 Client ID: TLZ-22										
Chloride	27.3	4	30.4	77		-	-	40-151	-	18
Sulfate	14.7	8	22.1	92		-	-	60-140	-	20
General Chemistry - Westborough Lab Associated sample(s): 02-03,17-19 QC Batch ID: WG874940-4 QC Sample: L1607269-02 Client ID: TLZ-90										
Nitrogen, Total Kjeldahl	0.132J	8	7.56	94		-	-	77-111	-	24
General Chemistry - Westborough Lab Associated sample(s): 02-03 QC Batch ID: WG874950-4 QC Sample: L1606591-25 Client ID: MS Sample										
Nitrogen, Ammonia	1.21	4	5.02	95		-	-	80-120	-	20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG875167-4 QC Sample: L1607269-02 Client ID: TLZ-90										
Dissolved Organic Carbon	0.73J	4	5.0	**124**	Q	-	-	80-120	-	20

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 09-19 QC Batch ID: WG875652-4 QC Sample: L1607269-09 Client ID: TLZ-22									
Alkalinity, Total	10.0	100	112	102	-	-	86-116	-	10

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG873758-2 QC Sample: L1607269-08 Client ID: TLZ-101						
pH (H)	6.2	6.2	SU	0		5
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG873851-2 QC Sample: L1606927-01 Client ID: DUP Sample						
Alkalinity, Total	9.60	9.40	mg CaCO3/L	2		10
General Chemistry - Westborough Lab Associated sample(s): 01-02,04-08 QC Batch ID: WG873944-3 QC Sample: L1606927-03 Client ID: DUP Sample						
Nitrogen, Ammonia	0.027J	0.036J	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG874066-3 QC Sample: L1607269-01 Client ID: TLZ-100						
Nitrogen, Nitrate	0.027J	0.030J	mg/l	NC		6
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG874067-3 QC Sample: L1607269-01 Client ID: TLZ-100						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG874069-3 QC Sample: L1607269-01 Client ID: TLZ-100						
Nitrogen, Nitrate/Nitrite	0.027J	0.030J	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 11-19 QC Batch ID: WG874070-3 QC Sample: L1607269-11 Client ID: TL-5						
Nitrogen, Nitrate	1.2	1.2	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 11-19 QC Batch ID: WG874071-3 QC Sample: L1607269-11 Client ID: TL-5						
Nitrogen, Nitrite	0.014J	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 11-19 QC Batch ID: WG874072-3 QC Sample: L1607269-11 Client ID: TL-5						
Nitrogen, Nitrate/Nitrite	1.2	1.2	mg/l	0		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Parameter	Native Sample	Duplicate Sample	Units	RPD		RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 09-19 QC Batch ID: WG874122-2 QC Sample: L1607374-01 Client ID: DUP Sample						
pH	7.8	8.1	SU	4		5
General Chemistry - Westborough Lab Associated sample(s): 01-19 QC Batch ID: WG874151-3 QC Sample: L1607269-11 Client ID: TL-5						
Phosphorus, Orthophosphate	0.004J	0.004J	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 03-19 QC Batch ID: WG874430-3 QC Sample: L1607269-11 Client ID: TL-5						
Dissolved Organic Carbon	4.0	1.2	mg/l	**108**	Q	20
General Chemistry - Westborough Lab Associated sample(s): 01,04-16 QC Batch ID: WG874501-3 QC Sample: L1607269-12 Client ID: TL-3						
Nitrogen, Total Kjeldahl	ND	ND	mg/l	NC		24
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG874530-4 QC Sample: L1607317-06 Client ID: DUP Sample						
Chloride	0.061J	ND	mg/l	NC		18
Sulfate	ND	0.069J	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 09-19 QC Batch ID: WG874541-3 QC Sample: L1607269-09 Client ID: TLZ-22						
Nitrogen, Ammonia	0.036J	0.037J	mg/l	NC		20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 09-19 QC Batch ID: WG874924-4 QC Sample: L1607269-09 Client ID: TLZ-22						
Chloride	27.3	27.3	mg/l	0		18
Sulfate	14.7	14.8	mg/l	1		20
General Chemistry - Westborough Lab Associated sample(s): 02-03,17-19 QC Batch ID: WG874940-3 QC Sample: L1607269-02 Client ID: TLZ-90						
Nitrogen, Total Kjeldahl	0.132J	0.153J	mg/l	NC		24

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 02-03 QC Batch ID: WG874950-3 QC Sample: L1606591-25 Client ID: DUP Sample					
Nitrogen, Ammonia	1.21	1.19	mg/l	2	20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG875167-3 QC Sample: L1607269-01 Client ID: TLZ-100					
Dissolved Organic Carbon	0.94J	0.89J	mg/l	NC	20
General Chemistry - Westborough Lab Associated sample(s): 09-19 QC Batch ID: WG875652-2 QC Sample: L1607269-09 Client ID: TLZ-22					
Alkalinity, Total	10.0	10.0	mg CaCO3/L	0	10

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent
B	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1607269-01A	Plastic 250ml HNO3 preserved	A	<2	4.0	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-01B	Plastic 250ml H2SO4 preserved	A	<2	4.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1607269-01C	Glass 120ml/4oz unpreserved	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-01D	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1607269-01E	Plastic 250ml unpreserved w/No H	A	N/A	4.0	Y	Absent	ALK-T-2320(14)
L1607269-01X	Vial H2SO4 preserved split	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-01Y	Vial H2SO4 preserved split	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-02A	Plastic 250ml HNO3 preserved	A	<2	4.0	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-02B	Plastic 250ml H2SO4 preserved	A	<2	4.0	Y	Absent	HOLD-WETCHEM(0)
L1607269-02C	Glass 120ml/4oz unpreserved	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-02D	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1607269-02E	Plastic 250ml unpreserved w/No H	A	N/A	4.0	Y	Absent	ALK-T-2320(14)
L1607269-02F	Plastic 500ml H2SO4 preserved	A	<2	4.0	Y	Absent	TKN-4500(28),TNITROGEN(28),NH3-350(28)
L1607269-02X	Vial H2SO4 preserved split	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-02Y	Vial H2SO4 preserved split	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-03A	Vial H2SO4 preserved	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-03B	Vial H2SO4 preserved	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-03C	Plastic 250ml HNO3 preserved	A	<2	4.0	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-03D	Plastic 500ml H2SO4 preserved	A	<2	4.0	Y	Absent	TKN-4500(28),TNITROGEN(28),NH3-350(28)
L1607269-03E	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1607269-03F	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1607269
Report Date: 03/23/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1607269-04A	Vial H2SO4 preserved	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-04B	Vial H2SO4 preserved	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-04C	Plastic 250ml HNO3 preserved	A	<2	4.0	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-04D	Plastic 500ml H2SO4 preserved	A	<2	4.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1607269-04E	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1607269-04F	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	ALK-T-2320(14)
L1607269-05A	Vial H2SO4 preserved	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-05B	Vial H2SO4 preserved	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-05C	Plastic 250ml HNO3 preserved	A	<2	4.0	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-05D	Plastic 500ml H2SO4 preserved	A	<2	4.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1607269-05E	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1607269-05F	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	ALK-T-2320(14)
L1607269-06A	Vial H2SO4 preserved	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-06B	Vial H2SO4 preserved	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-06C	Plastic 250ml HNO3 preserved	A	<2	4.0	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-06D	Plastic 500ml H2SO4 preserved	A	<2	4.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1607269-06E	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1607269-06F	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	ALK-T-2320(14)
L1607269-07A	Vial H2SO4 preserved	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-07B	Vial H2SO4 preserved	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-07C	Plastic 250ml HNO3 preserved	A	<2	4.0	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-07D	Plastic 500ml H2SO4 preserved	A	<2	4.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1607269-07E	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1607269-07F	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	ALK-T-2320(14)
L1607269-08A	Vial H2SO4 preserved	A	N/A	4.0	Y	Absent	DOC-5310(28)
L1607269-08B	Vial H2SO4 preserved	A	N/A	4.0	Y	Absent	DOC-5310(28)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB
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Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1607269-08C	Plastic 250ml HNO3 preserved	A	<2	4.0	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-08D	Plastic 500ml H2SO4 preserved	A	<2	4.0	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1607269-08E	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1607269-08F	Plastic 500ml unpreserved	A	7	4.0	Y	Absent	ALK-T-2320(14)
L1607269-09A	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-09B	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-09C	Plastic 250ml HNO3 preserved	B	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-09D	Plastic 500ml unpreserved	B	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01),NH3-350(28)
L1607269-09E	Plastic 500ml H2SO4 preserved	B	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1607269-09F	Plastic 250ml unpreserved w/No H	B	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1607269-10A	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-10B	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-10C	Plastic 250ml HNO3 preserved	B	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-10D	Plastic 500ml unpreserved	B	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01),NH3-350(28)
L1607269-10E	Plastic 500ml H2SO4 preserved	B	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1607269-10F	Plastic 250ml unpreserved w/No H	B	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1607269-11A	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-11B	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-11C	Plastic 250ml HNO3 preserved	B	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-11D	Plastic 500ml unpreserved	B	6	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01),NH3-350(28)
L1607269-11E	Plastic 500ml H2SO4 preserved	B	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1607269-11F	Plastic 250ml unpreserved w/No H	B	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1607269-12A	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-12B	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-12C	Plastic 250ml HNO3 preserved	B	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

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Project Number: WV-1009

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Report Date: 03/23/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1607269-12D	Plastic 500ml unpreserved	B	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01),NH3-350(28)
L1607269-12E	Plastic 500ml H2SO4 preserved	B	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1607269-12F	Plastic 250ml unpreserved w/No H	B	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1607269-13A	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-13B	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-13C	Plastic 250ml HNO3 preserved	B	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-13D	Plastic 500ml unpreserved	B	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01),NH3-350(28)
L1607269-13E	Plastic 500ml H2SO4 preserved	B	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1607269-13F	Plastic 250ml unpreserved w/No H	B	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1607269-14A	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-14B	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-14C	Plastic 250ml HNO3 preserved	B	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-14D	Plastic 500ml unpreserved	B	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01),NH3-350(28)
L1607269-14E	Plastic 500ml H2SO4 preserved	B	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1607269-14F	Plastic 250ml unpreserved w/No H	B	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1607269-15A	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-15B	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-15C	Plastic 250ml HNO3 preserved	B	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-15D	Plastic 500ml unpreserved	B	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01),NH3-350(28)
L1607269-15E	Plastic 500ml H2SO4 preserved	B	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1607269-15F	Plastic 250ml unpreserved w/No H	B	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1607269-16A	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-16B	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-16C	Plastic 250ml HNO3 preserved	B	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-16D	Plastic 500ml unpreserved	B	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01),NH3-350(28)

*Values in parentheses indicate holding time in days

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Report Date: 03/23/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1607269-16E	Plastic 500ml H2SO4 preserved	B	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1607269-16F	Plastic 250ml unpreserved w/No H	B	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1607269-17A	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-17B	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-17C	Plastic 250ml HNO3 preserved	B	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-17D	Plastic 500ml unpreserved	B	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01),NH3-350(28)
L1607269-17E	Plastic 500ml H2SO4 preserved	B	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1607269-17F	Plastic 250ml unpreserved w/No H	B	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1607269-18A	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-18B	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-18C	Plastic 250ml HNO3 preserved	B	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-18D	Plastic 500ml unpreserved	B	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01),NH3-350(28)
L1607269-18E	Plastic 500ml H2SO4 preserved	B	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1607269-18F	Plastic 250ml unpreserved w/No H	B	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1607269-19A	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-19B	Vial H2SO4 preserved	B	N/A	4.5	Y	Absent	DOC-5310(28)
L1607269-19C	Plastic 250ml HNO3 preserved	B	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1607269-19D	Plastic 500ml unpreserved	B	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01),NH3-350(28)
L1607269-19E	Plastic 500ml H2SO4 preserved	B	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28)
L1607269-19F	Plastic 250ml unpreserved w/No H	B	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1607269-20A	Plastic 500ml H2SO4 preserved	B	<2	4.5	Y	Absent	-

*Values in parentheses indicate holding time in days

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GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

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Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-PRB	**Lab Number:**	L1607269
Project Number:	WV-1009	**Report Date:**	03/23/16

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.

41 Alpha Analytical Labs Internally-developed Performance-based Method.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL
8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220

320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

Date Rec'd in Lab: 3/14/16

ALPHA Job #: L1607269

Client Information

Client: Watervision LLC
Address: 481 Great Rd, St. 3 Acton, MA 01720
Phone: 603-496-2916
Email: dtrusler@watervision llc.com

Project Information

Project Name: EPA-PRS
Project Location: Mashpee
Project #: WV-1029
Project Manager: Donna Trusler
ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☑ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Yes ☐ No CT RCP Analytical Methods
☐ Other State /Fed Program _____ Criteria _____

Additional Project Information:

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2
SVOC: ☐ ABN ☐ PAH
METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15
METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13
EPH: ☐ Ranges & Targets ☐ Ranges Only
VPH: ☐ Ranges & Targets ☐ Ranges Only
☐ PCB ☐ PEST
TPH: ☐ Quant Only ☐ Fingerprint
Total N, NH3-N, pH, Cl, SO4, NO3, NO2, ortho P
Total Alk
Dissolved As, Mn, Fe, B
Dissolved Organic Carbon

SAMPLE INFO
See below
Filtration
☐ Field = FF
☐ Lab to do
Preservation
☐ Lab to do

TOTAL # BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	Sample Comments
07269-4	TLZ-100	3/14/16	10:50	Water	DT	FF-metals to do DOC-lab to do
22	TLZ-90	3/14/16	12:00	"	SW/DT	FF-metals, tpN, N DOC-lab to do
23	TLZ-80	3/14/16	12:40	"	DT	FF-metals + DOC
24	TLZ-70	3/14/16	13:35	"	SW	FF-metals DOC
25	TLZ-60	3/14/16	14:15	"	DT	FF-metals, DOC
26	TLZ-50	3/14/16	15:25	"	DT	FF-metals DOC
27	TLZ-4	3/14/16	14:55	"	SW	FF-metals + DOC
28	TLZ-101	3/14/16	14:20	"	DT	

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Container Type											
Preservative											

Relinquished By:	Date/Time	Received By:	Date/Time
	3/14/16 16:00		3/14/16 16:00
	3/14/16 16:30		3/14/16 16:30
	3/14/16 17:45		3/14/16 17:45

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO. 01-01 (rev. 12-Mar-2012)

CHAIN OF CUSTODY

PAGE 1 OF 2

Date Rec'd in Lab: 3/15/16

ALPHA Job #: ~~L1607402~~ L1607269 m.c.

ALPHA ANALYTICAL

8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220

320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: WaferVision LLC

Address: 481 Great Rd, St. 3, Acton, MA

Phone: 603-498-2916

Email: dtruslow@wafervisionllc.com

Additional Project Information:

Project Information

Project Name: EPA - PRB

Project Location: Mashpee, MA

Project #: WV-1009

Project Manager: Danna Truslow

ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods

☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)

☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)

☐ Yes ☐ No NPDES RGP

☐ Other State /Fed Program ______ Criteria ______

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; Dissolved Metals As, Fe, Mn; Dissolved Organic Carbon; pH, SO4, Cl, NO3, NO2, orthoP; Total N, NH3-N; Total Alkalinity

SAMPLE INFO — Filtration: ☒ Field ☐ Lab to do; Preservation: ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	Dissolved Metals As, Fe, Mn	Dissolved Organic Carbon	pH, SO4, Cl, NO3, NO2, orthoP	Total N, NH3-N	Total Alkalinity	Sample Comments	Total # Bottles
07269-09 (~~07402-01~~) m.c.	TLZ-22	3/14/16	16:50	Water	SW	✓	✓	✓	✓	✓		
7269-10 (~~02~~)	TLZ-31	3/14/16	17:20	"	DT	✓	✓	✓	✓	✓		
11 (~~03~~)	TL-5	3/14/16	18:05	"	DT	✓	✓	✓	✓	✓		
12 (~~04~~)	TL-3	3/14/16	17:55	"	SW	✓	✓	✓	✓	✓		
13 (~~05~~)	TLZ-40	3/14/16	16:35	"	DT	✓	✓	✓	✓	✓		
14 (~~06~~)	TLZ-14	3/14/16	15:50	"	SW	✓	✓	✓	✓	✓		
15 (~~07~~)	TL-6	3/15/16	10:15	"	DT	✓	✓	✓	✓	✓		
16 (~~08~~)	TL-7	3/15/16		"	DT	✓	✓	✓	✓	✓		
17 (~~09~~)	TL-2	3/15/16	11:35	"	SW	✓	✓	✓	✓	✓		
18 (~~10~~)	TL-2A	3/15/16	11:35	"	SW	✓	✓	✓	✓	✓		

Container Type:

Preservative:

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	3/15/16 3:55pm	[signature]	3/15/16 15:55

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

Serial_No:03231611:53 ~~L160 7402~~ L1607269

CHAIN OF CUSTODY

PAGE 2 OF 2

Date Rec'd in Lab: 3/15/16

ALPHA Job #: ~~L160 7402~~

ALPHA ANALYTICAL
World Class Chemistry
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: Water Vision LLC
Address: 481 Great Rd, St. 3, Acton, MA
Phone: 603-498-2916
Email: dtrosler@watervisionllc.com

Project Information

Project Name: EPA - PRB
Project Location: Mashpee MA
Project #: WV-1009
Project Manager: Danna Trosler
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program ____ Criteria ____

Additional Project Information:

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint

Handwritten analyses: (A) Dissolved Metals Fe, Mn, As, B; (A) Dissolved organic Carbon; pH, SO4, Cl, NO2, NO3, o-PO4 (DP); TKN N; NH3-N; Total Alk

SAMPLE INFO — Filtration: ☒ Field ☐ Lab to do; Preservation: ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	Diss. Metals	DOC	pH, SO4, Cl, NO2, NO3, o-PO4	TKN N	NH3-N	Total Alk	Sample Comments
~~07402-11~~	TL-1	3/15/16	10:12	Water	SW	X	X	X	X	X		
07269-20 ~~-12~~	TLZ-90	3/15/16	12:25	Water	DT				X			to replace TLZ 90 Total N from 3/14/16

Container Type	
Preservative	

Container Type: P= Plastic, A= Amber glass, V= Vial, G= Glass, B= Bacteria cup, C= Cube, O= Other, E= Encore, D= BOD Bottle

Preservative: A= None, B= HCl, C= HNO_3, D= H_2SO_4, E= NaOH, F= MeOH, G= $NaHSO_4$, H = $Na_2S_2O_3$, I= Ascorbic Acid, J = NH_4Cl, K= Zn Acetate, O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	3/15/16 3:55pm	[signature]	3/15/16 1555

ANALYTICAL REPORT

Lab Number:	L1612601
Client:	Watervision, LLC 454 Court Street Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA-PRB
Project Number:	WV-1009
Report Date:	05/06/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1612601-01	TLZ-14	WATER	MASHPEE, MA	04/27/16 11:00	04/27/16
L1612601-02	TLZ-22	WATER	MASHPEE, MA	04/27/16 11:22	04/27/16
L1612601-03	TLZ-31	WATER	MASHPEE, MA	04/27/16 12:05	04/27/16
L1612601-04	TLZ-40	WATER	MASHPEE, MA	04/27/16 12:30	04/27/16
L1612601-05	TLZ-40 DUP	WATER	MASHPEE, MA	04/27/16 12:35	04/27/16
L1612601-06	TLZ-50	WATER	MASHPEE, MA	04/27/16 13:15	04/27/16
L1612601-07	TLZ-60	WATER	MASHPEE, MA	04/27/16 14:30	04/27/16
L1612601-08	TLZ-70	WATER	MASHPEE, MA	04/27/16 15:20	04/27/16
L1612601-09	TLZ-80	WATER	MASHPEE, MA	04/27/16 15:25	04/27/16
L1612601-10	TLZ-90	WATER	MASHPEE, MA	04/27/16 13:50	04/27/16

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Melissa Cripps

Title: Technical Director/Representative

Date: 05/06/16

METALS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-01
Client ID: TLZ-14
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/27/16 11:00
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0047	J	mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 01:23	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0167	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 01:23	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.031	J	mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 01:23	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0230		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 01:23	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-02
Client ID: TLZ-22
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/27/16 11:22
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 01:27	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0373		mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 01:27	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.19		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 01:27	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0164		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 01:27	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-03
Client ID: TLZ-31
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/27/16 12:05
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 00:39	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0094	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 00:39	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.061		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 00:39	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0022	J	mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 00:39	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-04
Client ID: TLZ-40
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/27/16 12:30
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 01:54	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0104	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 01:54	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 01:54	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0332		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 01:54	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-05
Client ID: TLZ-40 DUP
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/27/16 12:35
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 01:58	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0097	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 01:58	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.046	J	mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 01:58	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0304		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 01:58	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-06
Client ID: TLZ-50
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/27/16 13:15
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0030	J	mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 02:03	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0104	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 02:03	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.39		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 02:03	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.116		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 02:03	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-07
Client ID: TLZ-60
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/27/16 14:30
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0025	J	mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 02:07	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0101	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 02:07	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.41		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 02:07	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.235		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 02:07	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-08
Client ID: TLZ-70
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/27/16 15:20
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 02:11	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0099	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 02:11	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.088		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 02:11	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0135		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 02:11	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-09
Client ID: TLZ-80
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/27/16 15:25
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 02:16	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0092	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 02:16	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.026	J	mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 02:16	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0702		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 02:16	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-10
Client ID: TLZ-90
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/27/16 13:50
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0025	J	mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 02:20	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0082	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 02:20	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.19		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 02:20	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0238		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 02:20	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-10 Batch: WG889935-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 01:01	1,6010C	PS
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 01:01	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 01:01	1,6010C	PS
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 01:01	1,6010C	PS

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-10 Batch: WG889935-2								
Arsenic, Dissolved	111		-		80-120	-		
Boron, Dissolved	109		-		80-120	-		
Iron, Dissolved	95		-		80-120	-		
Manganese, Dissolved	96		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG889935-4 QC Sample: L1612601-03 Client ID: TLZ-31												
Arsenic, Dissolved	ND	0.12	0.124	103		-	-		75-125	-		20
Boron, Dissolved	0.0094J	1	1.07	107		-	-		75-125	-		20
Iron, Dissolved	0.061	1	0.98	92		-	-		75-125	-		20
Manganese, Dissolved	0.0022J	0.5	0.478	96		-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG889935-3 QC Sample: L1612601-03 Client ID: TLZ-31						
Arsenic, Dissolved	ND	0.0038J	mg/l	NC		20
Boron, Dissolved	0.0094J	0.0110J	mg/l	NC		20
Iron, Dissolved	0.061	0.027J	mg/l	NC		20
Manganese, Dissolved	0.0022J	ND	mg/l	NC		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-01
Client ID: TLZ-14
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 11:00
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.70		mg CaCO3/L	2.00	NA	1	-	04/29/16 09:02	121,2320B	AW
pH (H)	5.2		SU	-	NA	1	-	04/28/16 10:50	121,4500H+-B	LH
Nitrogen, Ammonia	0.050	J	mg/l	0.075	0.028	1	04/28/16 18:00	04/28/16 23:14	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/28/16 19:16	44,353.2	MR
Nitrogen, Nitrate	0.034	J	mg/l	0.10	0.019	1	-	04/28/16 19:16	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.034	J	mg/l	0.10	0.019	1	-	04/28/16 19:16	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	05/05/16 18:53	107,-	JO
Nitrogen, Total Kjeldahl	0.213	J	mg/l	0.300	0.066	1	04/30/16 08:56	05/02/16 23:39	121,4500N-C	AT
Phosphorus, Orthophosphate	0.012		mg/l	0.005	0.001	1	-	04/28/16 22:16	121,4500P-E	MR
Dissolved Organic Carbon	1.8		mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	12.9		mg/l	0.500	0.054	1	-	04/30/16 02:51	44,300.0	AU
Sulfate	5.30		mg/l	1.00	0.150	1	-	04/30/16 02:51	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-02
Client ID: TLZ-22
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 11:22
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	10.1		mg CaCO3/L	2.00	NA	1	-	04/29/16 09:02	121,2320B	AW
pH (H)	5.3		SU	-	NA	1	-	04/28/16 10:50	121,4500H+-B	LH
Nitrogen, Ammonia	0.172		mg/l	0.075	0.028	1	04/28/16 18:00	04/28/16 23:20	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/28/16 19:17	44,353.2	MR
Nitrogen, Nitrate	0.16		mg/l	0.10	0.019	1	-	04/28/16 19:17	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.16		mg/l	0.10	0.019	1	-	04/28/16 19:17	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	05/05/16 18:53	107,-	JO
Nitrogen, Total Kjeldahl	0.135	J	mg/l	0.300	0.066	1	04/30/16 08:56	05/02/16 23:40	121,4500N-C	AT
Phosphorus, Orthophosphate	0.013		mg/l	0.005	0.001	1	-	04/28/16 22:16	121,4500P-E	MR
Dissolved Organic Carbon	1.1		mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	25.2		mg/l	0.500	0.054	1	-	04/30/16 03:03	44,300.0	AU
Sulfate	15.0		mg/l	1.00	0.150	1	-	04/30/16 03:03	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-03
Client ID: TLZ-31
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 12:05
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	10.0		mg CaCO3/L	2.00	NA	1	-	04/29/16 09:02	121,2320B	AW
pH (H)	5.6		SU	-	NA	1	-	04/28/16 10:50	121,4500H+-B	LH
Nitrogen, Ammonia	0.174		mg/l	0.075	0.028	1	04/28/16 18:00	04/28/16 23:20	44,350.1	AT
Nitrogen, Nitrite	0.013	J	mg/l	0.050	0.010	1	-	04/28/16 19:24	44,353.2	MR
Nitrogen, Nitrate	2.0		mg/l	0.10	0.019	1	-	04/28/16 19:24	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.0		mg/l	0.10	0.019	1	-	04/28/16 19:24	44,353.2	MR
Total Nitrogen	2.0		mg/l	0.30	0.30	1	-	05/05/16 18:53	107,-	JO
Nitrogen, Total Kjeldahl	0.078	J	mg/l	0.300	0.066	1	04/30/16 08:56	05/02/16 23:45	121,4500N-C	AT
Phosphorus, Orthophosphate	0.014		mg/l	0.005	0.001	1	-	04/28/16 22:18	121,4500P-E	MR
Dissolved Organic Carbon	0.41	J	mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	32.3		mg/l	0.500	0.054	1	-	04/30/16 03:15	44,300.0	AU
Sulfate	6.72		mg/l	1.00	0.150	1	-	04/30/16 03:15	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-04
Client ID: TLZ-40
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 12:30
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.20		mg CaCO3/L	2.00	NA	1	-	04/29/16 09:02	121,2320B	AW
pH (H)	5.6		SU	-	NA	1	-	04/28/16 10:50	121,4500H+-B	LH
Nitrogen, Ammonia	0.110		mg/l	0.075	0.028	1	04/28/16 18:00	04/28/16 23:21	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/28/16 19:25	44,353.2	MR
Nitrogen, Nitrate	3.0		mg/l	0.10	0.019	1	-	04/28/16 19:25	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.0		mg/l	0.10	0.019	1	-	04/28/16 19:25	44,353.2	MR
Total Nitrogen	3.0		mg/l	0.30	0.30	1	-	05/05/16 18:53	107,-	JO
Nitrogen, Total Kjeldahl	0.093	J	mg/l	0.300	0.066	1	04/30/16 08:56	05/02/16 23:46	121,4500N-C	AT
Phosphorus, Orthophosphate	0.012		mg/l	0.005	0.001	1	-	04/28/16 22:18	121,4500P-E	MR
Dissolved Organic Carbon	0.40	J	mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	43.2		mg/l	0.500	0.054	1	-	04/30/16 03:27	44,300.0	AU
Sulfate	4.53		mg/l	1.00	0.150	1	-	04/30/16 03:27	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-05
Client ID: TLZ-40 DUP
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 12:35
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.40		mg CaCO3/L	2.00	NA	1	-	04/29/16 09:02	121,2320B	AW
pH (H)	5.6		SU	-	NA	1	-	04/28/16 10:50	121,4500H+-B	LH
Nitrogen, Ammonia	0.046	J	mg/l	0.075	0.028	1	04/28/16 18:00	04/28/16 23:22	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/28/16 19:26	44,353.2	MR
Nitrogen, Nitrate	3.0		mg/l	0.10	0.019	1	-	04/28/16 19:26	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.0		mg/l	0.10	0.019	1	-	04/28/16 19:26	44,353.2	MR
Total Nitrogen	3.0		mg/l	0.30	0.30	1	-	05/05/16 18:53	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/30/16 08:56	05/02/16 23:47	121,4500N-C	AT
Phosphorus, Orthophosphate	0.013		mg/l	0.005	0.001	1	-	04/28/16 22:18	121,4500P-E	MR
Dissolved Organic Carbon	0.44	J	mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	43.2		mg/l	0.500	0.054	1	-	04/30/16 03:39	44,300.0	AU
Sulfate	4.47		mg/l	1.00	0.150	1	-	04/30/16 03:39	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-06
Client ID: TLZ-50
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 13:15
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	14.8		mg CaCO3/L	2.00	NA	1	-	04/29/16 09:02	121,2320B	AW
pH (H)	5.8		SU	-	NA	1	-	04/28/16 10:50	121,4500H+-B	LH
Nitrogen, Ammonia	0.089		mg/l	0.075	0.028	1	04/28/16 18:00	04/28/16 23:23	44,350.1	AT
Nitrogen, Nitrite	0.013	J	mg/l	0.050	0.010	1	-	04/28/16 19:28	44,353.2	MR
Nitrogen, Nitrate	0.83		mg/l	0.10	0.019	1	-	04/28/16 19:28	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.83		mg/l	0.10	0.019	1	-	04/28/16 19:28	44,353.2	MR
Total Nitrogen	0.83		mg/l	0.30	0.30	1	-	05/05/16 18:53	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/30/16 08:56	05/02/16 23:48	121,4500N-C	AT
Phosphorus, Orthophosphate	0.016		mg/l	0.005	0.001	1	-	04/28/16 22:19	121,4500P-E	MR
Dissolved Organic Carbon	0.47	J	mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.3		mg/l	0.500	0.054	1	-	04/30/16 03:51	44,300.0	AU
Sulfate	9.75		mg/l	1.00	0.150	1	-	04/30/16 03:51	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-07
Client ID: TLZ-60
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 14:30
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	12.4		mg CaCO3/L	2.00	NA	1	-	04/29/16 09:02	121,2320B	AW
pH (H)	5.8		SU	-	NA	1	-	04/28/16 10:50	121,4500H+-B	LH
Nitrogen, Ammonia	0.039	J	mg/l	0.075	0.028	1	04/28/16 18:00	04/28/16 23:24	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/28/16 19:33	44,353.2	MR
Nitrogen, Nitrate	0.44		mg/l	0.10	0.019	1	-	04/28/16 19:33	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.44		mg/l	0.10	0.019	1	-	04/28/16 19:33	44,353.2	MR
Total Nitrogen	0.44		mg/l	0.30	0.30	1	-	05/05/16 18:53	107,-	JO
Nitrogen, Total Kjeldahl	0.172	J	mg/l	0.300	0.066	1	04/30/16 08:56	05/02/16 23:49	121,4500N-C	AT
Phosphorus, Orthophosphate	0.018		mg/l	0.005	0.001	1	-	04/28/16 22:19	121,4500P-E	MR
Dissolved Organic Carbon	0.45	J	mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	22.6		mg/l	0.500	0.054	1	-	04/30/16 04:03	44,300.0	AU
Sulfate	7.65		mg/l	1.00	0.150	1	-	04/30/16 04:03	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-08
Client ID: TLZ-70
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 15:20
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	10.1		mg CaCO3/L	2.00	NA	1	-	04/29/16 09:02	121,2320B	AW
pH (H)	5.6		SU	-	NA	1	-	04/28/16 10:50	121,4500H+-B	LH
Nitrogen, Ammonia	0.079		mg/l	0.075	0.028	1	04/28/16 18:00	04/28/16 23:25	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/28/16 19:34	44,353.2	MR
Nitrogen, Nitrate	0.91		mg/l	0.10	0.019	1	-	04/28/16 19:34	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.91		mg/l	0.10	0.019	1	-	04/28/16 19:34	44,353.2	MR
Total Nitrogen	1.0		mg/l	0.30	0.30	1	-	05/05/16 18:53	107,-	JO
Nitrogen, Total Kjeldahl	0.131	J	mg/l	0.300	0.066	1	04/30/16 08:56	05/02/16 23:50	121,4500N-C	AT
Phosphorus, Orthophosphate	0.019		mg/l	0.005	0.001	1	-	04/28/16 22:19	121,4500P-E	MR
Dissolved Organic Carbon	0.43	J	mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	23.4		mg/l	0.500	0.054	1	-	04/30/16 04:15	44,300.0	AU
Sulfate	8.24		mg/l	1.00	0.150	1	-	04/30/16 04:15	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-09
Client ID: TLZ-80
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 15:25
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	14.1		mg CaCO3/L	2.00	NA	1	-	04/29/16 09:02	121,2320B	AW
pH (H)	5.7		SU	-	NA	1	-	04/28/16 10:50	121,4500H+-B	LH
Nitrogen, Ammonia	0.030	J	mg/l	0.075	0.028	1	04/28/16 18:00	04/28/16 23:26	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/28/16 19:35	44,353.2	MR
Nitrogen, Nitrate	1.3		mg/l	0.10	0.019	1	-	04/28/16 19:35	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.3		mg/l	0.10	0.019	1	-	04/28/16 19:35	44,353.2	MR
Total Nitrogen	1.3		mg/l	0.30	0.30	1	-	05/05/16 18:53	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/30/16 08:56	05/02/16 23:50	121,4500N-C	AT
Phosphorus, Orthophosphate	0.013		mg/l	0.005	0.001	1	-	04/28/16 22:20	121,4500P-E	MR
Dissolved Organic Carbon	0.46	J	mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	14.5		mg/l	0.500	0.054	1	-	04/30/16 05:03	44,300.0	AU
Sulfate	11.3		mg/l	1.00	0.150	1	-	04/30/16 05:03	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

SAMPLE RESULTS

Lab ID: L1612601-10
Client ID: TLZ-90
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 13:50
Date Received: 04/27/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	17.6		mg CaCO3/L	2.00	NA	1	-	04/29/16 09:02	121,2320B	AW
pH (H)	5.7		SU	-	NA	1	-	04/28/16 10:50	121,4500H+-B	LH
Nitrogen, Ammonia	0.057	J	mg/l	0.075	0.028	1	04/28/16 18:00	04/28/16 23:26	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/28/16 19:37	44,353.2	MR
Nitrogen, Nitrate	0.55		mg/l	0.10	0.019	1	-	04/28/16 19:37	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.55		mg/l	0.10	0.019	1	-	04/28/16 19:37	44,353.2	MR
Total Nitrogen	0.55		mg/l	0.30	0.30	1	-	05/05/16 18:53	107,-	JO
Nitrogen, Total Kjeldahl	0.079	J	mg/l	0.300	0.066	1	04/30/16 08:56	05/02/16 23:51	121,4500N-C	AT
Phosphorus, Orthophosphate	0.025		mg/l	0.005	0.001	1	-	04/28/16 22:20	121,4500P-E	MR
Dissolved Organic Carbon	0.53	J	mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	14.2		mg/l	0.500	0.054	1	-	04/30/16 05:15	44,300.0	AU
Sulfate	13.5		mg/l	1.00	0.150	1	-	04/30/16 05:15	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG888414-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	04/28/16 18:36	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG888415-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/28/16 18:42	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG888416-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	04/28/16 18:36	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG888460-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/28/16 18:00	04/28/16 22:58	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG888526-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	04/28/16 22:16	121,4500P-E	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG888746-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	04/29/16 09:02	121,2320B	AW
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-10 Batch: WG889621-1										
Chloride	ND		mg/l	0.500	0.054	1	-	04/29/16 22:27	44,300.0	AU
Sulfate	ND		mg/l	1.00	0.150	1	-	04/29/16 22:27	44,300.0	AU
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG890041-1										
Nitrogen, Total Kjeldahl	0.122	J	mg/l	0.300	0.022	1	04/30/16 08:56	05/02/16 23:34	121,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG890192-1										
Dissolved Organic Carbon	0.14	J	mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG888184-1								
pH	101		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG888414-2								
Nitrogen, Nitrate	92		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG888415-2								
Nitrogen, Nitrite	98		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG888416-2								
Nitrogen, Nitrate/Nitrite	92		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG888460-2								
Nitrogen, Ammonia	92		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG888526-2								
Phosphorus, Orthophosphate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG888746-2								
Alkalinity, Total	103		-		90-110	-		10

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-10 Batch: WG889621-2					
Chloride	101	-	90-110	-	
Sulfate	97	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG890041-2					
Nitrogen, Total Kjeldahl	99	-	78-122	-	
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG890192-2					
Dissolved Organic Carbon	106	-	90-110	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG888414-4 QC Sample: L1612601-02 Client ID: TLZ-22												
Nitrogen, Nitrate	0.16	4	3.8	91		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG888415-4 QC Sample: L1612601-02 Client ID: TLZ-22												
Nitrogen, Nitrite	ND	4	3.9	98		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG888416-4 QC Sample: L1612601-02 Client ID: TLZ-22												
Nitrogen, Nitrate/Nitrite	0.16	4	3.8	91		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG888460-4 QC Sample: L1612601-01 Client ID: TLZ-14												
Nitrogen, Ammonia	0.050J	4	3.79	95		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG888526-4 QC Sample: L1612601-01 Client ID: TLZ-14												
Phosphorus, Orthophosphate	0.012	0.5	0.420	82		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG888746-4 QC Sample: L1612820-05 Client ID: MS Sample												
Alkalinity, Total	101.	100	159	**58**	Q	-	-		86-116	-		10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG889621-3 QC Sample: L1612813-01 Client ID: MS Sample												
Chloride	14.7	4	18.2	87		-	-		40-151	-		18
Sulfate	12.2	8	20.4	102		-	-		60-140	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG890041-4 QC Sample: L1612601-02 Client ID: TLZ-22												
Nitrogen, Total Kjeldahl	0.135J	8	7.68	96		-	-		77-111	-		24
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG890192-4 QC Sample: L1612601-02 Client ID: TLZ-22												
Dissolved Organic Carbon	1.1	4	5.8	117		-	-		80-120	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG888184-2 QC Sample: L1612601-01 Client ID: TLZ-14						
pH (H)	5.2	5.1	SU	2		5
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG888414-3 QC Sample: L1612601-02 Client ID: TLZ-22						
Nitrogen, Nitrate	0.16	0.16	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG888415-3 QC Sample: L1612601-02 Client ID: TLZ-22						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG888416-3 QC Sample: L1612601-02 Client ID: TLZ-22						
Nitrogen, Nitrate/Nitrite	0.16	0.16	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG888460-3 QC Sample: L1612601-01 Client ID: TLZ-14						
Nitrogen, Ammonia	0.050J	0.043J	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG888526-3 QC Sample: L1612601-02 Client ID: TLZ-22						
Phosphorus, Orthophosphate	0.013	0.012	mg/l	8		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG888746-3 QC Sample: L1612820-05 Client ID: DUP Sample						
Alkalinity, Total	101.	101	mg CaCO3/L	0		10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG889621-4 QC Sample: L1612813-01 Client ID: DUP Sample						
Chloride	14.7	14.7	mg/l	0		18
Sulfate	12.2	12.3	mg/l	1		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG890041-3 QC Sample: L1612601-02 Client ID: TLZ-22					
Nitrogen, Total Kjeldahl	0.135J	0.268J	mg/l	NC	24
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG890192-3 QC Sample: L1612601-01 Client ID: TLZ-14					
Dissolved Organic Carbon	1.8	1.8	mg/l	0	20

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent
B	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1612601-01A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-01B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-01C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612601-01D	Plastic 500ml unpreserved	B	8	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612601-01E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612601-01F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)
L1612601-02A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-02B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-02C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612601-02D	Plastic 500ml unpreserved	B	8	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612601-02E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612601-02F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)
L1612601-03A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-03B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-03C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612601-03D	Plastic 500ml unpreserved	B	8	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612601-03E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612601-03F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)
L1612601-04A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-04B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-04C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1612601-04D	Plastic 500ml unpreserved	B	8	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612601-04E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612601-04F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)
L1612601-05A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-05B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-05C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612601-05D	Plastic 500ml unpreserved	B	8	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612601-05E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612601-05F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)
L1612601-06A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-06B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-06C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612601-06D	Plastic 500ml unpreserved	B	8	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612601-06E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612601-06F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)
L1612601-07A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-07B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-07C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612601-07D	Plastic 500ml unpreserved	B	8	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612601-07E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612601-07F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)
L1612601-08A	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1612601-08B	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1612601-08C	Plastic 250ml HNO3 preserved	A	<2	4.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612601-08D	Plastic 500ml unpreserved	A	8	4.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1612601
Report Date: 05/06/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1612601-08E	Plastic 500ml H2SO4 preserved	A	<2	4.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612601-08F	Plastic 250ml unpreserved w/No H	A	N/A	4.6	Y	Absent	ALK-T-2320(14)
L1612601-09A	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1612601-09B	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1612601-09C	Plastic 250ml HNO3 preserved	A	<2	4.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612601-09D	Plastic 500ml unpreserved	A	8	4.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612601-09E	Plastic 500ml H2SO4 preserved	A	<2	4.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612601-09F	Plastic 250ml unpreserved w/No H	A	N/A	4.6	Y	Absent	ALK-T-2320(14)
L1612601-10A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-10B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1612601-10C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612601-10D	Plastic 500ml unpreserved	B	8	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612601-10E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612601-10F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name:	EPA-PRB	**Lab Number:**	L1612601
Project Number:	WV-1009	**Report Date:**	05/06/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-PRB	**Lab Number:**	L1612601
Project Number:	WV-1009	**Report Date:**	05/06/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1612601
Report Date: 05/06/16

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

Serial_No:05061612:32

CHAIN OF CUSTODY

PAGE ____ OF ____

ALPHA ANALYTICAL

8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Date Rec'd in Lab: 4/27/16

ALPHA Job #: L1612601

Project Information

Project Name: EPA-PRB
Project Location: Mashpee
Project #: WV-1009
Project Manager: Danna Truslow
ALPHA Quote #:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Client Information

Client: WaterVision LLC
Address: 481 Great Rd. Acton, MA 01720
Phone: 603-498-2916
Email: dtruslow@watervisionllc.com

Additional Project Information:

Turn-Around Time

☐ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorga...)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targe...)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program ____ Criteria ____

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; pH, SO4, Cl, NO3, NO2, Others; diss metals* - As, Fe, B, Mn; total N, NH3-N; Total Alk; DOC*

SAMPLE INFO
Filtration: ☒ Field ☐ Lab to do
Preservation: ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	pH, SO4, Cl, NO3, NO2, Others	diss metals* - As, Fe, B, Mn	total N, NH3-N	Total Alk	DOC*	Sample Comments	Total # Bottles
12601 .01	TLZ-14	4/27/16	11:00	water	SW	✓	✓	✓	✓	✓		
.02	TLZ-22	4/27/16	11:22	water	SW	✓	✓	✓	✓	✓		
.03	TLZ-31	4/27/16	12:05	water	SW	✓	✓	✓	✓	✓		
.04	TLZ-40	4/27/16	12:30	water	SW	✓	✓	✓	✓	✓		
.05	TLZ-40 DUP	4/27/16	12:35	water	SW	✓	✓	✓	✓	✓		
.06	TLZ-50	4/27/16	13:15	water	SW	✓	✓	✓	✓	✓		
.07	TLZ-60	4/27/16	14:30	water	SW	✓	✓	✓	✓	✓		
.08	TLZ-70	4/27/16	15:20	water	SW	✓	✓	✓	✓	✓		
.09	TLZ-80	4/27/16	15:25	water	SW	✓	✓	✓	✓	✓		
.10	TLZ-90	4/27/16	13:50	water	SW	✓	✓	✓	✓	✓		

Container Type
Preservative

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Samantha Wright	4/27/16 16:16	John Schoop AAL	4/27/16 16:16
John Schoop AAL	4/27/16 17:46	Richard Scott	4/27/16 17:46

FORM NO: 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L1612813
Client:	Watervision, LLC 454 Court Street Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA PRB- MASHPEE
Project Number:	WV-1009
Report Date:	05/05/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009

Lab Number: L1612813
Report Date: 05/05/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1612813-01	TL-1 DUP	WATER	MASHPEE, MA	04/28/16 09:19	04/28/16
L1612813-02	TL-4	WATER	MASHPEE, MA	04/27/16 16:50	04/28/16
L1612813-03	TL-3	WATER	MASHPEE, MA	04/27/16 17:12	04/28/16
L1612813-04	TLZ-100	WATER	MASHPEE, MA	04/28/16 10:15	04/28/16
L1612813-05	TL-2	WATER	MASHPEE, MA	04/28/16 10:15	04/28/16
L1612813-06	TL-6	WATER	MASHPEE, MA	04/28/16 11:40	04/28/16
L1612813-07	TL-7	WATER	MASHPEE, MA	04/28/16 12:25	04/28/16
L1612813-08	TL-5	WATER	MASHPEE, MA	04/28/16 11:05	04/28/16
L1612813-09	TL-1	WATER	MASHPEE, MA	04/28/16 09:17	04/28/16

Project Name: EPA PRB- MASHPEE **Lab Number:** L1612813
Project Number: WV-1009 **Report Date:** 05/05/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA PRB- MASHPEE **Lab Number:** L1612813
Project Number: WV-1009 **Report Date:** 05/05/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Nitrogen, Nitrate

L1612813-02 and -03: The sample was analyzed for Nitrite within the method required holding time. An aliquot of sample was then preserved and analyzed for Nitrate.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Michelle M. Morris

Title: Technical Director/Representative Date: 05/05/16

METALS

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009
Lab Number: L1612813
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-01
Client ID: TL-1 DUP
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/28/16 09:19
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0034	J	mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 02:24	EPA 3005A	1,6010C	PS
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 02:24	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 02:24	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.104		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 02:24	EPA 3005A	1,6010C	PS

Project Name: EPA PRB- MASHPEE
Lab Number: L1612813
Project Number: WV-1009
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-02
Client ID: TL-4
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 16:50
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0022	J	mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 04:40	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0315		mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 04:40	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 04:40	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0266		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 04:40	EPA 3005A	1,6010C	PS

Project Name: EPA PRB- MASHPEE
Lab Number: L1612813
Project Number: WV-1009
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-03
Client ID: TL-3
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 17:12
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 04:44	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0234	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 04:44	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.10		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 04:44	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0433		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 04:44	EPA 3005A	1,6010C	PS

Project Name: EPA PRB- MASHPEE
Lab Number: L1612813
Project Number: WV-1009
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-04
Client ID: TLZ-100
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/28/16 10:15
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 04:48	EPA 3005A	1,6010C	PS
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 04:48	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.37		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 04:48	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.180		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 04:48	EPA 3005A	1,6010C	PS

Project Name: EPA PRB- MASHPEE
Lab Number: L1612813
Project Number: WV-1009
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-05
Client ID: TL-2
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/28/16 10:15
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 04:52	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0119	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 04:52	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.059		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 04:52	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.135		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 04:52	EPA 3005A	1,6010C	PS

Project Name: EPA PRB- MASHPEE
Lab Number: L1612813
Project Number: WV-1009
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-06
Client ID: TL-6
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/28/16 11:40
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 04:56	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0160	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 04:56	EPA 3005A	1,6010C	PS
Iron, Dissolved	1.0		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 04:56	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0570		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 04:56	EPA 3005A	1,6010C	PS

Project Name: EPA PRB- MASHPEE
Lab Number: L1612813
Project Number: WV-1009
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-07
Client ID: TL-7
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/28/16 12:25
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 05:00	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0149	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 05:00	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 05:00	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0536		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 05:00	EPA 3005A	1,6010C	PS

Project Name: EPA PRB- MASHPEE
Lab Number: L1612813
Project Number: WV-1009
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-08
Client ID: TL-5
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/28/16 11:05
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 05:04	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0131	J	mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 05:04	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.36		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 05:04	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.101		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 05:04	EPA 3005A	1,6010C	PS

Project Name: EPA PRB- MASHPEE
Lab Number: L1612813
Project Number: WV-1009
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-09
Client ID: TL-1
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/28/16 09:17
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 05:07	EPA 3005A	1,6010C	PS
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 05:07	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 05:07	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.114		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 05:07	EPA 3005A	1,6010C	PS

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009
Lab Number: L1612813
Report Date: 05/05/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-09 Batch: WG889935-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/03/16 18:55	05/04/16 01:01	1,6010C	PS
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/03/16 18:55	05/04/16 01:01	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/03/16 18:55	05/04/16 01:01	1,6010C	PS
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	05/03/16 18:55	05/04/16 01:01	1,6010C	PS

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA PRB- MASHPEE

Project Number: WV-1009

Lab Number: L1612813

Report Date: 05/05/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-09 Batch: WG889935-2								
Arsenic, Dissolved	111		-		80-120	-		
Boron, Dissolved	109		-		80-120	-		
Iron, Dissolved	95		-		80-120	-		
Manganese, Dissolved	96		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009

Lab Number: L1612813
Report Date: 05/05/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG889935-4 QC Sample: L1612601-03 Client ID: MS Sample												
Arsenic, Dissolved	ND	0.12	0.124	103		-	-		75-125	-		20
Boron, Dissolved	0.0094J	1	1.07	107		-	-		75-125	-		20
Iron, Dissolved	0.061	1	0.98	92		-	-		75-125	-		20
Manganese, Dissolved	0.0022J	0.5	0.478	96		-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009

Lab Number: L1612813
Report Date: 05/05/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG889935-3 QC Sample: L1612601-03 Client ID: DUP Sample						
Arsenic, Dissolved	ND	0.0038J	mg/l	NC		20
Boron, Dissolved	0.0094J	0.0110J	mg/l	NC		20
Iron, Dissolved	0.061	0.027J	mg/l	NC		20
Manganese, Dissolved	0.0022J	ND	mg/l	NC		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009
Lab Number: L1612813
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-01
Client ID: TL-1 DUP
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/28/16 09:19
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.40		mg CaCO3/L	2.00	NA	1	-	04/29/16 10:53	121,2320B	AW
pH (H)	5.0		SU	-	NA	1	-	04/29/16 02:20	121,4500H+-B	VM
Nitrogen, Ammonia	0.061	J	mg/l	0.075	0.028	1	04/29/16 10:45	05/03/16 00:14	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/29/16 20:56	44,353.2	MR
Nitrogen, Nitrate	0.25		mg/l	0.10	0.019	1	-	04/29/16 20:56	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.25		mg/l	0.10	0.019	1	-	04/29/16 20:56	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	05/03/16 12:12	107,-	JO
Nitrogen, Total Kjeldahl	0.273	J	mg/l	0.300	0.066	1	04/29/16 09:13	05/02/16 22:38	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	04/29/16 06:05	121,4500P-E	TA
Dissolved Organic Carbon	1.0		mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	14.7		mg/l	0.500	0.054	1	-	04/29/16 21:03	44,300.0	AU
Sulfate	12.2		mg/l	1.00	0.150	1	-	04/29/16 21:03	44,300.0	AU

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009
Lab Number: L1612813
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-02
Client ID: TL-4
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 16:50
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	4.00		mg CaCO3/L	2.00	NA	1	-	04/29/16 10:53	121,2320B	AW
pH (H)	5.0		SU	-	NA	1	-	04/29/16 02:20	121,4500H+-B	VM
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/29/16 10:45	05/03/16 00:16	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.020	0.001	1	-	04/28/16 23:17	121,4500NO2-B	MR
Nitrogen, Nitrate	0.66		mg/l	0.10	0.019	1	-	04/29/16 21:14	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.66		mg/l	0.10	0.019	1	-	04/29/16 21:14	44,353.2	MR
Total Nitrogen	0.98		mg/l	0.30	0.30	1	-	05/03/16 12:12	107,-	JO
Nitrogen, Total Kjeldahl	0.324		mg/l	0.300	0.066	1	04/29/16 09:13	05/02/16 22:39	121,4500N-C	AT
Phosphorus, Orthophosphate	0.003	J	mg/l	0.005	0.001	1	-	04/28/16 22:39	121,4500P-E	MR
Dissolved Organic Carbon	1.8		mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.4		mg/l	0.500	0.054	1	-	04/29/16 21:15	44,300.0	AU
Sulfate	8.91		mg/l	1.00	0.150	1	-	04/29/16 21:15	44,300.0	AU

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009
Lab Number: L1612813
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-03
Client ID: TL-3
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/27/16 17:12
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	5.40		mg CaCO3/L	2.00	NA	1	-	04/29/16 10:53	121,2320B	AW
pH (H)	5.0		SU	-	NA	1	-	04/29/16 02:20	121,4500H+-B	VM
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/29/16 10:45	05/03/16 00:17	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.020	0.001	1	-	04/28/16 23:18	121,4500NO2-B	MR
Nitrogen, Nitrate	2.2		mg/l	0.10	0.019	1	-	04/29/16 21:20	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.2		mg/l	0.10	0.019	1	-	04/29/16 21:20	44,353.2	MR
Total Nitrogen	2.2		mg/l	0.30	0.30	1	-	05/03/16 12:12	107,-	JO
Nitrogen, Total Kjeldahl	0.116	J	mg/l	0.300	0.066	1	04/29/16 09:13	05/02/16 22:39	121,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	04/28/16 22:39	121,4500P-E	MR
Dissolved Organic Carbon	0.78	J	mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	24.5		mg/l	0.500	0.054	1	-	04/29/16 21:27	44,300.0	AU
Sulfate	7.48		mg/l	1.00	0.150	1	-	04/29/16 21:27	44,300.0	AU

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009
Lab Number: L1612813
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-04
Client ID: TLZ-100
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/28/16 10:15
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	13.7		mg CaCO3/L	2.00	NA	1	-	04/29/16 10:53	121,2320B	AW
pH (H)	5.4		SU	-	NA	1	-	04/29/16 02:20	121,4500H+-B	VM
Nitrogen, Ammonia	0.047	J	mg/l	0.075	0.028	1	04/29/16 10:45	05/03/16 00:21	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/29/16 20:58	44,353.2	MR
Nitrogen, Nitrate	0.030	J	mg/l	0.10	0.019	1	-	04/29/16 20:58	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.030	J	mg/l	0.10	0.019	1	-	04/29/16 20:58	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	05/03/16 12:12	107,-	JO
Nitrogen, Total Kjeldahl	0.148	J	mg/l	0.300	0.066	1	04/29/16 09:13	05/02/16 22:40	121,4500N-C	AT
Phosphorus, Orthophosphate	0.015		mg/l	0.005	0.001	1	-	04/29/16 06:06	121,4500P-E	TA
Dissolved Organic Carbon	0.90	J	mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	13.2		mg/l	0.500	0.054	1	-	04/29/16 21:39	44,300.0	AU
Sulfate	15.9		mg/l	1.00	0.150	1	-	04/29/16 21:39	44,300.0	AU

