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October 29, 2014

Mr. Dan Iacovelli  
Hopedale Park Commission  
P.O. Box 7  
Town Hall  
Hopedale, Massachusetts 01747

**Re: *Dry-Weather Outfall Monitoring  
Three Outfalls at Hopedale Pond  
ESS Project No. H167-000***

Dear Mr. Iacovelli:

ESS Group, Inc. (ESS) has prepared this report summarizing the results of the recent dry-weather outfall monitoring event conducted on behalf of the Town of Hopedale (Town). This investigation was conducted as a follow-up to previous outfall sampling completed as part of the Hopedale Pond Diagnostic/Feasibility Study (ESS 2009a) and subsequent illicit discharge tracking (ESS 2009b). The purpose of the current study was to document and describe the nature of dry-weather flows to Hopedale Pond and begin to chart a way forward to resolving the problems identified.

### **APPROACH**

Observations by the Town suggested that three drains along the eastern periphery of Hopedale Pond continue to exhibit dry-weather discharges. These include two previously documented drains (Station 4 and Station SS11 in the Hopedale Pond Diagnostic/Feasibility Study) as well as one new outfall (Station 1-2014) that emerges adjacent to the Dutcher Street entrance to the Town Parklands and continues through a series of open channel and culverted segments down to the northern end of Hopedale Pond (Figure 1, attached at the end of this report).

ESS visited each of the three outfall locations on September 23, 2014. September 23 was preceded by the prescribed period of dry weather—less than 0.1 inch of rain over the previous 72 hours. This ensured that observations at each outfall were reflective of true dry-weather conditions.

During the monitoring event, the area around each outfall was photographed and documented in a field notebook. Additionally, where flow was observed, the following water quality parameters were field-measured:

- Discharge (flow).
- Temperature.
- Specific conductance.
- pH.
- Dissolved oxygen.
- Color.
- Turbidity.



Water samples were obtained and sent to Alpha Analytical (a Massachusetts-

**Floatables (left) and bank erosion (right) were evident at Station 1-2014. However, no signs of contaminated dry-weather discharges were observed.**



certified laboratory) for the following analyses:

- *Escherichia coli* (*E. coli*).
- Total suspended solids (TSS).
- Total phosphorus.
- Dissolved phosphorus.
- Nitrate.
- Nitrite.
- Total Kjeldahl nitrogen (TKN).
- Ammonia.
- Surfactants.

## **RESULTS**

No dry-weather discharge was observed at the northernmost location, Station 1-2014. Therefore, water quality sampling was not conducted at this location. Observations of the area did not indicate staining, sheens, excessive plant/algal growth or odors that would be suggestive of illicit wastewater discharges or dumping. However, accumulated plastic floatables and areas of bank erosion were noted, indicating that stormwater adversely effects this location.



**Station 4 (left) and SS11 (right) were both characterized by minimal flow rates. The water level in the outfall pipe at SS11 is misleadingly high due to debris in the pipe and intrusion of pond water in the foreground. Flow was measured and samples were collected up gradient of this portion of the pipe.**

The two southern outfall locations (Stations SS11 and 4) were found to produce dry-weather flow at the time of visit, although discharge rates were very low (Table A). Field-measured and laboratory water quality analyses were conducted at these locations.

In general, the field-measured water quality results were similar to those obtained in 2008 – 2009 (ESS 2009a), except that specific conductance, a measure of dissolved ionic salts, was lower than previously observed during dry-weather conditions (Table A).

Additionally, the observed dry-weather flow rate was marginally lower than the range previously observed in the 2008 – 2009 period. However, neither of these observations definitively supports the presence or absence of illicit discharge.

**Table A. Summary of Field-measured Water Quality Results**

Station	Date	Temperature (°C)	pH (SU)	Dissolved Oxygen		Specific Conductance (µS/cm)	Turbidity (NTU)	Color (PCU)	Flow (cfs)
				(mg/L)	(%)				
4	9/23/14	13.5	7.02	7.44	73.2	706	1.21	5	0.013
	5/29/08 to 1/19/09 (High)	19.9	7.9	9.59	97.9	1142	4.9	5	1.02
	5/29/08 to 1/19/09 (Low)	7.3	5.2	7.38	65.0	790	0.6	0	0.04
SS11	9/23/14	14.2	7.15	8.00	77.9	712	50	15	0.001

