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**1.0 Project Name:** Lake Monitoring Network 2020-2022

**2.0 Requesting Agency:** United States Environmental Protection Agency

**3.0 Date of Project:** Sample collection September 2020 – October 2022

**4.0 Project Fiscal Information:** Job Number 33340000, Activity Code V4PC

**5.0 Project Manager:** Johannus Franken – Project Manager, BFBM;  
Dean Bryson – Supervisor, BFBM

## **6.0 Special Training Needs/Certification**

Assistants to the project will be trained in the operation and use of all sampling equipment. The training will entail calibration methods, deployment techniques and data retrieval from the equipment. The Project Manager or designee will be responsible for any necessary training.

Safety training and safety requirements will comply with Bureau of Freshwater and Biological Monitoring's Field Work Health and Safety Plan (HASP) Version #2 August 2019 and any amendments due to Covid-19 safety guidelines.

BFBM is certified by the Office of Quality Assurance (certified lab ID # 11896) for the following parameters during field work for this project: temperature, pH, conductance, dissolved oxygen (DO), turbidity, and chlorophyll a.

## **7.0 Project Background**

This Network was designed to provide the water quality data necessary to assess the ecological health of the State's lentic water resources and the needs of the watershed management and water quality assessment {305(b)/303(d)} programs. This approach comports with the guidance provided in USEPA's publication, "Elements of a State Water Monitoring and Assessment Program," March 2003, which requires that states develop and implement long-term strategies that include monitoring of all state water body types including lakes. and the needs of the watershed management and water quality assessment {305(b)/303(d)} programs. This approach comports with the guidance provided in USEPA's publication, "Elements of a State Water Monitoring and Assessment Program," March 2003, which requires that states develop and implement long-term strategies that include monitoring of all state water body types including lakes.

## **8.0 Project Description**

Project will collect ambient water quality information for NJ lakes. The Network consists of three components: a statewide statistical (probabilistic) survey, statewide reference lakes, and targeted regional lakes.

For the Statewide Statistical Survey, 50 lakes, referred to as a Panel, will be sampled over 2 years or 25 lakes per year. A total of 250 lakes were selected for sampling over a 10-year period. Individual Panels of 50 lakes will have sufficient statistical confidence to assess

statewide status every two years. It is anticipated that statewide trends will be assessed after all 250 lakes are sampled. Lakes were selected using USEPA probabilistic site selection methodology {Generalized Random Tessellation Stratified (GRTS) survey design for a point resource with reverse hierarchical ordering (RHO), see (Taylor, 2015)<sup>1</sup>}. Potential sites included all lakes (public and private) on DEP Geographic Information System (GIS) Coverage “NJ National Hydrography Dataset,” greater than or equal to 5 acres, minimum one meter deep, including potable water supply reservoirs and unnamed lakes.

All potential lakes will be visited by BFBM staff to ascertain that the waterbodies are suitable for sampling per the design criteria (see Appendix A, List of Statewide Statistical Survey Lakes). Actual sampling sites in each lake will be determined during the first on-water site visit and will be selected based on actual morphometry, as determined by this on-site visit. At that time, each in-lake station will be recorded with a handheld Global Positioning System (GPS) and stored on the DEP GIS system. This will allow printing of aerial photography maps showing actual sample sites. If a lake does not meet design criteria such as inadequate depth, or if access or safety issues exist, the lake will be eliminated. A replacement will be selected, in order, from the list of potential oversample lakes (see Appendix B, List of Potential Oversample Lakes). Digital photographs will also be taken showing overview of the lake, outlet, and drainage pipes.

In addition to the statistical survey sites, statewide reference and targeted regional lakes will be sampled. Eight (8) statewide reference lakes representing each Omernik Level III ecoregion will be sampled one time annually in the growing season to demonstrate status established in previous sampling at these lakes. See Appendix C, List of Reference Lakes. Twelve (12) targeted regional lakes will be sampled five times annually. These lakes were chosen by BFBM in consultation with the Bureau of Environmental Analysis, Restoration, and Standards (BEARS) from the Atlantic Water Region to align with the current Integrated Report assessment cycle (See Appendix D, List of Targeted Regional Lakes).

<sup>1</sup> Taylor, Brian. 2015. "New Jersey Lake Survey Design". DEP BFBM.

## 9.0 Project Objectives

### Statewide Statistical Survey

Data will be collected to evaluate the trophic state of selected lakes and assess the ecological health of the State's lentic water resources. Fifty lakes (designated as a Panel) are monitored every two years to develop baseline, statewide status, and eventually trend information for New Jersey lakes.

### Statewide Reference Lakes

Data will be collected for reference lakes from each Omernik Level III ecoregion within the State. These lakes are intended to be minimally disturbed by human activity and preferably in an area protected from human-induced changes. BFBM and BEARS established the following criteria for selecting Reference lakes:

Manmade or natural lakes:

- ◆  $\geq 5$  acres in surface area/ 1-meter depth minimum
- ◆ Surrounding land use  $< 20\%$  Urban + Ag,  $< 2\%$  impervious cover

- ◆ No discharges into lake
- ◆ No regulated discharges upstream of lake inlet.

Shoreline Characteristics (if available):

- ◆ Trees/Shrub > 75%
- ◆ Lawns/grasses < 25%
- ◆ Bare ground < 5%
- ◆ Shoreline anthropogenic disturbance (shoreline modifications/development) < 5%

Reference lake data will document baseline information on minimally or non-impacted water quality, ecological integrity, and the trophic state of lakes within each ecoregion. Reference lakes will be monitored every year and can be used to measure variations and trends resulting from climate change and land use. Data may also be compared to disturbed lakes within the same ecoregion to gauge the degree of impairment. Reference data will also serve to inform criteria development, specifically nutrients, to determine criteria that are attainable and appropriate for the ecoregion, and adequate to control nutrient enrichment.

#### Regional Targeted Lakes

The Department has adopted a Regional Comprehensive Assessment Method for the Integrated Water Quality Monitoring and Assessment Report intended to produce a robust assessment of environmental conditions affecting water quality in a selected water region. This new Regional Comprehensive Assessment will incorporate one of five water regions (Atlantic Coastal, Lower Delaware, Northwest, Raritan, and Northeast) during each Integrated Report cycle. The rotating region approach will result in a comprehensive assessment of the entire state every 10 years. This approach will encourage development of measures to restore, maintain and enhance water quality uses that maximize effectiveness and efficiency in achieving positive environmental outcomes that are tailored to the unique circumstances of each region. Lakes monitored for the Regional Comprehensive Assessment will adhere to the sampling frequency requirements as outlined in the 2014 Integrated Water Quality Monitoring and Assessment Methods Document. Targeted regional lakes were selected for the Integrated Report cycle in the Atlantic Water Region by BEARS and BFBM.

## **10.0 Monitoring Network Design**

Water quality monitoring will take place at up to three in-lake stations that best represent the limnological aspects of the lake. If the lake is expected to exhibit relatively uniform water quality characteristics, then one sample station will be located approximately in the center of the lake. The other two stations, if needed, will be in sections of the lake which may be expected to exhibit differing water quality. In the event an existing lake must be eliminated, water quality monitoring stations at the replacement lake will be selected in the same manner.

#### Statewide Statistical Survey

Every two years, fifty, of the 250 probabilistically-selected lakes will be monitored in order to develop baseline, status, and trend information for New Jersey lakes. Sites are expected to be sampled one time per year (growing season, defined below in section 14.0).

- Panel 7 Network lakes were sampled in 2015/2016

- USEPA NLA lakes were sampled in 2017
- Panel 8 Network lakes were partially sampled in 2018/2019. Panel 8 will be resampled in 2021/2022 to comply with network design
- USEPA NLA lakes are scheduled for sampling in 2022
- Panel 9 Network lakes will be sampled in 2023/2024
- Panel 10 Network lakes will be sampled in 2025/2026
- Panel 11 Network lakes will be sampled in 2027/2028

#### Statewide Reference Lakes

Statewide reference lakes will be monitored to document baseline, status, and trend information on minimally or non-impacted water quality, ecological integrity, and the trophic state of lakes within each ecoregion. Sites will not be sampled during 2020 and sampling frequency for 2021 will be determined.

#### Targeted Regional Lakes

Targeted regional lakes will be monitored to produce an assessment of environmental conditions affecting water quality in a selected water region. Sites are expected to be sampled five times per year, April through October. Due to the 2020 COVID-19 pandemic, the sampling schedule was shortened and will be performed in September and October 2020. In order to comply with the Integrated Report cycle, Atlantic Region lakes will be sampled (as stated above) in 2021 and 2022.

See Appendix E, 2020-2022 Lake Sampling Parameters, for a table of the sampling frequency and associated parameters for each sampling type.

## **11.0 Sampling Procedures**

**11.1 General Procedures:** Statistical Survey and Reference lakes will be sampled once during the growing season (June through September). Targeted regional lake sampling will take place five times from April through October. Sample bottles will be provided by the contracted New Jersey certified laboratory listed in section 16.1. Sample volume and container type will be as described in the respective laboratory's "Quality Manual" and/ or SOP, approved by DEP Office of Quality Assurance (OQA).

**11.2 Cleaning Sample Equipment:** Prior to field sampling, all sample collection equipment will be cleaned using the protocol outlined in Appendix F, Submerged Water Sampler Cleaning Method.

**11.3 In-Lake Sampling Procedures and Parameters:** Samples will be collected at multiple lake locations (up to four in-lake stations). Samples will be collected as per "DEP Field Sampling Procedures Manual," 2005. Samples will be collected using a submerged sampler, which will be cleaned at the BFBM laboratory prior to use at each lake. An equipment blank of ULTRA-PURE water will be collected in the lab from the submerged sampler prior to the first sample for each lake. The equipment blank will be analyzed for Total Phosphorus, Nitrite and Nitrate (NO<sub>2</sub>+NO<sub>3</sub>), ammonia and Total Kjeldahl Nitrogen (TKN). Reference lakes require collection of an additional equipment blank for ortho phosphorus analysis. The submerged sampler will be field rinsed with "water of interest"

prior to collecting a sample at each station or depth for the lake. Each individual lake will require one clean submerged sampler.

A top-to-bottom profile will be collected at each in-lake station for luminescent dissolved oxygen (LDO, in the case of a Hydrolab meter) or optical dissolved oxygen (ODO, in the case of a YSI meter), pH, chlorophyll a, phycocyanin, specific conductance, and water temperature. Readings for these parameters will be collected as stated below.

All stations require a reading at 0.1 meter below surface and determined sample depth. Stations with total depths  $\leq 1.0$  meters require readings at half of the total depth. Stations with total depths  $< 3.0$  meters require readings at 0.5 meter intervals. Stations with total depths  $\geq 3.0$  meters require readings at 1.0 meter intervals. Stations with total depths  $> 1.0$  meters require a reading at 0.5 meters above the bottom.

Readings and sample depths will not necessarily be recorded at whole numbers due to the high accuracy ( $\pm 0.04\text{m}$ ) of the depth sensor used.

Total depth and interval/sample depth will be determined using either Hydrolab MS5 or YSI Pro DSS. The Hydrolab MS5 and YSI Pro DSS are multi-parameter water quality systems that combine depth, temperature, pH, phycocyanin, chlorophyll a, conductance, and OLDO/ODO probes into one meter that is submersible to the desired depth in the lake. The YSI Pro DSS is also equipped with a Total Algae Sensor which measures phycocyanin and chlorophyll a. A sample for Total Phosphorus, Nitrite and Nitrate, ammonia, TKN, hardness, alkalinity, turbidity and chlorophyll a will be collected from approximately one-meter depth or mid-depth at stations  $< 1.5$  meters. Turbidity will be measured at the sampled depth using a Hach 2100Q Turbidity meter.

**11.4 Aquatic vegetation (macrophytes):** During the growing season, a gross estimate of total areal coverage of dominant type(s) of macrophytes will be made. This estimate will be made following the procedure outlined in Appendix G, Lake Macrophyte Areal Extent.

**11.5 Chlorophyll a:** A depth-dependent sample will be collected for chlorophyll a. Sample analysis will be performed by BFBM staff at BFBM Laboratory, 35 Arctic Parkway, Ewing. BFBM staff will use a modified version of EPA Method 445.0 for this analysis. Samples will be collected in 500 ml amber glass or brown plastic bottles and stored on ice to 4° C.

**11.6 Phycocyanin:** BFBM will screen for cyanobacteria in the field using a Turner Designs Fluorosense handheld fluorometer and the YSI Pro DSS Total Algae Sensor. The Fluorosense and Total Algae Sensor will assist with the in-situ detection of phycocyanin, a pigment unique to cyanobacteria, a naturally occurring component of a lake phytoplankton community. Under certain conditions, a cyanobacteria population can rapidly increase in density, forming a bloom which can potentially produce toxins, called cyanotoxins. These cyanobacteria blooms are known as Harmful Algal blooms (HABs). The Fluorosense will be used at the water surface (0.1m) and sample depth (determined by total depth, see 11.3). A vertical profile of chlorophyll a and phycocyanin will also be collected to determine concentrations of these compounds throughout the water column. If phycocyanin levels are approaching HAB conditions, a sample will be collected and analyzed for cyanotoxins

and cell identification and enumeration. HAB sampling and analysis will follow guidance in the NJ Cyanobacterial Harmful Algal Bloom (HABs) Freshwater Recreational Response Strategy

**11.7 Physical Habitat (PHab) Characterization:** During the growing season, a PHab characterization will be performed at all lakes. PHab characterization method was utilized by the USEPA as part of the NLA. Procedures are outlined in: *USEPA. 2012 National Lakes Assessment: Field Operations Manual, Version 1.0, May 15, 2012. EPA 841-B-11-003. U.S. Environmental Protection Agency, Office of Water, Washington, DC.*

## 12.0 Data Quality/Quality Control Requirements

### 12.1 Testing by BFBM

BFBM is certified by the DEP-OQA (certified lab ID # 11896) for all parameters listed below:

Temperature, pH, Conductance and DO are will be measured using a Hydrolab MS5 or YSI Pro DSS. The Hydrolab MS5 and YSI Pro DSS are multi-parameter water quality systems that combines temperature, pH, conductance, and LDO or ODO probes into one meter that is submersible to the desired depth of the lake.

*Temperature:* The probe is calibrated with a NIST-certified thermometer on a quarterly basis. Records of the calibration shall be maintained by the BFBM.

*pH:* The probe is calibrated daily per OQA recommendations. The probe is also checked each day of use with a buffer which corresponds to the expected range of the values to be measured. After three hours of continuous use, the pH of the certified buffer will be checked. Records of all calibrations and calibration checks shall be maintained in the field logbook.

*Conductance:* The probe is calibrated on a weekly basis per OQA recommendations. The probe is also checked each day of use with a certified standard which corresponds to the expected range of the values to be measured. Records of all calibrations and calibration checks shall be maintained in the field logbook.

*DO:* A Winkler check is performed on a weekly basis. The meter is also barometrically compensated and checked at each sampling site. Records of all calibrations and calibration checks shall be maintained in the field logbook.

*Turbidity:* HACH Model 2100Q turbidimeter is calibrated once every three months per OQA recommendations. The meter is then checked with certified standards for accuracy within the calibration range during each day of use. Records of all calibrations and calibration checks shall be maintained in the field logbook.

*Chlorophyll a:* BFBM will follow the procedures and calibration requirements required by EPA Method 445.0

*Bureau of Water Monitoring Certified SOP, for field measurements and calibrations.*

*Bureau of Water Monitoring Certified SOP for the analysis of chlorophyll a.*

*DEP Field Sampling Procedures Manual (2005).*

*NJAC 7:18 - Regulations Governing the Certification of Laboratories and Environmental Measurements.*

#### Other Parameters:

*Ambient Air Temperature:* Fisher Brand Traceable Flip-Stick Thermometer is calibrated with a NIST-certified thermometer before the sampling run. Air temperature is measured for general information purposes only and not used for project's data objectives.

*Barometer:* Thommen TX Mechanical Barometer when using a Hydrolab MS5 or built-in barometer when using YSI ProDSS Handheld and measured for LDO/ODO meter compensation only. Not used for project's data objectives.

*Chlorophyll a/ Phycocyanin (YSI ProDSS):* The probe is calibrated using a rhodamine dye solution on a weekly basis per manufacturers recommendation.

*Cyanotoxins:* BFBM will follow the procedures and calibration requirements required by the Abraxis ELISA method.

*Forel-Ule Color:* Forel-Ule Color Comparator. Forel-Ule Color is measured for general information purposes and not used for project's data objectives.

*Secchi Depth:* Universal secchi disc to measure transparency.

### **12.2 Additional Testing performed by a NJ Certified Laboratory**

For samples delivered to a NJ certified laboratory, testing will be done by a method for which the laboratory has certification as listed in section 16.1. Quality control procedures (including required calibrations and quality control procedures required by regulation or by the method) shall be defined in the laboratory's Quality Manual (QM) or Standard Operating Procedures (SOPs). The QM and SOPs must be approved by the DEP-OQA.

### **13.0 Data Analysis**

Data is collected to evaluate the trophic state of selected lakes and assess the ecological health of the State's lentic water resources to develop baseline, and eventually statewide status and trend information for New Jersey lakes using the probabilistic design. Reference lake data will document baseline information on water quality, ecological integrity, and the trophic state of minimally or non-impacted lakes within each ecoregion. Over time this data can be used to measure variations and trends resulting from land use and climate change and will also be used to compare to disturbed lakes within the same ecoregion to gauge the degree of impairment. Reference lake data will also serve to inform nutrient criteria development.

Data will be forwarded to staff of BEARS for additional analysis. BEARS staff will evaluate water quality results as they relate to Surface Water Quality Criteria thresholds, historical data, and other sources. However, BFBM will do an evaluation of results of the Statewide Statistical Survey. This analysis will include estimating the status of lake water quality with a known amount of statistical confidence as well as identifying patterns and trends by ecological region. Statistical summaries will be produced based on this assessment. HAB results will be compared to NJDEP Recommended NJ Action Level and Health Advisory Guidelines for Recreational Exposure to Microcystin-LR, Cylindrospermopsin, and Anatoxin-a. If a HAB is confirmed through laboratory analysis, BFBM will follow response actions as outlined in the NJDEP Cyanobacterial Harmful Algal Bloom (HABs) Freshwater Recreational Response Strategy.

## 14.0 Sampling Schedule

Initial site selection has been completed. Field reconnaissance of 2020-2022 sites will be conducted prior to initiation of sampling. Statistical survey lakes will be sampled once during the growing season (June through September). Reference lakes sampling schedule will be determined for 2021 and 2022. Targeted Regional lakes will be sampled five times between April and October. See Appendix E, 2020-2022 Lake Sampling Parameters for a table of the sampling frequency for each component and associated parameters.

## 15.0 Resource Needs

BFBM will need a minimum of two hourly staff, in addition to the existing full-time staff, to complete this project.

## 16.0 Quality Assurance

**16.1 Laboratory Analysis:** The following parameters will be analyzed by the New Jersey certified laboratory listed below. Any laboratory used shall be certified by DEP's OQA for the requested parameters. The reporting levels, listed in the table below, are **required** for this project.

Parameter	Laboratory	Detection Limit (mg/L)	Reporting Level (mg/L)	Holding Time	Preservative	Volume
Nitrite + Nitrate	DOH cert # 11036	0.003	0.012	28 days	See Note 1	500ml
Ammonia (Non-distillation)	DOH cert # 11036	0.009	0.010	28 days	See Notes 1 & 3	
Ammonia (Distillation)	DOH cert # 11036	0.013	0.05	28 days	See Note 1	
Total Kjeldahl Nitrogen	DOH cert # 11036	0.028	0.100	28 days	See Note 1	
Total Phosphorus	DOH cert # 11036	0.005	0.010	28 days	See Note 1	250ml
Ortho Phosphorus (see note 5)	DOH cert # 11036	0.001	0.005	48 hours	Ice to 4°C	250ml
Alkalinity	DOH cert # 11036	1	1	14 days	Ice to 4°C	500ml
Hardness	DOH cert # 11036	0.069	0.662	6 months	See Note 2	250ml
Chlorophyll a	BFBM cert # 11896	0.1 (µg/L)	N/A	24 hours	Ice to 4°C	500ml
Cyanotoxins (see Note 4)	BFBM cert # NA	0.10 ppb	0.15 ppb	6 months	Ice to 4°C in field. Freeze within 24 hours.	50ml

Note 1): Conc. H<sub>2</sub>SO<sub>4</sub> to pH 2; ice to 4°C

Note 2): Conc. HNO<sub>3</sub> to pH of less than 2

Note 3): Samples with turbidity levels > 10NTU's must be distilled. The turbidity level determined by the BFBM will be noted on the chain of custody forms and on the sample bottles relinquished to the NJ certified laboratory for ammonia testing.

Note 4): Not a NJ certified parameter. Samples can be analyzed by BFBM using a microtiter plate Enzyme-Linked Immuno-Sorbent Assay (ELISA) using the Abraxis kits for Microcystins, Anatoxin and Cylindrospermopsin. This method was utilized by the USEPA as part of the NLA. QA/QC procedures are outlined in: *USEPA. 2009 (Final). Survey of the Nation's Lakes: Integrated Quality Assurance Project Plan. EPA/841-B-07-003. U.S. Environmental Protection Agency, Office of Water and Office of Research and Development, Washington, DC.*

Note 5): Reference sites only.

**16.2 Equipment Blanks:** This sample is collected by completely filling a clean submerged sampler (see cleaning protocol in Appendix F, Submerged Water Sampler Cleaning Method) with ULTRA-PURE water. An equipment blank, of a volume necessary for analysis, is then taken from the submerged sampler by filling the bottle(s) approximately halfway from the first nozzle and then the rest of the way with the second nozzle (if applicable). The equipment blank is preserved with concentrated H<sub>2</sub>SO<sub>4</sub> to pH 2 and iced to 4°C. Analysis includes the same chemical parameters listed above except for alkalinity, hardness, Chlorophyll "a," and Cyanotoxins.

**16.3 Sample Containers:** Analytical sample containers shall be dedicated, single-use. Sample containers shall be provided by the NJ certified laboratory.

**16.4 Chain of Custody:** Chain of custody procedures are required for all samples forwarded to a NJ certified laboratory for testing (see Appendix H, NJ Department of Health Sample Submittal Form). Information to be recorded includes all information required by N.J.A.C. 7:18-5.6(d) and 8.5(c). For Chl "a" analysis performed by BFBM, chain of custody forms will not be used; details concerning sample collection and analysts will be recorded in field logbook and laboratory records.

## 17.0 Data Validation

The Project Manager and Supervisor are responsible for all initial data validation. If apparent anomalous data is suspected (e.g. dissolved values larger than total values; field blank values larger than ambient values), the Project Manager and/or the Supervisor will review the sampling procedures with the field sampler to make sure the proper collection and preservation procedures were followed. Additionally, for nutrient parameters (particularly Ammonia, TKN, Nitrate + Nitrite and Phosphorus), the field sampler, Project Manager and/or the Supervisor may perform further water quality logic tests on the suspect data, as described in the U.S. Geological Survey Open File Report 02/383; 2003, entitled, *"Methods for Quality Assurance Review of Water Quality Data in New Jersey."*

If the data is still suspect, the NJ certified laboratory will be contacted. An internal review of their laboratory procedures and/or calculations used in the analysis of the suspect sample, with special emphasis on transcription of data to assure that no transposition of figures occurred will

be conducted. The NJ certified laboratory will be asked to check on equipment calibration. If no problems are found in the analytical laboratory procedures, the data may then be compared to any historical data that might have been collected at the same site prior to the most recent sampling event to see if similar anomalies might have been found previously. The suspect data may also be compared to literature values or standard analytical treatises to verify whether the results are within the limits of accuracy of the test method.

If no obvious problems are found after these reviews, the complete data set will be reported with the suspect data identified as such. The BFBM will then conduct its own review of the data, as it relates to the objectives(s) and data accuracy required in this project.

## **18.0 Data Storage**

Data will be stored locally in electronic format (MS Access). Water quality data will be entered into New Jersey's Water Quality Data Exchange (WQDE) and uploaded into USEPA's water quality data system, WQX, by June of the year following receipt of results from the analytical laboratory. All raw data records shall be maintained for a period of no less than five years. See Appendix I for Data Management information.

## **19.0 Performance System Audits**

All NJ certified laboratories are subject to audits and to the requirements of the DEP-OQA's Laboratory Certification Program as well as internal performance evaluations. DEP-OQA will be notified of field monitoring schedules for possible audits.

## **20.0 Data Reporting**

### **20.1 Preliminary Reporting of Data**

Preliminary analytical data will be reported to BFBM, from the laboratory employed for this project, in either hardcopy, electronic format or by verbal communication to the Project Manager, within 21 calendar days from receipt of sample. Samples which yield results considered anomalous by the Project Manager and/ or Supervisor will be validated as specified in section 17.0, Data Validation.

### **20.2 Final Reporting of Data**

Final analytical data will be reported to BFBM, from the laboratory employed for this project, in the agreed upon format within 40 calendar days from receipt of sample. All data shall be reported in a complete and concise fashion and shall meet the reporting requirements of NJAC 7:18. Routine quality control results must be retained on file for review by the BFBM and the OQA.

Data will be summarized and evaluated by the BFBM to assess the water quality and health of the lakes sampled using the analytical data, field measurements, and observations collected during this study. Data will evaluate the trophic state of selected lakes and assess the ecological health of the State's lentic water resources in order to develop baseline, statewide status and eventually trend information for New Jersey lakes using the probabilistic study design. Final

data reporting will also include the evaluation of water quality results as they relate to Surface Water Quality Criteria thresholds, historical data, and other sources.

Final data will be accessible through the National Water Monitoring Council's Water Quality Portal ([waterqualitydata.us](http://waterqualitydata.us)) and used by the NJDEP Bureau of Environmental Analyses, Restoration and Standards in the generation of the biennial New Jersey Integrated Water Quality and Assessment Report [305(b) and 303(d)].

## **21.0 Assessment, Oversight, and Response**

The Project Manager will be responsible for the oversight of all activities relating to this project. The Project Manager will assess field collection functions and make corrections when necessary to maintain the data accuracy as defined in this plan. If any changes or modifications are made to this plan regarding data collection, as it relates to the objectives(s) and data accuracy required in this project, all original signees of the QAPP will be notified.

**Appendix A**  
**List of Statewide Statistical Survey Lakes**

<b>Site ID</b>	<b>GNIS Name</b>	<b>County</b>	<b>Municipality</b>
NJLM-1339	Reynolds Lake	SUSSEX	HAMPTON TWP
NJLM-1323	"Franklin Preserve 1"	BURLINGTON	WOODLAND TWP
NJLM-0191	"Hawkins Bridge"	BURLINGTON	WASHINGTON TWP
NJLM-0657		WARREN	FRANKLIN TWP
NJLM-0121		SUSSEX	FRANKFORD TWP
NJLM-1196	Verona Lake	ESSEX	VERONA TWP
NJLM-1335		MORRIS	JEFFERSON TWP
NJLM-0605	Collins Pond	SUSSEX	SPARTA TWP
NJLM-0899	"Cameron Park"	CAPE MAY	UPPER TWP
NJW04459-252	Mud Pond	WARREN	HARDWICK TWP
NJLM-0829	Green Brook Pond	BERGEN	TENAFLY BORO
NJLM-1001	"Cutt Bros"	BURLINGTON	TABERNACLE TWP
NJLM-1309	"Lee Bros"	BURLINGTON	WOODLAND TWP
NJW04459-413	Lake Kemah	SUSSEX	HAMPTON TWP
NJLM-1088		CUMBERLAND	DOWNE TWP
NJLM-1387	Butler Reservoir (Kakeout)	MORRIS	KINNELON BORO
NJLM-0697	"Franklin Preserve 2"	BURLINGTON	WOODLAND TWP
NJLM-1261	Curlis Lake	MERCER	HOPEWELL TWP
NJW04459-084	Timber Lake	BURLINGTON	MEDFORD TWP
NJLM-1079	"Hanover Lake"	OCEAN	PLUMSTED TWP
NJW04459-265	Skyline Lakes	PASSAIC	RINGWOOD BORO
NJLM-0360	Round Valley Reservoir	HUNTERDON	CLINTON TWP
NJLM-0092	Meadow Lakes	MERCER	EAST WINDSOR TWP
NJLM-1311	"Pine Island"	BURLINGTON	WASHINGTON TWP

**Appendix B**  
**List of Potential Oversample Lakes**

<b>Site ID</b>	<b>GNIS Name</b>	<b>County</b>	<b>Municipality</b>
NJLM-0123	Lake Ocquittunk	SUSSEX	SANDYSTON TWP
NJLM-0188	Unnamed	MORRIS	MONTVILLE TWP
NJLM-1142	Weequahic Lake	ESSEX	NEWARK CITY
NJW04459-254	"Overpeck Creek"	BERGEN	LEONIA BORO
NJLM-0731	Unnamed	MONMOUTH	COLTS NECK TWP
NJW04459-331	Camp Inawendiwin Lake	BURLINGTON	TABERNACLE TWP
NJLM-0198	"Batona Trail"	BURLINGTON	WASHINGTON TWP
NJW04459-116	Hainsville Pond	SUSSEX	MONTAGUE TWP
NJLM-0416	Unnamed	MORRIS	HANOVER TWP
NJLM-0640	Unnamed	SALEM	LOWER ALLOWAYS CREEK
NJLM-1072	Unnamed	CUMBERLAND	DOWNE TWP
NJW04459-425	Lawrence Lake	SUSSEX	ANDOVER TWP
NJLM-1171	Unnamed	MORRIS	ROCKAWAY TWP
NJLM-1176	Lake My-An-Ho	CAMDEN	WINSLOW TWP
NJLM-0706	Cloverleaf Lake	ATLANTIC	HAMILTON TWP
NJLM-0957	Unnamed	SUSSEX	SPARTA TWP

**Appendix C**  
**List of Statewide Reference Lakes**

<b>Site ID</b>	<b>GNIS Name</b>	<b>County</b>	<b>Municipality</b>
NJW04459-058	Mount Misery Lake	Burlington	Pemberton Twp
NJW04459-352	Hands Mill Pond	Cumberland	Maurice River Twp
NJLM-0028	Green Turtle Lake	Passaic	West Milford Twp
NJW04459-134	Silver Lake	Sussex	Hardyston Twp
NJW04459-097	Great Gorge	Sussex	Vernon Twp
NJW00459-233	Watchu Pond	Sussex	Byram Twp
NJW04459-339	Mashipacong Pond	Sussex	Montague Twp
NJW04459-009	Deer Park Pond	Warren	Allamuchy

**Appendix D**  
**List of Targeted Regional Lakes**

<b>Site ID</b>	<b>GNIS Name</b>	<b>County</b>	<b>Municipality</b>
NJW04459-150	Pancoast Mill Pond	Atlantic	BUENA VISTA TWP
NJLM-0704	Lake Lenape	Atlantic	HAMILTON TWP
NJLM-1027	Hammonton Lake	Atlantic	HAMMONTON
NJW04459-248	Bargaintown Pond	Atlantic	LINWOOD CITY
NJLM-0353	Lake Absegami	Burlington	BASS RIVER TWP
NJLM-1252	Indian Mills Lake	Burlington	SHAMONG TWP
NJLM-1308	Oswego Lake	Burlington	WASHINGTON TWP
NJW04459-091	Sylvan Lake	Monmouth	AVON-BY-THE-SEA
NJLM-1207	Swimming River	Monmouth	COLTS NECK TWP
NJLM-0742	Wells Mills Reservoir	Ocean	OCEAN TWP
NJLM-0744	Holiday Lake	Ocean	STAFFORD TWP
NJLM-0614	Pohatcong Lake	Ocean	TUCKERTON BORO
NJW04459-077	Lake Riviera	Ocean	BRICK TWP

**Appendix E**  
**2020-2022 Lake Sampling Parameters**

<b>Indicator Type</b>	<b>Indicator</b>	<b>Prob Lakes</b>	<b>Statewide Reference (by Ecoregion)</b>	<b>Targeted Regional (Water Region)</b>
<b>Trophic Indicators</b>	Vertical profile measurements (DO, Temperature, pH)	x	x	x
	Secchi Disk transparency	x	x	x
	Water chemistry	Conductivity Turbidity Alkalinity Hardness Color	Conductivity Turbidity Alkalinity Hardness Color	Conductivity Turbidity Alkalinity Hardness Color
	Nutrients	TP, NH3, TKN, NO2-NO3	TP, Ortho P, NH3, TKN, NO2-NO3	TP, NH3, TKN, NO2-NO3
	Chlorophyll-a	x	x	x
<b>Ecological Integrity</b>	Physical habitat characterization	x	x	x
	Visual Assessment	x	x	x
<b>Human Use</b>	Phytoplankton (cyanobacteria)	Checked during each visit with handheld fluorometer		
	Algal toxins (cyanotoxins) per section 11.6	x	x	x

<b>Number of Lakes</b>	Total Number of lakes sampled/ category	250; 5 panels of 50 lakes sampled over 10 years	8	13
<b>Duration</b>	Time period to sample all lakes	2 years/ 50 lake statewide panel	2 years/ statewide	2 years/ region <sup>1</sup>
<b>Frequency</b>	samples /year	25 lakes per year, 1X June-Sept	1X June-Sept	5X April-Oct
<b>Sites/lake</b>	in-lake stations	1 to 4	1 to 4	1 to 4

## **Appendix F**

### **Submerged Water Sampler Cleaning Method**

1. Fill small graduated cup with 1oz. of concentrated Liqui-Nox soap. Add this soap into a one-gallon plastic container. Fill container with ULTRA-PURE water and mix well. This makes an approximate 1% “Liqui-Nox solution”.
2. Don a set of disposable gloves and rinse them thoroughly with ULTRA-PURE water.
3. With one end sealed and spout(s) in the closed position, fill dirty submerged sampler approximately halfway with Liqui-Nox solution.
4. Scrub the submerged sampler thoroughly, inside and out, using the dedicated submerged sampler cleaning brush. This includes scrubbing of both stoppers.
5. Close the open stopper and vigorously shake the submerged sampler with Liqui-Nox solution inside for approximately 10 seconds.
6. Open spout(s) and allow equal amounts of the contained solution to flow through each spout until the bottle is empty.
7. Put on a new set of disposable gloves and rinse them thoroughly with ULTRA-PURE water.
8. Open both stoppers and rinse bottle with ULTRA-PURE water a minimum of three times.
9. Re-seal one end of the bottle and fill sampler to capacity with ULTRA-PURE water. Close the other end and shake vigorously. Open spout(s) and allow rinsate to flow through spout(s) until empty.
10. Repeat step 9 two more times.
11. Place a new polyethylene bag into the submerged sampler carrying case. Place cleaned submerged sampler into bag and seal case with painters tape. Write "CLEAN, Date of cleaning, and INITIALS of cleaning person" on tape.
12. Rinse cleaning brush three times with ULTRA-PURE water, replace in bag and store in lakes cabinet.

**If a trace nutrient problem arises upon analysis while using the above method, a final step will be added. This step will add an acid rinse, followed by several rinses with ULTRA-PURE water to ensure that all trace nutrients are eliminated from the submerged sampler.**

## Appendix G Lake Macrophyte Areal Extent

Lake macrophyte areal extent is determined by preparing an aerial photograph map of each lake prior to the sampling date. This is done using the latest version of aerial photography available and using GIS shapefiles for lake identification. The map should include the entire area of the lake so that it can be used for navigation/identification while on the lake.

During the lake visit, all macrophytes observed should be marked on the aerial photograph map. This is done using a combination of landmarks (such as houses, bridges, etc.), lake shoreline features and estimated distances to these features. Areal extent should be marked as accurately as possible so it can be transcribed to GIS maps for use in reports.

Upon return to the office, the aerial photograph map can be modified with the polygon that best represents the areal extent of the macrophytes present in each lake. This is done by creating the polygon using the graphics tool and the fill/shading that will represent macrophyte cover.



# Appendix H NJ Department of Health Sample Submittal Form

Field ID Number

New Jersey Department of Health  
Environmental and Chemical Laboratory Services  
PO Box 361, Trenton, NJ 08625-0361  
Phone: 609-530-2820  
**ORGANIC AND INORGANIC CHEMISTRY SAMPLE SUBMITTAL**  
(See Instructions)

Lab Sample Number  
(For Lab Use Only)

AGENCY INFORMATION			
Submitting Agency NJDEP-BFBM	Send Results To Johannus Franken	Agency No. 207	Project Name Lakes
Street Address 35 Arctic Parkway	Final Report Option <input type="checkbox"/> Tier 1 <input type="checkbox"/> Tier 2	Would you like copies of the internal chain of custody forms sent with your report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Project Code V4PC
	Electronic Report Option <input type="checkbox"/> EDD <input type="checkbox"/> E-2		Memo Number
City, State, Zip Code Trenton, NJ 08625	Phone 609-292-0427	Fax 609-633-1095	Email johannus.franken@dep.nj.gov

SAMPLE INFORMATION			
Sample Point/Station ID Number/Water Facility ID	Collection Date (YY/MM/DD)	<b>Sample Type</b>	
Sampling Site/Facility/Supply/Location/Sampling Point	Coll. Time (24h) Start   Coll. Time (24h) End	<b>Non-Potable:</b> <input type="checkbox"/> Stream/Surface <input type="checkbox"/> Tissue <input type="checkbox"/> Ground Water <input type="checkbox"/> Sewage: <input type="checkbox"/> Private Well <input type="checkbox"/> Raw <input type="checkbox"/> Effluent <input type="checkbox"/> Septic <input type="checkbox"/> Industrial: <input type="checkbox"/> Ocean/Saline <input type="checkbox"/> Raw <input type="checkbox"/> Effluent <input type="checkbox"/> Sediment <b>Potable:</b> <input type="checkbox"/> Groundwater Rule <input type="checkbox"/> At Source <input type="checkbox"/> Source <input type="checkbox"/> Flushed <input type="checkbox"/> Confirmation <input type="checkbox"/> 1st Draw <input type="checkbox"/> Raw <input type="checkbox"/> Lead Source Line <input type="checkbox"/> Finished <input type="checkbox"/> Surface H <sub>2</sub> O Intake <input type="checkbox"/> Private Well <input type="checkbox"/> Distribution System Fraction: <input checked="" type="checkbox"/> Total <input type="checkbox"/> Dissolved Other: <input type="checkbox"/> _____ Priority: <input type="checkbox"/> Routine <input type="checkbox"/> Priority <input checked="" type="checkbox"/> Emergency	
Waterbody Name	Sample Retention Retain? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes   Duration _____		
Municipality/County	Type of Sampling Event <input checked="" type="checkbox"/> Regular <input type="checkbox"/> Compliance <input type="checkbox"/> Repeat <input type="checkbox"/> Non-Regulatory <input type="checkbox"/> Other		
Sampling Point Street Address	If Repeat or GWR, List Original Lab Sample No.		
PWSID	Sample Collector		
	Trip #		

FIELD INFORMATION		
Air Temp °C	Water Temp °C	Stream Flow-CFS
Weather Conditions	Sample pH (Field)	Gage Height-Ft.
Preserved in: <input checked="" type="checkbox"/> Field <input type="checkbox"/> Lab	DO (mg/l)	Spec.Cond. (µS/CM)
Date: ____/____/____	DO% Sat	Salinity (ppm)
Time: ____:____	Sample Depth (meters)	Tide Stage
Chlorine Residual	Barometric Pressure (mmHg)	Turbidity (NTU)
Comments/Field Checks		

ANALYSIS REQUESTS			
<b>Metals</b> <input type="checkbox"/> Ag ..... Silver <input type="checkbox"/> Al ..... Aluminum <input type="checkbox"/> As ..... Arsenic <input type="checkbox"/> B ..... Boron <input type="checkbox"/> Ba ..... Barium <input type="checkbox"/> Be ..... Beryllium <input type="checkbox"/> Ca ..... Calcium <input type="checkbox"/> Cd ..... Cadmium <input type="checkbox"/> Co ..... Cobalt <input type="checkbox"/> CR-T ..... Chromium <input type="checkbox"/> Cu ..... Copper <input type="checkbox"/> Fe ..... Iron <input type="checkbox"/> K ..... Potassium <input type="checkbox"/> Mg ..... Magnesium <input type="checkbox"/> Mn ..... Manganese <input type="checkbox"/> Mo ..... Molybdenum <input type="checkbox"/> Na ..... Sodium <input type="checkbox"/> Ni ..... Nickel <input type="checkbox"/> Pb ..... Lead <input type="checkbox"/> Sb ..... Antimony <input type="checkbox"/> Se ..... Selenium <input type="checkbox"/> Si ..... Silica <input type="checkbox"/> Tl ..... Thallium <input type="checkbox"/> U ..... Uranium <input type="checkbox"/> V ..... Vanadium <input type="checkbox"/> Zn ..... Zinc <b>Preferred Methodology</b> <input type="checkbox"/> EPA 200.7 / 200.9 <input type="checkbox"/> EPA 200.8	<b>General</b> <input type="checkbox"/> Alkalinity <input type="checkbox"/> Bromide by IC <input type="checkbox"/> Chloride <input type="checkbox"/> Chloride by IC <input type="checkbox"/> Chromium, Hexavalent <input type="checkbox"/> Chromium, Hexavalent by IC <input type="checkbox"/> Color <input type="checkbox"/> Conductance <input type="checkbox"/> Cyanide <input type="checkbox"/> Dissolved Oxygen <input type="checkbox"/> Fluoride <input type="checkbox"/> Fluoride by IC <input type="checkbox"/> Hardness <input type="checkbox"/> MBAS <input type="checkbox"/> Odor <input type="checkbox"/> pH <input type="checkbox"/> Phenols (PW) <input type="checkbox"/> Phenols (NPW) <input type="checkbox"/> Sulfate by IC <input type="checkbox"/> Sulfate Lachat <input type="checkbox"/> Turbidity <b>Mercury</b> <input type="checkbox"/> Mercury by EPA 245.1 <input type="checkbox"/> Low Level Mercury EPA 1631E	<b>Organics (Drinking Water)</b> <input type="checkbox"/> EPA 504.1 - EDB, DBCP, 123TCP <input type="checkbox"/> EPA 505 - Chlordane <input type="checkbox"/> EPA 505 - Toxaphene <input type="checkbox"/> EPA 507 - N and P containing Pesticides <input type="checkbox"/> EPA 515.3 - Chlorinated Acid Herbicides <input type="checkbox"/> EPA 524.2 - Purgeables <input type="checkbox"/> EPA 525.2 - Liquid-Solid Extractables <input type="checkbox"/> EPA 531.1 - N-Methylcarbamoyloximes and N-Methylcarbamates <b>Organics (Non-Potable Water)</b> <input type="checkbox"/> EPA 624 - Purgeables <input type="checkbox"/> EPA 625 - Base/Neutral and Acid Extractables	<b>Residues</b> <input type="checkbox"/> Total Suspended Solids (TSS) <input type="checkbox"/> Total Solids (TS) <input type="checkbox"/> Total Dissolved Solids (TDS) <input type="checkbox"/> Settleable Solids (SS) <input type="checkbox"/> Total Volatile Solids (TVS) <b>Nutrients</b> <input type="checkbox"/> Nitrite <input type="checkbox"/> Total Phosphorus <input type="checkbox"/> Ammonia <input type="checkbox"/> Nitrate (Calculated) <input type="checkbox"/> Nitrogen, Total (Calculated) <input type="checkbox"/> Nitrite + Nitrate <input type="checkbox"/> Ortho Phosphorus <input type="checkbox"/> Total Kjeldahl Nitrogen (TKN)
<b>Other</b> <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____		<b>Demands</b> <input type="checkbox"/> Total Organic Carbon (TOC) <input type="checkbox"/> Dissolved Organic Carbon (DOC) <input type="checkbox"/> Chemical Oxygen Demand (COD) <b>Suggested Dilutions</b> <input type="checkbox"/> BOD5 <input type="checkbox"/> BOD20   _____ <input type="checkbox"/> CBOD5 <input type="checkbox"/> CBOD20   _____	

Relinquished By:	Affiliation:	Received By:	Affiliation:	Date/Time	Reason for Custody Change
Name (Print): _____	_____	Name (Print): _____	_____	_____	_____
Signature: _____	_____	Signature: _____	_____	_____	_____
Name (Print): _____	_____	Name (Print): _____	_____	_____	_____
Signature: _____	_____	Signature: _____	_____	_____	_____

CHEM-44  
FEB 16

## Appendix I Data Management Tables

For Data Management purposes, Water Chemistry is defined as parameters analyzed by a lab; Field measurements are defined as analyze immediately parameters.

### Inventory

<b>Geographic Regions</b>	Statewide
<b>Counties</b>	All
<b>Dates</b>	September 2020 to December 2022
<b>Status</b>	Future/Planned
<b>Sample Frequency</b>	Periodic
<b>Seasons Sampled</b>	Spring, Summer, Fall
<b>Waterbody Type</b>	Lakes, Reservoirs
<b>Salinity Category</b>	Fresh
<b>Tidal Influence</b>	Non-tidal
<b>Project Description</b>	Statewide Statistical lakes will be monitored to evaluate the trophic state of lakes and assess the ecological health of the State's lentic water resources. Statewide reference lakes will be monitored in order to document baseline, status, and trend information on minimally or non-impacted water quality, ecological integrity and the trophic state of lakes within each ecoregion. Targeted regional lakes will be monitored in order to produce a robust assessment of environmental conditions affecting water quality in a selected water region according to the Integrated Water Quality Monitoring and Assessment Report cycle.
<b>Parameters analyzed type</b>	Biological - Algae; Chemical/physical: Nutrients

## Data Management Supplement

<b>QAPP network path file location?</b>	V:\LUM\BFBM\Bfbm\Quality Assurance Plans\Calendar Year 2020 QAPPs
<b>Where will data be recorded in field (media)</b>	Field data sheet, Hydrolab Surveyor 4a and YSI Pro DSS
<b>If on tablet or phone, will download occur at office or wirelessly?</b>	N/A
<b>If on tablets or phones, who will do the download?</b>	N/A
<b>If data collected electronically, where will it be stored?</b>	V:\LUM\BFBM\Lakes and Fishibi\Lakes Monitoring\Databases
<b>Format to be received from Lab</b>	DOH Text File
<b>Method of receipt from lab/s</b>	Citrix
<b>Personnel receiving outside lab data</b>	Leigh Lager
<b>Is data expected to go to WQDE/STORET?</b>	Yes
<b>Data manager - (Bureau and Name)</b>	BFBM Leigh Lager

**Table 1. Sample locations** (Statistical lakes will be added after selection and evaluation)

Station ID	Waterbody/ Location	Latitude-dd	Longitude-dd	County	Site exists in WQDE?	Location Type
NJW04459-058-1	Mt. Misery Lake	39.925783	-74.526095	Burlington	Yes	Lakes
NJW04459-058-2	Mt. Misery Lake	39.924246	-74.523682	Burlington	Yes	Lakes
NJW04459-352-1	Hands Mill Pond	39.243287	-74.901574	Cumberland	Yes	Lakes
NJW04459-352-2	Hands Mill Pond	39.245199	-74.90433	Cumberland	Yes	Lakes
NJLM-0028-1	Green Turtle Lake	41.143351	-74.329651	Passaic	Yes	Lakes
NJLM-0028-2	Green Turtle Lake	41.148516	-74.329033	Passaic	Yes	Lakes
NJW04459-233-1	Watchu Pond	40.928053	-74.770434	Sussex	Yes	Lakes
NJW04459-233-2	Watchu Pond	40.930143	-74.769398	Sussex	Yes	Lakes
NJW04459-233-3	Watchu Pond	40.931352	-74.767907	Sussex	Yes	Lakes
NJW04459-134-1	Silver Lake	41.121719	-74.532404	Sussex	Yes	Lakes
NJW04459-097-1	Great Gorge Lake	41.161202	-74.523444	Sussex	Yes	Lakes
NJW04459-097-2	Great Gorge Lake	41.161322	-74.518986	Sussex	Yes	Lakes
NJW04459-339-1	Mashipacong Pond	41.269306	-74.726483	Sussex	Yes	Lakes
NJW04459-339-2	Mashipacong Pond	41.26544	-74.729664	Sussex	Yes	Lakes
NJW04459-009-1	Deer Park Pond	40.903843	-74.796497	Warren	Yes	Lakes
NJW04459-009-2	Deer Park Pond	40.9062	-74.794777	Warren	Yes	Lakes
NJW04459-150-1	Pancoast Mill Pond	39.520182	-74.877152	Atlantic	Yes	Lakes
NJW04459-150-2	Pancoast Mill Pond	39.521111	-74.87356	Atlantic	Yes	Lakes
NJLM-0704-1	Lake Lenape	*	*	Atlantic	No	Lakes
NJLM-0704-2	Lake Lenape	*	*	Atlantic	No	Lakes
NJLM-0704-3	Lake Lenape	*	*	Atlantic	No	Lakes
NJLM-1027-1	Hammonton Lake	*	*	Atlantic	No	Lakes
NJLM-1027-1	Hammonton Lake	*	*	Atlantic	No	Lakes
NJW04459-248-1	Bargaintown Pond	39.363473	-74.577371	Atlantic	Yes	Lakes
NJW04459-248-2	Bargaintown Pond	39.366658	-74.579668	Atlantic	Yes	Lakes
NJLM-0353-1	Lake Absegami	*	*	Burlington	No	Lakes
NJLM-0353-2	Lake Absegami	*	*	Burlington	No	Lakes
NJLM-1252-1	Indian Mills Lake	*	*	Burlington	No	Lakes
NJLM-1252-2	Indian Mills Lake	*	*	Burlington	No	Lakes
NJLM-1308-1	Oswego Lake	*	*	Burlington	No	Lakes
NJLM-1308-2	Oswego Lake	*	*	Burlington	No	Lakes
NJLM-1308-3	Oswego Lake	*	*	Burlington	No	Lakes
NJW04459-077-1	Lake Riviera	40.050887	-74.150497	Ocean	Yes	Lakes
NJW04459-077-2	Lake Riviera	40.048124	-74.146936	Ocean	Yes	Lakes
NJW04459-091-1	Sylvan Lake	*	*	Monmouth	No	Lakes
NJW04459-091-1	Sylvan Lake	*	*	Monmouth	No	Lakes
NJLM-1207-1	Swimming River Reservoir	*	*	Monmouth	No	Lakes
NJLM-1207-2	Swimming River Reservoir	*	*	Monmouth	No	Lakes
NJLM-1207-3	Swimming River Reservoir	*	*	Monmouth	No	Lakes
NJLM-1207-4	Swimming River Reservoir	*	*	Monmouth	No	Lakes
NJLM-0742-1	Wells Mills Reservoir	*	*	Ocean	No	Lakes
NJLM-0742-2	Wells Mills Reservoir	*	*	Ocean	No	Lakes
NJLM-0744-1	Holiday Lake	*	*	Ocean	No	Lakes
NJLM-0744-2	Holiday Lake	*	*	Ocean	No	Lakes
NJLM-0614-1	Pohatcong Lake	*	*	Ocean	No	Lakes
NJLM-0614-2	Pohatcong Lake	*	*	Ocean	No	Lakes

\*Lat/Long will be updated after evaluation of field conditions

**Table 2. Sample types**

STATION ID	Field Msr/Obs	Flow	Water Chemistry	Continuous Monitoring	Biological Sampling	Sediment Collection	Bacteria Collection	Habitat	Metrics	Indices
NJW04459-058-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-058-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-352-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-352-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-0028-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-0028-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-233-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-233-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-233-3	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-134-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-097-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-097-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-339-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-339-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-009-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-009-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-150-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-150-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-0704-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-0704-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-0704-3	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-1027-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-1027-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-248-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-248-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-0353-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-0353-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-1252-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-1252-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-1308-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-1308-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-1308-3	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-077-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-077-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-091-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJW04459-091-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-1207-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-1207-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-1207-3	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-1207-4	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-0742-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-0742-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-0744-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-0744-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-0614-1	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO
NJLM-0614-2	YES	NO	YES	NO	NO	NO	NO	YES	NO	NO

**Table 3. Partners**

STATION ID	Field Msr/Obs	Flow	Water Chemistry	Continuous Monitoring	Biological Sampling	Sediment Collection	Bacteria Collection
NJW04459-058-1	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-058-2	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-352-1	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-352-2	DEP	NO	DEP	NO	NO	NO	NO
NJLM-0028-1	DEP	NO	DEP	NO	NO	NO	NO
NJLM-0028-2	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-233-1	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-233-2	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-233-3	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-134-1	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-097-1	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-097-2	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-339-1	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-339-2	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-009-1	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-009-2	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-150-1	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-150-2	DEP	NO	DEP	NO	NO	NO	NO
NJLM-0704-1	DEP	NO	DEP	NO	NO	NO	NO
NJLM-0704-2	DEP	NO	DEP	NO	NO	NO	NO
NJLM-0704-3	DEP	NO	DEP	NO	NO	NO	NO
NJLM-1027-1	DEP	NO	DEP	NO	NO	NO	NO
NJLM-1027-1	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-248-1	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-248-2	DEP	NO	DEP	NO	NO	NO	NO
NJLM-0353-1	DEP	NO	DEP	NO	NO	NO	NO
NJLM-0353-2	DEP	NO	DEP	NO	NO	NO	NO
NJLM-1252-1	DEP	NO	DEP	NO	NO	NO	NO
NJLM-1252-2	DEP	NO	DEP	NO	NO	NO	NO
NJLM-1308-1	DEP	NO	DEP	NO	NO	NO	NO
NJLM-1308-2	DEP	NO	DEP	NO	NO	NO	NO
NJLM-1308-3	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-077-1	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-077-2	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-091-1	DEP	NO	DEP	NO	NO	NO	NO
NJW04459-091-1	DEP	NO	DEP	NO	NO	NO	NO
NJLM-1207-1	DEP	NO	DEP	NO	NO	NO	NO
NJLM-1207-2	DEP	NO	DEP	NO	NO	NO	NO
NJLM-1207-3	DEP	NO	DEP	NO	NO	NO	NO
NJLM-1207-4	DEP	NO	DEP	NO	NO	NO	NO
NJLM-0742-1	DEP	NO	DEP	NO	NO	NO	NO
NJLM-0742-2	DEP	NO	DEP	NO	NO	NO	NO
NJLM-0744-1	DEP	NO	DEP	NO	NO	NO	NO
NJLM-0744-2	DEP	NO	DEP	NO	NO	NO	NO
NJLM-0614-1	DEP	NO	DEP	NO	NO	NO	NO
NJLM-0614-2	DEP	NO	DEP	NO	NO	NO	NO

**Table 4. Field measures**

<b>Field Name</b>	<b>WQDE Name</b>	<b>Media</b>	<b>Units</b>
Barometric Pressure	Barometric pressure	Air (Weather)	mmHg
Total Depth	Depth, bottom	Water	m
Secchi Depth	Depth, Secchi disk depth	Water	m
Secchi Depth	Depth, Secchi disk depth (choice list)	Water	m
Dissolved oxygen	Dissolved oxygen (DO)	Water	mg/l
Dissolved oxygen saturation	Dissolved oxygen saturation	Water	%
pH	pH	Water	None
Specific Conductivity	Specific conductance	Water	uS/cm
Air Temp	Temperature, air	Air (Weather)	deg C
Water Temp	Temperature, water	Water	deg C
Turbidity	Turbidity	Water	NTU

**Table 5. Chemistry**

<b>Analysis (lab name)</b>	<b>EPA Characteristic Name</b>	<b>Method Speciation Name</b>	<b>Result Sample Fraction</b>	<b>Result Measure Unit</b>	<b>Result Value Type</b>	<b>Sample Collection Type</b>	<b>Sample Collection Equipment</b>
Nitrite + Nitrate as N	Inorganic nitrogen (nitrate and nitrite)	as N	Total	mg/l	Actual	Grab	Water Sampler (Other)
Total Kjeldahl Nitrogen	Kjeldahl nitrogen	as N	Total	mg/l	Actual	Grab	Water Sampler (Other)
Ammonia as N	Ammonia-nitrogen	as N	Total	mg/l	Actual	Grab	Water Sampler (Other)
Phosphorus, Total	Phosphate-phosphorus	as P	Total	mg/l	Actual	Grab	Water Sampler (Other)
Orthophosphate as P	Orthophosphate	as P	Total	mg/l	Actual	Grab	Water Sampler (Other)
Total Alkalinity	Alkalinity, total		Total	mg/l	Actual	Grab	Water Sampler (Other)
Hardness, Total	Hardness, carbonate	as CaCO3	Total	mg/l	Calculated	Grab	Water Sampler (Other)
Chlorophyll a	Chlorophyll a		Total	ug/l	Actual	Grab	Water Sampler (Other)
Microcystins	Microcystins		Total	ug/l	Actual	Grab	Water Sampler (Other)
Cylindrospermopsin	Cylindrospermopsin		Total	ug/l	Actual	Grab	Water Sampler (Other)
Antatoxin-A	Antatoxin-A		Total	ug/l	Actual	Grab	Water Sampler (Other)

**Table 6. Laboratory**

Parameter	Laboratory	Lab Number	Method	Method ID Context	Lower Reporting Limit	units	Method Detection Limit	units	Upper Reporting Limit (MPN/100 ml)	units	Holding Time	Preservative
Nitrite + Nitrate, as N	NJ DEPARTMENT OF HEALTH - 11036	11036	4500-NO3(F)	APHA	0.012	mg/l	0.0038	mg/l			28 days	pH<2, Ice to 4°C
Total Kjeldahl Nitrogen	NJ DEPARTMENT OF HEALTH - 11036	11036	351.2	USEPA	0.1	mg/l	0.055	mg/l			28 days	pH<2, Ice to 4°C
Ammonia as N	NJ DEPARTMENT OF HEALTH - 11036	11036	4500-NH3(H)	APHA	0.01	mg/l	0.0038	mg/l			28 days	pH<2, Ice to 4°C
Phosphorus, Total	NJ DEPARTMENT OF HEALTH - 11036	11036	365.1	USEPA	0.01	mg/l	0.0047	mg/l			28 days	pH<2, Ice to 4°C
Orthophosphate as P	NJ DEPARTMENT OF HEALTH - 11036	11036	365.1	USEPA	0.005	mg/l	0.0016	mg/l			48 hours	Ice to <4 °C
Total Alkalinity	NJ DEPARTMENT OF HEALTH - 11036	11036	2320-B	APHA	1	mg/l	1	mg/l			14 days	Ice to <4 °C
Hardness, Total	NJ DEPARTMENT OF HEALTH - 11036	11036	2340 B-11 ICP	APHA	0.662	mg/l	0.069	mg/l			14 days	Ice to <4 °C
Chlorophyll a	DEP - ENVIRONMENTAL MONITORING LABORATORY - 11896	11896	445	USEPA	*	ug/l	*	ug/l			24 hours	Ice to <4 °C
Microcystins	DEP - ENVIRONMENTAL MONITORING LABORATORY - 11896	11896	546	USEPA	0.1	ug/l	0.1	ug/l			24 hours	Ice to <4 °C
Cylindrospermopsin	DEP - ENVIRONMENTAL MONITORING LABORATORY - 11896	11896	ELISA	ABRAXIS	0.04	ug/l	0.04	ug/l			24 hours	Ice to <4 °C
Antatoxin-A	DEP - ENVIRONMENTAL MONITORING LABORATORY - 11896	11896	ELISA	ABRAXIS	0.1	ug/l	0.1	ug/l			24 hours	Ice to <4 °C

\* To be determined when spectrophotometer is calibrated