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009
Lab Number: L1612813
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-05
Client ID: TL-2
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/28/16 10:15
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.50		mg CaCO3/L	2.00	NA	1	-	04/29/16 10:53	121,2320B	AW
pH (H)	4.8		SU	-	NA	1	-	04/29/16 02:20	121,4500H+-B	VM
Nitrogen, Ammonia	0.048	J	mg/l	0.075	0.028	1	04/29/16 10:45	05/03/16 00:22	44,350.1	AT
Nitrogen, Nitrite	0.035	J	mg/l	0.050	0.010	1	-	04/29/16 21:08	44,353.2	MR
Nitrogen, Nitrate	0.29		mg/l	0.10	0.019	1	-	04/29/16 21:08	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.29		mg/l	0.10	0.019	1	-	04/29/16 21:08	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	05/03/16 12:12	107,-	JO
Nitrogen, Total Kjeldahl	0.295	J	mg/l	0.300	0.066	1	04/29/16 09:13	05/02/16 22:43	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	04/29/16 06:06	121,4500P-E	TA
Dissolved Organic Carbon	1.1		mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	17.4		mg/l	0.500	0.054	1	-	04/30/16 00:39	44,300.0	AU
Sulfate	7.36		mg/l	1.00	0.150	1	-	04/30/16 00:39	44,300.0	AU

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009
Lab Number: L1612813
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-06
Client ID: TL-6
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/28/16 11:40
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.00		mg CaCO3/L	2.00	NA	1	-	04/29/16 10:53	121,2320B	AW
pH (H)	4.7		SU	-	NA	1	-	04/29/16 02:20	121,4500H+-B	VM
Nitrogen, Ammonia	0.029	J	mg/l	0.075	0.028	1	04/29/16 10:45	05/03/16 00:22	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/29/16 21:09	44,353.2	MR
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	04/29/16 21:09	44,353.2	MR
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	04/29/16 21:09	44,353.2	MR
Total Nitrogen	0.34		mg/l	0.30	0.30	1	-	05/03/16 12:12	107,-	JO
Nitrogen, Total Kjeldahl	0.340		mg/l	0.300	0.066	1	04/29/16 09:13	05/02/16 22:44	121,4500N-C	AT
Phosphorus, Orthophosphate	0.010		mg/l	0.005	0.001	1	-	04/29/16 06:07	121,4500P-E	TA
Dissolved Organic Carbon	3.7		mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	11.9		mg/l	0.500	0.054	1	-	04/30/16 00:51	44,300.0	AU
Sulfate	4.15		mg/l	1.00	0.150	1	-	04/30/16 00:51	44,300.0	AU

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009
Lab Number: L1612813
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-07
Client ID: TL-7
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/28/16 12:25
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.40		mg CaCO3/L	2.00	NA	1	-	04/29/16 10:53	121,2320B	AW
pH (H)	4.7		SU	-	NA	1	-	04/29/16 02:20	121,4500H+-B	VM
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/29/16 10:45	05/03/16 00:23	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/29/16 21:11	44,353.2	MR
Nitrogen, Nitrate	0.73		mg/l	0.10	0.019	1	-	04/29/16 21:11	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.73		mg/l	0.10	0.019	1	-	04/29/16 21:11	44,353.2	MR
Total Nitrogen	0.73		mg/l	0.30	0.30	1	-	05/03/16 12:12	107,-	JO
Nitrogen, Total Kjeldahl	0.192	J	mg/l	0.300	0.066	1	04/29/16 09:13	05/02/16 22:47	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	04/29/16 06:07	121,4500P-E	TA
Dissolved Organic Carbon	1.1		mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	25.0		mg/l	0.500	0.054	1	-	04/30/16 01:03	44,300.0	AU
Sulfate	10.4		mg/l	1.00	0.150	1	-	04/30/16 01:03	44,300.0	AU

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009
Lab Number: L1612813
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-08
Client ID: TL-5
Sample Location: MASHPEE, MA
Matrix: Water

Date Collected: 04/28/16 11:05
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.40		mg CaCO3/L	2.00	NA	1	-	04/29/16 10:53	121,2320B	AW
pH (H)	4.5		SU	-	NA	1	-	04/29/16 02:20	121,4500H+-B	VM
Nitrogen, Ammonia	0.138		mg/l	0.075	0.028	1	04/29/16 10:45	05/03/16 00:24	44,350.1	AT
Nitrogen, Nitrite	0.012	J	mg/l	0.050	0.010	1	-	04/29/16 21:12	44,353.2	MR
Nitrogen, Nitrate	0.98		mg/l	0.10	0.019	1	-	04/29/16 21:12	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.98		mg/l	0.10	0.019	1	-	04/29/16 21:12	44,353.2	MR
Total Nitrogen	2.2		mg/l	0.30	0.30	1	-	05/03/16 12:12	107,-	JO
Nitrogen, Total Kjeldahl	1.19		mg/l	0.300	0.066	1	04/29/16 09:13	05/02/16 22:48	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	04/29/16 06:07	121,4500P-E	TA
Dissolved Organic Carbon	1.2		mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	20.3		mg/l	0.500	0.054	1	-	04/30/16 01:15	44,300.0	AU
Sulfate	10.5		mg/l	1.00	0.150	1	-	04/30/16 01:15	44,300.0	AU

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009
Lab Number: L1612813
Report Date: 05/05/16

SAMPLE RESULTS

Lab ID: L1612813-09
Client ID: TL-1
Sample Location: MASHPEE, MA
Matrix: Water
Date Collected: 04/28/16 09:17
Date Received: 04/28/16
Field Prep: Field Filtered (Metals and DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.80		mg CaCO3/L	2.00	NA	1	-	04/29/16 10:53	121,2320B	AW
pH (H)	4.8		SU	-	NA	1	-	04/29/16 02:20	121,4500H+-B	VM
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/29/16 10:45	05/03/16 00:25	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/29/16 21:13	44,353.2	MR
Nitrogen, Nitrate	0.25		mg/l	0.10	0.019	1	-	04/29/16 21:13	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.25		mg/l	0.10	0.019	1	-	04/29/16 21:13	44,353.2	MR
Total Nitrogen	0.83		mg/l	0.30	0.30	1	-	05/03/16 12:12	107,-	JO
Nitrogen, Total Kjeldahl	0.578		mg/l	0.300	0.066	1	04/29/16 09:13	05/02/16 22:49	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	04/29/16 06:08	121,4500P-E	TA
Dissolved Organic Carbon	1.4		mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	14.5		mg/l	0.500	0.054	1	-	04/30/16 01:27	44,300.0	AU
Sulfate	11.7		mg/l	1.00	0.150	1	-	04/30/16 01:27	44,300.0	AU

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009
Lab Number: L1612813
Report Date: 05/05/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 02-03 Batch: WG888526-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	04/28/16 22:16	121,4500P-E	MR
General Chemistry - Westborough Lab for sample(s): 01,04-09 Batch: WG888602-1										
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	04/29/16 06:05	121,4500P-E	TA
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG888630-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/29/16 10:45	05/02/16 23:58	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG888633-1										
Nitrogen, Total Kjeldahl	0.178	J	mg/l	0.300	0.022	1	04/29/16 09:13	05/02/16 22:27	121,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG888744-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	04/29/16 10:53	121,2320B	AW
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG888919-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	04/29/16 20:06	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01,04-09 Batch: WG888920-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/29/16 20:12	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG888921-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	04/29/16 20:06	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 02-03 Batch: WG889114-1										
Nitrogen, Nitrite	ND		mg/l	0.020	0.001	1	-	04/28/16 23:17	121,4500NO2-B	MR
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-09 Batch: WG889621-1										
Chloride	ND		mg/l	0.500	0.054	1	-	04/29/16 22:27	44,300.0	AU
Sulfate	ND		mg/l	1.00	0.150	1	-	04/29/16 22:27	44,300.0	AU
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG890192-1										
Dissolved Organic Carbon	0.14	J	mg/l	1.0	0.12	1	05/04/16 08:41	05/04/16 08:41	121,5310C	DW

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009

Lab Number: L1612813
Report Date: 05/05/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 02-03 Batch: WG888526-2								
Phosphorus, Orthophosphate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG888568-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01,04-09 Batch: WG888602-2								
Phosphorus, Orthophosphate	91		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG888630-2								
Nitrogen, Ammonia	99		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG888633-2								
Nitrogen, Total Kjeldahl	92		-		78-122	-		
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG888744-2								
Alkalinity, Total	103		-		90-110	-		10
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG888919-2								
Nitrogen, Nitrate	96		-		90-110	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA PRB- MASHPEE

Project Number: WV-1009

Lab Number: L1612813

Report Date: 05/05/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01,04-09 Batch: WG888920-2					
Nitrogen, Nitrite	102	-	90-110	-	20
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG888921-2					
Nitrogen, Nitrate/Nitrite	96	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 02-03 Batch: WG889114-2					
Nitrogen, Nitrite	94	-	90-110	-	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-09 Batch: WG889621-2					
Chloride	101	-	90-110	-	
Sulfate	97	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG890192-2					
Dissolved Organic Carbon	106	-	90-110	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009

Lab Number: L1612813
Report Date: 05/05/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 02-03 QC Batch ID: WG888526-4 QC Sample: L1612601-01 Client ID: MS Sample												
Phosphorus, Orthophosphate	0.012	0.5	0.420	82		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01,04-09 QC Batch ID: WG888602-4 QC Sample: L1612813-01 Client ID: TL-1 DUP												
Phosphorus, Orthophosphate	0.005	0.5	0.477	94		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG888630-4 QC Sample: L1612813-01 Client ID: TL-1 DUP												
Nitrogen, Ammonia	0.061J	4	3.60	90		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG888633-4 QC Sample: L1612813-04 Client ID: TLZ-100												
Nitrogen, Total Kjeldahl	0.148J	8	7.29	91		-	-		77-111	-		24
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG888744-4 QC Sample: L1612813-02 Client ID: TL-4												
Alkalinity, Total	4.00	100	107	103		-	-		86-116	-		10
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG888919-4 QC Sample: L1612813-04 Client ID: TLZ-100												
Nitrogen, Nitrate	0.030J	4	3.7	92		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01,04-09 QC Batch ID: WG888920-4 QC Sample: L1612813-04 Client ID: TLZ-100												
Nitrogen, Nitrite	ND	4	4.0	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG888921-4 QC Sample: L1612813-04 Client ID: TLZ-100												
Nitrogen, Nitrate/Nitrite	0.030J	4	3.7	92		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 02-03 QC Batch ID: WG889114-4 QC Sample: L1612813-03 Client ID: TL-3												
Nitrogen, Nitrite	ND	0.1	0.100	100		-	-		85-115	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009

Lab Number: L1612813
Report Date: 05/05/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG889621-3 QC Sample: L1612813-01 Client ID: TL-1 DUP									
Chloride	14.7	4	18.2	87	-	-	40-151	-	18
Sulfate	12.2	8	20.4	102	-	-	60-140	-	20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG890192-4 QC Sample: L1612601-02 Client ID: MS Sample									
Dissolved Organic Carbon	1.1	4	5.8	117	-	-	80-120	-	20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009

Lab Number: L1612813
Report Date: 05/05/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 02-03 QC Batch ID: WG888526-3 QC Sample: L1612601-02 Client ID: DUP Sample						
Phosphorus, Orthophosphate	0.013	0.012	mg/l	8		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG888568-2 QC Sample: L1612813-01 Client ID: TL-1 DUP						
pH (H)	5.0	4.8	SU	4		5
General Chemistry - Westborough Lab Associated sample(s): 01,04-09 QC Batch ID: WG888602-3 QC Sample: L1612813-01 Client ID: TL-1 DUP						
Phosphorus, Orthophosphate	0.005	0.005	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG888630-3 QC Sample: L1612813-01 Client ID: TL-1 DUP						
Nitrogen, Ammonia	0.061J	0.043J	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG888633-3 QC Sample: L1612813-04 Client ID: TLZ-100						
Nitrogen, Total Kjeldahl	0.148J	0.174J	mg/l	NC		24
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG888744-3 QC Sample: L1612813-02 Client ID: TL-4						
Alkalinity, Total	4.00	3.90	mg CaCO3/L	3		10
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG888919-3 QC Sample: L1612813-04 Client ID: TLZ-100						
Nitrogen, Nitrate	0.030J	0.028J	mg/l	NC		6
General Chemistry - Westborough Lab Associated sample(s): 01,04-09 QC Batch ID: WG888920-3 QC Sample: L1612813-04 Client ID: TLZ-100						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG888921-3 QC Sample: L1612813-04 Client ID: TLZ-100						
Nitrogen, Nitrate/Nitrite	0.030J	0.028J	mg/l	NC		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009

Lab Number: L1612813
Report Date: 05/05/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 02-03 QC Batch ID: WG889114-3 QC Sample: L1612813-02 Client ID: TL-4					
Nitrogen, Nitrite	ND	ND	mg/l	NC	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG889621-4 QC Sample: L1612813-01 Client ID: TL-1 DUP					
Chloride	14.7	14.7	mg/l	0	18
Sulfate	12.2	12.3	mg/l	1	20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG890192-3 QC Sample: L1612601-01 Client ID: DUP Sample					
Dissolved Organic Carbon	1.8	1.8	mg/l	0	20

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009

Lab Number: L1612813
Report Date: 05/05/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1612813-01A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-01B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-01C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612813-01D	Plastic 500ml unpreserved	A	8	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612813-01E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612813-01F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1612813-02A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-02B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-02C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612813-02D	Plastic 500ml unpreserved	A	8	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-4500NO2(2),NO3-353(2),PH-4500(.01)
L1612813-02E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612813-02F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1612813-03A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-03B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-03C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612813-03D	Plastic 500ml unpreserved	A	8	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-4500NO2(2),NO3-353(2),PH-4500(.01)
L1612813-03E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612813-03F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1612813-04A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-04B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-04C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009

Lab Number: L1612813
Report Date: 05/05/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1612813-04D	Plastic 500ml unpreserved	A	8	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612813-04E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612813-04F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1612813-05A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-05B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-05C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612813-05D	Plastic 500ml unpreserved	A	8	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612813-05E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612813-05F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1612813-06A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-06B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-06C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612813-06D	Plastic 500ml unpreserved	A	8	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612813-06E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612813-06F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1612813-07A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-07B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-07C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612813-07D	Plastic 500ml unpreserved	A	8	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612813-07E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612813-07F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1612813-08A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-08B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-08C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612813-08D	Plastic 500ml unpreserved	A	8	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)

*Values in parentheses indicate holding time in days

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009

Lab Number: L1612813
Report Date: 05/05/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1612813-08E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612813-08F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1612813-09A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-09B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1612813-09C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1612813-09D	Plastic 500ml unpreserved	A	8	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1612813-09E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1612813-09F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name:	EPA PRB- MASHPEE	**Lab Number:**	L1612813
Project Number:	WV-1009	**Report Date:**	05/05/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA PRB- MASHPEE	**Lab Number:**	L1612813
Project Number:	WV-1009	**Report Date:**	05/05/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name: EPA PRB- MASHPEE
Project Number: WV-1009
Lab Number: L1612813
Report Date: 05/05/16

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE _____ OF _____

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Date Rec'd in Lab: 4/28/16

ALPHA Job #: L1612813

Client Information

Client: WATERVISION LLC
Address: 491 GROAT RD
ACTON MA
Phone: 603-498-2916
Email: ~~dannat@~~ dtruslow@watervisionllc.com
Additional Project Information:

Project Information

Project Name: GRA PRD - Mashpee
Project Location: Mashpee, MA
Project #: WV-1009
Project Manager: Danna Truslow
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2
SVOC: ☐ ABN ☐ PAH
METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15
METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13
EPH: ☐ Ranges & Targets ☐ Ranges Only
VPH: ☐ Ranges & Targets ☐ Ranges Only
☐ PCB ☐ PEST
TPH: ☐ Quant Only ☐ Fingerprint
DOC
Dissolved Fe, Mn, As, B
pH, Cl, SO4, NO3, NO2, PO4
Total Alk
Total N; NH3-N

SAMPLE INFO

Filtration
☒ Field ☒
☐ Lab to do
Preservation
☐ Lab to do

Sample Comments

TOTAL # BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	TOTAL # BOTTLES
12813-01	TL-1 dup	4-28-16	9:19	water	SW	25
02	TL-4	4-27-16	16:50	water	SW	25
03	TL-3	4-27-16	17:12	"	SW	25
04	TL2-100	4-28-16	10:15	"	DT	25
05	TL-2	4-28-16	10:15	"	SW	25
06	TL-6	4-28-16	11:40	"	SW	25
07	TL-7	4-28-16	12:25	"	DT	25
08	TL-5	4-28-16	11:05	"	SW	25
09	TL-1	4-28-16	9:17	"	SW	25

Container Type	
Container Type	
Preservative	

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
	4/29/16 16:27		4/29/16 16:27

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L1608272
Client:	Watervision, LLC 454 Court Stree Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA-PRB
Project Number:	WV-1009
Report Date:	03/29/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1608272-01	SFZ-25	WATER	FALMOUTH-SAILFISH	03/22/16 14:30	03/22/16
L1608272-02	SFZ-30	WATER	FALMOUTH-SAILFISH	03/22/16 14:45	03/22/16
L1608272-03	SFZ-48	WATER	FALMOUTH-SAILFISH	03/22/16 13:25	03/22/16
L1608272-04	SFZ-24	WATER	FALMOUTH-SAILFISH	03/22/16 14:25	03/22/16
L1608272-05	SFZ-67	WATER	FALMOUTH-SAILFISH	03/22/16 11:10	03/22/16
L1608272-06	SFZ-42	WATER	FALMOUTH-SAILFISH	03/22/16 12:25	03/22/16
L1608272-07	SFZ-77	WATER	FALMOUTH-SAILFISH	03/22/16 11:20	03/22/16
L1608272-08	SFZ-36	WATER	FALMOUTH-SAILFISH	03/22/16 13:35	03/22/16
L1608272-09	SFZ-54	WATER	FALMOUTH-SAILFISH	03/22/16 12:45	03/22/16
L1608272-10	SFZ-19	WATER	FALMOUTH-SAILFISH	03/22/16 15:45	03/22/16

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608272
Report Date: 03/29/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Dissolved Metals

The WG877602-4 MS recovery, performed on L1608272-01, is outside the acceptance criteria for arsenic (139%). A post digestion spike was performed and was within acceptance criteria.

Nitrogen, Total Kjeldahl

L1608272-01 and -04: The sample has an elevated detection limit due to the dilution required by the sample matrix.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

The WG877115-3 MS recovery (124%), performed on L1608272-07, is outside the acceptance criteria; however, the associated LCS recovery is within overall method allowances. No further action was required.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Kelly Stenstrom

Title: Technical Director/Representative Date: 03/29/16

METALS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-01
Client ID: SFZ-25
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/22/16 14:30
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0037	J	mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 15:54	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0328		mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 15:54	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 15:54	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.321		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 15:54	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-02
Client ID: SFZ-30
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/22/16 14:45
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 16:10	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0425		mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 16:10	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.12		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 16:10	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.108		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 16:10	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-03
Client ID: SFZ-48
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/22/16 13:25
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 16:15	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0174	J	mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 16:15	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.28		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 16:15	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.146		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 16:15	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-04
Client ID: SFZ-24
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/22/16 14:25
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0021	J	mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 16:19	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0310		mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 16:19	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 16:19	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.317		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 16:19	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-05
Client ID: SFZ-67
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/22/16 11:10
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 16:41	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0200	J	mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 16:41	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.11		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 16:41	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0281		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 16:41	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-06
Client ID: SFZ-42
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/22/16 12:25
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 16:45	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0419		mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 16:45	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.021	J	mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 16:45	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0189		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 16:45	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-07
Client ID: SFZ-77
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/22/16 11:20
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 16:50	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0209	J	mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 16:50	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 16:50	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0252		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 16:50	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-08
Client ID: SFZ-36
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/22/16 13:35
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 16:54	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0417		mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 16:54	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 16:54	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0338		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 16:54	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-09
Client ID: SFZ-54
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/22/16 12:45
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 16:58	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0165	J	mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 16:58	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.27		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 16:58	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0224		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 16:58	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-10
Client ID: SFZ-19
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/22/16 15:45
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 17:07	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0150	J	mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 17:07	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 17:07	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0237		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 17:07	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-10 Batch: WG877602-1										
Arsenic, Dissolved	0.0020	J	mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 16:37	1,6010C	PS
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 16:37	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 16:37	1,6010C	PS
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 16:37	1,6010C	PS

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-10 Batch: WG877602-2								
Arsenic, Dissolved	110		-		80-120	-		
Boron, Dissolved	109		-		80-120	-		
Iron, Dissolved	94		-		80-120	-		
Manganese, Dissolved	103		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG877602-4 QC Sample: L1608272-01 Client ID: SFZ-25												
Arsenic, Dissolved	0.0037J	0.12	0.167	**139**	Q	-	-		75-125	-		20
Boron, Dissolved	0.0328	1	1.27	124		-	-		75-125	-		20
Iron, Dissolved	ND	1	1.2	120		-	-		75-125	-		20
Manganese, Dissolved	0.321	0.5	0.940	124		-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG877602-3 QC Sample: L1608272-01 Client ID: SFZ-25						
Arsenic, Dissolved	0.0037J	0.0039J	mg/l	NC		20
Boron, Dissolved	0.0328	0.0308	mg/l	6		20
Iron, Dissolved	ND	0.020J	mg/l	NC		20
Manganese, Dissolved	0.321	0.319	mg/l	1		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-01
Client ID: SFZ-25
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/22/16 14:30
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.60		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	4.8		SU	-	NA	1	-	03/22/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	0.030	J	mg/l	0.075	0.021	1	03/23/16 21:00	03/25/16 00:00	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/22/16 23:00	44,353.2	MR
Nitrogen, Nitrate	8.9		mg/l	0.50	0.094	5	-	03/22/16 23:24	44,353.2	MR
Nitrogen, Nitrate/Nitrite	8.9		mg/l	0.50	0.094	5	-	03/22/16 23:24	44,353.2	MR
Total Nitrogen	8.9		mg/l	0.60	0.60	2	-	03/28/16 12:44	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.600	0.186	2	03/24/16 09:25	03/24/16 23:23	121,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	03/24/16 01:40	121,4500P-E	LH
Dissolved Organic Carbon	0.79	J	mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.8		mg/l	0.500	0.054	1	-	03/24/16 16:56	44,300.0	AU
Sulfate	12.2		mg/l	1.00	0.051	1	-	03/24/16 16:56	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-02
Client ID: SFZ-30
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/22/16 14:45
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	6.40		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	5.5		SU	-	NA	1	-	03/22/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	0.035	J	mg/l	0.075	0.021	1	03/23/16 21:00	03/25/16 00:03	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/22/16 23:01	44,353.2	MR
Nitrogen, Nitrate	4.3		mg/l	0.10	0.019	1	-	03/22/16 23:26	44,353.2	MR
Nitrogen, Nitrate/Nitrite	4.3		mg/l	0.10	0.019	1	-	03/22/16 23:26	44,353.2	MR
Total Nitrogen	4.3		mg/l	0.30	0.30	1	-	03/28/16 12:44	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/24/16 09:25	03/24/16 23:24	121,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	03/24/16 01:40	121,4500P-E	LH
Dissolved Organic Carbon	0.58	J	mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.0		mg/l	0.500	0.054	1	-	03/24/16 17:08	44,300.0	AU
Sulfate	9.81		mg/l	1.00	0.051	1	-	03/24/16 17:08	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-03
Client ID: SFZ-48
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/22/16 13:25
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	6.10		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	5.5		SU	-	NA	1	-	03/22/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	0.031	J	mg/l	0.075	0.021	1	03/23/16 21:00	03/25/16 00:04	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/22/16 23:02	44,353.2	MR
Nitrogen, Nitrate	1.7		mg/l	0.10	0.019	1	-	03/22/16 23:02	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.7		mg/l	0.10	0.019	1	-	03/22/16 23:02	44,353.2	MR
Total Nitrogen	1.7		mg/l	0.30	0.30	1	-	03/28/16 12:44	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/24/16 09:25	03/24/16 23:25	121,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/24/16 01:40	121,4500P-E	LH
Dissolved Organic Carbon	0.68	J	mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	43.0		mg/l	0.500	0.054	1	-	03/24/16 17:20	44,300.0	AU
Sulfate	9.57		mg/l	1.00	0.051	1	-	03/24/16 17:20	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-04
Client ID: SFZ-24
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/22/16 14:25
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.60		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	4.7		SU	-	NA	1	-	03/22/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	0.023	J	mg/l	0.075	0.021	1	03/23/16 21:00	03/25/16 00:04	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/22/16 23:13	44,353.2	MR
Nitrogen, Nitrate	8.9		mg/l	0.50	0.094	5	-	03/22/16 23:32	44,353.2	MR
Nitrogen, Nitrate/Nitrite	8.9		mg/l	0.50	0.094	5	-	03/22/16 23:32	44,353.2	MR
Total Nitrogen	8.9		mg/l	0.60	0.60	2	-	03/28/16 12:44	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.600	0.186	2	03/24/16 09:25	03/24/16 23:25	121,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	03/24/16 01:41	121,4500P-E	LH
Dissolved Organic Carbon	0.76	J	mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.8		mg/l	0.500	0.054	1	-	03/24/16 17:32	44,300.0	AU
Sulfate	12.3		mg/l	1.00	0.051	1	-	03/24/16 17:32	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-05
Client ID: SFZ-67
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/22/16 11:10
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	7.90		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	5.7		SU	-	NA	1	-	03/22/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	0.026	J	mg/l	0.075	0.021	1	03/23/16 21:00	03/25/16 00:05	44,350.1	AT
Nitrogen, Nitrite	0.012	J	mg/l	0.050	0.010	1	-	03/22/16 23:14	44,353.2	MR
Nitrogen, Nitrate	2.9		mg/l	0.10	0.019	1	-	03/22/16 23:34	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.9		mg/l	0.10	0.019	1	-	03/22/16 23:34	44,353.2	MR
Total Nitrogen	2.9		mg/l	0.30	0.30	1	-	03/28/16 12:44	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/24/16 09:25	03/24/16 23:29	121,4500N-C	AT
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	03/24/16 01:41	121,4500P-E	LH
Dissolved Organic Carbon	0.50	J	mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	17.5		mg/l	0.500	0.054	1	-	03/24/16 17:44	44,300.0	AU
Sulfate	11.5		mg/l	1.00	0.051	1	-	03/24/16 17:44	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-06
Client ID: SFZ-42
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/22/16 12:25
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.30		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	5.5		SU	-	NA	1	-	03/22/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/23/16 21:00	03/25/16 00:06	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/22/16 23:15	44,353.2	MR
Nitrogen, Nitrate	3.0		mg/l	0.10	0.019	1	-	03/22/16 23:15	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.0		mg/l	0.10	0.019	1	-	03/22/16 23:15	44,353.2	MR
Total Nitrogen	3.0		mg/l	0.30	0.30	1	-	03/28/16 12:44	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/24/16 09:25	03/24/16 23:31	121,4500N-C	AT
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	03/24/16 01:42	121,4500P-E	LH
Dissolved Organic Carbon	0.61	J	mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	31.0		mg/l	0.500	0.054	1	-	03/24/16 17:56	44,300.0	AU
Sulfate	13.9		mg/l	1.00	0.051	1	-	03/24/16 17:56	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-07
Client ID: SFZ-77
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/22/16 11:20
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	86.4		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	7.8		SU	-	NA	1	-	03/22/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	0.072	J	mg/l	0.075	0.021	1	03/23/16 21:00	03/25/16 00:07	44,350.1	AT
Nitrogen, Nitrite	0.014	J	mg/l	0.050	0.010	1	-	03/22/16 23:16	44,353.2	MR
Nitrogen, Nitrate	1.7		mg/l	0.10	0.019	1	-	03/22/16 23:16	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.7		mg/l	0.10	0.019	1	-	03/22/16 23:16	44,353.2	MR
Total Nitrogen	1.7		mg/l	0.30	0.30	1	-	03/28/16 12:44	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/24/16 09:25	03/24/16 23:32	121,4500N-C	AT
Phosphorus, Orthophosphate	0.034		mg/l	0.005	0.001	1	-	03/24/16 01:42	121,4500P-E	LH
Dissolved Organic Carbon	0.66	J	mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	15.8		mg/l	0.500	0.054	1	-	03/24/16 18:08	44,300.0	AU
Sulfate	15.5		mg/l	1.00	0.051	1	-	03/24/16 18:08	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-08
Client ID: SFZ-36
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/22/16 13:35
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	4.80		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	5.5		SU	-	NA	1	-	03/22/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/23/16 21:00	03/25/16 00:08	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/22/16 23:18	44,353.2	MR
Nitrogen, Nitrate	2.4		mg/l	0.10	0.019	1	-	03/22/16 23:18	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.4		mg/l	0.10	0.019	1	-	03/22/16 23:18	44,353.2	MR
Total Nitrogen	2.4		mg/l	0.30	0.30	1	-	03/28/16 12:44	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/24/16 09:25	03/24/16 23:33	121,4500N-C	AT
Phosphorus, Orthophosphate	0.007		mg/l	0.005	0.001	1	-	03/24/16 01:42	121,4500P-E	LH
Dissolved Organic Carbon	0.84	J	mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	26.5		mg/l	0.500	0.054	1	-	03/24/16 18:56	44,300.0	AU
Sulfate	10.2		mg/l	1.00	0.051	1	-	03/24/16 18:56	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-09
Client ID: SFZ-54
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/22/16 12:45
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	7.50		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	5.7		SU	-	NA	1	-	03/22/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	0.025	J	mg/l	0.075	0.021	1	03/23/16 21:00	03/25/16 00:11	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/22/16 23:19	44,353.2	MR
Nitrogen, Nitrate	2.6		mg/l	0.10	0.019	1	-	03/22/16 23:19	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.6		mg/l	0.10	0.019	1	-	03/22/16 23:19	44,353.2	MR
Total Nitrogen	2.6		mg/l	0.30	0.30	1	-	03/28/16 12:44	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/24/16 09:25	03/24/16 23:34	121,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	03/24/16 01:43	121,4500P-E	LH
Dissolved Organic Carbon	0.60	J	mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	28.1		mg/l	0.500	0.054	1	-	03/24/16 19:08	44,300.0	AU
Sulfate	9.94		mg/l	1.00	0.051	1	-	03/24/16 19:08	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608272-10
Client ID: SFZ-19
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/22/16 15:45
Date Received: 03/22/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	5.30		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	5.4		SU	-	NA	1	-	03/22/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/23/16 21:00	03/25/16 00:12	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/22/16 23:20	44,353.2	MR
Nitrogen, Nitrate	0.72		mg/l	0.10	0.019	1	-	03/22/16 23:20	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.72		mg/l	0.10	0.019	1	-	03/22/16 23:20	44,353.2	MR
Total Nitrogen	0.72		mg/l	0.30	0.30	1	-	03/28/16 12:44	107,-	JO
Nitrogen, Total Kjeldahl	0.102	J	mg/l	0.300	0.093	1	03/24/16 09:25	03/24/16 23:35	121,4500N-C	AT
Phosphorus, Orthophosphate	0.041		mg/l	0.005	0.001	1	-	03/24/16 01:44	121,4500P-E	LH
Dissolved Organic Carbon	1.3		mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	20.2		mg/l	0.500	0.054	1	-	03/24/16 19:20	44,300.0	AU
Sulfate	9.31		mg/l	1.00	0.051	1	-	03/24/16 19:20	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG876364-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	03/22/16 22:30	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG876365-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	03/22/16 22:30	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG876366-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/22/16 22:32	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG876738-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/23/16 21:00	03/24/16 23:49	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG876800-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	03/24/16 01:39	121,4500P-E	LH
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG876947-1										
Nitrogen, Total Kjeldahl	0.093	J	mg/l	0.300	0.031	1	03/24/16 09:25	03/24/16 23:18	121,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG877115-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-10 Batch: WG877718-1										
Chloride	ND		mg/l	0.500	0.054	1	-	03/24/16 16:32	44,300.0	AU
Sulfate	0.121	J	mg/l	1.00	0.051	1	-	03/24/16 16:32	44,300.0	AU
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG877770-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG876364-2								
Nitrogen, Nitrate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG876365-2								
Nitrogen, Nitrate/Nitrite	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG876366-2								
Nitrogen, Nitrite	100		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG876400-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG876738-2								
Nitrogen, Ammonia	96		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG876800-2								
Phosphorus, Orthophosphate	102		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG876947-2								
Nitrogen, Total Kjeldahl	99		-		78-122	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG877115-2					
Dissolved Organic Carbon	100	-	90-110	-	
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-10 Batch: WG877718-2					
Chloride	105	-	90-110	-	
Sulfate	101	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG877770-3					
Alkalinity, Total	104	-	90-110	-	10

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG876364-4 QC Sample: L1608272-03 Client ID: SFZ-48												
Nitrogen, Nitrate	1.7	4	5.7	100		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG876365-4 QC Sample: L1608272-03 Client ID: SFZ-48												
Nitrogen, Nitrate/Nitrite	1.7	4	5.7	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG876366-4 QC Sample: L1608272-03 Client ID: SFZ-48												
Nitrogen, Nitrite	ND	4	4.2	105		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG876738-4 QC Sample: L1608272-01 Client ID: SFZ-25												
Nitrogen, Ammonia	0.030J	4	3.76	94		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG876800-4 QC Sample: L1608411-08 Client ID: MS Sample												
Phosphorus, Orthophosphate	0.005	0.5	0.500	99		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG876947-4 QC Sample: L1608272-05 Client ID: SFZ-67												
Nitrogen, Total Kjeldahl	ND	8	6.69	84		-	-		77-111	-		24
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG877115-3 QC Sample: L1608272-07 Client ID: SFZ-77												
Dissolved Organic Carbon	0.66J	4	5.0	**124**	Q	-	-		80-120	-		20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG877718-3 QC Sample: L1608272-02 Client ID: SFZ-30												
Chloride	19.0	4	22.4	86		-	-		40-151	-		18
Sulfate	9.81	8	17.5	96		-	-		60-140	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG877770-4 QC Sample: L1608272-01 Client ID: SFZ-25												
Alkalinity, Total	2.60	100	99.0	96		-	-		86-116	-		10

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG876364-3 QC Sample: L1608272-03 Client ID: SFZ-48						
Nitrogen, Nitrate	1.7	1.7	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG876365-3 QC Sample: L1608272-03 Client ID: SFZ-48						
Nitrogen, Nitrate/Nitrite	1.7	1.7	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG876366-3 QC Sample: L1608272-03 Client ID: SFZ-48						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG876400-2 QC Sample: L1608177-01 Client ID: DUP Sample						
pH	7.4	7.4	SU	0		5
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG876738-3 QC Sample: L1608272-01 Client ID: SFZ-25						
Nitrogen, Ammonia	0.030J	0.034J	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG876800-3 QC Sample: L1608411-01 Client ID: DUP Sample						
Phosphorus, Orthophosphate	0.002J	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG876947-3 QC Sample: L1608272-05 Client ID: SFZ-67						
Nitrogen, Total Kjeldahl	ND	ND	mg/l	NC		24
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG877115-4 QC Sample: L1608272-06 Client ID: SFZ-42						
Dissolved Organic Carbon	0.61J	0.58J	mg/l	NC		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG877718-4 QC Sample: L1608272-02 Client ID: SFZ-30					
Chloride	19.0	18.8	mg/l	1	18
Sulfate	9.81	9.02	mg/l	8	20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG877770-2 QC Sample: L1608272-01 Client ID: SFZ-25					
Alkalinity, Total	2.60	2.60	mg CaCO3/L	0	10

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent
B	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1608272-01A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-01B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-01C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608272-01D	Plastic 500ml unpreserved	B	7	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608272-01E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608272-01F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)
L1608272-02A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-02B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-02C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608272-02D	Plastic 500ml unpreserved	B	7	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608272-02E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608272-02F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)
L1608272-03A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-03B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-03C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608272-03D	Plastic 500ml unpreserved	B	7	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608272-03E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608272-03F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)
L1608272-04A	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608272-04B	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608272-04C	Plastic 250ml HNO3 preserved	A	<2	3.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1608272-04D	Plastic 500ml unpreserved	A	7	3.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608272-04E	Plastic 500ml H2SO4 preserved	A	<2	3.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608272-04F	Plastic 250ml unpreserved w/No H	A	N/A	3.1	Y	Absent	ALK-T-2320(14)
L1608272-05A	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608272-05B	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608272-05C	Plastic 250ml HNO3 preserved	A	<2	3.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608272-05D	Plastic 500ml unpreserved	A	7	3.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608272-05E	Plastic 500ml H2SO4 preserved	A	<2	3.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608272-05F	Plastic 250ml unpreserved w/No H	A	N/A	3.1	Y	Absent	ALK-T-2320(14)
L1608272-06A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-06B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-06C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608272-06D	Plastic 500ml unpreserved	B	7	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608272-06E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608272-06F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)
L1608272-07A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-07B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-07C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608272-07D	Plastic 500ml unpreserved	B	7	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608272-07E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608272-07F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)
L1608272-08A	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608272-08B	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608272-08C	Plastic 250ml HNO3 preserved	A	<2	3.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608272-08D	Plastic 500ml unpreserved	A	7	3.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608272
Report Date: 03/29/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1608272-08E	Plastic 500ml H2SO4 preserved	A	<2	3.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608272-08F	Plastic 250ml unpreserved w/No H	A	N/A	3.1	Y	Absent	ALK-T-2320(14)
L1608272-09A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-09B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-09C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608272-09D	Plastic 500ml unpreserved	B	7	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608272-09E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608272-09F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)
L1608272-10A	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-10B	Vial H2SO4 preserved	B	N/A	2.2	Y	Absent	DOC-5310(28)
L1608272-10C	Plastic 250ml HNO3 preserved	B	<2	2.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608272-10D	Plastic 500ml unpreserved	B	7	2.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608272-10E	Plastic 500ml H2SO4 preserved	B	<2	2.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608272-10F	Plastic 250ml unpreserved w/No H	B	N/A	2.2	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name:	EPA-PRB	**Lab Number:**	L1608272
Project Number:	WV-1009	**Report Date:**	03/29/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-PRB	**Lab Number:**	L1608272
Project Number:	WV-1009	**Report Date:**	03/29/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-PRB	**Lab Number:**	L1608272
Project Number:	WV-1009	**Report Date:**	03/29/16

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE _____ OF _____

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Date Rec'd in Lab: 3/22/16

ALPHA Job #: L6048272

Client Information

Client: WATERVISION LLC
Address: 481 Great Rd
Acton, MA 01720
Phone: 603-498-2916
Email: dtruslow@watervisionllc.com

Additional Project Information:

Project Information

Project Name: EPA - PRB
Project Location: Falmouth - Sailfish
Project #: WV-1009
Project Manager: Danna Truslow
ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due:

Report Information - Data Deliverables

☐ ADEx ☑ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2
SVOC: ☐ ABN ☐ PAH
METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15
METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13
EPH: ☐ Ranges & Targets ☐ Ranges Only
VPH: ☐ Ranges & Targets ☐ Ranges Only
☐ PCB ☐ PEST
TPH: ☐ Quant Only ☐ Fingerprint
wlt SO4, Cl, NO3, NO2, OPhos
diss As, Fe, B, Mn ★
Total N NH3-N
Total Alk
DOC ★

SAMPLE INFO
Filtration
☒ Field ★
☐ Lab to do
Preservation
☐ Lab to do

Sample Comments

TOTAL # BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials
0827201	SFZ-25	3-22-16	14:30	Water	DT/MB
.02	SFZ-30	3-22-16	14:45	water	DT
.03	SFZ-48	"	13:25	"	MB
.04	SFZ-24	"	14:25	"	MB/DT
.05	SFZ-67	"	11:10	"	DT
.06	SFZ-42	"	12:25	"	DT/MB
.07	SFZ-77	"	11:20	"	MB
.08	SFZ-36	"	13:35	"	DT
.09	SFZ-51	"	12:45	"	DT
.10	SFZ-19	"	15:45	"	DT

Container Type
Preservative

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
	3-22-16 16:13		3/22/16 16:15
	3/22/16 17:38		3/22/16 17:38

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L1608411
Client:	Watervision, LLC 454 Court Stree Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA-PRB
Project Number:	WV-1009
Report Date:	03/29/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1608411-01	SF-1	WATER	FALMOUTH-SAILFISH	03/23/16 09:40	03/23/16
L1608411-02	SF-10	WATER	FALMOUTH-SAILFISH	03/23/16 10:00	03/23/16
L1608411-03	SF-3	WATER	FALMOUTH-SAILFISH	03/23/16 14:30	03/23/16
L1608411-04	SF-4	WATER	FALMOUTH-SAILFISH	03/23/16 13:00	03/23/16
L1608411-05	SF-6	WATER	FALMOUTH-SAILFISH	03/23/16 11:30	03/23/16
L1608411-06	SF-5D	WATER	FALMOUTH-SAILFISH	03/23/16 11:00	03/23/16
L1608411-07	SF-5S	WATER	FALMOUTH-SAILFISH	03/23/16 11:45	03/23/16
L1608411-08	SF-2	WATER	FALMOUTH-SAILFISH	03/23/16 09:05	03/23/16

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608411
Report Date: 03/29/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Lura L Troy

Title: Technical Director/Representative Date: 03/29/16

METALS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-01
Client ID: SF-1
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/23/16 09:40
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0024	J	mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 17:11	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0145	J	mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 17:11	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.040	J	mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 17:11	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.249		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 17:11	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-02
Client ID: SF-10
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/23/16 10:00
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0027	J	mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 17:33	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0141	J	mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 17:33	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.038	J	mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 17:33	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.241		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 17:33	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-03
Client ID: SF-3
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/23/16 14:30
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 17:37	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0228	J	mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 17:37	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.74		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 17:37	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.503		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 17:37	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-04
Client ID: SF-4
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/23/16 13:00
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 17:41	EPA 3005A	1,6010C	PS
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 17:41	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 17:41	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0100		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 17:41	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-05
Client ID: SF-6
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/23/16 11:30
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 17:46	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0147	J	mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 17:46	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.21		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 17:46	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.310		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 17:46	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-06
Client ID: SF-5D
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/23/16 11:00
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 17:50	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0079	J	mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 17:50	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.091		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 17:50	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0526		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 17:50	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-07
Client ID: SF-5S
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/23/16 11:45
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0020	J	mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 17:54	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0086	J	mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 17:54	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.12		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 17:54	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.302		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 17:54	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009
Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-08
Client ID: SF-2
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 03/23/16 09:05
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 17:58	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0147	J	mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 17:58	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 17:58	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0478		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 17:58	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-08 Batch: WG877602-1										
Arsenic, Dissolved	0.0020	J	mg/l	0.0050	0.0020	1	03/26/16 11:05	03/28/16 16:37	1,6010C	PS
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	03/26/16 11:05	03/28/16 16:37	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	03/26/16 11:05	03/28/16 16:37	1,6010C	PS
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	03/26/16 11:05	03/28/16 16:37	1,6010C	PS

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-08 Batch: WG877602-2								
Arsenic, Dissolved	110		-		80-120	-		
Boron, Dissolved	109		-		80-120	-		
Iron, Dissolved	94		-		80-120	-		
Manganese, Dissolved	103		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877602-4 QC Sample: L1608272-01 Client ID: MS Sample												
Arsenic, Dissolved	0.0037J	0.12	0.167	**139**	Q	-	-		75-125	-		20
Boron, Dissolved	0.0328	1	1.27	124		-	-		75-125	-		20
Iron, Dissolved	ND	1	1.2	120		-	-		75-125	-		20
Manganese, Dissolved	0.321	0.5	0.940	124		-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877602-3 QC Sample: L1608272-01 Client ID: DUP Sample						
Arsenic, Dissolved	0.0037J	0.0039J	mg/l	NC		20
Boron, Dissolved	0.0328	0.0308	mg/l	6		20
Iron, Dissolved	ND	0.020J	mg/l	NC		20
Manganese, Dissolved	0.321	0.319	mg/l	1		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-01
Client ID: SF-1
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/23/16 09:40
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.20		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	4.9		SU	-	NA	1	-	03/23/16 21:40	121,4500H+-B	AS
Nitrogen, Ammonia	0.029	J	mg/l	0.075	0.021	1	03/24/16 20:00	03/28/16 23:13	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/23/16 20:13	44,353.2	MR
Nitrogen, Nitrate	3.0		mg/l	0.10	0.019	1	-	03/23/16 20:13	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.0		mg/l	0.10	0.019	1	-	03/23/16 20:13	44,353.2	MR
Total Nitrogen	3.0		mg/l	0.30	0.30	1	-	03/29/16 14:50	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/25/16 10:14	03/28/16 22:36	121,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/24/16 01:45	121,4500P-E	LH
Dissolved Organic Carbon	1.1		mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	29.7		mg/l	0.500	0.054	1	-	03/24/16 19:32	44,300.0	AU
Sulfate	10.2		mg/l	1.00	0.051	1	-	03/24/16 19:32	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-02
Client ID: SF-10
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/23/16 10:00
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	4.8		SU	-	NA	1	-	03/23/16 21:40	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/24/16 20:00	03/28/16 23:13	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/23/16 20:14	44,353.2	MR
Nitrogen, Nitrate	2.8		mg/l	0.10	0.019	1	-	03/23/16 20:14	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.8		mg/l	0.10	0.019	1	-	03/23/16 20:14	44,353.2	MR
Total Nitrogen	2.8		mg/l	0.30	0.30	1	-	03/29/16 14:50	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/25/16 10:14	03/28/16 22:39	121,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/24/16 01:45	121,4500P-E	LH
Dissolved Organic Carbon	1.0		mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	29.1		mg/l	0.500	0.054	1	-	03/24/16 19:44	44,300.0	AU
Sulfate	10.2		mg/l	1.00	0.051	1	-	03/24/16 19:44	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-03
Client ID: SF-3
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/23/16 14:30
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	4.10		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	4.9		SU	-	NA	1	-	03/23/16 21:40	121,4500H+-B	AS
Nitrogen, Ammonia	0.060	J	mg/l	0.075	0.021	1	03/24/16 20:00	03/28/16 23:14	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/23/16 20:16	44,353.2	MR
Nitrogen, Nitrate	2.5		mg/l	0.10	0.019	1	-	03/23/16 20:16	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.5		mg/l	0.10	0.019	1	-	03/23/16 20:16	44,353.2	MR
Total Nitrogen	2.5		mg/l	0.30	0.30	1	-	03/29/16 14:50	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/25/16 10:14	03/28/16 22:39	121,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/24/16 01:45	121,4500P-E	LH
Dissolved Organic Carbon	1.6		mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	20.1		mg/l	0.500	0.054	1	-	03/24/16 19:56	44,300.0	AU
Sulfate	12.8		mg/l	1.00	0.051	1	-	03/24/16 19:56	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-04
Client ID: SF-4
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/23/16 13:00
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	45.9		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	6.4		SU	-	NA	1	-	03/23/16 21:40	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/24/16 20:00	03/28/16 23:18	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/23/16 20:17	44,353.2	MR
Nitrogen, Nitrate	0.52		mg/l	0.10	0.019	1	-	03/23/16 20:17	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.52		mg/l	0.10	0.019	1	-	03/23/16 20:17	44,353.2	MR
Total Nitrogen	0.52		mg/l	0.30	0.30	1	-	03/29/16 14:50	107,-	JO
Nitrogen, Total Kjeldahl	0.208	J	mg/l	0.300	0.093	1	03/25/16 10:14	03/28/16 22:40	121,4500N-C	AT
Phosphorus, Orthophosphate	0.003	J	mg/l	0.005	0.001	1	-	03/24/16 01:46	121,4500P-E	LH
Dissolved Organic Carbon	3.3		mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	16.4		mg/l	0.500	0.054	1	-	03/24/16 20:08	44,300.0	AU
Sulfate	13.2		mg/l	1.00	0.051	1	-	03/24/16 20:08	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-05
Client ID: SF-6
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/23/16 11:30
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	5.10		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	5.4		SU	-	NA	1	-	03/23/16 21:40	121,4500H+-B	AS
Nitrogen, Ammonia	0.024	J	mg/l	0.075	0.021	1	03/24/16 20:00	03/28/16 23:19	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/23/16 20:18	44,353.2	MR
Nitrogen, Nitrate	0.72		mg/l	0.10	0.019	1	-	03/23/16 20:18	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.72		mg/l	0.10	0.019	1	-	03/23/16 20:18	44,353.2	MR
Total Nitrogen	0.72		mg/l	0.30	0.30	1	-	03/29/16 14:50	107,-	JO
Nitrogen, Total Kjeldahl	0.101	J	mg/l	0.300	0.093	1	03/25/16 10:14	03/28/16 22:41	121,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/24/16 01:46	121,4500P-E	LH
Dissolved Organic Carbon	1.7		mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	20.2		mg/l	0.500	0.054	1	-	03/24/16 20:20	44,300.0	AU
Sulfate	10.8		mg/l	1.00	0.051	1	-	03/24/16 20:20	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-06
Client ID: SF-5D
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/23/16 11:00
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	9.90		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	5.8		SU	-	NA	1	-	03/23/16 21:40	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/24/16 20:00	03/28/16 23:19	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/23/16 20:29	44,353.2	MR
Nitrogen, Nitrate	3.1		mg/l	0.10	0.019	1	-	03/23/16 20:29	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.1		mg/l	0.10	0.019	1	-	03/23/16 20:29	44,353.2	MR
Total Nitrogen	3.1		mg/l	0.30	0.30	1	-	03/29/16 14:50	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/25/16 10:14	03/28/16 22:42	121,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/24/16 01:46	121,4500P-E	LH
Dissolved Organic Carbon	0.71	J	mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	13.4		mg/l	0.500	0.054	1	-	03/24/16 21:08	44,300.0	AU
Sulfate	6.86		mg/l	1.00	0.051	1	-	03/24/16 21:08	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-07
Client ID: SF-5S
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/23/16 11:45
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.10		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	4.7		SU	-	NA	1	-	03/23/16 21:40	121,4500H+-B	AS
Nitrogen, Ammonia	0.025	J	mg/l	0.075	0.021	1	03/24/16 20:00	03/28/16 23:20	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/23/16 20:30	44,353.2	MR
Nitrogen, Nitrate	2.8		mg/l	0.10	0.019	1	-	03/23/16 20:30	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.8		mg/l	0.10	0.019	1	-	03/23/16 20:30	44,353.2	MR
Total Nitrogen	3.1		mg/l	0.30	0.30	1	-	03/29/16 14:50	107,-	JO
Nitrogen, Total Kjeldahl	0.335		mg/l	0.300	0.093	1	03/25/16 10:14	03/28/16 22:43	121,4500N-C	AT
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/24/16 01:47	121,4500P-E	LH
Dissolved Organic Carbon	1.1		mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	15.4		mg/l	0.500	0.054	1	-	03/24/16 21:20	44,300.0	AU
Sulfate	16.0		mg/l	1.00	0.051	1	-	03/24/16 21:20	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

SAMPLE RESULTS

Lab ID: L1608411-08
Client ID: SF-2
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 03/23/16 09:05
Date Received: 03/23/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.90		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG
pH (H)	5.2		SU	-	NA	1	-	03/23/16 21:40	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/24/16 20:00	03/28/16 23:21	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/23/16 20:31	44,353.2	MR
Nitrogen, Nitrate	2.3		mg/l	0.10	0.019	1	-	03/23/16 20:31	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.3		mg/l	0.10	0.019	1	-	03/23/16 20:31	44,353.2	MR
Total Nitrogen	2.3		mg/l	0.30	0.30	1	-	03/29/16 14:50	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.093	1	03/25/16 10:14	03/28/16 22:44	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	03/24/16 01:47	121,4500P-E	LH
Dissolved Organic Carbon	0.98	J	mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
Anions by Ion Chromatography - Westborough Lab										
Chloride	12.8		mg/l	0.500	0.054	1	-	03/24/16 21:32	44,300.0	AU
Sulfate	10.7		mg/l	1.00	0.051	1	-	03/24/16 21:32	44,300.0	AU

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG876760-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	03/23/16 20:08	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG876761-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/23/16 20:10	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG876800-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	03/24/16 01:39	121,4500P-E	LH
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG877110-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	03/23/16 20:08	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG877115-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	03/24/16 16:19	03/24/16 16:19	121,5310C	SD
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG877163-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.021	1	03/24/16 20:00	03/28/16 22:55	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG877386-1										
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.031	1	03/25/16 10:14	03/28/16 22:25	121,4500N-C	AT
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-08 Batch: WG877718-1										
Chloride	ND		mg/l	0.500	0.054	1	-	03/24/16 16:32	44,300.0	AU
Sulfate	0.121	J	mg/l	1.00	0.051	1	-	03/24/16 16:32	44,300.0	AU
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG877770-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	03/27/16 08:13	121,2320B	SG

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG876760-2								
Nitrogen, Nitrate	98		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG876761-2								
Nitrogen, Nitrite	102		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG876779-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG876800-2								
Phosphorus, Orthophosphate	102		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG877110-2								
Nitrogen, Nitrate/Nitrite	98		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG877115-2								
Dissolved Organic Carbon	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG877163-2								
Nitrogen, Ammonia	93		-		80-120	-		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG877386-2					
Nitrogen, Total Kjeldahl	96	-	78-122	-	
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-08 Batch: WG877718-2					
Chloride	105	-	90-110	-	
Sulfate	101	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG877770-3					
Alkalinity, Total	104	-	90-110	-	10

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG876760-4 QC Sample: L1608411-05 Client ID: SF-6												
Nitrogen, Nitrate	0.72	4	4.7	100		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG876761-4 QC Sample: L1608411-05 Client ID: SF-6												
Nitrogen, Nitrite	ND	4	4.0	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG876800-4 QC Sample: L1608411-08 Client ID: SF-2												
Phosphorus, Orthophosphate	0.005	0.5	0.500	99		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877110-4 QC Sample: L1608411-05 Client ID: SF-6												
Nitrogen, Nitrate/Nitrite	0.72	4	4.7	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877115-3 QC Sample: L1608272-07 Client ID: MS Sample												
Dissolved Organic Carbon	0.66J	4	5.0	**124**	Q	-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877163-4 QC Sample: L1608467-01 Client ID: MS Sample												
Nitrogen, Ammonia	0.021J	4	3.73	93		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877386-4 QC Sample: L1608411-01 Client ID: SF-1												
Nitrogen, Total Kjeldahl	ND	8	6.85	86		-	-		77-111	-		24
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877718-3 QC Sample: L1608272-02 Client ID: MS Sample												
Chloride	19.0	4	22.4	86		-	-		40-151	-		18
Sulfate	9.81	8	17.5	96		-	-		60-140	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877770-4 QC Sample: L1608272-01 Client ID: MS Sample												
Alkalinity, Total	2.60	100	99.0	96		-	-		86-116	-		10

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG876760-3 QC Sample: L1608411-05 Client ID: SF-6						
Nitrogen, Nitrate	0.72	0.72	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG876761-3 QC Sample: L1608411-05 Client ID: SF-6						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG876779-2 QC Sample: L1608300-01 Client ID: DUP Sample						
pH	6.9	6.9	SU	0		5
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG876800-3 QC Sample: L1608411-01 Client ID: SF-1						
Phosphorus, Orthophosphate	0.002J	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877110-3 QC Sample: L1608411-05 Client ID: SF-6						
Nitrogen, Nitrate/Nitrite	0.72	0.72	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877115-4 QC Sample: L1608272-06 Client ID: DUP Sample						
Dissolved Organic Carbon	0.61J	0.58J	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877163-3 QC Sample: L1608467-01 Client ID: DUP Sample						
Nitrogen, Ammonia	0.021J	0.029J	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877386-3 QC Sample: L1608411-01 Client ID: SF-1						
Nitrogen, Total Kjeldahl	ND	ND	mg/l	NC		24