Many sampling constituents (e.g., bacteria, nutrients, ammonia, surfactants, etc.) may be associated with direct illicit connections or diluted sources of wastewater; however, these constituents may arise from non-wastewater sources as well (e.g., animal droppings, solid waste, atmospheric deposition, etc.). Clearly, reliance on individual constituents (e.g., bacteria) can be misleading; but this problem can be minimized by considering multiple constituents and their concentrations. Our approach to your project involved what may be referred to as “fingerprinting” sources by measuring a suite of sampling constituents that, as a group, leave a relatively definitive signature. Specifically, we look for the combined presence of bacteria, ammonia, and surfactants at certain benchmark levels. Phosphorus, nitrogen and suspended solids are used to support our conclusions. Table B provides our laboratory analytical results in comparison with those obtained as part of the Hopedale Pond Diagnostic/Feasibility study (ESS 2009a). Following Table B, we discuss our findings.

**Table B. Summary of Laboratory Water Quality Results**

Station	Date	E. coli (MPN/100mL)	TSS (mg/L)	TKN (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	MBA Surfactants (mg/L)
4	9/23/14	34,000	<5.0	2.38	0.592	3.2	0.098	0.197	0.180	0.050
	5/29/08 to 1/19/09 (High)	>20,000	<2.5	2.73	1.890	2.97	0.073	0.277	0.244	NS
	5/29/08 to 1/19/09 (Low)	5	<2.0	0.356	<0.065	2.10	<0.011	<0.005	<0.005	NS
SS11	9/23/14	180	11	0.686	0.252	2.5	<0.050	0.077	<0.010	0.050
Raw Residential Wastewater (range)*		1x10 <sup>6</sup> – 1x10 <sup>7</sup>	NA	16 to 189	2.0 – 5.0	0.2 to 8.5	NA	0.2 to 32	NA	1.0
Diluted Residential Wastewater		1x10 <sup>3</sup> – 1x10 <sup>5</sup>	NA	NA	0.2 – 1.0	NA	NA	NA	NA	>0.25

\*Source: Lowe et al. (2009); Pitt (2004)  
NS = Not sampled; NA = Not available

Pathogenic bacteria, such as fecal coliform, *E. coli*, and enterococci, are commonly present in raw wastewater at order-of-magnitude concentrations in the range of  $10^6 - 10^7$  cfu/100 mL (i.e., in the millions). *E. coli* are present at similar levels in the feces of other animals (e.g., dogs and raccoons); however, this pathogen is unlikely to be found at such elevated levels where fecal contamination has *not* occurred. We found intermittent concentrations of  $10^5$  cfu/100 mL (i.e., tens of thousands) for *E. coli* at Station 4. This is indicative of an intermittent discharge of moderately diluted human wastewater or animal excrement (e.g., from raccoons living in the sewer pipes). Concentrations of *E. coli* found at Station SS11 are not indicative of fecal contamination.

Ammonia may occur in dry-weather discharge as a product of the breakdown of urea, which is a component in urine. Concentration of ammonia commonly occurs in raw wastewater or fecal discharge from other warm-blooded animals in the range of 2.0 – 5.0 mg/L. We found intermittent levels of ammonia in the range of approximately 0.5 – 1.9 mg/mL at Station 4. This is indicative of intermittent discharge of diluted human wastewater or animal feces. Concentrations found at Station SS11 are not indicative of fecal contamination.

Surfactants are manmade degreasing agents found in soaps. They do not generally occur in the environment above background levels of approximately 0.1 mg/L. Surfactants are a good indicator of the presence of domestic wastewater because of their presence in soaps; however, they breakdown fairly readily in the environment and so their absence does not entirely rule out illicit discharges. Surfactants were not sampled in 2008; however, we did sample for surfactants in 2014. Surfactants were found at both stations at levels below typical background. This suggests that human wastewater sources are unlikely to be present.

From the sampling data we collected at Station 4, we conclude that a significant source of fecal contamination is present. This source could be intermittent, diluted human waste or animal excrement or a combination of the two; but since surfactants were not found above the benchmark level of 0.1 mg/L, the source is mostly likely to be nonhuman. Samples for nitrogen (TKN, nitrate, and nitrite) and phosphorus (total and dissolved) indicate the presence of fecal contamination. Sampling data collected for Station SS11 is not consistent with either contamination by human waste or animal feces.

