RI HAB Monitoring
Revision: 3
Revision Date: February 2018
Page 1 of 32

Quality Assurance Project Plan (QAPP)

Rhode Island Freshwater Harmful Algal Bloom Monitoring
Rhode Island Department of Environmental Management (RIDEM)
Office of Water Resources

Approval List:

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Quality Assurance Project Plan Coordinator
USEPA Region 1- New England Regional Laboratory

Diane Switzer for Hilary Snook 3/1/2018

Hilary Snook
Technical Lead
USEPA Region 1- New England Regional Laboratory

Jen Brady 3/15/18

Jennifer Brady
EPA Project Officer
USEPA Region 1- New England

Contents

Introduction

The Rhode Island Department of Environmental Management (RIDEM) and the Rhode Island Department of Health (HEALTH) work cooperatively to detect the presence of cyanobacteria blooms, evaluate the potential risks to the public, and, when necessary, issue health advisories notifying the public of health concerns. The agencies jointly issue health/recreational advisories when any of the following three guidelines are met:

- Evidence of a visible cyanobacteria scum or mat or lake/pond-wide cyanobacteria bloom.
- Cyanobacteria cell count exceeding 70,000 cells/mL.
- Toxin (Microcystin-LR) level of lysed cells meeting or exceeding 4 ppb (µg/l).

Health advisories instruct individuals to avoid all contact with the affected waterbody, including recreational activities such as swimming, boating, or fishing. People are also advised to not eat fish from the affected waterbody or to allow pets to wade or swim in, or drink untreated water from the affected waters. Health advisories remain in effect for the remainder of what is considered to be the recreation season (until November 1st), unless follow-up sampling by a city, town, or third party indicate that the advisory can be lifted. Health advisories may be lifted after two successive and representative sampling rounds, two weeks apart, demonstrate no evidence of a cyanobacterial scum or mat and demonstrate cyanobacteria cell counts and toxin levels below threshold concentrations.

RIDEM's Office of Water Resources (OWR) receives reports annually about nuisance algal conditions and cyanobacteria blooms from municipal staff, lake and watershed associations, and the broader public. In the past seven (7) years, a total of 32 waterbodies have had recreational/health advisories issued with an average of ten (10) waterbodies per year. Twelve (12) of the 32 waterbodies are public drinking water supplies and nearly all the remaining waterbodies have a public boat/canoe launch or are heavily used for recreational activities.

Purpose and Description

The objective of this Quality Assurance Project Plan (QAPP) is to present the organization, objectives, and specific quality assurance/quality control (QA/QC) procedures associated with the harmful algal bloom monitoring and evaluation that RIDEM and HEALTH plan for 2017-2018. This includes waterbody evaluation, water sample collection, and sample analysis for various algal toxins as well as cyanobacteria ID and enumeration.

Organization Chart

Table 1: Personnel involved with 2017 HAB monitoring and evaluation.

Personnel	Affiliation & Contact Information	Project Responsibilities
Seasonal Intern	Seasonal Intern, TMDL (401)222-4700	Field Reconnaissance/Site Evaluation Water Quality Sampling
Brian Zalewsky	Supervising Environmental Planner, TMDL (401)222-4700 x 7145 brian.zalewsky@dem.ri.gov	Project Lead/ Consultation on HAB advisories
Jane Sawyers	Supervising Environmental Planner, Monitoring/ Nutrient Criteria (401)222-4700 x 7239 jane.sawyers@dem.ri.gov	Consultation on HAB Advisories
Elizabeth Scott	Deputy Chief of Water Quality & Standards, Office of Water Resources (401)222-4700 x 7300 elizabeth.scott@dem.ri.gov	Program Supervisor, Project QA Officer Consultation on HAB Advisories
Evan Philo	Principal Environmental Lab Scientist, RIDOH (401)222-5553 evan.philo@health.ri.gov	Lead-Laboratory/ Toxin Analysis
Sherry Poucher	RIDOH Environmental Health Dept. Environmental Scientist, RIDOH (401)222-7727 Sherry.Poucher@health.ri.gov	Health Advisories/ Consultation on HAB advisories/ Issuance of advisories
Nora Conlon	Quality Assurance Project Plan Coordinator USEPA Region 1- New England Regional Laboratory 617-918-8335 Conlon.nora@Epa.gov	Approval of QAPP

Project Lead

The Project Lead is responsible for the implementation of the study and its related QAPP. Consequently, the RIDEM Project Lead is responsible for:

- Developing a sufficient QAPP and distributed to all project personnel,
- Ensuring overall goal and requirements of the QAPP are met through effective planning and organizing,
- Establish adequate lines of communication,
- Ensuring Standard Operating Procedures (SOPs) that outline current practices are written, approved, and distributed to project personnel,
- Assure all data products are reviewed and approved according to accepted policies and guidelines before release.
- Provide field and sample collection training and equipment to seasonal personnel.

Program Supervisor

The Program Supervisor/Project QA Officer's responsibility include:

- Assure the project is properly organized and has adequate lines of communication
- Make certain program roles are clearly understood,
- Ensuring Standard Operating Procedures (SOPs) that outline current practices are written, approved, and distributed to project personnel,
- Complete program-level corrective actions on an as-needed basis,
- Review reports to ensure quality assurance (QA) goals are met.

Field Monitoring Staff

A seasonal intern will conduct field reconnaissance and be responsible for following field/sampling SOPs and project QAPPs. All collection and delivery of samples will be performed by intern as well. Responsibilities include:

- Ensuring the sampling schedule is maintained
- Completing the monitoring staff commitments for all surveys
- Ensuring adequate lines of communication
- Follow all quality assurance/quality control (QA/QC) requirements
- Managing the bi-weekly field sampling activities to ensure field procedures and activities conform to the requirements of the applicable SOPs
- Resolving day-to-day problems in the implementation of the monitoring study
- Audit records and field data for accuracy, validity, and completeness
- Communicating problems to Project Lead.
- Organization/filing of results electronically
- Developing and maintaining database of results

Monitoring for 2017 and 2018

Thirty-two (32) waterbodies will be evaluated for the presence of cyanobacteria blooms on a bi-weekly basis from late June through October. Table 2 lists the waterbodies that will be evaluated during this time and the general location where initial access is gained. All 32 waterbodies have an established history of cyanobacteria blooms, as evidenced by: elevated levels of cyano-toxins, cyanobacterial cell counts greater than 70,000 cells/mL, and/or visible evidence of waterbody-wide cyanobacteria bloom. Many of these waterbodies have had health/ recreational advisories issued for these reasons in the past 6 years. Some waterbodies are also documented as having elevated levels of chlorophyll-a and/or total phosphorous. Maps of waterbodies with planned access points are included in Appendix B.

The evaluation consists of a site visit and visual examination of as much of the waterbody as possible from the shoreline of public access areas and/or private property, when permission is granted. Photographs are taken at various locations at each site regardless of the presence or absence of a bloom in order to keep continuous visual records of RIDEM visits. If a cyanobacteria bloom is evident (scum, dense mat, extensive clumps, spilled paint or pea soup appearance, streaking, etc.), a sample is collected following QA/QC methods and submitted to the State Health Laboratory for cyanotoxin analysis and enumeration/ID. Field sheets are completed at each site as well which record various weather conditions, recreational activities, where the bloom is present on the waterbody if at all, and if a sample was collected.

In Rhode Island, a recreational advisory is issued if a visible scum/mat exists waterbody-wide, microcystin levels exceed 4 ppb, or total cyanobacteria cell count exceeds 70,000 cells/mL. In mid-July, the State Health Laboratory added the capability to conduct enumeration/ID of bloom samples submitted. All waterbodies in Table 2 will be visually evaluated bi-weekly, regardless of whether a cyanobacteria bloom is present. If a waterbody with an existing advisory exhibits no evidence of a bloom it is re-sampled for

toxin analysis and cyanobacteria enumeration/ ID on a bi-weekly basis. An advisory is rescinded if two successive toxin results (2 weeks apart) show levels below the 4 ppb EPA advisory level and there is no evidence of a bloom present.

Study/Monitoring Objectives

This monitoring plan is meant to be applicable for the years 2017-2018 and is designed to address the following objectives:

- Routinely evaluate the occurrence and extent of harmful algal blooms (HAB's) in 32 waterbodies with a known history of toxin production and/or exceedances of cyanobacteria cell count advisory threshold.
- Evaluate toxin concentrations during and after active HABs throughout the sampling season (bi-weekly from June-October). Toxins include total microcystins, anatoxin, nodularin, and cylindrospermopsin.
- Compare toxin concentrations with visual observations of blooms
- Provide adequate information for both issuance and rescindment of health advisories.
- Respond to and evaluate reports of cyanobacteria blooms from the public and other agencies about any waterbodies not included in Table 2.

Table 2. List of Waterbodies Evaluated for Cyanobacteria Blooms.

Name	Town	Waterbody ID	Primary Access
Almy Pond	Newport	RI0010047L-01	Put in off Coggeshell Ave on South side
Blackamore Pond	Cranston	RI0006018L-06	Put in off Waterman Ave
Cunliff Lake-Roger Williams Park (RWP)	Providence	RI0006017L-05	Put in at Trailhead parking area
Deep Spring Lake -RWP	Providence	RI0006017L-05	Put in across from Cunliff parking lot
Easton Pond- North	Newport	RI0007035L-03	Put in on access road off Bliss Mine Rd
Easton Pond- South	Newport	RI0007035L-04	Put in on access road off Bliss Mine Rd.
Edgewood Lake	Providence	RI0006017L-05	Put in off Edgewood Blvd
Elm Lake- RWP	Providence	RI0006017L-05	Put in South side of FC Greene Memorial Blvd
Gardiner Pond	Middletown	RI0007035L-01	Put in off Hanging Rock Rd.
Japanese Gardens- RWP	Providence	RI0006017L-05	Put in near Carousel
J.L. Curran Reservoir	Cranston	RI0006016L-02	Put in at access area off Seven Mile Rd
Lawton Valley Reservoir	Portsmouth	RI0007035L-06	Put in at access road off Flanagan Rd
Mashapaug Pond	Providence	RI0006017L-06	Put in at cement ramp near baseball field at end of Access Rd or Providence Boating Center
Melville Ponds	Portsmouth	RI0007029R-04	Put in near elementary school at fishing dock
Nonquit Pond	Tiverton	RI0007035L -08	Put in off Neck Rd
Omega Pond	East Providence	RI0004009L-03	Put in off Rodger Williams Ave near Railroad crossing
Paradise Pond	Middletown	RI0007035L-02	Put in at 600 Paradise Ave
Pleasure Lake- RWP	Providence	RI0006017L-05	Put in off Natural History Ave
Polo Lake-RWP	Providence	RI0006017L-05	Put in near zip line exit
Roosevelt Lake-RWP	Providence	RI0006017L-05	Put in off Fredrick C Green Memorial Blvd
Scott Pond	Lincoln	RI0001003L-01	Put in at fishing area off Rte. 122
Sisson Pond	Portsmouth	RI0007035L-10	Put in at access road off Union St.
Slack Reservoir	Smithfield-Johnston	RI0002007L-03	Put in at public beach off Green Lake Drive
Slater Memorial Park Pond	Pawtucket	RI0004009R-01A	Put in near paddleboat rentals
Spectacle Pond	Cranston	RI0006017L-07	Put in at baseball field (Carlton St) or Providence Jewelry Museum (light craft/dirt access)
St. Mary's Pond	Portsmouth	RI0007035L-05	Put in at access road off Union St.
Stafford Pond	Tiverton	RI0007037L-01	Put in at DEM Boat Ramp or Pelletier Ln
Ten Mile River	East Providence	RI0004009R-01B	Put in on North Broadway
Turner Reservoir	Rumford	RI0004009L-01B	Put in at access road off Newman Ave
Warwick Pond	Warwick	RI0007024L-02	Put in at cement ramp off at end of Wells Ave
Watson Reservoir	Little Compton	RI0007035L-07	Put in on access road off Old Main Rd
Willow Lake- RWP	Providence	RI0006017L-05	Put in near bridge or paddle boat rentals

Field Sampling Methods

Protocols

Photographs

During field reconnaissance, photos are taken at various locations at each site regardless of the presence of a bloom. They provide documentation of conditions of the waterbody at that time. Photographs serve the purpose of capturing the range of conditions present such as conditions near shore, percent coverage of bloom, and other general observations. Pictures are taken from generally the same area if a waterbody is sampled more than once. Once in the office the photos are downloaded to a designated network drive and folder for storage.

