# Memorandum

**To:** Ms. Colleen Conover, Lake Hopatcong Commission

**From:** Will Kelleher, Princeton Hydro

**CC:** Fred Lubnow, Ph.D., Princeton Hydro

Patrick Rose, Princeton Hydro

**RE:** 29 July 2022 – Cyanotoxin Testing – Lake Hopatcong

**Pages:** eight

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Princeton Hydro conducted the first of two 2022 cyanobacteria / cyanotoxin testing events at Lake Hopatcong on 29 July 2022. The data collected as part of this effort are provided below.

*Methodology*

Princeton Hydro sampled at nine (9) stations on 29 July 2022. At each station, plankton grab samples were collected, preserved with Lugol's. The cyanobacteria community was identified to genus and densities were quantified as cells / mL. In addition, at each site samples were collected in glass vials and analyzed the same day for the cyanotoxin microcystin utilizing Abraxis Algal Toxin Test Strip Kits and read with an Abraxis Field Meter. It should be noted that this analytical methodology is not NJ-State certified, however, the resulting data can be used for informational and management purposes. *In-situ* monitoring was also conducted at each station utilizing an In-Situ AquaTROLL 500 water quality meter which was calibrated prior to use; Princeton Hydro is State certified in its use of field meters (#10006). *In-situ* phycocyanin and chlorophyll-*a* concentrations were also measured at each station with Turner fluoroprobes. The locations of the sample stations are shown in the figure attached to the end of this memo. Stations B1-B8 from previous years were once again sampled during this event, with a new B10 being established in the northern portion of Crescent Cove. An updated figure of the three sampling stations in the River Styx / Crescent Cove area, including the new location of B10, is provided at the end of the report.

*Results*

The results of the sampling effort are listed in the following tables (Tables 1 through 5).

**Table 1: Cyanotoxin Data**

| Station | Microcystin Test Result |
|---|---|
| B1 | Negative |
| B2 | Negative |
| B3 | Negative |
| B4 | Negative |
| B5 | Negative |
| B6 | Negative |
| B7 | Negative |
| B8 | Negative |
| B10 | Negative |

**Table 2: *In-situ* Data**

| *In-Situ* Data 7/29/22 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Station | Depth (meters) | | Temperature | Specific Conductance | Dissolved Oxygen | | pH |
| | Secchi | Sample | °C | µS/cm | mg/L | % Sat. | S.U. |
| B1 | 0.9 | 0.5 | 27.37 | 406.25 | 8.33 | 108.94 | 7.93 |
| B2 | 1.0 | 0.5 | 27.13 | 454.33 | 7.43 | 96.71 | 7.68 |
| B3 | 0.4 | 0.5 | 26.23 | 624.05 | 7.14 | 97.26 | 7.89 |
| B4 | 0.4 | 0.5 | 25.78 | 674.39 | 7.32 | 99.08 | 7.90 |
| B5 | 1.5 | 0.5 | 26.48 | 458.90 | 7.43 | 95.69 | 7.67 |
| B6 | 0.9 | 0.5 | 26.44 | 439.72 | 6.51 | 83.63 | 7.44 |
| B7 | 0.2+ | 0.5 | 26.40 | 458.78 | 7.20 | 92.55 | 7.62 |
| B8 | 1.5 | 0.5 | 27.08 | 456.15 | 7.81 | 101.38 | 7.85 |
| B10 | 0.4 | 0.5 | 27.39 | 592.85 | 11.48 | 149.92 | 9.12 |

**Table 3: Observations**

| Station | Observations |
|---|---|
| B1 | Fine particulates and a yellow/brown hue |
| B2 | Fine particulates and a yellow/brown hue |
| B3 | Very green water with an abundance of particulates |
| B4 | Consistent with B3, green hue and cloudy appearance with an abundane of suspended pariculates |
| B5 | Mostly clear water with few suspended particulates observed |
| B6 | Brown/yellow hue with a moderate density of suspended particulates |
| B7 | Slight brown hue with some fine suspended particulates |
| B8 | Moderate density of fine particulates |
| B10 | Dense accumulation of suspended particulates, cloudy green appearance, and some wind blown accumulation |

**Table 4: Phycocyanin and Chlorophyll *a* Concentrations**

| Station | Phycocyanin | Chlorophyll a |
|---|---|---|
| | ppb | ppb |
| B1 | 22 | 15 |
| B2 | 17 | 16 |
| B3 | 133 | 17 |
| B4 | 137 | 17 |
| B5 | 15 | 9 |
| B6 | 25 | 22 |
| B7 | 32 | 23 |
| B8 | 18 | 13 |
| B10 | 140 | 17 |