*We found strong evidence of fecal contamination at Station 4, which most likely comes from a nonhuman animal source; but could be the result of diluted wastewater from one or more illicit connections.*

## **RECOMMENDATIONS AND OPINIONS OF COST**

1. The results of this study generally agreed with those obtained in 2009 (ESS 2009a). There is likely to be a fecal source present in the drainage system contributing to the Station 4 outfall. This source could be diluted wastewater or diluted animal waste. As such, revisiting an illicit discharge detection program in this system is recommended. Previous investigations documented the presence of optical brighteners (laundry detergent additives) in multiple locations within the drainage system, including the interconnection with the Town of Milford's drains at the upper end of the system (ESS 2009b).

As an initial step, we recommend meeting with the Hopedale Highway Department to solicit their input with regard to any additional information on illicit discharges documented in this system since the date of ESS's last investigation. Information provided by the Highway Department would then be used to refine an approach for tracking remaining any illicit discharges to their source(s) so that the Town can initiate the process of eliminating them. Meeting with the Highway

Department and developing an illicit discharge detection plan for the Station 4 outfall could be accomplished for approximately \$2,000. Our approach would likely include a combination of closed circuit camera investigation and dye-tracing. Costs for undertaking the illicit discharge detection program would be provided as part of the plan.

*As next steps, we recommend meeting with your Highway Department, considering an illicit discharge investigation as well as a conceptual stormwater BMP design study.*

2. Given the lack of dry-weather flow at Station 1-2014 and the unremarkable water quality results at Station SS11, it is recommended that efforts at these locations focus on addressing known stormwater-related issues. Station 4 was also previously documented to contribute a sizable load of pollutants during wet weather. As such, it is recommended that stormwater improvements be pursued to complement the illicit discharge work identified in Recommendation 1.

At Station 1-2014, this could include limited wet-weather water quality sampling to establish the actual pollutant load being contributed from its associated drainage area and develop an appropriate level of load reduction. This location was not sampled in 2008 – 2009 and the level of pollutant loading is not known. Based on observations of the receiving channel (moderate to severe bank erosion, deposits of fine sediments and floatable debris) it is likely that some degree of bank stabilization and either upland best management practices (BMPs) or end-of-pipe retrofits would help to reduce the adverse effects of stormwater.

At Station SS11 and Station 4, excessive concentrations of nutrients, sediments and bacteria were documented in stormwater samples collected in 2009 (ESS 2009a). A next logical step in addressing these issues would be to initiate a conceptual design study to evaluate the feasibility of implementing both upland BMPs, where possible, and also effective but visually attractive end-of-pipe BMPs, such as vegetated gravel wetlands, bioretention systems or slow sand filters on Town land.

Such a study would cost approximately \$10,000 to \$11,000 to complete, but the results could be used to support future applications to state grant programs. The study would include a strategy for obtaining future grant funding for the improvements it recommends.

3. Lastly, although it was not a specific target of this investigation, ESS did notice that the map of the Town Parklands near Station 1-2014 at the Dutcher Street trailhead. The map is badly weathered, making it difficult to read. The Town may want to consider repairing or replacing the sign to make the Parklands more welcoming to visitors entering from Dutcher Street. The sign could be redesigned to provide both directional and interpretive information. Costs to develop content and design a new layout would be anticipated to run between \$2,500 and \$6,000, depending on how complex a design is desired by the Town. Costs to produce the signage would be expected to range from as little as \$200 to \$2,500 or more, depending on dimensions, materials and any additional structural support requirements.



Weathered map of the Hopedale Parklands at the Dutcher Street trailhead.



Mr. Dan Iacovelli  
October 28, 2014

The Town could save installation costs by providing the labor to mount the signage.

**REFERENCES**

ESS Group, Inc. 2009a. Diagnostic and Feasibility Study for Hopedale Pond. Prepared for the Town of Hopedale, Massachusetts.

ESS Group, Inc. 2009b. Dutcher Street Outfall and Optical Brightener Testing. November 11, 2009 Memorandum to Eugene Phillips, Town Coordinator. Prepared for the Town of Hopedale, Massachusetts.