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877718-4 QC Sample: L1608272-02 Client ID: DUP Sample					
Chloride	19.0	18.8	mg/l	1	18
Sulfate	9.81	9.02	mg/l	8	20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG877770-2 QC Sample: L1608272-01 Client ID: DUP Sample					
Alkalinity, Total	2.60	2.60	mg CaCO3/L	0	10

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1608411-01A	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-01B	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-01C	Plastic 250ml HNO3 preserved	A	<2	3.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608411-01D	Plastic 500ml unpreserved	A	7	3.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608411-01E	Plastic 500ml H2SO4 preserved	A	<2	3.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608411-01F	Plastic 250ml unpreserved w/No H	A	N/A	3.1	Y	Absent	ALK-T-2320(14)
L1608411-02A	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-02B	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-02C	Plastic 250ml HNO3 preserved	A	<2	3.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608411-02D	Plastic 500ml unpreserved	A	7	3.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608411-02E	Plastic 500ml H2SO4 preserved	A	<2	3.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608411-02F	Plastic 250ml unpreserved w/No H	A	N/A	3.1	Y	Absent	ALK-T-2320(14)
L1608411-03A	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-03B	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-03C	Plastic 250ml HNO3 preserved	A	<2	3.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608411-03D	Plastic 500ml unpreserved	A	7	3.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608411-03E	Plastic 500ml H2SO4 preserved	A	<2	3.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608411-03F	Plastic 250ml unpreserved w/No H	A	N/A	3.1	Y	Absent	ALK-T-2320(14)
L1608411-04A	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-04B	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-04C	Plastic 250ml HNO3 preserved	A	<2	3.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1608411-04D	Plastic 500ml unpreserved	A	7	3.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608411-04E	Plastic 500ml H2SO4 preserved	A	<2	3.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608411-04F	Plastic 250ml unpreserved w/No H	A	N/A	3.1	Y	Absent	ALK-T-2320(14)
L1608411-05A	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-05B	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-05C	Plastic 250ml HNO3 preserved	A	<2	3.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608411-05D	Plastic 500ml unpreserved	A	7	3.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608411-05E	Plastic 500ml H2SO4 preserved	A	<2	3.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608411-05F	Plastic 250ml unpreserved w/No H	A	N/A	3.1	Y	Absent	ALK-T-2320(14)
L1608411-06A	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-06B	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-06C	Plastic 250ml HNO3 preserved	A	<2	3.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608411-06D	Plastic 500ml unpreserved	A	7	3.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608411-06E	Plastic 500ml H2SO4 preserved	A	<2	3.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608411-06F	Plastic 250ml unpreserved w/No H	A	N/A	3.1	Y	Absent	ALK-T-2320(14)
L1608411-07A	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-07B	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-07C	Plastic 250ml HNO3 preserved	A	<2	3.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608411-07D	Plastic 500ml unpreserved	A	7	3.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1608411-07E	Plastic 500ml H2SO4 preserved	A	<2	3.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608411-07F	Plastic 250ml unpreserved w/No H	A	N/A	3.1	Y	Absent	ALK-T-2320(14)
L1608411-08A	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-08B	Vial H2SO4 preserved	A	N/A	3.1	Y	Absent	DOC-5310(28)
L1608411-08C	Plastic 250ml HNO3 preserved	A	<2	3.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1608411-08D	Plastic 500ml unpreserved	A	7	3.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB
Project Number: WV-1009

Lab Number: L1608411
Report Date: 03/29/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1608411-08E	Plastic 500ml H2SO4 preserved	A	<2	3.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1608411-08F	Plastic 250ml unpreserved w/No H	A	N/A	3.1	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name:	EPA-PRB	**Lab Number:**	L1608411
Project Number:	WV-1009	**Report Date:**	03/29/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-PRB	**Lab Number:**	L1608411
Project Number:	WV-1009	**Report Date:**	03/29/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-PRB	**Lab Number:**	L1608411
Project Number:	WV-1009	**Report Date:**	03/29/16

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE _____ OF _____

Date Rec'd in Lab: 3/23/16

ALPHA Job #: L1608411

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: WaterVision LLC
Address: 481 Great Rd. Acton, MA 01720
Phone: 603-498-2916
Email: dhruslow@watervision llc.com

Additional Project Information:

Project Information

Project Name: EPA-PRB
Project Location: Falmouth-Sailfish
Project #: WV-1009
Project Manager: Danna Truslow
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2
SVOC: ☐ ABN ☐ PAH
METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15
METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13
EPH: ☐ Ranges & Targets ☐ Ranges Only
VPH: ☐ Ranges & Targets ☐ Ranges Only
☐ PCB ☐ PEST
TPH: ☐ Quant Only ☐ Fingerprint
PH, SO4, Cl, NO3, NO2, Ortho-P
diss As, Fe, B, Mn *
Total N, NH3-N *
Total Alk
DOC *

SAMPLE INFO
Filtration
☒ Field *
☐ Lab to do
Preservation
☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	Sample Comments	TOTAL # BOTTLES
0841-01	SF-1	3/23/16	9:40	water	SW		
-02	SF-10	3/23/16	10:00	water	SW		
-03	SF-3	3/23/16	14:30	water	SW		
-04	SF-4	3/23/16	13:00	water	SW		
-05	SF-6	3/23/16	11:30	water	SW		
-06	SF-5D	3/23/16	11:00	water	DT		
-07	SF-5S	3/23/16	11:45	water	DT		
-08	SF-2	3/23/16	9:05	water	DT		

Container Type
Preservative

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Samantha Wright	3/23/16 16:44	Richard Scott	3/23/16 16:49

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L1613398
Client:	Watervision, LLC 454 Court Street Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA-SAILFISH-PRB
Project Number:	WV-1009
Report Date:	05/12/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613398
Report Date: 05/12/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1613398-01	SFZ-67	WATER	FALMOUTH, MA	05/04/16 12:30	05/04/16
L1613398-02	SFZ-57	WATER	FALMOUTH, MA	05/04/16 13:05	05/04/16
L1613398-03	SFZ-77	WATER	FALMOUTH, MA	05/04/16 12:10	05/04/16
L1613398-04	SFZ-50	WATER	FALMOUTH, MA	05/04/16 13:35	05/04/16
L1613398-05	SFZ-45	WATER	FALMOUTH, MA	05/04/16 14:25	05/04/16
L1613398-06	SFZ-40	WATER	FALMOUTH, MA	05/04/16 14:40	05/04/16
L1613398-07	SFZ-57 DUP	WATER	FALMOUTH, MA	05/04/16 13:10	05/04/16
L1613398-08	SFZ-33	WATER	FALMOUTH, MA	05/04/16 15:15	05/04/16

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA-SAILFISH-PRB **Lab Number:** L1613398
Project Number: WV-1009 **Report Date:** 05/12/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Nitrogen, Ammonia

The WG890563-3 Laboratory Duplicate RPD (43%), performed on L1613398-01, is above the acceptance criteria; however, the sample and duplicate results are less than five times the reporting limit. Therefore, the RPD is valid.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Lura L Troy

Title: Technical Director/Representative Date: 05/12/16

METALS

Project Name: EPA-SAILFISH-PRB
Lab Number: L1613398
Project Number: WV-1009
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-01
Client ID: SFZ-67
Sample Location: FALMOUTH, MA
Matrix: Water
Date Collected: 05/04/16 12:30
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/05/16 12:15	05/06/16 17:11	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0178	J	mg/l	0.0300	0.0070	1	05/05/16 12:15	05/06/16 17:11	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.041	J	mg/l	0.050	0.020	1	05/05/16 12:15	05/06/16 17:11	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0106		mg/l	0.0100	0.0020	1	05/05/16 12:15	05/06/16 17:11	EPA 3005A	1,6010C	PS

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-02
Client ID: SFZ-57
Sample Location: FALMOUTH, MA
Matrix: Water
Date Collected: 05/04/16 13:05
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/05/16 12:15	05/06/16 17:15	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0149	J	mg/l	0.0300	0.0070	1	05/05/16 12:15	05/06/16 17:15	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.042	J	mg/l	0.050	0.020	1	05/05/16 12:15	05/06/16 17:15	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0112		mg/l	0.0100	0.0020	1	05/05/16 12:15	05/06/16 17:15	EPA 3005A	1,6010C	PS

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-03
Client ID: SFZ-77
Sample Location: FALMOUTH, MA
Matrix: Water
Date Collected: 05/04/16 12:10
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0028	J	mg/l	0.0050	0.0020	1	05/05/16 12:15	05/06/16 17:38	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0194	J	mg/l	0.0300	0.0070	1	05/05/16 12:15	05/06/16 17:38	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/05/16 12:15	05/06/16 17:38	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0098	J	mg/l	0.0100	0.0020	1	05/05/16 12:15	05/06/16 17:38	EPA 3005A	1,6010C	PS

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-04
Client ID: SFZ-50
Sample Location: FALMOUTH, MA
Matrix: Water
Date Collected: 05/04/16 13:35
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/05/16 12:15	05/06/16 17:42	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0135	J	mg/l	0.0300	0.0070	1	05/05/16 12:15	05/06/16 17:42	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.049	J	mg/l	0.050	0.020	1	05/05/16 12:15	05/06/16 17:42	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.128		mg/l	0.0100	0.0020	1	05/05/16 12:15	05/06/16 17:42	EPA 3005A	1,6010C	PS

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-05
Client ID: SFZ-45
Sample Location: FALMOUTH, MA
Matrix: Water
Date Collected: 05/04/16 14:25
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/05/16 12:15	05/06/16 17:47	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0368		mg/l	0.0300	0.0070	1	05/05/16 12:15	05/06/16 17:47	EPA 3005A	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/05/16 12:15	05/06/16 17:47	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0160		mg/l	0.0100	0.0020	1	05/05/16 12:15	05/06/16 17:47	EPA 3005A	1,6010C	PS

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-06
Client ID: SFZ-40
Sample Location: FALMOUTH, MA
Matrix: Water
Date Collected: 05/04/16 14:40
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/05/16 12:15	05/06/16 17:51	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0394		mg/l	0.0300	0.0070	1	05/05/16 12:15	05/06/16 17:51	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.022	J	mg/l	0.050	0.020	1	05/05/16 12:15	05/06/16 17:51	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0284		mg/l	0.0100	0.0020	1	05/05/16 12:15	05/06/16 17:51	EPA 3005A	1,6010C	PS

Project Name: EPA-SAILFISH-PRB
Lab Number: L1613398
Project Number: WV-1009
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-07
Client ID: SFZ-57 DUP
Sample Location: FALMOUTH, MA
Matrix: Water
Date Collected: 05/04/16 13:10
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/05/16 12:15	05/06/16 17:55	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0147	J	mg/l	0.0300	0.0070	1	05/05/16 12:15	05/06/16 17:55	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.031	J	mg/l	0.050	0.020	1	05/05/16 12:15	05/06/16 17:55	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0104		mg/l	0.0100	0.0020	1	05/05/16 12:15	05/06/16 17:55	EPA 3005A	1,6010C	PS

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-08
Client ID: SFZ-33
Sample Location: FALMOUTH, MA
Matrix: Water
Date Collected: 05/04/16 15:15
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/05/16 12:15	05/06/16 18:00	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0366		mg/l	0.0300	0.0070	1	05/05/16 12:15	05/06/16 18:00	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.026	J	mg/l	0.050	0.020	1	05/05/16 12:15	05/06/16 18:00	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0663		mg/l	0.0100	0.0020	1	05/05/16 12:15	05/06/16 18:00	EPA 3005A	1,6010C	PS

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-08 Batch: WG890801-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/05/16 12:15	05/06/16 15:42	1,6010C	PS
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/05/16 12:15	05/06/16 15:42	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/05/16 12:15	05/06/16 15:42	1,6010C	PS
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	05/05/16 12:15	05/06/16 15:42	1,6010C	PS

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-SAILFISH-PRB

Project Number: WV-1009

Lab Number: L1613398

Report Date: 05/12/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-08 Batch: WG890801-2								
Arsenic, Dissolved	100		-		80-120	-		
Boron, Dissolved	101		-		80-120	-		
Iron, Dissolved	92		-		80-120	-		
Manganese, Dissolved	97		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613398
Report Date: 05/12/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG890801-4 QC Sample: L1613267-18 Client ID: MS Sample												
Arsenic, Dissolved	ND	0.12	0.122	102		-	-		75-125	-		20
Boron, Dissolved	0.041	1	1.05	101		-	-		75-125	-		20
Iron, Dissolved	0.41	1	1.3	89		-	-		75-125	-		20
Manganese, Dissolved	4.62	0.5	4.95	**66**	Q	-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613398
Report Date: 05/12/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG890801-3 QC Sample: L1613267-18 Client ID: DUP Sample						
Arsenic, Dissolved	ND	0.0024J	mg/l	NC		20
Iron, Dissolved	0.41	0.42	mg/l	2		20
Manganese, Dissolved	4.62	4.62	mg/l	0		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-01
Client ID: SFZ-67
Sample Location: FALMOUTH, MA
Matrix: Water

Date Collected: 05/04/16 12:30
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	7.00		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.6		SU	-	NA	1	-	05/05/16 00:28	121,4500H+-B	JC
Nitrogen, Ammonia	0.241		mg/l	0.075	0.028	1	05/04/16 23:00	05/05/16 23:23	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/04/16 22:33	44,353.2	MR
Nitrogen, Nitrate	3.1		mg/l	0.10	0.019	1	-	05/04/16 22:33	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.1		mg/l	0.10	0.019	1	-	05/04/16 22:33	44,353.2	MR
Total Nitrogen	3.1		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.150	J	mg/l	0.300	0.066	1	05/10/16 00:45	05/10/16 22:02	121,4500N-C	AT
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	05/04/16 21:50	121,4500P-E	MR
Dissolved Organic Carbon	0.48	J	mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	18.5		mg/l	0.500	0.054	1	-	05/05/16 21:26	44,300.0	AU
Sulfate	10.3		mg/l	1.00	0.150	1	-	05/05/16 21:26	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-02
Client ID: SFZ-57
Sample Location: FALMOUTH, MA
Matrix: Water

Date Collected: 05/04/16 13:05
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	6.10		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.4		SU	-	NA	1	-	05/05/16 00:28	121,4500H+-B	JC
Nitrogen, Ammonia	0.035	J	mg/l	0.075	0.028	1	05/04/16 23:00	05/05/16 23:28	44,350.1	AT
Nitrogen, Nitrite	0.017	J	mg/l	0.050	0.010	1	-	05/04/16 22:39	44,353.2	MR
Nitrogen, Nitrate	2.6		mg/l	0.10	0.019	1	-	05/04/16 22:39	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.6		mg/l	0.10	0.019	1	-	05/04/16 22:39	44,353.2	MR
Total Nitrogen	2.6		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.087	J	mg/l	0.300	0.066	1	05/10/16 00:45	05/10/16 22:03	121,4500N-C	AT
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	05/04/16 21:51	121,4500P-E	MR
Dissolved Organic Carbon	0.49	J	mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	27.7		mg/l	0.500	0.054	1	-	05/05/16 21:38	44,300.0	AU
Sulfate	9.13		mg/l	1.00	0.150	1	-	05/05/16 21:38	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-03
Client ID: SFZ-77
Sample Location: FALMOUTH, MA
Matrix: Water

Date Collected: 05/04/16 12:10
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	82.8		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	7.7		SU	-	NA	1	-	05/05/16 00:28	121,4500H+-B	JC
Nitrogen, Ammonia	0.080		mg/l	0.075	0.028	1	05/04/16 23:00	05/05/16 23:29	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/04/16 22:41	44,353.2	MR
Nitrogen, Nitrate	1.6		mg/l	0.10	0.019	1	-	05/04/16 22:41	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.6		mg/l	0.10	0.019	1	-	05/04/16 22:41	44,353.2	MR
Total Nitrogen	1.6		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.228	J	mg/l	0.300	0.066	1	05/10/16 00:45	05/10/16 22:05	121,4500N-C	AT
Phosphorus, Orthophosphate	0.037		mg/l	0.005	0.001	1	-	05/04/16 21:51	121,4500P-E	MR
Dissolved Organic Carbon	0.51	J	mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	14.9		mg/l	0.500	0.054	1	-	05/05/16 21:50	44,300.0	AU
Sulfate	14.4		mg/l	1.00	0.150	1	-	05/05/16 21:50	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-04
Client ID: SFZ-50
Sample Location: FALMOUTH, MA
Matrix: Water

Date Collected: 05/04/16 13:35
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.5		SU	-	NA	1	-	05/05/16 00:28	121,4500H+-B	JC
Nitrogen, Ammonia	0.068	J	mg/l	0.075	0.028	1	05/04/16 23:00	05/05/16 23:30	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/04/16 22:42	44,353.2	MR
Nitrogen, Nitrate	1.6		mg/l	0.10	0.019	1	-	05/04/16 22:42	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.6		mg/l	0.10	0.019	1	-	05/04/16 22:42	44,353.2	MR
Total Nitrogen	2.0		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.358		mg/l	0.300	0.066	1	05/10/16 00:45	05/10/16 22:06	121,4500N-C	AT
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	05/04/16 21:52	121,4500P-E	MR
Dissolved Organic Carbon	0.91	J	mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	41.0		mg/l	0.500	0.054	1	-	05/05/16 22:02	44,300.0	AU
Sulfate	8.88		mg/l	1.00	0.150	1	-	05/05/16 22:02	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-05
Client ID: SFZ-45
Sample Location: FALMOUTH, MA
Matrix: Water

Date Collected: 05/04/16 14:25
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	5.90		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.4		SU	-	NA	1	-	05/05/16 00:28	121,4500H+-B	JC
Nitrogen, Ammonia	0.049	J	mg/l	0.075	0.028	1	05/04/16 23:00	05/05/16 23:31	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/04/16 22:47	44,353.2	MR
Nitrogen, Nitrate	2.8		mg/l	0.10	0.019	1	-	05/04/16 22:47	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.8		mg/l	0.10	0.019	1	-	05/04/16 22:47	44,353.2	MR
Total Nitrogen	2.8		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.150	J	mg/l	0.300	0.066	1	05/10/16 00:45	05/10/16 22:07	121,4500N-C	AT
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	05/04/16 21:52	121,4500P-E	MR
Dissolved Organic Carbon	0.60	J	mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	30.2		mg/l	0.500	0.054	1	-	05/05/16 22:50	44,300.0	AU
Sulfate	13.2		mg/l	1.00	0.150	1	-	05/05/16 22:50	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-06
Client ID: SFZ-40
Sample Location: FALMOUTH, MA
Matrix: Water

Date Collected: 05/04/16 14:40
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	4.10		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.2		SU	-	NA	1	-	05/05/16 00:28	121,4500H+-B	JC
Nitrogen, Ammonia	0.124		mg/l	0.075	0.028	1	05/04/16 23:00	05/05/16 23:32	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/04/16 22:48	44,353.2	MR
Nitrogen, Nitrate	3.0		mg/l	0.10	0.019	1	-	05/04/16 22:48	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.0		mg/l	0.10	0.019	1	-	05/04/16 22:48	44,353.2	MR
Total Nitrogen	3.0		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.140	J	mg/l	0.300	0.066	1	05/10/16 00:45	05/10/16 22:08	121,4500N-C	AT
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	05/04/16 21:52	121,4500P-E	MR
Dissolved Organic Carbon	0.61	J	mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	23.4		mg/l	0.500	0.054	1	-	05/05/16 23:02	44,300.0	AU
Sulfate	11.5		mg/l	1.00	0.150	1	-	05/05/16 23:02	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-07
Client ID: SFZ-57 DUP
Sample Location: FALMOUTH, MA
Matrix: Water

Date Collected: 05/04/16 13:10
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	5.60		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.3		SU	-	NA	1	-	05/05/16 00:28	121,4500H+-B	JC
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/04/16 23:00	05/05/16 23:33	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/04/16 22:50	44,353.2	MR
Nitrogen, Nitrate	2.6		mg/l	0.10	0.019	1	-	05/04/16 22:50	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.6		mg/l	0.10	0.019	1	-	05/04/16 22:50	44,353.2	MR
Total Nitrogen	2.6		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.219	J	mg/l	0.300	0.066	1	05/10/16 00:45	05/10/16 22:11	121,4500N-C	AT
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	05/04/16 21:52	121,4500P-E	MR
Dissolved Organic Carbon	0.53	J	mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	27.7		mg/l	0.500	0.054	1	-	05/05/16 23:14	44,300.0	AU
Sulfate	9.41		mg/l	1.00	0.150	1	-	05/05/16 23:14	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613398
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613398-08
Client ID: SFZ-33
Sample Location: FALMOUTH, MA
Matrix: Water

Date Collected: 05/04/16 15:15
Date Received: 05/04/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.80		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.3		SU	-	NA	1	-	05/05/16 00:28	121,4500H+-B	JC
Nitrogen, Ammonia	0.040	J	mg/l	0.075	0.028	1	05/04/16 23:00	05/05/16 23:34	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/04/16 22:51	44,353.2	MR
Nitrogen, Nitrate	4.3		mg/l	0.10	0.019	1	-	05/04/16 22:51	44,353.2	MR
Nitrogen, Nitrate/Nitrite	4.3		mg/l	0.10	0.019	1	-	05/04/16 22:51	44,353.2	MR
Total Nitrogen	4.3		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.215	J	mg/l	0.300	0.066	1	05/10/16 00:45	05/10/16 22:12	121,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	05/04/16 21:53	121,4500P-E	MR
Dissolved Organic Carbon	0.59	J	mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.9		mg/l	0.500	0.054	1	-	05/05/16 23:26	44,300.0	AU
Sulfate	8.40		mg/l	1.00	0.150	1	-	05/05/16 23:26	44,300.0	AU

Project Name: EPA-SAILFISH-PRB **Lab Number:** L1613398

Project Number: WV-1009 **Report Date:** 05/12/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG890547-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	05/04/16 22:07	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG890548-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	05/04/16 22:07	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG890549-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/04/16 22:14	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG890553-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	05/04/16 21:50	121,4500P-E	MR
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG890563-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/04/16 23:00	05/05/16 23:07	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG891153-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-08 Batch: WG891440-1										
Chloride	ND		mg/l	0.500	0.054	1	-	05/05/16 18:14	44,300.0	AU
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-08 Batch: WG891440-1										
Sulfate	ND		mg/l	1.00	0.150	1	-	05/05/16 18:14	44,300.0	AU
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG891907-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
General Chemistry - Westborough Lab for sample(s): 01-08 Batch: WG892136-1										
Nitrogen, Total Kjeldahl	0.194	J	mg/l	0.300	0.022	1	05/10/16 00:45	05/10/16 21:50	121,4500N-C	AT

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613398
Report Date: 05/12/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG890547-2								
Nitrogen, Nitrate	98		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG890548-2								
Nitrogen, Nitrate/Nitrite	98		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG890549-2								
Nitrogen, Nitrite	100		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG890553-2								
Phosphorus, Orthophosphate	105		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG890563-2								
Nitrogen, Ammonia	94		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG890575-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG891153-2								
Dissolved Organic Carbon	100		-		90-110	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-SAILFISH-PRB

Project Number: WV-1009

Lab Number: L1613398

Report Date: 05/12/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-08 Batch: WG891440-2					
Chloride	100	-	90-110	-	
Sulfate	97	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG891907-2					
Alkalinity, Total	101	-	90-110	-	10
General Chemistry - Westborough Lab Associated sample(s): 01-08 Batch: WG892136-2					
Nitrogen, Total Kjeldahl	96	-	78-122	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613398
Report Date: 05/12/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG890547-4 QC Sample: L1613398-01 Client ID: SFZ-67												
Nitrogen, Nitrate	3.1	4	6.6	88		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG890548-4 QC Sample: L1613398-01 Client ID: SFZ-67												
Nitrogen, Nitrate/Nitrite	3.1	4	6.6	88		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG890549-4 QC Sample: L1613398-01 Client ID: SFZ-67												
Nitrogen, Nitrite	ND	4	3.9	98		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG890553-4 QC Sample: L1613398-08 Client ID: SFZ-33												
Phosphorus, Orthophosphate	0.004J	0.5	0.535	107		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG890563-4 QC Sample: L1613398-01 Client ID: SFZ-67												
Nitrogen, Ammonia	0.241	4	3.88	91		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG891153-5 QC Sample: L1613580-02 Client ID: MS Sample												
Dissolved Organic Carbon	0.88J	4	5.2	**131**	Q	-	-		80-120	-		20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG891440-3 QC Sample: L1613285-05 Client ID: MS Sample												
Chloride	20.6	4	23.9	81		-	-		40-151	-		18
Sulfate	13.0	8	20.7	96		-	-		60-140	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG891907-4 QC Sample: L1613375-01 Client ID: MS Sample												
Alkalinity, Total	379.	100	476	97		-	-		86-116	-		10
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG892136-4 QC Sample: L1613398-02 Client ID: SFZ-57												
Nitrogen, Total Kjeldahl	0.087J	8	7.45	93		-	-		77-111	-		24

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613398
Report Date: 05/12/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG890547-3 QC Sample: L1613398-01 Client ID: SFZ-67						
Nitrogen, Nitrate	3.1	3.1	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG890548-3 QC Sample: L1613398-01 Client ID: SFZ-67						
Nitrogen, Nitrate/Nitrite	3.1	3.1	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG890549-3 QC Sample: L1613398-01 Client ID: SFZ-67						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG890553-3 QC Sample: L1613398-01 Client ID: SFZ-67						
Phosphorus, Orthophosphate	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG890563-3 QC Sample: L1613398-01 Client ID: SFZ-67						
Nitrogen, Ammonia	0.241	0.156	mg/l	**43**	Q	20
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG890575-2 QC Sample: L1613398-01 Client ID: SFZ-67						
pH (H)	5.6	5.5	SU	2		5
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG891153-3 QC Sample: L1613580-01 Client ID: DUP Sample						
Dissolved Organic Carbon	0.55J	1.5	mg/l	NC		20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG891440-4 QC Sample: L1613285-05 Client ID: DUP Sample						
Chloride	20.6	20.6	mg/l	0		18
Sulfate	13.0	12.9	mg/l	1		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613398
Report Date: 05/12/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG891907-3 QC Sample: L1613375-01 Client ID: DUP Sample					
Alkalinity, Total	379.	378	mg CaCO3/L	0	10
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG892136-3 QC Sample: L1613398-02 Client ID: SFZ-57					
Nitrogen, Total Kjeldahl	0.087J	0.075J	mg/l	NC	24

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613398
Report Date: 05/12/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1613398-01A	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-01B	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-01C	Plastic 250ml HNO3 preserved	A	<2	2.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613398-01D	Plastic 500ml unpreserved	A	7	2.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613398-01E	Plastic 500ml H2SO4 preserved	A	<2	2.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613398-01F	Plastic 250ml unpreserved w/No H	A	N/A	2.7	Y	Absent	ALK-T-2320(14)
L1613398-02A	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-02B	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-02C	Plastic 250ml HNO3 preserved	A	<2	2.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613398-02D	Plastic 500ml unpreserved	A	7	2.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613398-02E	Plastic 500ml H2SO4 preserved	A	<2	2.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613398-02F	Plastic 250ml unpreserved w/No H	A	N/A	2.7	Y	Absent	ALK-T-2320(14)
L1613398-03A	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-03B	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-03C	Plastic 250ml HNO3 preserved	A	<2	2.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613398-03D	Plastic 500ml unpreserved	A	7	2.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613398-03E	Plastic 500ml H2SO4 preserved	A	<2	2.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613398-03F	Plastic 250ml unpreserved w/No H	A	N/A	2.7	Y	Absent	ALK-T-2320(14)
L1613398-04A	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-04B	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-04C	Plastic 250ml HNO3 preserved	A	<2	2.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613398
Report Date: 05/12/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1613398-04D	Plastic 500ml unpreserved	A	7	2.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613398-04E	Plastic 500ml H2SO4 preserved	A	<2	2.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613398-04F	Plastic 250ml unpreserved w/No H	A	N/A	2.7	Y	Absent	ALK-T-2320(14)
L1613398-05A	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-05B	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-05C	Plastic 250ml HNO3 preserved	A	<2	2.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613398-05D	Plastic 500ml unpreserved	A	7	2.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613398-05E	Plastic 500ml H2SO4 preserved	A	<2	2.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613398-05F	Plastic 250ml unpreserved w/No H	A	N/A	2.7	Y	Absent	ALK-T-2320(14)
L1613398-06A	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-06B	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-06C	Plastic 250ml HNO3 preserved	A	<2	2.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613398-06D	Plastic 500ml unpreserved	A	7	2.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613398-06E	Plastic 500ml H2SO4 preserved	A	<2	2.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613398-06F	Plastic 250ml unpreserved w/No H	A	N/A	2.7	Y	Absent	ALK-T-2320(14)
L1613398-07A	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-07B	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-07C	Plastic 250ml HNO3 preserved	A	<2	2.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613398-07D	Plastic 500ml unpreserved	A	7	2.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613398-07E	Plastic 500ml H2SO4 preserved	A	<2	2.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613398-07F	Plastic 250ml unpreserved w/No H	A	N/A	2.7	Y	Absent	ALK-T-2320(14)
L1613398-08A	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-08B	Vial H2SO4 preserved	A	N/A	2.7	Y	Absent	DOC-5310(28)
L1613398-08C	Plastic 250ml HNO3 preserved	A	<2	2.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613398-08D	Plastic 500ml unpreserved	A	7	2.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)

*Values in parentheses indicate holding time in days

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613398
Report Date: 05/12/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1613398-08E	Plastic 500ml H2SO4 preserved	A	<2	2.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613398-08F	Plastic 250ml unpreserved w/No H	A	N/A	2.7	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name:	EPA-SAILFISH-PRB	**Lab Number:**	L1613398
Project Number:	WV-1009	**Report Date:**	05/12/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-SAILFISH-PRB	**Lab Number:**	L1613398
Project Number:	WV-1009	**Report Date:**	05/12/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-SAILFISH-PRB	**Lab Number:**	L1613398
Project Number:	WV-1009	**Report Date:**	05/12/16

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

Serial_No:05121620:59

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 5/4/16

ALPHA Job #: L1613398

ALPHA ANALYTICAL

8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220

320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

Client Information

Client: Waterrvision LLC
Address: 481 Great Rd
Acton, MA
Phone: 603-498-2916
Email: dtruslow@waterrvisionllc.com

Additional Project Information:

Project Information

Project Name: EPA-SALFEA-PRB
Project Location: FALMOUTH, MA
Project #: WV-1007
Project Manager: Danna Truslow
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH *(only confirmed if pre-approved!)*

Date Due:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program ______ Criteria ______

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; pH, SO4, Cl, NH3, NO2+NO3; Diss. Metals Fe, Mn, As, DA; Diss. org Carbon; Total Alkalinity; Total N - Ammonia-N

SAMPLE INFO — Filtration: ☒ Field ☐ Lab to do; Preservation: ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	pH, SO4, Cl, NH3, NO2+NO3	Diss. Metals Fe, Mn, As, DA	Diss. org Carbon	Total Alkalinity	Total N - Ammonia-N	Sample Comments
13398-01	SFZ-47	5-04-16	12:30	H2O	DT	X	X	X	X	X	
.02	SFZ-57	"	13:05	"	DT	X	X	X	X	X	
.03	SFZ-77	"	12:10	"	DT	X	X	X	X	X	
.04	SFZ-50	5-04-16	13:35	"	DT	X	X	X	X	X	
.05	SFZ-45	"	14:25	"	DT	X	X	X	X	X	
.06	SFZ-40	"	14:40	"	DT	X	X	X	X	X	
.07	SFZ-57 dup	"	13:10	"	DT	X	X	X	X	X	
.08	SFZ-33	"	15:15	"	DT	X	X	X	X	X	

Container Type
Preservative

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	5-4-16 1601	[signature] AAL	5/4/16 16:01
[signature] AAL	5/4/16 17:55	[signature]	5/4/16 1755

FORM NO: 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L1613580
Client:	Watervision, LLC 454 Court Street Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA-SAILFISH-PRB
Project Number:	WV-1009
Report Date:	05/13/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613580
Report Date: 05/13/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1613580-01	SF-1	WATER	SAILFISH DR., FALMOUTH, MA	05/05/16 11:30	05/05/16
L1613580-02	SF-2	WATER	SAILFISH DR., FALMOUTH, MA	05/05/16 10:30	05/05/16
L1613580-03	SFZ-19	WATER	SAILFISH DR., FALMOUTH, MA	05/05/16 09:10	05/05/16
L1613580-04	SFZ-26	WATER	SAILFISH DR., FALMOUTH, MA	05/05/16 09:40	05/05/16
L1613580-05	SF-6	WATER	SAILFISH DR., FALMOUTH, MA	05/05/16 13:20	05/05/16
L1613580-06	SF-3	WATER	SAILFISH DR., FALMOUTH, MA	05/05/16 13:55	05/05/16
L1613580-07	SF-4	WATER	SAILFISH DR., FALMOUTH, MA	05/05/16 15:15	05/05/16
L1613580-08	SF-5D	WATER	SAILFISH DR., FALMOUTH, MA	05/05/16 15:20	05/05/16
L1613580-09	SF-3 DUP	WATER	SAILFISH DR., FALMOUTH, MA	05/05/16 14:00	05/05/16

Project Name: EPA-SAILFISH-PRB **Lab Number:** L1613580
Project Number: WV-1009 **Report Date:** 05/13/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA-SAILFISH-PRB **Lab Number:** L1613580
Project Number: WV-1009 **Report Date:** 05/13/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

L1613580-05 through -09: The Client IDs were specified by the client.

Nitrogen, Total Kjeldahl

L1613580-04: The sample has an elevated detection limit due to the dilution required by the sample matrix.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

The WG891153-5 MS recovery (131%), performed on L1613580-02, is outside the acceptance criteria; however, the associated LCS recovery is within criteria. No further action was taken.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:  Kelly Stenstrom

Title: Technical Director/Representative Date: 05/13/16

METALS

Project Name: EPA-SAILFISH-PRB
Lab Number: L1613580
Project Number: WV-1009
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-01
Client ID: SF-1
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water
Date Collected: 05/05/16 11:30
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/06/16 10:10	05/10/16 03:21	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0205	J	mg/l	0.0300	0.0070	1	05/06/16 10:10	05/10/16 03:21	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.25		mg/l	0.050	0.020	1	05/06/16 10:10	05/10/16 03:21	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.397		mg/l	0.0100	0.0020	1	05/06/16 10:10	05/10/16 03:21	EPA 3005A	1,6010C	AB

Project Name: EPA-SAILFISH-PRB
Lab Number: L1613580
Project Number: WV-1009
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-02
Client ID: SF-2
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water
Date Collected: 05/05/16 10:30
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/06/16 10:10	05/10/16 03:03	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0120	J	mg/l	0.0300	0.0070	1	05/06/16 10:10	05/10/16 03:03	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.039	J	mg/l	0.050	0.020	1	05/06/16 10:10	05/10/16 03:03	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0546		mg/l	0.0100	0.0020	1	05/06/16 10:10	05/10/16 03:03	EPA 3005A	1,6010C	AB

Project Name: EPA-SAILFISH-PRB
Lab Number: L1613580
Project Number: WV-1009
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-03
Client ID: SFZ-19
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water
Date Collected: 05/05/16 09:10
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/06/16 10:10	05/10/16 03:49	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0102	J	mg/l	0.0300	0.0070	1	05/06/16 10:10	05/10/16 03:49	EPA 3005A	1,6010C	AB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/06/16 10:10	05/10/16 03:49	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0418		mg/l	0.0100	0.0020	1	05/06/16 10:10	05/10/16 03:49	EPA 3005A	1,6010C	AB

Project Name: EPA-SAILFISH-PRB
Lab Number: L1613580
Project Number: WV-1009
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-04
Client ID: SFZ-26
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water
Date Collected: 05/05/16 09:40
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/06/16 10:10	05/10/16 03:53	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0249	J	mg/l	0.0300	0.0070	1	05/06/16 10:10	05/10/16 03:53	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.050		mg/l	0.050	0.020	1	05/06/16 10:10	05/10/16 03:53	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.287		mg/l	0.0100	0.0020	1	05/06/16 10:10	05/10/16 03:53	EPA 3005A	1,6010C	AB

Project Name: EPA-SAILFISH-PRB
Lab Number: L1613580
Project Number: WV-1009
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-05
Client ID: SF-6
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water
Date Collected: 05/05/16 13:20
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/06/16 10:10	05/10/16 03:58	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0117	J	mg/l	0.0300	0.0070	1	05/06/16 10:10	05/10/16 03:58	EPA 3005A	1,6010C	AB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/06/16 10:10	05/10/16 03:58	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0594		mg/l	0.0100	0.0020	1	05/06/16 10:10	05/10/16 03:58	EPA 3005A	1,6010C	AB

Project Name: EPA-SAILFISH-PRB
Lab Number: L1613580
Project Number: WV-1009
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-06
Client ID: SF-3
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water
Date Collected: 05/05/16 13:55
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0020	J	mg/l	0.0050	0.0020	1	05/06/16 10:10	05/10/16 04:02	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0172	J	mg/l	0.0300	0.0070	1	05/06/16 10:10	05/10/16 04:02	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.36		mg/l	0.050	0.020	1	05/06/16 10:10	05/10/16 04:02	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.120		mg/l	0.0100	0.0020	1	05/06/16 10:10	05/10/16 04:02	EPA 3005A	1,6010C	AB

Project Name: EPA-SAILFISH-PRB
Lab Number: L1613580
Project Number: WV-1009
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-07
Client ID: SF-4
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water
Date Collected: 05/05/16 15:15
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/06/16 10:10	05/10/16 04:12	EPA 3005A	1,6010C	AB
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/06/16 10:10	05/10/16 04:12	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.062		mg/l	0.050	0.020	1	05/06/16 10:10	05/10/16 04:12	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0780		mg/l	0.0100	0.0020	1	05/06/16 10:10	05/10/16 04:12	EPA 3005A	1,6010C	AB

Project Name: EPA-SAILFISH-PRB
Lab Number: L1613580
Project Number: WV-1009
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-08
Client ID: SF-5D
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water
Date Collected: 05/05/16 15:20
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/06/16 10:10	05/10/16 04:16	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0105	J	mg/l	0.0300	0.0070	1	05/06/16 10:10	05/10/16 04:16	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.22		mg/l	0.050	0.020	1	05/06/16 10:10	05/10/16 04:16	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0490		mg/l	0.0100	0.0020	1	05/06/16 10:10	05/10/16 04:16	EPA 3005A	1,6010C	AB

Project Name: EPA-SAILFISH-PRB
Lab Number: L1613580
Project Number: WV-1009
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-09
Client ID: SF-3 DUP
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water

Date Collected: 05/05/16 14:00
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/06/16 10:10	05/10/16 04:21	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0164	J	mg/l	0.0300	0.0070	1	05/06/16 10:10	05/10/16 04:21	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.092		mg/l	0.050	0.020	1	05/06/16 10:10	05/10/16 04:21	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.104		mg/l	0.0100	0.0020	1	05/06/16 10:10	05/10/16 04:21	EPA 3005A	1,6010C	AB

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613580
Report Date: 05/13/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-09 Batch: WG891171-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/06/16 10:10	05/10/16 01:27	1,6010C	AB
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/06/16 10:10	05/10/16 01:27	1,6010C	AB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/06/16 10:10	05/10/16 01:27	1,6010C	AB
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	05/06/16 10:10	05/10/16 01:27	1,6010C	AB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-SAILFISH-PRB

Project Number: WV-1009

Lab Number: L1613580

Report Date: 05/13/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-09 Batch: WG891171-2								
Arsenic, Dissolved	112		-		80-120	-		
Boron, Dissolved	107		-		80-120	-		
Iron, Dissolved	98		-		80-120	-		
Manganese, Dissolved	103		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613580
Report Date: 05/13/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891171-4 QC Sample: L1613580-02 Client ID: SF-2												
Arsenic, Dissolved	ND	0.12	0.134	112		-	-		75-125	-		20
Boron, Dissolved	0.0120J	1	1.07	107		-	-		75-125	-		20
Iron, Dissolved	0.039J	1	0.99	99		-	-		75-125	-		20
Manganese, Dissolved	0.0546	0.5	0.563	102		-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613580
Report Date: 05/13/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891171-3 QC Sample: L1613580-02 Client ID: SF-2						
Arsenic, Dissolved	ND	ND	mg/l	NC		20
Boron, Dissolved	0.0120J	0.0115J	mg/l	NC		20
Iron, Dissolved	0.039J	0.030J	mg/l	NC		20
Manganese, Dissolved	0.0546	0.0542	mg/l	1		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613580
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-01
Client ID: SF-1
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water

Date Collected: 05/05/16 11:30
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.90		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.3		SU	-	NA	1	-	05/05/16 22:56	121,4500H+-B	AS
Nitrogen, Ammonia	0.215		mg/l	0.075	0.028	1	05/05/16 23:00	05/06/16 23:20	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 01:08	44,353.2	MR
Nitrogen, Nitrate	3.8		mg/l	0.10	0.019	1	-	05/06/16 01:08	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.8		mg/l	0.10	0.019	1	-	05/06/16 01:08	44,353.2	MR
Total Nitrogen	3.8		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.224	J	mg/l	0.300	0.066	1	05/10/16 14:01	05/10/16 22:24	121,4500N-C	AT
Phosphorus, Orthophosphate	0.003	J	mg/l	0.005	0.001	1	-	05/07/16 00:18	121,4500P-E	MR
Dissolved Organic Carbon	0.55	J	mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	28.6		mg/l	0.500	0.054	1	-	05/06/16 19:48	44,300.0	AU
Sulfate	9.94		mg/l	1.00	0.150	1	-	05/06/16 19:48	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613580
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-02
Client ID: SF-2
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water

Date Collected: 05/05/16 10:30
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.90		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.0		SU	-	NA	1	-	05/05/16 22:56	121,4500H+-B	AS
Nitrogen, Ammonia	0.064	J	mg/l	0.075	0.028	1	05/05/16 23:00	05/06/16 23:23	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 01:09	44,353.2	MR
Nitrogen, Nitrate	1.6		mg/l	0.10	0.019	1	-	05/06/16 01:09	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.6		mg/l	0.10	0.019	1	-	05/06/16 01:09	44,353.2	MR
Total Nitrogen	1.6		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.094	J	mg/l	0.300	0.066	1	05/10/16 14:01	05/10/16 22:25	121,4500N-C	AT
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	05/07/16 00:18	121,4500P-E	MR
Dissolved Organic Carbon	0.88	J	mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	12.9		mg/l	0.500	0.054	1	-	05/06/16 20:00	44,300.0	AU
Sulfate	8.65		mg/l	1.00	0.150	1	-	05/06/16 20:00	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613580
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-03
Client ID: SFZ-19
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water

Date Collected: 05/05/16 09:10
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	4.10		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.0		SU	-	NA	1	-	05/05/16 22:56	121,4500H+-B	AS
Nitrogen, Ammonia	0.043	J	mg/l	0.075	0.028	1	05/05/16 23:00	05/06/16 23:24	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 01:10	44,353.2	MR
Nitrogen, Nitrate	0.59		mg/l	0.10	0.019	1	-	05/06/16 01:10	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.59		mg/l	0.10	0.019	1	-	05/06/16 01:10	44,353.2	MR
Total Nitrogen	0.59		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.282	J	mg/l	0.300	0.066	1	05/10/16 14:01	05/10/16 22:28	121,4500N-C	AT
Phosphorus, Orthophosphate	0.033		mg/l	0.005	0.001	1	-	05/07/16 00:19	121,4500P-E	MR
Dissolved Organic Carbon	1.4		mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	39.1		mg/l	0.500	0.054	1	-	05/06/16 20:12	44,300.0	AU
Sulfate	10.0		mg/l	1.00	0.150	1	-	05/06/16 20:12	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613580
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-04
Client ID: SFZ-26
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water

Date Collected: 05/05/16 09:40
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.40		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	4.5		SU	-	NA	1	-	05/05/16 22:56	121,4500H+-B	AS
Nitrogen, Ammonia	0.050	J	mg/l	0.075	0.028	1	05/05/16 23:00	05/06/16 23:24	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 01:12	44,353.2	MR
Nitrogen, Nitrate	7.0		mg/l	0.10	0.019	1	-	05/06/16 01:12	44,353.2	MR
Nitrogen, Nitrate/Nitrite	7.0		mg/l	0.10	0.019	1	-	05/06/16 01:12	44,353.2	MR
Total Nitrogen	7.0		mg/l	0.60	0.60	2	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.600	0.132	2	05/10/16 14:01	05/10/16 22:31	121,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	05/07/16 00:19	121,4500P-E	MR
Dissolved Organic Carbon	0.68	J	mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	19.1		mg/l	0.500	0.054	1	-	05/06/16 20:24	44,300.0	AU
Sulfate	10.4		mg/l	1.00	0.150	1	-	05/06/16 20:24	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613580
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-05
Client ID: SF-6
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water

Date Collected: 05/05/16 13:20
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	4.40		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.0		SU	-	NA	1	-	05/05/16 22:56	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/05/16 23:00	05/06/16 23:25	44,350.1	AT
Nitrogen, Nitrite	0.016	J	mg/l	0.050	0.010	1	-	05/06/16 01:22	44,353.2	MR
Nitrogen, Nitrate	0.59		mg/l	0.10	0.019	1	-	05/06/16 01:33	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.59		mg/l	0.10	0.019	1	-	05/06/16 01:33	44,353.2	MR
Total Nitrogen	0.59		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.169	J	mg/l	0.300	0.066	1	05/10/16 14:01	05/10/16 22:32	121,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	05/07/16 00:19	121,4500P-E	MR
Dissolved Organic Carbon	1.7		mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	14.7		mg/l	0.500	0.054	1	-	05/06/16 20:36	44,300.0	AU
Sulfate	11.4		mg/l	1.00	0.150	1	-	05/06/16 20:36	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613580
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-06
Client ID: SF-3
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water

Date Collected: 05/05/16 13:55
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.30		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	4.5		SU	-	NA	1	-	05/05/16 22:56	121,4500H+-B	AS
Nitrogen, Ammonia	0.034	J	mg/l	0.075	0.028	1	05/05/16 23:00	05/06/16 23:29	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 01:23	44,353.2	MR
Nitrogen, Nitrate	3.4		mg/l	0.10	0.019	1	-	05/06/16 01:23	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.4		mg/l	0.10	0.019	1	-	05/06/16 01:23	44,353.2	MR
Total Nitrogen	3.4		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	05/10/16 14:01	05/10/16 22:33	121,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	05/07/16 00:20	121,4500P-E	MR
Dissolved Organic Carbon	1.4		mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	15.8		mg/l	0.500	0.054	1	-	05/06/16 20:48	44,300.0	AU
Sulfate	12.4		mg/l	1.00	0.150	1	-	05/06/16 20:48	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613580
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-07
Client ID: SF-4
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water

Date Collected: 05/05/16 15:15
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	41.3		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	6.3		SU	-	NA	1	-	05/05/16 22:56	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/05/16 23:00	05/06/16 23:30	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 01:25	44,353.2	MR
Nitrogen, Nitrate	0.50		mg/l	0.10	0.019	1	-	05/06/16 01:25	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.50		mg/l	0.10	0.019	1	-	05/06/16 01:25	44,353.2	MR
Total Nitrogen	0.50		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.268	J	mg/l	0.300	0.066	1	05/10/16 14:01	05/10/16 22:34	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	05/07/16 00:20	121,4500P-E	MR
Dissolved Organic Carbon	2.0		mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	13.6		mg/l	0.500	0.054	1	-	05/06/16 21:00	44,300.0	AU
Sulfate	11.2		mg/l	1.00	0.150	1	-	05/06/16 21:00	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613580
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-08
Client ID: SF-5D
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water

Date Collected: 05/05/16 15:20
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	9.00		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.9		SU	-	NA	1	-	05/05/16 22:56	121,4500H+-B	AS
Nitrogen, Ammonia	0.038	J	mg/l	0.075	0.028	1	05/05/16 23:00	05/06/16 23:30	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 01:26	44,353.2	MR
Nitrogen, Nitrate	2.4		mg/l	0.10	0.019	1	-	05/06/16 01:26	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.4		mg/l	0.10	0.019	1	-	05/06/16 01:26	44,353.2	MR
Total Nitrogen	2.4		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.118	J	mg/l	0.300	0.066	1	05/10/16 14:01	05/10/16 22:34	121,4500N-C	AT
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	05/07/16 00:20	121,4500P-E	MR
Dissolved Organic Carbon	0.76	J	mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	16.6		mg/l	0.500	0.054	1	-	05/06/16 21:12	44,300.0	AU
Sulfate	6.64		mg/l	1.00	0.150	1	-	05/06/16 21:12	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613580
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613580-09
Client ID: SF-3 DUP
Sample Location: SAILFISH DR., FALMOUTH, MA
Matrix: Water

Date Collected: 05/05/16 14:00
Date Received: 05/05/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.20		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.0		SU	-	NA	1	-	05/05/16 22:56	121,4500H+-B	AS
Nitrogen, Ammonia	0.048	J	mg/l	0.075	0.028	1	05/05/16 23:00	05/06/16 23:31	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 01:27	44,353.2	MR
Nitrogen, Nitrate	3.4		mg/l	0.10	0.019	1	-	05/06/16 01:27	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.4		mg/l	0.10	0.019	1	-	05/06/16 01:27	44,353.2	MR
Total Nitrogen	3.4		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	05/10/16 14:01	05/10/16 22:35	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	05/07/16 00:21	121,4500P-E	MR
Dissolved Organic Carbon	1.4		mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	15.7		mg/l	0.500	0.054	1	-	05/06/16 22:24	44,300.0	AU
Sulfate	11.1		mg/l	1.00	0.150	1	-	05/06/16 22:24	44,300.0	AU

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009
Lab Number: L1613580
Report Date: 05/13/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG891009-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	05/06/16 01:03	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG891010-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	05/06/16 01:03	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG891011-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 01:05	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG891029-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/05/16 23:00	05/06/16 23:07	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG891153-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	05/06/16 07:23	05/06/16 07:23	121,5310C	DW
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG891485-1										
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	05/07/16 00:17	121,4500P-E	MR
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG891912-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-09 Batch: WG892127-1										
Sulfate	ND		mg/l	1.00	0.150	1	-	05/06/16 17:24	44,300.0	AU
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-09 Batch: WG892127-1										
Chloride	ND		mg/l	0.500	0.054	1	-	05/06/16 17:24	44,300.0	AU
General Chemistry - Westborough Lab for sample(s): 01-09 Batch: WG892295-1										
Nitrogen, Total Kjeldahl	0.110	J	mg/l	0.300	0.022	1	05/10/16 14:01	05/10/16 22:17	121,4500N-C	AT

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613580
Report Date: 05/13/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG891009-2								
Nitrogen, Nitrate	98		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG891010-2								
Nitrogen, Nitrate/Nitrite	98		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG891011-2								
Nitrogen, Nitrite	100		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG891024-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG891029-2								
Nitrogen, Ammonia	102		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG891153-2								
Dissolved Organic Carbon	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG891485-2								
Phosphorus, Orthophosphate	96		-		90-110	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-SAILFISH-PRB

Project Number: WV-1009

Lab Number: L1613580

Report Date: 05/13/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG891912-2					
Alkalinity, Total	101	-	90-110	-	10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-09 Batch: WG892127-2					
Chloride	100	-	90-110	-	
Sulfate	98	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-09 Batch: WG892295-2					
Nitrogen, Total Kjeldahl	96	-	78-122	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613580
Report Date: 05/13/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891009-4 QC Sample: L1613580-04 Client ID: SFZ-26												
Nitrogen, Nitrate	7.0	4	11	100		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891010-4 QC Sample: L1613580-04 Client ID: SFZ-26												
Nitrogen, Nitrate/Nitrite	7.0	4	11	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891011-4 QC Sample: L1613580-04 Client ID: SFZ-26												
Nitrogen, Nitrite	ND	4	4.0	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891029-4 QC Sample: L1613580-01 Client ID: SF-1												
Nitrogen, Ammonia	0.215	4	4.05	96		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891153-5 QC Sample: L1613580-02 Client ID: SF-2												
Dissolved Organic Carbon	0.88J	4	5.2	**131**	Q	-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891485-4 QC Sample: L1613580-04 Client ID: SFZ-26												
Phosphorus, Orthophosphate	0.004J	0.5	0.505	101		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891912-4 QC Sample: L1613580-02 Client ID: SF-2												
Alkalinity, Total	3.90	100	107	103		-	-		86-116	-		10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG892127-3 QC Sample: L1613375-06 Client ID: MS Sample												
Chloride	3.46	4	7.52	102		-	-		40-151	-		18
Sulfate	9.92	8	17.9	100		-	-		60-140	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG892295-4 QC Sample: L1613580-03 Client ID: SFZ-19												
Nitrogen, Total Kjeldahl	0.282J	8	7.66	96		-	-		77-111	-		24

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613580
Report Date: 05/13/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891009-3 QC Sample: L1613580-04 Client ID: SFZ-26						
Nitrogen, Nitrate	7.0	6.9	mg/l	1		6
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891010-3 QC Sample: L1613580-04 Client ID: SFZ-26						
Nitrogen, Nitrate/Nitrite	7.0	6.9	mg/l	1		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891011-3 QC Sample: L1613580-04 Client ID: SFZ-26						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891024-2 QC Sample: L1613580-01 Client ID: SF-1						
pH (H)	5.3	5.3	SU	0		5
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891029-3 QC Sample: L1613580-01 Client ID: SF-1						
Nitrogen, Ammonia	0.215	0.185	mg/l	15		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891153-3 QC Sample: L1613580-01 Client ID: SF-1						
Dissolved Organic Carbon	0.55J	1.5	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891485-3 QC Sample: L1613580-02 Client ID: SF-2						
Phosphorus, Orthophosphate	0.006	0.006	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG891912-3 QC Sample: L1613580-02 Client ID: SF-2						
Alkalinity, Total	3.90	4.00	mg CaCO3/L	3		10

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613580
Report Date: 05/13/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG892127-4 QC Sample: L1613375-06 Client ID: DUP Sample					
Chloride	3.46	3.44	mg/l	1	18
Sulfate	9.92	9.77	mg/l	2	20
General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG892295-3 QC Sample: L1613580-03 Client ID: SFZ-19					
Nitrogen, Total Kjeldahl	0.282J	0.213J	mg/l	NC	24

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613580
Report Date: 05/13/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1613580-01A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-01B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-01C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613580-01D	Plastic 500ml unpreserved	A	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613580-01E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613580-01F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613580-02A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-02B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-02C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613580-02D	Plastic 500ml unpreserved	A	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613580-02E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613580-02F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613580-03A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-03B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-03C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613580-03D	Plastic 500ml unpreserved	A	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613580-03E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613580-03F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613580-04A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-04B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-04C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613580
Report Date: 05/13/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1613580-04D	Plastic 500ml unpreserved	A	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613580-04E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613580-04F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613580-05A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-05B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-05C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613580-05D	Plastic 500ml unpreserved	A	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613580-05E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613580-05F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613580-06A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-06B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-06C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613580-06D	Plastic 500ml unpreserved	A	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613580-06E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613580-06F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613580-07A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-07B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-07C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613580-07D	Plastic 500ml unpreserved	A	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613580-07E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613580-07F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613580-08A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-08B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-08C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613580-08D	Plastic 500ml unpreserved	A	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)

