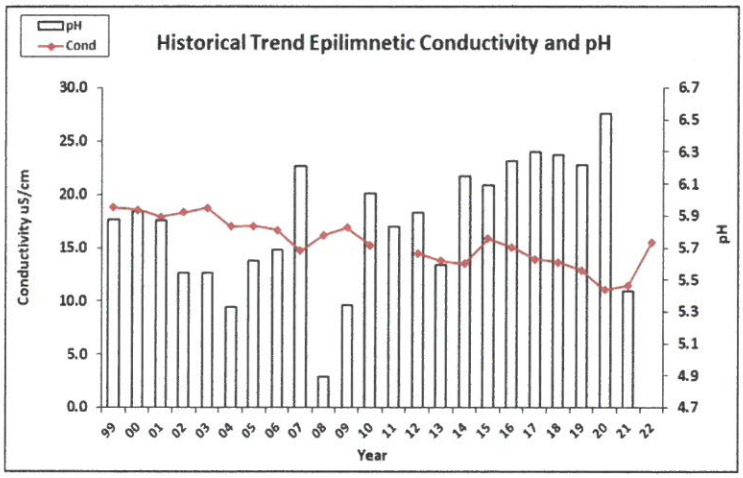
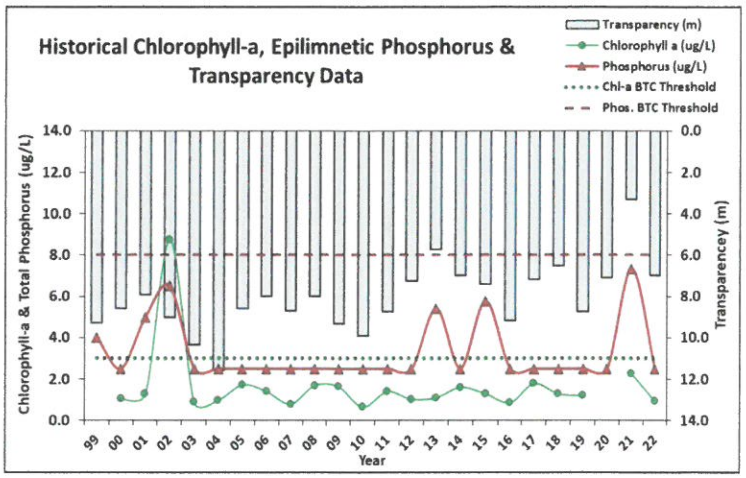
VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
LONG POND, LEMPSTER
2022 DATA SUMMARY

RECOMMENDED ACTIONS: Great job sampling in 2022! Pond quality is representative of oligotrophic, or high quality conditions. Epilimnetic pH levels have improved since 2008 and we hope to see this continue! Pond clarity (transparency) has declined since monitoring began and may be due to an increase in algal growth within the Metalimnion or thermocline of the pond. Or, it could also be a result of the pond becoming darker, or more tea colored, over time due to storm events flushing systems rich in dissolved organic acids that impart a tea color to the water. Apparent color data indicate darker water conditions since 2017, with the exception of the 2020 and 2022 droughts. Logging activity in the western sub-watershed of the pond may have influenced the occurrence of a cyanobacteria bloom in November of 2022. Logging can cause pulses of nutrients to be transported to ground and surface waters during storm events and these nutrients can fuel cyanobacteria growth. Be aware of potential cyanobacteria blooms or scums and report to NHDES' Harmful Algal Bloom Program. If possible, increase monitoring frequency to once per month, typically June, July and August, to better assess seasonal variations and historical trends, particularly in hypolimnetic dissolved oxygen and phosphorus levels. Keep up the great work!