**Table 5: Plankton Data**

| Cyanobacteria Community Composition Analysis | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Location: Lake Hopatcong | | Sampling Date: 7/29/22 | | | | Examination Date: 8/1/22 | | | |
| Cyanophyta (Blue-Green Algae) | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B10 |
| *Aphanizomenon* | 29,910 | 32,309 | 220,948 | 193,880 | 24,518 | 42,937 | 41,929 | 25,698 | 170,931 |
| *Aphanocapsa* | | | | | | | | 4,509 | |
| *Cylindrospermopsis* | 1,394 | | 459,572 | 419,932 | 10,980 | 6,047 | | 1,713 | 918,442 |
| *Dolichospermum* | 6,111 | | | | | 202 | 1,123 | 1,533 | 10,423 |
| *Microcystis* | 1,286 | 18,136 | 7,070 | 2,117 | 5,117 | 9,676 | 3,494 | 2,615 | 417 |
| *Pseudanabaena* | 64,001 | 30,147 | 71,587 | 140,542 | 33,365 | 54,628 | 37,686 | 34,625 | 79,212 |
| *Woronichinia* | 429 | | 2,209 | 847 | 746 | 5,846 | 9,983 | | |
| Total Cyanobacteria Cells/mL | 103,130 | 80,593 | 761,386 | 757,317 | 74,725 | 119,336 | 94,215 | 70,693 | 1,179,424 |

*Results*

A total of seven cyanobacteria genera were identified in the near-shore samples. Cyanobacteria densities were elevated throughout the lake and all stations had cell counts that exceeded 80,000 cells/mL which would all fall under the "Advisory" HAB Alert Level. Note, since these data were not developed by NJDEP, they can not be used for regulatory purposes. However, the data can be used for both educational and management purposes.

All three stations in the River Styx / Crescent Cove area had cyanobacteria cell counts that exceeded 700,000 cells/mL which is indicative of an intense cyanobacteria bloom. Cyanobacteria cell counts ranged from a minimum of 70,693 cells/mL at B7 to a maximum of 1,179,424 cells/mL at B10. The dominant genus varied by station and included *Cylindrospermopsis, Aphanizomenon, and Pseudanabaena*. Please note that the *Pseudanabaena* genus is comprised of extremely fine filaments and thus does not account for as much biovolume as some of the bigger genera, such as *Microcystis or Dolichospermum*. This may explain why the stations outside of the River Styx / Crescent Cove area had cyanobacteria cell counts much higher than the respective phycocyanin concentrations would suggest. The dominant genus in the River Styx / Crescent Cove bloom was *Cylindrospermopsis*.

Phycocyanin concentrations were elevated in several stations throughout the lake, most notably within Crescent Cove where concentrations reached a maximum of 140 ppb (Table 4). Outside of Crescent Cove, phycocyanin readings varied from 15 ppb at B5 to 32 ppb at B7. Based on these results, cyanobacteria densities are elevated throughout the lake with an active bloom present in the River Styx / Crescent Cove area.

Microcystins were negative at all nine stations, indicating that concentrations were absent or well below the detection limit for these tests (<1 ppb). Please note that while microcystins is typically the most common group of cyanotoxins found in freshwater systems, they are only one group. Other cyanotoxins that NJDEP has recommended thresholds for include cylindrospermopsin, anatoxin-a and saxitoxin. However, these other cyanotoxins tend to be rare in New Jersey lakes and reservoirs.

Although no cyanotoxins were detected in the River Styx / Crescent Cove area from the samples collected on 29 July, these conditions can change rapidly. The extremely elevated cyanobacteria cell counts pose a continued risk that cyanotoxins may be present. The risk for cyanotoxin exposure may increase following an algaecide treatment, as cyanobacteria can release cyanotoxins upon senescence.

Photos of all stations can be found at the end of this document. Overall, clarity at stations outside of Crescent Cove was good and visual conditions were normal for this period of the year.

