



TOWN OF EASTHAM

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January 10, 2017

Mr. Sean Cronin
Sr. Deputy Commissioner of Local Services
Division of Local Services
Commonwealth of Massachusetts
P.O. Box 9569
Boston, MA 02114

RE: Eastham Community Compact

Dear Mr. Cronin,

For the Community Compact between the Lt. Governor, Karen Polito, and the Town of Eastham, we had requested assistance with implementing a watershed resource management best practice. Consistent with the Community Compact, in 2016, the Cape Cod Commission identified funds provided by the Massachusetts Department of Environmental Protection to conduct and complete two efforts to promote best practices in watershed resource management in the Town of Eastham.

The first completed study was a site investigation to support the potential installation of a Permeable Reactive Barrier (PRB) at the Cape Cod National Seashore (CCNS) in the Salt Pond watershed. Salt Pond has a 100% nitrogen removal Total Maximum Daily Load (TMDL). If constructed, the PRB would reduce nitrogen and other pollutants carried through groundwater and ultimately discharged to Salt Pond. The site investigation was necessary to ensure that the potential project would be located in an area with appropriate soils, depth to groundwater, groundwater nitrogen concentrations, and other factors that would justify pursuing this PRB at the chosen location. The completed site investigation revealed that this location is appropriate for further analysis and potential PRB construction. This study was valuable in assisting the town in advancing its water quality improvement planning and implementation efforts. The town will use this study to work with the CCNS to pursue further analysis and potential construction of a PRB to improve water quality in Salt Pond.

The second study focused on planning in shared watersheds in ongoing. This is an important exercise for Eastham because in watersheds shared among two or more towns, nitrogen removal responsibility is allocated to each town based on the water-use-per-parcel proxy. Currently Eastham is developing a municipal water system that will provide water use per parcel to confirm the actual flow. In working toward developing this collaboration, Eastham will be able to refine approaches that will provide maximum benefit at lowest cost building on regional experience from pilot demonstrations that may be worthy of expansion. Eastham will use this information as a basis for determining its' ultimate share of responsibility for nitrogen removal as the 208 Plan Update implementation progresses.

Respectfully,

Sheila Vanderhoef
Town Administrator

Memorandum

To Paul Niedzwiecki, Executive Director
Patty Daley, Deputy Director
Kristy Senatori, Deputy Director
Erin Perry, Special Projects Coordinator

CC Betsy Shreve, AICP, AECOM Project Director
AECOM PRB Team

Subject **Cape Cod Commission
208 Water Quality Management Plan Update
Task Order 12B
Technical Memorandum for Eastham Salt Pond Phase 1 – Permeable Reactive
Barrier (PRB) Initial Site Characterization**

Project Number 60303168

From Thomas Parece, P.E., AECOM Project Manager

Date June 30, 2016

1. Background

- A. This technical memorandum presents a summary of the findings from an initial site characterization completed at the Eastham Salt Pond Visitor Center. To support assessment of the site for pilot demonstration for non-traditional methods for nutrient management, three groundwater monitoring wells were installed and sampled in order to better assess the nitrate profile and other groundwater quality parameters in the groundwater.

2. Introduction

- A. The Nauset Estuary Integrated Approach to Watershed Nutrient Management includes the Eastham Salt Pond Phase 1 - Permeable Reactive Barrier (PRB) Initial Site Characterization. The goal of this project is to establish a successful pilot demonstration site for non-traditional methods for nutrient management.
- B. PRBs are a non-traditional wastewater treatment technology designed to intercept and reduce the levels of nitrate in the groundwater by treating groundwater by biological denitrification before it reaches sensitive surface water bodies. PRBs are a passive treatment technology that does not require active pumping or operation. The PRB treatment zone is located in the groundwater saturated zone below the water table, where amendments are added to form the PRB. PRBs are typically oriented perpendicular to the direction of groundwater flow and rely on the natural groundwater gradient to carry the contaminant through the PRB. The system is permeable because the amendments added do not interfere with groundwater flow, and nitrate is removed as groundwater passes through the PRB.

- C. The Town of Eastham has recommended the Salt Pond Visitor Center located within the Cape Cod National Seashore (CCNS) to be considered as a demonstration site for Permeable Reactive Barrier (PRB) technology. Salt Pond is a significantly impaired water body within the Nauset Harbor Embayment System which is shared by the Towns of Eastham and Orleans and the CCNS. According to the Massachusetts Estuaries Project (MEP), this system is currently over its critical nitrogen loading limit and requires 100 percent removal of nitrogen. A project at this site to address nitrogen impacts to this water body provides a unique opportunity to partner with the Cape Cod National Seashore. The Cape Cod National Seashore has endorsed the project and is willing to partner with Eastham.
- D. The purpose of this technical memorandum is to describe the findings from the initial site characterization of groundwater at the Salt Pond Visitor Center in order to demonstrate the potential for this site for a demonstration PRB.

3. Project Planning

- A. A kick-off meeting was held on May 17, 2016 where representatives from AECOM, CCC, and National Park Services (NPS) participated. During the meeting, participants discussed locations and agreed to install new monitoring wells off of the parking lot, near the bike path. The locations were selected due to anticipated higher nitrate concentrations from the densely populated upgradient area. Additionally, the team discussed drilling and well constructions methods.
- B. The Salt Pond Visitor Center is a NPS site and therefore required a Scientific Research and Collecting Permit. The permit allows NPS to monitor research, education, and other activities at their sites. The permit for this project was submitted on June 10, 2016 and approved (Permit Number CACO-2016-SCI-0028) prior to field work began (see attachment).

4. Field Investigation Activities

- A. Based on locations agreed upon by AECOM, CCC, and NPS, locations were staked in the field and DigSafe and Eastham DPW were notified. Drilling occurred on June 23, 2016. Hand-clearing was performed to a depth of five feet in order to confirm absence of underground utilities. Mr. James Harmon, NER Regional Archeologist for NPS, was on-site to monitor the first five feet of hand-clearing and observe for archaeological objects. It was confirmed that nothing of archaeological significance was observed during the hand-clearing.
- B. A driller subcontracted by AECOM (New England Geotech, LLC) installed three monitoring wells using a direct-push drill rig (Geoprobe®). All monitoring wells were located between the bike path and the Salt Pond Visitor Center parking lot (see attached Figures 1 and 2). Two monitoring (ESMW-11S and ESMW-11I) were installed at the same location (approximately three feet apart) with screens in different vertical depth intervals to evaluate nitrate concentrations in groundwater vertically in the aquifer. The third monitoring well (ESMW-12S) was installed in a second location approximately 100 feet west at a depth of 55 feet in order to allow for assessment of groundwater hydraulic gradient. Table 1 shows the well screen locations and water levels for each of the three wells installed. The well screen for well ESMW-12S was located approximately 8 feet lower than measured depth to groundwater to account for tidal fluctuations.
- C. At monitoring wells ESMW-11I soil samples were collected using direct-push five foot length macro-core samplers to a depth of 55 feet below ground surface (bgs).