Lowe, K. S., M. B. Tucholke, J. M. B. Tomaras, K. Conn, C. Hoppe, J. E. Drewes, J. E. McCray and J. Munakata-Marr. 2009. Influent Constituent Characteristics of the Modern Waste Stream from Single Sources. Final Report to the Water Environment Research Foundation. London: IWA Publishing.

Makarewicz, J. C. and B. L. Cady. 1994. Causes of Foaming and Surfactant Source Identification in Sandy Creek, Orleans and Monroe County, New York. Technical Reports Paper 102. Accessed online on October 7, 2014:  
[http://digitalcommons.brockport.edu/tech\\_rep/102](http://digitalcommons.brockport.edu/tech_rep/102)

Please contact either of the undersigned with any questions regarding this report. Jim Riordan may be reached at (401) 330-1221. Matt Ladewig may be reached at (401) 330-1204.

Sincerely,

**ESS GROUP, INC.**

A handwritten signature in blue ink that reads "M. James Riordan".

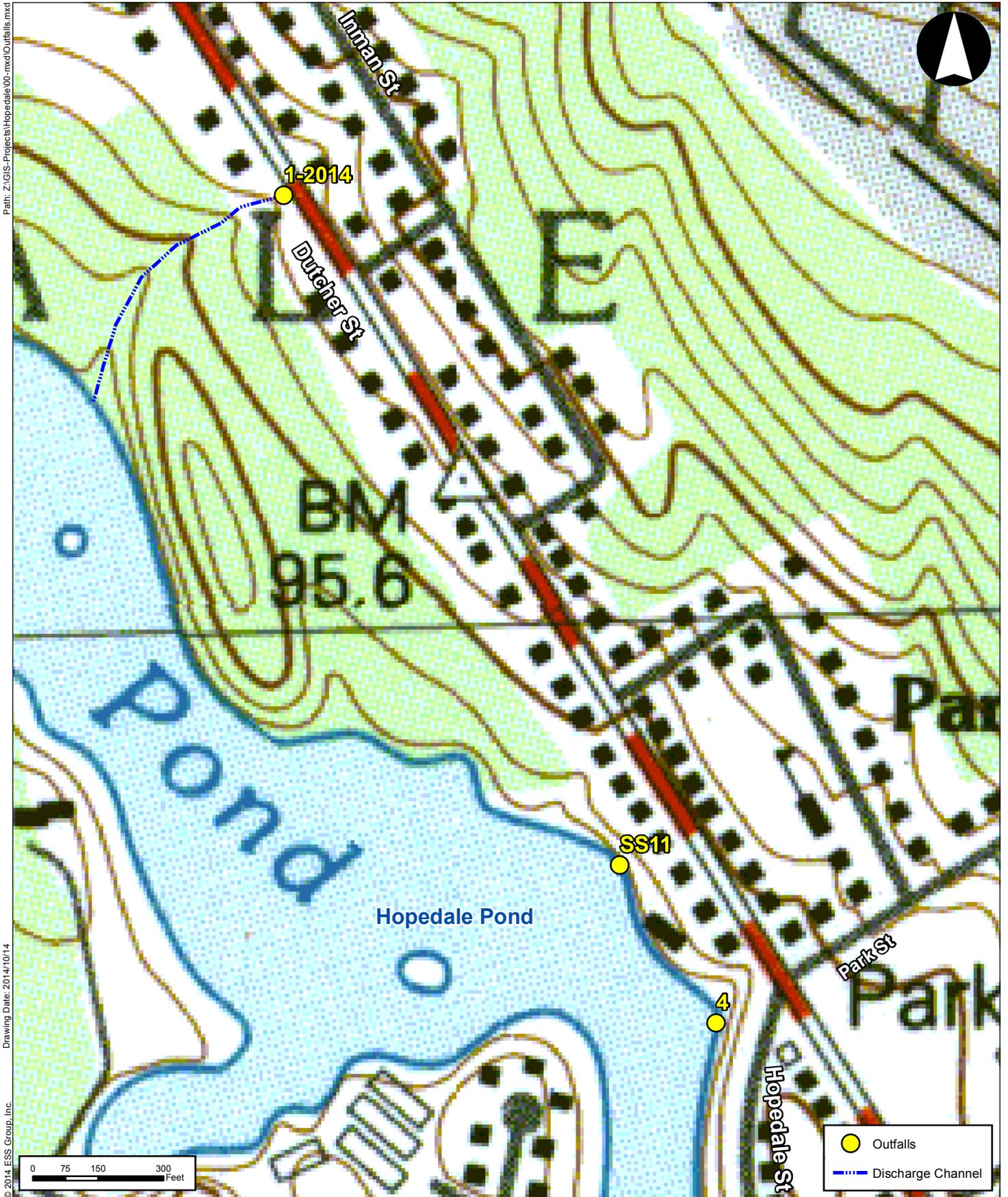
M. James Riordan, AICP, LEED AP  
Principal Scientist