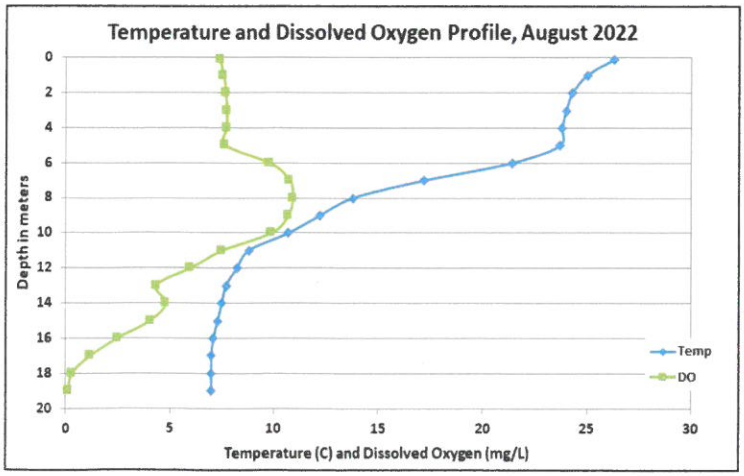
HISTORICAL WATER QUALITY TREND ANALYSIS

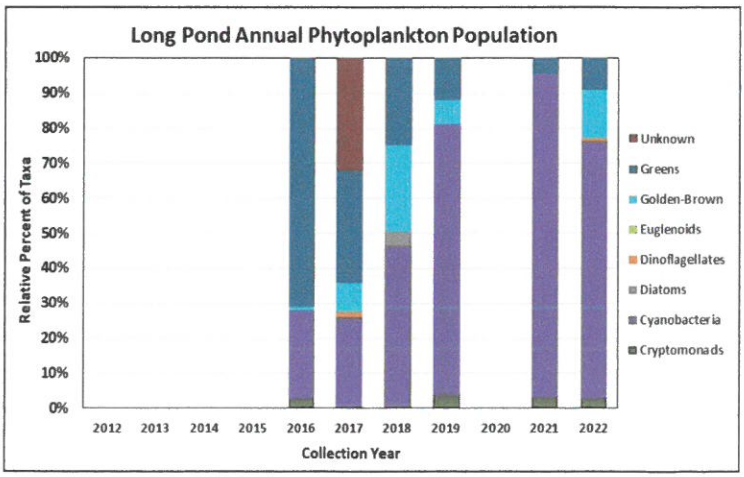
Parameter	Trend	Parameter	Trend
Conductivity	Improving	**Chlorophyll-a**	Stable
pH (epilimnion)	Improving	**Transparency**	Worsening
		Phosphorus (epilimnion)	Stable





DISSOLVED OXYGEN AND PHYTOPLANKTON
(Note: Information may not be collected annually)





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LONG POND, LEMPSTER
2022 DATA SUMMARY

OBSERVATIONS *(Refer to Table 1 and Historical Deep Spot Data Graphics)*

- **CHLOROPHYLL-A:** Chlorophyll level was within a low range in August, decreased from 2021, and was less than the state median and the threshold for oligotrophic lakes. Historical trend analysis indicates stable, yet variable, chlorophyll levels since monitoring began.
- **CONDUCTIVITY/CHLORIDE:** Epilimnetic (upper water layer), Metalimnetic (middle water layer), Hypolimnetic (lower water layer), Back Cove, and Outlet conductivity and/or chloride levels were very low and much less than the state medians. Historical trend analysis indicates significantly decreasing (improving) epilimnetic conductivity levels since monitoring began.
- **COLOR:** Apparent color measured in the epilimnion indicates the water was clear with little to no tea, or brown, coloring in August.
- **E. COLI:** High Ledge and Public Beach E. coli levels were very low and much less than the state standards for public beaches and surface waters.
- **TOTAL PHOSPHORUS:** Epilimnetic phosphorus level was within a very low range in August, decreased from 2021, and was much less than the state median and the threshold for oligotrophic lakes. Historical trend analysis indicates stable, yet variable, epilimnetic phosphorus levels since monitoring began. Metalimnetic and Hypolimnetic phosphorus levels were also within a low range and decreased from 2021. Back Cove and Outlet phosphorus levels were within a low range for NH lakes but slightly above average for those stations.
- **TRANSPARENCY:** Transparency measured without the viewscope (NVS) was below average (worse) for the pond in August likely due to wave conditions, increased (improved) greatly from the low level measured in 2021, and was much higher (better) than the state median. However historical trend analysis indicates significantly decreasing (worsening) NVS transparency since monitoring began. Viewscope (VS) transparency was slightly higher (better) than NVS transparency and a better measure of actual conditions.
- **TURBIDITY:** Epilimnetic, Metalimnetic, Hypolimnetic, Back Cove and turbidity levels were within a low range. Outlet turbidity levels were within a low range for NH lakes, but slightly elevated for that station.
- **PH:** Epilimnetic pH data was invalidated due to a laboratory instrument error and we apologize for the inconvenience. Historical trend analysis indicates significantly increasing (improving) epilimnetic pH levels since monitoring began. Metalimnetic, Back Cove and Outlet pH levels were slightly less than the desirable range 6.5-8.0 units. Hypolimnetic pH level was slightly acidic, less than desirable and potentially critical to aquatic life.