Table 1 - Well Screen Locations and Elevations (feet bgs)

Well ID	Well Depth	Well Screen	Water Level
ESMW-11I	55	45 - 55	18.90
ESMW-11S	38	28 - 38	18.05
ESMW-12S	55	45 - 55	21.90

- A. Salt Pond is tidally influenced, and groundwater in the immediate vicinity is expected to rise and fall with the tidal cycle. Water elevation was reported to change by approximately 7 feet between high and low tide during the period of field sampling. The June 2016 tide charts indicate a maximum change of approximately 10 feet and a minimum change of approximately 5 feet at Salt Pond Bay. Following well installation on June 23, 2016, groundwater elevation variability was attempted to be quantified using a down-well water level logger. However, due to software issue with the logger, the unit was unable to be deployed. After resolving the software issue, the well logger was deployed into well ESMW-12 on June 28, 2016 to a depth of approximately 50 feet bgs, approximately half way down the well screen. The well logger was retrieved on June 29, 2016 approximately 24 hours after being deployed; however, the logger only recorded one reading. Tidal groundwater elevation fluctuation is not considered a key design parameter for a PRB Demonstration Test. Water level loggers could be deployed at the time of a PRB Demonstration Test.
- B. Groundwater samples were collected from the three newly installed wells on June 28, 2016. The samples were collected using a peristaltic pump. Groundwater samples collected were submitted to ESS laboratory for analyses shown in the Table 2. Table 3 presents an overview of the groundwater monitoring analyses and relevance to assessment of groundwater conditions relative to PRB consideration. Sampling was also attempted at an existing well with three discrete screens (ESMW-2S (40 to 50 feet bgs), ESMW-2I (60 to 70 feet bgs), and ESMW-2D (100 to 110 feet bgs)). However, samples were unable to be collected due to slow recharge in these wells, which may have been caused by the small diameter well screens ($\frac{3}{4}$ -inch) and/or the depths. Depth to groundwater measurements were recorded for each of the three screened intervals (ESMW-2S, ESMW-2I, and ESMW-2D).

Table 2 – Summary of Laboratory Analyses

Parameter	ESMW-11S	ESMW-11I	ESMW-12S
Nitrate	X	X	X
Total Kjeldahl Nitrogen	X	X	X
Ammonia Nitrogen	X	X	X
Nitrite	X	X	X
Dissolved Iron	X	X	X
Dissolved Manganese	X	X	X
Boron	X	X	X
Chloride	X	X	X
Dissolved Organic Carbon	X	X	X
Sulfate	X	X	X
Total Phosphorus	X	X	X

Table 3 - Summary of Analyses for Groundwater Performance Evaluation

Parameter	Relevance to PRB Design
Nitrate	Primary groundwater compound targeted for treatment.
Nitrite	Intermediate nitrogen species from the aerobic nitrification of ammonia to nitrate.
Ammonia	Reduced inorganic nitrogen species that occurs in proximity of leach fields and landfills.
Total Nitrogen	Analyses provide a summation of all organic and inorganic nitrogen species in groundwater as a result of leach fields and landfill.
Metals (Fe, Mn)	Mobility of metals can be impacted by groundwater geochemistry changes, notably pH and ORP.
Dissolved Organic Carbon (DOC)	Analysis is an estimate of the organic content in a water sample (that can pass through a filter). Organic carbon can be a food source for soil microorganisms. In addition, denitrification PRBs would apply a carbon substrate to the aquifer, and DOC would increase in monitoring wells impacted by additional of amendment.
Sulfate	Sulfate will decrease with generation of sufficiently anaerobic conditions favorable for sulfate-reducing bacteria.
pH	Denitrification optimal pH (6.0 and 8.5). Groundwater pH can decrease as a result of fermentation of injected carbon substrates.
ORP	ORP will decrease with generation of reducing conditions following injection of carbon substrate.
Chloride	Chloride concentrations are higher in salt water, and higher concentrations would indicate influence of salt water intrusion.
Boron	Boron is present in laundry detergents and is an indicator of groundwater flow emanating from leach fields.
Total Phosphate	Phosphate is another nutrient (like nitrogen) needed for cellular growth.

- C. Two soil samples (one of sandy soil and one of silty clay soil) were collected from soil boring ESMW-111 and were submitted for ESS laboratory for analysis of grain size distribution.

5. Results and Conclusions

- A. The soil cores observed during installation of monitoring wells ESMW-111 indicated that subsurface materials consist mostly of sand (fine to fine-medium) with little to some gravel and few to little silt in most depths. Discrete lens of firm, silty clay were observed in this boring at approximately 30.5 to 33.5, 38 to 39, and 40.5 to 45.5 feet bgs. The clay layers had the appearance of marine clay and did not have high plasticity. Hydraulic conductivity can be estimated based on the field characterization of these soil samples. Table 4 outlines characteristic hydraulic conductivities for various lithologies (Fetter, 2001).

Table 4 - Characteristic Hydraulic Conductivities for Various Lithologies

Lithology	Hydraulic Conductivity (cm/sec)
Silt, sandy silts, clayey sands, till	10^{-6} to 10^{-4}
Silty sands, fine sands	10^{-5} to 10^{-3}
Well-sorted sands, glacial outwash	10^{-3} to 10^{-1}

Based on the lithology observed, the hydraulic conductivity of the sandy portions of the aquifer would be estimated to be in the range of 10^{-3} to 10^{-5} , and the presence of gravel would suggest hydraulic conductivity would be in the higher end of this range. Intervals of firm, silty clay would have a much lower hydraulic conductivity (estimated in the range of 10^{-5} to 10^{-6} cm/s) based on the above table and other observations of similar marine silty, clay in Massachusetts. Samples of sandy soil and silty clay soil were submitted for laboratory grain size analysis, and this analysis can be used to better estimate hydraulic conductivity of the site aquifer layers. Groundwater flow, and therefore nitrate transport, will be significantly less in the discrete layers of silty, clay.

- B. The groundwater samples analyzed detected nitrate in all three new monitoring wells with nitrate concentrations ranging between 1.02 and 3.74 mg/L. The highest nitrate concentration was measured in monitoring well ESMW-12S (western new monitoring well). Well ESMW-12S was the only well where ammonia was detected (0.39 mg/L), and Total Kjeldahl Nitrogen (sum of ammonia and organic nitrogen) was highest at this well (1.22 mg/L). These nitrogen results suggest the influence of a septic system upgradient and nearby. Based on oxidation-reduction potential (ORP), groundwater near well ESMW-12S was most reducing of the three new wells. Many metals are more mobile under more reducing conditions, and dissolved iron and dissolved manganese concentrations were also measured to be highest at ESMW-12. Compared to nitrate, total phosphate concentrations (<0.1 to 0.17 mg/L) are significantly lower. Table 5 summarizes the laboratory and water quality results. The laboratory report is provided as an attachment.
- C. The new monitoring wells should be surveyed to identify exact location and elevation (ground surface and top of PVC casing). The locations of the new wells shown on figures are approximate based on measurement in the field by AECOM staff. Additionally, the existing well screens at ESMW-2 should be surveyed and the same time as the new wells, and sampled and analyzed for nitrate and total nitrogen. A synoptic round of groundwater elevation should consider other wells in Eastham upgradient of the site (to the north) as well as Salt Pond water elevation to estimate hydraulic gradient. In addition, slug testing is recommended in the new wells to validate site-specific values for hydraulic conductivity compared to the estimates based on soil grain observation and size. Using these hydrogeologic characteristics, groundwater flow rate can be estimated in order to calculate nitrate and nitrogen loads flowing to Salt Pond. This load can be used for design of a PRB demonstration test.
- D. Data collected as part of this Initial Site Characterization effort indicate nitrate concentrations in groundwater flowing towards Salt Pond that could be intercepted with a PRB. Additional site-specific hydrogeological data (notably groundwater elevations to determine hydraulic gradient) will enable nitrate flux to be estimated such that a cost per mass nitrate removal for a PRB can be calculated and compared to other locations or nitrate reduction processes.

Table 5 – June 2016 Groundwater Sampling Results

Parameter	Unit	ESMW-11S	ESMW-11I	ESMW-12S
Field Parameters				
pH	pH units	6.02	6.67	6.98
Specific Conductivity	µS/cm	170.00	242.00	431.00
DO	mg/L	6.52	5.60	3.76
ORP	mV	74.00	-148.00	-260.60
Turbidity	NTU	33.00	67.80	290.00
Laboratory Parameters				
Nitrate	mg/L	1.71	1.02	3.74
Total Kjeldahl Nitrogen	mg/L	0.33	0.2	1.22
Dissolved Iron	mg/L	<0.1	<0.1	0.39
Dissolved Manganese	mg/L	<0.01	<0.01	0.042
Boron	mg/L	0.28	0.086	0.352
Ammonia Nitrogen	mg/L	0.176	0.245	1.13
Chloride	mg/L	<0.05	<0.05	<0.05
Dissolved Organic Carbon	mg/L	31.7	48	89.8
Nitrite	mg/L	<0.5	0.585	0.563
Sulfate	mg/L	11.3	14.5	14
Total Phosphorus	mg/L	<0.1	0.12	0.17

Notes:

1. ESMW-11I and ESMW-12S are located at the same screen interval.

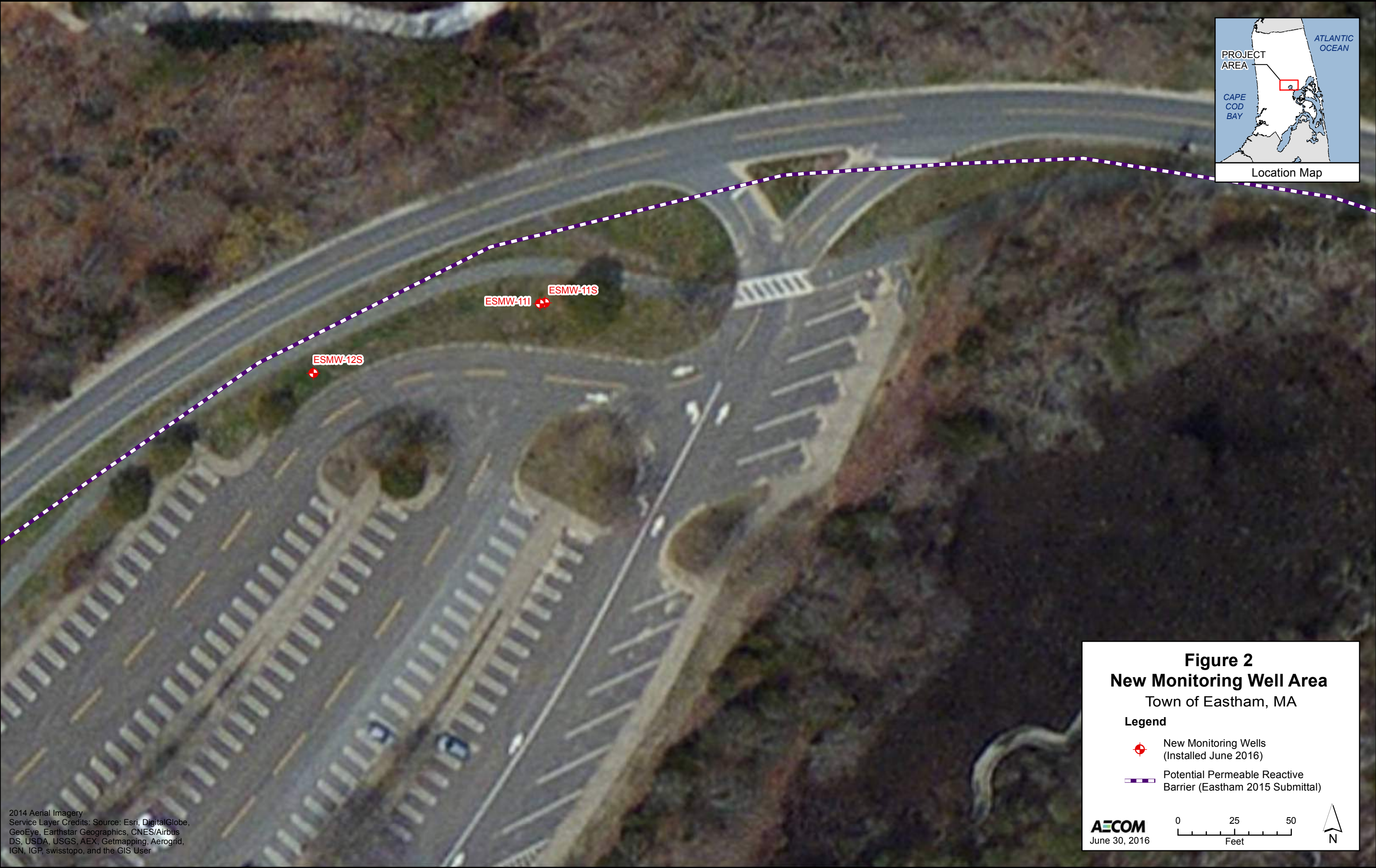
6. References

Fetter, C. W. 2001. Applied Hydrogeology. Upper Saddle River, N.J.: Prentice Hall.

Attachments



2014 Aerial Imagery
Service Layer Credits: Source: Esri,
DigitalGlobe, GeoEye, Earthstar
Geographics, CNES/Airbus DS,
USDA, USGS, AEX, Getmapping,
Aerogrid, IGN, IGP, swisstopo, and
the GIS User Community





APPLICATION FOR A SCIENTIFIC RESEARCH AND COLLECTING PERMIT

United States Department of the Interior

National Park Service

All or some of the information you provide may become available to the public.

OMB # 1024-0236
Exp. Date 04/30/2017
Form No. 10-741a

Name of the National Park Service area you are applying to: Cape Cod	
Type of application: New application	Please enter numbers for permit renewal or modification requests: Previously assigned NPS study number: Previously assigned NPS permit number:

Contact information for the current principal investigator		
Principal investigator: Mrs Julianne Marrion	Office phone: 978-905-2419	
Mailing address of principal investigator: 250 Apollo Drive Chelmsford, MA 01824 United States	Alternative phone: Office fax: Office email address: julianne.marrion@aecom.com	
Name of the current institution represented AECOM		
Additional investigators or key field assistants (first name, last name, office phone, office email)		
Name: Paul Dombrowski	Phone: 978 905 2955	Email: paulm.dombrowski@aecom.com
Name: Tom Parece	Phone: 978.905.2354	Email: Tom.Parece@aecom.com

Scientific Study Information	
Study Title (maximum 300 characters) Eastham Salt Pond - PRB Site Characterization	
Purpose of the study (maximum 4000 characters) The goal of this study is to determine the site characterization of nitrogen in groundwater in order to further support development of the Eastham Salt Pond Permeable Reactive Barrier (PRB) to reduce nitrate loading into Salt Pond.	
Summary of proposed field methods and activities (extract from the study proposal where appropriate - maximum 4000 characters) Field work will include installation of up to three groundwater monitoring wells and sampling new and existing monitoring wells. Two of these three wells will be installed at the same location to allow for vertical profile assessment of nitrogen. The archaeologists' scope has been submitted to NPS and is pending approval. The proposed scope includes hand excavation of up to three 50cm x 50cm test pits by an archaeologist to a depth of 2-3 ft. The test pits will be backfilled at the end of the day. Locations will be hand excavated to a depth of 5 ft by driller in order to verify that area does not have underground utilities prior to drilling and well installation. Subsurface soil samples will also be collected at one location for soil characterization. Groundwater samples will be collected and analyzed.	
Study Schedule Initial starting date of the study: Jun 07, 2016 Estimated date the entire study may end: Dec 30, 2016	Field Schedule Date to begin study within the park this application year: Jun 15, 2016 Date to end study within the park this application year: Jun 30, 2016
Activity Type: Research	
Do you anticipate receiving funding assistance from the U.S. Federal Government for this study? (Yes or No) No	

<p>If yes specify the agency(s):</p>
<p>Where will data, maps, photos, etc. (not specimens) reside upon completion of this study? Data, maps, and photos will be provided to the Cape Cod Commission upon completion of this project.</p>
<p>Location(s) where you propose activities will take place within the National Park System area(s): The proposed monitoring wells are located next to the bike path that runs alongside Nauset Road. Wells will be installed between the bike path and the Salt Pond Visitor Center parking lot.</p>
<p>Your proposed method of access (vehicles, aircraft, boat, snowmobile, foot, etc.): These locations are readily accessible by foot or vehicle.</p>
<p>Paperwork Reduction Act Statement: A federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. Public reporting for this collection of information form is estimated to average 1.38 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms. Direct comments regarding this burden estimate or any aspect of this form to Dr. John G. Dennis, Natural Resources (3130 MIB), National Park Service, 1849 C Street, N.W., Washington, DC 20240.</p> <p>Privacy Act Notice: Scientific research, education and collecting activities within units of the National Park System that may impact parks invoke a permitting and reporting requirement per regulations at 36 CFR 1.6 (Permits), 36 CFR 2.1 (Preservation of Natural, Cultural and Archeological Resources), and 36 CFR 2.5 (Research Specimens). The National Park Service collects information about permit applicants and permittees to administer and document research, collecting, and reporting activities within parks. The information disclosed on this form is required and may result in denial of permit applications if not provided.</p>

AECOM

250 Apollo Drive, Chelmsford, MA 01824
(978) 905-2100 - office, (978) 905-2101 - faxBoring/Well ID: ESMW-111Page 1 of 1Project Name: CCC Eastham PRBDrilling Company: NE Geotech

Surface Comp:

Project Number: 60303168Drilling Method: Geoprobe, push

Grout (bgs):

Date Pre-Cleared: 06/23/2016Rig Type: Geoprobe

Filter Pack (bgs):

Date Started Drilling: 06/23/2016

Casing ID:

Riser (bgs):

Date Finished Drilling: 06/23/2016Water Level While Drilling (bgs): 18.9Well Screen (bgs): 45-55Logged By: BKMTotal Depth of Boring (bgs): 55.0

