

# Town of Allenstown Bacterial Source Tracking and Sampling

## Phase II



August 2016

Prepared By:

**Hoyle, Tanner**  
& Associates, Inc.

# Table of Contents

Background.....	3
Purpose.....	3
Procedure.....	5
Findings/Results.....	6
Appendix.....	10

## **Background**

The National Pollutant Discharge Elimination System (NPDES) permit in New Hampshire is known as the New Hampshire Small Municipal Separate Storm Sewer System General Permit. The last enforceable New Hampshire Small MS4 General Permit (MS4) expired in 2008, but remains in effect until a new permit is issued. A Draft 2008 MS4 was written but never became enforceable, as it stayed in draft form. The subsequent February 2013 draft version of the MS4 has served to update the requirements of the previous Draft 2008 MS4.

The MS4 permit applies to communities that contain urbanized areas within their political boundaries. The 2010 urbanized area data was released by the Bureau of the Census and as a result, many communities that did not fall under the MS4 permit during the 2008 draft now contain new “urbanized areas” which make them subject to the requirements of the MS4 permit.

The Town of Allenstown, New Hampshire, is one of the many communities that was not identified in the 2008 draft MS4, but contains a new urbanized area. The “urbanized area” of Allenstown is considered part of the MS4 area as of the Draft 2013 Permit. This designation makes the Town responsible for meeting all of the MS4 conditions in the stormwater system. The Town of Allenstown is looking ahead in order to meet the requirements of this permit before the permit is finalized and then becomes enforceable by the USEPA. This urbanized area of Allenstown will be subject to the MS4 permit when it becomes final. Prior baseline outfall sampling and screening was conducted pursuant to Part 2.3.4.9.a. (dry weather) and 2.3.4.8.d.i-iii. of the 2013 draft MS4 during the summer of 2014. Results from the summer 2014 sampling event indicated that there were two outfalls containing E. coli above the water quality threshold levels: Outfall 1 and Outfall 18.

The Town of Allenstown completed its first round (Phase I) of bacterial source tracking and sampling in August of 2015 in order to isolate and eventually remove E. coli sources found in Outfalls 1 and 18 which are contained within catchments 1 and 18. Catchments include all conveyance structures and piping that drains to each outfall. During baseline dry weather sampling conducted in August of 2015, both catchments had exceedances of E. coli. A summary of the sampling results and analysis were included in a report by Hoyle, Tanner dated December 10, 2015. Since the sources of E. coli could not be confirmed, additional dry and wet weather testing was recommended, which was completed as part of this Task Order: Phase II Bacteria Source Investigation & Sampling for MS4.

## **Purpose**

The objective of the Phase 2 work is to conduct further evaluation of the storm drain catchment areas’ tributary to Outfalls No. 1 and No. 18 in order to determine the source(s) of the E. coli bacteria detected during prior sampling and testing such that, the bacteria sources can be mitigated or eliminated using Illicit Discharge and Detection Elimination (IDDE) protocols and the information obtained during the previous evaluations. This is the next step towards finding and eliminating potential illicit discharges to the town’s stormwater collection system as required by the IDDE program requirements of the Draft MS4 Stormwater Permit. The work includes physical evaluation of pipes and structures as well as additional sampling and testing in the catchment areas tributary to Outfalls 1 and 18.

## Potential Sources

Hoyle, Tanner participated in a kickoff meeting with the Town, conducted several site visits of the catchment areas, and collected additional historic plans of the drainage system. Based on discussions with the Town and previous sampling results, potential sources for E. coli were identified for Phase II investigation.

### Catchment One

Potential sources of E. coli in the Outfall 1 Subcatchment Area included possible illicit discharges from Recycling Mechanical, surface runoff or floor drain discharges from the Allenstown Wastewater Treatment Facility (WWTF), and surface runoff conveyed within the Canal Street “brook”.