A handwritten signature in blue ink that reads "Matt Ladewig".

Matt Ladewig, CLM  
Project Scientist

Attachments:

- (a) Lab Reports
- (b) Map of Outfall Locations



**Hopedale Dry Weather Sampling**  
Hopedale, Massachusetts

**Locations of Outfalls Visited**  
**September 23, 2014**

1 inch = 300 feet



Source: 1) USGS, Topos, 1987

**Figure 1**



## ANALYTICAL REPORT

Lab Number:	L1422161
Client:	ESS Group Incorporated 10 Hemmingway Dr 2nd Fl East Providence, RI 02915
ATTN:	Matt Ladewig
Phone:	(401) 330-1204
Project Name:	HOPEDALE DRY WEATHER
Project Number:	Not Specified
Report Date:	09/29/14

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), USDA (Permit #P-330-11-00240), NC (666), TX (T104704476), DOD (L2217), US Army Corps of Engineers.

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Eight Walkup Drive, Westborough, MA 01581-1019  
508-898-9220 (Fax) 508-898-9193 800-624-9220 - [www.alphalab.com](http://www.alphalab.com)



**Project Name:** HOPEDALE DRY WEATHER  
**Project Number:** Not Specified

**Lab Number:** L1422161  
**Report Date:** 09/29/14

<b>Alpha Sample ID</b>	<b>Client ID</b>	<b>Matrix</b>	<b>Sample Location</b>	<b>Collection Date/Time</b>	<b>Receive Date</b>
L1422161-01	4	WATER	MA	09/23/14 08:25	09/23/14
L1422161-02	SS11	WATER	MA	09/23/14 08:53	09/23/14

**Project Name:** HOPEDALE DRY WEATHER  
**Project Number:** Not Specified

**Lab Number:** L1422161  
**Report Date:** 09/29/14

### 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. 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.

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**Project Name:** HOPEDALE DRY WEATHER  
**Project Number:** Not Specified

**Lab Number:** L1422161  
**Report Date:** 09/29/14

### Case Narrative (continued)

#### Sample Receipt

The samples were received at the laboratory above the required temperature range. The samples were transported to the laboratory in a cooler with ice and delivered directly from the sampling site.

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: 09/29/14

# **INORGANICS & MISCELLANEOUS**

**Project Name:** HOPEDALE DRY WEATHER  
**Project Number:** Not Specified

**Lab Number:** L1422161  
**Report Date:** 09/29/14

**SAMPLE RESULTS**

**Lab ID:** L1422161-01  
**Client ID:** 4  
**Sample Location:** MA  
**Matrix:** Water

**Date Collected:** 09/23/14 08:25  
**Date Received:** 09/23/14  
**Field Prep:** Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
<b>Microbiological Analysis - Westborough Lab</b>										
E. Coli (MPN)	34000		MPN/100ml	200	NA	200	-	09/23/14 15:40	30,9223B	SE
<b>General Chemistry - Westborough Lab</b>										
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	09/25/14 14:20	30,2540D	DW
Nitrogen, Ammonia	0.592		mg/l	0.075	--	1	09/23/14 13:19	09/24/14 19:17	30,4500NH3-BH	AT
Nitrogen, Nitrite	0.098		mg/l	0.050	--	1	-	09/24/14 04:22	44,353.2	DB
Nitrogen, Nitrate	3.2		mg/l	0.10	--	1	-	09/24/14 04:22	44,353.2	DB
Nitrogen, Total Kjeldahl	2.38		mg/l	0.300	--	1	09/23/14 12:07	09/24/14 19:45	30,4500N-C	AT
Phosphorus, Total	0.197		mg/l	0.010	--	1	09/24/14 10:30	09/25/14 09:55	30,4500P-E	TE
Phosphorus, Soluble	0.180		mg/l	0.010	--	1	09/26/14 11:40	09/26/14 15:04	30,4500P-E	SD
Surfactants, MBAS	0.050		mg/l	0.050	--	1	09/23/14 18:32	09/23/14 20:23	30,5540C	MR