Sump (bgs):

(Note: bgs = below ground surface)

Depth Range	Blow per 6 Inch	Recovery ft/ft	PID	Lab Sample ID	USCS	Geologic Description Method:
						<u>Pre-cleared to 5ft, fine to med sand w/ some gravel, it brown</u>
<u>5-10</u>		<u>4.0</u>				<u>NO sample</u> <u>fine sand, some gravel, it brown</u>
<u>10-15</u>		<u>4.0</u>				<u>NO sample</u> <u>fine sand, some gravel, it brown</u>
<u>15-20</u>		<u>3.5</u>		<u>took sample</u>		<u>water @ bottom ft of core</u> <u>fine sand, ~20% silt, it brown, some gravel</u> <u>wet</u>
<u>20-25</u>		<u>3.5</u>		<u>took sample</u>		<u>20-22 ft brown, fine to med sand w/ ~20% silt, wet, some gravel</u> <u>22-24 med sand w/ ~10% silt, loose</u> <u>few lg cobble @ bottom wet, some firm</u>
<u>25-30</u>		<u>3.0</u>				<u>fine to med sand w/ some ang gravel</u> <u>~10% silt, somewhat firm, brown</u> <u>wet</u>
<u>30-35</u>		<u>3.75</u>		<u>took sample</u>		<u>top few inches - med to coarse sand, brown</u> <u>30.5-33 - very firm material, silty clay, reddish- orange</u> <u>33-33.5 - very firm silty clay, grey bottom .5- back to fine sand</u>
<u>35-40</u>		<u>4.0</u>				<u>35-38 - fine to med sand, firm, ~20% silt</u> <u>some gravel, it brown, wet</u> <u>38-39 - very dense + firm, silty + clay like it brown to dark grey, wet</u>
<u>40-45</u>		<u>4.0</u>		<u>took sample</u>		<u>40-40.5 - fine to med sand, brown, wet, somewhat firm</u> <u>40.5-44 - very firm + dense, silty clay, dark grey, wet</u>
<u>45-50</u>		<u>4.0</u>		<u>took sample</u>		<u>45-45.5 - firm silty, dense wet, grey</u> <u>45.5-46 - organicish-brown med sand, wet,</u> <u>46-49 - fine to med sand, it brown, some gravel, wet</u>
<u>50-55</u>		<u>4.25</u>		<u>took sample</u>		<u>whole core fine sand, it brown, wet</u> <u>somewhat firm ~10% silt</u>

Lithology:

Comments:

1.)

5.)

2.)

6.)

3.)

7.)

4.)

8.)

Cape Cod Commission – 208 Water Quality Management Plan Update Task 12B

June 23, 2016 Field Work Pictures



ESMW-11I: 15-20 ft



ESMW-11I: 20-25 ft



ESMW-11I: 30-35 ft



ESMW-11I: 35-40 ft



ESMW-11I: 40-45 ft



ESMW-11I: 50-55 ft



ESMW-11I(left) and ESMW-11S(right)



ESMW-12S



Overview



CERTIFICATE OF ANALYSIS

Julianne Marrion
AECOM Environment - ENSR
250 Apollo Drive
Chelmsford, MA 01824

RE: CCC - Eastham (600303168)
ESS Laboratory Work Order Number: 1606729

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED

By ESS Laboratory at 4:12 pm, Jul 01, 2016

Analytical Summary

The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with NELAC Standards, A2LA and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham

ESS Laboratory Work Order: 1606729

SAMPLE RECEIPT

The following samples were received on June 28, 2016 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has performed and reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Data Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Lab Number	Sample Name	Matrix	Analysis
1606729-01	ESMW-12S	Ground Water	200.7, 300.0, 350.1, 351.2, 353.2, 365.1, 5310B, 9250
1606729-02	ESMW-11S	Ground Water	200.7, 300.0, 350.1, 351.2, 353.2, 365.1, 5310B, 9250
1606729-03	ESMW-11I	Ground Water	200.7, 300.0, 350.1, 351.2, 353.2, 365.1, 5310B, 9250



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham

ESS Laboratory Work Order: 1606729

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

[Definitions of Quality Control Parameters](#)
[Semivolatile Organics Internal Standard Information](#)
[Semivolatile Organics Surrogate Information](#)
[Volatile Organics Internal Standard Information](#)
[Volatile Organics Surrogate Information](#)
[EPH and VPH Alkane Lists](#)



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham

ESS Laboratory Work Order: 1606729

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015D - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham
Client Sample ID: ESMW-12S
Date Sampled: 06/28/16 13:40
Percent Solids: N/A

ESS Laboratory Work Order: 1606729
ESS Laboratory Sample ID: 1606729-01
Sample Matrix: Ground Water
Units: mg/L

Extraction Method: 3005A

Dissolved Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Iron	0.352 (0.050)		200.7		1	KJK	06/29/16 23:12	50	25	CF62912
Manganese	1.13 (0.010)		200.7		1	KJK	06/29/16 23:12	50	25	CF62912



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham
Client Sample ID: ESMW-12S
Date Sampled: 06/28/16 13:40
Percent Solids: N/A

ESS Laboratory Work Order: 1606729
ESS Laboratory Sample ID: 1606729-01
Sample Matrix: Ground Water
Units: mg/L

Extraction Method: 3005A

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Boron	ND (0.050)		200.7		1	KJK	06/29/16 22:29	50	25	CF62912



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham
Client Sample ID: ESMW-12S
Date Sampled: 06/28/16 13:40
Percent Solids: N/A

ESS Laboratory Work Order: 1606729
ESS Laboratory Sample ID: 1606729-01
Sample Matrix: Ground Water

Classical Chemistry

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Ammonia as N	0.39 (0.10)		350.1		1	JLK	06/29/16 21:10	mg/L	CF62942
Chloride	89.8 (3.0)		9250		1	JLK	06/30/16 20:32	mg/L	CF63054
Dissolved Organic Carbon (Average)	0.563 (0.500)		5310B		1	DEL	06/30/16 17:15	mg/L	[CALC]
Nitrate as N	3.74 (0.210)		353.2		10	EEM	06/29/16 15:12	mg/L	[CALC]
Nitrite as N	0.042 (0.010)		353.2		1	EEM	06/29/16 14:34	mg/L	CF62917
Sulfate	14.0 (10.0)		300.0		10	JLK	06/30/16 18:21	mg/L	CF63041
Total Kjeldahl Nitrogen as N	1.22 (0.20)		351.2		1	JLK	06/30/16 17:54	mg/L	CF62927
Total Phosphate as P	0.17 (0.10)		365.1		1	EEM	07/01/16 14:47	mg/L	CG60113



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham
Client Sample ID: ESMW-11S
Date Sampled: 06/28/16 15:00
Percent Solids: N/A

ESS Laboratory Work Order: 1606729
ESS Laboratory Sample ID: 1606729-02
Sample Matrix: Ground Water
Units: mg/L

Extraction Method: 3005A

Dissolved Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Iron	0.280 (0.050)		200.7		1	KJK	06/29/16 23:17	50	25	CF62912
Manganese	0.176 (0.010)		200.7		1	KJK	06/29/16 23:17	50	25	CF62912



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham
Client Sample ID: ESMW-11S
Date Sampled: 06/28/16 15:00
Percent Solids: N/A

ESS Laboratory Work Order: 1606729
ESS Laboratory Sample ID: 1606729-02
Sample Matrix: Ground Water
Units: mg/L

Extraction Method: 3005A

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Boron	ND (0.050)		200.7		1	KJK	06/29/16 22:34	50	25	CF62912



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham
Client Sample ID: ESMW-11S
Date Sampled: 06/28/16 15:00
Percent Solids: N/A

ESS Laboratory Work Order: 1606729
ESS Laboratory Sample ID: 1606729-02
Sample Matrix: Ground Water

Classical Chemistry

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Ammonia as N	ND (0.10)		350.1		1	JLK	06/29/16 21:11	mg/L	CF62942
Chloride	31.7 (3.0)		9250		1	JLK	06/30/16 20:34	mg/L	CF63054
Dissolved Organic Carbon (Average)	ND (0.500)		5310B		1	DEL	06/30/16 19:09	mg/L	[CALC]
Nitrate as N	1.71 (0.110)		353.2		5	EEM	06/29/16 15:16	mg/L	[CALC]
Nitrite as N	ND (0.010)		353.2		1	EEM	06/29/16 14:37	mg/L	CF62917
Sulfate	11.3 (10.0)		300.0		10	JLK	06/30/16 18:37	mg/L	CF63041
Total Kjeldahl Nitrogen as N	0.33 (0.20)		351.2		1	JLK	06/30/16 17:54	mg/L	CF62927
Total Phosphate as P	ND (0.10)		365.1		1	EEM	07/01/16 14:48	mg/L	CG60113



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham
Client Sample ID: ESMW-111
Date Sampled: 06/28/16 15:50
Percent Solids: N/A

ESS Laboratory Work Order: 1606729
ESS Laboratory Sample ID: 1606729-03
Sample Matrix: Ground Water
Units: mg/L

Extraction Method: 3005A

Dissolved Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Iron	0.086 (0.050)		200.7		1	KJK	06/29/16 23:21	50	25	CF62912
Manganese	0.245 (0.010)		200.7		1	KJK	06/29/16 23:21	50	25	CF62912



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham
Client Sample ID: ESMW-111
Date Sampled: 06/28/16 15:50
Percent Solids: N/A

ESS Laboratory Work Order: 1606729
ESS Laboratory Sample ID: 1606729-03
Sample Matrix: Ground Water
Units: mg/L

Extraction Method: 3005A

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Boron	ND (0.050)		200.7		1	KJK	06/29/16 22:38	50	25	CF62912



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham
Client Sample ID: ESMW-111
Date Sampled: 06/28/16 15:50
Percent Solids: N/A

ESS Laboratory Work Order: 1606729
ESS Laboratory Sample ID: 1606729-03
Sample Matrix: Ground Water

Classical Chemistry

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Ammonia as N	ND (0.10)		350.1		1	JLK	06/29/16 21:12	mg/L	CF62942
Chloride	48.0 (3.0)		9250		1	JLK	06/30/16 20:35	mg/L	CF63054
Dissolved Organic Carbon (Average)	0.585 (0.500)		5310B		1	DEL	06/30/16 19:21	mg/L	[CALC]
Nitrate as N	1.02 (0.110)		353.2		5	EEM	06/29/16 15:17	mg/L	[CALC]
Nitrite as N	ND (0.010)		353.2		1	EEM	06/29/16 14:38	mg/L	CF62917
Sulfate	14.5 (10.0)		300.0		10	JLK	06/30/16 18:53	mg/L	CF63041
Total Kjeldahl Nitrogen as N	0.20 (0.20)		351.2		1	JLK	06/30/16 17:55	mg/L	CF62927
Total Phosphate as P	0.12 (0.10)		365.1		1	EEM	07/01/16 14:49	mg/L	CG60113



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham

ESS Laboratory Work Order: 1606729

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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Dissolved Metals

Batch CF62912 - 3005A

Blank

Iron	ND	0.050	mg/L							
Manganese	ND	0.010	mg/L							

Blank

Iron	ND	0.020	mg/L							
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LCS

Iron	1.27	0.050	mg/L	1.250		102	80-120			
Manganese	0.249	0.010	mg/L	0.2500		100	80-120			

LCS

Iron	0.535	0.020	mg/L	0.5000		107	80-120			
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LCS Dup

Iron	1.23	0.050	mg/L	1.250		99	80-120	3	20	
Manganese	0.240	0.010	mg/L	0.2500		96	80-120	4	20	

LCS Dup

Iron	0.509	0.020	mg/L	0.5000		102	80-120	5	20	
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Total Metals

Batch CF62912 - 3005A

Blank

Boron	ND	0.050	mg/L							
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LCS

Boron	0.253	0.050	mg/L	0.2500		101	85-115			
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LCS Dup

Boron	0.253	0.050	mg/L	0.2500		101	85-115	0.2	20	
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Classical Chemistry

Batch CF62917 - [CALC]

Blank

Nitrate as N	ND	0.010	mg/L							
Nitrite as N	ND	0.010	mg/L							
Nitrite as N	ND	0.010	mg/L							

LCS

Nitrate as N	ND		mg/L							
Nitrite as N	0.269		mg/L	0.2497		108	90-110			
Nitrite as N	0.269		mg/L	0.2497		108	90-110			

Batch CF62918 - [CALC]