A video inspection of portions of the existing drainage system was performed on March 15, 2016 to investigate potential illicit discharges in the area of Recycling Mechanical on Ferry Street as well as confirm the existing drainage pipe configuration. Since the Phase I E. coli sampling was concluded in 2015, Recycling Mechanical tied a new sewer force main into a sewer manhole on Ferry Street which was inspected by the Town sometime around February of 2016. Based on conversations with the Town, the location of the previous private septic disposal system is unknown and it is believed that the old sewer service pipe comes out of the building toward Ferry Street. The video inspection of the existing drainage line between drain manholes SD-15 to SD-14 on Ferry Street revealed an intruding lateral pipe coming from the direction of Recycling Mechanical. The lateral enters the existing drain line approximately 30 feet west of SD-15 and was observed to have clear water flowing out of the lateral pipe. It should be noted that there was light rain during the time of the video inspection. To verify if this intruding lateral was contributing toward E. coli concentrations in the catchment area, flows from the drain manholes immediately upstream (SD-5) and downstream (SD-14) were identified as critical sampling locations.

Hoyle, Tanner also visited the Allenstown Wastewater Treatment Facility (WWTF) site and spoke with Jeffrey Backman, the WWTF Superintendent. Mr. Backman stated that all floor drains in buildings at the WWTF site have been capped to prevent illicit discharges into the stormwater system. Mr. Backman also explained where many of the catch basins around the WWTF site have been plated to prevent runoff from entering the system. To better isolate sources of E. coli, drain manhole SD-9 was identified as a critical sampling location because flow from Ferry Street joins flow from the WWTF in this structure.

The Town also indicated that the Canal Street “brook” was suspected of having high E. coli concentrations as evidenced by a sample reportedly taken from the brook and tested at the WWTF. The brook consists of a ditch along the east side of Canal Street flowing toward Ferry Street. The brook is largely fed from a wetland area on the eastern side of the Eversource parcel located between Canal Street and Reynolds Ave. The wetlands appear to be very slow moving and stagnant and provide a slow discharge across Eversource property, into the brook. The brook is captured by a catchbasin at the corner of Canal Street and Ferry Street. The Town indicated that this catch basin discharges directly into drain manhole SD-15, but video inspection and a subsequent field observation of the catch basin confirm that the catch basin actually outlets directly into the existing drain line as an intruding lateral pipe, approximately 138 feet north of SD-15.

## **Catchment Eighteen**

The “frog pond”, a stream on the east side of Granite Street, has been suspected of contributing to the E. coli concentrations and was not previously sampled during Phase I sampling. The frog pond introduces surface water runoff from outside the MS4 limits into the municipal system through a culvert under Granite Street which connects to catch basin CB-239, the structure immediately downstream from the frog pond, A visual inspection of CB-239 was conducted and no contributing flow except from the frog pond was observed.

CB-100, located at the base of a private resident’s driveway, is connected to a series of drain manholes along Townhouse Road. The drainage line laterally connects to the center of a culvert passing under Townhouse Road. The drainage network running along Townhouse Road is a new addition to the system after residents were complaining about their backyards flooding when the stream behind their homes overtopped during large rain events. The addition of the closed drainage system has resolved this issue, however drainage can only enter the system through CB-100. If contaminants are found to increase from the inlet side to the outlet side of the Townhouse Road culvert, lateral lines intersecting the Townhouse Road drain line may be the cause.

Another location of interest is a 6” plastic pipe discharging flow just upstream of the Townhouse Road culvert. Iron bacteria was observed at the outlet of the 6” plastic pipe.

Just upstream from previously sampled point 1.11, two streams coverage. One stream runs parallel to Townhouse Road with duplex homes on both sides. The second stream can be traced back to “frog pond”, travels through the Townhouse Road culvert, and converges with the first stream. Sampling both streams before the convergence would isolate the contaminate source.

## **Procedure**

E. coli sampling locations were chosen prior to the field effort using GIS mapping information from previous studies. Locations were preselected prior to sampling in order to obtain the most representative samples to track the source of E. coli contamination within catchment one and eighteen.

During Phase I sampling, it was a priority to repeat sampling locations from the previous study and to expand to new locations and isolate the source. Dry or low flow within manholes at the sampling locations limited the number of samples taken. During Phase II sampling, sandbags were used to back up flow within manholes when flow was too low to sample. Using this method allowed for more samples to be taken and a larger sample to be collected and analyzed.

Preliminary field tests were conducted at locations where taking an E. coli sample was not critical to test for concentrations of ammonia, chlorine, and detergents, which are indicators of the presence of wastewater. If any of these tests showed high concentrations an E. coli sample was taken.

Clean lab containers were used to collect the samples. Samples were preserved according to lab requirements and holding times were met prior to delivery to the lab.

## Findings/Results

Preliminary E. coli sampling results from Eastern Analytical showed low E. coli concentrations at all Phase II sampled locations. For the purposes of this study, the MPN/100mL method can be directly compared to cfu/100mL method, and all areas were found to be well below the 235 cfu/100mL EPA E. coli threshold for stormwater. Threshold of water quality criteria for MS4 sampling are displayed in Table 1. Six locations sampled in Phase I were resampled in Phase II. A comparison of the Phase II results versus the Phase I results are shown in Table 2. The samples located on the same line indicates that they were collected in the same location during both sampling rounds. The results of the three wastewater constituent field tests are shown in Table 3.

**Table 1: Threshold Water Quality Criteria for MS4 Sampling**

Minimum Parameters:	Threshold Levels / Single Sample
Ammonia	≥ 0.5 mg/L
Chlorine	>0.02 mg/L
Surfactants (MBAs)	≥0.25 mg/L
E. Coli	235 cfu/100 mL
Specific Conductivity	NA
Salinity	NA
Temperature	≥83°F (28.3°C) and change 5°C (2.8°C) in rivers

### Catchment One

While all sampled locations were well below the EPA E. coli threshold, the most significant source of E. coli within the outfall 1 subcatchment area was identified to be from the Canal Street “brook”. The brook (Sample 2.6) enters into a catch basin, 5-CB, on the corner of Canal Street and Ferry Street. Based on the video inspection of the drainage pipes, it is believed that the catch basin outlet intersects with the main line at a different location than depicted on the Town’s GIS. The concentration decreased as expected between sample 2.1 and 2.6, where drainage from upper Ferry Street converges with drainage from the Canal Street “brook”. No samples were taken directly from the brook during Phase I.

Sample 2.2, which was previously believed to be the location at which 5-CB connects to SD-15, was significantly lower than the concentration of Sample 2.6. These results are in agreement with the discovery from the TV inspection that 5-CB is not connected directly to SD-15. The inlet location of the pipe coming into SD-15, where sample 2.2 was collected is unknown.

A field test was conducted at the inlet to a drain manhole (known as SD-5) where the catchment from of a series of three catch basins converge located on Ferry St. Again low detected levels of ammonia, chlorine, and detergents did not suggest that wastewater was entering the system at this location subsequently, no E. coli sample was collected.

The remaining samples 2.3, 2.4, and 2.5 were taken from manholes on Ferry St outside of the WWTF and each sample resulted in E. coli concentrations below the EPA threshold. Samples 2.4 and 2.5 were

resampled locations from Phase I sampling. The results for these locations were two orders of magnitude smaller for Phase II sampling versus Phase I sampling. The lowest concentration of E. coli found within the Outfall 1 catchment area was sample 2.3 for Phase II sampling. A comparison of the results for sample 2.1, 2.3, and 2.4 are unexpected due to the fact that these samples were taken in series and show fluctuating E. coli concentrations. Between samples 2.1 and 2.3 the concentrations appear to decrease 100 MNP/100 mL without additional drainage diluting the flow. The source of the 30 MPN/100mL spike between samples 2.3 and 2.4 is unknown because the field test collected showed no signs of wastewater indicators.

Variation between Phase I and Phase II sampling results within SD-6A, SD-14, and SD-15 may have been a result of Recycling Mechanical connecting to the Town sewer system, which was inspected in February 2016. This recent connection could have eliminated an illicit sewer discharge into the drainage system running along Ferry St. During Phase II sampling the drain coming from the Recycling Mechanical building was noted as dry.

### **Catchment Eighteen**

The E.coli test results for “frog pond” were 2 MNP/100mL, which was lower than anticipated because it was targeted as a high contaminate source. “Frog pond” was not tested during Phase I because the location was outside of the jurisdictional MS4 boundary.

Sample 2.8 was taken at the inlet to the Townhouse Road culvert, same location as sample 1.13, and resulted in a concentration of >1 MNP/100mL. The low concentrations found in “frog pond” and at the Townhouse Rd culvert leads us to believe that there are no E. coli sources upstream of the culvert.

A field test was conducted at the outlet of a 6” plastic pipe discharging upstream of the culvert inlet under Townhouse Road. The field test results did not indicate any presence of wastewater in the drainage, thus an E. coli test was not conducted. However, the iron bacteria observed is still of concern.

At the stream convergence adjacent to Meadow Lane, two samples, Samples 2.9 and 2.10, were taken from each branch of the converging stream. Both samples yielded low levels of E. coli, 10.9 MPN/100 mL and 14.8 MPN/100 mL, respectively. No samples were taken previously at these locations as the water was still at the time of Phase I sampling, however Sample 1.12 was taken just upstream of the convergence and Samples 1.11 and 1.11A were taken downstream within a catch basin. A comparison of the Phase I and Phase II samples show no correlation, thus no confident conclusions can be drawn based on these two isolated sampling events.

The Town is planning to reconstruct this portion of the sewer and drainage system in this area in the near future as it is known to historically be a problem area. Construction had not yet commenced at the time this report was written.

Wet weather sampling is planned to investigate the possibility of E. coli entering the system in surface water runoff. The lab and field results of this study are included in the Appendix of this report. An abbreviated representation of this information is presented in Table 2 below. The full version is in Table 3 which is included in the Appendix of this report.

**Table 2: E.Coli Sampling Results Phase II- April 2016**

Sample ID	Date / Time	E.Coli (MPN/100mL)	# mL's of sample	Manhole, Catch Basin, Outfall, or Open Channel	Catchment #
2.1	4-20-2016/9:11	<b>148.3</b>	100	MH	1
2.2	4-20-2016/9:20	<1	100	MH	1
2.3	4-20-2016/9:29	<b>54.8</b>	100	MH	1
2.4	4-20-2016/10:17	<b>86.0</b>	100	MH	1
2.5	4-20-2016/10:52	<b>81.6</b>	100	MH	1
2.6	4-20-2016/11:18	<b>161.6</b>	100	Brook	1
2.7	4-20-2016/11:38	<b>2.0</b>	100	Pond	18
2.8	4-20-2016/1:25	<1	100	Culvert	18
2.9	4-20-2016/1:33	<b>10.9</b>	100	Stream	18
2.10	4-20-2016/1:38	<b>14.8</b>	100	Stream	18
2.11	4-20-2016/1:51	<b>9.7</b>	100	Outfall	18

**Table 3: Results from Phase II Wastewater Constituent Field Tests**

Sample ID	Date	Ammonia (ppm)	Chlorine (mg/L)	Detergent (ppm)	Catchment #
2.FT1	20-Apr-2016	0	0	0.1	1
2.FT2	20-Apr-2016	0.25	0	0	18
2.FT3	20-Apr-2016	0.25	0	0.2	18

**Bold** font indicates that the analyte was detected.  
 < = "Less than" indicates that the analyte was detected, but still below the minimum detection limit.  
 Grey Shading indicates that the analyte was detected above the Threshold Limit of 235 cfu/100 mL.  
 > = "Greater than" indicates that the total E.coli counts were higher than the lab reporting levels.



## **Recommendations**

### **Catchment One**

The Phase II sampling results show the E. coli concentrations in Catchment One have decreased below recommended limit likely due to a possible illicit sewer discharge eliminated from the drainage system. It is recommended that the Town hold off on additional sampling and investigation. Once the MS4 General Permit is finalized in New Hampshire sampling of this outfall will be required. If the results of future required sampling show an increase in E. coli concentrations above the newly enforceable limit, the Town should consider investigation of possible contamination from the Canal Street brook.

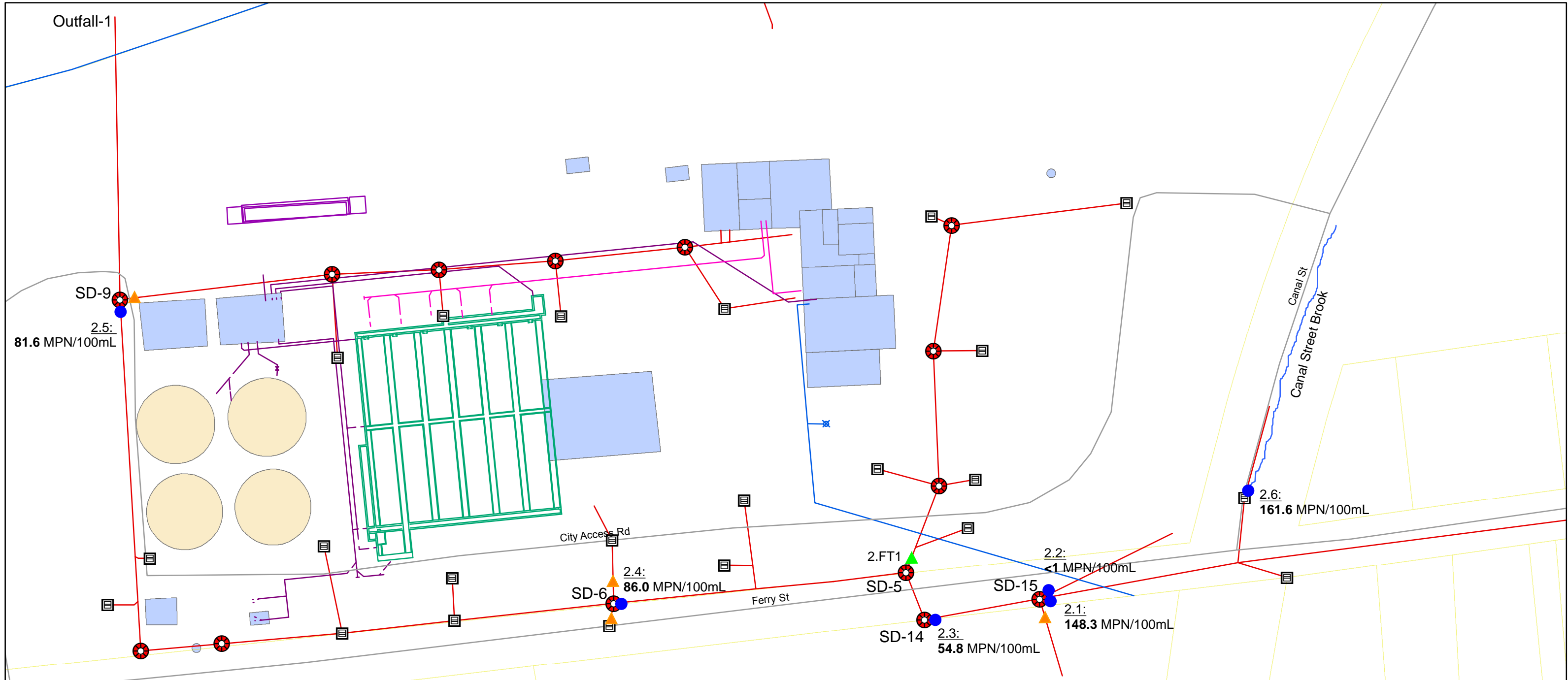
### **Catchment Eighteen**

E. coli concentrations in Catchment Eighteen have also been shown to be below the recommended limit during Phase II sampling. Without a potential known source of E. coli eliminated from the area, the cause of previously high E. coli concentrations detected in Phase 1 may be caused by surface water runoff. Phase 1 sampling was conducted in August when surface water is more stagnant. Planned wet weather sampling of Outfall 18 will provide additional information.

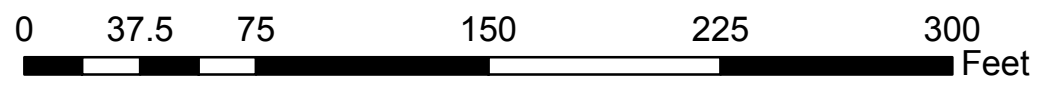
# Appendix

# Figures

# TOWN OF ALLENSTOWN, NEW HAMPSHIRE BACTERIAL SOURCE TRACKING AND SAMPLING - OUTFALL 1



Legend		14.8 MPN/100mL	E. coli Concentration	2.10: Sample #			
	Manhole		Roads		Sludge_Piping		TaxMap
	Catch_Basin		WaterEdge		Aeration_Tanks		Clarifier
	Scales		Airlines		DrainagePipesAT		WTF_Locations
	Field Test		Phase II Sample		Dry/No Flow		

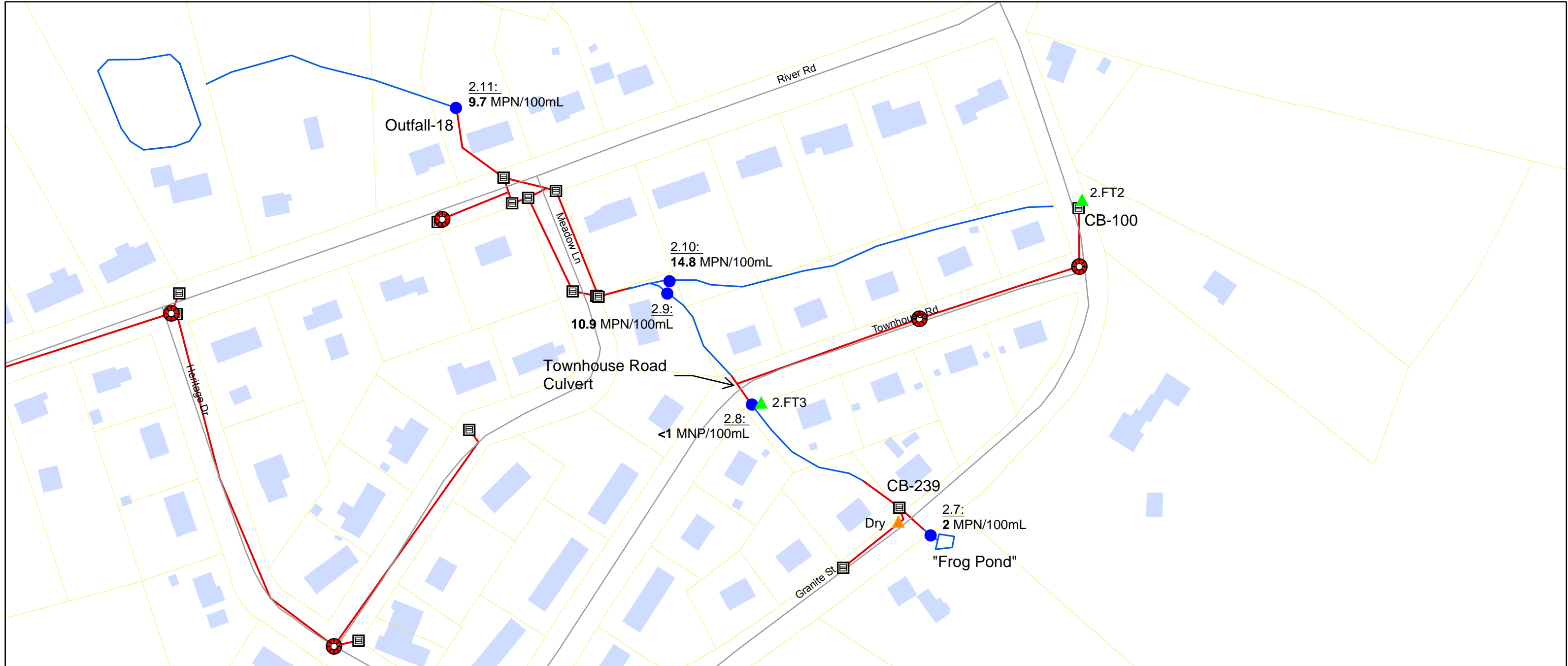


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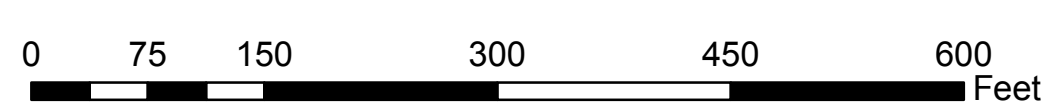
Date: July 2016

# TOWN OF ALLENSTOWN, NEW HAMPSHIRE

## BACTERIAL SOURCE TRACKING AND SAMPLING - OUTFALL 18



Legend		14.8 MPN/100mL	E. coli Concentration	2.10:	Sample #
	Manhole		Roads		TaxMap
	Catch_Basin		WaterEdge		Buildings
	Phase II Sample		Field Test		Dry/No Flow



Hoyle, Tanner  
& Associates, Inc.

Date: July 2016

# Lab Reports

Marisa DiBiaso  
Hoyle, Tanner & Associates, Inc.  
100 International Drive, Suite 360  
Portsmouth, NH 03801



Subject: Laboratory Report

Eastern Analytical, Inc. ID: 155100  
Client Identification: Allenstown  
Date Received: 4/20/2016

Dear Ms. DiBiaso :

Enclosed please find the laboratory report for the above identified project. All analyses were performed in accordance with our QA/QC Program. Unless otherwise stated, holding times, preservation techniques, container types, and sample conditions adhered to EPA Protocol. Samples which were collected by Eastern Analytical, Inc. (EAI) were collected in accordance with approved EPA procedures. Eastern Analytical, Inc. certifies that the enclosed test results meet all requirements of NELAP and other applicable state certifications. Please refer to our website at [www.eailabs.com](http://www.eailabs.com) for a copy of our NELAP certificate and accredited parameters.

The following standard abbreviations and conventions apply to all EAI reports:

- Solid samples are reported on a dry weight basis, unless otherwise noted
- < : "less than" followed by the reporting limit
- > : "greater than" followed by the reporting limit
- %R : % Recovery


Eastern Analytical Inc. maintains certification in the following states: Connecticut (PH-0492), Maine (NH005), Massachusetts (M-NH005), New Hampshire/NELAP (1012), Rhode Island (269) and Vermont (VT1012).

The following information is contained within this report: Sample Conditions summary, Analytical Results/Data, Quality Control data (if requested) and copies of the Chain of Custody. This report may not be reproduced except in full, without the the written approval of the laboratory.

If you have any questions regarding the results contained within, please feel free to directly contact me or the chemist(s) who performed the testing in question. Unless otherwise requested, we will dispose of the sample(s) 30 days from the sample receipt date.

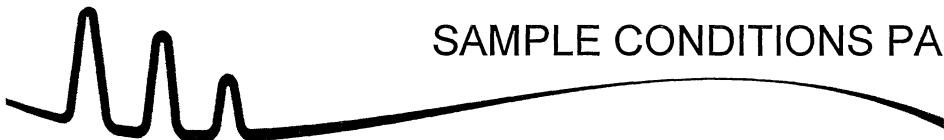
We appreciate this opportunity to be of service and look forward to your continued patronage.

Sincerely,

  
Lorraine Olashaw, Lab Director

4.26.16  
Date

5  
# of pages (excluding cover letter)



# SAMPLE CONDITIONS PAGE

EAI ID#: 155100

Client: **Hoyle, Tanner & Associates, Inc.**

Client Designation: **Allenstown**

Temperature upon receipt (°C): **1.1**

Received on ice or cold packs (Yes/No): **Y**

Acceptable temperature range (°C): 0-6

Lab ID	Sample ID	Date Received	Date Sampled	Sample Matrix	% Dry Weight	Exceptions/Comments (other than thermal preservation)
155100.01	1	4/20/16	4/20/16	aqueous		Adheres to Sample Acceptance Policy
155100.02	2	4/20/16	4/20/16	aqueous		Adheres to Sample Acceptance Policy
155100.03	3	4/20/16	4/20/16	aqueous		Adheres to Sample Acceptance Policy
155100.04	4	4/20/16	4/20/16	aqueous		Adheres to Sample Acceptance Policy
155100.05	5	4/20/16	4/20/16	aqueous		Adheres to Sample Acceptance Policy
155100.06	6	4/20/16	4/20/16	aqueous		Adheres to Sample Acceptance Policy
155100.07	7	4/20/16	4/20/16	aqueous		Adheres to Sample Acceptance Policy
155100.08	8	4/20/16	4/20/16	aqueous		Adheres to Sample Acceptance Policy
155100.09	9	4/20/16	4/20/16	aqueous		Adheres to Sample Acceptance Policy
155100.1	10	4/20/16	4/20/16	aqueous		Adheres to Sample Acceptance Policy
155100.11	11	4/20/16	4/20/16	aqueous		Adheres to Sample Acceptance Policy

Samples were properly preserved and the pH measured when applicable unless otherwise noted. Analysis of solids for pH, Flashpoint, Ignitibility, Paint Filter, Corrosivity, Conductivity and Specific Gravity are reported on an "as received" basis.