*Values in parentheses indicate holding time in days

Project Name: EPA-SAILFISH-PRB
Project Number: WV-1009

Lab Number: L1613580
Report Date: 05/13/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1613580-08E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613580-08F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613580-09A	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-09B	Vial H2SO4 preserved	A	N/A	3.8	Y	Absent	DOC-5310(28)
L1613580-09C	Plastic 250ml HNO3 preserved	A	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613580-09D	Plastic 500ml unpreserved	A	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613580-09E	Plastic 500ml H2SO4 preserved	A	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613580-09F	Plastic 250ml unpreserved w/No H	A	N/A	3.8	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name:	EPA-SAILFISH-PRB	**Lab Number:**	L1613580
Project Number:	WV-1009	**Report Date:**	05/13/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-SAILFISH-PRB	**Lab Number:**	L1613580
Project Number:	WV-1009	**Report Date:**	05/13/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-SAILFISH-PRB	**Lab Number:**	L1613580
Project Number:	WV-1009	**Report Date:**	05/13/16

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

Serial_No:05131613:11

STATE FORM - CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 5/5/16

ALPHA Job #: L1613580

ALPHA ANALYTICAL

WESTBORO, MA
TEL: 508-898-9220
FAX: 508-898-9193

MANSFIELD, MA
TEL: 508-822-9300
FAX: 508-822-3288

Client Information

Client: WATERVISION LLC
Address: 481 GREAT RD
ACTON, MA
Phone: 603-498-2916
Fax:
Email: dtruslow@watervisionllc.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: EPA-Sailfish-PRB
Project Location: Sailfish Dr. Falmouth, MA
Project/PWS ID#: WV-1009
Project Manager: Danna Truslow
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH *(only confirmed if pre-approved!)*

Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☒ EMAIL
☐ ADEx ☐ Add'l Deliverables

Billing Information

☒ Same as Client info PO #:

Please Indicate PWS Class Below

☐ COM
☐ NTNC
☐ TNC

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: Dissolved Metals * Fe, Mn, Bi, As * | Dissolved Org. Carbon * | pH, NO3, NO2, SO4, Cl, ortho P | Total P, Alkalinity | Total N, Ammonia

SAMPLE HANDLING
Filtration Field *
☒ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(PLEASE CHECK BELOW)

ALPHA Lab ID (Lab Use Only)	DEP Location Code	DEP Location Name	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Dissolved Metals	Dissolved Org. Carbon	pH, NO3, NO2, SO4, Cl, ortho P	Total P, Alkalinity	Total N, Ammonia	Source(1) Multiple	Source(1) Single	Type Raw	Type Finished	Sample(2) Routine	Sample(2) Special	TOTAL # BOTTLES
13580.01		SF-1	5-5-16	11:30	Water	DT	✓	✓	✓	✓	✓							
.02		SF-2	5-5-16	10:30	"	DT	✓	✓	✓	✓	✓							
.03		SFZ-19	"	9:10	"	DT	✓	✓	✓	✓	✓							
.04		SFZ-26	"	9:40	"	DT	✓	✓	✓	✓	✓							
.05		SFZ-6	"	13:20	"	DT	✓	✓	✓	✓	✓							
.06		SFZ-3	"	13:55	"	SW	✓	✓	✓	✓	✓							
.07		SFZ-4	"	15:15	"	SW	✓	✓	✓	✓	✓							
.08		SFZ-5D	"	15:20	"	DT	✓	✓	✓	✓	✓							
.09		SFZ-3 dup	"	14:00	"	SW	✓	✓	✓	✓	✓							

(1) If Source is Multiple, please list connected sources
(2) If Sample type is special please explain

Container Type
Preservative

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	5/5/16 16:10	[signature] AAC	5/5/16 16:10
[signature] AAC	5-5-16 18:00	[signature]	5/5/16 1800

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-15 (rev. 16-NOV-10)

ANALYTICAL REPORT

Lab Number:	L1613822
Client:	Watervision, LLC 454 Court Street Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA-PRB-SAILFISH
Project Number:	WV-1009
Report Date:	05/12/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA-PRB-SAILFISH
Project Number: WV-1009

Lab Number: L1613822
Report Date: 05/12/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1613822-01	SF-5S	WATER	FALMOUTH-SAILFISH	05/06/16 16:40	05/06/16
L1613822-02	SF-5S DUP	WATER	FALMOUTH-SAILFISH	05/06/16 16:45	05/06/16

Project Name: EPA-PRB-SAILFISH
Project Number: WV-1009

Lab Number: L1613822
Report Date: 05/12/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name:	EPA-PRB-SAILFISH	**Lab Number:**	L1613822
Project Number:	WV-1009	**Report Date:**	05/12/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:  Kelly Stenstrom

Title: Technical Director/Representative Date: 05/12/16

METALS

Project Name: EPA-PRB-SAILFISH
Lab Number: L1613822
Project Number: WV-1009
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613822-01
Client ID: SF-5S
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 05/06/16 16:40
Date Received: 05/06/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/10/16 01:54	EPA 3005A	1,6010C	AB
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/07/16 05:40	05/10/16 01:54	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.026	J	mg/l	0.050	0.020	1	05/07/16 05:40	05/10/16 01:54	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0746		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/10/16 01:54	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-SAILFISH
Lab Number: L1613822
Project Number: WV-1009
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613822-02
Client ID: SF-5S DUP
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 05/06/16 16:45
Date Received: 05/06/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/10/16 01:59	EPA 3005A	1,6010C	AB
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/07/16 05:40	05/10/16 01:59	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.021	J	mg/l	0.050	0.020	1	05/07/16 05:40	05/10/16 01:59	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0763		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/10/16 01:59	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-SAILFISH
Project Number: WV-1009
Lab Number: L1613822
Report Date: 05/12/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-02 Batch: WG891518-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/09/16 23:38	1,6010C	AB
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/07/16 05:40	05/09/16 23:38	1,6010C	AB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/07/16 05:40	05/09/16 23:38	1,6010C	AB
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/09/16 23:38	1,6010C	AB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB-SAILFISH

Project Number: WV-1009

Lab Number: L1613822

Report Date: 05/12/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-02 Batch: WG891518-2								
Arsenic, Dissolved	114		-		80-120	-		
Boron, Dissolved	108		-		80-120	-		
Iron, Dissolved	80		-		80-120	-		
Manganese, Dissolved	88		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB-SAILFISH
Project Number: WV-1009

Lab Number: L1613822
Report Date: 05/12/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891518-4 QC Sample: L1613820-01 Client ID: MS Sample												
Arsenic, Dissolved	ND	0.12	0.184	**153**	Q	-	-		75-125	-		20
Boron, Dissolved	0.0174J	1	1.43	**143**	Q	-	-		75-125	-		20
Iron, Dissolved	0.042J	1	1.3	**130**	Q	-	-		75-125	-		20
Manganese, Dissolved	0.0263	0.5	0.693	**133**	Q	-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB-SAILFISH
Project Number: WV-1009

Lab Number: L1613822
Report Date: 05/12/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891518-3 QC Sample: L1613820-01 Client ID: DUP Sample						
Arsenic, Dissolved	ND	ND	mg/l	NC		20
Boron, Dissolved	0.0174J	0.0170J	mg/l	NC		20
Iron, Dissolved	0.042J	0.043J	mg/l	NC		20
Manganese, Dissolved	0.0263	0.0256	mg/l	3		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA-PRB-SAILFISH
Project Number: WV-1009
Lab Number: L1613822
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613822-01
Client ID: SF-5S
Sample Location: FALMOUTH-SAILFISH
Matrix: Water
Date Collected: 05/06/16 16:40
Date Received: 05/06/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.10		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	4.4		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	0.051	J	mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 21:54	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/07/16 00:23	44,353.2	MR
Nitrogen, Nitrate	2.2		mg/l	0.10	0.019	1	-	05/07/16 00:23	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.2		mg/l	0.10	0.019	1	-	05/07/16 00:23	44,353.2	MR
Total Nitrogen	2.2		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.081	J	mg/l	0.300	0.066	1	05/07/16 10:24	05/09/16 21:42	121,4500N-C	AT
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	05/07/16 00:35	121,4500P-E	MR
Dissolved Organic Carbon	1.3		mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	11.4		mg/l	0.500	0.054	1	-	05/09/16 22:39	44,300.0	AU
Sulfate	16.1		mg/l	1.00	0.150	1	-	05/09/16 22:39	44,300.0	AU

Project Name: EPA-PRB-SAILFISH
Project Number: WV-1009
Lab Number: L1613822
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613822-02
Client ID: SF-5S DUP
Sample Location: FALMOUTH-SAILFISH
Matrix: Water

Date Collected: 05/06/16 16:45
Date Received: 05/06/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.20		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	4.4		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	0.060	J	mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 21:55	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/07/16 00:29	44,353.2	MR
Nitrogen, Nitrate	2.2		mg/l	0.10	0.019	1	-	05/07/16 00:29	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.2		mg/l	0.10	0.019	1	-	05/07/16 00:29	44,353.2	MR
Total Nitrogen	2.2		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.084	J	mg/l	0.300	0.066	1	05/07/16 10:24	05/09/16 21:43	121,4500N-C	AT
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	05/07/16 00:36	121,4500P-E	MR
Dissolved Organic Carbon	1.1		mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	11.4		mg/l	0.500	0.054	1	-	05/09/16 22:51	44,300.0	AU
Sulfate	17.2		mg/l	1.00	0.150	1	-	05/09/16 22:51	44,300.0	AU

Project Name: EPA-PRB-SAILFISH
Project Number: WV-1009
Lab Number: L1613822
Report Date: 05/12/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG891464-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	05/06/16 23:12	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG891465-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	05/06/16 23:12	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG891466-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 23:14	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG891486-1										
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	05/07/16 00:23	121,4500P-E	MR
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG891549-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 21:50	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG891551-1										
Nitrogen, Total Kjeldahl	0.115	J	mg/l	0.300	0.022	1	05/07/16 10:24	05/09/16 21:22	121,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG891913-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG892033-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-02 Batch: WG892532-1										
Sulfate	ND		mg/l	1.00	0.150	1	-	05/09/16 17:39	44,300.0	AU
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-02 Batch: WG892532-1										
Chloride	ND		mg/l	0.500	0.054	1	-	05/09/16 17:39	44,300.0	AU

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB-SAILFISH
Project Number: WV-1009

Lab Number: L1613822
Report Date: 05/12/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG891464-2								
Nitrogen, Nitrate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG891465-2								
Nitrogen, Nitrate/Nitrite	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG891466-2								
Nitrogen, Nitrite	98		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG891478-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG891486-2								
Phosphorus, Orthophosphate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG891549-2								
Nitrogen, Ammonia	96		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG891551-2								
Nitrogen, Total Kjeldahl	101		-		78-122	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB-SAILFISH

Project Number: WV-1009

Lab Number: L1613822

Report Date: 05/12/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG891913-2					
Alkalinity, Total	102	-	90-110	-	10
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG892033-2					
Dissolved Organic Carbon	98	-	90-110	-	
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-02 Batch: WG892532-2					
Chloride	98	-	90-110	-	
Sulfate	96	-	90-110	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB-SAILFISH
Project Number: WV-1009

Lab Number: L1613822
Report Date: 05/12/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891464-4 QC Sample: L1613822-01 Client ID: SF-5S												
Nitrogen, Nitrate	2.2	4	6.2	100		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891465-4 QC Sample: L1613822-01 Client ID: SF-5S												
Nitrogen, Nitrate/Nitrite	2.2	4	6.2	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891466-4 QC Sample: L1613822-01 Client ID: SF-5S												
Nitrogen, Nitrite	ND	4	3.8	95		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891486-4 QC Sample: L1613822-02 Client ID: SF-5S DUP												
Phosphorus, Orthophosphate	0.006	0.5	0.514	102		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891549-4 QC Sample: L1613820-03 Client ID: MS Sample												
Nitrogen, Ammonia	ND	4	3.73	93		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891551-4 QC Sample: L1613820-01 Client ID: MS Sample												
Nitrogen, Total Kjeldahl	0.083J	8	7.13	89		-	-		77-111	-		24
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891913-4 QC Sample: L1613060-01 Client ID: MS Sample												
Alkalinity, Total	19.3	100	121	102		-	-		86-116	-		10
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG892033-4 QC Sample: L1613820-12 Client ID: MS Sample												
Dissolved Organic Carbon	0.69J	4	5.1	**127**	Q	-	-		80-120	-		20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG892532-3 QC Sample: L1613820-01 Client ID: MS Sample												
Chloride	34.3	4	36.8	62		-	-		40-151	-		18
Sulfate	10.2	8	17.8	95		-	-		60-140	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB-SAILFISH
Project Number: WV-1009

Lab Number: L1613822
Report Date: 05/12/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891464-3 QC Sample: L1613822-01 Client ID: SF-5S						
Nitrogen, Nitrate	2.2	2.2	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891465-3 QC Sample: L1613822-01 Client ID: SF-5S						
Nitrogen, Nitrate/Nitrite	2.2	2.2	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891466-3 QC Sample: L1613822-01 Client ID: SF-5S						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891478-2 QC Sample: L1613820-01 Client ID: DUP Sample						
pH	4.3	4.3	SU	0		5
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891486-3 QC Sample: L1613822-01 Client ID: SF-5S						
Phosphorus, Orthophosphate	0.006	0.006	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891549-3 QC Sample: L1613820-03 Client ID: DUP Sample						
Nitrogen, Ammonia	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891551-3 QC Sample: L1613820-01 Client ID: DUP Sample						
Nitrogen, Total Kjeldahl	0.083J	0.088J	mg/l	NC		24
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG891913-3 QC Sample: L1613060-01 Client ID: DUP Sample						
Alkalinity, Total	19.3	19.6	mg CaCO3/L	2		10
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG892033-3 QC Sample: L1613820-11 Client ID: DUP Sample						
Dissolved Organic Carbon	0.75J	1.5	mg/l	NC		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB-SAILFISH
Project Number: WV-1009

Lab Number: L1613822
Report Date: 05/12/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG892532-4 QC Sample: L1613820-01 Client ID: DUP Sample					
Chloride	34.3	34.3	mg/l	0	18
Sulfate	10.2	10.5	mg/l	3	20

Project Name: EPA-PRB-SAILFISH
Project Number: WV-1009

Lab Number: L1613822
Report Date: 05/12/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1613822-01A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1613822-01B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1613822-01C	Plastic 500ml unpreserved	A	7	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613822-01D	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613822-01E	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1613822-01F	Plastic 120ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613822-02A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1613822-02B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1613822-02C	Plastic 500ml unpreserved	A	7	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613822-02D	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613822-02E	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1613822-02F	Plastic 120ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name:	EPA-PRB-SAILFISH	**Lab Number:**	L1613822
Project Number:	WV-1009	**Report Date:**	05/12/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-PRB-SAILFISH	**Lab Number:**	L1613822
Project Number:	WV-1009	**Report Date:**	05/12/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

STATE FORM - CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL

WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193

MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 5/6/16

ALPHA Job #: 21613822

Client Information

Client: WaterVision LLC

Address: 560 Great Rd. Acton, MA

Phone: 603-766-6670

Fax:

Email: dtruslow@watervisionllc.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: EPA PRB - Saltfish

Project Location: Falmouth - Saltfish

Project/PWS ID#: WV-1009

Project Manager: Danna Truslow

ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☒ EMAIL

☐ ADEx ☐ Add'l Deliverables

Billing Information

☒ Same as Client info PO #:

Please Indicate PWS Class Below

☐ COM

☐ NTNC

☐ TNC

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: pH, SO_4, Cl, NO_3, NO_2, Ophos; Total N, NH_3; Total Alk.; Diss metals – As, Fe, Mn, B*; DOC *

SAMPLE HANDLING

Filtration

* ☒ Done

☐ Not needed

☐ Lab to do

Preservation

☐ Lab to do

(PLEASE CHECK BELOW)

ALPHA Lab ID (Lab Use Only)	DEP Location Code	DEP Location Name	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	pH, SO_4, Cl, NO_3, NO_2, Ophos	Total N, NH_3	Total Alk.	Diss metals – As, Fe, Mn, B*	DOC *	Source(1) Multiple	Source(1) Single	Type Raw	Type Finished	Sample(2) Routine	Sample(2) Special	TOTAL # BOTTLES
13822-01	SF-5S		5/6/16	16:40	water	SW	✓	✓	✓	✓	✓							
02	SF-5S	dup	5/6/16	16:45	water	SW	✓	✓	✓	✓	✓							

(1) If Source is Multiple, please list connected sources

(2) If Sample type is special please explain

Container Type

Preservative

Relinquished By:	Date/Time	Received By:	Date/Time
Samantha Wright	5/6/16 18:33		5/6/16

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-15 (rev. 16-NOV-10)

ANALYTICAL REPORT

Lab Number:	L1609568
Client:	Watervision, LLC 454 Court Stree Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA-DENNIS PRB
Project Number:	WV-1009
Report Date:	04/08/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1609568-01	VLZ-66	WATER	DENNIS, MA	03/31/16 18:15	04/01/16
L1609568-02	VL-2	WATER	DENNIS, MA	03/31/16 17:00	04/01/16
L1609568-03	VLZ-61-DUP	WATER	DENNIS, MA	03/31/16 18:40	04/01/16
L1609568-04	VLZ-61	WATER	DENNIS, MA	03/31/16 18:25	04/01/16
L1609568-05	VLZ-56	WATER	DENNIS, MA	04/01/16 09:05	04/01/16
L1609568-06	VLZ-52	WATER	DENNIS, MA	04/01/16 10:45	04/01/16
L1609568-07	VL-1	WATER	DENNIS, MA	04/01/16 12:15	04/01/16
L1609568-08	VL-3	WATER	DENNIS, MA	04/01/16 13:15	04/01/16
L1609568-09	VL-3 DUP	WATER	DENNIS, MA	04/01/16 13:25	04/01/16
L1609568-10	VL-4	WATER	DENNIS, MA	04/01/16 14:15	04/01/16
L1609568-11	VL-5	WATER	DENNIS, MA	04/01/16 15:30	04/01/16
L1609568-12	VL-6	WATER	DENNIS, MA	04/01/16 16:15	04/01/16
L1609568-13	VLZ-44	WATER	DENNIS, MA	04/01/16 09:15	04/01/16
L1609568-14	VLZ-48	WATER	DENNIS, MA	04/01/16 11:20	04/01/16

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

L1609568-06, and -08 through -10: The sample has an elevated detection limit due to the dilution required by the sample matrix.

Nitrogen, Total Kjeldahl

L1609568-08 and -09: The sample has an elevated detection limit due to the dilution required by the sample matrix.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Cristin Walker

Title: Technical Director/Representative Date: 04/08/16

METALS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-01
Client ID: VLZ-66
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 03/31/16 18:15
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/07/16 10:58	04/07/16 17:57	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0366		mg/l	0.0300	0.0070	1	04/07/16 10:58	04/07/16 17:57	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.14		mg/l	0.050	0.020	1	04/07/16 10:58	04/07/16 17:57	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0141		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/07/16 17:57	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-02
Client ID: VL-2
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 03/31/16 17:00
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0033	J	mg/l	0.0050	0.0020	1	04/07/16 10:58	04/07/16 18:39	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0369		mg/l	0.0300	0.0070	1	04/07/16 10:58	04/07/16 18:39	EPA 3005A	1,6010C	PS
Iron, Dissolved	1.3		mg/l	0.050	0.020	1	04/07/16 10:58	04/07/16 18:39	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0717		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/07/16 18:39	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Lab Number: L1609568
Project Number: WV-1009
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-03
Client ID: VLZ-61-DUP
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 03/31/16 18:40
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/07/16 10:58	04/07/16 18:43	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0312		mg/l	0.0300	0.0070	1	04/07/16 10:58	04/07/16 18:43	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.21		mg/l	0.050	0.020	1	04/07/16 10:58	04/07/16 18:43	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0265		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/07/16 18:43	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-04
Client ID: VLZ-61
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 03/31/16 18:25
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0024	J	mg/l	0.0050	0.0020	1	04/07/16 10:58	04/07/16 19:45	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0325		mg/l	0.0300	0.0070	1	04/07/16 10:58	04/07/16 19:45	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.13		mg/l	0.050	0.020	1	04/07/16 10:58	04/07/16 19:45	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0275		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/07/16 19:45	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-05
Client ID: VLZ-56
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 04/01/16 09:05
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0025	J	mg/l	0.0050	0.0020	1	04/07/16 10:58	04/07/16 19:49	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0329		mg/l	0.0300	0.0070	1	04/07/16 10:58	04/07/16 19:49	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.038	J	mg/l	0.050	0.020	1	04/07/16 10:58	04/07/16 19:49	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0105		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/07/16 19:49	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-06
Client ID: VLZ-52
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 04/01/16 10:45
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0052		mg/l	0.0050	0.0020	1	04/07/16 10:58	04/07/16 19:53	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0306		mg/l	0.0300	0.0070	1	04/07/16 10:58	04/07/16 19:53	EPA 3005A	1,6010C	PS
Iron, Dissolved	3.6		mg/l	0.050	0.020	1	04/07/16 10:58	04/07/16 19:53	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.108		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/07/16 19:53	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-07
Client ID: VL-1
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 04/01/16 12:15
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/07/16 10:58	04/07/16 23:19	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0188	J	mg/l	0.0300	0.0070	1	04/07/16 10:58	04/07/16 23:19	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.39		mg/l	0.050	0.020	1	04/07/16 10:58	04/07/16 23:19	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0277		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/07/16 23:19	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-08
Client ID: VL-3
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 04/01/16 13:15
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0073		mg/l	0.0050	0.0020	1	04/07/16 10:58	04/07/16 23:40	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0343		mg/l	0.0300	0.0070	1	04/07/16 10:58	04/07/16 23:40	EPA 3005A	1,6010C	PS
Iron, Dissolved	6.0		mg/l	0.050	0.020	1	04/07/16 10:58	04/07/16 23:40	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0871		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/07/16 23:40	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-09
Client ID: VL-3 DUP
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 04/01/16 13:25
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0049	J	mg/l	0.0050	0.0020	1	04/07/16 10:58	04/08/16 00:05	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0344		mg/l	0.0300	0.0070	1	04/07/16 10:58	04/08/16 00:05	EPA 3005A	1,6010C	PS
Iron, Dissolved	3.5		mg/l	0.050	0.020	1	04/07/16 10:58	04/08/16 00:05	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0659		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/08/16 00:05	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-10
Client ID: VL-4
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 04/01/16 14:15
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0033	J	mg/l	0.0050	0.0020	1	04/07/16 10:58	04/08/16 01:03	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0237	J	mg/l	0.0300	0.0070	1	04/07/16 10:58	04/08/16 01:03	EPA 3005A	1,6010C	PS
Iron, Dissolved	1.7		mg/l	0.050	0.020	1	04/07/16 10:58	04/08/16 01:03	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0637		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/08/16 01:03	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Lab Number: L1609568
Project Number: WV-1009
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-11
Client ID: VL-5
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 04/01/16 15:30
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/07/16 10:58	04/08/16 01:08	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0198	J	mg/l	0.0300	0.0070	1	04/07/16 10:58	04/08/16 01:08	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.12		mg/l	0.050	0.020	1	04/07/16 10:58	04/08/16 01:08	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0204		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/08/16 01:08	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-12
Client ID: VL-6
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 04/01/16 16:15
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/07/16 10:58	04/08/16 01:12	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0134	J	mg/l	0.0300	0.0070	1	04/07/16 10:58	04/08/16 01:12	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.15		mg/l	0.050	0.020	1	04/07/16 10:58	04/08/16 01:12	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0321		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/08/16 01:12	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-13
Client ID: VLZ-44
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 04/01/16 09:15
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0031	J	mg/l	0.0050	0.0020	1	04/07/16 10:58	04/08/16 01:16	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0415		mg/l	0.0300	0.0070	1	04/07/16 10:58	04/08/16 01:16	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.19		mg/l	0.050	0.020	1	04/07/16 10:58	04/08/16 01:16	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0636		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/08/16 01:16	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-14
Client ID: VLZ-48
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 04/01/16 11:20
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/07/16 10:58	04/08/16 01:21	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0250	J	mg/l	0.0300	0.0070	1	04/07/16 10:58	04/08/16 01:21	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.93		mg/l	0.050	0.020	1	04/07/16 10:58	04/08/16 01:21	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.466		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/08/16 01:21	EPA 3005A	1,6010C	PS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-14 Batch: WG881274-1										
Arsenic, Dissolved	0.0031	J	mg/l	0.0050	0.0020	1	04/07/16 10:58	04/07/16 19:14	1,6010C	PS
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	04/07/16 10:58	04/07/16 19:14	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	04/07/16 10:58	04/07/16 19:14	1,6010C	PS
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	04/07/16 10:58	04/07/16 19:14	1,6010C	PS

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-DENNIS PRB

Project Number: WV-1009

Lab Number: L1609568

Report Date: 04/08/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-14 Batch: WG881274-2								
Arsenic, Dissolved	108		-		80-120	-		
Boron, Dissolved	107		-		80-120	-		
Iron, Dissolved	97		-		80-120	-		
Manganese, Dissolved	102		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-14 QC Batch ID: WG881274-4 QC Sample: L1609568-01 Client ID: VLZ-66												
Arsenic, Dissolved	ND	0.12	0.131	109		-	-		75-125	-		20
Boron, Dissolved	0.0366	1	1.11	107		-	-		75-125	-		20
Iron, Dissolved	0.14	1	1.1	96		-	-		75-125	-		20
Manganese, Dissolved	0.0141	0.5	0.524	102		-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-14 QC Batch ID: WG881274-3 QC Sample: L1609568-01 Client ID: VLZ-66						
Arsenic, Dissolved	ND	0.0021J	mg/l	NC		20
Boron, Dissolved	0.0366	0.0338	mg/l	8		20
Iron, Dissolved	0.14	0.16	mg/l	13		20
Manganese, Dissolved	0.0141	0.0140	mg/l	1		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-01
Client ID: VLZ-66
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 03/31/16 18:15
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	7.20		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	5.5		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	0.030	J	mg/l	0.075	0.028	1	04/06/16 11:15	04/06/16 15:56	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:18	44,353.2	MR
Nitrogen, Nitrate	3.2		mg/l	0.10	0.019	1	-	04/01/16 23:18	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.2		mg/l	0.10	0.019	1	-	04/01/16 23:18	44,353.2	MR
Total Nitrogen	3.2		mg/l	0.30	0.30	1	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/06/16 09:59	04/06/16 16:36	121,4500N-C	JO
Phosphorus, Orthophosphate	0.008		mg/l	0.005	0.001	1	-	04/02/16 01:52	121,4500P-E	LH
Dissolved Organic Carbon	0.55	J	mg/l	1.0	0.12	1	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	36.8		mg/l	0.500	0.054	1	-	04/04/16 12:38	44,300.0	JT
Sulfate	12.6		mg/l	1.00	0.150	1	-	04/04/16 12:38	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-02
Client ID: VL-2
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 03/31/16 17:00
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.50		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	5.0		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/06/16 11:15	04/06/16 16:00	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:28	44,353.2	MR
Nitrogen, Nitrate	4.4		mg/l	0.10	0.019	1	-	04/01/16 23:28	44,353.2	MR
Nitrogen, Nitrate/Nitrite	4.4		mg/l	0.10	0.019	1	-	04/01/16 23:28	44,353.2	MR
Total Nitrogen	4.8		mg/l	0.30	0.30	1	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	0.392		mg/l	0.300	0.066	1	04/06/16 09:59	04/06/16 16:39	121,4500N-C	JO
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	04/02/16 01:52	121,4500P-E	LH
Dissolved Organic Carbon	0.95	J	mg/l	1.0	0.12	1	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	72.2		mg/l	2.50	0.270	5	-	04/04/16 16:14	44,300.0	JT
Sulfate	11.1		mg/l	1.00	0.150	1	-	04/04/16 12:50	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-03
Client ID: VLZ-61-DUP
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 03/31/16 18:40
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	5.40		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	5.3		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	0.044	J	mg/l	0.075	0.028	1	04/06/16 11:15	04/06/16 16:00	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:30	44,353.2	MR
Nitrogen, Nitrate	2.8		mg/l	0.10	0.019	1	-	04/01/16 23:30	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.8		mg/l	0.10	0.019	1	-	04/01/16 23:30	44,353.2	MR
Total Nitrogen	2.8		mg/l	0.30	0.30	1	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	0.128	J	mg/l	0.300	0.066	1	04/06/16 09:59	04/06/16 16:40	121,4500N-C	JO
Phosphorus, Orthophosphate	0.009		mg/l	0.005	0.001	1	-	04/02/16 01:53	121,4500P-E	LH
Dissolved Organic Carbon	0.81	J	mg/l	1.0	0.12	1	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	31.9		mg/l	0.500	0.054	1	-	04/04/16 13:02	44,300.0	JT
Sulfate	11.3		mg/l	1.00	0.150	1	-	04/04/16 13:02	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-04
Client ID: VLZ-61
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 03/31/16 18:25
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	5.40		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	5.4		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/06/16 11:15	04/06/16 16:01	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:31	44,353.2	MR
Nitrogen, Nitrate	2.8		mg/l	0.10	0.019	1	-	04/01/16 23:31	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.8		mg/l	0.10	0.019	1	-	04/01/16 23:31	44,353.2	MR
Total Nitrogen	2.8		mg/l	0.30	0.30	1	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/06/16 09:59	04/06/16 16:40	121,4500N-C	JO
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	04/02/16 01:53	121,4500P-E	LH
Dissolved Organic Carbon	0.49	J	mg/l	1.0	0.12	1	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	31.9		mg/l	0.500	0.054	1	-	04/04/16 13:14	44,300.0	JT
Sulfate	12.0		mg/l	1.00	0.150	1	-	04/04/16 13:14	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-05
Client ID: VLZ-56
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 04/01/16 09:05
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	6.70		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	5.4		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/06/16 11:15	04/06/16 16:02	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:32	44,353.2	MR
Nitrogen, Nitrate	4.2		mg/l	0.10	0.019	1	-	04/01/16 23:32	44,353.2	MR
Nitrogen, Nitrate/Nitrite	4.2		mg/l	0.10	0.019	1	-	04/01/16 23:32	44,353.2	MR
Total Nitrogen	4.2		mg/l	0.30	0.30	1	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/06/16 09:59	04/06/16 16:44	121,4500N-C	JO
Phosphorus, Orthophosphate	0.008		mg/l	0.005	0.001	1	-	04/02/16 01:53	121,4500P-E	LH
Dissolved Organic Carbon	0.68	J	mg/l	1.0	0.12	1	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	33.3		mg/l	0.500	0.054	1	-	04/04/16 13:26	44,300.0	JT
Sulfate	10.8		mg/l	1.00	0.150	1	-	04/04/16 13:26	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-06
Client ID: VLZ-52
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 04/01/16 10:45
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	10.0		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	5.8		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	0.031	J	mg/l	0.075	0.028	1	04/07/16 08:16	04/07/16 18:36	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:33	44,353.2	MR
Nitrogen, Nitrate	4.0		mg/l	0.10	0.019	1	-	04/01/16 23:33	44,353.2	MR
Nitrogen, Nitrate/Nitrite	4.0		mg/l	0.10	0.019	1	-	04/01/16 23:33	44,353.2	MR
Total Nitrogen	5.1		mg/l	0.30	0.30	1	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	1.09		mg/l	0.300	0.066	1	04/06/16 09:59	04/06/16 16:45	121,4500N-C	JO
Phosphorus, Orthophosphate	0.017		mg/l	0.005	0.001	1	-	04/02/16 01:55	121,4500P-E	LH
Dissolved Organic Carbon	0.68	J	mg/l	2.0	0.24	2	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	31.5		mg/l	0.500	0.054	1	-	04/04/16 13:38	44,300.0	JT
Sulfate	11.3		mg/l	1.00	0.150	1	-	04/04/16 13:38	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-07
Client ID: VL-1
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 04/01/16 12:15
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.20		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	4.4		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/06/16 11:15	04/06/16 16:04	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:35	44,353.2	MR
Nitrogen, Nitrate	2.2		mg/l	0.10	0.019	1	-	04/01/16 23:35	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.2		mg/l	0.10	0.019	1	-	04/01/16 23:35	44,353.2	MR
Total Nitrogen	2.5		mg/l	0.30	0.30	1	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	0.308		mg/l	0.300	0.066	1	04/06/16 09:59	04/06/16 16:46	121,4500N-C	JO
Phosphorus, Orthophosphate	0.007		mg/l	0.005	0.001	1	-	04/02/16 01:55	121,4500P-E	LH
Dissolved Organic Carbon	0.72	J	mg/l	1.0	0.12	1	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	41.4		mg/l	0.500	0.054	1	-	04/04/16 13:50	44,300.0	JT
Sulfate	14.1		mg/l	1.00	0.150	1	-	04/04/16 13:50	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-08
Client ID: VL-3
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 04/01/16 13:15
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.90		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	4.6		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	0.032	J	mg/l	0.075	0.028	1	04/07/16 08:16	04/07/16 18:36	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:36	44,353.2	MR
Nitrogen, Nitrate	5.8		mg/l	0.10	0.019	1	-	04/01/16 23:36	44,353.2	MR
Nitrogen, Nitrate/Nitrite	5.8		mg/l	0.10	0.019	1	-	04/01/16 23:36	44,353.2	MR
Total Nitrogen	5.8		mg/l	0.60	0.60	2	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	0.351	J	mg/l	0.600	0.132	2	04/06/16 09:59	04/06/16 16:47	121,4500N-C	JO
Phosphorus, Orthophosphate	0.011		mg/l	0.005	0.001	1	-	04/02/16 01:56	121,4500P-E	LH
Dissolved Organic Carbon	1.0	J	mg/l	2.0	0.24	2	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	56.0		mg/l	2.50	0.270	5	-	04/04/16 16:50	44,300.0	JT
Sulfate	13.6		mg/l	1.00	0.150	1	-	04/04/16 14:02	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-09
Client ID: VL-3 DUP
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 04/01/16 13:25
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.80		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	4.7		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	0.051	J	mg/l	0.075	0.028	1	04/06/16 11:15	04/06/16 16:06	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:41	44,353.2	MR
Nitrogen, Nitrate	5.9		mg/l	0.10	0.019	1	-	04/01/16 23:41	44,353.2	MR
Nitrogen, Nitrate/Nitrite	5.9		mg/l	0.10	0.019	1	-	04/01/16 23:41	44,353.2	MR
Total Nitrogen	5.9		mg/l	0.60	0.60	2	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	0.132	J	mg/l	0.600	0.132	2	04/06/16 09:59	04/06/16 16:47	121,4500N-C	JO
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	04/02/16 01:56	121,4500P-E	LH
Dissolved Organic Carbon	1.1	J	mg/l	2.0	0.24	2	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	55.8		mg/l	2.50	0.270	5	-	04/04/16 17:02	44,300.0	JT
Sulfate	13.3		mg/l	1.00	0.150	1	-	04/04/16 14:38	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-10
Client ID: VL-4
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 04/01/16 14:15
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	3.60		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	4.6		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/07/16 08:16	04/07/16 18:37	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:43	44,353.2	MR
Nitrogen, Nitrate	6.2		mg/l	0.10	0.019	1	-	04/01/16 23:43	44,353.2	MR
Nitrogen, Nitrate/Nitrite	6.2		mg/l	0.10	0.019	1	-	04/01/16 23:43	44,353.2	MR
Total Nitrogen	8.6		mg/l	0.60	0.60	2	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	2.41		mg/l	0.600	0.132	2	04/06/16 09:59	04/06/16 16:48	121,4500N-C	JO
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	04/02/16 01:56	121,4500P-E	LH
Dissolved Organic Carbon	0.86	J	mg/l	2.0	0.24	2	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	56.6		mg/l	2.50	0.270	5	-	04/04/16 17:14	44,300.0	JT
Sulfate	11.9		mg/l	1.00	0.150	1	-	04/04/16 14:50	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-11
Client ID: VL-5
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 04/01/16 15:30
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	4.10		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	5.0		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	0.035	J	mg/l	0.075	0.028	1	04/06/16 11:15	04/06/16 16:07	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:44	44,353.2	MR
Nitrogen, Nitrate	1.9		mg/l	0.10	0.019	1	-	04/01/16 23:44	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.9		mg/l	0.10	0.019	1	-	04/01/16 23:44	44,353.2	MR
Total Nitrogen	2.3		mg/l	0.30	0.30	1	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	0.384		mg/l	0.300	0.066	1	04/06/16 09:59	04/06/16 16:49	121,4500N-C	JO
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	04/02/16 01:56	121,4500P-E	LH
Dissolved Organic Carbon	0.89	J	mg/l	1.0	0.12	1	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	29.6		mg/l	0.500	0.054	1	-	04/04/16 15:02	44,300.0	JT
Sulfate	10.6		mg/l	1.00	0.150	1	-	04/04/16 15:02	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-12
Client ID: VL-6
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 04/01/16 16:15
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	12.3		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	5.8		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	0.089		mg/l	0.075	0.028	1	04/07/16 08:16	04/07/16 18:41	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:45	44,353.2	MR
Nitrogen, Nitrate	1.2		mg/l	0.10	0.019	1	-	04/01/16 23:45	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.2		mg/l	0.10	0.019	1	-	04/01/16 23:45	44,353.2	MR
Total Nitrogen	5.6		mg/l	0.30	0.30	1	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	4.36		mg/l	0.300	0.066	1	04/06/16 09:59	04/06/16 16:50	121,4500N-C	JO
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	04/02/16 01:57	121,4500P-E	LH
Dissolved Organic Carbon	0.79	J	mg/l	1.0	0.12	1	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	32.3		mg/l	0.500	0.054	1	-	04/04/16 15:14	44,300.0	JT
Sulfate	15.6		mg/l	1.00	0.150	1	-	04/04/16 15:14	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-13
Client ID: VLZ-44
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 04/01/16 09:15
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.50		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	4.8		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/06/16 11:15	04/06/16 16:12	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:46	44,353.2	MR
Nitrogen, Nitrate	4.3		mg/l	0.10	0.019	1	-	04/01/16 23:46	44,353.2	MR
Nitrogen, Nitrate/Nitrite	4.3		mg/l	0.10	0.019	1	-	04/01/16 23:46	44,353.2	MR
Total Nitrogen	4.3		mg/l	0.30	0.30	1	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/06/16 09:59	04/06/16 16:51	121,4500N-C	JO
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	04/02/16 01:57	121,4500P-E	LH
Dissolved Organic Carbon	0.72	J	mg/l	1.0	0.12	1	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	88.9		mg/l	2.50	0.270	5	-	04/04/16 17:26	44,300.0	JT
Sulfate	11.6		mg/l	1.00	0.150	1	-	04/04/16 15:26	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

SAMPLE RESULTS

Lab ID: L1609568-14
Client ID: VLZ-48
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 04/01/16 11:20
Date Received: 04/01/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	14.4		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
pH (H)	5.9		SU	-	NA	1	-	04/01/16 23:17	121,4500H+-B	AS
Nitrogen, Ammonia	0.029	J	mg/l	0.075	0.028	1	04/06/16 11:15	04/06/16 16:12	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:56	44,353.2	MR
Nitrogen, Nitrate	2.4		mg/l	0.10	0.019	1	-	04/02/16 00:02	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.4		mg/l	0.10	0.019	1	-	04/02/16 00:02	44,353.2	MR
Total Nitrogen	2.4		mg/l	0.30	0.30	1	-	04/08/16 10:04	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/06/16 09:59	04/06/16 16:52	121,4500N-C	JO
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	04/02/16 01:57	121,4500P-E	LH
Dissolved Organic Carbon	0.57	J	mg/l	1.0	0.12	1	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
Anions by Ion Chromatography - Westborough Lab										
Chloride	34.3		mg/l	0.500	0.054	1	-	04/04/16 15:38	44,300.0	JT
Sulfate	18.1		mg/l	1.00	0.150	1	-	04/04/16 15:38	44,300.0	JT

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-04 Batch: WG879692-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	04/01/16 23:08	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-04 Batch: WG879693-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:10	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 05-14 Batch: WG879694-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	04/01/16 23:13	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 05-14 Batch: WG879695-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	04/01/16 23:15	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-04 Batch: WG879697-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	04/01/16 23:08	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 05-14 Batch: WG879698-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	04/01/16 23:13	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-14 Batch: WG879720-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	04/02/16 01:48	121,4500P-E	LH
General Chemistry - Westborough Lab for sample(s): 01-14 Batch: WG880045-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	04/04/16 09:53	121,2320B	AW
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-14 Batch: WG880242-1										
Sulfate	ND		mg/l	1.00	0.150	1	-	04/04/16 12:14	44,300.0	JT
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-14 Batch: WG880242-1										
Chloride	ND		mg/l	0.500	0.054	1	-	04/04/16 12:14	44,300.0	JT
General Chemistry - Westborough Lab for sample(s): 01-14 Batch: WG880552-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	04/05/16 18:24	04/05/16 18:24	121,5310C	ML
General Chemistry - Westborough Lab for sample(s): 01-14 Batch: WG880761-1										
Nitrogen, Total Kjeldahl	0.072	J	mg/l	0.300	0.022	1	04/06/16 09:59	04/06/16 16:33	121,4500N-C	JO
General Chemistry - Westborough Lab for sample(s): 01-05,07,09,11,13-14 Batch: WG880765-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/06/16 11:15	04/06/16 15:48	44,350.1	JO
General Chemistry - Westborough Lab for sample(s): 06,08,10,12 Batch: WG881208-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/07/16 08:16	04/07/16 18:33	44,350.1	JO

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 Batch: WG879692-2								
Nitrogen, Nitrate	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-04 Batch: WG879693-2								
Nitrogen, Nitrite	104		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 05-14 Batch: WG879694-2								
Nitrogen, Nitrate	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 05-14 Batch: WG879695-2								
Nitrogen, Nitrite	102		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-04 Batch: WG879697-2								
Nitrogen, Nitrate/Nitrite	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 05-14 Batch: WG879698-2								
Nitrogen, Nitrate/Nitrite	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-14 Batch: WG879715-1								
pH	101		-		99-101	-		5

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-14 Batch: WG879720-2					
Phosphorus, Orthophosphate	100	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-14 Batch: WG880045-2					
Alkalinity, Total	104	-	90-110	-	10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-14 Batch: WG880242-2					
Chloride	100	-	90-110	-	
Sulfate	101	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-14 Batch: WG880552-2					
Dissolved Organic Carbon	94	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-14 Batch: WG880761-2					
Nitrogen, Total Kjeldahl	94	-	78-122	-	
General Chemistry - Westborough Lab Associated sample(s): 01-05,07,09,11,13-14 Batch: WG880765-2					
Nitrogen, Ammonia	92	-	80-120	-	20
General Chemistry - Westborough Lab Associated sample(s): 06,08,10,12 Batch: WG881208-2					
Nitrogen, Ammonia	88	-	80-120	-	20

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG879692-4 QC Sample: L1609568-01 Client ID: VLZ-66												
Nitrogen, Nitrate	3.2	4	7.1	98		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG879693-4 QC Sample: L1609568-01 Client ID: VLZ-66												
Nitrogen, Nitrite	ND	4	4.1	102		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 05-14 QC Batch ID: WG879694-4 QC Sample: L1609568-13 Client ID: VLZ-44												
Nitrogen, Nitrate	4.3	4	8.2	98		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 05-14 QC Batch ID: WG879695-4 QC Sample: L1609568-13 Client ID: VLZ-44												
Nitrogen, Nitrite	ND	4	4.1	102		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG879697-4 QC Sample: L1609568-01 Client ID: VLZ-66												
Nitrogen, Nitrate/Nitrite	3.2	4	7.1	98		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 05-14 QC Batch ID: WG879698-4 QC Sample: L1609568-13 Client ID: VLZ-44												
Nitrogen, Nitrate/Nitrite	4.3	4	8.2	98		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-14 QC Batch ID: WG879720-4 QC Sample: L1609568-14 Client ID: VLZ-48												
Phosphorus, Orthophosphate	0.006	0.5	0.487	96		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-14 QC Batch ID: WG880045-4 QC Sample: L1609568-04 Client ID: VLZ-61												
Alkalinity, Total	5.40	100	107	102		-	-		86-116	-		10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-14 QC Batch ID: WG880242-3 QC Sample: L1609568-01 Client ID: VLZ-66												
Chloride	36.8	4	39.2	63		-	-		40-151	-		18
Sulfate	12.6	8	21.2	108		-	-		60-140	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-14 QC Batch ID: WG880552-4 QC Sample: L1609568-01 Client ID: VLZ-66									
Dissolved Organic Carbon	0.55J	4	4.5	113	-	-	80-120	-	20
General Chemistry - Westborough Lab Associated sample(s): 01-14 QC Batch ID: WG880761-4 QC Sample: L1609568-01 Client ID: VLZ-66									
Nitrogen, Total Kjeldahl	ND	8	6.43	80	-	-	77-111	-	24
General Chemistry - Westborough Lab Associated sample(s): 01-05,07,09,11,13-14 QC Batch ID: WG880765-4 QC Sample: L1609115-01 Client ID: MS Sample									
Nitrogen, Ammonia	0.038J	4	3.90	98	-	-	80-120	-	20
General Chemistry - Westborough Lab Associated sample(s): 06,08,10,12 QC Batch ID: WG881208-4 QC Sample: L1609932-02 Client ID: MS Sample									
Nitrogen, Ammonia	ND	8	6.96	87	-	-	80-120	-	20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG879692-3 QC Sample: L1609568-01 Client ID: VLZ-66						
Nitrogen, Nitrate	3.2	3.2	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG879693-3 QC Sample: L1609568-01 Client ID: VLZ-66						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 05-14 QC Batch ID: WG879694-3 QC Sample: L1609568-13 Client ID: VLZ-44						
Nitrogen, Nitrate	4.3	4.4	mg/l	2		6
General Chemistry - Westborough Lab Associated sample(s): 05-14 QC Batch ID: WG879695-3 QC Sample: L1609568-13 Client ID: VLZ-44						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG879697-3 QC Sample: L1609568-01 Client ID: VLZ-66						
Nitrogen, Nitrate/Nitrite	3.2	3.2	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 05-14 QC Batch ID: WG879698-3 QC Sample: L1609568-13 Client ID: VLZ-44						
Nitrogen, Nitrate/Nitrite	4.3	4.4	mg/l	2		20
General Chemistry - Westborough Lab Associated sample(s): 01-14 QC Batch ID: WG879715-2 QC Sample: L1609409-01 Client ID: DUP Sample						
pH	7.9	7.8	SU	1		5
General Chemistry - Westborough Lab Associated sample(s): 01-14 QC Batch ID: WG879720-3 QC Sample: L1609568-13 Client ID: VLZ-44						
Phosphorus, Orthophosphate	0.005	0.006	mg/l	18		20
General Chemistry - Westborough Lab Associated sample(s): 01-14 QC Batch ID: WG880045-3 QC Sample: L1609568-04 Client ID: VLZ-61						
Alkalinity, Total	5.40	5.40	mg CaCO3/L	0		10

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-14 QC Batch ID: WG880242-4 QC Sample: L1609568-01 Client ID: VLZ-66					
Chloride	36.8	36.7	mg/l	0	18
Sulfate	12.6	12.5	mg/l	1	20
General Chemistry - Westborough Lab Associated sample(s): 01-14 QC Batch ID: WG880552-3 QC Sample: L1609568-02 Client ID: VL-2					
Dissolved Organic Carbon	0.95J	0.85J	mg/l	NC	20
General Chemistry - Westborough Lab Associated sample(s): 01-14 QC Batch ID: WG880761-3 QC Sample: L1609568-01 Client ID: VLZ-66					
Nitrogen, Total Kjeldahl	ND	ND	mg/l	NC	24
General Chemistry - Westborough Lab Associated sample(s): 01-05,07,09,11,13-14 QC Batch ID: WG880765-3 QC Sample: L1609115-01 Client ID: DUP Sample					
Nitrogen, Ammonia	0.038J	0.168	mg/l	NC	20
General Chemistry - Westborough Lab Associated sample(s): 06,08,10,12 QC Batch ID: WG881208-3 QC Sample: L1609932-01 Client ID: DUP Sample					
Nitrogen, Ammonia	ND	ND	mg/l	NC	20

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent
B	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1609568-01A	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-01B	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-01C	Plastic 250ml HNO3 preserved	A	<2	5.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609568-01D	Plastic 500ml unpreserved	A	7	5.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609568-01E	Plastic 500ml H2SO4 preserved	A	<2	5.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609568-01F	Plastic 250ml unpreserved w/No H	A	N/A	5.1	Y	Absent	ALK-T-2320(14)
L1609568-02A	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-02B	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-02C	Plastic 250ml HNO3 preserved	A	<2	5.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609568-02D	Plastic 500ml unpreserved	A	7	5.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609568-02E	Plastic 500ml H2SO4 preserved	A	<2	5.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609568-02F	Plastic 250ml unpreserved w/No H	A	N/A	5.1	Y	Absent	ALK-T-2320(14)
L1609568-03A	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-03B	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-03C	Plastic 250ml HNO3 preserved	A	<2	5.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609568-03D	Plastic 500ml unpreserved	A	7	5.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609568-03E	Plastic 500ml H2SO4 preserved	A	<2	5.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609568-03F	Plastic 250ml unpreserved w/No H	A	N/A	5.1	Y	Absent	ALK-T-2320(14)
L1609568-04A	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-04B	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-04C	Plastic 250ml HNO3 preserved	A	<2	5.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1609568-04D	Plastic 500ml unpreserved	A	7	5.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609568-04E	Plastic 500ml H2SO4 preserved	A	<2	5.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609568-04F	Plastic 250ml unpreserved w/No H	A	N/A	5.1	Y	Absent	ALK-T-2320(14)
L1609568-05A	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-05B	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-05C	Plastic 250ml HNO3 preserved	A	<2	5.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609568-05D	Plastic 500ml unpreserved	A	7	5.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609568-05E	Plastic 500ml H2SO4 preserved	A	<2	5.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609568-05F	Plastic 250ml unpreserved w/No H	A	N/A	5.1	Y	Absent	ALK-T-2320(14)
L1609568-06A	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-06B	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-06C	Plastic 250ml HNO3 preserved	A	<2	5.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609568-06D	Plastic 500ml unpreserved	A	7	5.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609568-06E	Plastic 500ml H2SO4 preserved	A	<2	5.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609568-06F	Plastic 250ml unpreserved w/No H	A	N/A	5.1	Y	Absent	ALK-T-2320(14)
L1609568-07A	Vial H2SO4 preserved	B	N/A	4.7	Y	Absent	DOC-5310(28)
L1609568-07B	Vial H2SO4 preserved	B	N/A	4.7	Y	Absent	DOC-5310(28)
L1609568-07C	Plastic 250ml HNO3 preserved	B	<2	4.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609568-07D	Plastic 500ml unpreserved	B	7	4.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609568-07E	Plastic 500ml H2SO4 preserved	B	<2	4.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609568-07F	Plastic 250ml unpreserved w/No H	B	N/A	4.7	Y	Absent	ALK-T-2320(14)
L1609568-08A	Vial H2SO4 preserved	B	N/A	4.7	Y	Absent	DOC-5310(28)
L1609568-08B	Vial H2SO4 preserved	B	N/A	4.7	Y	Absent	DOC-5310(28)
L1609568-08C	Plastic 250ml HNO3 preserved	B	<2	4.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609568-08D	Plastic 500ml unpreserved	B	7	4.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)

*Values in parentheses indicate holding time in days

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1609568-08E	Plastic 500ml H2SO4 preserved	B	<2	4.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609568-08F	Plastic 250ml unpreserved w/No H	B	N/A	4.7	Y	Absent	ALK-T-2320(14)
L1609568-09A	Vial H2SO4 preserved	B	N/A	4.7	Y	Absent	DOC-5310(28)
L1609568-09B	Vial H2SO4 preserved	B	N/A	4.7	Y	Absent	DOC-5310(28)
L1609568-09C	Plastic 250ml HNO3 preserved	B	<2	4.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609568-09D	Plastic 500ml unpreserved	B	7	4.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609568-09E	Plastic 500ml H2SO4 preserved	B	<2	4.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609568-09F	Plastic 250ml unpreserved w/No H	B	N/A	4.7	Y	Absent	ALK-T-2320(14)
L1609568-10A	Vial H2SO4 preserved	B	N/A	4.7	Y	Absent	DOC-5310(28)
L1609568-10B	Vial H2SO4 preserved	B	N/A	4.7	Y	Absent	DOC-5310(28)
L1609568-10C	Plastic 250ml HNO3 preserved	B	<2	4.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609568-10D	Plastic 500ml unpreserved	B	7	4.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609568-10E	Plastic 500ml H2SO4 preserved	B	<2	4.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609568-10F	Plastic 250ml unpreserved w/No H	B	N/A	4.7	Y	Absent	ALK-T-2320(14)
L1609568-11A	Vial H2SO4 preserved	B	N/A	4.7	Y	Absent	DOC-5310(28)
L1609568-11B	Vial H2SO4 preserved	B	N/A	4.7	Y	Absent	DOC-5310(28)
L1609568-11C	Plastic 250ml HNO3 preserved	B	<2	4.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609568-11D	Plastic 500ml unpreserved	B	7	4.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609568-11E	Plastic 500ml H2SO4 preserved	B	<2	4.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609568-11F	Plastic 250ml unpreserved w/No H	B	N/A	4.7	Y	Absent	ALK-T-2320(14)
L1609568-12A	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-12B	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-12C	Plastic 250ml HNO3 preserved	A	<2	5.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609568-12D	Plastic 500ml unpreserved	A	7	5.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609568-12E	Plastic 500ml H2SO4 preserved	A	<2	5.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)

*Values in parentheses indicate holding time in days

Project Name: EPA-DENNIS PRB
Project Number: WV-1009

Lab Number: L1609568
Report Date: 04/08/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1609568-12F	Plastic 250ml unpreserved w/No H	A	N/A	5.1	Y	Absent	ALK-T-2320(14)
L1609568-13A	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-13B	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	DOC-5310(28)
L1609568-13C	Plastic 250ml HNO3 preserved	A	<2	5.1	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609568-13D	Plastic 500ml unpreserved	A	7	5.1	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609568-13E	Plastic 500ml H2SO4 preserved	A	<2	5.1	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609568-13F	Plastic 250ml unpreserved w/No H	A	N/A	5.1	Y	Absent	ALK-T-2320(14)
L1609568-14A	Vial H2SO4 preserved	B	N/A	4.7	Y	Absent	DOC-5310(28)
L1609568-14B	Vial H2SO4 preserved	B	N/A	4.7	Y	Absent	DOC-5310(28)
L1609568-14C	Plastic 250ml HNO3 preserved	B	<2	4.7	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609568-14D	Plastic 500ml unpreserved	B	7	4.7	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609568-14E	Plastic 500ml H2SO4 preserved	B	<2	4.7	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609568-14F	Plastic 250ml unpreserved w/No H	B	N/A	4.7	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name:	EPA-DENNIS PRB	**Lab Number:**	L1609568
Project Number:	WV-1009	**Report Date:**	04/08/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-DENNIS PRB	**Lab Number:**	L1609568
Project Number:	WV-1009	**Report Date:**	04/08/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name: EPA-DENNIS PRB
Project Number: WV-1009
Lab Number: L1609568
Report Date: 04/08/16

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

Serial_No:04081613:11

CHAIN OF CUSTODY

PAGE 1 OF 2

ALPHA ANALYTICAL

8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Date Rec'd in Lab: 4/1/16

ALPHA Job #: L1609568

Project Information

Project Name: EPA - Dennis PRB
Project Location: Dennis, MA
Project #: WV-1009
Project Manager: Danna Truslow
ALPHA Quote #:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Client Information

Client: Watervision LLC
Address: 481 Great Rd, Acton, MA
Phone: 603-498-2916
Email: dtruslow@watervisionllc.com

Regulatory Requirements & Project Information Requirements

☐ Yes ☒ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☒ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☐ Other State /Fed Program ____ Criteria ____

Turn-Around Time

☒ Standard ☐ RUSH *(only confirmed if pre-approved!)*

Date Due:

Additional Project Information:

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; (A) pH, SO4, Cl, NO3, NO2, o-phos; (B) Dissolved As, Mn, Fe, Ba; (C) Total N, NH3; (D) Alk - Total; (E) DOC

SAMPLE INFO — Filtration: ☒ Field ☐ Lab to do; Preservation: ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	pH, SO4, Cl, NO3, NO2, o-phos	Dissolved As, Mn, Fe, Ba	Total N, NH3	Alk - Total	DOC	Sample Comments	Total # Bottles
09568-01	VLZ-66	3-31-16	18:15	water	SW	✓	✓	✓	✓	✓		
02	VL-2	3-31-16	17:00	water	DT	✓	✓	✓	✓	✓		
03	VLZ-61-dup	3-31-16	18:40	water	DT	✓	✓	✓	✓	✓		
04	VLZ-61	3-31-16	18:25	water	DT	✓	✓	✓	✓	✓		
05	VLZ-50	4-01-16	9:05	"	"	✓	✓	✓	✓	✓		
06	VLZ-52	4-01-16	10:45	"	"	✓	✓	✓	✓	✓		
07	VL-1	4-01-16	12:15	"	"	✓	✓	✓	✓	✓		
08	VL-3	4-01-16	13:15	"	"	✓	✓	✓	✓	✓		
09	VL-3 dup	4-01-16	13:25	"	"	✓	✓	✓	✓	✓		
10	VL-4	4-01-16	14:15	"	"	✓	✓	✓	✓	✓		

Container Type	
Preservative	

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	19:10 4-1-16	Richard Scott	4/1/16 19:10

FORM NO: 01-01 (rev. 12-Mar-2012)

CHAIN OF CUSTODY

PAGE 2 OF 2

Date Rec'd in Lab: 4/1/16

ALPHA Job #: L1609568

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Project Information

Project Name: EPA-Dennis PRB
Project Location: Dennis, MA
Project #: WV-1009
Project Manager: Danna Troslow
ALPHA Quote #:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Client Information

Client: Watervision LLC
Address: 481 Great Rd, Acton, MA
Phone: 603-498-2916
Email: dtroslow@watervisionllc.com

Additional Project Information:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Regulatory Requirements & Project Information Requirements

☐ Yes ☒ No MA MCP Analytical Methods
☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☒ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☐ Other State /Fed Program Criteria

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2
SVOC: ☐ ABN ☐ PAH
METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15
METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13
EPH: ☐ Ranges & Targets ☐ Ranges Only
VPH: ☐ Ranges & Targets ☐ Ranges Only
☐ PCB ☐ PEST
TPH: ☐ Quant Only ☐ Fingerprint
pH, SO_4, Cl, NO_3, NO_2, DOC
Dissolved Fe, Mn, As, Ba, Pb
Total N
ALK-total, NH_3
SO_4/H_2S

SAMPLE INFO
Filtration: ☒ Field ☐ Lab to do
Preservation: ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	pH, SO4, Cl, NO3, NO2, DOC	Dissolved Fe, Mn, As, Ba, Pb	Total N	ALK-total, NH3	SO4/H2S	Sample Comments	Total # Bottles
09568-11	VL-5	4-1-16	15:30	water	SW	✓	✓	✓	✓	✓		
12	VL-6	4-1-16	16:15	water	SW	✓	✓	✓	✓	✓		
13	VLZ-44	4-1-16	9:15	water	SW	✓	✓	✓	✓	✓		
14	VLZ-48	4-1-16	11:20	water	SW	✓	✓	✓	✓	✓		

Container Type
Preservative

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	19:10 4/1/16	Richard Scott	4/1/16 19:20

FORM NO: 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L1613820
Client:	Watervision, LLC 454 Court Street Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA-PRB-DENNIS
Project Number:	WV-1009
Report Date:	05/12/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1613820-01	VL-1	WATER	DENNIS, MA	05/06/16 13:35	05/06/16
L1613820-02	VL-2	WATER	DENNIS, MA	05/06/16 09:20	05/06/16
L1613820-03	VL-3	WATER	DENNIS, MA	05/06/16 10:10	05/06/16
L1613820-04	VL-3 DUP	WATER	DENNIS, MA	05/06/16 10:12	05/06/16
L1613820-05	VL-4	WATER	DENNIS, MA	05/06/16 10:47	05/06/16
L1613820-06	VL-5	WATER	DENNIS, MA	05/06/16 11:35	05/06/16
L1613820-07	VL-6	WATER	DENNIS, MA	05/06/16 12:16	05/06/16
L1613820-08	VLZ-48	WATER	DENNIS, MA	05/06/16 12:40	05/06/16
L1613820-09	VLZ-66	WATER	DENNIS, MA	05/06/16 09:30	05/06/16
L1613820-10	VLZ-61	WATER	DENNIS, MA	05/06/16 10:20	05/06/16
L1613820-11	VLZ-56	WATER	DENNIS, MA	05/06/16 11:10	05/06/16
L1613820-12	VLZ-52	WATER	DENNIS, MA	05/06/16 12:15	05/06/16

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA-PRB-DENNIS **Lab Number:** L1613820
Project Number: WV-1009 **Report Date:** 05/12/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Dissolved Metals

The WG891518-4 MS recoveries, performed on L1613820-01, are outside the acceptance criteria for arsenic (153%), boron (143%), iron (130%) and manganese (133%). A post digestion spike was performed and yielded unacceptable recoveries for arsenic (212%), boron (184%), iron (190%) and manganese (197%). This has been attributed to sample matrix.