**Project Name:** HOPEDALE DRY WEATHER  
**Project Number:** Not Specified

**Lab Number:** L1422161  
**Report Date:** 09/29/14

**SAMPLE RESULTS**

**Lab ID:** L1422161-02  
**Client ID:** SS11  
**Sample Location:** MA  
**Matrix:** Water

**Date Collected:** 09/23/14 08:53  
**Date Received:** 09/23/14  
**Field Prep:** Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
<b>Microbiological Analysis - Westborough Lab</b>										
E. Coli (MPN)	180		MPN/100ml	1.0	NA	1	-	09/23/14 15:40	30,9223B	SE
<b>General Chemistry - Westborough Lab</b>										
Solids, Total Suspended	11.		mg/l	5.0	NA	1	-	09/25/14 14:20	30,2540D	DW
Nitrogen, Ammonia	0.252		mg/l	0.075	--	1	09/23/14 13:19	09/24/14 19:18	30,4500NH3-BH	AT
Nitrogen, Nitrite	ND		mg/l	0.050	--	1	-	09/24/14 04:22	44,353.2	DB
Nitrogen, Nitrate	2.5		mg/l	0.10	--	1	-	09/24/14 04:22	44,353.2	DB
Nitrogen, Total Kjeldahl	0.686		mg/l	0.300	--	1	09/23/14 17:42	09/24/14 20:05	30,4500N-C	AT
Phosphorus, Total	0.077		mg/l	0.010	--	1	09/24/14 10:30	09/25/14 09:55	30,4500P-E	TE
Phosphorus, Soluble	ND		mg/l	0.010	--	1	09/26/14 11:40	09/26/14 15:04	30,4500P-E	SD
Surfactants, MBAS	0.050		mg/l	0.050	--	1	09/23/14 18:32	09/23/14 20:24	30,5540C	MR



**Project Name:** HOPEDALE DRY WEATHER  
**Project Number:** Not Specified

**Lab Number:** L1422161  
**Report Date:** 09/29/14

**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 Batch: WG724457-1										
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	--	1	09/23/14 12:07	09/24/14 19:34	30,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG724492-1										
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	09/23/14 13:19	09/24/14 19:07	30,4500NH3-BH	AT
Microbiological Analysis - Westborough Lab for sample(s): 01-02 Batch: WG724589-1										
E. Coli (MPN)	<1		MPN/100ml	1	NA	1	-	09/23/14 15:40	30,9223B	SE
General Chemistry - Westborough Lab for sample(s): 02 Batch: WG724597-1										
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	--	1	09/23/14 17:42	09/24/14 19:57	30,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG724602-1										
Surfactants, MBAS	ND		mg/l	0.050	--	1	09/23/14 18:32	09/23/14 20:22	30,5540C	MR
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG724637-1										
Nitrogen, Nitrate	ND		mg/l	0.10	--	1	-	09/24/14 03:44	44,353.2	DB
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG724640-1										
Nitrogen, Nitrite	ND		mg/l	0.050	--	1	-	09/24/14 03:57	44,353.2	DB
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG724921-1										
Phosphorus, Total	ND		mg/l	0.010	--	1	09/24/14 10:30	09/25/14 09:34	30,4500P-E	TE
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG725142-1										
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	09/25/14 14:20	30,2540D	DW
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG725700-1										
Phosphorus, Soluble	ND		mg/l	0.010	--	1	09/26/14 11:40	09/26/14 15:03	30,4500P-E	SD

## Lab Control Sample Analysis

### Batch Quality Control

**Project Name:** HOPEDALE DRY WEATHER

**Project Number:** Not Specified

**Lab Number:** L1422161

**Report Date:** 09/29/14

Parameter	LCS		LCSD		%Recovery Limits	RPD	Qual	RPD Limits
	%Recovery	Qual	%Recovery	Qual				
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG724457-2								
Nitrogen, Total Kjeldahl	97		-		78-122	-		
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG724492-2								
Nitrogen, Ammonia	96		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 02 Batch: WG724597-2								
Nitrogen, Total Kjeldahl	102		-		78-122	-		
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG724602-2								
Surfactants, MBAS	96		-		65-126	-		
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG724637-2								
Nitrogen, Nitrate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG724640-2								
Nitrogen, Nitrite	100		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG724921-2								
Phosphorus, Total	101		-		80-120	-		