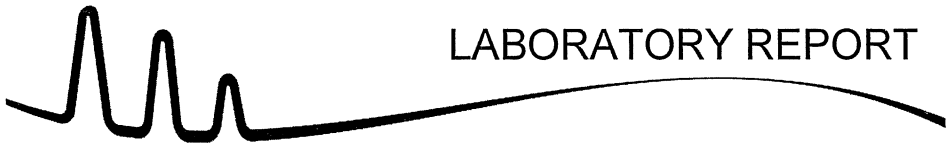
Immediate analyses, pH, Total Residual Chlorine, Dissolved Oxygen and Sulfite, performed at the laboratory were run outside of the recommended 15 minute hold time.

All results contained in this report relate only to the above listed samples.

References include:

- 1) EPA 600/4-79-020, 1983
- 2) Standard Methods for Examination of Water and Wastewater, 20th Edition, 1998 and 22nd Edition, 2012
- 3) Test Methods for Evaluating Solid Waste SW 846 3rd Edition including updates IVA and IVB
- 4) Hach Water Analysis Handbook, 2nd edition, 1992





# LABORATORY REPORT

EAI ID#: 155100

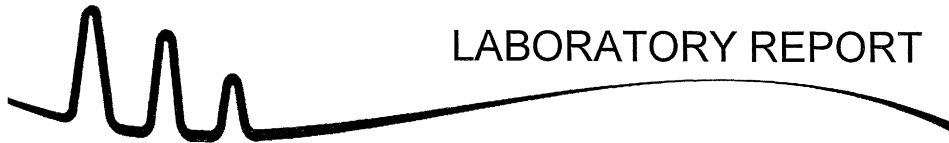
Client: Hoyle, Tanner & Associates, Inc.

Client Designation: Allenstown

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Sample ID:	1	2	3	4							
Lab Sample ID:	155100.01	155100.02	155100.03	155100.04							
Matrix:	aqueous	aqueous	aqueous	aqueous							
Date Sampled:	4/20/16	4/20/16	4/20/16	4/20/16							
Date Received:	4/20/16	4/20/16	4/20/16	4/20/16							
					Units	Analysis		Date	Time	Method	Analyst
E.coli	148.3	< 1	54.8	86.0	MPN/100ml	04/20/16	15:40	9223B	KL		

Sample ID:	5	6	7	8							
Lab Sample ID:	155100.05	155100.06	155100.07	155100.08							
Matrix:	aqueous	aqueous	aqueous	aqueous							
Date Sampled:	4/20/16	4/20/16	4/20/16	4/20/16							
Date Received:	4/20/16	4/20/16	4/20/16	4/20/16							
					Units	Analysis		Date	Time	Method	Analyst
E.coli	81.6	161.6	2.0	< 1	MPN/100ml	04/20/16	15:40	9223B	KL		



# LABORATORY REPORT

EAI ID#: 155100

Client: **Hoyle, Tanner & Associates, Inc.**

Client Designation: **Allenstown**

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<b>Sample ID:</b>	9	10	11						
<b>Lab Sample ID:</b>	155100.09	155100.1	155100.11						
<b>Matrix:</b>	aqueous	aqueous	aqueous						
<b>Date Sampled:</b>	4/20/16	4/20/16	4/20/16						
<b>Date Received:</b>	4/20/16	4/20/16	4/20/16						
<b>E.coli</b>	<b>10.9</b>	<b>14.8</b>	<b>9.7</b>	<b>MPN/100ml</b>	<b>4/20/16</b>	<b>15:40</b>	<b>9223B</b>	<b>KL</b>	