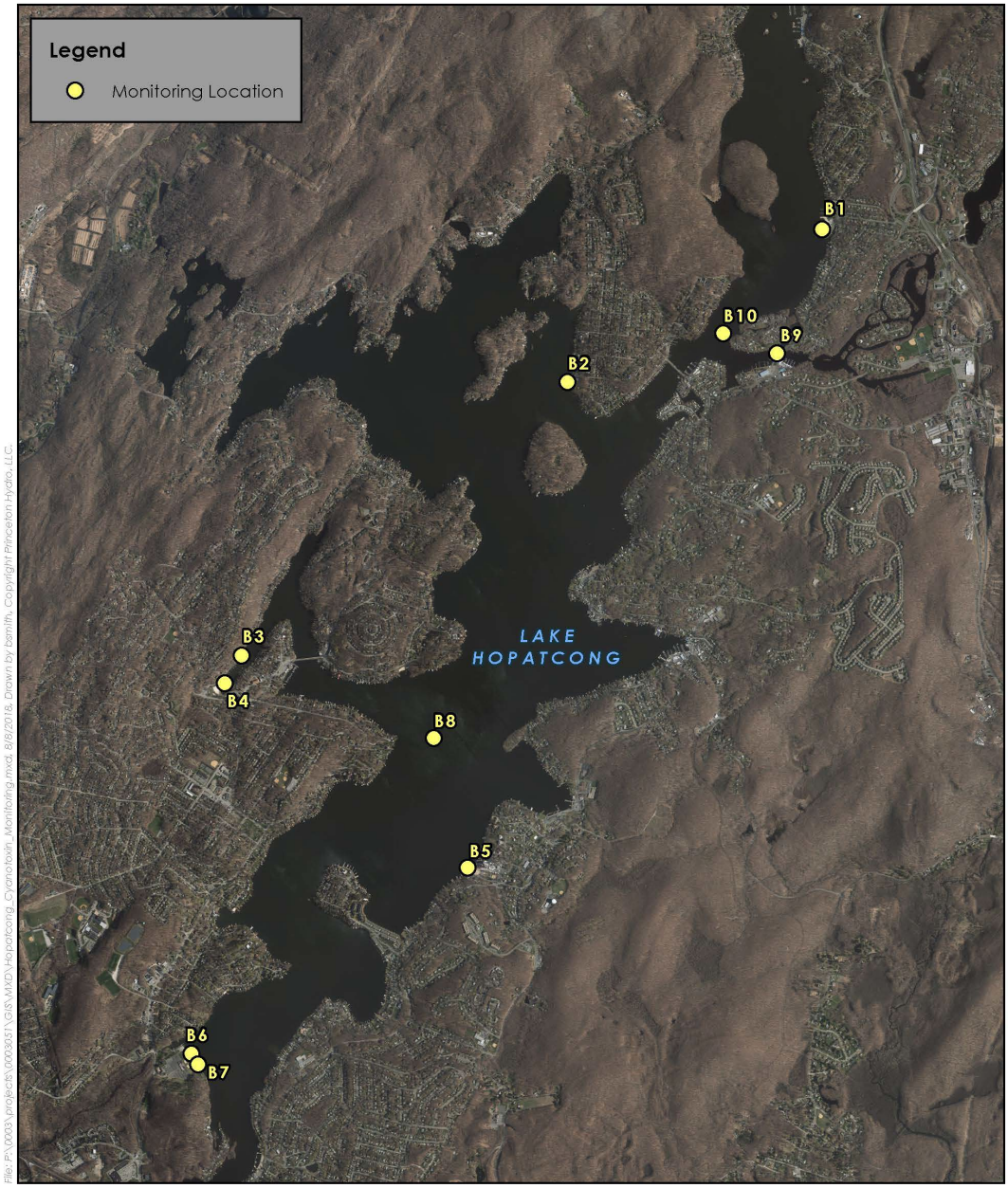
The report from local residents about a potential HAB at Shore Hills Beach appears to have been a wind-blown accumulation within the boat launch area. While the near-shore boat launch had some accumulated algal biomass, the beach area looked normal upon visiting the site (see photos). Additionally, the Air Curtain was in operation and contributed toward preventing an accumulation of cells in the beach area, where the cyanobacteria cell count was 175,338 cells / mLs. In contrast, the boat launch area had a cell count of 1,797,360 cells / mLs.

Please feel free to contact myself, Patrick Rose, or Dr. Fred Lubnow with any questions or concerns.

Sincerely,

Will Kelleher
Staff Scientist
Princeton Hydro, LLC

**Site Location Map**




File: P:\0003\projects\0003051\GIS\MXD\Hopatcong_Cyanotoxin_Monitoring.mxd, 8/8/2018, Drawn by bsmith, Copyright Princeton Hydro, LLC.

NOTES:
1. Monitoring locations are approximate.
2. 2015 orthoimagery obtained from NJ Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS).