Nitrogen, Total Kjeldahl

L1613820-03, -04 and -05: The sample has an elevated detection limit due to the dilution required by the sample matrix.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

The WG892033-4 MS recovery (127%), performed on L1613820-12, is outside the acceptance criteria; however, the associated LCS recovery is within criteria. No further action was taken.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Kelly Stenstrom

Title: Technical Director/Representative Date: 05/12/16

METALS

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-01
Client ID: VL-1
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 13:35
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/09/16 23:52	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0174	J	mg/l	0.0300	0.0070	1	05/07/16 05:40	05/09/16 23:52	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.042	J	mg/l	0.050	0.020	1	05/07/16 05:40	05/09/16 23:52	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0263		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/09/16 23:52	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-02
Client ID: VL-2
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 09:20
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/10/16 00:33	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0328		mg/l	0.0300	0.0070	1	05/07/16 05:40	05/10/16 00:33	EPA 3005A	1,6010C	AB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/07/16 05:40	05/10/16 00:33	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0429		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/10/16 00:33	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-03
Client ID: VL-3
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 10:10
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/10/16 00:37	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0286	J	mg/l	0.0300	0.0070	1	05/07/16 05:40	05/10/16 00:37	EPA 3005A	1,6010C	AB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/07/16 05:40	05/10/16 00:37	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0449		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/10/16 00:37	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-04
Client ID: VL-3 DUP
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 10:12
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/10/16 00:42	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0284	J	mg/l	0.0300	0.0070	1	05/07/16 05:40	05/10/16 00:42	EPA 3005A	1,6010C	AB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/07/16 05:40	05/10/16 00:42	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0451		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/10/16 00:42	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-05
Client ID: VL-4
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 10:47
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/10/16 00:46	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0180	J	mg/l	0.0300	0.0070	1	05/07/16 05:40	05/10/16 00:46	EPA 3005A	1,6010C	AB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/07/16 05:40	05/10/16 00:46	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0497		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/10/16 00:46	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-06
Client ID: VL-5
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 11:35
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/10/16 00:51	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0112	J	mg/l	0.0300	0.0070	1	05/07/16 05:40	05/10/16 00:51	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.023	J	mg/l	0.050	0.020	1	05/07/16 05:40	05/10/16 00:51	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0130		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/10/16 00:51	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-07
Client ID: VL-6
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 12:16
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/10/16 00:55	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0101	J	mg/l	0.0300	0.0070	1	05/07/16 05:40	05/10/16 00:55	EPA 3005A	1,6010C	AB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/07/16 05:40	05/10/16 00:55	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0157		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/10/16 00:55	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-08
Client ID: VLZ-48
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 12:40
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/10/16 01:00	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0202	J	mg/l	0.0300	0.0070	1	05/07/16 05:40	05/10/16 01:00	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.51		mg/l	0.050	0.020	1	05/07/16 05:40	05/10/16 01:00	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.419		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/10/16 01:00	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-09
Client ID: VLZ-66
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 09:30
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/10/16 01:36	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0306		mg/l	0.0300	0.0070	1	05/07/16 05:40	05/10/16 01:36	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.67		mg/l	0.050	0.020	1	05/07/16 05:40	05/10/16 01:36	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0464		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/10/16 01:36	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-10
Client ID: VLZ-61
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 10:20
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/10/16 01:40	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0283	J	mg/l	0.0300	0.0070	1	05/07/16 05:40	05/10/16 01:40	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.022	J	mg/l	0.050	0.020	1	05/07/16 05:40	05/10/16 01:40	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0209		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/10/16 01:40	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-11
Client ID: VLZ-56
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 11:10
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/10/16 01:45	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0290	J	mg/l	0.0300	0.0070	1	05/07/16 05:40	05/10/16 01:45	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.69		mg/l	0.050	0.020	1	05/07/16 05:40	05/10/16 01:45	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.0263		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/10/16 01:45	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-12
Client ID: VLZ-52
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 12:15
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0027	J	mg/l	0.0050	0.0020	1	05/07/16 05:40	05/10/16 01:49	EPA 3005A	1,6010C	AB
Boron, Dissolved	0.0271	J	mg/l	0.0300	0.0070	1	05/07/16 05:40	05/10/16 01:49	EPA 3005A	1,6010C	AB
Iron, Dissolved	0.90		mg/l	0.050	0.020	1	05/07/16 05:40	05/10/16 01:49	EPA 3005A	1,6010C	AB
Manganese, Dissolved	0.104		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/10/16 01:49	EPA 3005A	1,6010C	AB

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-12 Batch: WG891518-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/07/16 05:40	05/09/16 23:38	1,6010C	AB
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/07/16 05:40	05/09/16 23:38	1,6010C	AB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/07/16 05:40	05/09/16 23:38	1,6010C	AB
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	05/07/16 05:40	05/09/16 23:38	1,6010C	AB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB-DENNIS

Project Number: WV-1009

Lab Number: L1613820

Report Date: 05/12/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-12 Batch: WG891518-2								
Arsenic, Dissolved	114		-		80-120	-		
Boron, Dissolved	108		-		80-120	-		
Iron, Dissolved	80		-		80-120	-		
Manganese, Dissolved	88		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG891518-4 QC Sample: L1613820-01 Client ID: VL-1												
Arsenic, Dissolved	ND	0.12	0.184	**153**	Q	-	-		75-125	-		20
Boron, Dissolved	0.0174J	1	1.43	**143**	Q	-	-		75-125	-		20
Iron, Dissolved	0.042J	1	1.3	**130**	Q	-	-		75-125	-		20
Manganese, Dissolved	0.0263	0.5	0.693	**133**	Q	-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG891518-3 QC Sample: L1613820-01 Client ID: VL-1						
Arsenic, Dissolved	ND	ND	mg/l	NC		20
Boron, Dissolved	0.0174J	0.0170J	mg/l	NC		20
Iron, Dissolved	0.042J	0.043J	mg/l	NC		20
Manganese, Dissolved	0.0263	0.0256	mg/l	3		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-01
Client ID: VL-1
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 05/06/16 13:35
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.20		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	4.3		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	0.037	J	mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 22:04	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 23:54	44,353.2	MR
Nitrogen, Nitrate	2.6		mg/l	0.10	0.019	1	-	05/06/16 23:54	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.6		mg/l	0.10	0.019	1	-	05/06/16 23:54	44,353.2	MR
Total Nitrogen	2.6		mg/l	0.30	0.30	1	-	05/10/16 12:07	107,-	JO
Nitrogen, Total Kjeldahl	0.083	J	mg/l	0.300	0.066	1	05/07/16 10:24	05/09/16 21:25	121,4500N-C	AT
Phosphorus, Orthophosphate	0.008		mg/l	0.005	0.001	1	-	05/07/16 00:24	121,4500P-E	MR
Dissolved Organic Carbon	1.1		mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	34.3		mg/l	0.500	0.054	1	-	05/09/16 19:15	44,300.0	AU
Sulfate	10.2		mg/l	1.00	0.150	1	-	05/09/16 19:15	44,300.0	AU

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-02
Client ID: VL-2
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 05/06/16 09:20
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.90		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	4.5		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 22:05	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 23:56	44,353.2	MR
Nitrogen, Nitrate	4.5		mg/l	0.10	0.019	1	-	05/06/16 23:56	44,353.2	MR
Nitrogen, Nitrate/Nitrite	4.5		mg/l	0.10	0.019	1	-	05/06/16 23:56	44,353.2	MR
Total Nitrogen	4.5		mg/l	0.30	0.30	1	-	05/10/16 12:07	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	05/07/16 10:24	05/09/16 21:27	121,4500N-C	AT
Phosphorus, Orthophosphate	0.008		mg/l	0.005	0.001	1	-	05/07/16 00:24	121,4500P-E	MR
Dissolved Organic Carbon	0.79	J	mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	40.9		mg/l	5.00	0.541	10	-	05/10/16 00:39	44,300.0	AU
Sulfate	10.6		mg/l	1.00	0.150	1	-	05/09/16 19:27	44,300.0	AU

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-03
Client ID: VL-3
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 05/06/16 10:10
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.50		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	4.4		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 22:06	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 23:57	44,353.2	MR
Nitrogen, Nitrate	7.1		mg/l	0.10	0.019	1	-	05/06/16 23:57	44,353.2	MR
Nitrogen, Nitrate/Nitrite	7.1		mg/l	0.10	0.019	1	-	05/06/16 23:57	44,353.2	MR
Total Nitrogen	7.1		mg/l	0.60	0.60	2	-	05/10/16 12:07	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.600	0.132	2	05/07/16 10:24	05/09/16 21:31	121,4500N-C	AT
Phosphorus, Orthophosphate	0.007		mg/l	0.005	0.001	1	-	05/07/16 00:25	121,4500P-E	MR
Dissolved Organic Carbon	0.97	J	mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	42.8		mg/l	5.00	0.541	10	-	05/10/16 00:51	44,300.0	AU
Sulfate	11.8		mg/l	1.00	0.150	1	-	05/09/16 20:03	44,300.0	AU

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-04
Client ID: VL-3 DUP
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 10:12
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.50		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	4.4		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 22:08	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/07/16 00:02	44,353.2	MR
Nitrogen, Nitrate	7.1		mg/l	0.10	0.019	1	-	05/07/16 00:02	44,353.2	MR
Nitrogen, Nitrate/Nitrite	7.1		mg/l	0.10	0.019	1	-	05/07/16 00:02	44,353.2	MR
Total Nitrogen	7.1		mg/l	0.60	0.60	2	-	05/10/16 12:07	107,-	JO
Nitrogen, Total Kjeldahl	0.238	J	mg/l	0.600	0.132	2	05/07/16 10:24	05/09/16 21:32	121,4500N-C	AT
Phosphorus, Orthophosphate	0.007		mg/l	0.005	0.001	1	-	05/07/16 00:25	121,4500P-E	MR
Dissolved Organic Carbon	0.84	J	mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	42.1		mg/l	5.00	0.541	10	-	05/10/16 01:03	44,300.0	AU
Sulfate	12.4		mg/l	1.00	0.150	1	-	05/09/16 20:15	44,300.0	AU

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-05
Client ID: VL-4
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 10:47
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	2.40		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	4.4		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	0.047	J	mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 22:12	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/07/16 00:03	44,353.2	MR
Nitrogen, Nitrate	7.4		mg/l	0.10	0.019	1	-	05/07/16 00:03	44,353.2	MR
Nitrogen, Nitrate/Nitrite	7.4		mg/l	0.10	0.019	1	-	05/07/16 00:03	44,353.2	MR
Total Nitrogen	7.4		mg/l	0.60	0.60	2	-	05/10/16 12:07	107,-	JO
Nitrogen, Total Kjeldahl	0.164	J	mg/l	0.600	0.132	2	05/07/16 10:24	05/09/16 21:33	121,4500N-C	AT
Phosphorus, Orthophosphate	0.007		mg/l	0.005	0.001	1	-	05/07/16 00:26	121,4500P-E	MR
Dissolved Organic Carbon	0.84	J	mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	43.0		mg/l	0.500	0.054	1	-	05/09/16 20:27	44,300.0	AU
Sulfate	11.7		mg/l	1.00	0.150	1	-	05/09/16 20:27	44,300.0	AU

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-06
Client ID: VL-5
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 05/06/16 11:35
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	5.90		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.0		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 22:13	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/07/16 00:05	44,353.2	MR
Nitrogen, Nitrate	1.0		mg/l	0.10	0.019	1	-	05/07/16 00:05	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.0		mg/l	0.10	0.019	1	-	05/07/16 00:05	44,353.2	MR
Total Nitrogen	1.0		mg/l	0.30	0.30	1	-	05/10/16 12:07	107,-	JO
Nitrogen, Total Kjeldahl	0.098	J	mg/l	0.300	0.066	1	05/07/16 10:24	05/09/16 21:33	121,4500N-C	AT
Phosphorus, Orthophosphate	0.009		mg/l	0.005	0.001	1	-	05/07/16 00:26	121,4500P-E	MR
Dissolved Organic Carbon	1.2		mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	15.5		mg/l	0.500	0.054	1	-	05/09/16 20:39	44,300.0	AU
Sulfate	4.49		mg/l	1.00	0.150	1	-	05/09/16 20:39	44,300.0	AU

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-07
Client ID: VL-6
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 05/06/16 12:16
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	4.80		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	4.9		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 22:14	44,350.1	AT
Nitrogen, Nitrite	0.014	J	mg/l	0.050	0.010	1	-	05/07/16 00:11	44,353.2	MR
Nitrogen, Nitrate	0.41		mg/l	0.10	0.019	1	-	05/07/16 00:11	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.41		mg/l	0.10	0.019	1	-	05/07/16 00:11	44,353.2	MR
Total Nitrogen	0.41		mg/l	0.30	0.30	1	-	05/10/16 12:07	107,-	JO
Nitrogen, Total Kjeldahl	0.169	J	mg/l	0.300	0.066	1	05/07/16 10:24	05/09/16 21:34	121,4500N-C	AT
Phosphorus, Orthophosphate	0.007		mg/l	0.005	0.001	1	-	05/07/16 00:26	121,4500P-E	MR
Dissolved Organic Carbon	1.1		mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	20.1		mg/l	0.500	0.054	1	-	05/09/16 20:51	44,300.0	AU
Sulfate	13.6		mg/l	1.00	0.150	1	-	05/09/16 20:51	44,300.0	AU

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-08
Client ID: VLZ-48
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 05/06/16 12:40
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	14.2		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.5		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	0.036	J	mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 22:14	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/07/16 00:12	44,353.2	MR
Nitrogen, Nitrate	2.5		mg/l	0.10	0.019	1	-	05/07/16 00:12	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.5		mg/l	0.10	0.019	1	-	05/07/16 00:12	44,353.2	MR
Total Nitrogen	2.8		mg/l	0.30	0.30	1	-	05/10/16 12:07	107,-	JO
Nitrogen, Total Kjeldahl	0.350		mg/l	0.300	0.066	1	05/07/16 10:24	05/09/16 21:35	121,4500N-C	AT
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	05/07/16 00:27	121,4500P-E	MR
Dissolved Organic Carbon	0.57	J	mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	36.2		mg/l	0.500	0.054	1	-	05/09/16 21:03	44,300.0	AU
Sulfate	16.3		mg/l	1.00	0.150	1	-	05/09/16 21:03	44,300.0	AU

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-09
Client ID: VLZ-66
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 05/06/16 09:30
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.40		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.3		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	0.031	J	mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 22:15	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/07/16 00:14	44,353.2	MR
Nitrogen, Nitrate	3.2		mg/l	0.10	0.019	1	-	05/07/16 00:14	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.2		mg/l	0.10	0.019	1	-	05/07/16 00:14	44,353.2	MR
Total Nitrogen	3.2		mg/l	0.30	0.30	1	-	05/10/16 12:07	107,-	JO
Nitrogen, Total Kjeldahl	0.074	J	mg/l	0.300	0.066	1	05/07/16 10:24	05/09/16 21:36	121,4500N-C	AT
Phosphorus, Orthophosphate	0.013		mg/l	0.005	0.001	1	-	05/07/16 00:27	121,4500P-E	MR
Dissolved Organic Carbon	0.66	J	mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	33.8		mg/l	0.500	0.054	1	-	05/09/16 21:15	44,300.0	AU
Sulfate	11.8		mg/l	1.00	0.150	1	-	05/09/16 21:15	44,300.0	AU

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-10
Client ID: VLZ-61
Sample Location: DENNIS, MA
Matrix: Water
Date Collected: 05/06/16 10:20
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	4.70		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.1		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 22:16	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/07/16 00:19	44,353.2	MR
Nitrogen, Nitrate	3.2		mg/l	0.10	0.019	1	-	05/07/16 00:19	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.2		mg/l	0.10	0.019	1	-	05/07/16 00:19	44,353.2	MR
Total Nitrogen	3.2		mg/l	0.30	0.30	1	-	05/10/16 12:07	107,-	JO
Nitrogen, Total Kjeldahl	0.203	J	mg/l	0.300	0.066	1	05/07/16 10:24	05/09/16 21:37	121,4500N-C	AT
Phosphorus, Orthophosphate	0.012		mg/l	0.005	0.001	1	-	05/07/16 00:27	121,4500P-E	MR
Dissolved Organic Carbon	0.69	J	mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	32.2		mg/l	0.500	0.054	1	-	05/09/16 21:27	44,300.0	AU
Sulfate	9.42		mg/l	1.00	0.150	1	-	05/09/16 21:27	44,300.0	AU

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-11
Client ID: VLZ-56
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 05/06/16 11:10
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	6.80		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.2		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 22:17	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/07/16 00:20	44,353.2	MR
Nitrogen, Nitrate	3.9		mg/l	0.10	0.019	1	-	05/07/16 00:20	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.9		mg/l	0.10	0.019	1	-	05/07/16 00:20	44,353.2	MR
Total Nitrogen	3.9		mg/l	0.30	0.30	1	-	05/10/16 12:07	107,-	JO
Nitrogen, Total Kjeldahl	0.288	J	mg/l	0.300	0.066	1	05/07/16 10:24	05/09/16 21:38	121,4500N-C	AT
Phosphorus, Orthophosphate	0.009		mg/l	0.005	0.001	1	-	05/07/16 00:34	121,4500P-E	MR
Dissolved Organic Carbon	0.75	J	mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	31.9		mg/l	0.500	0.054	1	-	05/09/16 22:15	44,300.0	AU
Sulfate	10.3		mg/l	1.00	0.150	1	-	05/09/16 22:15	44,300.0	AU

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

SAMPLE RESULTS

Lab ID: L1613820-12
Client ID: VLZ-52
Sample Location: DENNIS, MA
Matrix: Water

Date Collected: 05/06/16 12:15
Date Received: 05/06/16
Field Prep: Field Filtered (Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	9.00		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
pH (H)	5.3		SU	-	NA	1	-	05/06/16 22:36	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 22:18	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/07/16 00:21	44,353.2	MR
Nitrogen, Nitrate	3.9		mg/l	0.10	0.019	1	-	05/07/16 00:21	44,353.2	MR
Nitrogen, Nitrate/Nitrite	3.9		mg/l	0.10	0.019	1	-	05/07/16 00:21	44,353.2	MR
Total Nitrogen	3.9		mg/l	0.30	0.30	1	-	05/11/16 10:31	107,-	JO
Nitrogen, Total Kjeldahl	0.660		mg/l	0.300	0.066	1	05/07/16 10:24	05/09/16 21:39	121,4500N-C	AT
Phosphorus, Orthophosphate	0.019		mg/l	0.005	0.001	1	-	05/07/16 00:35	121,4500P-E	MR
Dissolved Organic Carbon	0.69	J	mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	30.1		mg/l	0.500	0.054	1	-	05/09/16 22:27	44,300.0	AU
Sulfate	10.7		mg/l	1.00	0.150	1	-	05/09/16 22:27	44,300.0	AU

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009
Lab Number: L1613820
Report Date: 05/12/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG891461-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	05/06/16 23:03	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG891462-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	05/06/16 23:03	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG891463-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 23:05	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 11-12 Batch: WG891464-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	05/06/16 23:12	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 11-12 Batch: WG891465-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	05/06/16 23:12	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 11-12 Batch: WG891466-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/06/16 23:14	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-12 Batch: WG891486-1										
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	05/07/16 00:23	121,4500P-E	MR
General Chemistry - Westborough Lab for sample(s): 01-12 Batch: WG891549-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/07/16 10:59	05/09/16 21:50	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01-12 Batch: WG891551-1										
Nitrogen, Total Kjeldahl	0.115	J	mg/l	0.300	0.022	1	05/07/16 10:24	05/09/16 21:22	121,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 01-12 Batch: WG891913-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	05/09/16 10:14	121,2320B	AW
General Chemistry - Westborough Lab for sample(s): 01-12 Batch: WG892033-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	05/09/16 13:11	05/09/16 13:11	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-12 Batch: WG892532-1										
Sulfate	ND		mg/l	1.00	0.150	1	-	05/09/16 17:39	44,300.0	AU
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-12 Batch: WG892532-1										
Chloride	ND		mg/l	0.500	0.054	1	-	05/09/16 17:39	44,300.0	AU

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG891461-2								
Nitrogen, Nitrate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG891462-2								
Nitrogen, Nitrate/Nitrite	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG891463-2								
Nitrogen, Nitrite	98		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 11-12 Batch: WG891464-2								
Nitrogen, Nitrate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 11-12 Batch: WG891465-2								
Nitrogen, Nitrate/Nitrite	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 11-12 Batch: WG891466-2								
Nitrogen, Nitrite	98		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-12 Batch: WG891478-1								
pH	100		-		99-101	-		5

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-12 Batch: WG891486-2					
Phosphorus, Orthophosphate	100	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-12 Batch: WG891549-2					
Nitrogen, Ammonia	96	-	80-120	-	20
General Chemistry - Westborough Lab Associated sample(s): 01-12 Batch: WG891551-2					
Nitrogen, Total Kjeldahl	101	-	78-122	-	
General Chemistry - Westborough Lab Associated sample(s): 01-12 Batch: WG891913-2					
Alkalinity, Total	102	-	90-110	-	10
General Chemistry - Westborough Lab Associated sample(s): 01-12 Batch: WG892033-2					
Dissolved Organic Carbon	98	-	90-110	-	
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-12 Batch: WG892532-2					
Chloride	98	-	90-110	-	
Sulfate	96	-	90-110	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG891461-4 QC Sample: L1613820-06 Client ID: VL-5												
Nitrogen, Nitrate	1.0	4	5.0	100		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG891462-4 QC Sample: L1613820-06 Client ID: VL-5												
Nitrogen, Nitrate/Nitrite	1.0	4	5.0	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG891463-4 QC Sample: L1613820-06 Client ID: VL-5												
Nitrogen, Nitrite	ND	4	3.9	98		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 11-12 QC Batch ID: WG891464-4 QC Sample: L1613822-01 Client ID: MS Sample												
Nitrogen, Nitrate	2.2	4	6.2	100		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 11-12 QC Batch ID: WG891465-4 QC Sample: L1613822-01 Client ID: MS Sample												
Nitrogen, Nitrate/Nitrite	2.2	4	6.2	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 11-12 QC Batch ID: WG891466-4 QC Sample: L1613822-01 Client ID: MS Sample												
Nitrogen, Nitrite	ND	4	3.8	95		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG891486-4 QC Sample: L1613822-02 Client ID: MS Sample												
Phosphorus, Orthophosphate	0.006	0.5	0.514	102		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG891549-4 QC Sample: L1613820-03 Client ID: VL-3												
Nitrogen, Ammonia	ND	4	3.73	93		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG891551-4 QC Sample: L1613820-01 Client ID: VL-1												
Nitrogen, Total Kjeldahl	0.083J	8	7.13	89		-	-		77-111	-		24

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery		MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG891913-4 QC Sample: L1613060-01 Client ID: MS Sample										
Alkalinity, Total	19.3	100	121	102		-	-	86-116	-	10
General Chemistry - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG892033-4 QC Sample: L1613820-12 Client ID: VLZ-52										
Dissolved Organic Carbon	0.69J	4	5.1	**127**	Q	-	-	80-120	-	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG892532-3 QC Sample: L1613820-01 Client ID: VL-1										
Chloride	34.3	4	36.8	62		-	-	40-151	-	18
Sulfate	10.2	8	17.8	95		-	-	60-140	-	20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG891461-3 QC Sample: L1613820-06 Client ID: VL-5						
Nitrogen, Nitrate	1.0	1.0	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG891462-3 QC Sample: L1613820-06 Client ID: VL-5						
Nitrogen, Nitrate/Nitrite	1.0	1.0	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG891463-3 QC Sample: L1613820-06 Client ID: VL-5						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 11-12 QC Batch ID: WG891464-3 QC Sample: L1613822-01 Client ID: DUP Sample						
Nitrogen, Nitrate	2.2	2.2	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 11-12 QC Batch ID: WG891465-3 QC Sample: L1613822-01 Client ID: DUP Sample						
Nitrogen, Nitrate/Nitrite	2.2	2.2	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 11-12 QC Batch ID: WG891466-3 QC Sample: L1613822-01 Client ID: DUP Sample						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG891478-2 QC Sample: L1613820-01 Client ID: VL-1						
pH (H)	4.3	4.3	SU	0		5
General Chemistry - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG891486-3 QC Sample: L1613822-01 Client ID: DUP Sample						
Phosphorus, Orthophosphate	0.006	0.006	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG891549-3 QC Sample: L1613820-03 Client ID: VL-3						
Nitrogen, Ammonia	ND	ND	mg/l	NC		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG891551-3 QC Sample: L1613820-01 Client ID: VL-1					
Nitrogen, Total Kjeldahl	0.083J	0.088J	mg/l	NC	24
General Chemistry - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG891913-3 QC Sample: L1613060-01 Client ID: DUP Sample					
Alkalinity, Total	19.3	19.6	mg CaCO3/L	2	10
General Chemistry - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG892033-3 QC Sample: L1613820-11 Client ID: VLZ-56					
Dissolved Organic Carbon	0.75J	1.5	mg/l	NC	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-12 QC Batch ID: WG892532-4 QC Sample: L1613820-01 Client ID: VL-1					
Chloride	34.3	34.3	mg/l	0	18
Sulfate	10.2	10.5	mg/l	3	20

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent
B	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1613820-01A	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-01B	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-01C	Plastic 500ml unpreserved	B	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613820-01D	Plastic 500ml H2SO4 preserved	B	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613820-01E	Plastic 250ml unpreserved w/No H	B	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613820-01F	Plastic 120ml HNO3 preserved	B	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613820-02A	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-02B	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-02C	Plastic 500ml unpreserved	B	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613820-02D	Plastic 500ml H2SO4 preserved	B	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613820-02E	Plastic 250ml unpreserved w/No H	B	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613820-02F	Plastic 120ml HNO3 preserved	B	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613820-03A	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-03B	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-03C	Plastic 500ml unpreserved	B	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613820-03D	Plastic 500ml H2SO4 preserved	B	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613820-03E	Plastic 250ml unpreserved w/No H	B	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613820-03F	Plastic 120ml HNO3 preserved	B	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613820-04A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1613820-04B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1613820-04C	Plastic 500ml unpreserved	A	7	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613820-04D	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613820-04E	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1613820-04F	Plastic 120ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613820-05A	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-05B	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-05C	Plastic 500ml unpreserved	B	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613820-05D	Plastic 500ml H2SO4 preserved	B	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613820-05E	Plastic 250ml unpreserved w/No H	B	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613820-05F	Plastic 120ml HNO3 preserved	B	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613820-06A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1613820-06B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1613820-06C	Plastic 500ml unpreserved	A	7	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613820-06D	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613820-06E	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1613820-06F	Plastic 120ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613820-07A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1613820-07B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1613820-07C	Plastic 500ml unpreserved	A	7	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613820-07D	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613820-07E	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1613820-07F	Plastic 120ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613820-08A	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-08B	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-08C	Plastic 500ml unpreserved	B	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1613820-08D	Plastic 500ml H2SO4 preserved	B	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613820-08E	Plastic 250ml unpreserved w/No H	B	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613820-08F	Plastic 120ml HNO3 preserved	B	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613820-09A	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-09B	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-09C	Plastic 500ml unpreserved	B	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613820-09D	Plastic 500ml H2SO4 preserved	B	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613820-09E	Plastic 250ml unpreserved w/No H	B	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613820-09F	Plastic 120ml HNO3 preserved	B	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613820-10A	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-10B	Vial H2SO4 preserved	B	N/A	3.8	Y	Absent	DOC-5310(28)
L1613820-10C	Plastic 500ml unpreserved	B	7	3.8	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613820-10D	Plastic 500ml H2SO4 preserved	B	<2	3.8	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613820-10E	Plastic 250ml unpreserved w/No H	B	N/A	3.8	Y	Absent	ALK-T-2320(14)
L1613820-10F	Plastic 120ml HNO3 preserved	B	<2	3.8	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613820-11A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1613820-11B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1613820-11C	Plastic 500ml unpreserved	A	7	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613820-11D	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613820-11E	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1613820-11F	Plastic 120ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613820-12A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1613820-12B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1613820-12C	Plastic 500ml unpreserved	A	7	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613820-12D	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB-DENNIS
Project Number: WV-1009

Lab Number: L1613820
Report Date: 05/12/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1613820-12E	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1613820-12F	Plastic 120ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name:	EPA-PRB-DENNIS	**Lab Number:**	L1613820
Project Number:	WV-1009	**Report Date:**	05/12/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-PRB-DENNIS	**Lab Number:**	L1613820
Project Number:	WV-1009	**Report Date:**	05/12/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name: EPA-PRB-DENNIS **Lab Number:** L1613820

Project Number: WV-1009 **Report Date:** 05/12/16

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

ALPHA ANALYTICAL

8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220

320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

CHAIN OF CUSTODY

PAGE 1 OF 2

Date Rec'd in Lab: 5/6/16

ALPHA Job #: L1613820

Client Information

Client: Water Vision LLC

Address: 560 Great Rd.
Acton, MA

Phone: 603-766-6670

Email: dtruslow@watervisionllc.com

Additional Project Information:

Project Information

Project Name: EPA PRB-Dennis

Project Location: Dennis, MA

Project #: WV-1009

Project Manager: Donna Truslow

ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods

☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)

☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)

☐ Yes ☐ No NPDES RGP

☐ Other State /Fed Program ____ Criteria *

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2 | SVOC: ☐ ABN ☐ PAH | METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15 | METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13 | EPH: ☐ Ranges & Targets ☐ Ranges Only | VPH: ☐ Ranges & Targets ☐ Ranges Only | ☐ PCB ☐ PEST | TPH: ☐ Quant Only ☐ Fingerprint | pH, SO4, Cl, NO3, NO2, o-phos | total KN, NH3 | Total Alk | Diss. metals - As, Fe, Mn, B * | DOC *

SAMPLE INFO
Filtration
* ☒ Field
☐ Lab to do
Preservation
☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC	SVOC	METALS	METALS	EPH	VPH	PCB/PEST	TPH	pH, SO4, Cl, NO3, NO2, o-phos	total KN, NH3	Total Alk	Diss. metals - As, Fe, Mn, B *	DOC *	[illegible]	Sample Comments	TOTAL # BOTTLES
13820-01	VL-1	5/6/16	13:35	water	SW									✓	✓	✓	✓	✓			
02	VL-2	5/6/16	9:20	↓	SW									✓	✓	✓	✓	✓			
03	VL-3	5/6/16	10:10		SW									✓	✓	✓	✓	✓			
04	VL-3 DUP	5/6/16	10:12		SW									✓	✓	✓	✓	✓			
05	VL-4	5/6/16	10:47		SW									✓	✓	✓	✓	✓			
06	VL-5	5/6/16	11:35		SW									✓	✓	✓	✓	✓			
07	VL-6	5/6/16	12:16		SW									✓	✓	✓	✓	✓			
08	VLZ-48	5/6/16	12:40		DT									✓	✓	✓	✓	✓			
09	VLZ-66	5/6/16	9:30		DT									✓	✓	✓	✓	✓			
10	VLZ-61	5/6/16	10:20	↓	DT									✓	✓	✓	✓	✓			

Container Type	
Preservative	

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Samantha Wright	5/6/16 18:33	[signature]	5/6/16 1833

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

CHAIN OF CUSTODY

PAGE 2 OF 2

ALPHA ANALYTICAL

8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Date Rec'd in Lab: 5/6/16

ALPHA Job #: L1613800

Client Information

Client: WaterVision LLC
Address: 560 Great Road, Acton, MA
Phone: 603-766-6670
Email: dtruslow@watervisionllc.com

Additional Project Information:

Project Information

Project Name: EPA PRB - Dennis
Project Location: Dennis, MA
Project #: WV-1009
Project Manager: Danica Truslow
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due:

Report Information - Data Deliverables

☐ ADEx ☐ EMAIL

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2
SVOC: ☐ ABN ☐ PAH
METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15
METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13
EPH: ☐ Ranges & Targets ☐ Ranges Only
VPH: ☐ Ranges & Targets ☐ Ranges Only
☐ PCB ☐ PEST
TPH: ☐ Quant Only ☐ Fingerprint
pH, SO_4, Cl, NO_3, NO_2, Ortho
Total N, NH_3
Total Alk
Diss. metals - As, Fe, Mn, B*
DOC*

SAMPLE INFO
Filtration
* ☒ Field ☐ Lab to do
Preservation
☐ Lab to do

Sample Comments

TOTAL # BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	pH	SO_4, Cl, NO_3, NO_2, Ortho	Total N, NH_3	Total Alk	Diss. metals - As, Fe, Mn, B*	DOC*	Sample Comments	TOTAL # BOTTLES
13800-11	VLZ-56	5/6/16	11:10	water	DT	✓	✓	✓	✓	✓			
12	VLZ-52	5/6/16	12:15	water	DT	✓	✓	✓	✓	✓			

Container Type													
Preservative													

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Samantha Wright	5/6/16 18:33		5/6/16 1618

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L1609192
Client:	Watervision, LLC 454 Court Stree Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA-PRB-ORLEANS
Project Number:	WV-1009
Report Date:	04/06/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1609192-01	LPZ-39	WATER	ORLEANS, MA	03/30/16 14:20	03/30/16
L1609192-02	LPZ-80	WATER	ORLEANS, MA	03/30/16 15:10	03/30/16
L1609192-03	LPZ-29	WATER	ORLEANS, MA	03/30/16 12:50	03/30/16
L1609192-04	LPZ-29D	WATER	ORLEANS, MA	03/30/16 12:58	03/30/16
L1609192-05	LP-4	WATER	ORLEANS, MA	03/30/16 11:10	03/30/16
L1609192-06	LPZ-15	WATER	ORLEANS, MA	03/30/16 13:15	03/30/16
L1609192-07	LPZ-90	WATER	ORLEANS, MA	03/30/16 11:05	03/30/16
L1609192-08	LPZ-21	WATER	ORLEANS, MA	03/30/16 12:15	03/30/16
L1609192-09	LPZ-10	WATER	ORLEANS, MA	03/30/16 12:05	03/30/16
L1609192-10	LPZ-71	WATER	ORLEANS, MA	03/30/16 16:10	03/30/16

Project Name:	EPA-PRB-ORLEANS	**Lab Number:**	L1609192
Project Number:	WV-1009	**Report Date:**	04/06/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA-PRB-ORLEANS **Lab Number:** L1609192
Project Number: WV-1009 **Report Date:** 04/06/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

Nitrogen, Nitrate

The WG878916-4 MS recovery (82%), performed on L1609192-01, is outside the acceptance criteria; however, the associated LCS recovery is within overall method allowances. No further action was required.

Alkalinity, Total

The WG879068-4 MS recovery (84%), performed on L1609192-02, is outside the acceptance criteria; however, the associated LCS recovery is within criteria. No further action was taken.

Nitrogen, Ammonia

The WG879617-3 Laboratory Duplicate RPD (81%), performed on L1609192-01, is above the acceptance criteria; however, the sample and duplicate results are less than five times the reporting limit. Therefore, the RPD is valid.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Cristin Walker

Title: Technical Director/Representative Date: 04/06/16

METALS

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-01
Client ID: LPZ-39
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/30/16 14:20
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/01/16 15:36	04/05/16 11:22	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0407		mg/l	0.0300	0.0070	1	04/01/16 15:36	04/05/16 11:22	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.78		mg/l	0.050	0.020	1	04/01/16 15:36	04/05/16 11:22	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.248		mg/l	0.0100	0.0020	1	04/01/16 15:36	04/05/16 11:22	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-02
Client ID: LPZ-80
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/30/16 15:10
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0071		mg/l	0.0050	0.0020	1	04/01/16 15:36	04/05/16 14:47	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0218	J	mg/l	0.0300	0.0070	1	04/01/16 15:36	04/05/16 14:47	EPA 3005A	1,6010C	PS
Iron, Dissolved	14.		mg/l	0.050	0.020	1	04/01/16 15:36	04/05/16 14:47	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.126		mg/l	0.0100	0.0020	1	04/01/16 15:36	04/05/16 14:47	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-03
Client ID: LPZ-29
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/30/16 12:50
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/01/16 15:36	04/05/16 14:51	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0278	J	mg/l	0.0300	0.0070	1	04/01/16 15:36	04/05/16 14:51	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.053		mg/l	0.050	0.020	1	04/01/16 15:36	04/05/16 14:51	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0407		mg/l	0.0100	0.0020	1	04/01/16 15:36	04/05/16 14:51	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-04
Client ID: LPZ-29D
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/30/16 12:58
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0021	J	mg/l	0.0050	0.0020	1	04/01/16 15:36	04/05/16 14:56	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0290	J	mg/l	0.0300	0.0070	1	04/01/16 15:36	04/05/16 14:56	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.038	J	mg/l	0.050	0.020	1	04/01/16 15:36	04/05/16 14:56	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0403		mg/l	0.0100	0.0020	1	04/01/16 15:36	04/05/16 14:56	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-05
Client ID: LP-4
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/30/16 11:10
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/01/16 15:36	04/05/16 15:00	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0151	J	mg/l	0.0300	0.0070	1	04/01/16 15:36	04/05/16 15:00	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.083		mg/l	0.050	0.020	1	04/01/16 15:36	04/05/16 15:00	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0518		mg/l	0.0100	0.0020	1	04/01/16 15:36	04/05/16 15:00	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-06
Client ID: LPZ-15
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/30/16 13:15
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/01/16 15:36	04/05/16 15:17	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0163	J	mg/l	0.0300	0.0070	1	04/01/16 15:36	04/05/16 15:17	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.038	J	mg/l	0.050	0.020	1	04/01/16 15:36	04/05/16 15:17	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0190		mg/l	0.0100	0.0020	1	04/01/16 15:36	04/05/16 15:17	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-07
Client ID: LPZ-90
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/30/16 11:05
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0185		mg/l	0.0050	0.0020	1	04/01/16 15:36	04/05/16 15:22	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0231	J	mg/l	0.0300	0.0070	1	04/01/16 15:36	04/05/16 15:22	EPA 3005A	1,6010C	PS
Iron, Dissolved	12.		mg/l	0.050	0.020	1	04/01/16 15:36	04/05/16 15:22	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.359		mg/l	0.0100	0.0020	1	04/01/16 15:36	04/05/16 15:22	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-08
Client ID: LPZ-21
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/30/16 12:15
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0020	J	mg/l	0.0050	0.0020	1	04/01/16 15:36	04/05/16 15:26	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0317		mg/l	0.0300	0.0070	1	04/01/16 15:36	04/05/16 15:26	EPA 3005A	1,6010C	PS
Iron, Dissolved	0.037	J	mg/l	0.050	0.020	1	04/01/16 15:36	04/05/16 15:26	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.0423		mg/l	0.0100	0.0020	1	04/01/16 15:36	04/05/16 15:26	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-10
Client ID: LPZ-71
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/30/16 16:10
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0279		mg/l	0.0050	0.0020	1	04/01/16 15:36	04/05/16 15:30	EPA 3005A	1,6010C	PS
Boron, Dissolved	0.0258	J	mg/l	0.0300	0.0070	1	04/01/16 15:36	04/05/16 15:30	EPA 3005A	1,6010C	PS
Iron, Dissolved	30.		mg/l	0.050	0.020	1	04/01/16 15:36	04/05/16 15:30	EPA 3005A	1,6010C	PS
Manganese, Dissolved	0.198		mg/l	0.0100	0.0020	1	04/01/16 15:36	04/05/16 15:30	EPA 3005A	1,6010C	PS

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1609192
Report Date: 04/06/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-08,10 Batch: WG879550-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/01/16 15:36	04/05/16 10:48	1,6010C	PS
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	04/01/16 15:36	04/05/16 10:48	1,6010C	PS
Iron, Dissolved	ND		mg/l	0.050	0.020	1	04/01/16 15:36	04/05/16 10:48	1,6010C	PS
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	04/01/16 15:36	04/05/16 10:48	1,6010C	PS

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB-ORLEANS

Project Number: WV-1009

Lab Number: L1609192

Report Date: 04/06/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-08,10 Batch: WG879550-2								
Arsenic, Dissolved	108		-		80-120	-		
Boron, Dissolved	111		-		80-120	-		
Iron, Dissolved	87		-		80-120	-		
Manganese, Dissolved	95		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-08,10 QC Batch ID: WG879550-4 QC Sample: L1609015-01 Client ID: MS Sample												
Arsenic, Dissolved	0.0024J	0.12	0.132	110		-	-		75-125	-		20
Boron, Dissolved	0.272	1	1.40	113		-	-		75-125	-		20
Iron, Dissolved	3.5	1	4.3	80		-	-		75-125	-		20
Manganese, Dissolved	0.613	0.5	1.08	93		-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-08,10 QC Batch ID: WG879550-3 QC Sample: L1609015-01 Client ID: DUP Sample						
Arsenic, Dissolved	0.0024J	0.0022J	mg/l	NC		20
Iron, Dissolved	3.5	3.6	mg/l	3		20
Manganese, Dissolved	0.613	0.618	mg/l	1		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-01
Client ID: LPZ-39
Sample Location: ORLEANS, MA
Matrix: Water

Date Collected: 03/30/16 14:20
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	23.9		mg CaCO3/L	2.00	NA	1	-	03/31/16 09:48	121,2320B	SG
pH (H)	6.0		SU	-	NA	1	-	03/30/16 22:06	121,4500H+-B	AS
Nitrogen, Ammonia	0.196		mg/l	0.075	0.028	1	04/01/16 16:00	04/02/16 00:01	44,350.1	AT
Nitrogen, Nitrite	0.016	J	mg/l	0.050	0.010	1	-	03/30/16 22:03	44,353.2	ML
Nitrogen, Nitrate	0.44		mg/l	0.10	0.019	1	-	03/30/16 22:03	44,353.2	ML
Nitrogen, Nitrate/Nitrite	0.44		mg/l	0.10	0.019	1	-	03/30/16 22:03	44,353.2	ML
Total Nitrogen	0.79		mg/l	0.30	0.30	1	-	04/05/16 17:20	107,-	JO
Nitrogen, Total Kjeldahl	0.347		mg/l	0.300	0.066	1	04/04/16 20:00	04/05/16 13:27	121,4500N-C	JO
Phosphorus, Orthophosphate	0.031		mg/l	0.005	0.001	1	-	03/31/16 02:57	121,4500P-E	LH
Dissolved Organic Carbon	0.69	J	mg/l	1.0	0.12	1	03/31/16 09:08	03/31/16 09:08	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	66.3		mg/l	5.00	0.541	10	-	03/31/16 22:43	44,300.0	AU
Sulfate	2.34		mg/l	1.00	0.150	1	-	03/31/16 19:07	44,300.0	AU

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-02
Client ID: LPZ-80
Sample Location: ORLEANS, MA
Matrix: Water

Date Collected: 03/30/16 15:10
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	32.4		mg CaCO3/L	2.00	NA	1	-	03/31/16 09:48	121,2320B	SG
pH (H)	6.4		SU	-	NA	1	-	03/30/16 22:06	121,4500H+-B	AS
Nitrogen, Ammonia	0.060	J	mg/l	0.075	0.028	1	04/01/16 16:00	04/02/16 00:04	44,350.1	AT
Nitrogen, Nitrite	0.017	J	mg/l	0.050	0.010	1	-	03/30/16 22:14	44,353.2	ML
Nitrogen, Nitrate	0.069	J	mg/l	0.10	0.019	1	-	03/30/16 22:14	44,353.2	ML
Nitrogen, Nitrate/Nitrite	0.069	J	mg/l	0.10	0.019	1	-	03/30/16 22:14	44,353.2	ML
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	04/05/16 17:20	107,-	JO
Nitrogen, Total Kjeldahl	0.105	J	mg/l	0.300	0.066	1	04/04/16 20:00	04/05/16 13:28	121,4500N-C	JO
Phosphorus, Orthophosphate	0.682		mg/l	0.005	0.001	1	-	03/31/16 02:58	121,4500P-E	LH
Dissolved Organic Carbon	1.8		mg/l	1.0	0.12	1	03/31/16 09:08	03/31/16 09:08	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	25.7		mg/l	0.500	0.054	1	-	03/31/16 19:19	44,300.0	AU
Sulfate	8.28		mg/l	1.00	0.150	1	-	03/31/16 19:19	44,300.0	AU

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-03
Client ID: LPZ-29
Sample Location: ORLEANS, MA
Matrix: Water

Date Collected: 03/30/16 12:50
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.40		mg CaCO3/L	2.00	NA	1	-	03/31/16 09:48	121,2320B	SG
pH (H)	5.4		SU	-	NA	1	-	03/30/16 22:06	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/01/16 16:00	04/02/16 00:07	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/30/16 22:15	44,353.2	ML
Nitrogen, Nitrate	1.8		mg/l	0.10	0.019	1	-	03/30/16 22:15	44,353.2	ML
Nitrogen, Nitrate/Nitrite	1.8		mg/l	0.10	0.019	1	-	03/30/16 22:15	44,353.2	ML
Total Nitrogen	1.8		mg/l	0.30	0.30	1	-	04/05/16 17:20	107,-	JO
Nitrogen, Total Kjeldahl	0.097	J	mg/l	0.300	0.066	1	04/04/16 20:00	04/05/16 13:29	121,4500N-C	JO
Phosphorus, Orthophosphate	0.019		mg/l	0.005	0.001	1	-	03/31/16 03:00	121,4500P-E	LH
Dissolved Organic Carbon	0.61	J	mg/l	1.0	0.12	1	03/31/16 09:08	03/31/16 09:08	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	307.		mg/l	12.5	1.35	25	-	04/01/16 00:55	44,300.0	AU
Sulfate	7.19		mg/l	1.00	0.150	1	-	03/31/16 19:31	44,300.0	AU

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-04
Client ID: LPZ-29D
Sample Location: ORLEANS, MA
Matrix: Water

Date Collected: 03/30/16 12:58
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.40		mg CaCO3/L	2.00	NA	1	-	03/31/16 09:48	121,2320B	SG
pH (H)	5.4		SU	-	NA	1	-	03/30/16 22:06	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/01/16 16:00	04/02/16 00:08	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/30/16 22:16	44,353.2	ML
Nitrogen, Nitrate	1.8		mg/l	0.10	0.019	1	-	03/30/16 22:16	44,353.2	ML
Nitrogen, Nitrate/Nitrite	1.8		mg/l	0.10	0.019	1	-	03/30/16 22:16	44,353.2	ML
Total Nitrogen	1.8		mg/l	0.30	0.30	1	-	04/05/16 17:20	107,-	JO
Nitrogen, Total Kjeldahl	0.097	J	mg/l	0.300	0.066	1	04/04/16 20:00	04/05/16 13:29	121,4500N-C	JO
Phosphorus, Orthophosphate	0.020		mg/l	0.005	0.001	1	-	03/31/16 03:00	121,4500P-E	LH
Dissolved Organic Carbon	0.31	J	mg/l	1.0	0.12	1	03/31/16 09:08	03/31/16 09:08	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	299.		mg/l	12.5	1.35	25	-	04/01/16 03:07	44,300.0	AU
Sulfate	7.01		mg/l	1.00	0.150	1	-	03/31/16 19:43	44,300.0	AU

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-05
Client ID: LP-4
Sample Location: ORLEANS, MA
Matrix: Water

Date Collected: 03/30/16 11:10
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	11.3		mg CaCO3/L	2.00	NA	1	-	03/31/16 09:48	121,2320B	SG
pH (H)	5.6		SU	-	NA	1	-	03/30/16 22:06	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/01/16 16:00	04/02/16 00:09	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/30/16 22:18	44,353.2	ML
Nitrogen, Nitrate	1.3		mg/l	0.10	0.019	1	-	03/30/16 22:18	44,353.2	ML
Nitrogen, Nitrate/Nitrite	1.3		mg/l	0.10	0.019	1	-	03/30/16 22:18	44,353.2	ML
Total Nitrogen	1.3		mg/l	0.30	0.30	1	-	04/05/16 17:20	107,-	JO
Nitrogen, Total Kjeldahl	0.136	J	mg/l	0.300	0.066	1	04/04/16 20:00	04/05/16 13:30	121,4500N-C	JO
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	03/31/16 03:01	121,4500P-E	LH
Dissolved Organic Carbon	0.85	J	mg/l	1.0	0.12	1	03/31/16 09:08	03/31/16 09:08	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	42.6		mg/l	0.500	0.054	1	-	03/31/16 19:55	44,300.0	AU
Sulfate	16.3		mg/l	1.00	0.150	1	-	03/31/16 19:55	44,300.0	AU

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-06
Client ID: LPZ-15
Sample Location: ORLEANS, MA
Matrix: Water

