Memorandum

To: Ms. Colleen Conover, Lake Hopatcong Commission

From: Patrick Rose, Princeton Hydro

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

RE: 19 August 2022 – Cyanotoxin Testing – Lake Hopatcong

Pages: eight

Princeton Hydro conducted the second of two 2022 cyanobacteria / cyanotoxin testing events at Lake Hopatcong on 19 August 2022. The data collected as part of this effort are provided below.

Methodology

Princeton Hydro sampled at nine (9) stations on 19 August 2022. At each station, plankton grab samples were collected and 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 8/19/22							
Station	Depth (meters)		Temperature	Specific Conductance	Dissolved Oxygen		pH
	Secchi	Sample	°C	µS/cm	mg/L	% Sat.	S.U.
B1	0.7+	0.5	25.65	427.20	9.50	119.60	8.07
B2	1.0	0.5	25.30	461.80	8.58	107.50	7.84
B3	0.4	0.5	24.48	539.60	8.37	98.90	8.26
B4	0.4	0.5	23.49	555.40	6.85	82.70	7.71
B5	0.9+	0.5	25.25	459.20	8.72	108.80	8.10
B6	0.8+	0.5	24.12	401.60	7.95	97.10	7.65
B7	0.8+	0.5	24.16	400.20	7.84	96.20	7.60
B8	1.2	0.5	25.30	455.60	8.91	111.30	8.16
B10	0.4	0.5	25.07	519.20	11.14	138.60	8.82

Table 3: Observations

Station	Observations
B1	Cloudy yellow/green water
B2	Yellow/green water color
B3	Green water due to the presence of planktonic cyanobacteria
B4	Green water due to the presence of planktonic cyanobacteria
B5	Green water due to the presence of planktonic cyanobacteria; light surface streak accumulation
B6	Cloudy yellow/green water with fine particulates
B7	Cloudy yellow/green water with fine particulates
B8	Green water due to the presence of planktonic cyanobacteria; abundance of fine particulates at the surface
B10	Green water due to the presence of planktonic cyanobacteria; light surface streak accumulation

Table 4: Phycocyanin and Chlorophyll *a* Concentrations

Station	Phycocyanin	Chlorophyll a
	ppb	ppb
B1	32	11
B2	18	6
B3	83	16
B4	71	11
B5	29	6
B6	25	14
B7	24	11
B8	25	4
B10	79	10

Table 5: Plankton Data

Cyanobacteria Community Composition Analysis									
Sampling Location: Lake Hopatcong	Sampling Date: 8/19/22					Examination Date: 8/23/22			
Cyanophyta (Blue-Green Algae)	B1	B2	B3	B4	B5	B6	B7	B8	B10
Aphanizomenon	10,749	99,780	34,305	16,238	36,476	22,942	50,539	22,950	131,957
Aphanocapsa				8,005					
Cylindrospermopsis	261,978	33,635	559,939	480,732	62,974	91,338	80,231	55,969	391,598
Dolichospermum	4,231	3,800	4,765		6,209			363	1,068
Microcystis	6,975	282	572	686	222	1,577	2,780	363	712
Pseudanabaena	4,688	11,399		8,005	6,098	2,438	3,159	3,175	10,087
Woronichinia	686		191	686		143	253		
Total Cyanobacteria Cells/mL	289,308	148,896	599,771	514,351	111,978	118,439	136,961	82,819	535,422

Summary

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 500,000 cells/mL which is indicative of an intense cyanobacteria bloom. However, please note that cyanobacteria densities at all three stations in this area decreased relative to the first cyanotoxin event as a result of the GreenClean treatment. Specifically, cell counts at B3, B4, and B10 decreased 21%, 32%, and 55%, respectively. Cyanobacteria densities increased relative to the first cyanotoxin event at all other stations, with the exception of B6.

Cyanobacteria cell counts ranged from a minimum of 82,819 cells/mL at B8 to a maximum of 599,771 cells/mL at B3. The dominant genus was *Cylindrospermopsis* at all stations besides B2, in which *Aphanizomenon* was the

dominant genus. The main body of the lake had a greener color than during the July cyanotoxin event, similar to the water color in River Styx / Crescent cove but not as intense. This color change is likely related to the relative increase of the planktonic cyanobacteria genus *Cylindrospermopsis* throughout the lake.

Phycocyanin values were most elevated within Crescent Cove again, although similar to cyanobacteria densities, phycocyanin values at B3, B4, and B10 decreased 38%, 48%, and 44%, respectively (Table 4). Outside of Crescent Cove, phycocyanin readings varied from 18 ppb at B2 to 32 ppb at B1. Based on these results, cyanobacteria densities continue to be elevated throughout the lake.