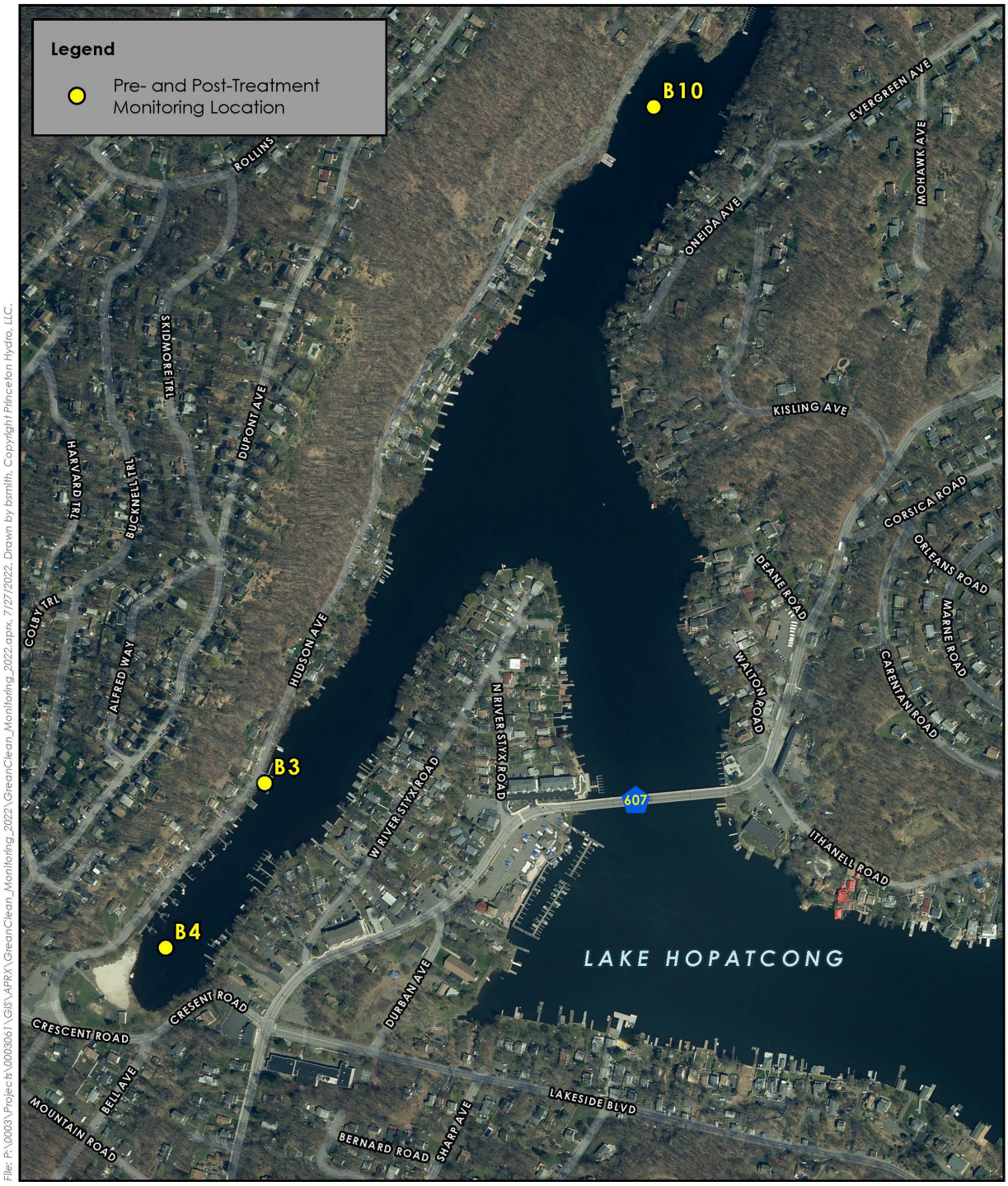
0 2,000 4,000 Feet

Map Projection: NAD 1983 StatePlane New Jersey FIPS 2900 Feet

**CYANOTOXIN MONITORING LOCATION MAP**

LAKE HOPATCONG
MORRIS AND SUSSEX COUNTIES
NEW JERSEY

PRINCETON HYDRO
SCIENCE DESIGN ENGINEERING
www.PrincetonHydro.com




File: P:\0003\Projects\0003061\GIS\APRX\GreanClean_Monitoring_2022\GreanClean_Monitoring_2022.aprx, 7/27/2022, Drawn by bsmith, Copyright Princeton Hydro, LLC.

NOTES:
1. Monitoring locations are approximate.
2. Roads obtained from the NJ Geographic Information Network (NJGIN) Open Data portal: https://njgin.nj.gov/
3. 2020 orthoimagery obtained from NJ Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS).

0 250 500 Feet

Map Projection: NAD 1983 StatePlane New Jersey FIPS 2900 Feet

## 2022 GREENCLEAN TREATMENT MONITORING LOCATIONS

LAKE HOPATCONG COMMISSION
BOROUGH OF HOPATCONG
SUSSEX COUNTY
NEW JERSEY

PRINCETON HYDRO
SCIENCE DESIGN ENGINEERING
www.PrincetonHydro.com

**Photographs of Near-Shore Sampling Sites**

**B1**

**B2**

**B3**

**B4**

**B5**

**B6**

**B7**

**B8**

**B10**

**Shore Hills Boat Launch**

**Shore Hills Beach**