Date Collected: 03/30/16 13:15
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	10.2		mg CaCO3/L	2.00	NA	1	-	03/31/16 09:48	121,2320B	SG
pH (H)	5.4		SU	-	NA	1	-	03/30/16 22:06	121,4500H+-B	AS
Nitrogen, Ammonia	0.044	J	mg/l	0.075	0.028	1	04/01/16 16:00	04/02/16 00:10	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/30/16 22:19	44,353.2	ML
Nitrogen, Nitrate	0.48		mg/l	0.10	0.019	1	-	03/30/16 22:19	44,353.2	ML
Nitrogen, Nitrate/Nitrite	0.48		mg/l	0.10	0.019	1	-	03/30/16 22:19	44,353.2	ML
Total Nitrogen	0.48		mg/l	0.30	0.30	1	-	04/05/16 17:20	107,-	JO
Nitrogen, Total Kjeldahl	0.147	J	mg/l	0.300	0.066	1	04/04/16 20:00	04/05/16 13:31	121,4500N-C	JO
Phosphorus, Orthophosphate	0.008		mg/l	0.005	0.001	1	-	03/31/16 03:01	121,4500P-E	LH
Dissolved Organic Carbon	1.0		mg/l	1.0	0.12	1	03/31/16 09:08	03/31/16 09:08	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	46.1		mg/l	5.00	0.541	10	-	04/01/16 05:55	44,300.0	AU
Sulfate	12.8		mg/l	1.00	0.150	1	-	03/31/16 20:07	44,300.0	AU

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-07
Client ID: LPZ-90
Sample Location: ORLEANS, MA
Matrix: Water

Date Collected: 03/30/16 11:05
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	30.2		mg CaCO3/L	2.00	NA	1	-	03/31/16 09:48	121,2320B	SG
pH (H)	6.3		SU	-	NA	1	-	03/30/16 22:06	121,4500H+-B	AS
Nitrogen, Ammonia	0.117		mg/l	0.075	0.028	1	04/01/16 16:00	04/02/16 00:11	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/30/16 22:20	44,353.2	ML
Nitrogen, Nitrate	0.051	J	mg/l	0.10	0.019	1	-	03/30/16 22:20	44,353.2	ML
Nitrogen, Nitrate/Nitrite	0.051	J	mg/l	0.10	0.019	1	-	03/30/16 22:20	44,353.2	ML
Total Nitrogen	1.4		mg/l	0.30	0.30	1	-	04/05/16 17:20	107,-	JO
Nitrogen, Total Kjeldahl	1.42		mg/l	0.300	0.066	1	04/04/16 20:00	04/05/16 13:32	121,4500N-C	JO
Phosphorus, Orthophosphate	0.002	J	mg/l	0.005	0.001	1	-	03/31/16 03:01	121,4500P-E	LH
Dissolved Organic Carbon	0.66	J	mg/l	1.0	0.12	1	03/31/16 09:08	03/31/16 09:08	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	26.8		mg/l	0.500	0.054	1	-	03/31/16 20:19	44,300.0	AU
Sulfate	11.4		mg/l	1.00	0.150	1	-	03/31/16 20:19	44,300.0	AU

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-08
Client ID: LPZ-21
Sample Location: ORLEANS, MA
Matrix: Water

Date Collected: 03/30/16 12:15
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	15.8		mg CaCO3/L	2.00	NA	1	-	03/31/16 09:48	121,2320B	SG
pH (H)	5.6		SU	-	NA	1	-	03/30/16 22:06	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/01/16 16:00	04/02/16 00:11	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/30/16 22:21	44,353.2	ML
Nitrogen, Nitrate	1.3		mg/l	0.10	0.019	1	-	03/30/16 22:21	44,353.2	ML
Nitrogen, Nitrate/Nitrite	1.3		mg/l	0.10	0.019	1	-	03/30/16 22:21	44,353.2	ML
Total Nitrogen	1.3		mg/l	0.30	0.30	1	-	04/05/16 17:20	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	04/04/16 20:00	04/05/16 13:35	121,4500N-C	JO
Phosphorus, Orthophosphate	0.025		mg/l	0.005	0.001	1	-	03/31/16 03:02	121,4500P-E	LH
Dissolved Organic Carbon	0.48	J	mg/l	1.0	0.12	1	03/31/16 09:08	03/31/16 09:08	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	144.		mg/l	5.00	0.541	10	-	04/01/16 06:07	44,300.0	AU
Sulfate	8.11		mg/l	1.00	0.150	1	-	03/31/16 21:43	44,300.0	AU

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-09
Client ID: LPZ-10
Sample Location: ORLEANS, MA
Matrix: Water

Date Collected: 03/30/16 12:05
Date Received: 03/30/16
Field Prep: None

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
pH (H)	6.6		SU	-	NA	1	-	03/30/16 22:06	121,4500H+-B	AS
Nitrogen, Nitrite	0.023	J	mg/l	0.050	0.010	1	-	03/30/16 22:23	44,353.2	ML
Nitrogen, Nitrate	1.6		mg/l	0.10	0.019	1	-	03/30/16 22:23	44,353.2	ML
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	03/31/16 03:02	121,4500P-E	LH
Anions by Ion Chromatography - Westborough Lab										
Chloride	56.4		mg/l	5.00	0.541	10	-	04/01/16 06:19	44,300.0	AU
Sulfate	13.3		mg/l	1.00	0.150	1	-	03/31/16 21:55	44,300.0	AU

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

SAMPLE RESULTS

Lab ID: L1609192-10
Client ID: LPZ-71
Sample Location: ORLEANS, MA
Matrix: Water

Date Collected: 03/30/16 16:10
Date Received: 03/30/16
Field Prep: Field Filtered (Dissolved Metals)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	43.9		mg CaCO3/L	2.00	NA	1	-	03/31/16 09:48	121,2320B	SG
pH (H)	6.4		SU	-	NA	1	-	03/30/16 22:06	121,4500H+-B	AS
Nitrogen, Ammonia	0.110		mg/l	0.075	0.028	1	04/01/16 16:00	04/02/16 00:12	44,350.1	AT
Nitrogen, Nitrite	0.027	J	mg/l	0.050	0.010	1	-	03/30/16 22:24	44,353.2	ML
Nitrogen, Nitrate	0.11		mg/l	0.10	0.019	1	-	03/30/16 22:24	44,353.2	ML
Nitrogen, Nitrate/Nitrite	0.11		mg/l	0.10	0.019	1	-	03/30/16 22:24	44,353.2	ML
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	04/05/16 17:20	107,-	JO
Nitrogen, Total Kjeldahl	0.199	J	mg/l	0.300	0.066	1	04/04/16 20:00	04/05/16 13:36	121,4500N-C	JO
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	03/31/16 03:02	121,4500P-E	LH
Dissolved Organic Carbon	1.7		mg/l	1.0	0.12	1	03/31/16 09:08	03/31/16 09:08	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	27.1		mg/l	0.500	0.054	1	-	03/31/16 22:07	44,300.0	AU
Sulfate	10.3		mg/l	1.00	0.150	1	-	03/31/16 22:07	44,300.0	AU

Project Name: EPA-PRB-ORLEANS **Lab Number:** L1609192

Project Number: WV-1009 **Report Date:** 04/06/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG878916-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	03/30/16 21:56	44,353.2	ML
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG878918-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/30/16 21:58	44,353.2	ML
General Chemistry - Westborough Lab for sample(s): 01-10 Batch: WG878967-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	03/31/16 02:46	121,4500P-E	LH
General Chemistry - Westborough Lab for sample(s): 01-08,10 Batch: WG879063-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	03/31/16 09:08	03/31/16 09:08	121,5310C	DW
General Chemistry - Westborough Lab for sample(s): 01-08,10 Batch: WG879068-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	03/31/16 09:48	121,2320B	SG
General Chemistry - Westborough Lab for sample(s): 01-08,10 Batch: WG879617-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/01/16 16:00	04/01/16 23:45	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01-08,10 Batch: WG879641-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	03/30/16 21:56	44,353.2	ML
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-10 Batch: WG879679-1										
Chloride	ND		mg/l	0.500	0.054	1	-	03/31/16 18:43	44,300.0	AU
Sulfate	0.301	J	mg/l	1.00	0.150	1	-	03/31/16 18:43	44,300.0	AU
General Chemistry - Westborough Lab for sample(s): 01-08,10 Batch: WG880248-1										
Nitrogen, Total Kjeldahl	0.083	J	mg/l	0.300	0.022	1	04/04/16 20:00	04/05/16 13:24	121,4500N-C	JO

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG878916-2								
Nitrogen, Nitrate	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG878918-2								
Nitrogen, Nitrite	102		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG878931-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01-10 Batch: WG878967-2								
Phosphorus, Orthophosphate	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 Batch: WG879063-2								
Dissolved Organic Carbon	92		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 Batch: WG879068-2								
Alkalinity, Total	105		-		90-110	-		10
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 Batch: WG879617-2								
Nitrogen, Ammonia	94		-		80-120	-		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA-PRB-ORLEANS

Project Number: WV-1009

Lab Number: L1609192

Report Date: 04/06/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 Batch: WG879641-2					
Nitrogen, Nitrate/Nitrite	96	-	90-110	-	
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-10 Batch: WG879679-2					
Chloride	102	-	90-110	-	
Sulfate	110	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 Batch: WG880248-2					
Nitrogen, Total Kjeldahl	99	-	78-122	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG878916-4 QC Sample: L1609192-01 Client ID: LPZ-39												
Nitrogen, Nitrate	0.44	4	3.7	**82**	Q	-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG878918-4 QC Sample: L1609192-01 Client ID: LPZ-39												
Nitrogen, Nitrite	0.016J	4	4.1	102		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG878967-4 QC Sample: L1609192-10 Client ID: LPZ-71												
Phosphorus, Orthophosphate	ND	0.5	0.481	96		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 QC Batch ID: WG879063-4 QC Sample: L1609192-08 Client ID: LPZ-21												
Dissolved Organic Carbon	0.48J	4	4.4	111		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 QC Batch ID: WG879068-4 QC Sample: L1609192-02 Client ID: LPZ-80												
Alkalinity, Total	32.4	100	116	**84**	Q	-	-		86-116	-		10
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 QC Batch ID: WG879617-4 QC Sample: L1609192-01 Client ID: LPZ-39												
Nitrogen, Ammonia	0.196	4	3.76	89		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 QC Batch ID: WG879641-4 QC Sample: L1609192-01 Client ID: LPZ-39												
Nitrogen, Nitrate/Nitrite	0.44	4	3.7	82		-	-		80-120	-		20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG879679-3 WG879679-4 QC Sample: L1609047-01 Client ID: MS Sample												
Chloride	2320	1000	3340	103		3360	104		40-151	1		18
Sulfate	75.6	400	506	108		512	109		60-140	1		20
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 QC Batch ID: WG880248-4 QC Sample: L1609330-01 Client ID: MS Sample												
Nitrogen, Total Kjeldahl	0.474	8	7.71	90		-	-		77-111	-		24

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG878916-3 QC Sample: L1609192-01 Client ID: LPZ-39						
Nitrogen, Nitrate	0.44	0.44	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG878918-3 QC Sample: L1609192-01 Client ID: LPZ-39						
Nitrogen, Nitrite	0.016J	0.016J	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG878931-2 QC Sample: L1609111-01 Client ID: DUP Sample						
pH	7.8	7.8	SU	0		5
General Chemistry - Westborough Lab Associated sample(s): 01-10 QC Batch ID: WG878967-3 QC Sample: L1609192-01 Client ID: LPZ-39						
Phosphorus, Orthophosphate	0.031	0.032	mg/l	3		20
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 QC Batch ID: WG879063-3 QC Sample: L1609192-10 Client ID: LPZ-71						
Dissolved Organic Carbon	1.7	1.6	mg/l	6		20
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 QC Batch ID: WG879068-3 QC Sample: L1609192-02 Client ID: LPZ-80						
Alkalinity, Total	32.4	32.9	mg CaCO3/L	2		10
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 QC Batch ID: WG879617-3 QC Sample: L1609192-01 Client ID: LPZ-39						
Nitrogen, Ammonia	0.196	0.082	mg/l	**81**	Q	20
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 QC Batch ID: WG879641-3 QC Sample: L1609192-01 Client ID: LPZ-39						
Nitrogen, Nitrate/Nitrite	0.44	0.44	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-08,10 QC Batch ID: WG880248-3 QC Sample: L1609330-01 Client ID: DUP Sample						
Nitrogen, Total Kjeldahl	0.474	0.544	mg/l	14		24

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1609192-01A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-01B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-01C	Plastic 250ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609192-01D	Plastic 500ml unpreserved	A	8	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609192-01E	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609192-01F	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1609192-02A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-02B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-02C	Plastic 250ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609192-02D	Plastic 500ml unpreserved	A	8	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609192-02E	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609192-02F	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1609192-03A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-03B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-03C	Plastic 250ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609192-03D	Plastic 500ml unpreserved	A	8	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609192-03E	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609192-03F	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1609192-04A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-04B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-04C	Plastic 250ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1609192-04D	Plastic 500ml unpreserved	A	8	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609192-04E	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609192-04F	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1609192-05A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-05B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-05C	Plastic 250ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609192-05D	Plastic 500ml unpreserved	A	8	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609192-05E	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609192-05F	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1609192-06A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-06B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-06C	Plastic 250ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609192-06D	Plastic 500ml unpreserved	A	8	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609192-06E	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609192-06F	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1609192-07A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-07B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-07C	Plastic 250ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609192-07D	Plastic 500ml unpreserved	A	8	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609192-07E	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609192-07F	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1609192-08A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-08B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-08C	Plastic 250ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609192-08D	Plastic 500ml unpreserved	A	8	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)

*Values in parentheses indicate holding time in days

Project Name: EPA-PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1609192
Report Date: 04/06/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1609192-08E	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609192-08F	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)
L1609192-09A	Plastic 500ml unpreserved	A	8	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609192-10A	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-10B	Vial H2SO4 preserved	A	N/A	3.3	Y	Absent	DOC-5310(28)
L1609192-10C	Plastic 250ml HNO3 preserved	A	<2	3.3	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609192-10D	Plastic 500ml unpreserved	A	8	3.3	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609192-10E	Plastic 500ml H2SO4 preserved	A	<2	3.3	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609192-10F	Plastic 250ml unpreserved w/No H	A	N/A	3.3	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name:	EPA-PRB-ORLEANS	**Lab Number:**	L1609192
Project Number:	WV-1009	**Report Date:**	04/06/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA-PRB-ORLEANS	**Lab Number:**	L1609192
Project Number:	WV-1009	**Report Date:**	04/06/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

mg 04/01/16 updated coc

Serial_No:04061614:36

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 3/30/16

ALPHA Job #: L1609192

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: Watervision LLC
Address: 481 Great Rd, Acton, MA
Phone: 603-498-2916
Email: dtruslow@watervisionllc.com

Project Information

Project Name: EPA PRB – Orleans
Project Location: Orleans, MA
Project #: WV-1009
Project Manager: Danna Truslow
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program ____ Criteria ____

Additional Project Information:

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; Total N; NH3-N; Dissolved As, Mn, Fe, B; Total Alkalinity; pH, SO4, Cl, NO3, NO2, o-Phos; DOC

SAMPLE INFO: Filtration ☒ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	Total N, NH3-N	Dissolved As, Mn, Fe, B	Total Alkalinity	pH, SO4, Cl, NO3, NO2, o-Phos	DOC	Sample Comments	Total # Bottles
09192-01	LPZ-39	3-30-16	14:20	Water	DT	x	x	e x	x e	x		
02	LPZ-80	〃	15:10	〃	DT	✓	✓	✓	✓	✓		
03	LPZ-29	〃	12:50	〃	〃	✓	✓	✓	✓	✓		
04	LPZ-29 D	〃	12:58	〃	〃	✓	✓	✓	✓	✓		
05	LP-4	〃	11:10	〃	〃	✓	✓	✓	✓	✓		
06	LPZ-15	〃	13:15	〃	〃	✓	✓	✓	✓	✓		
07	LPZ-90	〃	11:05	〃	DT	✓	✓	✓	✓	✓		
08	LPZ-21	〃	12:15	〃	DT	✓	✓	✓	✓	✓		
09	LPZ-10	〃	12:05	〃	〃				✓			
10	LPZ-71	〃	16:10	〃	〃	✓	✓	✓	✓	✓		

Container Type	
Preservative	

Container Type: P= Plastic, A= Amber glass, V= Vial, G= Glass, B= Bacteria cup, C= Cube, O= Other, E= Encore, D= BOD Bottle

Preservative: A= None, B= HCl, C= HNO_3, D= H_2SO_4, E= NaOH, F= MeOH, G= $NaHSO_4$, H = $Na_2S_2O_3$, I= Ascorbic Acid, J = NH_4Cl, K= Zn Acetate, O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	3-30-16 16:15	Charlie Hague AA	3/30/16 16:15
Charlie Hague AA	3/30/16 18:20	[signature]	3/30/16 18:20

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 3/30/16

ALPHA Job #: L1609192

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: WATERVISION LLC
Address: 481 GREAT RD, ACTON, MA
Phone: 603-498-2916
Email: dtruslow@watervisionllc.com

Additional Project Information:

Project Information

Project Name: EPA PRB – ORLEANS
Project Location: ORLEANS, MA
Project #: WV-1009
Project Manager: Danna Truslow
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program ____ Criteria ____

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; Total N, NH3-N; Dissolved Ag, Mn, Fe, B*; Total Alkalinity; pH SO4 Cl NO3 NO2 o-Phos; DOC*

SAMPLE INFO: Filtration ☒ Field* ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	Total N, NH3-N	Dissolved Ag, Mn, Fe, B	Total Alkalinity	pH SO4 Cl NO3 NO2 o-Phos	DOC	Sample Comments
09192-01	LPZ-39	3-30-16	14:20	Water	DT						
02	LPZ-80	"	15:10	"	DT	✓	✓	✓	✓	✓	
03	LPZ-29	"	12:50	"	"	✓	✓	✓	✓	✓	
04	LPZ-29 D	"	12:58	"	"	✓	✓	✓	✓	✓	
05	LP-4	"	11:10	"	"	✓	✓	✓	✓	✓	
06	LPZ-15	"	13:15	"	"	✓	✓	✓	✓	✓	
07	LPZ-90	"	11:05	"	DT	✓	✓	✓	✓	✓	
08	LPZ-21	"	12:15	"	DT	✓	✓	✓	✓	✓	
09	LPZ-10	"	12:05	"	"				✓		
10	LPZ-71	"	16:10	"	"	✓	✓	✓	✓	✓	

Container Type
Preservative

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	3-30-16 16:15	[signature] AAL	3/30/16 16:15
[signature] AAL	3/30/16 18:20	[signature]	3/30/16 1820

ANALYTICAL REPORT

Lab Number:	L1609305
Client:	Watervision, LLC 454 Court Stree Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA ORLEANS PRB
Project Number:	WV-1009
Report Date:	04/07/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA ORLEANS PRB
Project Number: WV-1009

Lab Number: L1609305
Report Date: 04/07/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1609305-01	LP-2	WATER	ORLEANS, MA	03/31/16 12:30	03/31/16
L1609305-02	LP-3	WATER	ORLEANS, MA	03/31/16 12:25	03/31/16
L1609305-03	LP-5	WATER	ORLEANS, MA	03/31/16 09:55	03/31/16
L1609305-04	LP-6	WATER	ORLEANS, MA	03/31/16 10:20	03/31/16
L1609305-05	LPZ-53	WATER	ORLEANS, MA	03/31/16 08:25	03/31/16
L1609305-06	LPZ-61	WATER	ORLEANS, MA	03/31/16 09:05	03/31/16
L1609305-07	LP-3 DUP	WATER	ORLEANS, MA	03/31/16 12:48	03/31/16

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA ORLEANS PRB **Lab Number:** L1609305
Project Number: WV-1009 **Report Date:** 04/07/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Nitrogen, Ammonia

L1609305-01: The sample has an elevated detection limit due to the dilution required by the sample matrix. The WG879971-1 Method Blank, associated with L1609305-02 through -07, has concentrations above the reporting limits. Since the samples were non-detect for this target analyte, no further actions were taken. The results of the original analysis are reported.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

L1609305-01 and -04: The sample has an elevated detection limit due to the dilution required by the sample matrix.

Nitrogen, Total Kjeldahl

L1609305-07: The sample has an elevated detection limit due to the dilution required by the sample matrix.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Melissa Cripps Melissa Cripps

Title: Technical Director/Representative Date: 04/07/16

METALS

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-01
Client ID: LP-2
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/31/16 12:30
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/06/16 12:06	04/07/16 01:41	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0119	J	mg/l	0.0300	0.0070	1	04/06/16 12:06	04/07/16 01:41	EPA 3005A	1,6010C	FB
Iron, Dissolved	5.3		mg/l	0.050	0.020	1	04/06/16 12:06	04/07/16 01:41	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.724		mg/l	0.0100	0.0020	1	04/06/16 12:06	04/07/16 01:41	EPA 3005A	1,6010C	FB

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-02
Client ID: LP-3
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/31/16 12:25
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/06/16 12:06	04/07/16 01:45	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0143	J	mg/l	0.0300	0.0070	1	04/06/16 12:06	04/07/16 01:45	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.25		mg/l	0.050	0.020	1	04/06/16 12:06	04/07/16 01:45	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.210		mg/l	0.0100	0.0020	1	04/06/16 12:06	04/07/16 01:45	EPA 3005A	1,6010C	FB

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-03
Client ID: LP-5
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/31/16 09:55
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/06/16 12:06	04/07/16 01:50	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0213	J	mg/l	0.0300	0.0070	1	04/06/16 12:06	04/07/16 01:50	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.44		mg/l	0.050	0.020	1	04/06/16 12:06	04/07/16 01:50	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.408		mg/l	0.0100	0.0020	1	04/06/16 12:06	04/07/16 01:50	EPA 3005A	1,6010C	FB

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-04
Client ID: LP-6
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/31/16 10:20
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/06/16 12:06	04/07/16 02:12	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0085	J	mg/l	0.0300	0.0070	1	04/06/16 12:06	04/07/16 02:12	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.14		mg/l	0.050	0.020	1	04/06/16 12:06	04/07/16 02:12	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.499		mg/l	0.0100	0.0020	1	04/06/16 12:06	04/07/16 02:12	EPA 3005A	1,6010C	FB

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-05
Client ID: LPZ-53
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/31/16 08:25
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/06/16 12:06	04/07/16 02:17	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0326		mg/l	0.0300	0.0070	1	04/06/16 12:06	04/07/16 02:17	EPA 3005A	1,6010C	FB
Iron, Dissolved	4.3		mg/l	0.050	0.020	1	04/06/16 12:06	04/07/16 02:17	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.334		mg/l	0.0100	0.0020	1	04/06/16 12:06	04/07/16 02:17	EPA 3005A	1,6010C	FB

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-06
Client ID: LPZ-61
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/31/16 09:05
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/06/16 12:06	04/06/16 22:14	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0336		mg/l	0.0300	0.0070	1	04/06/16 12:06	04/06/16 22:14	EPA 3005A	1,6010C	FB
Iron, Dissolved	1.3		mg/l	0.050	0.020	1	04/06/16 12:06	04/06/16 22:14	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.488		mg/l	0.0100	0.0020	1	04/06/16 12:06	04/06/16 22:14	EPA 3005A	1,6010C	FB

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-07
Client ID: LP-3 DUP
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/31/16 12:48
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/06/16 12:06	04/07/16 02:22	EPA 3005A	1,6010C	FB
Boron, Dissolved	0.0148	J	mg/l	0.0300	0.0070	1	04/06/16 12:06	04/07/16 02:22	EPA 3005A	1,6010C	FB
Iron, Dissolved	0.38		mg/l	0.050	0.020	1	04/06/16 12:06	04/07/16 02:22	EPA 3005A	1,6010C	FB
Manganese, Dissolved	0.195		mg/l	0.0100	0.0020	1	04/06/16 12:06	04/07/16 02:22	EPA 3005A	1,6010C	FB

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-07 Batch: WG880868-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	04/06/16 12:06	04/06/16 21:43	1,6010C	FB
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	04/06/16 12:06	04/06/16 21:43	1,6010C	FB
Iron, Dissolved	ND		mg/l	0.050	0.020	1	04/06/16 12:06	04/06/16 21:43	1,6010C	FB
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	04/06/16 12:06	04/06/16 21:43	1,6010C	FB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA ORLEANS PRB

Project Number: WV-1009

Lab Number: L1609305

Report Date: 04/07/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-07 Batch: WG880868-2								
Arsenic, Dissolved	101		-		80-120	-		
Boron, Dissolved	105		-		80-120	-		
Iron, Dissolved	90		-		80-120	-		
Manganese, Dissolved	95		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA ORLEANS PRB
Project Number: WV-1009

Lab Number: L1609305
Report Date: 04/07/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG880868-4 QC Sample: L1609305-06 Client ID: LPZ-61												
Arsenic, Dissolved	ND	0.12	0.121	101		-	-		75-125	-		20
Boron, Dissolved	0.0336	1	1.12	109		-	-		75-125	-		20
Iron, Dissolved	1.3	1	2.1	80		-	-		75-125	-		20
Manganese, Dissolved	0.488	0.5	0.968	96		-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA ORLEANS PRB
Project Number: WV-1009

Lab Number: L1609305
Report Date: 04/07/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG880868-3 QC Sample: L1609305-06 Client ID: LPZ-61						
Arsenic, Dissolved	ND	ND	mg/l	NC		20
Boron, Dissolved	0.0336	0.0331	mg/l	1		20
Iron, Dissolved	1.3	1.2	mg/l	8		20
Manganese, Dissolved	0.488	0.478	mg/l	2		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-01
Client ID: LP-2
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/31/16 12:30
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	32.5		mg CaCO3/L	2.00	NA	1	-	04/03/16 11:59	121,2320B	SG
pH (H)	5.9		SU	-	NA	1	-	03/31/16 21:34	121,4500H+-B	JC
Nitrogen, Ammonia	0.098	J	mg/l	0.150	0.057	2	04/05/16 20:30	04/06/16 15:08	44,350.1	JO
Nitrogen, Nitrite	0.025	J	mg/l	0.050	0.010	1	-	03/31/16 21:43	44,353.2	MR
Nitrogen, Nitrate	0.77		mg/l	0.10	0.019	1	-	03/31/16 21:43	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.77		mg/l	0.10	0.019	1	-	03/31/16 21:43	44,353.2	MR
Total Nitrogen	1.5		mg/l	0.30	0.30	1	-	04/07/16 11:42	107,-	JO
Nitrogen, Total Kjeldahl	0.703		mg/l	0.300	0.066	1	04/05/16 15:07	04/06/16 14:19	121,4500N-C	JO
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	03/31/16 23:33	121,4500P-E	LH
Dissolved Organic Carbon	3.4	J	mg/l	4.0	0.47	4	04/01/16 08:55	04/01/16 08:55	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	511.		mg/l	12.5	1.35	25	-	04/01/16 19:03	44,300.0	JT
Sulfate	5.75		mg/l	1.00	0.150	1	-	04/01/16 17:39	44,300.0	JT

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-02
Client ID: LP-3
Sample Location: ORLEANS, MA
Matrix: Water

Date Collected: 03/31/16 12:25
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	18.3		mg CaCO3/L	2.00	NA	1	-	04/03/16 11:59	121,2320B	SG
pH (H)	6.0		SU	-	NA	1	-	03/31/16 21:34	121,4500H+-B	JC
Nitrogen, Ammonia	0.053	JB	mg/l	0.075	0.028	1	04/03/16 21:30	04/05/16 14:34	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/31/16 21:44	44,353.2	MR
Nitrogen, Nitrate	1.2		mg/l	0.10	0.019	1	-	03/31/16 21:44	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.2		mg/l	0.10	0.019	1	-	03/31/16 21:44	44,353.2	MR
Total Nitrogen	1.9		mg/l	0.30	0.30	1	-	04/07/16 11:42	107,-	JO
Nitrogen, Total Kjeldahl	0.700		mg/l	0.300	0.066	1	04/05/16 15:07	04/06/16 14:20	121,4500N-C	JO
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	03/31/16 23:33	121,4500P-E	LH
Dissolved Organic Carbon	1.1		mg/l	1.0	0.12	1	04/01/16 08:55	04/01/16 08:55	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	75.1		mg/l	5.00	0.541	10	-	04/01/16 20:51	44,300.0	JT
Sulfate	12.6		mg/l	1.00	0.150	1	-	04/01/16 17:51	44,300.0	JT

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-03
Client ID: LP-5
Sample Location: ORLEANS, MA
Matrix: Water

Date Collected: 03/31/16 09:55
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	16.6		mg CaCO3/L	2.00	NA	1	-	04/03/16 11:59	121,2320B	SG
pH (H)	5.6		SU	-	NA	1	-	03/31/16 21:34	121,4500H+-B	JC
Nitrogen, Ammonia	0.034	JB	mg/l	0.075	0.028	1	04/03/16 21:30	04/05/16 14:35	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/31/16 21:45	44,353.2	MR
Nitrogen, Nitrate	0.41		mg/l	0.10	0.019	1	-	03/31/16 21:45	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.41		mg/l	0.10	0.019	1	-	03/31/16 21:45	44,353.2	MR
Total Nitrogen	0.41		mg/l	0.30	0.30	1	-	04/07/16 11:42	107,-	JO
Nitrogen, Total Kjeldahl	0.244	J	mg/l	0.300	0.066	1	04/05/16 15:07	04/06/16 14:21	121,4500N-C	JO
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	03/31/16 23:33	121,4500P-E	LH
Dissolved Organic Carbon	2.5		mg/l	2.0	0.24	2	04/01/16 08:55	04/01/16 08:55	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	234.		mg/l	12.5	1.35	25	-	04/01/16 21:03	44,300.0	JT
Sulfate	7.53		mg/l	1.00	0.150	1	-	04/01/16 18:03	44,300.0	JT

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-04
Client ID: LP-6
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/31/16 10:20
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	5.40		mg CaCO3/L	2.00	NA	1	-	04/03/16 11:59	121,2320B	SG
pH (H)	5.6		SU	-	NA	1	-	03/31/16 21:34	121,4500H+-B	JC
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/03/16 21:30	04/05/16 14:38	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/31/16 21:47	44,353.2	MR
Nitrogen, Nitrate	1.3		mg/l	0.10	0.019	1	-	03/31/16 21:47	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.3		mg/l	0.10	0.019	1	-	03/31/16 21:47	44,353.2	MR
Total Nitrogen	1.3		mg/l	0.30	0.30	1	-	04/07/16 11:42	107,-	JO
Nitrogen, Total Kjeldahl	0.112	J	mg/l	0.300	0.066	1	04/05/16 15:07	04/06/16 14:22	121,4500N-C	JO
Phosphorus, Orthophosphate	0.004	J	mg/l	0.005	0.001	1	-	04/02/16 01:49	121,4500P-E	LH
Dissolved Organic Carbon	1.2	J	mg/l	2.0	0.24	2	04/01/16 08:55	04/01/16 08:55	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	444.		mg/l	12.5	1.35	25	-	04/01/16 21:15	44,300.0	JT
Sulfate	3.08		mg/l	1.00	0.150	1	-	04/01/16 18:15	44,300.0	JT

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-05
Client ID: LPZ-53
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/31/16 08:25
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	22.9		mg CaCO3/L	2.00	NA	1	-	04/03/16 11:59	121,2320B	SG
pH (H)	5.8		SU	-	NA	1	-	03/31/16 21:34	121,4500H+-B	JC
Nitrogen, Ammonia	0.053	JB	mg/l	0.075	0.028	1	04/03/16 21:30	04/05/16 14:39	44,350.1	JO
Nitrogen, Nitrite	0.021	J	mg/l	0.050	0.010	1	-	03/31/16 21:48	44,353.2	MR
Nitrogen, Nitrate	1.8		mg/l	0.10	0.019	1	-	03/31/16 21:48	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.8		mg/l	0.10	0.019	1	-	03/31/16 21:48	44,353.2	MR
Total Nitrogen	1.8		mg/l	0.30	0.30	1	-	04/07/16 11:42	107,-	JO
Nitrogen, Total Kjeldahl	0.145	J	mg/l	0.300	0.066	1	04/05/16 15:07	04/06/16 14:23	121,4500N-C	JO
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	04/02/16 01:50	121,4500P-E	LH
Dissolved Organic Carbon	0.69	J	mg/l	1.0	0.12	1	04/01/16 08:55	04/01/16 08:55	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	173.		mg/l	12.5	1.35	25	-	04/01/16 22:15	44,300.0	JT
Sulfate	5.50		mg/l	1.00	0.150	1	-	04/01/16 18:27	44,300.0	JT

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-06
Client ID: LPZ-61
Sample Location: ORLEANS, MA
Matrix: Water

Date Collected: 03/31/16 09:05
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	29.7		mg CaCO3/L	2.00	NA	1	-	04/03/16 11:59	121,2320B	SG
pH (H)	6.0		SU	-	NA	1	-	03/31/16 21:34	121,4500H+-B	JC
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/03/16 21:30	04/05/16 14:40	44,350.1	JO
Nitrogen, Nitrite	0.017	J	mg/l	0.050	0.010	1	-	03/31/16 21:58	44,353.2	MR
Nitrogen, Nitrate	1.0		mg/l	0.10	0.019	1	-	03/31/16 21:58	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.0		mg/l	0.10	0.019	1	-	03/31/16 21:58	44,353.2	MR
Total Nitrogen	1.0		mg/l	0.30	0.30	1	-	04/07/16 11:42	107,-	JO
Nitrogen, Total Kjeldahl	0.114	J	mg/l	0.300	0.066	1	04/05/16 15:07	04/06/16 14:24	121,4500N-C	JO
Phosphorus, Orthophosphate	0.024		mg/l	0.005	0.001	1	-	04/02/16 01:50	121,4500P-E	LH
Dissolved Organic Carbon	0.96	J	mg/l	1.0	0.12	1	04/01/16 08:55	04/01/16 08:55	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	93.9		mg/l	5.00	0.541	10	-	04/01/16 22:27	44,300.0	JT
Sulfate	4.22		mg/l	1.00	0.150	1	-	04/01/16 18:39	44,300.0	JT

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

SAMPLE RESULTS

Lab ID: L1609305-07
Client ID: LP-3 DUP
Sample Location: ORLEANS, MA
Matrix: Water
Date Collected: 03/31/16 12:48
Date Received: 03/31/16
Field Prep: Field Filtered (Dissolved Metals, DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	18.9		mg CaCO3/L	2.00	NA	1	-	04/03/16 11:59	121,2320B	SG
pH (H)	6.0		SU	-	NA	1	-	03/31/16 21:34	121,4500H+-B	JC
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/03/16 21:30	04/05/16 14:41	44,350.1	JO
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/31/16 22:05	44,353.2	MR
Nitrogen, Nitrate	1.2		mg/l	0.10	0.019	1	-	03/31/16 22:05	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.2		mg/l	0.10	0.019	1	-	03/31/16 22:05	44,353.2	MR
Total Nitrogen	1.2		mg/l	0.60	0.60	2	-	04/07/16 11:42	107,-	JO
Nitrogen, Total Kjeldahl	0.440	J	mg/l	0.600	0.132	2	04/05/16 15:07	04/06/16 14:29	121,4500N-C	JO
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	04/02/16 01:50	121,4500P-E	LH
Dissolved Organic Carbon	1.2		mg/l	1.0	0.12	1	04/01/16 08:55	04/01/16 08:55	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	77.0		mg/l	5.00	0.541	10	-	04/01/16 22:39	44,300.0	JT
Sulfate	12.4		mg/l	1.00	0.150	1	-	04/01/16 18:51	44,300.0	JT

Project Name: EPA ORLEANS PRB **Lab Number:** L1609305

Project Number: WV-1009 **Report Date:** 04/07/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-07 Batch: WG879275-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	03/31/16 21:53	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-07 Batch: WG879276-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	03/31/16 21:56	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG879322-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	03/31/16 23:24	121,4500P-E	LH
General Chemistry - Westborough Lab for sample(s): 01-07 Batch: WG879411-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	04/01/16 08:55	04/01/16 08:55	121,5310C	DW
General Chemistry - Westborough Lab for sample(s): 01-07 Batch: WG879642-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	03/31/16 21:53	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 04-07 Batch: WG879720-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	04/02/16 01:48	121,4500P-E	LH
General Chemistry - Westborough Lab for sample(s): 01-07 Batch: WG879921-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	04/03/16 11:59	121,2320B	SG
General Chemistry - Westborough Lab for sample(s): 02-07 Batch: WG879971-1										
Nitrogen, Ammonia	0.095		mg/l	0.075	0.028	1	04/03/16 21:30	04/05/16 14:45	44,350.1	JO
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-07 Batch: WG880157-1										
Chloride	ND		mg/l	0.500	0.054	1	-	04/01/16 17:15	44,300.0	JT
Sulfate	ND		mg/l	1.00	0.150	1	-	04/01/16 17:15	44,300.0	JT
General Chemistry - Westborough Lab for sample(s): 01-07 Batch: WG880567-1										
Nitrogen, Total Kjeldahl	0.134	J	mg/l	0.300	0.022	1	04/05/16 15:07	04/06/16 14:13	121,4500N-C	JO
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG880647-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	04/05/16 20:30	04/06/16 14:46	44,350.1	JO

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA ORLEANS PRB

Project Number: WV-1009

Lab Number: L1609305

Report Date: 04/07/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-07 Batch: WG879275-2								
Nitrogen, Nitrate	98		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-07 Batch: WG879276-2								
Nitrogen, Nitrite	104		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-07 Batch: WG879302-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG879322-2								
Phosphorus, Orthophosphate	97		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-07 Batch: WG879411-2								
Dissolved Organic Carbon	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-07 Batch: WG879642-2								
Nitrogen, Nitrate/Nitrite	98		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 04-07 Batch: WG879720-2								
Phosphorus, Orthophosphate	100		-		90-110	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA ORLEANS PRB

Project Number: WV-1009

Lab Number: L1609305

Report Date: 04/07/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-07 Batch: WG879921-3					
Alkalinity, Total	103	-	90-110	-	10
General Chemistry - Westborough Lab Associated sample(s): 02-07 Batch: WG879971-2					
Nitrogen, Ammonia	92	-	80-120	-	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-07 Batch: WG880157-2					
Chloride	100	-	90-110	-	
Sulfate	103	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-07 Batch: WG880567-2					
Nitrogen, Total Kjeldahl	96	-	78-122	-	
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG880647-2					
Nitrogen, Ammonia	90	-	80-120	-	20

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA ORLEANS PRB
Project Number: WV-1009

Lab Number: L1609305
Report Date: 04/07/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG879275-4 QC Sample: L1609305-06 Client ID: LPZ-61												
Nitrogen, Nitrate	1.0	4	4.9	98		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG879276-4 QC Sample: L1609305-06 Client ID: LPZ-61												
Nitrogen, Nitrite	0.017J	4	4.1	102		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-03 QC Batch ID: WG879322-4 QC Sample: L1609150-02 Client ID: MS Sample												
Phosphorus, Orthophosphate	0.007	0.5	0.512	101		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG879411-4 QC Sample: L1609305-04 Client ID: LP-6												
Dissolved Organic Carbon	1.2J	16	18	112		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG879642-4 QC Sample: L1609305-06 Client ID: LPZ-61												
Nitrogen, Nitrate/Nitrite	1.0	4	4.9	98		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 04-07 QC Batch ID: WG879720-4 QC Sample: L1609568-14 Client ID: MS Sample												
Phosphorus, Orthophosphate	0.006	0.5	0.487	96		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG879921-4 QC Sample: L1609047-01 Client ID: MS Sample												
Alkalinity, Total	6160	500	6510	**70**	Q	-	-		86-116	-		10
General Chemistry - Westborough Lab Associated sample(s): 02-07 QC Batch ID: WG879971-4 QC Sample: L1608970-01 Client ID: MS Sample												
Nitrogen, Ammonia	ND	4	3.49	87		-	-		80-120	-		20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG880157-4 QC Sample: L1609305-05 Client ID: LPZ-53												
Chloride	173.	100	288	114		-	-		40-151	-		18
Sulfate	5.50	8	14.7	115		-	-		60-140	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA ORLEANS PRB
Project Number: WV-1009

Lab Number: L1609305
Report Date: 04/07/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG880567-4 QC Sample: L1609305-06 Client ID: LPZ-61									
Nitrogen, Total Kjeldahl	0.114J	8	7.26	91	-	-	77-111	-	24
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG880647-4 QC Sample: L1608970-04 Client ID: MS Sample									
Nitrogen, Ammonia	0.094	4	3.71	90	-	-	80-120	-	20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA ORLEANS PRB
Project Number: WV-1009

Lab Number: L1609305
Report Date: 04/07/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG879275-3 QC Sample: L1609305-06 Client ID: LPZ-61						
Nitrogen, Nitrate	1.0	1.0	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG879276-3 QC Sample: L1609305-06 Client ID: LPZ-61						
Nitrogen, Nitrite	0.017J	0.014J	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG879302-2 QC Sample: L1609256-01 Client ID: DUP Sample						
pH	7.1	7.0	SU	1		5
General Chemistry - Westborough Lab Associated sample(s): 01-03 QC Batch ID: WG879322-3 QC Sample: L1609150-01 Client ID: DUP Sample						
Phosphorus, Orthophosphate	2.01	1.97	mg/l	2		20
General Chemistry - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG879411-3 QC Sample: L1609305-07 Client ID: LP-3 DUP						
Dissolved Organic Carbon	1.2	1.2	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG879642-3 QC Sample: L1609305-06 Client ID: LPZ-61						
Nitrogen, Nitrate/Nitrite	1.0	1.0	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 04-07 QC Batch ID: WG879720-3 QC Sample: L1609568-13 Client ID: DUP Sample						
Phosphorus, Orthophosphate	0.005	0.006	mg/l	18		20
General Chemistry - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG879921-2 QC Sample: L1609047-01 Client ID: DUP Sample						
Alkalinity, Total	6160	5990	mg CaCO3/L	3		10
General Chemistry - Westborough Lab Associated sample(s): 02-07 QC Batch ID: WG879971-3 QC Sample: L1608970-01 Client ID: DUP Sample						
Nitrogen, Ammonia	ND	ND	mg/l	NC		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA ORLEANS PRB
Project Number: WV-1009

Lab Number: L1609305
Report Date: 04/07/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG880157-3 QC Sample: L1609305-05 Client ID: LPZ-53					
Sulfate	5.50	5.64	mg/l	3	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG880157-3 QC Sample: L1609305-05 Client ID: LPZ-53					
Chloride	173.	177	mg/l	2	18
General Chemistry - Westborough Lab Associated sample(s): 01-07 QC Batch ID: WG880567-3 QC Sample: L1609305-06 Client ID: LPZ-61					
Nitrogen, Total Kjeldahl	0.114J	ND	mg/l	NC	24
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG880647-3 QC Sample: L1608970-04 Client ID: DUP Sample					
Nitrogen, Ammonia	0.094	0.098	mg/l	3	20

Project Name: EPA ORLEANS PRB
Project Number: WV-1009

Lab Number: L1609305
Report Date: 04/07/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1609305-01A	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	DOC-5310(28)
L1609305-01B	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	ARCHIVE(0)
L1609305-01C	Plastic 250ml HNO3 preserved	A	<2	2.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609305-01D	Plastic 500ml unpreserved	A	7	2.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609305-01E	Plastic 500ml H2SO4 preserved	A	<2	2.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609305-01F	Plastic 250ml unpreserved w/No H	A	N/A	2.6	Y	Absent	ALK-T-2320(14)
L1609305-02A	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	DOC-5310(28)
L1609305-02B	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	DOC-5310(28)
L1609305-02C	Plastic 250ml HNO3 preserved	A	<2	2.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609305-02D	Plastic 500ml unpreserved	A	8	2.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609305-02E	Plastic 500ml H2SO4 preserved	A	<2	2.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609305-02F	Plastic 250ml unpreserved w/No H	A	N/A	2.6	Y	Absent	ALK-T-2320(14)
L1609305-03A	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	DOC-5310(28)
L1609305-03B	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	DOC-5310(28)
L1609305-03C	Plastic 250ml HNO3 preserved	A	<2	2.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609305-03D	Plastic 500ml unpreserved	A	7	2.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609305-03E	Plastic 500ml H2SO4 preserved	A	<2	2.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609305-03F	Plastic 250ml unpreserved w/No H	A	N/A	2.6	Y	Absent	ALK-T-2320(14)
L1609305-04A	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	DOC-5310(28)
L1609305-04B	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	DOC-5310(28)
L1609305-04C	Plastic 250ml HNO3 preserved	A	<2	2.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name: EPA ORLEANS PRB
Project Number: WV-1009

Lab Number: L1609305
Report Date: 04/07/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1609305-04D	Plastic 500ml unpreserved	A	8	2.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609305-04E	Plastic 500ml H2SO4 preserved	A	<2	2.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609305-04F	Plastic 250ml unpreserved w/No H	A	N/A	2.6	Y	Absent	ALK-T-2320(14)
L1609305-05A	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	DOC-5310(28)
L1609305-05B	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	DOC-5310(28)
L1609305-05C	Plastic 250ml HNO3 preserved	A	<2	2.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609305-05D	Plastic 500ml unpreserved	A	7	2.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609305-05E	Plastic 500ml H2SO4 preserved	A	<2	2.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609305-05F	Plastic 250ml unpreserved w/No H	A	N/A	2.6	Y	Absent	ALK-T-2320(14)
L1609305-06A	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	DOC-5310(28)
L1609305-06B	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	DOC-5310(28)
L1609305-06C	Plastic 250ml HNO3 preserved	A	<2	2.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609305-06D	Plastic 500ml unpreserved	A	7	2.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609305-06E	Plastic 500ml H2SO4 preserved	A	<2	2.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609305-06F	Plastic 250ml unpreserved w/No H	A	N/A	2.6	Y	Absent	ALK-T-2320(14)
L1609305-07A	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	DOC-5310(28)
L1609305-07B	Vial H2SO4 preserved	A	N/A	2.6	Y	Absent	DOC-5310(28)
L1609305-07C	Plastic 250ml HNO3 preserved	A	<2	2.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1609305-07D	Plastic 500ml unpreserved	A	7	2.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1609305-07E	Plastic 500ml H2SO4 preserved	A	<2	2.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1609305-07F	Plastic 250ml unpreserved w/No H	A	N/A	2.6	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name:	EPA ORLEANS PRB	**Lab Number:**	L1609305
Project Number:	WV-1009	**Report Date:**	04/07/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA ORLEANS PRB	**Lab Number:**	L1609305
Project Number:	WV-1009	**Report Date:**	04/07/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name: EPA ORLEANS PRB
Project Number: WV-1009
Lab Number: L1609305
Report Date: 04/07/16

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

Serial_No:04071616:26

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 3/31/16

ALPHA Job #: L1609305

ALPHA ANALYTICAL

8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220

320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Project Information

Project Name: EPA Orleans PRB

Project Location: Orleans, MA

Project #: WV-1009

Project Manager: Dawna Truslow

ALPHA Quote #:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Client Information

Client: Watervision LLC

Address: 401 Great Rd, Acton, MA

Phone: 603-498-2916

Email: dtruslow@watervisionllc.com

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods

☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)

☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)

☐ Yes ☐ No NPDES RGP

☐ Other State /Fed Program ______ Criteria ______

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Additional Project Information:

Vollo

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; Total N, NH3-N; DOC; diss Fe, Mn, As, BA; Total Alk; SO4, Cl, OPO4-P, NO3, NO2; pH

SAMPLE INFO — Filtration: ☒ Field ☐ Lab to do; Preservation: ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	Total N, NH3-N	DOC	diss Fe, Mn, As, BA	Total Alk	SO4, Cl, OPO4-P, NO3, NO2, pH	Sample Comments
09305-01	LP-2	3-31-16	12:30	water	DT	✓	✓	✓	✓	✓	one DOC unfiltered labeled
02	LP-3	3-31-16	12:25	water	SW	✓	✓	✓	✓	✓	
03	LP-5	3-31-16	9:55	water	DT	✓	✓	✓	✓	✓	
04	LP-6	3-31-16	10:20	water	SW	✓	✓	✓	✓	✓	
05	LPZ-53	3-31-16	8:25	water	DT	✓	✓	✓	✓	✓	
06	LPZ-63	3-31-16	9:05	water	DT	✓	✓	✓	✓	✓	
07	LP-3 deep	3-31-16	12:48	water	SW	✓	✓	✓	✓	✓	

Container Type

Preservative

Container Type	Preservative
P= Plastic	A= None
A= Amber glass	B= HCl
V= Vial	C= HNO_3
G= Glass	D= H_2SO_4
B= Bacteria cup	E= NaOH
C= Cube	F= MeOH
O= Other	G= $NaHSO_4$
E= Encore	H = $Na_2S_2O_3$
D= BOD Bottle	I= Ascorbic Acid
	J = NH_4Cl
	K= Zn Acetate
	O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	3/31/16 1522	[signature]	3/31/16 1522
[signature]	3/31/16 1656	[signature]	3/31/16 1656

FORM NO: 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L1613895
Client:	Watervision, LLC 454 Court Street Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA PRB-ORLEANS
Project Number:	WV-1009
Report Date:	05/13/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1613895
Report Date: 05/13/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1613895-01	LP-3	WATER	ORLEANS	05/09/16 15:07	05/09/16
L1613895-02	LP-6	WATER	ORLEANS	05/09/16 13:35	05/09/16
L1613895-03	LP-6 DUP	WATER	ORLEANS	05/09/16 13:45	05/09/16
L1613895-04	LP-5	WATER	ORLEANS	05/09/16 12:25	05/09/16
L1613895-05	LP-4	WATER	ORLEANS	05/09/16 11:10	05/09/16

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1613895
Report Date: 05/13/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA PRB-ORLEANS **Lab Number:** L1613895
Project Number: WV-1009 **Report Date:** 05/13/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Dissolved Metals

The WG892821-4 MS recovery, performed on L1613895-01, is outside the acceptance criteria for manganese (182%). A post digestion spike was performed and was within acceptance criteria.

Dissolved Organic Carbon

The samples were field filtered; a filter blank was not received.

L1613895-02 and -03: The samples has\ve an elevated detection limit due to the dilution required by the sample matrix.