## Lab Control Sample Analysis

Batch Quality Control

**Project Name:** HOPEDALE DRY WEATHER

**Lab Number:** L1422161

**Project Number:** Not Specified

**Report Date:** 09/29/14

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG725700-2					
Phosphorus, Soluble	97	-	80-120	-	

### Matrix Spike Analysis Batch Quality Control

**Project Name:** HOPEDALE DRY WEATHER  
**Project Number:** Not Specified

**Lab Number:** L1422161  
**Report Date:** 09/29/14

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Qual	MSD Found	MSD %Recovery	MSD Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG724457-4 QC Sample: L1422161-01 Client ID: 4												
Nitrogen, Total Kjeldahl	2.38	8	9.67	91	-	-	-	-	77-111	-	-	24
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG724492-4 QC Sample: L1422161-02 Client ID: SS11												
Nitrogen, Ammonia	0.252	4	3.96	93	-	-	-	-	80-120	-	-	20
General Chemistry - Westborough Lab Associated sample(s): 02 QC Batch ID: WG724597-4 QC Sample: L1420141-19 Client ID: MS Sample												
Nitrogen, Total Kjeldahl	10.2	8	18.8	108	-	-	-	-	77-111	-	-	24
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG724602-4 QC Sample: L1422161-01 Client ID: 4												
Surfactants, MBAS	0.050	0.4	0.270	55	-	-	-	-	52-157	-	-	32
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG724637-4 QC Sample: L1422250-01 Client ID: MS Sample												
Nitrogen, Nitrate	0.91	4	4.8	97	-	-	-	-	83-113	-	-	6
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG724640-4 QC Sample: L1422250-01 Client ID: MS Sample												
Nitrogen, Nitrite	0.10	4	4.1	100	-	-	-	-	80-120	-	-	20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG724921-3 QC Sample: L1422072-02 Client ID: MS Sample												
Phosphorus, Total	0.211	0.5	0.705	99	-	-	-	-	75-125	-	-	20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG725700-3 QC Sample: L1420141-20 Client ID: MS Sample												
Phosphorus, Soluble	0.100	0.5	0.581	96	-	-	-	-	75-125	-	-	20

## Lab Duplicate Analysis

### Batch Quality Control

**Project Name:** HOPEDALE DRY WEATHER

**Project Number:** Not Specified

**Lab Number:** L1422161

**Report Date:** 09/29/14

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG724457-3 QC Sample: L1422161-01 Client ID: 4						
Nitrogen, Total Kjeldahl	2.38	2.25	mg/l	6		24
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG724492-3 QC Sample: L1422161-02 Client ID: SS11						
Nitrogen, Ammonia	0.252	0.274	mg/l	8		20
General Chemistry - Westborough Lab Associated sample(s): 02 QC Batch ID: WG724597-3 QC Sample: L1420141-19 Client ID: DUP Sample						
Nitrogen, Total Kjeldahl	10.2	10.0	mg/l	2		24
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG724602-3 QC Sample: L1422198-03 Client ID: DUP Sample						
Surfactants, MBAS	0.110	0.110	mg/l	0		32
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG724637-3 QC Sample: L1422250-01 Client ID: DUP Sample						
Nitrogen, Nitrate	0.91	0.81	mg/l	12	Q	6
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG724640-3 QC Sample: L1422250-01 Client ID: DUP Sample						
Nitrogen, Nitrite	0.10	0.090	mg/l	11		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG724921-4 QC Sample: L1422072-02 Client ID: DUP Sample						
Phosphorus, Total	0.211	0.211	mg/l	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG725142-2 QC Sample: L1421979-03 Client ID: DUP Sample						
Solids, Total Suspended	140	150	mg/l	7		29
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG725700-4 QC Sample: L1420141-20 Client ID: DUP Sample						
Phosphorus, Soluble	0.100	0.101	mg/l	1		20