Station Name	Table 1. 2022 Average Water Quality Data for LONG POND - LEMPSTER										
	Alk. (mg/L)	Chlor-a (ug/L)	Chloride (mg/L)	Color (pcu)	Cond. (us/cm)	E. coli (mpn/100mL)	Total P (ug/L)	Trans. (m)		Turb. (ntu)	pH
								NVS	VS		
Epilimnion	2.0	0.94	2	20	15.5		3	7.00	7.60	0.19	7.41
Metalimnion					14.7		5			0.42	6.23
Hypolimnion					17.1		8			0.30	5.60
Back Cove					15.8		7			0.36	6.07
High Ledge						1					
Public Beach						1					
Outlet					16.0		8			0.83	6.07

NH Median Values

Median values generated from historic lake monitoring data.

Alkalinity: 4.5 mg/L
Chlorophyll-a: 4.39 ug/L
Conductivity: 42.3 uS/cm
Chloride: 5 mg/L
Total Phosphorus: 11 ug/L
Transparency: 3.3 m
pH: 6.6

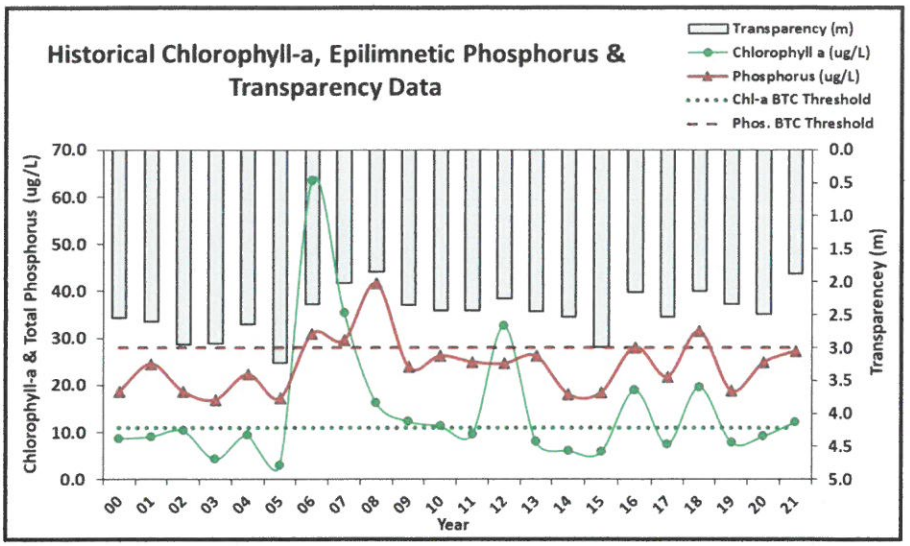
NH Water Quality Standards

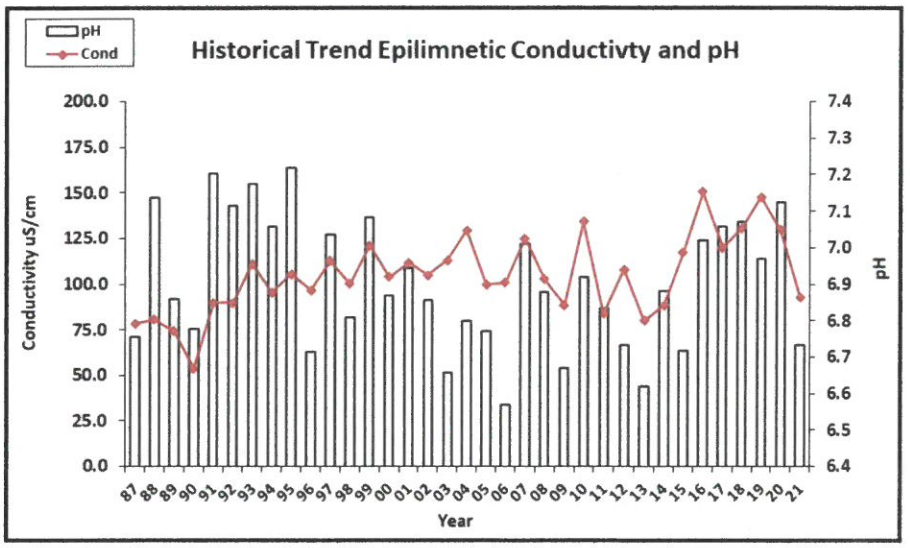
Numeric criteria for specific parameters. Water quality violation if thresholds exceeded.