The WG892290-3 Laboratory Duplicate RPD, performed on L1613895-01, is above the acceptance criteria for (57%); however, the sample and duplicate results are less than five times the reporting limit. Therefore, the RPD is valid.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Melissa Cripps Melissa Cripps

Title: Technical Director/Representative Date: 05/13/16

METALS

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1613895
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613895-01
Client ID: LP-3
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 15:07
Date Received: 05/09/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/11/16 12:05	05/11/16 23:34	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0165	J	mg/l	0.0300	0.0070	1	05/11/16 12:05	05/11/16 23:34	EPA 3005A	1,6010C	MC
Iron, Dissolved	0.65		mg/l	0.050	0.020	1	05/11/16 12:05	05/11/16 23:34	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.112		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/11/16 23:34	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Lab Number: L1613895
Project Number: WV-1009
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613895-02
Client ID: LP-6
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 13:35
Date Received: 05/09/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0021	J	mg/l	0.0050	0.0020	1	05/11/16 12:05	05/11/16 23:52	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0103	J	mg/l	0.0300	0.0070	1	05/11/16 12:05	05/11/16 23:52	EPA 3005A	1,6010C	MC
Iron, Dissolved	1.1		mg/l	0.050	0.020	1	05/11/16 12:05	05/11/16 23:52	EPA 3005A	1,6010C	MC
Manganese, Dissolved	1.15		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/11/16 23:52	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1613895
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613895-03
Client ID: LP-6 DUP
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 13:45
Date Received: 05/09/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0032	J	mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 00:19	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0103	J	mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 00:19	EPA 3005A	1,6010C	MC
Iron, Dissolved	4.0		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 00:19	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.660		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 00:19	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Lab Number: L1613895
Project Number: WV-1009
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613895-04
Client ID: LP-5
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 12:25
Date Received: 05/09/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 00:24	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0214	J	mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 00:24	EPA 3005A	1,6010C	MC
Iron, Dissolved	0.21		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 00:24	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.115		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 00:24	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Lab Number: L1613895
Project Number: WV-1009
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613895-05
Client ID: LP-4
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 11:10
Date Received: 05/09/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 00:28	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0156	J	mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 00:28	EPA 3005A	1,6010C	MC
Iron, Dissolved	0.068		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 00:28	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.0265		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 00:28	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1613895
Report Date: 05/13/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-05 Batch: WG892821-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/11/16 12:05	05/11/16 23:25	1,6010C	MC
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/11/16 12:05	05/11/16 23:25	1,6010C	MC
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/11/16 12:05	05/11/16 23:25	1,6010C	MC
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/11/16 23:25	1,6010C	MC

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA PRB-ORLEANS

Project Number: WV-1009

Lab Number: L1613895

Report Date: 05/13/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-05 Batch: WG892821-2								
Arsenic, Dissolved	102		-		80-120	-		
Boron, Dissolved	102		-		80-120	-		
Iron, Dissolved	93		-		80-120	-		
Manganese, Dissolved	100		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1613895
Report Date: 05/13/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892821-4 QC Sample: L1613895-01 Client ID: LP-3												
Arsenic, Dissolved	ND	0.12	0.123	102		-	-		75-125	-		20
Boron, Dissolved	0.0165J	1	1.02	102		-	-		75-125	-		20
Iron, Dissolved	0.65	1	1.6	95		-	-		75-125	-		20
Manganese, Dissolved	0.112	0.5	1.02	**182**	Q	-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1613895
Report Date: 05/13/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892821-3 QC Sample: L1613895-01 Client ID: LP-3						
Arsenic, Dissolved	ND	ND	mg/l	NC		20
Boron, Dissolved	0.0165J	0.0167J	mg/l	NC		20
Iron, Dissolved	0.65	0.70	mg/l	7		20
Manganese, Dissolved	0.112	0.113	mg/l	1		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1613895
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613895-01
Client ID: LP-3
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 15:07
Date Received: 05/09/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	20.6		mg CaCO3/L	2.00	NA	1	-	05/11/16 10:18	121,2320B	AW
pH (H)	5.7		SU	-	NA	1	-	05/09/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/10/16 11:36	05/10/16 22:59	44,350.1	AT
Nitrogen, Nitrite	0.015	J	mg/l	0.050	0.010	1	-	05/10/16 21:05	44,353.2	MR
Nitrogen, Nitrate	0.90		mg/l	0.10	0.019	1	-	05/10/16 21:05	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.90		mg/l	0.10	0.019	1	-	05/10/16 21:05	44,353.2	MR
Total Nitrogen	1.2		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	0.310		mg/l	0.300	0.066	1	05/10/16 18:00	05/11/16 23:24	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	05/10/16 03:45	121,4500P-E	TA
Dissolved Organic Carbon	1.5		mg/l	1.0	0.12	1	05/10/16 08:01	05/10/16 08:01	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	71.4		mg/l	5.00	0.541	10	-	05/10/16 22:13	44,300.0	AU
Sulfate	12.5		mg/l	1.00	0.150	1	-	05/10/16 18:28	44,300.0	AU

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1613895
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613895-02
Client ID: LP-6
Sample Location: ORLEANS
Matrix: Water

Date Collected: 05/09/16 13:35
Date Received: 05/09/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.60		mg CaCO3/L	2.00	NA	1	-	05/11/16 10:18	121,2320B	AW
pH (H)	5.6		SU	-	NA	1	-	05/09/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	0.057	J	mg/l	0.075	0.028	1	05/10/16 11:36	05/10/16 23:01	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/10/16 21:06	44,353.2	MR
Nitrogen, Nitrate	1.4		mg/l	0.10	0.019	1	-	05/10/16 21:06	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.4		mg/l	0.10	0.019	1	-	05/10/16 21:06	44,353.2	MR
Total Nitrogen	1.4		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	0.258	J	mg/l	0.300	0.066	1	05/10/16 18:00	05/11/16 23:25	121,4500N-C	AT
Phosphorus, Orthophosphate	0.006		mg/l	0.005	0.001	1	-	05/10/16 03:48	121,4500P-E	TA
Dissolved Organic Carbon	0.99	J	mg/l	2.0	0.24	2	05/10/16 08:01	05/10/16 08:01	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	263.		mg/l	12.5	1.35	25	-	05/10/16 22:25	44,300.0	AU
Sulfate	2.83		mg/l	1.00	0.150	1	-	05/10/16 18:40	44,300.0	AU

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1613895
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613895-03
Client ID: LP-6 DUP
Sample Location: ORLEANS
Matrix: Water

Date Collected: 05/09/16 13:45
Date Received: 05/09/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	9.10		mg CaCO3/L	2.00	NA	1	-	05/11/16 10:18	121,2320B	AW
pH (H)	5.6		SU	-	NA	1	-	05/09/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/10/16 11:36	05/10/16 23:02	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/10/16 21:08	44,353.2	MR
Nitrogen, Nitrate	1.4		mg/l	0.10	0.019	1	-	05/10/16 21:08	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.4		mg/l	0.10	0.019	1	-	05/10/16 21:08	44,353.2	MR
Total Nitrogen	1.7		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	0.309		mg/l	0.300	0.066	1	05/10/16 18:00	05/11/16 23:27	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	05/10/16 03:48	121,4500P-E	TA
Dissolved Organic Carbon	1.2	J	mg/l	2.0	0.24	2	05/10/16 08:01	05/10/16 08:01	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	288.		mg/l	12.5	1.35	25	-	05/10/16 22:37	44,300.0	AU
Sulfate	2.61		mg/l	1.00	0.150	1	-	05/10/16 18:52	44,300.0	AU

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1613895
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613895-04
Client ID: LP-5
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 12:25
Date Received: 05/09/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	15.7		mg CaCO3/L	2.00	NA	1	-	05/11/16 10:18	121,2320B	AW
pH (H)	5.5		SU	-	NA	1	-	05/09/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	0.061	J	mg/l	0.075	0.028	1	05/10/16 11:36	05/10/16 23:06	44,350.1	AT
Nitrogen, Nitrite	0.015	J	mg/l	0.050	0.010	1	-	05/10/16 21:13	44,353.2	MR
Nitrogen, Nitrate	0.74		mg/l	0.10	0.019	1	-	05/10/16 21:13	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.74		mg/l	0.10	0.019	1	-	05/10/16 21:13	44,353.2	MR
Total Nitrogen	1.6		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	0.815		mg/l	0.300	0.066	1	05/10/16 18:00	05/11/16 23:28	121,4500N-C	AT
Phosphorus, Orthophosphate	0.009		mg/l	0.005	0.001	1	-	05/10/16 03:49	121,4500P-E	TA
Dissolved Organic Carbon	2.6		mg/l	1.0	0.12	1	05/10/16 08:01	05/10/16 08:01	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	51.6		mg/l	5.00	0.541	10	-	05/10/16 23:25	44,300.0	AU
Sulfate	7.22		mg/l	1.00	0.150	1	-	05/10/16 19:04	44,300.0	AU

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1613895
Report Date: 05/13/16

SAMPLE RESULTS

Lab ID: L1613895-05
Client ID: LP-4
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 11:10
Date Received: 05/09/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	10.9		mg CaCO3/L	2.00	NA	1	-	05/11/16 10:18	121,2320B	AW
pH (H)	5.2		SU	-	NA	1	-	05/09/16 22:30	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/10/16 11:36	05/10/16 23:07	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/10/16 21:14	44,353.2	MR
Nitrogen, Nitrate	0.81		mg/l	0.10	0.019	1	-	05/10/16 21:14	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.81		mg/l	0.10	0.019	1	-	05/10/16 21:14	44,353.2	MR
Total Nitrogen	0.81		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	0.193	J	mg/l	0.300	0.066	1	05/10/16 18:00	05/11/16 23:29	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	05/10/16 03:50	121,4500P-E	TA
Dissolved Organic Carbon	0.94	J	mg/l	1.0	0.12	1	05/10/16 08:01	05/10/16 08:01	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	36.3		mg/l	0.500	0.054	1	-	05/10/16 19:16	44,300.0	AU
Sulfate	14.1		mg/l	1.00	0.150	1	-	05/10/16 19:16	44,300.0	AU

Project Name: EPA PRB-ORLEANS **Lab Number:** L1613895

Project Number: WV-1009 **Report Date:** 05/13/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-05 Batch: WG892211-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	05/10/16 03:44	121,4500P-E	TA
General Chemistry - Westborough Lab for sample(s): 01-05 Batch: WG892290-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	05/10/16 08:01	05/10/16 08:01	121,5310C	DW
General Chemistry - Westborough Lab for sample(s): 01-05 Batch: WG892418-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/10/16 11:36	05/10/16 22:44	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01-05 Batch: WG892513-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	05/10/16 20:23	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-05 Batch: WG892514-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/10/16 20:25	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-05 Batch: WG892515-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	05/10/16 20:28	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-05 Batch: WG892540-1										
Nitrogen, Total Kjeldahl	0.107	J	mg/l	0.300	0.022	1	05/10/16 18:00	05/11/16 23:10	121,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 01-05 Batch: WG892746-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	05/11/16 10:18	121,2320B	AW
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-05 Batch: WG892973-1										
Sulfate	ND		mg/l	1.00	0.150	1	-	05/10/16 16:52	44,300.0	AU
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-05 Batch: WG892973-1										
Chloride	ND		mg/l	0.500	0.054	1	-	05/10/16 16:52	44,300.0	AU

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1613895
Report Date: 05/13/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-05 Batch: WG892164-1								
pH	101		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01-05 Batch: WG892211-2								
Phosphorus, Orthophosphate	102		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-05 Batch: WG892290-2								
Dissolved Organic Carbon	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-05 Batch: WG892418-2								
Nitrogen, Ammonia	96		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-05 Batch: WG892513-2								
Nitrogen, Nitrate	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-05 Batch: WG892514-2								
Nitrogen, Nitrite	100		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-05 Batch: WG892515-2								
Nitrogen, Nitrate/Nitrite	96		-		90-110	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA PRB-ORLEANS

Project Number: WV-1009

Lab Number: L1613895

Report Date: 05/13/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-05 Batch: WG892540-2					
Nitrogen, Total Kjeldahl	100	-	78-122	-	
General Chemistry - Westborough Lab Associated sample(s): 01-05 Batch: WG892746-2					
Alkalinity, Total	102	-	90-110	-	10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-05 Batch: WG892973-2					
Chloride	97	-	90-110	-	
Sulfate	95	-	90-110	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1613895
Report Date: 05/13/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892211-4 QC Sample: L1613895-01 Client ID: LP-3												
Phosphorus, Orthophosphate	0.005	0.5	0.497	98		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892290-4 QC Sample: L1613895-02 Client ID: LP-6												
Dissolved Organic Carbon	0.99J	16	17	107		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892418-4 QC Sample: L1613895-01 Client ID: LP-3												
Nitrogen, Ammonia	ND	4	3.98	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892513-4 QC Sample: L1613856-01 Client ID: MS Sample												
Nitrogen, Nitrate	0.86	4	4.6	94		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892514-4 QC Sample: L1613856-01 Client ID: MS Sample												
Nitrogen, Nitrite	0.053	4	4.0	99		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892515-4 QC Sample: L1613965-01 Client ID: MS Sample												
Nitrogen, Nitrate/Nitrite	1.6	4	5.8	105		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892540-4 QC Sample: L1613895-02 Client ID: LP-6												
Nitrogen, Total Kjeldahl	0.258J	8	7.43	93		-	-		77-111	-		24
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892746-4 QC Sample: L1613895-02 Client ID: LP-6												
Alkalinity, Total	8.60	100	112	103		-	-		86-116	-		10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892973-3 QC Sample: L1613959-07 Client ID: MS Sample												
Chloride	ND	4	3.88	97		-	-		40-151	-		18
Sulfate	ND	8	8.05	101		-	-		60-140	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1613895
Report Date: 05/13/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892164-2 QC Sample: L1613862-01 Client ID: DUP Sample						
pH	7.6	7.6	SU	0		5
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892211-3 QC Sample: L1613895-05 Client ID: LP-4						
Phosphorus, Orthophosphate	0.005	0.005	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892290-3 QC Sample: L1613895-01 Client ID: LP-3						
Dissolved Organic Carbon	1.5	2.7	mg/l	**57**	Q	20
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892418-3 QC Sample: L1613895-01 Client ID: LP-3						
Nitrogen, Ammonia	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892513-3 QC Sample: L1613856-01 Client ID: DUP Sample						
Nitrogen, Nitrate	0.86	0.85	mg/l	1		6
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892514-3 QC Sample: L1613856-01 Client ID: DUP Sample						
Nitrogen, Nitrite	0.053	0.060	mg/l	12		20
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892515-3 QC Sample: L1613965-01 Client ID: DUP Sample						
Nitrogen, Nitrate/Nitrite	1.6	1.6	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892540-3 QC Sample: L1613895-02 Client ID: LP-6						
Nitrogen, Total Kjeldahl	0.258J	0.234J	mg/l	NC		24
General Chemistry - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892746-3 QC Sample: L1613895-02 Client ID: LP-6						
Alkalinity, Total	8.60	8.70	mg CaCO3/L	1		10

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1613895
Report Date: 05/13/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-05 QC Batch ID: WG892973-4 QC Sample: L1613959-07 Client ID: DUP Sample					
Chloride	ND	ND	mg/l	NC	18
Sulfate	ND	ND	mg/l	NC	20

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1613895
Report Date: 05/13/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1613895-01A	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1613895-01B	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1613895-01C	Plastic 500ml unpreserved	A	7	4.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613895-01D	Plastic 500ml H2SO4 preserved	A	<2	4.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613895-01E	Plastic 250ml unpreserved w/No H	A	N/A	4.6	Y	Absent	ALK-T-2320(14)
L1613895-01F	Plastic 250ml HNO3 preserved	A	<2	4.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613895-02A	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1613895-02B	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1613895-02C	Plastic 500ml unpreserved	A	7	4.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613895-02D	Plastic 500ml H2SO4 preserved	A	<2	4.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613895-02E	Plastic 250ml unpreserved w/No H	A	N/A	4.6	Y	Absent	ALK-T-2320(14)
L1613895-02F	Plastic 250ml HNO3 preserved	A	<2	4.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613895-03A	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1613895-03B	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1613895-03C	Plastic 500ml unpreserved	A	7	4.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613895-03D	Plastic 500ml H2SO4 preserved	A	<2	4.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613895-03E	Plastic 250ml unpreserved w/No H	A	N/A	4.6	Y	Absent	ALK-T-2320(14)
L1613895-03F	Plastic 250ml HNO3 preserved	A	<2	4.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613895-04A	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1613895-04B	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1613895-04C	Plastic 500ml unpreserved	A	7	4.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)

*Values in parentheses indicate holding time in days

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1613895
Report Date: 05/13/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1613895-04D	Plastic 500ml H2SO4 preserved	A	<2	4.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613895-04E	Plastic 250ml unpreserved w/No H	A	N/A	4.6	Y	Absent	ALK-T-2320(14)
L1613895-04F	Plastic 250ml HNO3 preserved	A	<2	4.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1613895-05A	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1613895-05B	Vial H2SO4 preserved	A	N/A	4.6	Y	Absent	DOC-5310(28)
L1613895-05C	Plastic 500ml unpreserved	A	7	4.6	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1613895-05D	Plastic 500ml H2SO4 preserved	A	<2	4.6	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1613895-05E	Plastic 250ml unpreserved w/No H	A	N/A	4.6	Y	Absent	ALK-T-2320(14)
L1613895-05F	Plastic 250ml HNO3 preserved	A	<2	4.6	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name:	EPA PRB-ORLEANS	**Lab Number:**	L1613895
Project Number:	WV-1009	**Report Date:**	05/13/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA PRB-ORLEANS	**Lab Number:**	L1613895
Project Number:	WV-1009	**Report Date:**	05/13/16

Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 5/9/16

ALPHA Job #: L1613895

ALPHA ANALYTICAL
8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220

320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

Client Information

Client: WaterVision LLC
Address: 560 Great Rd.
Acton, MA
Phone: 603-766-6670
Email: jtruslow@watervisionllc.com

Additional Project Information:

Project Information

Project Name: EPA PRB - Orleans
Project Location: Orleans
Project #: WV-1009
Project Manager: Danna Truslow
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH *(only confirmed if pre-approved!)*
Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program _____ Criteria B*

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2	SVOC: ☐ ABN ☐ PAH	METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15	METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13	EPH: ☐ Ranges & Targets ☐ Ranges Only	VPH: ☐ Ranges & Targets ☐ Ranges Only	☐ PCB ☐ PEST	TPH: ☐ Quant Only ☐ Fingerprint	pH, SO_4, Cl, NO_3, NO_2, Ophos	Total N, NH_3	Total Alk	Diss. metals - As, Fe, Mn, B*	DOC *	SAMPLE INFO: Filtration ☒ Field * ☐ Lab to do; Preservation ☐ Lab to do	Sample Comments	TOTAL # BOTTLES
13895 01	LP-3	5/9/16	15:07	water	SW									✓	✓	✓	✓	✓			
02	LP-6	5/9/16	13:35											✓	✓	✓	✓	✓			
03	LP-6 DUP	5/9/16	13:45											✓	✓	✓	✓	✓			
04	LP-5	5/9/16	12:25											✓	✓	✓	✓	✓			
05	LP-4	5/9/16	11:10											✓	✓	✓	✓	✓			

Container Type																					
Preservative																					

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Samantha Wright	5/9/16 15:40	Charles Thayer PDC	5/9/16 15:40
Charles Thayer PDC	5/9/16 17:15	[illegible] MC	5/9/16 17:15

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L1614094
Client:	Watervision, LLC 454 Court Street Suite 304 Portsmouth, NH 03801
ATTN:	Danna Truslow
Phone:	(603) 766-6670
Project Name:	EPA PRB-ORLEANS
Project Number:	WV-1009
Report Date:	05/17/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1614094
Report Date: 05/17/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1614094-01	LP-2	WATER	ORLEANS	05/09/16 16:45	05/10/16
L1614094-02	LPZ-15	WATER	ORLEANS	05/09/16 18:25	05/10/16
L1614094-03	LPZ-21	WATER	ORLEANS	05/09/16 18:58	05/10/16
L1614094-04	LPZ-29	WATER	ORLEANS	05/10/16 08:38	05/10/16
L1614094-05	LPZ-29 DUP	WATER	ORLEANS	05/10/16 08:43	05/10/16
L1614094-06	LPZ-39	WATER	ORLEANS	05/10/16 11:40	05/10/16
L1614094-07	LPZ-53	WATER	ORLEANS	05/10/16 14:10	05/10/16
L1614094-08	LPZ-61	WATER	ORLEANS	05/10/16 14:05	05/10/16
L1614094-09	LPZ-71	WATER	ORLEANS	05/10/16 13:10	05/10/16
L1614094-10	LPZ-80	WATER	ORLEANS	05/10/16 11:17	05/10/16
L1614094-11	LPZ-90	WATER	ORLEANS	05/10/16 09:22	05/10/16

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: EPA PRB-ORLEANS **Lab Number:** L1614094
Project Number: WV-1009 **Report Date:** 05/17/16

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

L1614094-06: The analyses performed were specified by the client.

Dissolved Organic Carbon

L1614094-01, -04 and -05: The sample has an elevated detection limit due to the dilution required by the sample matrix.

The samples were field filtered; a filter blank was not received.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Michelle M. Morris

Title: Technical Director/Representative Date: 05/17/16

METALS

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-01
Client ID: LP-2
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 16:45
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0020	J	mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 00:33	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0134	J	mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 00:33	EPA 3005A	1,6010C	MC
Iron, Dissolved	0.33		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 00:33	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.221		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 00:33	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-02
Client ID: LPZ-15
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 18:25
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 00:38	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0150	J	mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 00:38	EPA 3005A	1,6010C	MC
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 00:38	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.0148		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 00:38	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-03
Client ID: LPZ-21
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 18:58
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 00:42	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0314		mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 00:42	EPA 3005A	1,6010C	MC
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 00:42	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.0392		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 00:42	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-04
Client ID: LPZ-29
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 08:38
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 00:47	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0264	J	mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 00:47	EPA 3005A	1,6010C	MC
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 00:47	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.0449		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 00:47	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Lab Number: L1614094
Project Number: WV-1009
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-05
Client ID: LPZ-29 DUP
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 08:43
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 00:51	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0265	J	mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 00:51	EPA 3005A	1,6010C	MC
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 00:51	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.0442		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 00:51	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-06
Client ID: LPZ-39
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 11:40
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0023	J	mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 01:28	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0339		mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 01:28	EPA 3005A	1,6010C	MC
Iron, Dissolved	0.60		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 01:28	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.164		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 01:28	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-07
Client ID: LPZ-53
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 14:10
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 01:32	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0326		mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 01:32	EPA 3005A	1,6010C	MC
Iron, Dissolved	0.57		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 01:32	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.122		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 01:32	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-08
Client ID: LPZ-61
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 14:05
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0021	J	mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 01:37	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0345		mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 01:37	EPA 3005A	1,6010C	MC
Iron, Dissolved	0.33		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 01:37	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.169		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 01:37	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-09
Client ID: LPZ-71
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 13:10
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0220		mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 01:41	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0260	J	mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 01:41	EPA 3005A	1,6010C	MC
Iron, Dissolved	30.		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 01:41	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.186		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 01:41	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-10
Client ID: LPZ-80
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 11:17
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0036	J	mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 01:46	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0221	J	mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 01:46	EPA 3005A	1,6010C	MC
Iron, Dissolved	13.		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 01:46	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.116		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 01:46	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-11
Client ID: LPZ-90
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 09:22
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Dissolved Metals - Westborough Lab											
Arsenic, Dissolved	0.0163		mg/l	0.0050	0.0020	1	05/11/16 12:05	05/12/16 01:50	EPA 3005A	1,6010C	MC
Boron, Dissolved	0.0223	J	mg/l	0.0300	0.0070	1	05/11/16 12:05	05/12/16 01:50	EPA 3005A	1,6010C	MC
Iron, Dissolved	12.		mg/l	0.050	0.020	1	05/11/16 12:05	05/12/16 01:50	EPA 3005A	1,6010C	MC
Manganese, Dissolved	0.331		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/12/16 01:50	EPA 3005A	1,6010C	MC

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Westborough Lab for sample(s): 01-11 Batch: WG892821-1										
Arsenic, Dissolved	ND		mg/l	0.0050	0.0020	1	05/11/16 12:05	05/11/16 23:25	1,6010C	MC
Boron, Dissolved	ND		mg/l	0.0300	0.0070	1	05/11/16 12:05	05/11/16 23:25	1,6010C	MC
Iron, Dissolved	ND		mg/l	0.050	0.020	1	05/11/16 12:05	05/11/16 23:25	1,6010C	MC
Manganese, Dissolved	ND		mg/l	0.0100	0.0020	1	05/11/16 12:05	05/11/16 23:25	1,6010C	MC

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA PRB-ORLEANS

Project Number: WV-1009

Lab Number: L1614094

Report Date: 05/17/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-11 Batch: WG892821-2								
Arsenic, Dissolved	102		-		80-120	-		
Boron, Dissolved	102		-		80-120	-		
Iron, Dissolved	93		-		80-120	-		
Manganese, Dissolved	100		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1614094
Report Date: 05/17/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG892821-4 QC Sample: L1613895-01 Client ID: MS Sample												
Arsenic, Dissolved	ND	0.12	0.123	102		-	-		75-125	-		20
Boron, Dissolved	0.0165J	1	1.02	102		-	-		75-125	-		20
Iron, Dissolved	0.65	1	1.6	95		-	-		75-125	-		20
Manganese, Dissolved	0.112	0.5	1.02	**182**	Q	-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1614094
Report Date: 05/17/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG892821-3 QC Sample: L1613895-01 Client ID: DUP Sample						
Arsenic, Dissolved	ND	ND	mg/l	NC		20
Boron, Dissolved	0.0165J	0.0167J	mg/l	NC		20
Iron, Dissolved	0.65	0.70	mg/l	7		20
Manganese, Dissolved	0.112	0.113	mg/l	1		20

INORGANICS
&
MISCELLANEOUS

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-01
Client ID: LP-2
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 16:45
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	22.8		mg CaCO3/L	2.00	NA	1	-	05/12/16 10:30	121,2320B	AW
pH (H)	5.6		SU	-	NA	1	-	05/10/16 22:34	121,4500H+-B	AS
Nitrogen, Ammonia	0.059	J	mg/l	0.075	0.028	1	05/11/16 10:32	05/12/16 00:02	44,350.1	AT
Nitrogen, Nitrite	0.016	J	mg/l	0.050	0.010	1	-	05/10/16 22:15	44,353.2	MR
Nitrogen, Nitrate	1.3		mg/l	0.10	0.019	1	-	05/10/16 22:15	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.3		mg/l	0.10	0.019	1	-	05/10/16 22:15	44,353.2	MR
Total Nitrogen	3.4		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	2.09		mg/l	0.300	0.066	1	05/11/16 09:24	05/11/16 21:57	121,4500N-C	AT
Phosphorus, Orthophosphate	0.008		mg/l	0.005	0.001	1	-	05/10/16 23:28	121,4500P-E	MR
Dissolved Organic Carbon	2.1	J	mg/l	4.0	0.47	4	05/13/16 08:23	05/13/16 08:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	624.		mg/l	25.0	2.70	50	-	05/12/16 00:46	44,300.0	AU
Sulfate	4.60		mg/l	1.00	0.150	1	-	05/11/16 19:58	44,300.0	AU

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-02
Client ID: LPZ-15
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 18:25
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	11.5		mg CaCO3/L	2.00	NA	1	-	05/12/16 10:30	121,2320B	AW
pH (H)	5.5		SU	-	NA	1	-	05/10/16 22:34	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/11/16 10:32	05/12/16 00:02	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/10/16 22:16	44,353.2	MR
Nitrogen, Nitrate	0.78		mg/l	0.10	0.019	1	-	05/10/16 22:16	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.78		mg/l	0.10	0.019	1	-	05/10/16 22:16	44,353.2	MR
Total Nitrogen	0.78		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	0.159	J	mg/l	0.300	0.066	1	05/11/16 09:24	05/11/16 21:57	121,4500N-C	AT
Phosphorus, Orthophosphate	0.011		mg/l	0.005	0.001	1	-	05/10/16 23:28	121,4500P-E	MR
Dissolved Organic Carbon	0.91	J	mg/l	1.0	0.12	1	05/13/16 08:23	05/13/16 08:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	47.4		mg/l	0.500	0.054	1	-	05/11/16 20:10	44,300.0	AU
Sulfate	12.1		mg/l	1.00	0.150	1	-	05/11/16 20:10	44,300.0	AU

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-03
Client ID: LPZ-21
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/09/16 18:58
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	17.5		mg CaCO3/L	2.00	NA	1	-	05/12/16 10:30	121,2320B	AW
pH (H)	5.5		SU	-	NA	1	-	05/10/16 22:34	121,4500H+-B	AS
Nitrogen, Ammonia	0.054	J	mg/l	0.075	0.028	1	05/11/16 10:32	05/12/16 00:03	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/10/16 22:18	44,353.2	MR
Nitrogen, Nitrate	1.5		mg/l	0.10	0.019	1	-	05/10/16 22:18	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.5		mg/l	0.10	0.019	1	-	05/10/16 22:18	44,353.2	MR
Total Nitrogen	1.5		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	05/11/16 09:24	05/11/16 21:58	121,4500N-C	AT
Phosphorus, Orthophosphate	0.027		mg/l	0.005	0.001	1	-	05/10/16 23:29	121,4500P-E	MR
Dissolved Organic Carbon	0.92	J	mg/l	1.0	0.12	1	05/13/16 08:23	05/13/16 08:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	122.		mg/l	5.00	0.541	10	-	05/12/16 00:58	44,300.0	AU
Sulfate	7.12		mg/l	1.00	0.150	1	-	05/11/16 20:22	44,300.0	AU

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-04
Client ID: LPZ-29
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 08:38
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.60		mg CaCO3/L	2.00	NA	1	-	05/12/16 10:30	121,2320B	AW
pH (H)	5.2		SU	-	NA	1	-	05/10/16 22:34	121,4500H+-B	AS
Nitrogen, Ammonia	0.071	J	mg/l	0.075	0.028	1	05/11/16 10:32	05/12/16 00:04	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/10/16 22:28	44,353.2	MR
Nitrogen, Nitrate	2.0		mg/l	0.10	0.019	1	-	05/10/16 22:28	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.0		mg/l	0.10	0.019	1	-	05/10/16 22:28	44,353.2	MR
Total Nitrogen	2.0		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	05/11/16 09:24	05/11/16 21:59	121,4500N-C	AT
Phosphorus, Orthophosphate	0.023		mg/l	0.005	0.001	1	-	05/10/16 23:29	121,4500P-E	MR
Dissolved Organic Carbon	0.94	J	mg/l	2.0	0.24	2	05/13/16 08:23	05/13/16 08:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	284.		mg/l	12.5	1.35	25	-	05/12/16 01:10	44,300.0	AU
Sulfate	6.33		mg/l	1.00	0.150	1	-	05/11/16 20:34	44,300.0	AU

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-05
Client ID: LPZ-29 DUP
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 08:43
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	8.50		mg CaCO3/L	2.00	NA	1	-	05/12/16 10:30	121,2320B	AW
pH (H)	5.3		SU	-	NA	1	-	05/10/16 22:34	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/11/16 10:32	05/12/16 00:05	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/10/16 22:29	44,353.2	MR
Nitrogen, Nitrate	2.0		mg/l	0.10	0.019	1	-	05/10/16 22:29	44,353.2	MR
Nitrogen, Nitrate/Nitrite	2.0		mg/l	0.10	0.019	1	-	05/10/16 22:29	44,353.2	MR
Total Nitrogen	2.0		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	0.081	J	mg/l	0.300	0.066	1	05/11/16 09:24	05/11/16 22:00	121,4500N-C	AT
Phosphorus, Orthophosphate	0.022		mg/l	0.005	0.001	1	-	05/10/16 23:30	121,4500P-E	MR
Dissolved Organic Carbon	0.90	J	mg/l	2.0	0.24	2	05/13/16 08:23	05/13/16 08:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	285.		mg/l	12.5	1.35	25	-	05/12/16 01:22	44,300.0	AU
Sulfate	6.33		mg/l	1.00	0.150	1	-	05/11/16 20:46	44,300.0	AU

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-06
Client ID: LPZ-39
Sample Location: ORLEANS
Matrix: Water

Date Collected: 05/10/16 11:40
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/11/16 10:32	05/12/16 00:06	44,350.1	AT
Nitrogen, Nitrate/Nitrite	0.53		mg/l	0.10	0.019	1	-	05/11/16 22:17	44,353.2	MR
Total Nitrogen	0.83		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	0.300		mg/l	0.300	0.066	1	05/11/16 09:24	05/11/16 22:01	121,4500N-C	AT
Dissolved Organic Carbon	1.2		mg/l	1.0	0.12	1	05/13/16 08:23	05/13/16 08:23	121,5310C	DW

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-07
Client ID: LPZ-53
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 14:10
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	14.7		mg CaCO3/L	2.00	NA	1	-	05/12/16 10:30	121,2320B	AW
pH (H)	5.6		SU	-	NA	1	-	05/10/16 22:34	121,4500H+-B	AS
Nitrogen, Ammonia	0.038	J	mg/l	0.075	0.028	1	05/11/16 10:32	05/12/16 00:09	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/10/16 22:31	44,353.2	MR
Nitrogen, Nitrate	1.8		mg/l	0.10	0.019	1	-	05/10/16 22:31	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.8		mg/l	0.10	0.019	1	-	05/10/16 22:31	44,353.2	MR
Total Nitrogen	1.8		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	05/11/16 09:24	05/11/16 22:02	121,4500N-C	AT
Phosphorus, Orthophosphate	0.005		mg/l	0.005	0.001	1	-	05/10/16 23:31	121,4500P-E	MR
Dissolved Organic Carbon	0.65	J	mg/l	1.0	0.12	1	05/13/16 08:23	05/13/16 08:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	143.		mg/l	5.00	0.541	10	-	05/12/16 01:34	44,300.0	AU
Sulfate	4.46		mg/l	1.00	0.150	1	-	05/11/16 20:58	44,300.0	AU

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-08
Client ID: LPZ-61
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 14:05
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	26.9		mg CaCO3/L	2.00	NA	1	-	05/12/16 10:30	121,2320B	AW
pH (H)	6.0		SU	-	NA	1	-	05/10/16 22:34	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/11/16 10:32	05/12/16 00:10	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/10/16 22:32	44,353.2	MR
Nitrogen, Nitrate	1.0		mg/l	0.10	0.019	1	-	05/10/16 22:32	44,353.2	MR
Nitrogen, Nitrate/Nitrite	1.0		mg/l	0.10	0.019	1	-	05/10/16 22:32	44,353.2	MR
Total Nitrogen	1.0		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.066	1	05/11/16 09:24	05/11/16 22:03	121,4500N-C	AT
Phosphorus, Orthophosphate	0.035		mg/l	0.005	0.001	1	-	05/10/16 23:31	121,4500P-E	MR
Dissolved Organic Carbon	0.84	J	mg/l	1.0	0.12	1	05/13/16 08:23	05/13/16 08:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	78.7		mg/l	5.00	0.541	10	-	05/12/16 01:46	44,300.0	AU
Sulfate	2.39		mg/l	1.00	0.150	1	-	05/11/16 21:10	44,300.0	AU

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-09
Client ID: LPZ-71
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 13:10
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	38.2		mg CaCO3/L	2.00	NA	1	-	05/12/16 10:30	121,2320B	AW
pH (H)	6.2		SU	-	NA	1	-	05/10/16 22:34	121,4500H+-B	AS
Nitrogen, Ammonia	0.077		mg/l	0.075	0.028	1	05/11/16 10:32	05/12/16 00:11	44,350.1	AT
Nitrogen, Nitrite	0.024	J	mg/l	0.050	0.010	1	-	05/10/16 22:33	44,353.2	MR
Nitrogen, Nitrate	0.059	J	mg/l	0.10	0.019	1	-	05/10/16 22:33	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.059	J	mg/l	0.10	0.019	1	-	05/10/16 22:33	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	05/12/16 11:24	107,-	JO
Nitrogen, Total Kjeldahl	0.177	J	mg/l	0.300	0.066	1	05/11/16 09:24	05/11/16 22:08	121,4500N-C	AT
Phosphorus, Orthophosphate	0.003	J	mg/l	0.005	0.001	1	-	05/10/16 23:32	121,4500P-E	MR
Dissolved Organic Carbon	1.8		mg/l	1.0	0.12	1	05/13/16 08:23	05/13/16 08:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	25.0		mg/l	0.500	0.054	1	-	05/11/16 21:58	44,300.0	AU
Sulfate	8.42		mg/l	1.00	0.150	1	-	05/11/16 21:58	44,300.0	AU

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-10
Client ID: LPZ-80
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 11:17
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	29.0		mg CaCO3/L	2.00	NA	1	-	05/12/16 10:30	121,2320B	AW
pH (H)	6.4		SU	-	NA	1	-	05/10/16 22:34	121,4500H+-B	AS
Nitrogen, Ammonia	0.041	J	mg/l	0.075	0.028	1	05/11/16 10:32	05/12/16 00:12	44,350.1	AT
Nitrogen, Nitrite	0.017	J	mg/l	0.050	0.010	1	-	05/10/16 22:34	44,353.2	MR
Nitrogen, Nitrate	0.040	J	mg/l	0.10	0.019	1	-	05/10/16 22:34	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.040	J	mg/l	0.10	0.019	1	-	05/10/16 22:34	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	05/13/16 11:54	107,-	JO
Nitrogen, Total Kjeldahl	0.098	J	mg/l	0.300	0.066	1	05/11/16 09:24	05/11/16 22:09	121,4500N-C	AT
Phosphorus, Orthophosphate	0.721		mg/l	0.005	0.001	1	-	05/10/16 23:32	121,4500P-E	MR
Dissolved Organic Carbon	0.99	J	mg/l	1.0	0.12	1	05/13/16 08:23	05/13/16 08:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	24.2		mg/l	0.500	0.054	1	-	05/11/16 22:10	44,300.0	AU
Sulfate	7.70		mg/l	1.00	0.150	1	-	05/11/16 22:10	44,300.0	AU

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009
Lab Number: L1614094
Report Date: 05/17/16

SAMPLE RESULTS

Lab ID: L1614094-11
Client ID: LPZ-90
Sample Location: ORLEANS
Matrix: Water
Date Collected: 05/10/16 09:22
Date Received: 05/10/16
Field Prep: Field Filtered (Dissolved Metals & DOC)

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	30.0		mg CaCO3/L	2.00	NA	1	-	05/12/16 10:30	121,2320B	AW
pH (H)	6.4		SU	-	NA	1	-	05/10/16 22:34	121,4500H+-B	AS
Nitrogen, Ammonia	0.098		mg/l	0.075	0.028	1	05/11/16 10:32	05/12/16 00:13	44,350.1	AT
Nitrogen, Nitrite	0.014	J	mg/l	0.050	0.010	1	-	05/10/16 22:36	44,353.2	MR
Nitrogen, Nitrate	0.035	J	mg/l	0.10	0.019	1	-	05/10/16 22:36	44,353.2	MR
Nitrogen, Nitrate/Nitrite	0.035	J	mg/l	0.10	0.019	1	-	05/10/16 22:36	44,353.2	MR
Total Nitrogen	ND		mg/l	0.30	0.30	1	-	05/13/16 11:54	107,-	JO
Nitrogen, Total Kjeldahl	0.149	J	mg/l	0.300	0.066	1	05/11/16 09:24	05/11/16 22:09	121,4500N-C	AT
Phosphorus, Orthophosphate	0.085		mg/l	0.005	0.001	1	-	05/10/16 23:33	121,4500P-E	MR
Dissolved Organic Carbon	0.82	J	mg/l	1.0	0.12	1	05/13/16 08:23	05/13/16 08:23	121,5310C	DW
Anions by Ion Chromatography - Westborough Lab										
Chloride	25.0		mg/l	0.500	0.054	1	-	05/11/16 22:22	44,300.0	AU
Sulfate	10.5		mg/l	1.00	0.150	1	-	05/11/16 22:22	44,300.0	AU

Project Name: EPA PRB-ORLEANS **Lab Number:** L1614094

Project Number: WV-1009 **Report Date:** 05/17/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-05,07-11 Batch: WG892569-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.019	1	-	05/10/16 21:53	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-05,07-11 Batch: WG892570-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	05/10/16 21:53	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-05,07-11 Batch: WG892572-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.010	1	-	05/10/16 21:56	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-05,07-11 Batch: WG892589-1										
Phosphorus, Orthophosphate	ND		mg/l	0.005	0.001	1	-	05/10/16 23:27	121,4500P-E	MR
General Chemistry - Westborough Lab for sample(s): 01-11 Batch: WG892678-1										
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	0.022	1	05/11/16 09:24	05/11/16 21:48	121,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 01-11 Batch: WG892683-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.028	1	05/11/16 10:32	05/11/16 23:48	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 06 Batch: WG892958-1										
Nitrogen, Nitrate/Nitrite	ND		mg/l	0.10	0.019	1	-	05/11/16 21:10	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01-05,07-11 Batch: WG893181-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	05/12/16 10:30	121,2320B	AW
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-05,07-11 Batch: WG893417-1										
Chloride	ND		mg/l	0.500	0.054	1	-	05/11/16 17:22	44,300.0	AU
Sulfate	ND		mg/l	1.00	0.150	1	-	05/11/16 17:22	44,300.0	AU
General Chemistry - Westborough Lab for sample(s): 01-11 Batch: WG893597-1										
Dissolved Organic Carbon	ND		mg/l	1.0	0.12	1	05/13/16 08:23	05/13/16 08:23	121,5310C	DW

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1614094
Report Date: 05/17/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 Batch: WG892569-2								
Nitrogen, Nitrate	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 Batch: WG892570-2								
Nitrogen, Nitrate/Nitrite	96		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 Batch: WG892572-2								
Nitrogen, Nitrite	98		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 Batch: WG892582-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 Batch: WG892589-2								
Phosphorus, Orthophosphate	98		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-11 Batch: WG892678-2								
Nitrogen, Total Kjeldahl	94		-		78-122	-		
General Chemistry - Westborough Lab Associated sample(s): 01-11 Batch: WG892683-2								
Nitrogen, Ammonia	94		-		80-120	-		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: EPA PRB-ORLEANS

Project Number: WV-1009

Lab Number: L1614094

Report Date: 05/17/16

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 06 Batch: WG892958-2					
Nitrogen, Nitrate/Nitrite	96	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 Batch: WG893181-2					
Alkalinity, Total	103	-	90-110	-	10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-05,07-11 Batch: WG893417-2					
Chloride	98	-	90-110	-	
Sulfate	95	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-11 Batch: WG893597-2					
Dissolved Organic Carbon	99	-	90-110	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1614094
Report Date: 05/17/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 QC Batch ID: WG892569-4 QC Sample: L1614094-03 Client ID: LPZ-21												
Nitrogen, Nitrate	1.5	4	5.2	92		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 QC Batch ID: WG892570-4 QC Sample: L1614094-03 Client ID: LPZ-21												
Nitrogen, Nitrate/Nitrite	1.5	4	5.2	92		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 QC Batch ID: WG892572-4 QC Sample: L1614094-03 Client ID: LPZ-21												
Nitrogen, Nitrite	ND	4	3.9	98		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 QC Batch ID: WG892589-4 QC Sample: L1614094-01 Client ID: LP-2												
Phosphorus, Orthophosphate	0.008	0.5	0.491	97		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG892678-4 QC Sample: L1614094-08 Client ID: LPZ-61												
Nitrogen, Total Kjeldahl	ND	8	7.16	90		-	-		77-111	-		24
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG892683-4 QC Sample: L1614094-11 Client ID: LPZ-90												
Nitrogen, Ammonia	0.098	4	3.95	96		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 06 QC Batch ID: WG892958-4 QC Sample: L1613854-03 Client ID: MS Sample												
Nitrogen, Nitrate/Nitrite	3.8	4	7.6	95		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 QC Batch ID: WG893181-4 QC Sample: L1614094-02 Client ID: LPZ-15												
Alkalinity, Total	11.5	100	115	104		-	-		86-116	-		10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-05,07-11 QC Batch ID: WG893417-3 QC Sample: L1614094-09 Client ID: LPZ-71												
Chloride	25.0	4	28.0	74		-	-		40-151	-		18
Sulfate	8.42	8	16.9	106		-	-		60-140	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1614094
Report Date: 05/17/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG893597-4 QC Sample: L1614094-08 Client ID: LPZ-61									
Dissolved Organic Carbon	0.84J	16	18	111	-	-	80-120	-	20

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1614094
Report Date: 05/17/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 QC Batch ID: WG892569-3 QC Sample: L1614094-03 Client ID: LPZ-21						
Nitrogen, Nitrate	1.5	1.5	mg/l	0		6
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 QC Batch ID: WG892570-3 QC Sample: L1614094-03 Client ID: LPZ-21						
Nitrogen, Nitrate/Nitrite	1.5	1.5	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 QC Batch ID: WG892572-3 QC Sample: L1614094-03 Client ID: LPZ-21						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 QC Batch ID: WG892582-2 QC Sample: L1614094-01 Client ID: LP-2						
pH (H)	5.6	5.6	SU	0		5
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 QC Batch ID: WG892589-3 QC Sample: L1614094-10 Client ID: LPZ-80						
Phosphorus, Orthophosphate	0.721	0.723	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG892678-3 QC Sample: L1614094-08 Client ID: LPZ-61						
Nitrogen, Total Kjeldahl	ND	0.129J	mg/l	NC		24
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG892683-3 QC Sample: L1614094-11 Client ID: LPZ-90						
Nitrogen, Ammonia	0.098	0.096	mg/l	2		20
General Chemistry - Westborough Lab Associated sample(s): 06 QC Batch ID: WG892958-3 QC Sample: L1613854-03 Client ID: DUP Sample						
Nitrogen, Nitrate/Nitrite	3.8	3.8	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-05,07-11 QC Batch ID: WG893181-3 QC Sample: L1614094-02 Client ID: LPZ-15						
Alkalinity, Total	11.5	11.2	mg CaCO3/L	3		10

Lab Duplicate Analysis
Batch Quality Control

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1614094
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Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-05,07-11 QC Batch ID: WG893417-4 QC Sample: L1614094-09 Client ID: LPZ-71					
Chloride	25.0	25.0	mg/l	0	18
Sulfate	8.42	10.0	mg/l	17	20
General Chemistry - Westborough Lab Associated sample(s): 01-11 QC Batch ID: WG893597-3 QC Sample: L1614094-02 Client ID: LPZ-15					
Dissolved Organic Carbon	0.91J	0.92J	mg/l	NC	20

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1614094
Report Date: 05/17/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent
B	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1614094-01A	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-01B	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-01C	Plastic 500ml unpreserved	A	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1614094-01D	Plastic 500ml H2SO4 preserved	A	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1614094-01E	Plastic 250ml unpreserved w/No H	A	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1614094-01F	Plastic 250ml HNO3 preserved	A	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1614094-02A	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-02B	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-02C	Plastic 500ml unpreserved	A	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1614094-02D	Plastic 500ml H2SO4 preserved	A	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1614094-02E	Plastic 250ml unpreserved w/No H	A	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1614094-02F	Plastic 250ml HNO3 preserved	A	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1614094-03A	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-03B	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-03C	Plastic 500ml unpreserved	A	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1614094-03D	Plastic 500ml H2SO4 preserved	A	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1614094-03E	Plastic 250ml unpreserved w/No H	A	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1614094-03F	Plastic 250ml HNO3 preserved	A	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1614094-04A	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-04B	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)

*Values in parentheses indicate holding time in days

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1614094
Report Date: 05/17/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1614094-04C	Plastic 500ml unpreserved	A	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1614094-04D	Plastic 500ml H2SO4 preserved	A	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1614094-04E	Plastic 250ml unpreserved w/No H	A	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1614094-04F	Plastic 250ml HNO3 preserved	A	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1614094-05A	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-05B	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-05C	Plastic 500ml unpreserved	A	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1614094-05D	Plastic 500ml H2SO4 preserved	A	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1614094-05E	Plastic 250ml unpreserved w/No H	A	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1614094-05F	Plastic 250ml HNO3 preserved	A	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1614094-06A	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-06B	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-06D	Plastic 500ml H2SO4 preserved	A	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1614094-06F	Plastic 250ml HNO3 preserved	A	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1614094-07A	Vial H2SO4 preserved	B	N/A	3.2	Y	Absent	DOC-5310(28)
L1614094-07B	Vial H2SO4 preserved	B	N/A	3.2	Y	Absent	DOC-5310(28)
L1614094-07C	Plastic 500ml unpreserved	B	7	3.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1614094-07D	Plastic 500ml H2SO4 preserved	B	<2	3.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1614094-07E	Plastic 250ml unpreserved w/No H	B	N/A	3.2	Y	Absent	ALK-T-2320(14)
L1614094-07F	Plastic 250ml HNO3 preserved	B	<2	3.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1614094-08A	Vial H2SO4 preserved	B	N/A	3.2	Y	Absent	DOC-5310(28)
L1614094-08B	Vial H2SO4 preserved	B	N/A	3.2	Y	Absent	DOC-5310(28)
L1614094-08C	Plastic 500ml unpreserved	B	7	3.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1614094-08D	Plastic 500ml H2SO4 preserved	B	<2	3.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1614094-08E	Plastic 250ml unpreserved w/No H	B	N/A	3.2	Y	Absent	ALK-T-2320(14)

*Values in parentheses indicate holding time in days

Project Name: EPA PRB-ORLEANS
Project Number: WV-1009

Lab Number: L1614094
Report Date: 05/17/16

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1614094-08F	Plastic 250ml HNO3 preserved	B	<2	3.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1614094-09A	Vial H2SO4 preserved	B	N/A	3.2	Y	Absent	DOC-5310(28)
L1614094-09B	Vial H2SO4 preserved	B	N/A	3.2	Y	Absent	DOC-5310(28)
L1614094-09C	Plastic 500ml unpreserved	B	7	3.2	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1614094-09D	Plastic 500ml H2SO4 preserved	B	<2	3.2	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1614094-09E	Plastic 250ml unpreserved w/No H	B	N/A	3.2	Y	Absent	ALK-T-2320(14)
L1614094-09F	Plastic 250ml HNO3 preserved	B	<2	3.2	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1614094-10A	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-10B	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-10C	Plastic 500ml unpreserved	A	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1614094-10D	Plastic 500ml H2SO4 preserved	A	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1614094-10E	Plastic 250ml unpreserved w/No H	A	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1614094-10F	Plastic 250ml HNO3 preserved	A	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)
L1614094-11A	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-11B	Vial H2SO4 preserved	A	N/A	4.5	Y	Absent	DOC-5310(28)
L1614094-11C	Plastic 500ml unpreserved	A	7	4.5	Y	Absent	OPHOS-4500(2),SO4-300(28),CL-300(28),NO2-353(2),NO3-353(2),PH-4500(.01)
L1614094-11D	Plastic 500ml H2SO4 preserved	A	<2	4.5	Y	Absent	TKN-4500(28),NO3/NO2-353(28),TNITROGEN(28),NH3-350(28)
L1614094-11E	Plastic 250ml unpreserved w/No H	A	N/A	4.5	Y	Absent	ALK-T-2320(14)
L1614094-11F	Plastic 250ml HNO3 preserved	A	<2	4.5	Y	Absent	B-SI(180),FE-SI(180),AS-SI(180),MN-SI(180)

*Values in parentheses indicate holding time in days

Project Name:	EPA PRB-ORLEANS	**Lab Number:**	L1614094
Project Number:	WV-1009	**Report Date:**	05/17/16

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: DU Report with 'J' Qualifiers

Project Name:	EPA PRB-ORLEANS	**Lab Number:**	L1614094
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Data Qualifiers

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

Serial_No:05171611:16 L1614094

CHAIN OF CUSTODY

PAGE 1 OF 2

Date Rec'd in Lab: 5/10/16

ALPHA Job #: ~~L1613~~ L1614094

ALPHA ANALYTICAL
World Class Chemistry
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: Watervision LLC
Address: 560 Great Rd. Acton, MA
Phone: 603-766-6670
Email: dtruslow@watervisionllc.com

Additional Project Information:

Project Information

Project Name: EPA PRB-Orleans
Project Location: Orleans
Project #: WV-1009
Project Manager: Danna Truslow
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program ________ Criteria ________

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; pH, SO4, Cl, NO3, NO2, o-phos; Total N, NH3; Total Alk; Diss met - As, Fe, Mn, B*; DOC*

SAMPLE INFO: Filtration * ☒ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	pH, SO4, Cl, NO3, NO2, o-phos	Total N, NH3	Total Alk	Diss met - As, Fe, Mn, B*	DOC*	Sample Comments	Total # Bottles
14094.01	LP-2	5/9/16	16:45	water	SW	✓	✓	✓	✓	✓		
.02	LPZ-15	5/9/16	18:25	water	SW	↓	↓	↓	↓	↓		
.03	LPZ-21	5/9/16	18:58	water	SW	↓	↓	↓	↓	↓		
.04	LPZ-29	5/10/16	8:38	water	SW	↓	↓	↓	↓	↓		
.05	LPZ-29 DUP	5/10/16	8:43	water	SW	↓	↓	↓	↓	↓		
.06	LPZ-39	5/10/16	11:40	water	SW	↓	↓	↓	↓	↓		
.07	LPZ-53	5/10/16	14:10	water	SW	↓	↓	↓	↓	↓		
.08	LPZ-61	5/10/16	14:05	water	SW	↓	↓	↓	↓	↓		
.09	LPZ-71	5/10/16	13:10	water	SW	↓	↓	↓	↓	↓		
.10	LPZ-80	5/10/16	11:17	water	SW	↓	↓	↓	↓	↓		

Container Type
Preservative

Container Type	Preservative
P= Plastic	A= None
A= Amber glass	B= HCl
V= Vial	C= HNO_3
G= Glass	D= H_2SO_4
B= Bacteria cup	E= NaOH
C= Cube	F= MeOH
O= Other	G= $NaHSO_4$
E= Encore	H = $Na_2S_2O_3$
D= BOD Bottle	I= Ascorbic Acid
	J = NH_4Cl
	K= Zn Acetate
	O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Samantha Wright	5/10/16 17:15	[signature]	5/10/16 17:15

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

CHAIN OF CUSTODY

PAGE 2 OF 2

Date Rec'd in Lab: 5/10/16

ALPHA Job #: L1614094

ALPHA ANALYTICAL
8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220

320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

Client Information

Client: WaterVision LLC
Address: 560 Great Rd.
Acton, MA
Phone: 603-760-6670
Email: dtrusbw@watervisionllc.com

Additional Project Information:

Project Information

Project Name: EPA PRB - Orleans
Project Location: Orleans
Project #: WV-1009
Project Manager: Donna Trusbow
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program _____ Criteria *

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2	SVOC: ☐ ABN ☐ PAH	METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15	METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13	EPH: ☐ Ranges & Targets ☐ Ranges Only	VPH: ☐ Ranges & Targets ☐ Ranges Only	☐ PCB ☐ PEST	TPH: ☐ Quant Only ☐ Fingerprint	pH, SO4, Cl, NO3, NO2, o-PO4	Total N, NH3	Total Alk.	Diss. Met. - As, Fe, Mn, B	DOC *	SAMPLE INFO: Filtration ☒ Field ☐ Lab to do; Preservation ☐ Lab to do	Sample Comments	TOTAL # BOTTLES
14094.11	LPZ-90	5/10/16	9:22	water	SW									✓	✓	✓	✓	✓			

Container Type	Preservative
P= Plastic	A= None
A= Amber glass	B= HCl
V= Vial	C= HNO_3
G= Glass	D= H_2SO_4
B= Bacteria cup	E= NaOH
C= Cube	F= MeOH
O= Other	G= $NaHSO_4$
E= Encore	H = $Na_2S_2O_3$
D= BOD Bottle	I= Ascorbic Acid
	J = NH_4Cl
	K= Zn Acetate
	O= Other

Container Type											
Preservative											

Relinquished By:	Date/Time	Received By:	Date/Time
Samantha Wright	5/10/16 17:15		5/10/16 1715

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

Site Characterization for Design of Pilot-Scale Permeable Reactive Barriers for Nitrogen Reduction in Groundwater on Cape Cod

Field Conditions Review

Barnstable Water Quality Sampling
March 7 & 8, 2016

The first round of water quality sampling at the Barnstable Initial Site Characterization (ISC) site on Prince Avenue took place on March 7th and 8th 2016. this field work encompassed tasks 2d and 2e - measuring water levels at wells and piezometers, developing and purging wells and piezometers, measuring field water quality parameters, and sampling each well and piezometer for laboratory analysis for a range of parameters. Danna Truslow and Samantha Wright of WaterVision LLC completed all field measurements and sampling.

Upon arrival at the site all wells and piezometers were opened and well caps removed to allow equilibration with the atmosphere. If dedicated tubing was present in the wells this was also removed to allow for equilibration and measurement. Water levels were then measured to the nearest hundredth of a foot with a Solinst water level meter.

Calibration of field parameter meters was also completed before sampling began each day. Field parameters values on each meter were also checked at the end of each day against parameter standards to gauge any drift during the day. Two meters were used for field parameter sampling - a Yellow Springs Instrument (YSI) Model 556 multi-parameter sonde and a YSI Professional series multi-parameter sonde.

Well purging and sampling commenced after water level measurement was complete. Piezometers were first sampled beginning with the deepest and working towards the shallowest piezometers. Dedicated low-density polyethylene (LDPE) tubing had been placed in most piezometers and wells during the well installation task in late January 2016, but if was not present at the time of sampling, tubing was installed in wells prior to purging. A Geotech peristaltic pump was used to purge the wells of at least three well volumes or until field parameter measurements stabilized.

Field measurement of water temperature, pH, %-dissolved oxygen (DO), DO (mg/L), specific conductance, and oxidation/reduction potential (ORP) was regularly measured using the YSI's as purging continued. A visual description of the purged water was also noted. Initial samples were taken and measured using the calibration cup, however after initial sediment buildup in the wells cleared, field parameter measurement continued using a flow through chamber to allow for more

accurate DO measurements and for improved parameter stabilization during sampling. All field measurements and observations were noted on field sheets.

Water samples were taken in laboratory provided and pre-preserved sample bottles for the following parameters:

Name	Type
Nitrogen (total), Nitrogen (ammonia), Nitrogen (nitrate), Nitrogen (nitrite), Chloride, Sulfate, Total Alkalinity, Orthophosphate. pH	General chemistry
Organic carbon (dissolved)	Carbon analyses
Boron (dissolved), Iron (dissolved), Manganese (dissolved), Arsenic (dissolved)	Metals and minor elements

Samples taken for dissolved iron, manganese, arsenic and boron and for dissolved organic carbon analyses were first field filtered with a 0.45 micron cartridge filter before collection into sample bottles. Water samples collected for the remaining analyses were not field filtered. A duplicate set of samples was taken at one location for each day of sampling. Samples were kept on ice in laboratory provided coolers until laboratory courier pickup or delivery to Alpha Analytical Laboratory in Westborough, Massachusetts.

The weather for March 7th and 8th was partly cloudy with temperatures in the mid to upper 40's and 10-15 mile per hour winds. It was noted during this sampling event that the Professional Series YSI pH and ORP values seemed out of the expected range and/or were very slow to stabilize. Both of these measurements are made with the same parameter sensor so there may have been some operational problems with the probe. For this reason, pH was added to the laboratory analyses requested so that field and laboratory measurements could be compared and, ultimately, so that an accurate pH would be available for these samples.

Barnstable-PC Water Quality Sampling
April 18 & 19, 2016

The second round of water quality sampling at the Barnstable Initial Site Characterization (ISC) site on Prince Avenue took place on April 18th and 19th 2016. this field work encompassed tasks 2d and 2e - measuring water levels at wells and piezometers, developing and purging wells and piezometers, measuring field water quality parameters, and sampling each well and piezometer for laboratory analysis

for a range of parameters. Samantha Wright of WaterVision LLC completed all field measurements and sampling.

Upon arrival at the site all wells and piezometers were opened and well caps removed to allow equilibration with the atmosphere. If dedicated tubing was present in the wells this was also removed to allow for equilibration and measurement. Water levels were then measured to the nearest hundredth of a foot with a Solinst water level meter.

Calibration of field parameter meters was also completed before sampling began each day. Field parameters values on each meter were also checked at the end of each day against parameter standards to gauge any drift during the day. Two meters were used for field parameter sampling - a Yellow Springs Instrument (YSI) Model 556 multi-parameter sonde and a YSI Professional series multi-parameter sonde.

Well purging and sampling commenced after water level measurement was complete. Dedicated low-density polyethylene (LDPE) tubing had been placed in all piezometers and wells during the well installation task in late January 2016. A Geotech peristaltic pump was used to purge the wells of at least three well volumes or until field parameter measurements stabilized. A duplicate sample was taken at PC-2 on April 18th and at PCZ-50 on April 19th.