Blank

Nitrate as N	ND	0.020	mg/L							
Nitrate/Nitrite as N	ND	0.020	mg/L							

LCS

Nitrate as N	0.506		mg/L							
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CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham

ESS Laboratory Work Order: 1606729

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch CF62918 - General Preparation										
Nitrate/Nitrite as N	0.506		mg/L	0.5000		101	90-110			
Batch CF62927 - TKN Prep										
Blank										
Total Kjeldahl Nitrogen as N	ND	0.20	mg/L							
LCS										
Total Kjeldahl Nitrogen as N	24.3	2.00	mg/L	25.70		95	80-120			
Batch CF62942 - NH4 Prep										
Blank										
Ammonia as N	ND	0.10	mg/L							
LCS										
Ammonia as N	0.10	0.10	mg/L	0.09994		102	80-120			
LCS										
Ammonia as N	1.02	0.10	mg/L	0.9994		102	80-120			
Batch CF62952 - General Preparation										
Blank										
Dissolved Organic Carbon (1)	ND	0.500	mg/L							
Dissolved Organic Carbon (2)	ND	0.500	mg/L							
Dissolved Organic Carbon (Average)	ND	0.500	mg/L							
LCS										
Dissolved Organic Carbon (1)	4.85	0.500	mg/L	5.000		97	80-120			
Dissolved Organic Carbon (2)	4.93	0.500	mg/L	5.000		99	80-120			
Dissolved Organic Carbon (Average)	4.89	0.500	mg/L							
LCS Dup										
Dissolved Organic Carbon (1)	5.25	0.500	mg/L	5.000		105	80-120	8	200	
Dissolved Organic Carbon (2)	5.51	0.500	mg/L	5.000		110	80-120	11	200	
Dissolved Organic Carbon (Average)	5.38	0.500	mg/L							
Batch CF63041 - General Preparation										
Blank										
Sulfate	ND	1.0	mg/L							
LCS										
Sulfate	5.4		mg/L	4.994		109	90-110			
Batch CF63054 - General Preparation										
Blank										
Chloride	ND	3.0	mg/L							
LCS										
Chloride	31.3		mg/L	30.00		104	90-110			
Batch CG60113 - TPO4 Prep										
Blank										
Total Phosphate as P	ND	0.10	mg/L							
LCS										



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham

ESS Laboratory Work Order: 1606729

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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Classical Chemistry

Batch CG60113 - TPO4 Prep

Total Phosphate as P	0.52	0.10	mg/L	0.5000		104	90-110			
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CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham

ESS Laboratory Work Order: 1606729

Notes and Definitions

U	Analyte included in the analysis, but not detected
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report



CERTIFICATE OF ANALYSIS

Client Name: AECOM Environment - ENSR
Client Project ID: CCC - Eastham

ESS Laboratory Work Order: 1606729

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179

<http://www.health.ri.gov/find/labs/analytical/ESS.pdf>

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750

http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutOfStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002

<http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/documents/AllLabs.xls>

Massachusetts Potable and Non Potable Water: M-RI002

<http://public.dep.state.ma.us/Labcert/Labcert.aspx>

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424

<http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm>

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313

<http://www.wadsworth.org/labcert/elap/comm.html>

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006

http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752

http://www.depweb.state.pa.us/portal/server.pt/community/labs/13780/laboratory_accreditation_program/590095

ESS Laboratory Sample and Cooler Receipt Checklist

Client: AECOM Environment - ENSR - KPB/MM

ESS Project ID: 1606729

Shipped/Delivered Via: ESS Courier

Date Received: 6/28/2016

Project Due Date: 7/1/2016

Days for Project: 3 Day

1. Air bill manifest present?
Air No.: NA

6. Does COC match bottles?

2. Were custody seals present?

7. Is COC complete and correct?

3. Is radiation count <100 CPM?

8. Were samples received intact?

4. Is a Cooler Present?
Temp: 3.1 Iced with: Ice

9. Were labs informed about short holds & rushes? / No / NA

5. Was COC signed and dated by client?

10. Were any analyses received outside of hold time? Yes

11. Any Subcontracting needed? Yes
ESS Sample IDs: _____
Analysis: _____
TAT: _____

12. Were VOAs received? / No
a. Air bubbles in aqueous VOAs? Yes
b. Does methanol cover soil completely? Yes / No

13. Are the samples properly preserved? / No
a. If metals preserved upon receipt: Date: _____ Time: _____ By: _____
b. Low Level VOAs brought to freezer: Date: _____ Time: _____ By: _____

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes
a. Was there a need to contact the client? Yes / No
Who was contacted? _____ Date: _____ Time: _____ By: _____

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	47472	Yes	NA	Yes	1L Poly - Unpres	NP	
01	47475	Yes	NA	Yes	1L Poly - H2SO4	H2SO4	
01	47478	Yes	NA	Yes	250 mL Poly - H2SO4	H2SO4	
01	47481	Yes	NA	Yes	250 mL Poly - Unpres	NP	
01	47484	Yes	NA	Yes	250 mL Poly - Unpres	NP	
01	47491	Yes	No	Yes	VOA Vial - Unpres	NP	
01	47492	Yes	No	Yes	VOA Vial - Unpres	NP	
01	47493	Yes	No	Yes	VOA Vial - Unpres	NP	
02	47471	Yes	NA	Yes	1L Poly - Unpres	NP	
02	47474	Yes	NA	Yes	1L Poly - H2SO4	H2SO4	
02	47477	Yes	NA	Yes	250 mL Poly - H2SO4	H2SO4	
02	47480	Yes	NA	Yes	250 mL Poly - Unpres	NP	
02	47483	Yes	NA	Yes	250 mL Poly - Unpres	NP	
02	47488	Yes	No	Yes	VOA Vial - Unpres	NP	
02	47489	Yes	No	Yes	VOA Vial - Unpres	NP	
02	47490	Yes	No	Yes	VOA Vial - Unpres	NP	
03	47470	Yes	NA	Yes	1L Poly - Unpres	NP	
03	47473	Yes	NA	Yes	1L Poly - H2SO4	H2SO4	
03	47476	Yes	NA	Yes	250 mL Poly - H2SO4	H2SO4	
03	47479	Yes	NA	Yes	250 mL Poly - Unpres	NP	
03	47482	Yes	NA	Yes	250 mL Poly - Unpres	NP	
03	47485	Yes	No	Yes	VOA Vial - Unpres	NP	
03	47486	Yes	No	Yes	VOA Vial - Unpres	NP	

ESS Laboratory Sample and Cooler Receipt Checklist

Client: AECOM Environment - ENSR - KPB/MM

ESS Project ID: 1606729

03 47487 Yes No Yes VOA Vial - Unpres

Date Received: 6/28/2016

NP

2nd Review

Are barcode labels on correct containers?

Yes No

Completed			
By:	<u>[Signature]</u>	Date & Time:	<u>6/28/16 20:00</u>
Reviewed			
By:	<u>[Signature]</u>	Date & Time:	<u>6/28/16 20:25</u>
Delivered			
By:	<u>[Signature]</u>		<u>6/28/16 20:25</u>

ESS Laboratory

Division of Thielsch Engineering, Inc.

185 Frances Avenue, Cranston, RI 02910-2211

Tel. (401) 461-7181 Fax (401) 461-4486

www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time Standard Other

Regulatory State: MA RI CT NH NJ NY ME Other

Is this project for any of the following: (please circle)

MA-MCP Navy USACE CT DEP Other

Co. Name AECOM Project # CCC-Eastham

Contact Person Julianne Marston Address

City Chumford State MA Zip PO #

Tel. Fax email:

ESS Lab ID	Date	Collection Time	Grab-G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	Analysis	Ammonia	Nitrate, Nitrite, Nitrogen	Total Metals	Diss Metals	DOC	Total Phos, TKN	Nitrate	Total Nitrogen	Chloride
1	06/28/16	1340	G	GW	ESMNW-12S		8	250 mL	250 mL	X	X	X	X	X	X	X	X	X	X
2	06/28/16	1500	G	GW	ESMNW-11S		8			X	X	X	X	X	X	X	X	X	X
3	06/28/16	1550	G	GW	ESMNW-11E		8			X	X	X	X	X	X	X	X	X	X
	06/28/16		G	GW	ESMNW-2		2			X	X	X	X	X	X	X	X	X	X
	06/28/16		G	GW	ESMNW-2		2			X	X	X	X	X	X	X	X	X	X
	06/28/16		G	GW	ESMNW-2		2			X	X	X	X	X	X	X	X	X	X

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA Matrix: S-Soil SP-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present Yes No NA Internal Use Only Yes No NA Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Ascorbic Acid, 8-ZnAc, 9-

Seals Intact Yes No NA Sampled by: BWV

Cooler Temperature: 3.1 Ice on 9/04 Comments: 6-28-16 17:55 6-28-16 18:04 6-28-16 18:16 6-28-16 18:24 6-28-16 18:32 6-28-16 18:40 6-28-16 18:48 6-28-16 18:56 6-28-16 19:04 6-28-16 19:12 6-28-16 19:20 6-28-16 19:28 6-28-16 19:36 6-28-16 19:44 6-28-16 19:52 6-28-16 20:00 6-28-16 20:08 6-28-16 20:16 6-28-16 20:24 6-28-16 20:32 6-28-16 20:40 6-28-16 20:48 6-28-16 20:56 6-28-16 21:04 6-28-16 21:12 6-28-16 21:20 6-28-16 21:28 6-28-16 21:36 6-28-16 21:44 6-28-16 21:52 6-28-16 22:00 6-28-16 22:08 6-28-16 22:16 6-28-16 22:24 6-28-16 22:32 6-28-16 22:40 6-28-16 22:48 6-28-16 22:56 6-28-16 23:04 6-28-16 23:12 6-28-16 23:20 6-28-16 23:28 6-28-16 23:36 6-28-16 23:44 6-28-16 23:52 6-28-16 24:00

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ESS Laboratory

Division of Thielsch Engineering, Inc.

185 Frances Avenue, Cranston, RI 02910-2211

Tel. (401) 461-7181 Fax (401) 461-4486

www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time Standard Other

Regulatory State: MA RI CT NH NJ NY ME Other

Is this project for any of the following: (please circle)

MA-MCP Navy USACE CT DEP Other

Co. Name AECOM Project # CCC-Eastham

Contact Person Julianne Marion Address

City Chumford State MA Zip PO #

Tel. Fax email:

ESS Lab ID	Date	Collection Time	Grab-G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	Analysis
1	06/28/16	1340	G	GW	ESMNW-12S		8	250 mL	250 mL	X Nitrate, Nitrite, Nitrogen, Ammonia, Total Metals, Diss Metals, Total Phos, TKN, Nitrate
2	06/28/16	1500	G	GW	ESMNW-11S		8	250 mL	250 mL	X Nitrate, Nitrite, Nitrogen, Ammonia, Total Metals, Diss Metals, Total Phos, TKN, Nitrate
3	06/28/16	1550	G	GW	ESMNW-11E		8	250 mL	250 mL	X Nitrate, Nitrite, Nitrogen, Ammonia, Total Metals, Diss Metals, Total Phos, TKN, Nitrate
	06/28/16		G	GW	ESMNW-2		2	250 mL	250 mL	X Nitrate, Nitrite, Nitrogen, Ammonia, Total Metals, Diss Metals, Total Phos, TKN, Nitrate
	06/28/16		G	GW	ESMNW-2		2	250 mL	250 mL	X Nitrate, Nitrite, Nitrogen, Ammonia, Total Metals, Diss Metals, Total Phos, TKN, Nitrate
	06/28/16		G	GW	ESMNW-2		2	250 mL	250 mL	X Nitrate, Nitrite, Nitrogen, Ammonia, Total Metals, Diss Metals, Total Phos, TKN, Nitrate

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA Matrix: S-Soil SP-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present Yes No NA Internal Use Only Yes No NA Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Ascorbic Acid, 8-ZnAc, 9-

Seals Intact Yes No NA Sampled by: BWV

Cooler Temperature: 3.1 Ice on 9/04 Comments: X-3 DAY TAT

Relinquished by: (Signature, Date & Time) [Signature] 6-28-16 17:55 Relinquished by: (Signature, Date & Time) [Signature] 6-28-16 17:55

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22 Please fax to the laboratory all changes to Chain of Custody

1 (White) Lab Copy 2 (Yellow) Client Receipt

* By signing MA-MCP, client acknowledges samples were collected in accordance with MADEP CAM VIIA