Chloride: > 230 mg/L (chronic) **Turbidity:** > 10 NTU above natural
E. coli: > 88 cts/100 mL (beach)
E. coli: > 406 cts/100 mL (surface waters)
pH: between 6.5-8.0 (unless naturally occurring)

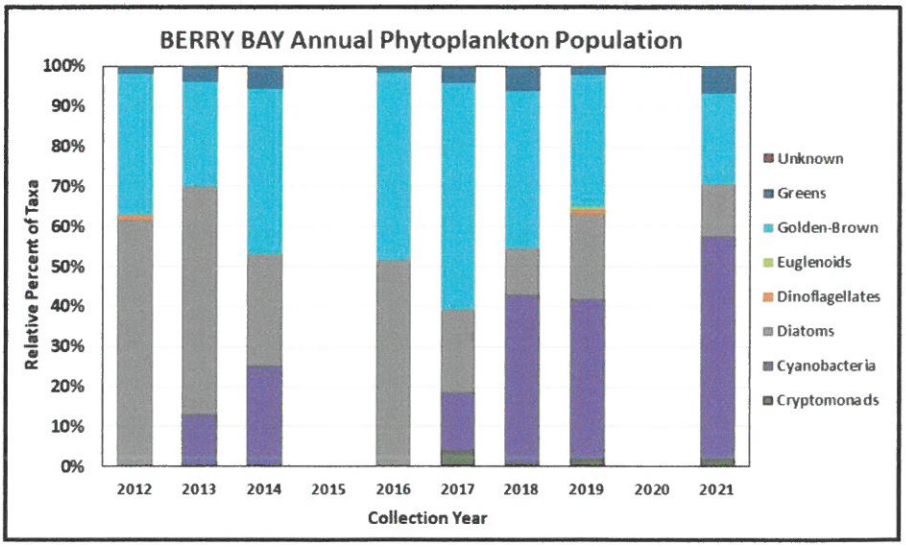
HOW TO READ YOUR VLAP REPORT

WATER QUALITY TREND ANALYSIS: Understanding how lake water quality has changed over time can identify potential problems and help guide watershed management activities. Statistical analyses are conducted on various parameters where ten or more consecutive years of data are available. Specifically, linear regression analyses are utilized to determine if the annual mean value of a parameter has changed significantly, increased or decreased, over time. A parameter has significantly changed if the significance value is less than 0.05, meaning there is 95% confidence that the values have increased or decreased. If there is not a significant change, then we look at the coefficient of variation to determine how stable or variable are the data. The graphics depict the average annual value for chlorophyll-a, transparency, and Epilimnetic total phosphorus, pH and conductivity. A significant increase in chlorophyll-a, total phosphorus and conductivity means that data are degrading or worsening over time; while a significant decrease means the data are improving over time. The opposite holds true for pH and transparency; a significant increase means the data are improving, while a significant decrease means the data are degrading or worsening. Total phosphorus and chlorophyll data are compared with the threshold associated with the lake's best trophic classification (BTC). Values above the thresholds are generally considered poor, while values below the thresholds are considered good (see page 1 for parameter thresholds).