Field measurement of water temperature, pH, %-dissolved oxygen (DO), DO (mg/L), specific conductance, and oxidation/reduction potential (ORP) was regularly measured using the YSI's as purging continued. A visual description of the purged water was also noted. Initial samples were taken and measured using the calibration cup, however after initial sediment buildup in the wells cleared, field parameter measurement continued using a flow through chamber to allow for more accurate DO measurements and for improved parameter stabilization during sampling. All field measurements and observations were noted on field sheets.

Water samples were taken in laboratory provided and pre-preserved sample bottles for the following parameters:

Name	Type
Nitrogen (total), Nitrogen (ammonia), Nitrogen (nitrate), Nitrogen (nitrite), Chloride, Sulfate, Total Alkalinity, Orthophosphate. pH	General chemistry
Organic carbon (dissolved)	Carbon analyses
Boron (dissolved), Iron (dissolved), Manganese (dissolved), Arsenic (dissolved)	Metals and minor elements

Samples taken for dissolved iron, manganese, arsenic and boron and for dissolved organic carbon analyses were first field filtered with a 0.45 micron cartridge filter before collection into sample bottles. Water samples collected for the remaining analyses were not field filtered. A duplicate set of samples was taken at one location for each day of sampling. Samples were kept on ice in laboratory provided coolers until laboratory courier pickup or delivery to Alpha Analytical Laboratory in Westborough, Massachusetts.

The weather for April 18th was sunny with temperatures in the low to mid 60s. The weather for April 19th was mostly cloudy with temperatures in the mid to upper 40's and 15-20 mile per hour winds. Both meters appeared to be giving accurate measurements and all wells pumped with minimal issue.

Mashpee Water Quality Sampling
March 14 & 15, 2016

The first round of water quality sampling at the Mashpee Initial Site Characterization (ISC) site in the conservation land west of the Sandalwood subdivision took place on March 14th and 15th 2016. This field work encompassed tasks 2d and 2e - measuring water levels at wells and piezometers, developing and purging wells and piezometers, measuring field water quality parameters, and sampling each well and piezometer for laboratory analysis for a range of parameters. Danna Truslow and Samantha Wright of WaterVision LLC completed all field measurements and sampling.

Upon arrival at the site all wells and piezometers were opened and well caps removed to allow equilibration with the atmosphere. If dedicated tubing was present in the wells this was also removed to allow for equilibration and measurement. Water levels were then measured to the nearest hundredth of a foot with a Solinst water level meter.

Calibration of field parameter meters was also completed before sampling began each day. Field parameters values on each meter were also checked at the end of each day against parameter standards to gauge any drift during the day. Two Yellow Springs Instrument (YSI) Model 556 multi-parameter sondes were used for field parameter sampling.

Well purging and sampling commenced after water level measurement was complete. Piezometers were first sampled beginning with the deepest and working towards the shallowest piezometers. Dedicated low-density polyethylene (LDPE) tubing had been placed in most piezometers and wells during the well installation task in late January 2016, but if was not present at the time of sampling, tubing was

installed in wells prior to purging. A Geotech peristaltic pump was used to purge the wells of at least three well volumes or until field parameter measurements stabilized.

Field measurement of water temperature, pH, %-dissolved oxygen (DO), DO (mg/L), specific conductance, and oxidation/reduction potential (ORP) was regularly measured using the YSIs as purging continued. A visual description of the purged water was also noted. Initial samples were taken and measured using the calibration cup, however after initial sediment buildup in the wells cleared, field parameter measurement continued using a flow through chamber to allow for more accurate DO measurements and for improved parameter stabilization during sampling. All field measurements and observations were noted on field sheets.

Water samples were taken in laboratory provided and pre-preserved sample bottles for the following parameters:

Name	Type
Nitrogen (total), Nitrogen (ammonia), Nitrogen (nitrate), Nitrogen (nitrite), Chloride, Sulfate, Total Alkalinity, Orthophosphate. pH	General chemistry
Organic carbon (dissolved)	Carbon analyses
Boron (dissolved), Iron (dissolved), Manganese (dissolved), Arsenic (dissolved)	Metals and minor elements

Samples taken for dissolved iron, manganese, arsenic and boron and for dissolved organic carbon analyses were first field filtered with a 0.45 micron cartridge filter before collection into sample bottles. Water samples collected for the remaining analyses were not field filtered. A duplicate set of samples was taken at one location for each day of sampling. Samples were kept on ice in laboratory provided coolers until laboratory courier pickup or delivery to Alpha Analytical Laboratory in Westborough, Massachusetts.

The weather for March 14th and 15th was moderate to heavy rain, freezing at times with temperatures in the high 30s to mid 40's and 10-25 mile per hour winds. It was noted during this sampling event that pH and ORP values of one of the YSIs seemed much lower than the expected range and were very slow to stabilize at times. Both of these measurements were made with the same parameter sensor so there may have been some operational problems with the probe. In addition, the driving rain made it difficult to keep instruments dry and water may have seeped into parts of both instruments potentially having an impact on accuracy. For this reason, pH was added to the laboratory analyses requested so that field and laboratory

measurements could be compared and, ultimately, so that an accurate pH would be available for these samples. Due to the depth of water, TL-7 was purged by hand using a check valve and the Waterra method. This made field filtration more difficult and some water in the sample may have bypassed the filter. When installing dedicated tubing into a well, occasionally it was difficult to determine if the tubing had reached the bottom of a well or was just hung up on a seam where two PVC lengths connected. At TL-2, the dedicated tubing was originally cut too short to reach the bottom of the well due to this difficulty and upon sampling the well the tube was lost down the well. Additional, tubing was added to the well to allow for sampling.

Mashpee Water Quality Sampling
April 27 & 28, 2016

The second round of water quality sampling at the Mashpee Initial Site Characterization (ISC) site in the conservation land west of the Sandalwood subdivision took place on April 27th and 28th 2016. This field work encompassed tasks 2d and 2e - measuring water levels at wells and piezometers, developing and purging wells and piezometers, measuring field water quality parameters, and sampling each well and piezometer for laboratory analysis for a range of parameters. Danna Truslow and Samantha Wright of WaterVision LLC completed all field measurements and sampling.

Upon arrival at the site all wells and piezometers were opened and well caps removed to allow equilibration with the atmosphere. If dedicated tubing was present in the wells this was also removed to allow for equilibration and measurement. Water levels were then measured to the nearest hundredth of a foot with a Solinst water level meter.

Calibration of field parameter meters was also completed before sampling began each day. Field parameters values on each meter were also checked at the end of each day against parameter standards to gauge any drift during the day. A Yellow Springs Instrument (YSI) Model 556 multi-parameter sonde and a YSI Model 556 Pro multi-parameter sonde were used for field parameter sampling.

Well purging and sampling commenced after water level measurement was complete. A Geotech peristaltic pump was used to purge the piezometers and several of the water table wells of at least three well volumes or until field parameter measurements stabilized. A Geotech Geosub was used to pump the remaining water table wells.

Field measurement of water temperature, pH, DO (mg/L), specific conductance, and oxidation/reduction potential (ORP) was regularly measured using the YSIs as purging continued. A visual description of the purged water was also noted. Initial samples were taken and measured using the calibration cup, however after initial sediment buildup in the wells cleared, field parameter measurement continued

using a flow through chamber to allow for more accurate DO measurements and for improved parameter stabilization during sampling. All field measurements and observations were noted on field sheets.

Water samples were taken in laboratory provided and pre-preserved sample bottles for the following parameters:

Name	Type
Nitrogen (total), Nitrogen (ammonia), Nitrogen (nitrate), Nitrogen (nitrite), Chloride, Sulfate, Total Alkalinity, Orthophosphate. pH	General chemistry
Organic carbon (dissolved)	Carbon analyses
Boron (dissolved), Iron (dissolved), Manganese (dissolved), Arsenic (dissolved)	Metals and minor elements

Samples taken for dissolved iron, manganese, arsenic and boron and for dissolved organic carbon analyses were first field filtered with a 0.45 micron cartridge filter before collection into sample bottles. Water samples collected for the remaining analyses were not field filtered. A duplicate set of samples was taken at one location for each day of sampling. Samples were kept on ice in laboratory provided coolers until laboratory courier pickup or delivery to Alpha Analytical Laboratory in Westborough, Massachusetts.

The weather for April 27th and 28th was sunny to partly sunny with temperatures in the low 40s to mid-50s.

A duplicate sample was taken at TLZ-40 (TLZ-40 DUP) on April 27th.

A duplicate sample was taken at TL-1 (TL-1 DUP) on April 28th.

Chemetrics were used to analyze dissolved oxygen concentrations at TL-6 and TLZ-100. Results are noted on field sheets.

Falmouth-Sailfish Water Level Measurement and Water Quality Sampling
March 22 & 23, 2016

The first round of water quality sampling at the Falmouth-Sailfish Drive Initial Site Characterization (ISC) site located on Sailfish and Tarpon Drive took place on March 22nd and 28th 2016. This field work encompassed Tasks 2d and 2e - measuring water levels at wells and piezometers, developing and purging wells and piezometers, measuring field water quality parameters, and sampling each well and piezometer for laboratory analysis for a range of parameters. Danna Truslow and Samantha Wright of WaterVision LLC and Marcel Beleval, USEPA completed all field measurements and sampling.

Upon arrival at the site all wells and piezometers were opened and well caps removed to allow equilibration with the atmosphere. If dedicated tubing was present in the wells this was also removed to allow for equilibration and measurement. Water levels were then measured to the nearest hundredth of a foot with a Solinst water level meter.

Calibration of field parameter meters was also completed before sampling began each day. Field parameters values on each meter were also checked at the end of each day against parameter standards to gauge any drift during the day. Two meters were used for field parameter sampling - a Yellow Springs Instrument (YSI) Model 556 multi-parameter sonde and a YSI Professional series multi-parameter sonde.

Well purging and sampling commenced after water level measurement was complete. Piezometers were first sampled beginning with the deepest and working towards the shallowest piezometers. Dedicated low-density polyethylene (LDPE) tubing had been placed in most piezometers and wells during the well installation task in February 2016, but if was not present at the time of sampling, tubing was installed in wells prior to purging. A Geotech peristaltic pump was used to purge the wells of at least three well volumes or until field parameter measurements stabilized.

Field measurement of water temperature, pH, %-dissolved oxygen (DO), DO (mg/L), specific conductance, and oxidation/reduction potential (ORP) was regularly measured using the YSI's as purging continued. A visual description of the purged water was also noted. Initial samples were taken and measured using the calibration cup, however after initial sediment buildup in the wells cleared, field parameter measurement continued using a flow through chamber to allow for more accurate DO measurements and for improved parameter stabilization during sampling. All field measurements and observations were noted on field sheets.

Water samples were taken in laboratory provided and pre-preserved sample bottles for the following parameters:

Name	Type
Nitrogen (total), Nitrogen (ammonia), Nitrogen (nitrate), Nitrogen (nitrite), Chloride, Sulfate, Total Alkalinity, Orthophosphate. pH	General chemistry
Organic carbon (dissolved)	Carbon analyses
Boron (dissolved), Iron (dissolved), Manganese (dissolved), Arsenic (dissolved)	Metals and minor elements

Samples taken for dissolved iron, manganese, arsenic and boron and for dissolved organic carbon analyses were first field filtered with a 0.45-micron cartridge filter before collection into sample bottles. Water samples collected for the remaining analyses were not field filtered. A duplicate set of samples was taken at one location for each day of sampling. Samples were kept on ice in laboratory provided coolers until laboratory courier pickup or delivery to Alpha Analytical Laboratory in Westborough, Massachusetts.

The weather for March 22nd was in the mid 40's and very breezy and on the 23rd was in the mid 50's and slightly breezy. The pH/ORP sensor had been changed on March 21st in the YSI 556 due to erratic changes in pH and ORP at the end of the sampling day at Mashpee on March 15th. The instrument was successfully calibrated on March 22 but pH and ORP values measured with the YSI 556 (YSI-1 in field sheets) were well out of previously measured ranges so pH was not noted and ORP was noted, but seemed incorrect. As in previous sampling rounds at Mashpee and Barnstable, pH was added to the laboratory analyses requested so that field and laboratory measurements could be compared and, ultimately, so that an accurate pH would be available for these samples.

Danna Truslow and Marcel Belaval conducted sampling on March 22nd and Danna Truslow and Samantha Wright sampled on March 23rd. Virginia Valiela from the Town of Falmouth and Sia Karplus, an environmental consultant to the Town both visited the site on the morning of March 22nd to observe sampling and to determine which hydrants required elevation information for site surveying.

Falmouth-Sailfish Water Level Measurement and Water Quality Sampling
May 4, 5 & 6, 2016

The second round of water quality sampling at the Falmouth-Sailfish Drive Initial Site Characterization (ISC) site located on Sailfish and Tarpon Drive took place on May 4th, 5th and 6th 2016. This field work encompassed Tasks 2d and 2e - measuring water levels at wells and piezometers, purging wells and piezometers, measuring field water quality parameters, and sampling each well and piezometer for laboratory analysis for a range of parameters. Danna Truslow and Samantha Wright of WaterVision LLC completed all field measurements and sampling.

Upon arrival at the site all wells and piezometers were opened and well caps removed to allow equilibration with the atmosphere. If dedicated tubing was present in the wells this was also removed to allow for equilibration and measurement. Water levels were then measured to the nearest hundredth of a foot with a Solinst water level meter.

Calibration of field parameter meters was also completed before sampling began each day. Field parameters values on each meter were also checked at the end of each day against parameter standards to gauge any drift during the day. Two meters were used for field parameter sampling - a Yellow Springs Instrument (YSI) Model 556 multi-parameter sonde and a YSI Professional series multi-parameter sonde.

Well purging and sampling commenced after water level measurement was complete. A Geotech peristaltic pump was used to purge the piezometers and several of the water table wells of at least three well volumes or until field parameter measurements stabilized. A Geotech Geosub was used to purge the remaining water table wells.

Field measurement of water temperature, pH, DO (mg/L), specific conductance, and oxidation/reduction potential (ORP) was regularly measured using the YSI's as purging continued. A visual description of the purged water was also noted. Initial samples were taken and measured using the calibration cup, however after initial sediment buildup in the wells cleared, field parameter measurement continued using a flow through chamber to allow for more accurate DO measurements and for improved parameter stabilization during sampling. All field measurements and observations were noted on field sheets.

Water samples were taken in laboratory provided and pre-preserved sample bottles for the following parameters:

Name	Type
Nitrogen (total), Nitrogen (ammonia), Nitrogen (nitrate), Nitrogen (nitrite), Chloride, Sulfate, Total Alkalinity, Orthophosphate. pH	General chemistry
Organic carbon (dissolved)	Carbon analyses
Boron (dissolved), Iron (dissolved), Manganese (dissolved), Arsenic (dissolved)	Metals and minor elements

Samples taken for dissolved iron, manganese, arsenic and boron and for dissolved organic carbon analyses were first field filtered with a 0.45-micron cartridge filter before collection into sample bottles. Water samples collected for the remaining analyses were not field filtered. A duplicate set of samples was taken at one location for each day of sampling. Samples were kept on ice in laboratory provided coolers until laboratory courier pickup or delivery to Alpha Analytical Laboratory in Westborough, Massachusetts.

The weather for May 4th was cloudy in the low 50's with rain beginning in the midafternoon, May 5th was in the mid 40's with rain and on the 6th the weather was mostly cloudy with temperatures in the high 50's.

pH using the YSI – Pro seemed to be equilibrating slowly during sampling on May 4th, but the end of day meter checks for the YSI – Pro showed the pH readings had only drifted minimally from the standard calibration (+0.05). During calibration of the YSI-Pro on the morning of May 5th, pH was out of range for calibration. A new YSI-Pro was picked up from Palms by Samantha Wright on the morning of May 5th on the way down to the site. Additionally, the water level meter was not giving accurate readings and another water level meter was picked up on the morning of May 5th. All water level readings were taken again with the new water level meter.

As in previous sampling rounds, pH was added to the laboratory analyses requested so that field and laboratory measurements could be compared and, ultimately, so that an accurate pH would be available for these samples.

A duplicate sample was taken at SFZ-DUP (SFZ-57 DUP) on May 4th.

A duplicate sample was taken at SF-3 (SF-3 DUP) on May 5th.

At SF-5S, after about 0.75 gallons of water were purged the well appeared to go dry. The pump was put into standby mode and the well was allowed to recharge for about 6 minutes. Purging resumed at 16:14 without issue after the purge rate was

turned down on the pump. A duplicate sample was taken at SF-5S (SF-5S DUP) on May 6th.

At SFZ-19 it was noted that pH and ORP were slow to equilibrate.

Dennis Water Quality Sampling
March 31 & April 1, 2016

The first round of water quality sampling at the Dennis Initial Site Characterization (ISC) site on Vinland Drive and Thorwald Drive place on March 31st and April 1st 2016. This field work encompassed tasks 2d and 2e - measuring water levels at wells and piezometers, developing and purging wells and piezometers, measuring field water quality parameters, and sampling each well and piezometer for laboratory analysis for a range of parameters. Danna Truslow and Samantha Wright of WaterVision LLC completed all field measurements and sampling.

Upon arrival at the site all wells and piezometers were opened and well caps removed to allow equilibration with the atmosphere. If dedicated tubing was present in the wells this was also removed to allow for equilibration and measurement. Water levels were then measured to the nearest hundredth of a foot with a Solinst water level meter.

Calibration of field parameter meters was also completed before sampling began each day. Field parameters values on each meter were also checked at the end of each day against parameter standards to gauge any drift during the day. Two meters were used for field parameter sampling - a Yellow Springs Instrument (YSI) Model 556 multi-parameter sonde and a YSI Professional series multi-parameter sonde.

Well purging and sampling commenced after water level measurement was complete. Piezometers were first sampled beginning with the deepest and working towards the shallowest piezometers. Dedicated low-density polyethylene (LDPE) tubing had been placed in most piezometers and wells during the well installation task in late February 2016, but if was not present at the time of sampling, tubing was installed in wells prior to purging. Due to the depths to groundwater at this site, peristaltic pumps could not be used, instead two alternative methods were used including using a bladder pump and a generator powered Waterra hydrolift. These were used to purge the wells of at least three well volumes or until field parameter measurements stabilized.

Field measurement of water temperature, pH, %-dissolved oxygen (DO), DO (mg/L), specific conductance, and oxidation/reduction potential (ORP) was regularly measured using the YSIs as purging continued. A visual description of the purged water was also noted. For wells purged using the bladder pump, all samples were monitored for field parameters using the flow through chamber. For wells purged

using the Waterra Hydrolift, all samples were taken and measured using the calibration cup. All field measurements and observations were noted on field sheets.

Water samples were taken in laboratory provided and pre-preserved sample bottles for the following parameters:

Name	Type
Nitrogen (total), Nitrogen (ammonia), Nitrogen (nitrate), Nitrogen (nitrite), Chloride, Sulfate, Total Alkalinity, Orthophosphate. pH	General chemistry
Organic carbon (dissolved)	Carbon analyses
Boron (dissolved), Iron (dissolved), Manganese (dissolved), Arsenic (dissolved)	Metals and minor elements

Samples taken for dissolved iron, manganese, arsenic and boron and for dissolved organic carbon analyses were first field filtered with a 0.45 micron cartridge filter before collection into sample bottles. Water samples collected for the remaining analyses were not field filtered. A duplicate set of samples was taken at one location for each day of sampling. Samples were kept on ice in laboratory provided coolers until laboratory courier pickup or delivery to Alpha Analytical Laboratory in Westborough, Massachusetts.

The weather for March 31st was partly sunny with temperatures in the upper 50s and 20-25 mile per hour wind. On April 1st there was light to heavy rain throughout the day with temperatures in the low to mid 50's and 20-25 mile per hour winds. It was noted during this sampling event that the DO values of one of the YSIs seemed much higher than the expected range. The YSI probe was knocked just prior to the high DO readings, but was recalibrated immediately. Following calibration, it continued to have DO readings. The following day this instrument also had issues calibrating for DO. The DO cap and solution were replaced, but there were still issues with readings higher than the expected range and the instrument was slow to stabilize at all. After sampling was complete the YSI was taken to Palms Environmental to be evaluated. A technician at Palms Environmental determined the cable that connected the YSI probe to the hand held unit needed to be replaced.

At VL-6, a blocked foot valve caused two restarts of the Waterra hydrolift during purging. Additionally, post-sampling the tubing at VLZ-56 dropped too deep into the well to pull out by hand. Tools will be brought during next sampling round to retrieve tubing as the well diameter is too small to insert another tube for sampling.

Dennis Water Quality Sampling

May 6, 2016

The second round of water quality sampling at the Dennis Initial Site Characterization (ISC) site on Vinland Drive and Thorwald Drive took place on May 6th 2016. This field work encompassed tasks 2d and 2e - measuring water levels at wells and piezometers, purging wells and piezometers, measuring field water quality parameters, and sampling each well and piezometer for laboratory analysis for a range of parameters. Danna Truslow and Samantha Wright of WaterVision LLC completed all field measurements and sampling.

Upon arrival at the site all wells and piezometers were opened and well caps removed to allow equilibration with the atmosphere. If dedicated tubing was present in the wells this was also removed to allow for equilibration and measurement. Water levels were then measured to the nearest hundredth of a foot with a Solinst water level meter.

Calibration of field parameter meters was also completed before sampling began each day. Field parameters values on each meter were also checked at the end of each day against parameter standards to gauge any drift during the day. Two meters were used for field parameter sampling - a Yellow Springs Instrument (YSI) Model 556 multi-parameter sonde and a YSI Professional series multi-parameter sonde.

Well purging and sampling commenced after water level measurement was complete. Piezometers were first sampled beginning with the deepest and working towards the shallowest piezometers. Due to the depths to groundwater at this site, peristaltic pumps could not be used, instead two alternative methods were used including using a Geotech Geosub powered by a marine battery and inverter and a generator powered Waterra hydrolift. The hydrolift was used to purge the piezometers and the Geosub was used to purge the water table wells. Wells were purged of at least three well volumes or until field parameter measurements stabilized.

Field measurement of water temperature, pH, DO (mg/L), specific conductance, and oxidation/reduction potential (ORP) was regularly measured using the YSIs as purging continued. A visual description of the purged water was also noted. All samples were monitored for field parameters using the flow through chamber. All field measurements and observations were noted on field sheets.

Water samples were taken in laboratory provided and pre-preserved sample bottles for the following parameters:

Name	Type
Nitrogen (total), Nitrogen (ammonia), Nitrogen (nitrate), Nitrogen (nitrite), Chloride, Sulfate, Total Alkalinity, Orthophosphate. pH	General chemistry
Organic carbon (dissolved)	Carbon analyses
Boron (dissolved), Iron (dissolved), Manganese (dissolved), Arsenic (dissolved)	Metals and minor elements

Samples taken for dissolved iron, manganese, arsenic and boron and for dissolved organic carbon analyses were first field filtered with a 0.45 micron cartridge filter before collection into sample bottles. Water samples collected for the remaining analyses were not field filtered. A duplicate set of samples was taken at one location for each day of sampling. Samples were kept on ice in laboratory provided coolers until laboratory courier pickup or delivery to Alpha Analytical Laboratory in Westborough, Massachusetts.

The weather for May 6th was cloudy with temperatures in the low to mid 50s and 5-15 mile per hour wind.

At VL-1, after about 0.75 gallons were purged the well seemed to go dry. The geosub was put into standby mode and the well was allowed to recharge for about 10 minutes. The pump was restarted at 13:14 at a lower purge rate that previously and the remaining gallons were purged without issue.

A duplicate sample was taken at VL-3 (VL-3 DUP).

At VLZ-44, after 1 gallons was purged the well went dry and no sample was able to be collected. VL-2 will be used for water quality data.

At VLZ-50, a clogged foot valve was replaced at the beginning of purging due to very high silt content in the groundwater.

Orleans Water Quality Sampling
March 30th and 31st, 2016

The first round of water quality sampling at the Orleans Initial Site Characterization (ISC) site on Herring Brook Way and Monument Road took place on March 30th and March 31st 2016. This field work encompassed tasks 2d and 2e - measuring water levels at wells and piezometers, developing and purging wells and piezometers,

measuring field water quality parameters, and sampling each well and piezometer for laboratory analysis for a range of parameters. Danna Truslow and Samantha Wright of WaterVision LLC completed all field measurements and sampling.

Upon arrival at the site all wells and piezometers were opened and well caps removed to allow equilibration with the atmosphere. If dedicated tubing was present in the wells this was also removed to allow for equilibration and measurement. Water levels were then measured to the nearest hundredth of a foot with a Solinst water level meter.

Calibration of field parameter meters was also completed before sampling began each day. Field parameters values on each meter were also checked at the end of each day against parameter standards to gauge any drift during the day. Two meters were used for field parameter sampling - a Yellow Springs Instrument (YSI) Model 556 multi-parameter sonde and an YSI Professional series multi-parameter sonde.

Well purging and sampling commenced after water level measurement was complete. Piezometers were first sampled beginning with the deepest and working towards the shallowest piezometers. Dedicated low-density polyethylene (LDPE) tubing had been placed in most piezometers and wells during the well installation task in late February 2016, but if was not present at the time of sampling, tubing was installed in wells prior to purging. A peristaltic pump was used to sample most wells but LP-6 which was sampled with a bladder pump as the depth to water (27 feet) exceeded the one atmosphere capability of the peristaltic pump.

Field measurement of water temperature, pH, %-dissolved oxygen (DO), DO (mg/L), specific conductance, and oxidation/reduction potential (ORP) was regularly measured using the YSIs as purging continued. A visual description of the purged water was also noted. At most wells samples were monitored for field parameters using the flow through chamber. A few sample locations were too silty for use of the cell and samples were instead taken into the calibration cup for measurement with the YSI instruments.

Water samples were taken in laboratory provided and pre-preserved sample bottles for the following parameters:

Name	Type
Nitrogen (total), Nitrogen (ammonia), Nitrogen (nitrate), Nitrogen (nitrite), Chloride, Sulfate, Total Alkalinity, Orthophosphate. pH	General chemistry
Organic carbon (dissolved)	Carbon analyses
Boron (dissolved), Iron (dissolved), Manganese (dissolved), Arsenic (dissolved)	Metals and minor elements

Samples taken for dissolved iron, manganese, arsenic and boron and for dissolved organic carbon analyses were first field filtered with a 0.45 micron cartridge filter before collection into sample bottles. Water samples collected for the remaining analyses were not field filtered. A duplicate set of samples was taken at one location for each day of sampling. Samples were kept on ice in laboratory provided coolers until laboratory courier pickup or delivery to Alpha Analytical Laboratory in Westborough, Massachusetts.

The weather for March 30th and 31st was partly sunny with temperatures in the low 50s and with 20-25 mile per hour winds. A great deal of sediment had accumulated at Well LP-2 and was difficult to pump. Distilled water was poured into the well during sampling to reduce viscosity and facilitate development of fines from the well. Extra volumes were pumped from the well to assure that the final sample had not been diluted. Well LPZ-10, the shallowest piezometer was also difficult to pump due to siltation and the well went dry several times during pumping. For this reason, only one sample bottle was filled for analysis of nitrate, nitrite, sulfate, chloride, orthophosphate, and pH.

Orleans Water Quality Sampling
May 9 & 10, 2016

The second round of water quality sampling at the Orleans Initial Site Characterization (ISC) site adjacent to Lonnie's Pond took place on May 9th and 10th 2016. This field work encompassed tasks 2d and 2e - measuring water levels at wells and piezometers, developing and purging wells and piezometers, measuring field water quality parameters, and sampling each well and piezometer for laboratory analysis for a range of parameters. Samantha Wright of WaterVision LLC completed all field measurements and sampling.

Upon arrival at the site all wells and piezometers were opened and well caps removed to allow equilibration with the atmosphere. If dedicated tubing was

present in the wells this was also removed to allow for equilibration and measurement. Water levels were then measured to the nearest hundredth of a foot with a Solinst water level meter.

Calibration of field parameter meters was also completed before sampling began each day. Field parameters values on each meter were also checked at the end of each day against parameter standards to gauge any drift during the day. Two instruments were used for field parameter sampling – a Yellow Springs Instrument (YSI) Model 556 multi-parameter sonde and a YSI Model 556 Pro multi-parameter sonde.

Well purging and sampling commenced after water level measurement was complete. A Geotech peristaltic pump was used to purge the piezometers of at least three well volumes or until field parameter measurements stabilized. A Geotech Geosub pump was used to purge the water table wells.

Field measurement of water temperature, pH, DO (mg/L), specific conductance, and oxidation/reduction potential (ORP) was regularly measured using the YSIs as purging continued. A visual description of the purged water was also noted. Initial samples were taken and measured using the calibration cup, however after initial sediment buildup in the wells cleared, field parameter measurement continued using a flow through chamber to allow for more accurate DO measurements and for improved parameter stabilization during sampling. All field measurements and observations were noted on field sheets.

Water samples were taken in laboratory provided and pre-preserved sample bottles for the following parameters:

Name	Type
Nitrogen (total), Nitrogen (ammonia), Nitrogen (nitrate), Nitrogen (nitrite), Chloride, Sulfate, Total Alkalinity, Orthophosphate. pH	General chemistry
Organic carbon (dissolved)	Carbon analyses
Boron (dissolved), Iron (dissolved), Manganese (dissolved), Arsenic (dissolved)	Metals and minor elements

Samples taken for dissolved iron, manganese, arsenic and boron and for dissolved organic carbon analyses were first field filtered with a 0.45 micron cartridge filter before collection into sample bottles. Water samples collected for the remaining analyses were not field filtered. A duplicate set of samples was taken at LP-6 on 5-9-16 and at LPZ-29 on May 10, 2016. Samples were kept on ice in laboratory

provided coolers until laboratory courier pickup or delivery to Alpha Analytical Laboratory in Westborough, Massachusetts.

The weather for May 9th and 10th was mostly sunny with temperatures in the low 50s to mid-60s with a slight breeze.

It was noted that LP-2 had very thick silt in the bottom of the well. Distilled water was poured down the well at several points to break up heavy silt and make it easier to pump. This well also went dry several times and the Geotech Geosub pump had some issues pumping such heavily silted water. A full three well volumes (2 gallons) were not able to be purged from this well due to these difficulties and the well was sampled after purging one gallon.

LP-3 was also very silty and it also kept going dry. As with LP-2, a full three well volumes (2 gallons) were not able to be purged from this well. LP-3 was sampled after purging one gallon.

LP-6 was also very silty and it kept going dry. However, a full three well volumes (1.5 gallons) were able to be purged after allowing well to recharge. During the first round of sampling this well was sampled using a bladder pump and dedicated tubing for the bladder pump was left in the well. During this sampling round this well was sampled with a Geosub pump, which requires different tubing than the bladder pump. Prior to purging, the old tubing was removed and new dedicated tubing was installed.

The water level at LPZ-10 was very low and did allow for purging or sampling.

LPZ-39 also kept going dry. A full three well volumes (4.5 gallons) were not able to be purged from this well. After over 2 hours or pumping and allowing the well to recharge, the well was partially sampled after purging 3 gallons. This well was only sampled for dissolved metals and DOC.

QAPP Documentation –
Barnstable – Prince Cove Site
Emily DiFranco

3/28/2016

Barnstable Well Installation 1/2016 and Field Work 3/7/2016

1. Review of Barnstable Fieldwork Summary memo dated 1/29/2016
    - 5 2-in diameter wells and 10 1-in diameter piezometers installed on 1/22/2016.
    - No well at PC-3, PC-5
    - Piezometers installed at PC-4 location
        - Did not reach sw/fw interface.
        - Installed at 13, 23, 30, 35,43, 50,60, 70, 80, and 88.5 feet bls
    - Nitrate field tests
        - 40% samples analyzed using colorimetric N-11 test and remaining were completed with test strips (QAPP modification memo?)
        - Will test strips be used exclusively in the future?
2. Barnstable data log book (installation 1/18/16)
    - All field sheets scanned and legible.
3. Barnstable Round 1 Field WQ Sampling Sheet (3/7-3/8)
    - All field sheets scanned and legible.
    - Dupe field parameter data was not found in log book.
4. Barnstable –Prince Cove WQ Data Summary V1 review
    - Some data entered incorrectly from field data log (noted in QAQC tabs and highlighted in purple). These data were re-entered correctly in the 2-in and 1-in data tables.
    - RPD calculated for two field dupes collected. Six total analytes exceeded the RFP of 20% for precision. They are highlighted in yellow.
        - If result was ND, <MDL was entered into spreadsheet. The MDL was used to calculate RPD in these cases.
        - Need to determine what to do with those samples. Keep in and highlight with notes and exclude from statistics?

6/1/2016

Barnstable Field Work 4/18 and 4/19/2016

1. Review of Barnstable Water Quality Sampling Field Methods- Round 2
    - Field summary complete
2. Barnstable Round 2 Field WQ Sampling Sheet (field work 4/18 and 4/19/2016)
    - All field sheets scanned and legible.
3. Barnstable –Prince Cove WQ Data Summary V4 AB-5-12 review
    - Some data entered incorrectly from field data log (noted in QAQC tabs and highlighted in purple). These data were re-entered correctly in the 2-in and 1-in data tables.
    - RPD calculated for two field dupes collected. Seven total analytes exceeded the RFP of 20% for precision. They are highlighted in yellow.
        - If result was ND, <MDL was entered into spreadsheet. The MDL was used to calculate RPD in these cases.
    - The note "U" is indicated for multiple analytes but is not defined in the notes column. Please define.

QAPP Documentation –
Mashpee – Timber Landing Road Site
Emily DiFranco

3/31/2016

Maspee Well Installation 1/2016 and Field Work 3/7/2016

1. Review of Mashpee Fieldwork summary memo dated 2/22/2016
    - 7 2-in diameter wells and 10 1-in diameter piezometers were installed in late January, early February 2016.
    - Piezometers installed at TL-4 location
        - Did not reach sw/fw interface.
        - Installed at 14,22,31,40,50,60, 70, 80, 90, and 100 feet bls
    - TL-7 not tested due to insufficient SP-15 tubing supplies
2. Mashpee data log book (installation 1/26/16 and 1/27/2016)
    - All field sheets scanned and legible.
3. Mashpee Round 1 Field WQ Sampling Sheet (3/7-3/8)
    - All field sheets scanned and legible.
    - Dupe field parameter data for TL-2A duplicate was not found in log book.
4. Mashpee WQ Data Summary V1 review
    - Two versions of WQ data spreadsheets on Google Drive – QA to version entitled 2016 Mashpee WQ Data Summary v1. Need to ensure all versions have dates attached to title. Created a folder for older versions so only most recent versions appear.
    - Some data entered incorrectly from field data log (noted in QAQC tabs and highlighted in purple). These data were re-entered correctly in the 2-in and 1-in data tables.
    - Significant increases in DO and nitrate at TL-7 and at TLZ-31 and TLZ-40.
    - RPD calculated for two field dupes collected. Four total analytes exceeded the RFP of 20% for precision. They are highlighted in yellow.
        - If result was ND, <MDL was entered into spreadsheet. The MDL was used to calculate RPD in these cases.

6/2/2016

Mashpee Field Work 4/27 and 4/28/2016

1. Review of Mashpee Fieldwork summary memo
2. Mashpee Round 1 Field WQ Sampling Sheet (4/27 and 4/28)
    - All field sheets scanned and legible.
    -
3. Mashpee WQ Data Summary Round 2 Review
    - Some data entered incorrectly from field data log (noted in QAQC tabs and highlighted in purple). These data were re-entered correctly in the 2-in and 1-in data tables.
    - Significant increases in DO and nitrate at TL-7 and at TLZ-31 and TLZ-40.
    - RPD calculated for two field dupes collected. Four total analytes exceeded the RFP of 20% for precision. They are highlighted in yellow.
        - If result was ND, <MDL was entered into spreadsheet. The MDL was used to calculate RPD in these cases.

CAPE COD PERMEABLE REACTIVE BARRIER
INITIAL HYDROGEOLOGIC SITE CHARACTERIZATION RESULTS AND EVALUATION OF SITE SUITABILITY FOR PERMEABLE REACTIVE BARRIER INSTALLATION

Appendix E

Mass Flux Calculation Spreadsheets for ISC Sites

Hydraulic Conductivity Estimates for Cape Cod PRB subsurface materials

Material Description	Estimated Hydraulic Conductivity (ft/day)	ISC sites
Clay with silt and sand	0.01	Dennis
VF to fine silty sand with clay	10	Orleans
Silty fine sand with clay	10	Orleans
fine to coarse sand with silt and clay	10	Orleans
silty fine to med sand with gravel and clay	40	Orleans
fine sand and silt	40	Mashpee
very fine to medium silty sand	40	Barnstable
Layered silt, fine to coarse sand,clay	40	Orleans
silty fine to coarse sand and some clay	100	Orleans
Silty fine to medium sand	150	Sailfish
silty fine to medium sand with some coarse sand and gravel	200	Orleans
silty fine to med sand with bands of coarse sand	200	Orleans
fine to medium sand	250	Barnstable, Mashpee
medium sand with minor silt	250	Barnstable
fine to coarse sand	300	Sailfish
fine to medium sand with gravel and cobbles	300	Mashpee
fine to coarse sand with some gravel	300	Sailfish
medium sand	300	Orleans
medium to coarse sand	350	Barnstable, Mashpee, Dennis
medium to coarse sand with gravel	350	Dennis, Sailfish

Estimate of Nitrate Mass Flux
Initial Site Characterization
Prince Cove, Barnstable, MA

Scenario A *** Based on hydraulic gradient between PC-2 and PC-1**

Note two versions with different hydraulic gradients

Reference Piezometer	Top of sample depth	Bottom of sample depth	Top of water quality interval	Bottom of water quality interval	Sediment description	Top of sediment sub-interval	Bottom of sediment sub-interval	Thickness of sediment sub-interval	Estimated Hydraulic Conductivity		Hydraulic Gradient *	Nitrate-Nitrogen Concentration	Unit Mass Flux of Nitrogen	Mass Flux of Nitrogen per Layer
	feet bgs	feet bgs	feet bgs	feet bgs		feet bgs	feet bgs	feet	ft/day	m/day	ft/ft	mg/L	grams/day/m2	grams/day/m of PRB length
PCZ-13	13	14	9.4	18.0	medium to coarse sand	9.4	13.6	4.2	350	106.68	0.011	1.4	1.643	2.103
					fine to medium sand	13.6	18.5	4.9	250	3.048	0.011	1.4	0.047	0.070
PCZ-23	22	23	18.0	26.0	fine to medium sand	18.5	26.0	7.5	250	76.2	0.011	2.3	1.928	4.407
PCZ-30	29	30	26.0	32.0	fine to medium sand	26.0	32.0	6.0	250	76.2	0.011	2.2	1.844	3.372
PCZ-35	34	35	32.0	38.5	fine to medium sand	32.0	35.0	3.0	250	76.2	0.011	2.3	1.928	1.763
					medium to coarse sand	35.0	38.5	3.5	350	106.68	0.011	2.3	2.699	2.879
PCZ-43	42	43	38.5	46.0	medium to coarse sand	38.5	46.0	7.5	350	106.68	0.011	2.3	2.699	6.170
PCZ-50	49	50	46.0	54.5	medium to coarse sand	46.0	54.5	8.5	350	106.68	0.011	2.0	2.347	6.080
PCZ-60	59	60	54.5	64.5	medium to coarse sand	54.5	57.3	2.8	350	6.096	0.011	2.0	0.134	0.114
					very fine to medium silty sand	57.3	61.1	3.8	40	12.192	0.011	2.0	0.268	0.311
					medium sand with minor silt	61.1	64.5	3.4	250	76.2	0.011	2.0	1.676	7.000
PCZ-70	69	70	64.5	74.5	fine to medium sand	64.5	74.5	10.0	250	76.2	0.011	0.02	0.017	0.051
PCZ-80	79	80	74.5	83.75	fine to medium sand	74.5	76.85	2.3	250	76.2	0.011	0.06	0.050	0.036
					medium to coarse sand	76.85	83.75	6.90	350	106.68	0.011	0.06	0.070	0.148
PCZ-90	87.5	88.5	83.75	90.0	medium to coarse sand	83.75	90.0	6.3	350	106.68	0.011	0.03	0.035	0.067

			Weighted Average Nitrate Concentration (mg/L)	Saturated Thickness (ft)	Total Nitrate Mass Flux (g/day/m)
	Scenario A * Based on hydraulic gradient between PC-2 and PC-1	Treatment zone	2.05	45.1	26.84
	Water Quality Interval containing Nitrate-N . 1.0 mg/l or greater	Total interval	1.41	80.6	34.57

Scenario B **** Based on hydraulic gradient between PC-7 and PC-4**

Note two versions with different hydraulic gradients

	Top of sample depth	Bottom of sample depth	Top of water quality interval	Bottom of water quality interval	Sediment description	Top of sediment sub-interval	Bottom of sediment sub-interval	Thickness of sediment sub-interval	Estimated Hydraulic Conductivity		Hydraulic Gradient **	Nitrate-Nitrogen Concentration	Unit Mass Flux of Nitrogen	Mass Flux of Nitrogen per Layer
	feet bgs	feet bgs	feet bgs	feet bgs		feet bgs	feet bgs	feet	Ft/day	m/day	ft/ft	mg/L	grams/day/m2	grams/day/m of PRB length
PCZ-13	13	14	9.4	18.5	medium to coarse sand	9.4	13.6	4.2	350	106.68	0.003	1.4	0.448	0.574
					fine to medium sand	13.6	18.5	4.9	250	3.048	0.003	1.4	0.013	0.019
PCZ-23	22	23	18.5	26.5	fine to medium sand	18.5	26.5	8.0	250	76.2	0.003	2.3	0.526	1.282
PCZ-30	29	30	26.5	32.5	fine to medium sand	26.5	32.5	6.0	250	76.2	0.003	2.2	0.503	0.920
PCZ-35	34	35	32.5	39.0	fine to medium sand	32.5	33.8	1.3	250	76.2	0.003	2.3	0.526	0.208
					medium to coarse sand	33.8	39.0	5.2	350	106.68	0.003	2.3	0.736	1.167
PCZ-43	42	43	39.0	46.5	medium to coarse sand	39.0	46.5	7.5	350	106.68	0.003	2.3	0.736	1.683
PCZ-50	49	50	46.5	55.0	medium to coarse sand	46.5	55.0	8.5	350	106.68	0.003	2.0	0.640	1.658
PCZ-60	59	60	55.0	65.0	medium to coarse sand	55.0	57.3	2.3	350	6.096	0.003	2.0	0.037	0.026
					very fine to medium silty sand	57.3	61.1	3.8	40	12.192	0.003	2.0	0.073	0.085
					medium sand with minor silt	61.1	65.0	3.9	250	76.2	0.003	2.0	0.457	0.543
PCZ-70	69	70	65.0	75.0	fine to medium sand	65.0	75.0	10.0	250	76.2	0.003	0.02	0.005	0.014
PCZ-80	79	80	75.0	84.25	fine to medium sand	75.0	76.85	1.8	250	76.2	0.003	0.06	0.014	0.008
					medium to coarse sand	76.85	84.25	7.40	350	106.68	0.003	0.06	0.019	0.043
PCZ-90	87.5	88.5	84.25	90.0	medium to coarse sand	84.25	90.0	5.8	350	106.68	0.003	0.03	0.010	0.017

			Weighted Average Nitrate Concentration (mg/L)	Saturated Thickness (ft)	Total Nitrate Mass Flux (g/day/m)
	Scenario B ** Based on hydraulic gradient between PC-7 and PC-4	Treatment zone	2.05	45.6	7.5
	Water Quality Interval containing Nitrate-N . 1.0 mg/l or greater	Total interval	1.42	80.6	8.2

Estimate of Nitrate Mass Flux
Initial Site Characterization
Timber Landing Road, Mashpee, MA

Reference Piezometer	Top of sample depth	Bottom of sample depth	Top of water quality interval	Bottom of water quality interval	Sediment description	Top of sediment sub-interval	Bottom of sediment sub-interval	Thickness of sediment sub-interval	Estimated Hydraulic Conductivity		Hydraulic Gradient *	Nitrate-Nitrogen Concentration	Unit Mass Flux of Nitrogen	Mass Flux of Nitrogen per Layer
	feet bgs	feet bgs	feet bgs	feet bgs		feet bgs	feet bgs	feet	ft/day	m/day	ft/ft	mg/L	grams/day/m2	grams/day/m of PRB length
TLZ-14	13	14	11.8	18.0	medium to coarse sand	11.8	18.0	6.2	350	106.68	0.003	0.2	0.064	0.121
TLZ-22	22	23	18.0	26.5	medium to coarse sand	18.0	26.5	8.5	350	106.7	0.003	0.1	0.032	0.083
TLZ-31	30	31	26.5	35.0	medium to coarse sand	26.5	35.0	8.5	350	106.7	0.003	2.1	0.672	1.741
TLZ-40	39	40	35.0	44.5	medium to coarse sand	35.0	44.5	9.5	350	106.7	0.003	2.7	0.864	2.502
TLZ-50	49	50	44.5	54.5	medium to coarse sand	44.5	46.1	1.6	350	106.7	0.003	0.6	0.192	0.094
					fine to medium sand	46.1	51.9	5.8	250	76.2	0.003	0.6	0.137	0.242
					fine sand and silt	51.9	54.5	2.6	40	12.2	0.003	0.6	0.022	0.017
TLZ-60	59	60	54.5	64.5	fine sand and silt	54.5	60.0	5.5	40	12.2	0.003	0.5	0.018	0.031
					fine to medium sand	60.0	64.5	4.5	250	76.2	0.003	0.5	0.114	0.157
TLZ-70	69	70	64.5	74.5	fine to medium sand	64.5	74.5	10.0	250	76.2	0.003	0.8	0.183	0.557
TLZ-80	79	80	74.5	84.5	fine to medium sand	74.5	80.0	5.5	250	76.2	0.003	1.0	0.229	0.383
					fine to medium sand with gravel and cobbles	80.0	84.5	4.5	300	91.4	0.003	1	0.274	0.376
TLZ-90	89	90	84.5	94.5	fine to medium sand with gravel and cobbles	84.5	94.5	10.0	300	91.4	0.003	0.4	0.110	0.334
TLZ-100	99	100	94.5	100.0	fine to medium sand with gravel and cobbles	94.5	100.0	5.5	300	91.4	0.003	0.0	0.000	0.000

Water Quality Interval containing Nitrate-N . 1.0 mg/l or greater

	Weighted Average Nitrate Concentration (mg/L)	Saturated Thickness (ft)	Total Nitrate Mass Flux (g/day/m)
Treatment zone	2.40	18.0	4.2
Total interval	0.89	88.2	6.6

Estimate of Nitrate Mass Flux
Initial Site Characterization
Sailfish Drive - Falmouth

Reference Piezometer	Top of sample depth	Bottom of sample depth	Top of water quality interval	Bottom of water quality interval	Sediment description	Top of sediment sub-interval	Bottom of sediment sub-interval	Thickness of sediment sub-interval	Estimated Hydraulic Conductivity		Hydraulic Gradient *	Nitrate-Nitrogen Concentration	Unit Mass Flux of Nitrogen	Mass Flux of Nitrogen per Layer
	feet bgs	feet bgs	feet bgs	feet bgs		feet bgs	feet bgs	feet	ft/day	m/day	ft/ft	mg/L	grams/day/m2	grams/day/m of PRB length
SFZ-19	18.0	19.0	17.4	22.0	medium to coarse sand with some gravel	17.4	21.1	3.7	350	106.68	0.0013	0.72	0.100	0.113
					Silty fine to medium sand	21.1	22.0	0.9	150	45.7	0.0013	0.72	0.043	0.012
SFZ-26	25.0	26.0	22.0	29.0	Silty fine to medium sand	22.0	29.0	7.0	150	45.7	0.0013	8.9	0.529	1.129
SFZ-33	32.0	33.0	29.0	36.0	Silty fine to medium sand	29.0	36.0	7.0	150	45.7	0.0013	4.3	0.256	0.545
SFZ-40	39.0	40.0	36.0	42.0	Silty fine to medium sand	36.0	40.0	4.0	150	45.7	0.0013	2.4	0.143	0.174
					fine to coarse sand with some gravel	40.0	42.0	2.0	300	91.4	0.0013	2.4	0.285	0.174
SFZ-45	44.0	45.0	42.0	47.0	fine to coarse sand with some gravel	42.0	46.1	4.1	300	91.4	0.0013	3.0	0.357	0.446
SFZ-50	49.0	50.0	47.0	53.0	fine to coarse sand with some gravel	47.0	60.0	13.0	300	91.4	0.0013	1.7	0.202	0.801
SFZ-57	56.0	57.0	53.0	61.5	fine to coarse sand with some gravel	53.0	61.5	8.5	300	91.4	0.0013	2.6	0.309	0.801
SFZ-67	66.0	67.0	61.5	71.5	fine to coarse sand	61.5	61.9	0.4	350	106.7	0.0013	2.9	0.402	0.049
					fine to coarse sand with some gravel	61.9	71.5	9.6	300	91.4	0.0013	2.9	0.345	1.009
SFZ-77	76.0	77.0	71.5	77.0	coarse sand and gravel	71.5	77.0	5.5	350	106.7	0.0013	1.7	0.236	0.395

Water Quality Interval containing Nitrate-N . 1.0 mg/l or greater

	Weighted Average Nitrate Concentration (mg/L)	Saturated Thickness (ft)	Total Nitrate Mass Flux (g/day/m)
Treatment zone	4.07	55.0	5.5
Total interval	3.79	59.6	5.6

Estimate of Nitrate Mass Flux
Initial Site Characterization
Vinland Drive - Dennis

Reference Piezometer	Top of sample depth	Bottom of sample depth	Top of water quality interval	Bottom of water quality interval	Sediment description	Top of sediment sub-interval	Bottom of sediment sub-interval	Thickness of sediment sub-interval	Estimated Hydraulic Conductivity		Hydraulic Gradient *	Nitrate-Nitrogen Concentration	Unit Mass Flux of Nitrogen	Mass Flux of Nitrogen per Layer
	feet bgs	feet bgs	feet bgs	feet bgs		feet bgs	feet bgs	feet	ft/day	m/day	ft/ft	mg/L	grams/day/m2	grams/day/m of PRB length
VLZ-44	43.0	44.0	42.3	45.5	medium to coarse sand with gravel	42.3	45.5	3.2	350	106.68	0.009	4.3	4.129	4.027
VLZ-48	47.0	48.0	45.5	49.5	medium to coarse sand with gravel	45.5	48.55	3.1	350	106.7	0.009	2.4	2.304	2.142
					Clay with silt and sand	48.55	49.5	1.0	0.01	0.00	0.009	2.4	0.000	0.000
VLZ-52	51.0	52.0	49.5	53.5	Clay with silt and sand	49.5	51.5	2.0	0.01	0.00	0.009	4.2	0.000	0.000
					medium to coarse sand	51.5	53.5	2.0	350	106.7	0.009	4.2	4.033	2.458
VLZ-56	55.0	56.0	53.5	58.0	medium to coarse sand	53.5	58.0	4.5	350	106.7	0.009	2.8	2.688	3.687
VLZ-61	60.0	61.0	58.0	63.0	medium to coarse sand	58.0	63.0	5.0	350	106.7	0.009	2.8	2.688	4.097
VLZ-66	65.0	66.0	63.0	66.2	medium to coarse sand	63.0	66.2	3.2	350	106.7	0.009	3.2	3.072	2.997

	Weighted Average Nitrate Concentration (mg/L)	Saturated Thickness (ft)	Total Nitrate Mass Flux (g/day/m)
Treatment zone	3.29	23.9	19.4
Total interval	3.29	23.9	19.4

Estimate of Nitrate Mass Flux
Initial Site Characterization
Lonnie's Pond - Orleans

Reference Piezometer	Top of sample depth	Bottom of sample depth	Top of water quality interval	Bottom of water quality interval	Sediment description	Top of sediment sub-interval	Bottom of sediment sub-interval	Thickness of sediment sub-interval	Estimated Hydraulic Conductivity		Hydraulic Gradient *	Nitrate-Nitrogen Concentration	Unit Mass Flux of Nitrogen	Mass Flux of Nitrogen per Layer
	feet bgs	feet bgs	feet bgs	feet bgs		feet bgs	feet bgs	feet	ft/day	m/day	ft/ft	mg/L	grams/day/m2	grams/day/m of PRB length
LPZ-10	9.0	10.0	8.0	12.0	silty fine to medium sand with some coarse sand and gravel	8.0	10.3	2.3	200	61.0	0.013	1.6	1.268	0.889
					fine to coarse sand with silt and clay	10.3	12.0	1.7	10	3.0	0.013	1.6	0.063	0.033
LPZ-15	14.0	15.0	12.0	17.5	fine to coarse sand with silt and clay	12.0	17.5	5.5	10	3.0	0.013	0.48	0.019	0.032
LPZ-21	20.0	21.0	17.5	24.5	fine to coarse sand with silt and clay	17.5	20.45	3.0	10	3.0	0.013	1.3	0.052	0.046
					silty fine to med sand with bands of coarse sand	20.45	24.5	4.1	200	61.0	0.013	1.3	1.030	1.272
LPZ-29	28.0	29.0	24.5	33.5	silty fine to med sand with bands of coarse sand	24.5	33.5	9.0	200	61.0	0.013	1.8	1.426	3.913
LPZ-39	38.0	39.0	33.5	45.5	silty fine to med sand with gravel and clay	33.5	46.1	12.6	40	12.2	0.013	0.4	0.070	0.268
LPZ-53	52.0	53.0	45.5	56.5	silty fine to med sand with gravel and clay	45.5	47.75	2.3	40	12.2	0.013	1.8	0.285	0.196
					Layered silt, fine to coarse sand,clay	47.75	51.6	3.9	40	12.2	0.013	1.8	0.285	0.335
					Fine to med silty sand with gravel and clay	51.6	55.5	3.9	40	12.2	0.013	1.8	0.285	0.339
					Silty clay, clayey sand, and v. fine silty sand	55.5	56.5	1.0	10	3.0	0.013	1.8	0.071	0.022
LPZ-61	60.0	61.0	56.5	65.5	Silty fine sand with clay	56.5	60.2	3.7	10	3.0	0.013	1.0	0.040	0.045
					Fine to med silty sand with gravel and clay	60.2	62.1	1.9	40	12.2	0.013	1.0	0.158	0.092
					Fine to med silty sand with gravel and clay	62.1	65.5	3.4	40	12.2	0.013	1.0	0.158	0.164
LPZ-71	70.0	71.0	65.5	75.0	Fine to med silty sand with gravel and clay	65.5	70.0	4.5	40	12.2	0.013	0.1	0.017	0.024
					medium sand	70.0	75.0	5.0	350	106.7	0.013	0.1	0.153	0.232
LPZ-80	79.0	80.0	75.0	84.5	medium sand	75.0	76.5	1.5	350	106.7	0.013	0.069	0.096	0.044
					VF to fine silty sand with clay	76.5	77.6	1.1	10	3.0	0.013	0.069	0.003	0.001
					medium sand	77.6	84.5	6.9	350	106.7	0.013	0.069	0.096	0.201
LPZ-90	89.0	90.0	84.5	90.0	medium sand	84.5	90.0	5.5	350	106.7	0.013	0.1	0.071	0.119

Water Quality Interval containing Nitrate-N . 1.0 mg/l or greater

	Weighted Average Nitrate Concentration (mg/L)	Saturated Thickness (ft)	Total Nitrate Mass Flux (g/day/m)
Treatment zone	1.67	57.5	7.4
Total interval	0.86	82.0	8.3