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 microcystin 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 19 August, these conditions can change rapidly. The 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.

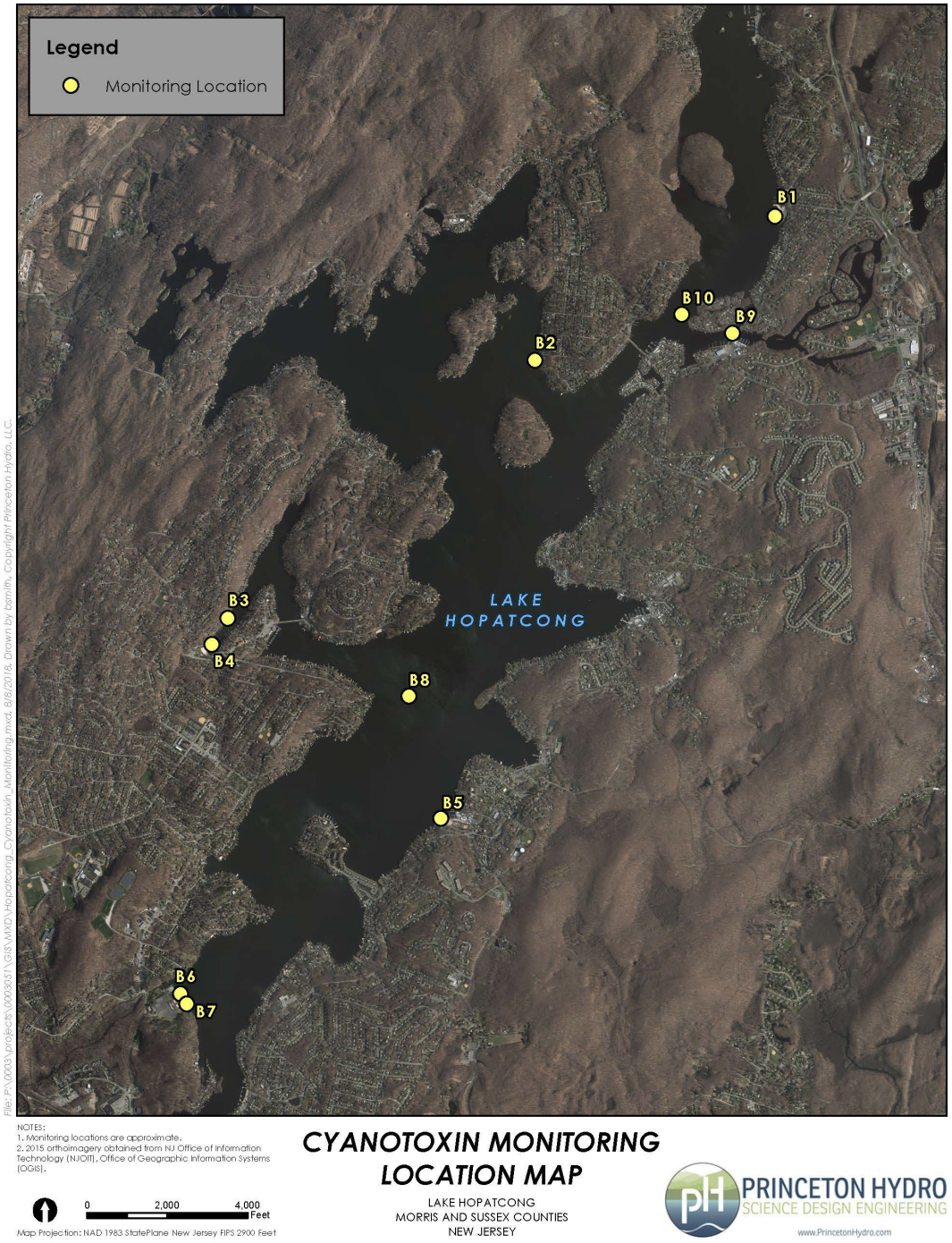
Photos of all stations can be found at the end of this document. Overall, clarity at stations outside of Crescent Cove was moderate, even with the greener water observed at many stations.