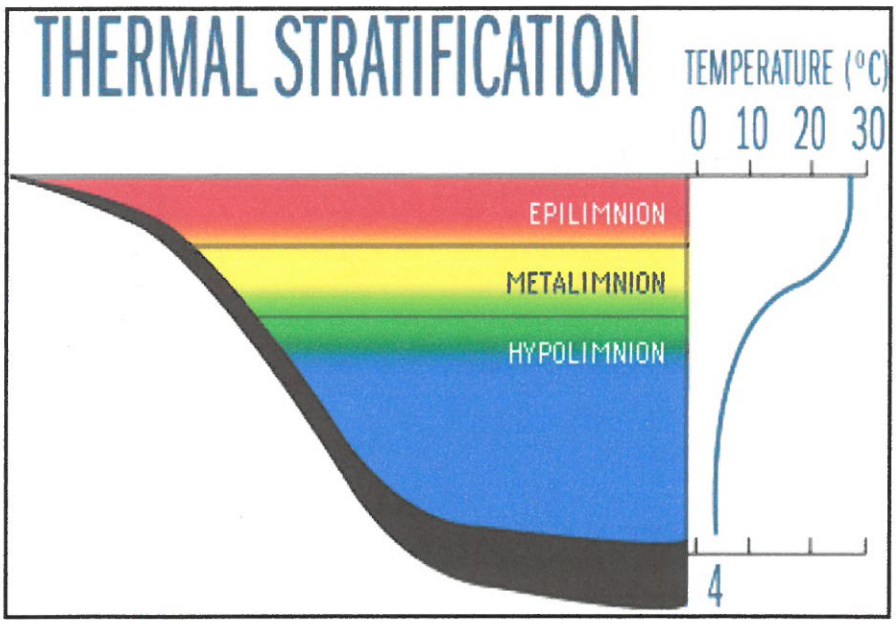


PHYTOPLANKTON: Microscopic plants, or algae, form the basis of the lake's food chain. They need sunlight and nutrients to grow and are typically found in the warmer Epilimnetic and Metalimnetic waters. The type of phytoplankton present in a lake can be used as an indicator of general lake quality and shifts in the dominant algal population over time can be an early warning to shifts in the aquatic ecosystem. Diatoms and golden-brown algae are typically found in the spring and fall, while green algae and cyanobacteria are more common in mid to late summer. An abundance or shift to cyanobacteria dominance over time may indicate excessive phosphorus or that the lake ecology is out of balance. Diatoms and golden-brown algae are typical of NH's less productive lakes. ***Note: Phytoplankton graphics are not included in all lake reports.***



HOW TO READ YOUR VLAP REPORT

DISSOLVED OXYGEN AND TEMPERATURE PROFILE: Depicts the amount of oxygen dissolved in water at various temperatures from the lake's surface to bottom. Dissolved oxygen (DO) in lake water is used by all forms of aquatic life and can help to assess the "health" of the lake ecosystem. NH's lakes typically mix twice annually; spring and fall. Spring turnover of lake water occurs after ice out as warmer air temperatures heat up surface waters. Eventually, the lake becomes thermally stratified with a layer of warm surface water overlying layers of dense cold water. Eventually three distinct layers form called the Epilimnion, Metalimnion, and Hypolimnion, and waters in these layers do not mix freely during summer months. Layers can be determined by looking at the DO/Temperature profile and graphic. Typically, DO is greater in the epilimnion due to wind and wave action mixing atmospheric oxygen into surface waters, as well as algal growth producing oxygen as a by-product of photosynthesis. As you move into the Metalimnion and Hypolimnion, DO can decrease to low levels as these layers do not get re-oxygenated and microbial activity utilizes DO to break down organic matter in bottom sediments. When fall arrives and colder air temperatures cool surface waters, fall turnover occurs, mixing the thermal layers until they are a uniform temperature and DO levels recover at deeper depths. Understanding DO and temperature patterns is important to lake management. These patterns reflect and influence lake productivity, physical properties, phosphorus cycling, and fish and aquatic animal populations. ***Note: Dissolved oxygen and temperature profiles are not included in all lake reports.***



OBSERVATIONS AND RECOMMENDATIONS SECTION

Chlorophyll-a: A photosynthetic pigment found in plants, including algae, and measured to estimate amount of algal growth in a lake system. Elevated chl-a levels indicate excessive algal growth typically caused by too many nutrients (phosphorus).

Conductivity/Chloride: Conductivity measures the ability of water to carry an electrical current. It is determined by the number of ions and minerals present. Chloride ion is naturally occurring in seawater, but less so in freshwaters. NH's soft water has naturally low conductivity and chloride values. Elevated conductivity and chloride may indicate pollution from such sources as road salting, septic systems, wastewater treatment plants, or agriculture runoff.