Field Sheets

The cyanobacteria bloom field data/observation sheet (Appendix A) will be filled out completely- taking careful note of weather conditions, area on lake where bloom is occurring and the characteristics of the bloom. Forms are completed for each site regardless of bloom presence. Once in the office field sheets are scanned and uploaded to a designated network drive for storage and future reference while hard copies are filed in the Office of Water Resources at DEM.

Water Samples

All public access areas along waterbody such as boat ramps, fishing access, and beach areas will be monitored and sampled if necessary. Water samples are analyzed for various algal toxins and enumeration/ID is conducted to determine genera of cyanobacteria forming bloom, and qualitative estimates of colony density, as detailed below. Cyanotoxin samples will be collected in 50mL amber glass vials obtained from the State Health Laboratory with the use of a sampling stick. Samples are taken from the densest portion of the bloom while making sure to not uptake floating debris. Vials are inverted on the surface of the water and up righted in order to collect sample. Samples are then labeled (with Date, Time, Location, and Office Division) and kept in a cooler on ice for transport to the State Health Laboratory with a completed Chain of Custody form (Appendix A).

Analytical Sampling/Methods

Analytical Laboratory and Analytes Measured

The Rhode Island State Health Laboratory, located in Providence, analyzes samples for algal toxins. In addition to total microcystins, the lab also analyzes samples for the following additional algal toxins: nodularin, anatoxin, and cylindrospermopsin. The State Health Laboratory also conducts enumeration/ID to evaluate the genera of cyanobacteria forming bloom. Appendix C displays the table of contents page of the toxin analysis SOP as well as the first page of the cyanobacteria enumeration and identification SOP. The analytical SOP for toxin analysis and enumeration/ID SOP are available as separate documents and are attached to the submission of this QAPP to EPA for review.

Cyanotoxin samples are run using a Direct Aqueous Injection UPLC/MS/MS analysis of the following toxins: Total Microcystins, Microcystin-YR, Microcystins-RR and LR (Desmethylated), Microcystin-WR, Microcystin-RR, Microcystin-LY, Microcystin-LW, Microcystin-LR, Microcystin-LF, Cylindrospermopsin, Anatoxin, Nodularin, and Microcystin-LA. RIDOH screens for the following genera in ID and enumeration of samples: *Anabaena, Aphanizomenon, Chlorella, Cylindrospermopis, Microcystis, Nodularia, Plantothrix, and Woronochina.* Table 3 provides analytical methods and reporting limits for all algal toxins.

Table 3: Analytical methods and reporting limits for algal toxin analysis.

Parameter	Analytical Method	Reporting Level (µg/L)	Holding Times (Days)
Total Microcystin	Direct Aqueous Injection UPLC/MS/MS	4 µg/L	28
Microcystin-YR	Direct Aqueous Injection UPLC/MS/MS	4 µg/L	28
Microcystin-RR (desmethylated)	Direct Aqueous Injection UPLC/MS/MS	4 µg/L	28
Microcystin-LR (desmethylated)	Direct Aqueous Injection UPLC/MS/MS	4 µg/L	28
Microcystin-WR	Direct Aqueous Injection UPLC/MS/MS	4 µg/L	28
Microcystin-RR	Direct Aqueous Injection UPLC/MS/MS	4 µg/L	28
Microcystin-LY	Direct Aqueous Injection UPLC/MS/MS	4 µg/L	28
Microcystin-LW	Direct Aqueous Injection UPLC/MS/MS	4 µg/L	28
Microcystin-LR	Direct Aqueous Injection UPLC/MS/MS	4 µg/L	28
Microcystin-LF	Direct Aqueous Injection UPLC/MS/MS	4 µg/L	28
Cylindrospermopsin	Direct Aqueous Injection UPLC/MS/MS	8 µg/L	28
Anatoxin	Direct Aqueous Injection UPLC/MS/MS	3 µg/L	28
Nodularin	Direct Aqueous Injection UPLC/MS/MS	0.005 µg/L	28
Microcystin-LA	Direct Aqueous Injection UPLC/MS/MS	4 µg/L	28

Quality Control and Quality Assurance

Field Work

Water samples are collected using the same SOPs in the 2011 QAPP: Rhode Island Department of Environmental Management Cyanobacteria Monitoring Program prepared by ESS Group Inc. No field equipment (such as secchi depth, temperature, dissolved oxygen, specific conductance) are used so corresponding SOPs from the 2011 QAPP are not applicable. Changes to monitoring frequency and number of waterbodies monitored are the notable changes to the QAPP. Number of waterbodies has increased to 29 across the state, mostly in urban areas with boating or fishing access and monitoring of sites has increased in frequency from once a month to a bi-weekly basis.

The project is considered complete and representative of the waterbodies when all waterbodies have been visited according to the established schedule, as safety and weather allows, and the recreational season is complete (typically November 1). To address accuracy and bias in field procedures, standardized, repeatable sample collection methods and chemical analysis procedures will be used for each sample. Given that this project is a rapid response/early warning protocol, evaluation of precision by collection of duplicates or blanks is not appropriate.

Toxin Analysis

Samples are submitted to the State Health Laboratory for toxin analysis and quantitative ID/colony count. The lab analyzes the following toxins: total microcystins, anatoxin, cylindrospermopsin, and nodularin. Analysis is conducted according to the Direct Aqueous Injection UPLC/MS/MS SOP (see Appendix C). The State Health Laboratory maintains an SOP for the toxin analysis and follows all QC/QA procedures for the laboratory procedures within the SOP, including criteria to qualify analytical results. Results from the toxin analysis will be compared to EPA-recommended benchmarks for recreational guidance and to previous years' results.

Other

Corrective Action

Monitoring staff will maintain close communication with the Project Lead. Changes to the sampling schedule, or any other aspects of the study, will only be made in accordance with the Project Lead. All field and laboratory personnel are responsible for notifying the Project Lead of circumstances that may necessitate any changes. Work plan amendments will reflect any changes to the project.

Chain of Custody

Proper handling of samples and procedures protect the integrity of samples from the initial sampling time, through transport, sample receipt, preparation, and analysis. All chain of custody procedures will be followed for the Rhode Island Department of Health (RIDOH) and Department of Environmental Management (RIDEM).

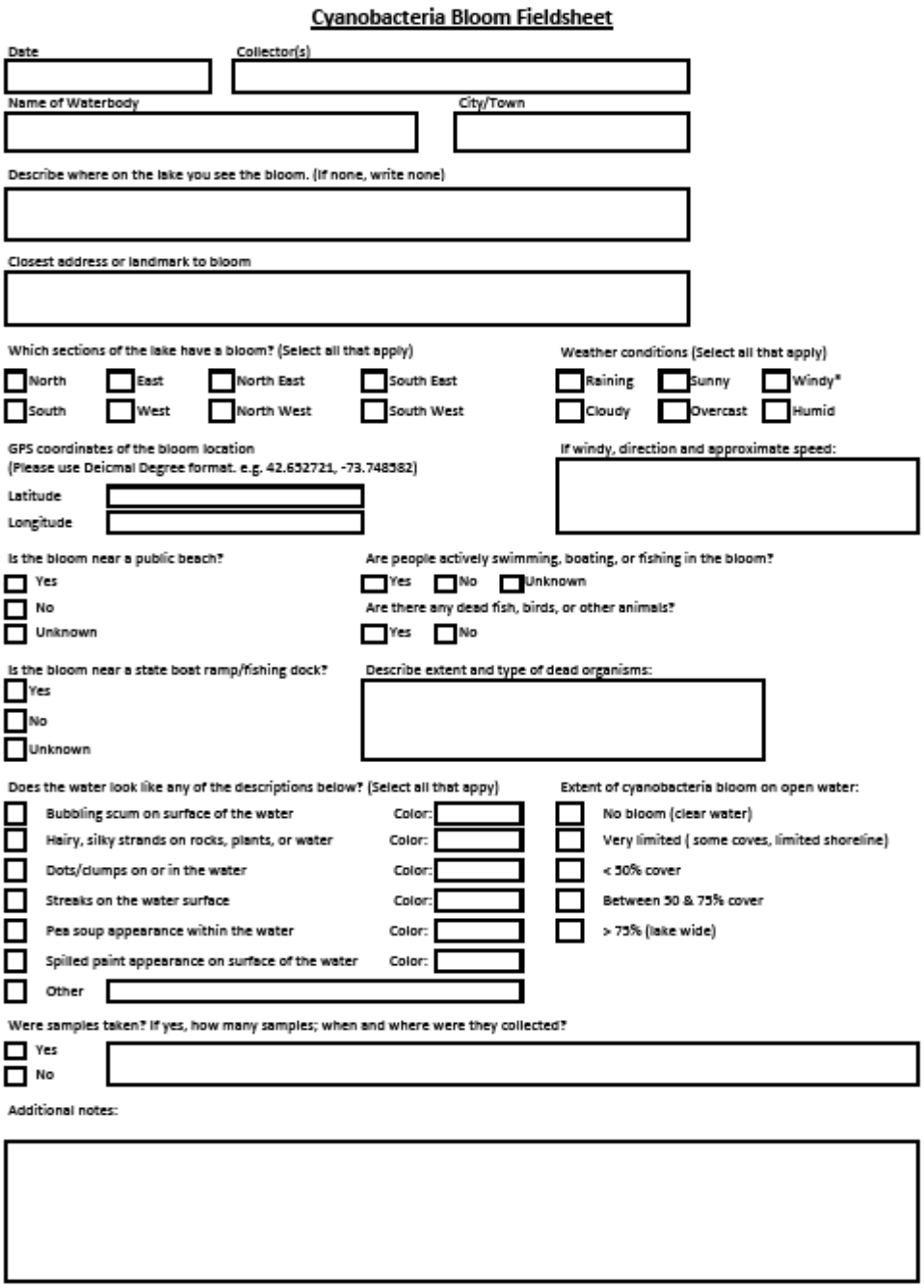
Data Management

All field sheets and Chain of Custody (COC) Forms will be maintained in the respective hard copy folders. Scanned copies of field sheets and Certificates of Analysis are saved electronically. An excel file records all results for toxin analysis and identification/enumeration.

Final Report

A report will be prepared by the Seasonal Intern to summarize field and analytical results from the sampling year.

Appendix A
Harmful Algal Bloom Field Data Sheet and Chain of Custody Form



Cyanobacteria Bloom Fieldsheet

Date | Collector(s)

Name of Waterbody | City/Town

Describe where on the lake you see the bloom. (If none, write none)

Closest address or landmark to bloom

Which sections of the lake have a bloom? (Select all that apply)
☐ North ☐ East ☐ North East ☐ South East
☐ South ☐ West ☐ North West ☐ South West

Weather conditions (Select all that apply)
☐ Raining ☐ Sunny ☐ Windy*
☐ Cloudy ☐ Overcast ☐ Humid

GPS coordinates of the bloom location
(Please use Deicmal Degree format. e.g. 42.652721, -73.748382)
Latitude
Longitude

If windy, direction and approximate speed:

Is the bloom near a public beach?
☐ Yes
☐ No
☐ Unknown

Are people actively swimming, boating, or fishing in the bloom?
☐ Yes ☐ No ☐ Unknown

Are there any dead fish, birds, or other animals?
☐ Yes ☐ No

Is the bloom near a state boat ramp/fishing dock?
☐ Yes
☐ No
☐ Unknown

Describe extent and type of dead organisms:

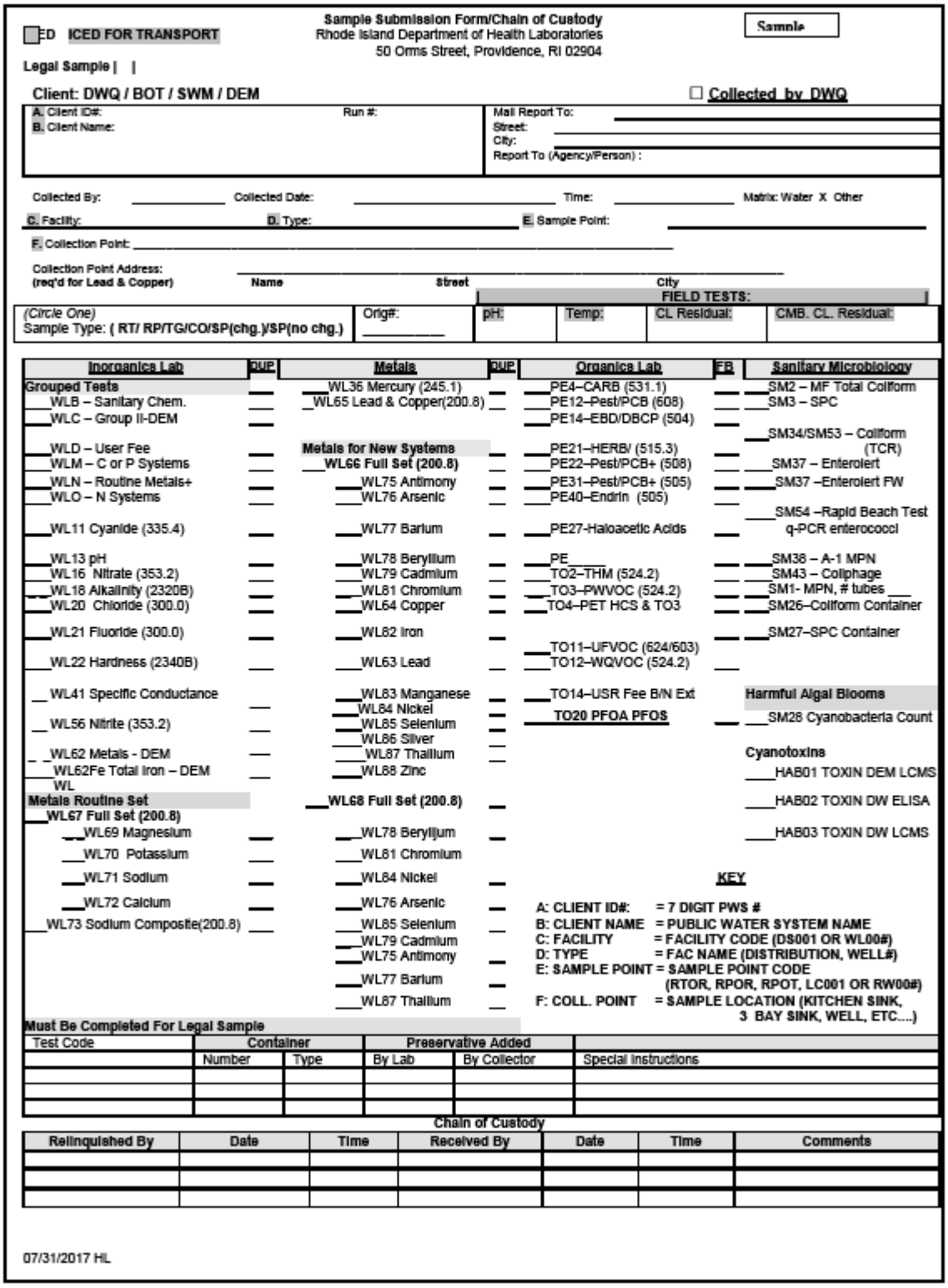
Does the water look like any of the descriptions below? (Select all that appy)
☐ Bubbling scum on surface of the water Color:
☐ Hairy, silky strands on rocks, plants, or water Color:
☐ Dots/clumps on or in the water Color:
☐ Streaks on the water surface Color:
☐ Pea soup appearance within the water Color:
☐ Spilled paint appearance on surface of the water Color:
☐ Other

Extent of cyanobacteria bloom on open water:
☐ No bloom (clear water)
☐ Very limited (some coves, limited shoreline)
☐ < 50% cover
☐ Between 50 & 75% cover
☐ > 75% (lake wide)

Were samples taken? If yes, how many samples; when and where were they collected?
☐ Yes
☐ No

Additional notes:

Figure 1: Field sheets used for field reconnaissance



☐ED ICED FOR TRANSPORT

Sample Submission Form/Chain of Custody
Rhode Island Department of Health Laboratories
50 Orms Street, Providence, RI 02904

Sample

Legal Sample | |

Client: DWQ / BOT / SWM / DEM ☐ Collected by DWQ

A. Client ID#: Run #:
B. Client Name:

Mail Report To:
Street:
City:
Report To (Agency/Person) :

Collected By: Collected Date: Time: Matrix: Water X Other

C. Facility: D. Type: E. Sample Point:

F. Collection Point:

Collection Point Address: (req'd for Lead & Copper) Name Street City

FIELD TESTS:

(Circle One) Sample Type: (RT/ RP/TG/CO/SP(chg.)/SP(no chg.)	Orig#:	pH:	Temp:	CL Residual:	CMB. CL. Residual:

Inorganics Lab	DUP	Metals	DUP	Organics Lab	FB	Sanitary Microbiology
Grouped Tests		___WL36 Mercury (245.1)		___PE4–CARB (531.1)		___SM2 – MF Total Coliform
___WLB – Sanitary Chem.		_WL65 Lead & Copper(200.8)		___PE12–Pest/PCB (608)		___SM3 – SPC
___WLC – Group II-DEM				___PE14–EBD/DBCP (504)		
						___SM34/SM53 – Coliform (TCR)
___WLD – User Fee		**Metals for New Systems**		___PE21–HERB/ (515.3)		
___WLM – C or P Systems		___**WL66 Full Set (200.8)**		___PE22–Pest/PCB+ (508)		___SM37 – Enterolert
___WLN – Routine Metals+		___WL75 Antimony		___PE31–Pest/PCB+ (505)		___SM37 –Enterolert FW
___WLO – N Systems		___WL76 Arsenic		___PE40–Endrin (505)		
						___SM54 –Rapid Beach Test q-PCR enterococci
___WL11 Cyanide (335.4)		___WL77 Barium		___PE27-Haloacetic Acids		
___WL13 pH		___WL78 Beryllium		___PE____		___SM38 – A-1 MPN
___WL16 Nitrate (353.2)		___WL79 Cadmium		___TO2–THM (524.2)		___SM43 – Coliphage
___WL18 Alkalinity (2320B)		___WL81 Chromium		___TO3–PWVOC (524.2)		___SM1- MPN, # tubes ___
___WL20 Chloride (300.0)		___WL64 Copper		___TO4–PET HCS & TO3		___SM26–Coliform Container
___WL21 Fluoride (300.0)		___WL82 Iron				___SM27–SPC Container
				___TO11–UFVOC (624/603)		
___WL22 Hardness (2340B)		___WL63 Lead		___TO12–WQVOC (524.2)		
___WL41 Specific Conductance		___WL83 Manganese		___TO14–USR Fee B/N Ext		**Harmful Algal Blooms**
		___WL84 Nickel		**TO20 PFOA PFOS**		
___WL56 Nitrite (353.2)		___WL85 Selenium				___SM28 Cyanobacteria Count
		___WL86 Silver				
___WL62 Metals - DEM		___WL87 Thallium				**Cyanotoxins**
___WL62Fe Total Iron – DEM WL		___WL88 Zinc				___HAB01 TOXIN DEM LCMS
Metals Routine Set		___**WL68 Full Set (200.8)**				___HAB02 TOXIN DW ELISA
___**WL67 Full Set (200.8)**						
___WL69 Magnesium		___WL78 Beryllium				___HAB03 TOXIN DW LCMS
___WL70 Potassium		___WL81 Chromium				
___WL71 Sodium		___WL84 Nickel				**KEY**
___WL72 Calcium		___WL76 Arsenic				
___WL73 Sodium Composite(200.8)		___WL85 Selenium				A: CLIENT ID#: = 7 DIGIT PWS #
		___WL79 Cadmium				B: CLIENT NAME = PUBLIC WATER SYSTEM NAME
		___WL75 Antimony				C: FACILITY = FACILITY CODE (DS001 OR WL00#)
		___WL77 Barium				D: TYPE = FAC NAME (DISTRIBUTION, WELL#)
		___WL87 Thallium				E: SAMPLE POINT = SAMPLE POINT CODE (RTOR, RPOR, RPOT, LC001 OR RW00#)
						F: COLL. POINT = SAMPLE LOCATION (KITCHEN SINK, 3 BAY SINK, WELL, ETC....)

Must Be Completed For Legal Sample

Test Code	Container		Preservative Added		
	Number	Type	By Lab	By Collector	Special Instructions

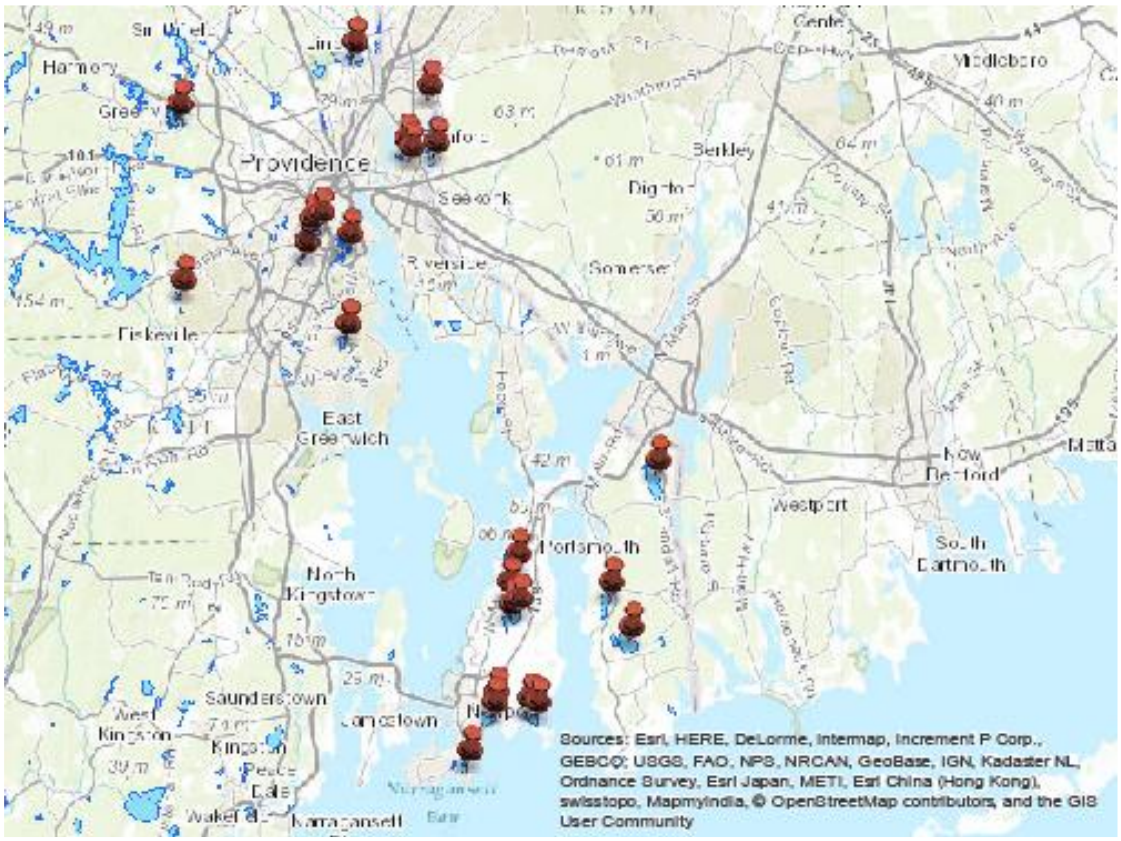
Chain of Custody

Relinquished By	Date	Time	Received By	Date	Time	Comments

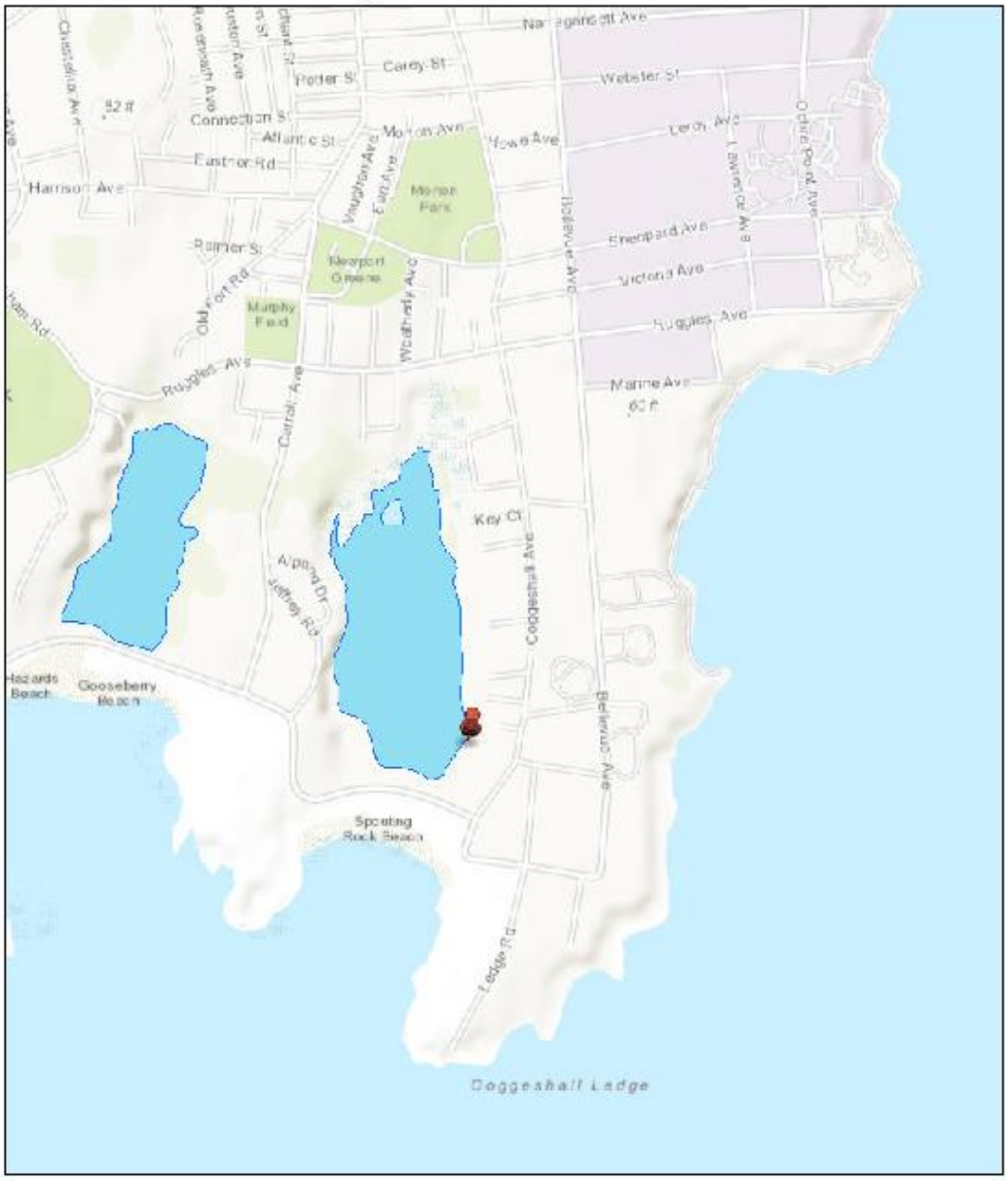
07/31/2017 HL

Figure 2: Chain of Custody Form for toxin analysis and algal ID/enumeration.

Appendix B
Maps of Sampling Sites



Almy Pond RI0010047L-01



August 18, 2017

Lakes

1:18,056

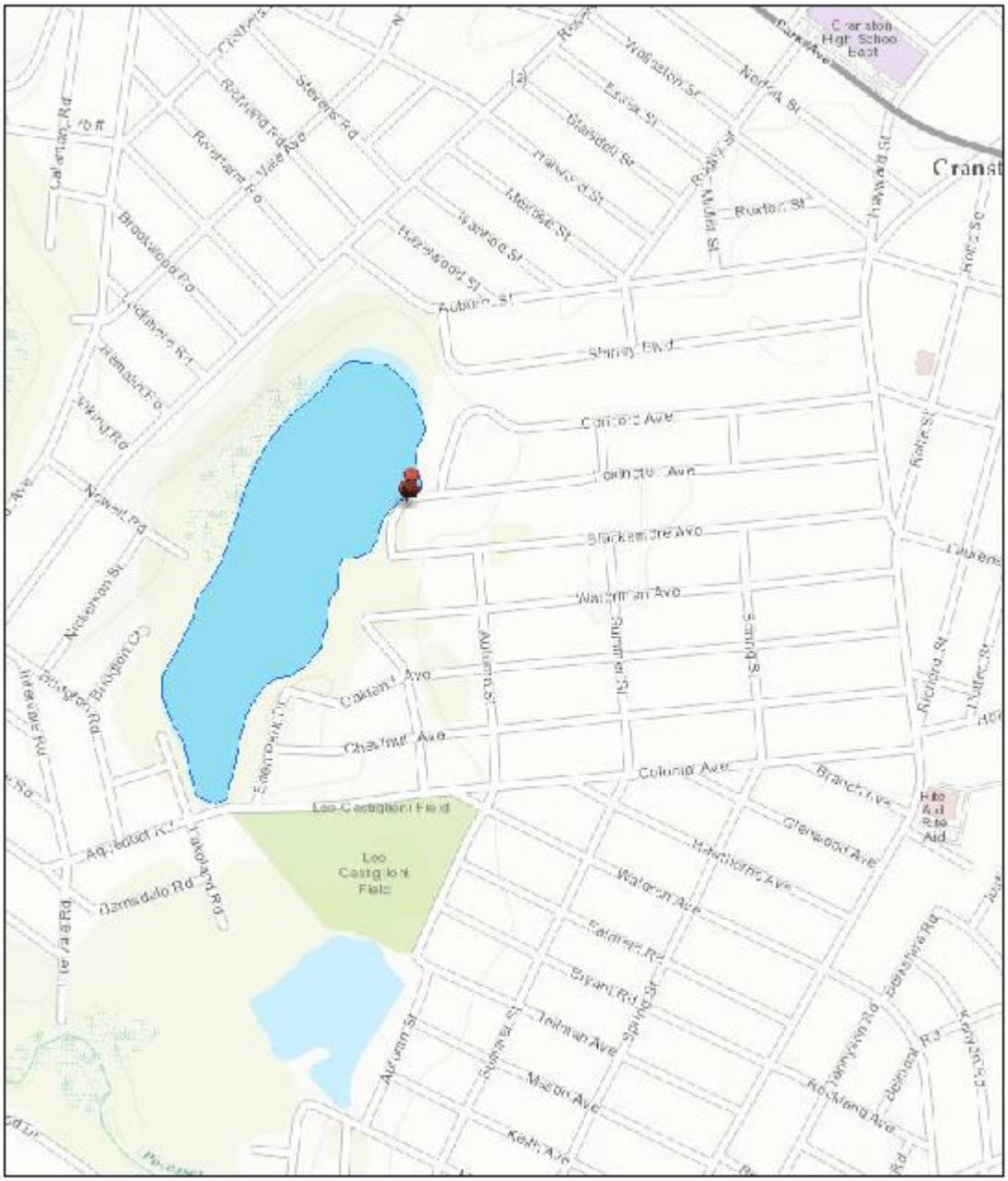
0 0.15 0.3 0.6 mi

0 0.175 0.35 0.7 km

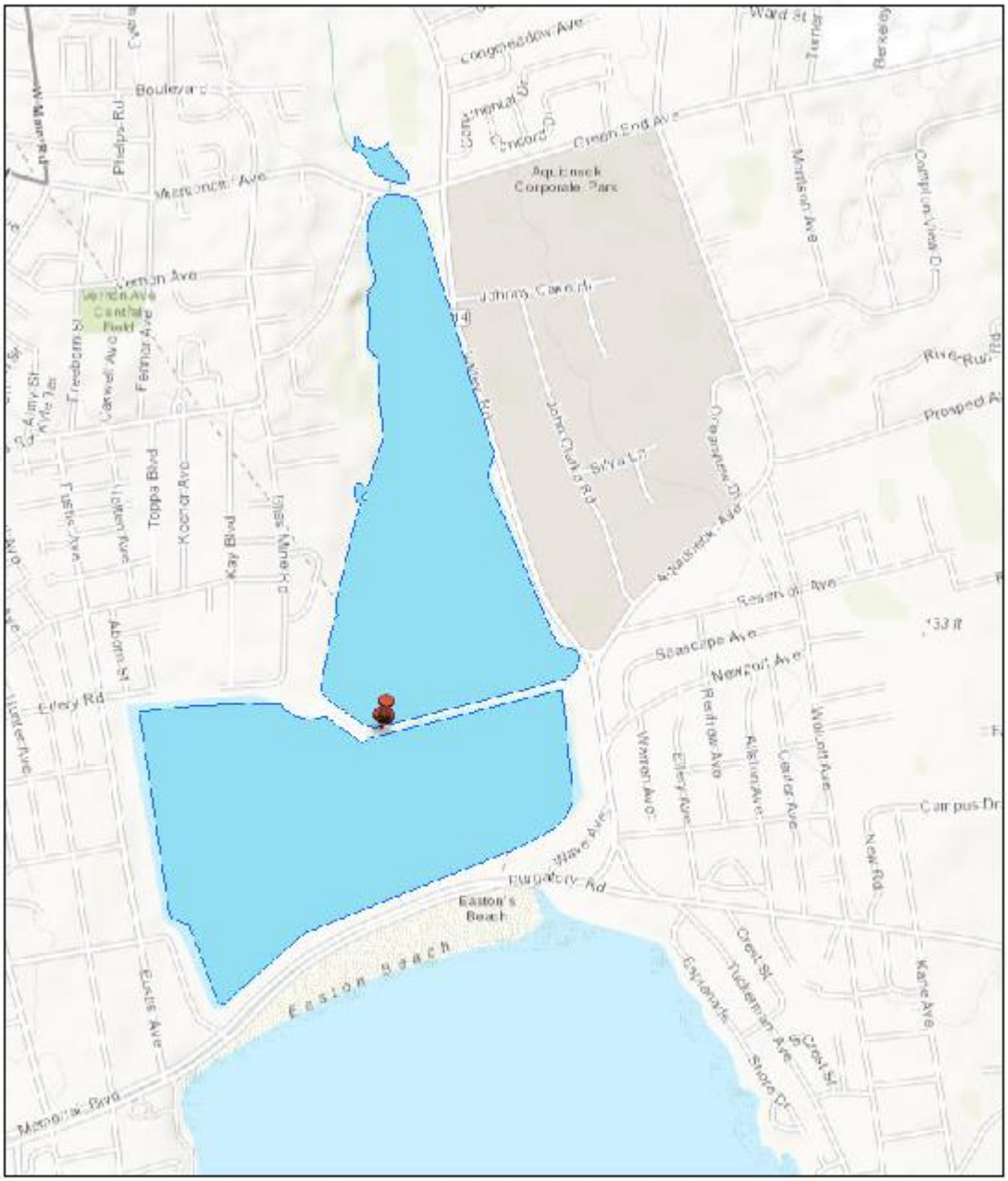
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

, University of Rhode Island Environmental Data Center (URIEDC), Rhode Island Department of Environmental Management (RIDEM) | RIEMA | RIGIS, University of Rhode Island Environmental Data Center | Esri, HERE |

Blackamore Pond RI0006018L-06



North and South Easton's Pond RI0007035L-03;-04



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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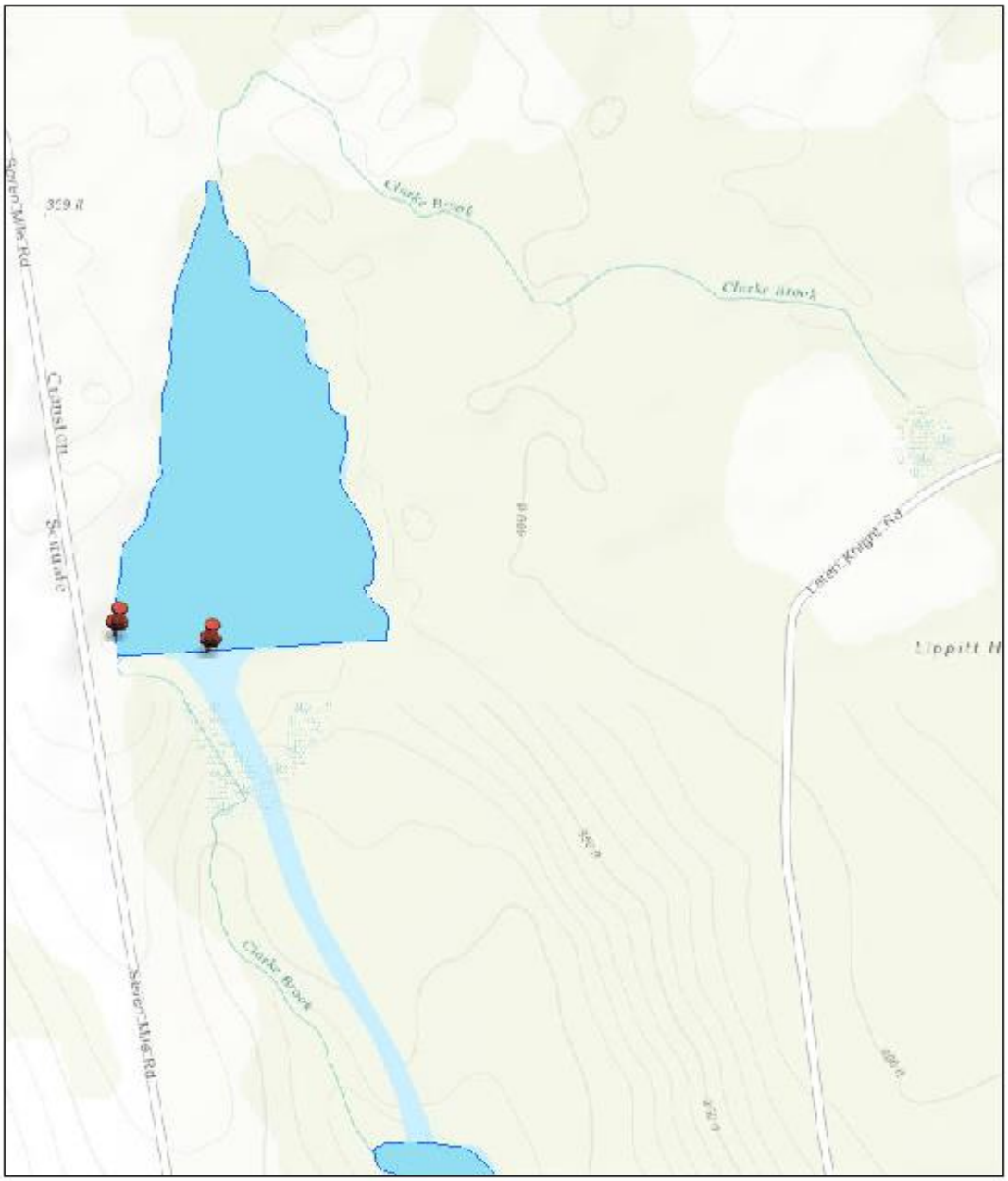
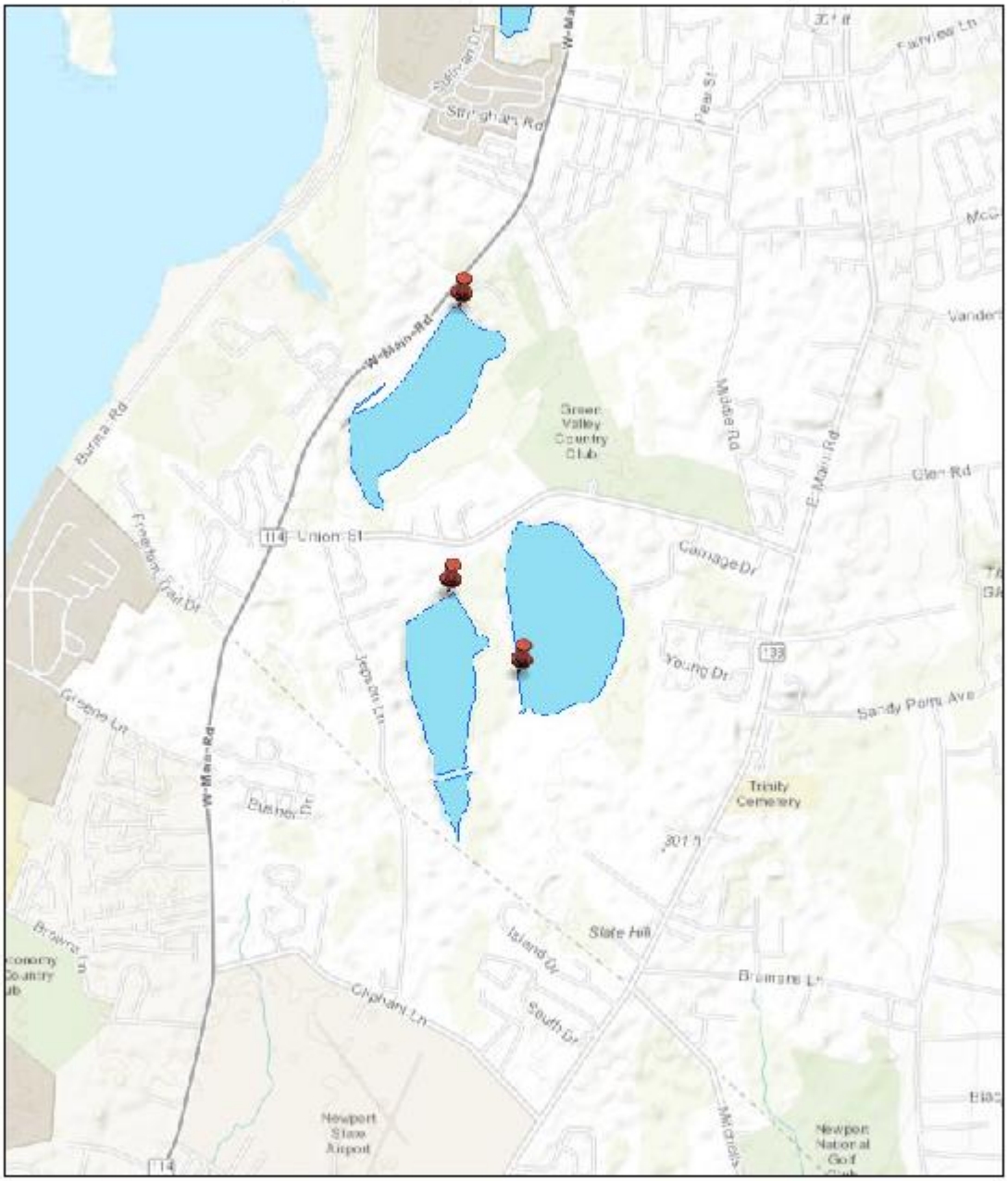
J.L. Curran Reservoir RI0006016L-02



Lawton Valley Reservoir, Sisson and Saint Mary's Pond



August 18, 2017

Lakes

1:36,112

0 0.3 0.6 1.2 mi

0 0.35 0.7 1.4 km

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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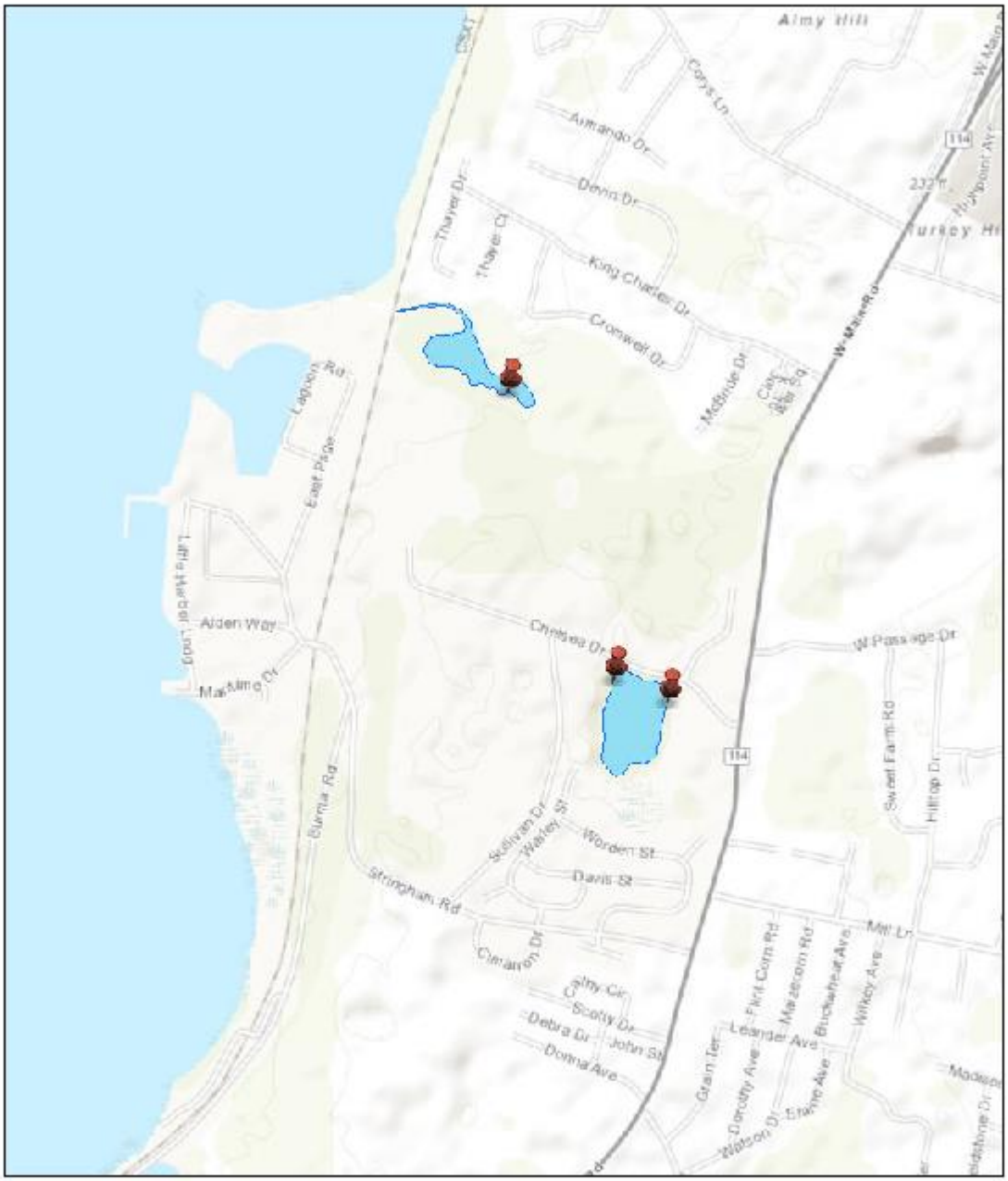
Melville Ponds RI0007029L-01



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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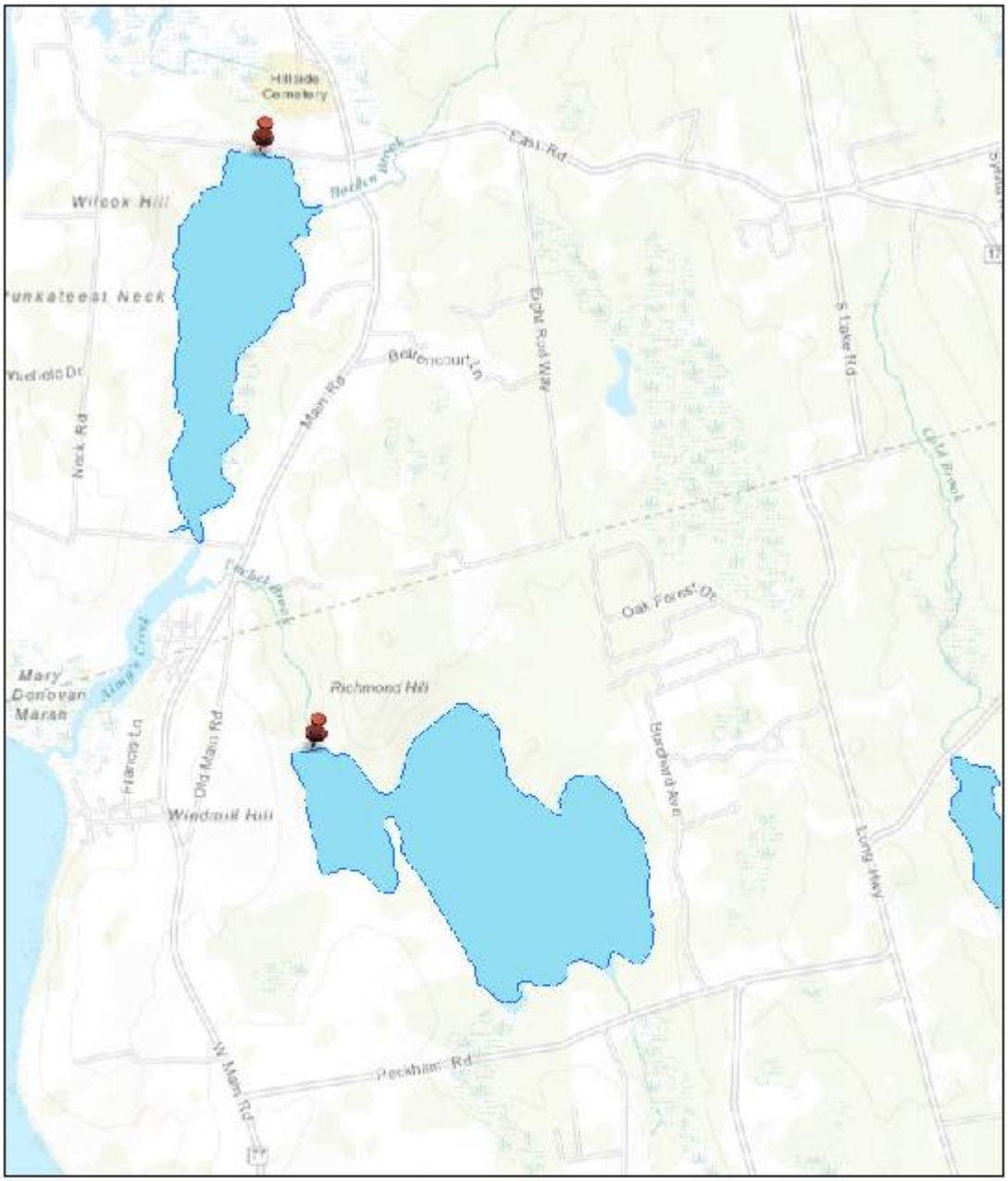
Nonquit Pond and Watson Reservoir RI0007035L-08;-07



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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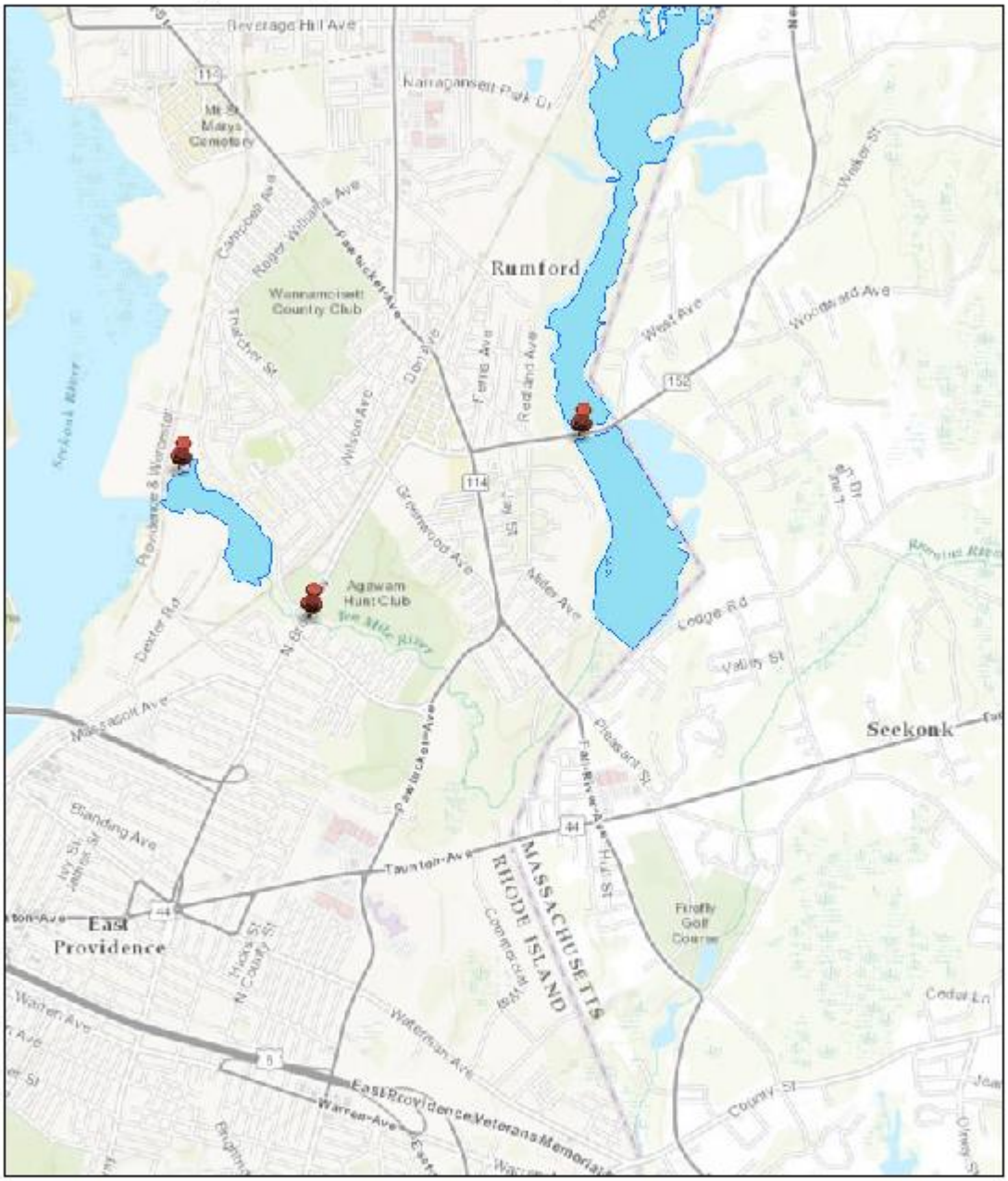
Omega Pond, Ten Mile River, and Turner Reservoir



August 18, 2017

Lakes

1:36,112

0 0.3 0.6 1.2 mi

0 0.35 0.7 1.4 km

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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Paradise and Gardiner Pond RI0007035L-02; -01

August 18, 2017

Lakes

1:18,056

0 0.15 0.3 0.6 mi

0 0.175 0.35 0.7 km

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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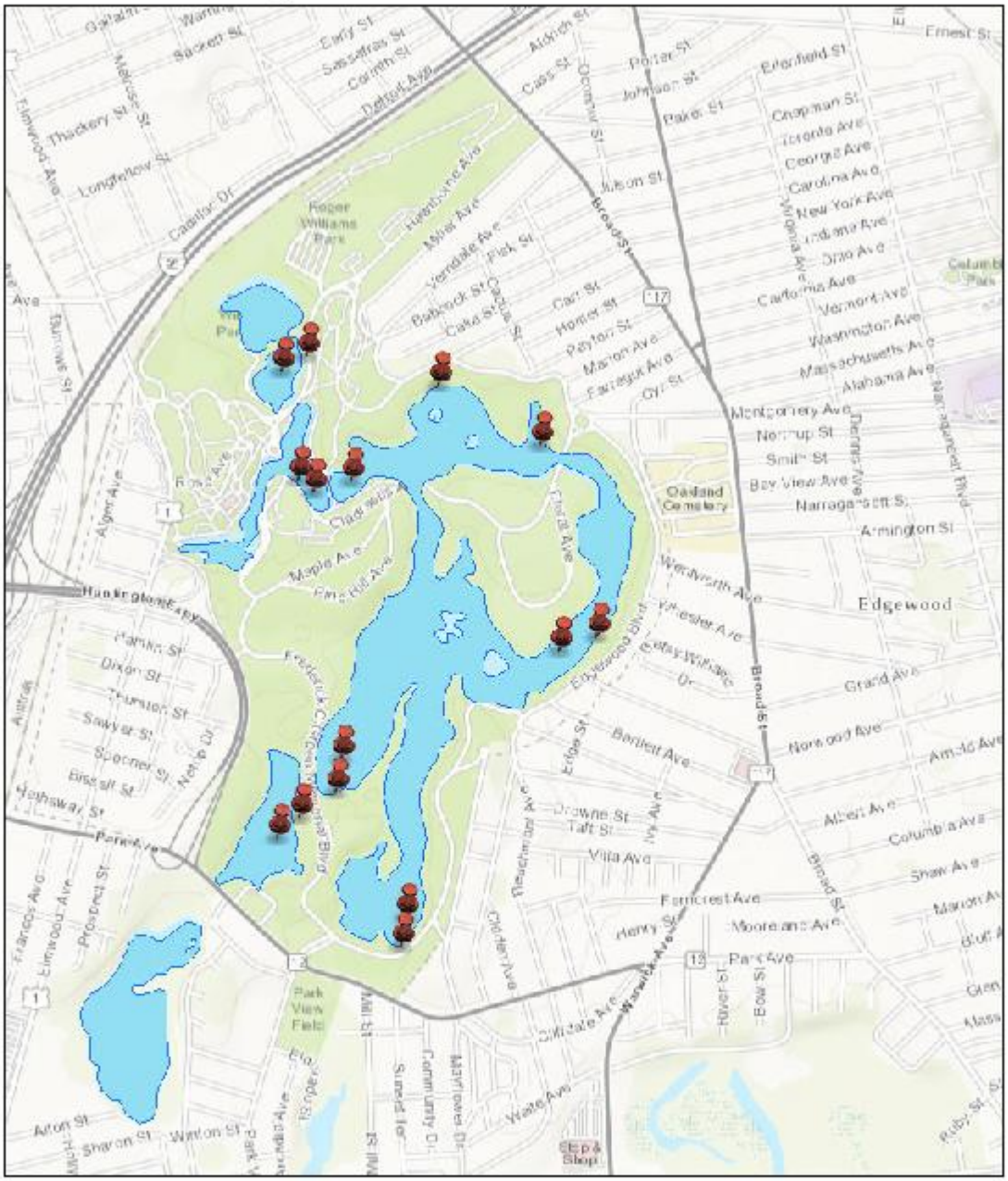
Roger Williams Park RI0006017L-05



August 18, 2017

Lakes

1:18,056

0 0.15 0.3 0.6 mi

0 0.175 0.35 0.7 km

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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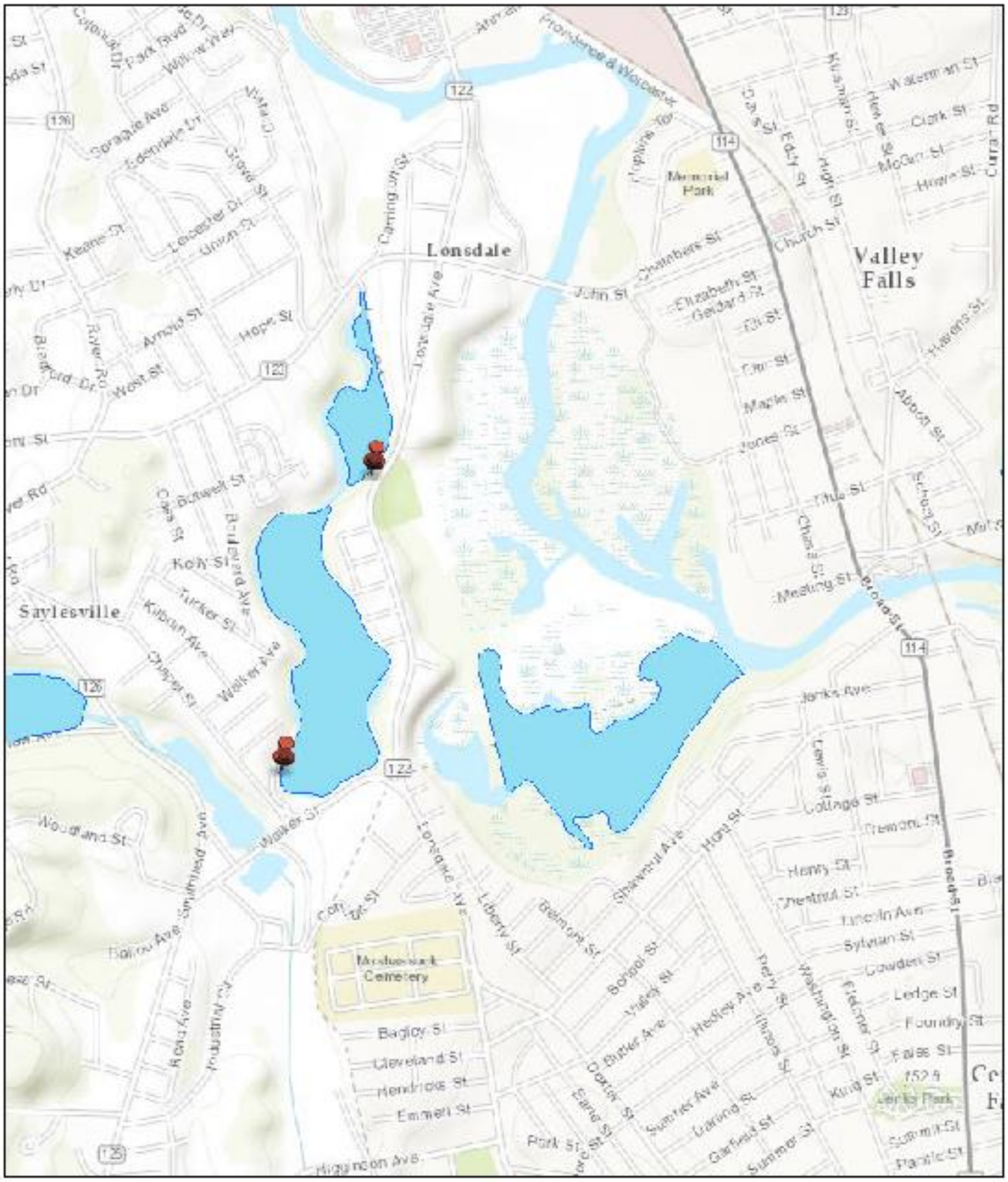
Scott Pond RI0001003L-01



August 18, 2017

Lakes

1:18,056

0 0.15 0.3 0.6 mi

0 0.175 0.35 0.7 km

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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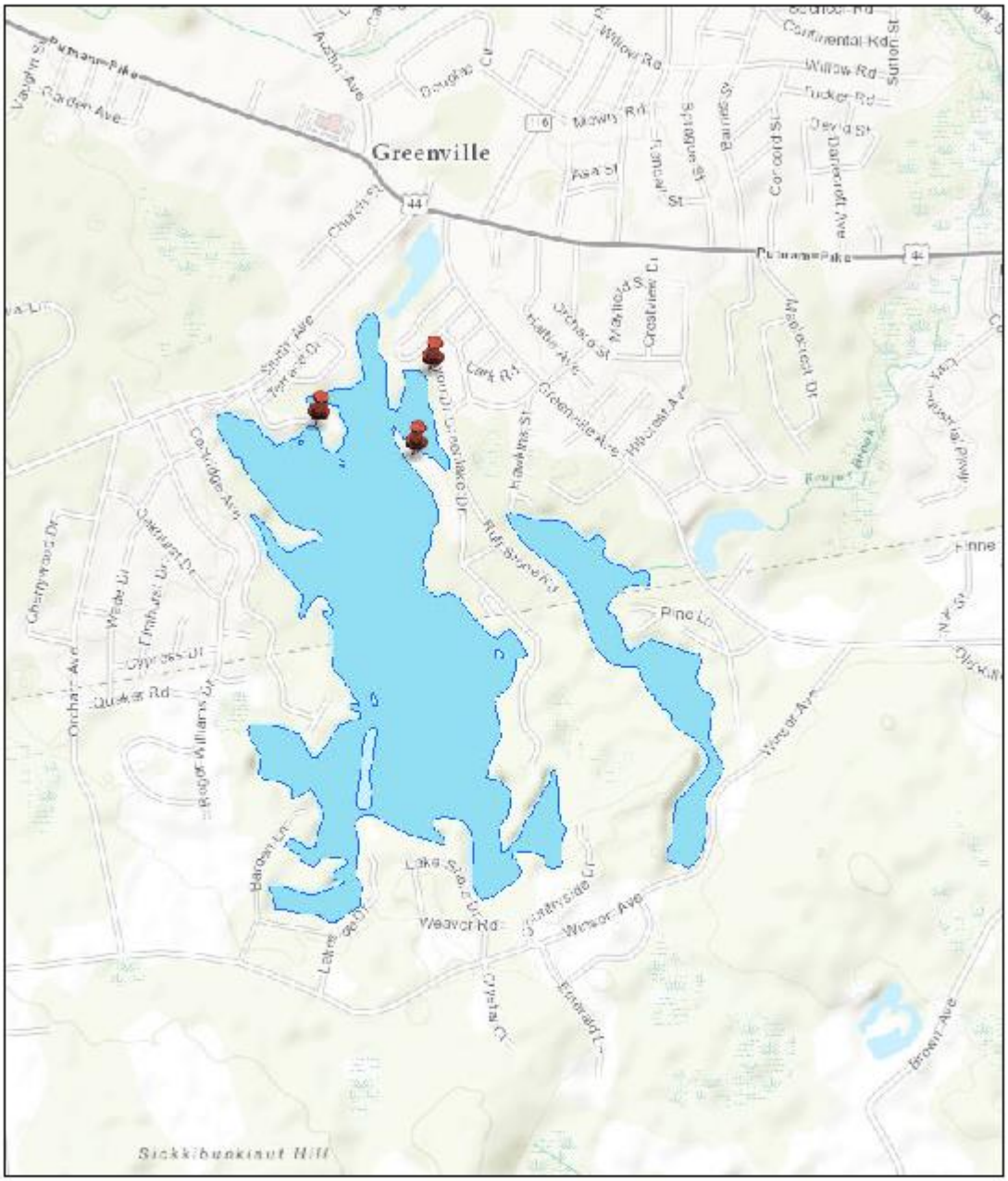
Slack Reservoir RI0002007L-03



August 18, 2017

Lakes

1:18,056

0 0.15 0.3 0.6 mi

0 0.175 0.35 0.7 km

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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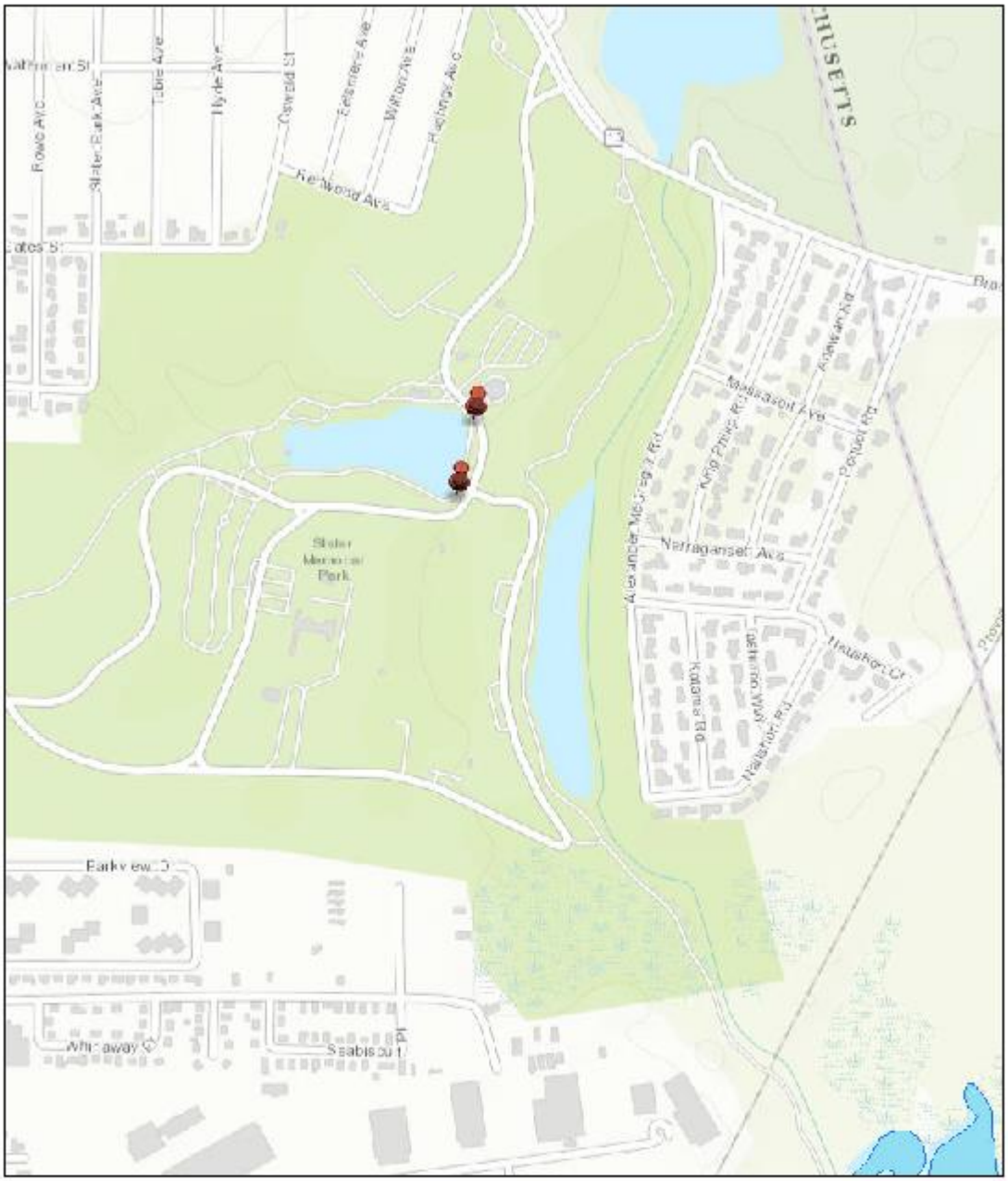
Slater Memorial Park Pond RI0004009R-01A



August 18, 2017

Lakes

1:9,028

0 0.075 0.15 0.3 mi

0 0.075 0.15 0.3 km

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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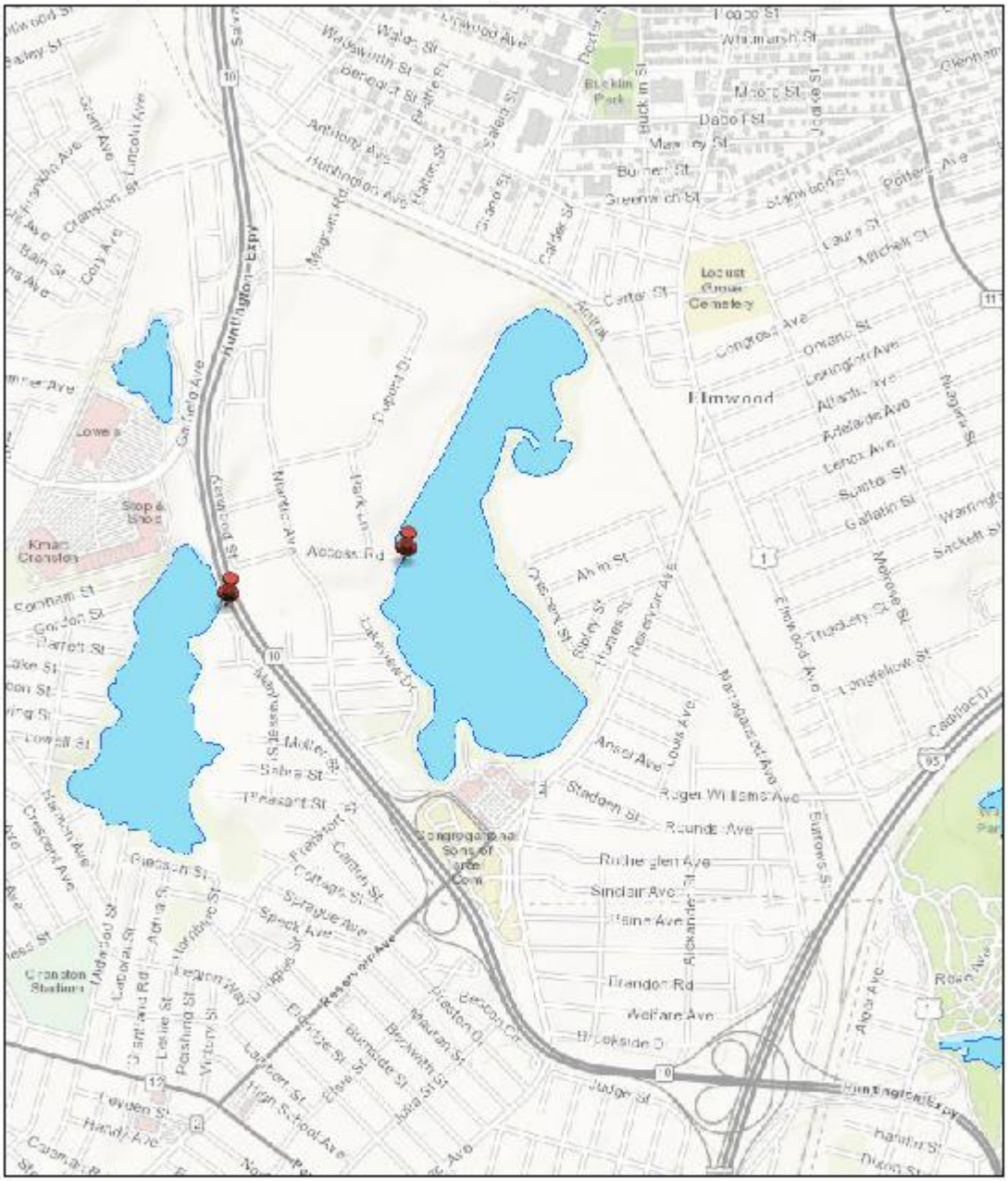
Spectacle and Mashapaug Pond RI0006017L-07; -06



August 18, 2017

Lakes

1:18,056

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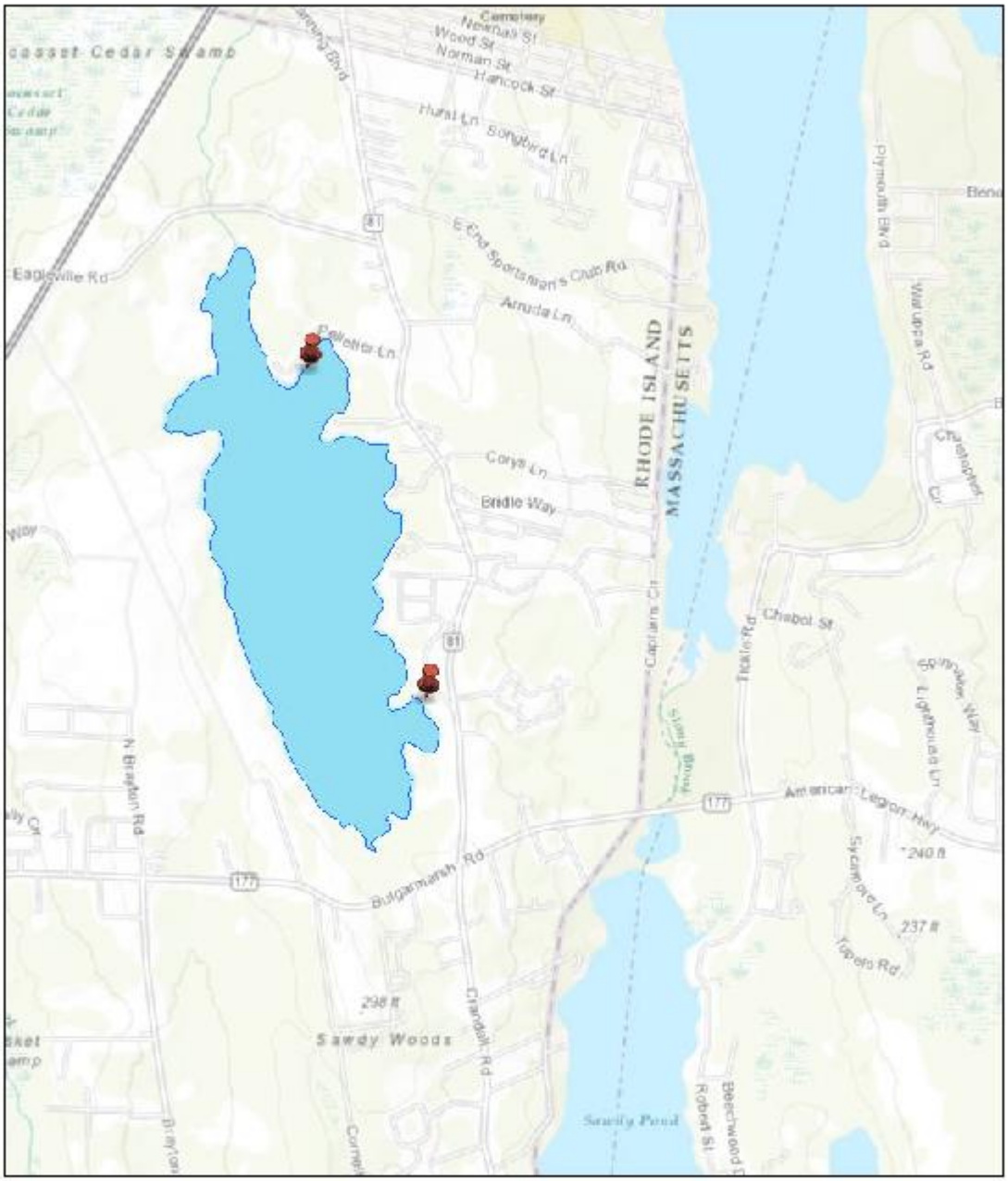
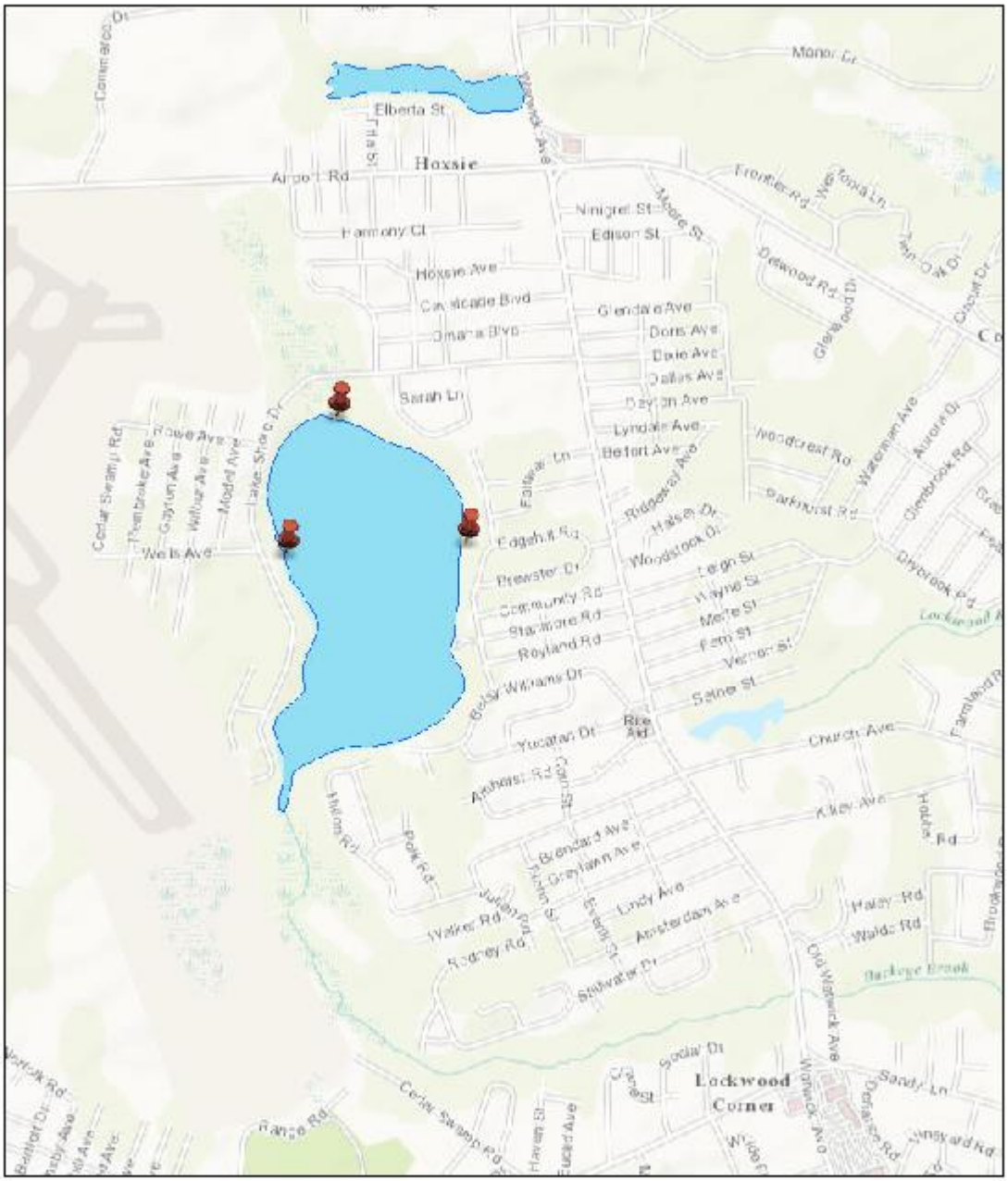
0 0.175 0.35 0.7 km

Stafford Pond RI0007037L-01



Warwick Pond RI0007024L-02



August 18, 2017

Lakes

1:18,056

0 0.15 0.3 0.6 mi

0 0.175 0.35 0.7 km

Appendix C
Health Lab Analytical SOP (Toxin Analysis)-Table of Content Page (full document attached separately)

Rhode Island State Health Laboratories
50 Orms Street, Providence, RI
Section: Environmental
Laboratory: Organic Chemistry

ID No.: 4249
Revision 4
Published Date: 10/26/2016 3:33:55 PM
Approved By: Henry Leibovitz

Select Cyanobacterial Toxins by Direct Aqueous Injection UPLC/MS/MS

TABLE OF CONTENTS

Health Lab Analytical SOP (Algal Enumeration/ID)-1st page (full document attached separately)

Rhode Island State Health Laboratories
50 Orms Street, Providence, RI
Section: Environmental
Laboratory: Water Microbiology

ID No.: 731
Revision 1
Published Date:
Approved By:

Cyanobacteria Harmful Algal Bloom Identification and Enumeration

1. **Title:** Cyanobacteria Harmful Algal Bloom Identification and Enumeration.

2. **References:**
   2.1. STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, 22nd EDITION, 10-17.

3. **Scope and Principle of the Analysis:**
   3.1. Fresh water samples are analyzed for the identification and enumeration of potentially harmful cyanobacteria species. The cyanobacteria genera of interest include: *Anabaena*, *Microcystis*, *Aphanizomenon*, *Planktothrix*, with a screen for other potentially toxic organisms. Freshwater samples will be taken from drinking water reservoirs and recreational freshwater then identification will be performed using a visual identification key. Cyanobacteria will be identified, and enumerated as units/mL by using a Sedgewick Rafter counting chamber for calculations.

   Our results will supplement those of cyanobacteria toxin monitoring performed by Food Chemistry to be utilized by RIDEM and HEALTH to determine appropriate public health action.

4. **Safety Issues**
   4.1. The samples may contain cyanotoxins. These potent toxins are easily absorbed through the skin and can cause damage to humans. Each sample should be treated as though it contains dangerous levels of cyanotoxin.
   4.2. Gloves should be worn when handling the samples.
   4.3. Samples are disposed of in a histology bucket after the read.

5. **Interferences**
   5.1. There are "look-alike" species that may be frequently mistaken for certain harmful species and must be distinguished for the count.
   5.2. Photos of harmful species, used for reference, will be taken by the Nikon Eclipse E400 camera microscope. Each photo will be labeled with the location site of the sample and archived digitally in a folder on the L drive sorted and named by the sample's date and Element work order number.

6. **Glassware**:
   1.1.1. 1.0mL Sedgewick Rafter counting chamber.
   1.1.2. 24x50mm coverslip

2. **Instrumentation:**
   2.1.1. Microscope equipped with 10X and 40X lenses.
   2.1.2. Nikon Eclipse E400 camera

3. **Sample Collection, Preservation and Storage**