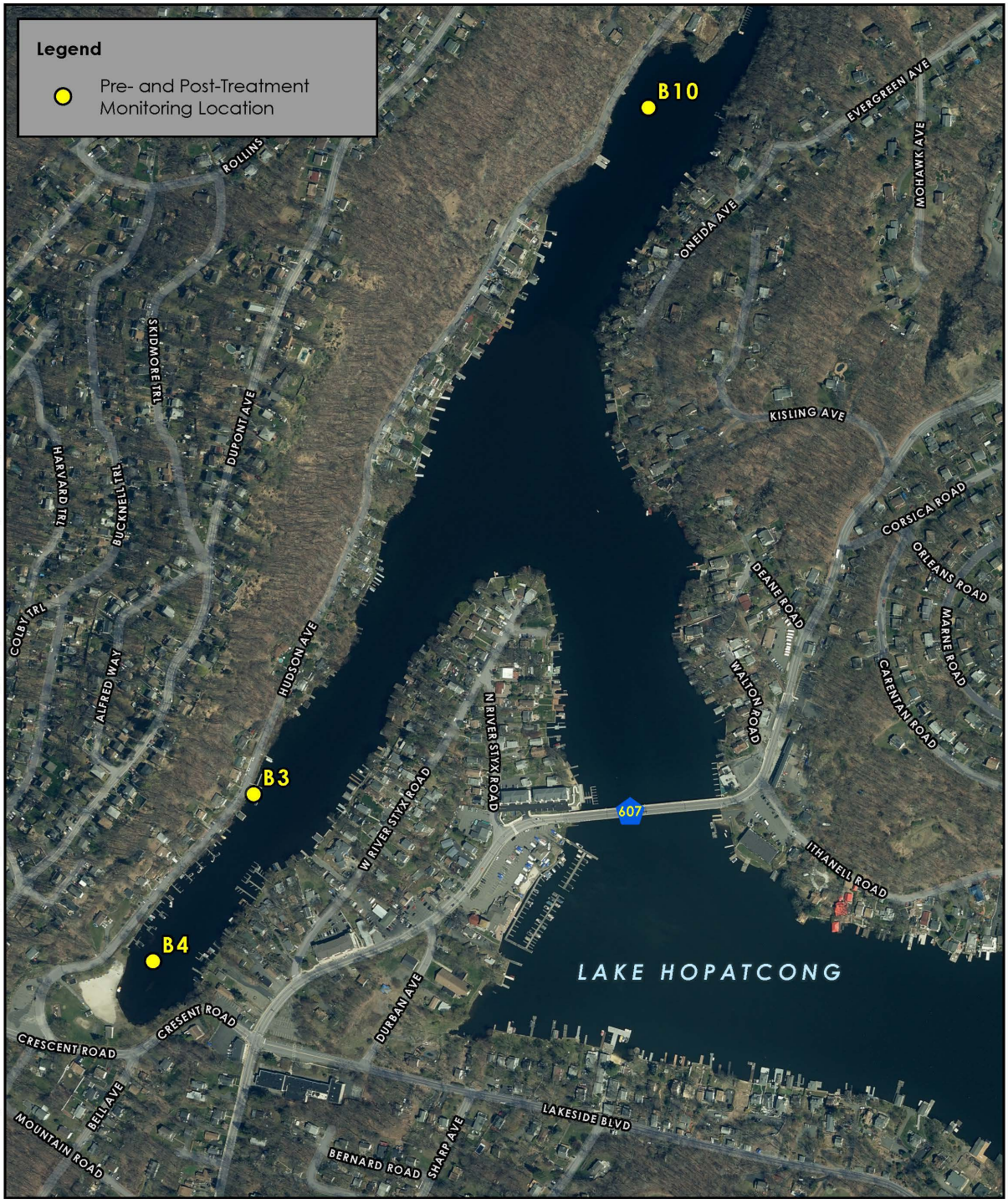
Please feel free to contact myself or Dr. Fred Lubnow with any questions or concerns.

Sincerely,

Patrick Rose
Environmental Scientist
Princeton Hydro, LLC

Site Location Map





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

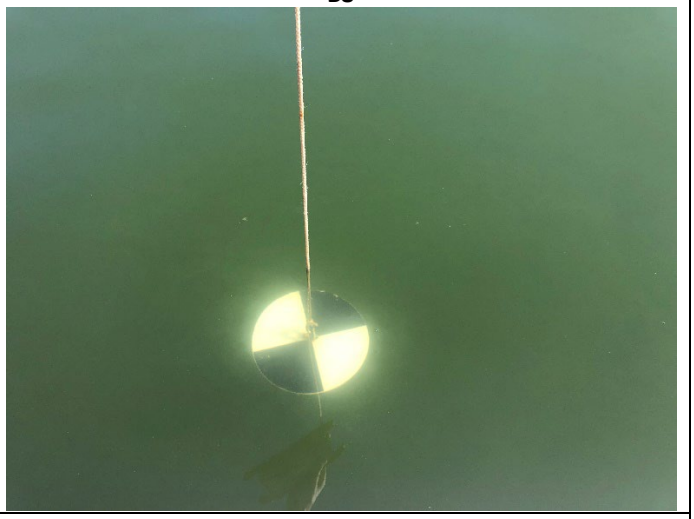
B4

B5

B6

B7

B8



B10