Project Name: HOPEDALE DRY WEATHER

Lab Number: L1422161

Project Number: Not Specified

Report Date: 09/29/14

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

## Cooler Information Custody Seal

## Cooler

A Absent

## Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1422161-01A	Bacteria Cup Na2S2O3 preserved	A	N/A	10.4	Y	Absent	E-COLI-QT(.25)
L1422161-01B	Bacteria Cup Na2S2O3 preserved	A	N/A	10.4	Y	Absent	E-COLI-QT(.25)
L1422161-01C	Plastic 250ml unpreserved	A	7	10.4	Y	Absent	SPHOS-4500(28)
L1422161-01D	Plastic 250ml unpreserved	A	7	10.4	Y	Absent	NO2-353(2),NO3-353(2)
L1422161-01E	Plastic 500ml H2SO4 preserved	A	<2	10.4	Y	Absent	TKN-4500(28),TPHOS-4500(28),NH3-4500(28)
L1422161-01F	Plastic 1000ml unpreserved	A	7	10.4	Y	Absent	MBAS-5540(2)
L1422161-01G	Plastic 1000ml unpreserved	A	7	10.4	Y	Absent	TSS-2540(7)
L1422161-01X	Plastic 250ml H2SO4 preserved sp	A	<2	10.4	Y	Absent	SPHOS-4500(28)
L1422161-02A	Bacteria Cup Na2S2O3 preserved	A	N/A	10.4	Y	Absent	E-COLI-QT(.25)
L1422161-02B	Bacteria Cup Na2S2O3 preserved	A	N/A	10.4	Y	Absent	E-COLI-QT(.25)
L1422161-02C	Plastic 250ml unpreserved	A	7	10.4	Y	Absent	SPHOS-4500(28)
L1422161-02D	Plastic 250ml unpreserved	A	7	10.4	Y	Absent	NO2-353(2),NO3-353(2)
L1422161-02E	Plastic 500ml H2SO4 preserved	A	<2	10.4	Y	Absent	TKN-4500(28),TPHOS-4500(28),NH3-4500(28)
L1422161-02F	Plastic 1000ml unpreserved	A	7	10.4	Y	Absent	MBAS-5540(2)
L1422161-02G	Plastic 1000ml unpreserved	A	7	10.4	Y	Absent	TSS-2540(7)
L1422161-02X	Plastic 250ml H2SO4 preserved sp	A	<2	10.4	Y	Absent	SPHOS-4500(28)

\*Values in parentheses indicate holding time in days



**Project Name:** HOPEDALE DRY WEATHER  
**Project Number:** Not Specified

**Lab Number:** L1422161  
**Report Date:** 09/29/14

## 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.
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.

### 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).
- 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.

**Report Format:** Data Usability Report



**Project Name:** HOPEDALE DRY WEATHER  
**Project Number:** Not Specified

**Lab Number:** L1422161  
**Report Date:** 09/29/14

#### **Data Qualifiers**

- 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. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- ND** - Not detected at the reporting limit (RL) for the sample.

**Project Name:** HOPEDALE DRY WEATHER

**Lab Number:** L1422161

**Project Number:** Not Specified

**Report Date:** 09/29/14

## REFERENCES

- 30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.
- 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

Last revised April 15, 2014

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**The following analytes are not included in our NELAP Scope of Accreditation:**

### Westborough Facility

**EPA 524.2:** Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether.

**EPA 8260C:** 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene, Iodomethane (methyl iodide), Methyl methacrylate, Azobenzene.

**EPA 8330A/B:** PETN, Picric Acid, Nitroglycerine, 2,6-DANT, 2,4-DANT.

**EPA 8270D:** 1-Methylnaphthalene, Dimethylnaphthalene, 1,4-Diphenylhydrazine.

**EPA 625:** 4-Chloroaniline, 4-Methylphenol.

**SM4500:** Soil: Total Phosphorus, TKN, NO<sub>2</sub>, NO<sub>3</sub>.

**EPA 9071:** Total Petroleum Hydrocarbons, Oil & Grease.

### Mansfield Facility

**EPA 8270D:** Biphenyl.

**EPA 2540D:** TSS

**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.

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**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, SM4500CI-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.**

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For a complete listing of analytes and methods, please contact your Alpha Project Manager.