Color: A visual measure of the color of water. This color is generally caused by decaying organic matter or by naturally occurring metals in the soils, such as iron and manganese. A highly colored lake generally has extensive wetlands along the shore or within the watershed, and often a mucky bottom, conditions often associated with eutrophic waters.

E. coli: *E. coli* is a natural component of the large intestines of humans and other warm-blooded animals. *E. coli* is used as an indicator organism for bacteriological monitoring because it is easily cultured and its presence in the water in defined amounts indicates that fecal matter MAY be present.

Total Phosphorus: Total phosphorus is a measure of all the phosphorus forms present in the water, including both inorganic and organic forms. In freshwater, it is the limiting nutrient that determines the amount of algal growth that can occur. Too much phosphorus can lead to excessive algal and cyanobacteria populations.

Transparency: Transparency, a measure of water clarity, is affected by the amount of algae, color, and particulate matter within a lake. It is measured using a 20 cm black and white Secchi disk.

Turbidity: Turbidity in the water is caused by suspended matter (such as clay, silt, and algae) that cause light to be scattered and absorbed, not transmitted in straight lines through water.

pH: pH is a measure of the hydrogen ions in the water or, in general terms, the acidity. New Hampshire lakes historically have slightly acidic pH levels due to acid rain and granite bedrock lacking in minerals that counteract inputs of the acid rain. Lake pH is important to the survival and reproduction of fish and other aquatic life.

EAI Analytical Labs

33 Whittemore Farm Road Swanzey, NH 03446
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Analytical Report Form

Client: Ashuelot River LAC
Contact: Barbara Skuly
Address: 19 Spring St., Swanzey, NH 03446
Phone: (603) 352-0987
email: bskuly@ne.rr.com

Project Description: E. coli river monitoring
Sample Type: surface water grabs
Sampled By: various, see COC
Report Date: September 16, 2022

Sample ID #	Sample Location	Date and Time Collected	Date and Time Analysis Completed	Analyst	Analyte	Method #	Detection Limit	Result	Unit of Measure
88208	28-ASH Pillsbury	9/15/22 0920	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**5**	MPN Index / 100mL
88209	27-ASH Mountain Rd.	9/15/22 0810	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**107**	MPN Index / 100mL
88210	24A-ASH Marlow	9/15/22 0815	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**80**	MPN Index / 100mL
88211	23-ASH Gilsum	9/15/22 0745	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**365**	MPN Index / 100mL
88212	20A-ASH Stone Arch Keene	9/15/22 0809	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**345**	MPN Index / 100mL
88213	18-ASH Rte 101	9/15/22 0835	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**727**	MPN Index / 100mL
88214	18-ASH Repl Rte 101	9/15/22 0835	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**579**	MPN Index / 100mL
88215	2-SBA Rte 32	9/15/22 0910	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**2,420**	MPN Index / 100mL
88216	16D-ASH U/S of Keene WWTF	9/15/22 0912	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**1,203**	MPN Index / 100mL
88217	16A-ASH mouth South Branch	9/15/22 0825	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**1,986**	MPN Index / 100mL
88218	16-ASH Cresson Cvd Bdg	9/15/22 1004	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**1,300**	MPN Index / 100mL
88219	15A-ASH Thompson Cvd Bdg	9/15/22 0950	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**1,203**	MPN Index / 100mL
88220	07-ASH Winchester	9/15/22 0841	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**2,420**	MPN Index / 100mL
88221	01-ASH Hinsdale	9/15/22 0804	9/16/22 1100	KC	E. coli	SM 9223B Quanti-Tray 18hr.	1	**1,300**	MPN Index / 100mL

Results relate only to the samples, as received by EAI Analytical Labs.

EAI Analytical Labs maintains accreditation with the State of New Hampshire Environmental Laboratory Accreditation Program (NHELAP), adhering to all standards put forth by the National Environmental Laboratory Accreditation Conference (NELAC). EAI Analytical Labs is certified by the States of Vermont and Massachusettes.

US EPA ID Code: NH01013
NH Laboratory Certification Number: 1007
VT Laboratory Number: VT - 100704
Laboratory Director: Daniel Crosby

NELAP ACCREDITED TNI LABORATORY

KC 9/16/2022
Reviewed by: