

# Lake Characterization and Restoration Plan Grant Proposal Guidance

## **Request for Proposals (RFP) for Lake Characterization and Restoration Grants**

Lake Characterization and Restoration Plan Grants are being solicited targeting specific eutrophic lakes for which a total maximum daily load (TMDL) for phosphorus has been prepared by the Department and subsequently approved by EPA Region 2. The Division of Watershed Management (DWM) is responsible for developing TMDLs to identify all the sources of a pollutant of concern for which surface water quality standards are not being met and set load reductions needed to meet surface water quality standards. TMDLs are required, under Section 303(d) of the federal Clean Water Act, to be developed for waterbodies that cannot meet surface water quality standards after the implementation of technology-based effluent limitations. Lake Characterization and Restoration Plans will be developed in 2 phases. Phase I will include obtaining data needed to complete source identification/relative contribution, in accordance with data gaps as set forth in the TMDL. Based on this information, the restoration approaches needed for a particular lake to achieve a TMDL will be identified and prioritized based on degree of effectiveness in reducing loads. Upon the satisfactory completion of Phase I, the applicant will be directed to design and install the specific implementation projects that have been prioritized for initial implementation in a Lake Restoration Implementation Plan, within the amount requested for implementation.

The approved TMDL reports for the subject lakes may be downloaded from the Department's web page at [www.state.nj.us/dep/watershedmgt/tmdl.htm](http://www.state.nj.us/dep/watershedmgt/tmdl.htm).

### **Phase I**

The purpose of a lake characterization is to provide a qualitative evaluation of a lake's ecology. A Lake Characterization Plan serves as a diagnostic tool to determine the specific water quality objectives and restoration approaches needed for a particular lake to achieve a TMDL by understanding the source and relative contribution of the nutrient loads e.g. where are they coming from. The pollutant of concern for the eutrophic lake TMDLs is phosphorus. Phosphorus is an essential nutrient for plants and algae, but is considered a pollutant when it stimulates excessive growth of aquatic plants and algae (primary production). As these aquatic plants and algae decay, oxygen levels in a lake are depleted, resulting in possible fish kills. This process of eutrophication compromises the overall ecological health of the lake. This RfP serves to realize the implementation plan identified by the Department in each of the TMDL reports listed under Supporting Documents in Appendix F-1.

TMDLs are established based on best available information. Nevertheless, for many lakes, the TMDLs have identified the need to update loading information. For example, some of the Lake TMDL documents detail the need to establish phosphorus contributions for factors such as internal load and septic systems. Only with a comprehensive Lake Characterization Plan can the

proper restoration measures be determined that, upon implementation, will achieve phosphorus reduction and reduce primary productivity. The Department is interested in understanding what are the source(s) of the nutrient load to the lake and how best to address the relative contribution from the various sources.

Please note that some lakes for which proposals are being sought have an asterisk next to their name, the Investigator interested in submitting a proposal for these lakes is encouraged to have early conversations with the DWM contact person. Such discussion should help to ensure that the proposal being developed would best fulfill the needs of the Department. Investigators are encouraged to prepare proposals in support of multiple projects for lakes that may be geographically close to another to support economies of scale. Investigators whom have previously replied to a June 2006 Request for Proposals for Lake Characterization Plan Grants put forth by the Department in coordination with Rutgers New Jersey EcoComplex must submit a new proposal under this RfP solicitation.

In addition to the quarterly submittal of progress reports, the Investigator(s) should expect to make presentations to and consult with the Department, watershed advisory committees and other audiences as appropriate throughout the contract period. At a minimum, this will include presentations to the Department at the midpoint and conclusion of the work period for both Phase I and II.

The Investigator(s) should incorporate the costs of monitoring (including contingencies due to, for instance, unanticipated weather events and/or drought), Quality Assurance Performance Plan preparation, travel, meetings (2 to 6) and information sharing into their contract budgets, as warranted.

In order to promote cost benefit savings Investigator(s) are encouraged to combine projects and to submit one proposal that details the requirements and budget for each individual Lake Characterization and Restoration Plan. The Investigator(s) are directed to incorporate findings from the approved TMDLs, Phase I Lake Diagnostic Studies, Department funded lake studies through Sections 319(h) and 604(b) funding and any other supporting lake documents into their proposals. Diagnostic-Feasibility studies were completed previously under the Department's Clean Lakes Program and may be downloaded at [www.state.nj.us/dep/watershedmgt](http://www.state.nj.us/dep/watershedmgt) under Publications "Lake Resource Documents" or from the New Jersey Environmental Digital Library at <http://njedl.rutgers.edu/njdlib/index.cfm> type in "lakes" under Quick Searches.

**List of Lakes Eligible under Lake Characterization and Restoration RFP**

Name of Lake	Watershed Management Area	County	Lake Owner
Cranberry Lake	WMA 1	Sussex County	State
Clove Acre Lake*	WMA 2	Sussex County	Municipal
Swartswood Lake*	WMA 2	Sussex County	State
Greenwood Lake*	WMA 3	Passaic County	State & Private
Verona Park Lake*	WMA 4	Essex County	County
Lincoln Park Lake	WMA 5	Hudson County	County
Overpeck Lake	WMA 5	Bergen County	County

Echo Lake	WMA 7	Union County	County
Round Valley Recreational Area	WMA 8	Hunterdon	State
Davidsons Mill Lake	WMA 9	Middlesex County	County
DeVoe Lake	WMA 9	Middlesex County	Municipal
Manalapan Lake*	WMA 9	Middlesex County	County
Topenemus Lake	WMA 9	Monmouth County	Municipal County
Deal Lake*	WMA 12	Monmouth County	Municipal & Private
Franklin Lake	WMA 12	Monmouth County	Municipal
Pohatcong Lake*	WMA 13	Ocean County	Municipal & Private
Hammonton Lake	WMA 14	Atlantic County	State & Municipal & Private
Lake Absegami	WMA 14	Burlington County	State
Sylvan Lakes	WMA 14	Burlington County	Municipal & Private
New Brooklyn Lake	WMA 15	Camden County	County
Dennisville Lake	WMA 16	Cape May County	Municipal
Lily Lake	WMA 16	Cape May County	State
Burnt Mill Pond	WMA 17	Cumberland County	Municipal
Giampietro Lake	WMA 17	Cumberland County	Municipal
Mary Elmer Lake	WMA 17	Cumberland County	Municipal
Memorial Lake	WMA 17	Salem County	
Sunset Lake	WMA 17	Cumberland County	Municipal & Private
Bell Lake	WMA 18	Gloucester County	Municipal
Bethel Lake	WMA 18	Gloucester County	
Blackwood Lake	WMA 18	Camden/Gloucester Counties	Municipal & Private
Cooper River Lake	WMA 18	Camden County	Municipal
Evans Pond/ Wallworth Lake	WMA 18	Camden County	County
Harrisonville Lake	WMA 18	Gloucester and Salem Counties	State FG &W
Kirkwood Lake	WMA 18	Camden County	Municipal
Strawbridge Lake	WMA 18	Burlington County	Municipal
Woodbury Lake	WMA 18	Gloucester County	
Sylvan Lakes	WMA 20	Burlington County	Municipal & Private

*\*This lake is the subject of an existing Department funded project that includes data collection, please contact DWM to discuss what additional data is still needed to complete a lake characterization-lake project may be an immediate candidate for Phase II implementation.*

Sublist 5 of the State of New Jersey's 2002 and 2004 *Integrated List of Waterbodies* identified the list of above lakes as being impaired for phosphorus, as evidenced by elevated total

phosphorus (TP), elevated chlorophyll-*a*, and/or macrophyte density that impairs recreational use (a qualitative assessment). Total phosphorus is the pollutant of concern, since this “independent” causal pollutant results in “dependent” responses in chlorophyll-*a* concentrations and/or macrophyte density. TMDLs alone are not sufficient to restore eutrophic lakes. The TMDL establishes the required nutrient reduction targets and provides the regulatory framework to effect those reductions. However, the nutrient load only affects the eutrophication potential of a lake. Most of the TMDL implementation plans call for the collection of additional monitoring data to develop a Lake Characterization Plan for each lake under Phase I to identify the relative contribution of each loading source to the lake. The plan will consider in-lake measures that need to be taken to supplement the nutrient reduction measures required by the TMDL. Phase II requires the development of a Lake Restoration Implementation Plan that identifies and prioritizes specific projects and restoration approaches to achieve the TMDL based on effectiveness in reducing loads.

### **Data Collection:**

All water quality sampling shall be performed in conformance with the Department’s Surface Water Quality Sampling Monitoring Protocol, and a Quality Assurance Project Plan (QAPP) must be submitted and approved by the Department prior to the initiation of monitoring. All data should be reported in metric units. Although full development of a QAPP is not required as part of the RfP, a draft QAPP providing a detailed sampling plan, should be developed and submitted with the proposal by the RfP deadline. Refer to the format provided in Appendix F-2.

The following lake information should be gathered, unless already available, which shall then be compiled for the Lake Characterization Plan in order to be able to develop restoration implementation component of the grant:

Basic physical characteristic of the lake:

- Bathymetric survey
- Lake area and watershed area
- Lake volume
- Depth of unconsolidated sediment

Basic Hydrologic information:

- Measurements of inflows and outflows under normal flow conditions
- Determine the hydrologic balance of the lake

Biological sampling (integrated sample from mixed surface layer), qualitative and quantitative evaluations:

- Algal abundance and composition (greens, diatoms, blue-greens)
- Algal blooms (presence, severity, extent)
- Aquatic vegetation (extent, diversity, invasive species)
- For biomass measurements - Phytoplankton as Chlorophyll *a*: Minimum of 12 samples collected over 4 sampling events (monthly); with samples taken in triplicate per event/site

Note: “Technical Manual for Phosphorus Evaluations for NJPDES Discharge to Surface Water Permits, Revised August 2008” should be referred to for details on biomass measurements. This

document may be downloaded from the Department's Division of Water Quality web page at [www.state.nj.us/dep/dwq/techman.htm](http://www.state.nj.us/dep/dwq/techman.htm)

In-lake water quality monitoring:

- 1-5 mid-lake sampling stations as needed to characterize the lake
- Chemistry (TP, SRP, chl-a, NO<sub>3</sub>-N +NO<sub>2</sub>-N, NH<sub>4</sub>-N, TKN, alkalinity, TSS, hardness temperature, DO, pH, conductivity, etc.)
- if applicable, surface, metalimnion, hypolimnion, and bottom sampling if stratified, otherwise surface and bottom or mid-depth.
- At least 2 consecutive days of diurnal dissolved oxygen monitoring (early morning and later afternoon) and to include pH and temperature parameters (hourly throughout the day)
- Secchi depths

When necessary, flow and water quality measurements of influent and effluent streams shall be taken periodically from spring to fall. Fish abundance and composition shall be assessed early autumn.

The following parameters may be considered and included in the scope of work provided justification is given as to the value added to finding out where the nutrient loads are coming from for the particular lake:

- Vegetation mapping (for shallow lakes using shore to center transects, measuring density and composition such as emergents, rooted floaters, submergents, free-floating plants, submerged macro-algae)
- Phytoplankton- Zooplankton sampling (abundance, composition and size ranges)
- Fish species and abundance, noting age distribution

### **Water Quality Analysis**

Due to the limitation of the available data, the Department chose an empirical model as the most appropriate means to relate annual phosphorus load and steady-state in-lake concentration of total phosphorus. The Reckhow (1979a) model was selected because the hydrologic, morphological and loading characteristics of the lakes for which TMDLs were developed for were well within the assumptions of the model and because it appeared to give the best predictive results for phosphorus concentration. Please refer to the specific TMDL Report which may be downloaded at [www.state.nj.us/dep/watershedmgt/tmdl.htm](http://www.state.nj.us/dep/watershedmgt/tmdl.htm) for the basis and background for this model selection and application. Using the Reckhow (1979a) model, the Investigator(s) is directed to calculate all loading estimates and revise reductions given in the TMDL for the following sources, as necessary, to achieve target concentration:

- Load per municipality in lakeshed (if more than one municipality)
- Tributaries loads
- Septic contributions
- Waterfowl
- Internal loads estimate
- Evaluate existing loading coefficients used in the lake TMDL
- Update storm water runoff contributions

- Update total phosphorus source loading
- Identification of storm water/surface water runoff “hot spots”
- Any additional source, provided that the source is more than 2% of the total loadings

Identify Load Reduction Strategies for each of the sources identified above, including but not limited to:

- BMPs—type and location and expected load reduction
- Septic systems—need for source reduction, alternatives to achieve, and expected load reductions
- Internal sources—alternatives to reduce and expected load reductions
- Biological assessments aimed at possible biological manipulation techniques
- Identify data and research gaps required to develop a lake restoration plan and account for cost

### **Ambient Lake Monitoring Network**

Under Section 314 of the federal Clean Water Act (CWA), states are required to assess the status and trends of water quality in lakes, including classification according to eutrophic condition. As cited in each of the TMDL reports, in response to the CWA and EPA requirements, the Department’s Water Monitoring & Standards (WM&S) initiated an Ambient Lake Monitoring Network program, in 2005, to provide the water quality data necessary to assess the ecological health of the State's lentic water resource. The network was probabilistically designed using all lakes, man-made or natural, wholly or partially within New Jersey's political boundaries, excepting water supply reservoirs being actively managed for potable water supply. Based on available resources, the New Jersey network was designed (with EPA assistance) to have 200 lakes total, which is a subset of the 1100 named lakes in New Jersey. Each year, a group of 40 lakes are sampled with the full network being monitored on a 5 year schedule. Having such a design has allowed New Jersey to certify to EPA that it is implementing at least one state-scale statistically valid probability survey and thus meet the performance-based standard for continued receipt of the 106 Monitoring Initiative grant funds. The general lake selection process used by New Jersey has also recently been followed nationally by USEPA for the Survey of the Nation's Lakes, in which WM&S also participated.

Sampling has recently begun in New Jersey for the 5th and final year of this network design - the list of lakes currently being monitored is available on the WM&S webpage at: <http://www.state.nj.us/dep/wms/bfbm/lakes.html>. The initial report, from the 1st group of 40 lakes sampled, is also available on the WM&S website at: <http://www.state.nj.us/dep/wms/bfbm/downloads.html#lake>. In addition to evaluating the ecological health of the particular lakes, information from this monitoring network is used in the Clean Water Act required biennial reporting of water quality conditions - the "New Jersey Integrated Water Quality Monitoring and Assessment Report." After the completion of this 5th group of 40 lakes, the statewide status of New Jersey's lakes will be able to be assessed, thus providing a picture of overall lake water quality in New Jersey. This information is expected to be available by the end of 2010. This monitoring effort is independent of this RfP; however this information can be another source of information that *if available* should be included in the for Lake Characterization and Restoration Grants proposal.

## **Phase II**

Upon the satisfactory completion of the specific Lake Characterization Plan portion of the grant, as notified in writing by the Department, the Investigator will be instructed to develop a Lake Restoration Implementation Plan. The Investigator should design and be prepared to install specific implementation projects based on the prioritization of BMPs for initial implementation as identified in the Lake Characterization Plan, within the budget amount requested by the Investigator for implementation.

### **Grant Processing Schedule**

Lake Characterization and Restoration Grant proposal should adhere to the schedule laid forth in Section 4.

### **Proposal Evaluation Criteria**

Proposals will be reviewed and prioritized for funding based on consideration of the following criteria, which is provided below in no specific order:

- Cost effectiveness, relative to the amount of work being proposed
- Size of the lake e.g. the number of acres
- Amount of work previously conducted on the lake and incorporated in the proposal
- Timeline for proposed Lake Characterization if identified in the TMDL report
- Identification as a State owned lake

### **Reporting Requirements for All Projects Selected for Funding**

The reporting requirements for Lake Characterization and Restoration Plan projects are the same as those specified in Section 8.1 and 8.2 per the formats provided in Appendix D and E.

### **Grants Reporting and Tracking System (GRTS) Reference Data**

GRTS requirements for Lake Characterization and Restoration Plan projects are the same as those specified in Section 9.2 and presented Appendix E.

### **Data Submission**

All data generated by a 319(h) project must be submitted to the Department in the format requested. This may include web-based entry or spreadsheet population.

### **OWNERSHIP/PROPRIETARY RIGHTS**

All information generated during the course of each 319(h) project, or materials purchased through 319(h) funds, must be provided to the Department in an acceptable format at the conclusion of the project. This includes data collected, maps generated, and all equipment (such as computers and GPS units) purchased with these grant funds.

## **Appendix F-1      Supporting Documents**

### **TMDL Reports**

The following TMDL reports may be downloaded from New Jersey Department of Environmental Protection – Division of Watershed Management web page at [www.state.nj.us/dep/watershedmgt.tmdl.htm](http://www.state.nj.us/dep/watershedmgt.tmdl.htm)

“TMDL for Phosphorus in Lower Sylvan Lake”, Adopted April 10, 2002

“TMDL for Phosphorus in Strawbridge Lake, Burlington County”, Adopted June 22, 2003

“Total Maximum Daily Loads for Phosphorus to Address 4 Eutrophic Lakes in the Northwest Water Region – Cranberry Lake, Ghost Lake, Lake Hopatcong and Lake Musconetcong”, Approved by EPA 9/17/03

“Total Maximum Daily Loads for Phosphorus to Address 3 Eutrophic Lakes in the Northeast Water Region - Lincoln Park Lakes, Overpeck Lake and Verona Park Lake”, Approved by EPA on 9/17/03

“Total Maximum Daily Loads for Phosphorus to Address 6 Eutrophic Lakes in the Raritan Water Region – Echo Lake, Davidson’s Mill Lake, Devoe Lake, Manalapan Lake, Topanemus Lake and Round Valley Reservoir”, Approved by EPA on 9/30/03

“Total Maximum Daily Loads for Phosphorus to Address 13 Eutrophic Lakes in the Lower Delaware Water Region – Bell Lake, Bethel Lake, Blackwood Lake, Burnt Mill Pond, Giampietro Lake, Harrisonville Lake, Imlaystown Lake, Kirkwood Lake, Mary Elmer Lake, Memorial Lake, Spring Lake, Sunset Lake, Woodbury Lake”, Approved by EPA on 9/30/03.

“Total Maximum Daily Loads for Phosphorus to Address 9 Eutrophic Lakes in the Atlantic Coastal Water Region – Deal Lake, Dennisville Lake, Franklin Lake, Hammonton Lake, Hook’s Creek Lake, Lake Absegami, Lily Lake, Lake Pohatcong and New Brooklyn Lake”, Approved by EPA on 9/30/03.

“TMDL for Phosphorus to Address Greenwood Lake in the Northeast Water Region”, Approved by EPA 9/29/04

“Total Maximum Daily Loads for Total Phosphorus to Address Four Stream Segments and Two Lakes in Cooper River Watershed, Camden County, Lower Delaware Water Region”, Approved by EPA on 9/30/04.

“TMDL to Address Phosphorus in the Clove Acres Lake and Papakating Creek, Northwest Water Region”, Approved by EPA on 9/30/04

## **Lake Documents**

The following Lake Documents may be downloaded from either the New Jersey Department of Environmental Protection – Division of Watershed Management web page at [www.state.nj.us/dep/watershedmgt](http://www.state.nj.us/dep/watershedmgt) under Publications “Lake Resource Documents” or from the New Jersey Environmental Digital Library at <http://njedl.rutgers.edu/njdlib/index.cfm> type in “lakes” under Quick Searches. The New Jersey Environmental Digital Library uses DjVu software, which you can download for free at <http://www.lizardtech.com/download/>. If after reviewing both web sites and a specific lake support document is not available electronically, please contact the Department’s DWM at (609) 633-1441 to request a hard copy.

An Application for A New Jersey Department of Environmental Protection Lake Management Phase II- Implementation Projects for the Restoration of Blackwood Lake

Cranberry Lake Diagnostic Feasibility Study

Deal Lake Management/Restoration Plan

Diagnostic-Feasibility Study of Bell Lake

Diagnostic-Feasibility Report for Blackwood Lake

Diagnostic-Feasibility Study of Burnt Mill Pond

Diagnostic-Feasibility Report for Dennisville Lake

Diagnostic-Feasibility Study of Giampietro Park Lake

Diagnostic - Feasibility Study of Hooks Creek Lake: Phase I

Diagnostic-Feasibility Study of Pohatcong Lake

Diagnostic-Feasibility Study for the Sylvan Lakes Restoration Project

Franklin Lake Diagnostic Feasibility Study

Hammonton Lake Diagnostic-Feasibility Study: Final Report

Intensive Lake Survey: Echo Lakes

Intensive Lake Survey: Lincoln Park Lakes

Intensive Lake Survey: New Brooklyn Lake

Intensive Lake Survey: Sunset and Mary Elmer Lakes

Intensive Lake Survey: Topanemus Lake

Intensive Lake Survey: Verona Park Lake

Lake Restoration Feasibility Study: Hammonton Lake

New Jersey Lakes Management Program Lakes Classification Study: Bethel Lake

New Jersey Lakes Management Program Lakes Classification Study: Clove Acres

New Jersey Lakes Management Program Lakes Classification Study: Davidson's Mill Lake

New Jersey Lakes Management Program Lakes Classification Study: Kirkwood Lake

New Jersey Lakes Management Program Lakes Classification Study : Lily Lake

New Jersey Lakes Management Program Lakes Classification Study: Manalapan Lake

New Jersey Lakes Management Program Lakes Classification Study: Memorial Lake

New Jersey Lakes Management Program Lakes Classification Study: Overpeck Lake

New Jersey Lakes Management Program Lakes Classification Study: Strawbridge Lake

New Jersey Lakes Management Program Lakes Classification Study: Topanemus Lake

New Jersey Lakes Management Program Lakes Classification Study: Woodbury Lake

Phase 1: Diagnostic-Feasibility Study of Lake Absegami

Phase 1: Diagnostic-Feasibility Study for De Voe Lake Restoration Project

Phase 1: Diagnostic-Feasibility Study of Greenwood Lake, New Jersey and New York

Phase 1: Diagnostic-Feasibility Study of Round Valley Recreational Area

## **Appendix F-2 Proposal Format**

### 1. PROPOSAL FORMAT

Proposals should be no longer than twenty (20) pages, not including qualifications and Quality Assurance Project Plan, and must follow the format outlined below:

#### **a) Cover page**

1. Subject and Date of Request for Proposal (RfP) Notification
2. Title of TMDL Report Name
3. Research Agenda Topic (e.g. Development of Lake Characterization and Restoration Plan for Cranberry Lake)
4. Proposal Title
5. Principal Investigator's Name, Affiliation and Contact Information
6. Total Budget
7. Expected time frame to complete work

#### **b) Proposal Overview**

The Proposal Overview is designed to provide a very brief description of the overall intent and direction of the proposed project. This section should be no longer than 2 pages.

1. Research Agenda topic (e.g. (e.g. Development of Lake Characterization and Restoration Plan for Cranberry Lake)
2. Proposal Title
3. Problem Statement
4. Objective(s)
5. General Methodology Description
6. Expected Products and Applications

#### **c) Research Proposal**

1. Problem Statement
2. Objective(s)
3. Background and Supporting Literature Review
4. Methods
  - a. Study design including site maps where appropriate
  - b. Detailed description of experimental protocols
  - c. Quality assurance overview (see below)
  - d. Data analyses (e.g., data format, statistical and graphical presentation of data)
5. Dated Schedule of Activities

6. Deliverables or Expected Products – including written reports, computer models, new methodology, etc.
7. References
8. Budget – breakdown of all anticipated expenses

**Timeline Summary (example)**

<b>Task</b>	<b>Description</b>	<b>Project Partners (list all)</b>	<b>Time Frame</b>
	Part I		
<b>I</b>			
<b>II</b>			
<b>III</b>			
	Part II		
<b>IV</b>			
<b>V</b>			

**Budget Summary (example)**

<b>Task</b>	<b>Project Partners and Description</b>	<b>Amount</b>
	Part 1	
<b>I</b>		
<b>II</b>		
<b>III</b>		
	Part II	
<b>IV</b>		
<b>V</b>		

**d) Qualifications**

1. Curriculum Vitae (CV) for each investigator or member of the project team who will spend a minimum of 10% of their time on this project (2 page maximum for each)
2. An overall statement of the qualifications of the project team or organization relative to the proposed research (not to exceed 3 pages). This should include client references.

**2. QUALITY ASSURANCE PROJECT PLAN (QAPP)**

Quality assurance shall be incorporated in the planning of a project. While all scientists strive to produce credible results, there is an increasing need for documenting the process of generating, analyzing and validating data. The concepts of Quality Assurance and Quality Control (QA/QC) should be familiar to all scientific disciplines. Quality Assurance (QA) is a management function that is based on review at the planning, implementation, analysis, and completion stages

of data collection. Quality Control (QC) is implemented at the field/bench level and it provides details on exactly how data of a specified quality are generated.

Each prospective Investigator shall provide a quality assurance overview of what they expect to accomplish in the proposal by including a preliminary QAPP see recommended format and language provided in Appendix F-3 or through a Quality Assurance Letter. A Quality Assurance Letter may suffice for lakes that are identified with an asterisk where an existing project is currently being conducted under a Department approved QAPP. The existing QAPP should be included with the proposal.

After notification of grant award a detailed QAPP must be submitted by the Investigator within one month after the notification which in turn must be approved by the Department before any work can be initiated. A Quality Assurance Project Plan (QAPP) is required for each parameter in which new data will be collected or generated.

### Appendix F-3 Quality Assurance Project Plan (QAPP) Format

#### Quality Assurance Project Plan (QAPP) Lake Characterization for (name of Lake)

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

Approved by: \_\_\_\_\_ Date: \_\_\_\_\_

Marc Ferko, Quality Assurance Officer  
NJDEP, Office of Quality Assurance

**Quality Assurance Project Plan  
For (Name of Lake)  
(Name of County), New Jersey**

**Submitted to:**

New Jersey Department of Environmental Protection  
Division of Watershed Management  
PO Box 418  
Trenton, New Jersey 08625-0418

**Submitted by:**

**Prepared by:**

**Date:**

**Project Name:**

**Project Requested by:**

**Project Manager:**

**Address:**

**Phone:**

**QA/QC Officer Name:**

**Address:**

**Phone:**

**Project Description:**

### **A. Scope of Work Statement and Objectives**

The specific tasks for the proposed project include (for example):

1. Update the bathymetry of the lake
2. Collect basic hydrologic information to develop hydrologic budget for the lake
3. Implement a (#) year water quality monitoring program that includes a total of (#) in-lake monitoring events
4. Quantify an annual pollutant budget, which addresses total phosphorus, total nitrogen and total suspended solids
5. Evaluate the targeted phosphorus load relative to the establishment of clear water state
6. Conduct a feasibility analysis to identify potential in-lake watershed based management techniques
7. Assess and identify site-specific phosphorus load reduction strategies

### **B. Date Usage** (example language provided):

The data collected for Lake Characterization Plan will support the eventual development of a Lake Restoration Plan for (name of Lake) and its lakeshed.

### **C. Sampling Procedures** (example language provided)

All sampling procedures shall be in conformance with standards limnological practices and procedures listed in “Standards Methods for the Examination of Water and Wastewater, (21<sup>st</sup> Edition)” (American Public Health Association, et al., 2005), State Protocol (NJDEP, 2005) and/or any applicable US EPA guidance document. Instrumentation used for the collection of field data (dissolved oxygen, temperature, pH and conductivity) shall be properly calibrated in conformance with manufacturer instructions. All sampling sites were chosen to be representative sites and are subject to approval by the New Jersey Department of Environmental Protection, Rutgers New Jersey EcoComplex and (name of Project Requestor).

The methodology for the biological parameters, such as chlorophyll *a*, are described in “Standard Methods for the Examination of Water and Wastewater (21<sup>st</sup> Edition)” (American Public Health Association, et al., 2005) and in “Limnological Analyses”, Third Edition (Wetzel and Likens, 2000).

### **D. Water Quality Monitoring Parameters and Frequency**

(This section would be fleshed out in detail upon approval of contract; however some description of parameters that are proposed to be collected, sampling locations, monitoring frequency and why particular parameter is being collected is warranted to support the cost and scope of the project proposal).

Note: Monitoring should reflect the actual level of work commensurate with the preparation of a Lake Characterization Plan - the use of existing data may preclude the need to collect all of the parameters listed in the parameter table below.

**Parameter Table** (example provided – The final table would be fleshed out in detail upon approval of contract and should be prepared in consultation with the state certified analytical laboratory that will be engaged to perform the analyses).

Parameter	Analytical Method Reference* (Standard Methods)	Sample Container and Preservation Method	Holding Time (Maximum)
Soluble Orthophosphate	4500- P E	1 pint plastic, filter, cool to 4°C	48 hours
Total Phosphorus	4500-P B-5 and 4500-P E	1 pint plastic, H <sub>2</sub> SO <sub>4</sub> added to pH <2, cool to 4°C	28 days
Total Dissolved Phosphorus	4500-P B-5 and 4500-P E	1 pint plastic, filter, H <sub>2</sub> SO <sub>4</sub> added to pH <2, cool to 4°C	28 days
Nitrate-N + Nitrite-N	419D/4500 NO2B EPA 354.1/352.1	1 pint plastic, cool to 4 EC	48 hours
Ammonia - N	4500 – NH <sub>3</sub> B	1 pint plastic, H <sub>2</sub> SO <sub>4</sub> added to pH <2, cool to 4 EC	28 days
Total Kjeldahl Nitrogen	4500orgBC	1 pint plastic, H <sub>2</sub> SO <sub>4</sub> added to pH <2, cool to 4 EC	28 days
Alkalinity	2320	1 pint plastic, filter, cool to 4°C	14 days
Total Hardness	2340C	1 pint plastic, HNO <sub>3</sub> added to pH <2, cool to 4°C	6 months
Total Suspended Solids	2540 D	1 pint plastic, cool to 4° C	7 days
Conductivity Profile	2510 B	<i>in situ</i>	N/A
pH Profile	4500-H <sup>+</sup> B	<i>in situ</i>	N/A
Dissolved Oxygen Profile	4500-O G	<i>in situ</i>	N/A
Temperature Profile	2500 B	<i>in situ</i>	N/A
Chlorophyll <i>a</i>	10200 H 1 & 2	1 quart plastic, the filter in field, freeze at 20°C	N/A

\* As per Standard Methods (American Public Health Association et al., 1998).

Note: Monitoring should reflect the actual level of work commensurate with the preparation of a Lake Characterization Plan - the use of existing data may preclude the need to collect all of the parameters listed in the example above.

**Information on Detection Limits, Precision and Accuracy for Discrete Water Quality Parameters** e.g. parameter detection limits, quantification limits, accuracy and precision – (This section to be completed upon approval of contract. A table should be prepared in consultation with a state certified licensed analytical laboratory that will be engaged to perform the analyses).

**Information on Detection Limits, Precision and Accuracy for *In-Situ* Parameters** (This section to be completed upon approval of contract).

**Proposed Schedule of Sampling Events for the Monitoring Program of (Name of Lake)**

Sampling Year	April	May	June	July	August	September
2010						
2011						

Note: Table to be completed upon approval of contract.

**Chain of Custody Procedures** (example language provided - This section to be finalized upon approval of contract and should be prepared in consultation with the state certified analytical laboratory that will be engaged to perform the analyses).

Chain of custody procedures will be utilized once the samples are collected and transported to the laboratory for analysis. Personnel responsible for sampling operations will inform the analytical laboratory at least (#) hours in advance of the date that the lake monitoring samples will be delivered.

The sample collector will be required to record the following information on the sampling container and field data sheets: (for example) sample number and/or station, date and time of collection, source, preservation technique and collector's name. The sample collector will also record pertinent field data, field observations and the analyses required on the field data sheets. A chain of custody form will be completed to identify the analyses requested and will be submitted to the laboratory at the time of sample delivery.

Following collection, samples will be placed on ice in an insulated container for transport to the laboratory. The sample collector or (name of person/organization) will deliver the samples to the laboratory, where laboratory personnel will visually inspect all samples containers to confirm the method transportation, date of collection and preservation techniques. Samples will not be accepted and fresh samples will be requested if for any reason the holding time was exceeded, proper preservation techniques were not followed or transportation conditions were unsuitable.

**Calibration Procedures and Preventative Maintenance** (This section to be finalized upon approval of contract and should be prepared in coordination with the state certified analytical laboratory that will be engaged to perform the analyses).

Field equipment will be calibrated on each sampling date in accordance with the manufacturer's instructions. Any problems will be corrected before samples are collected.

**Documentation, Data Reduction and Reporting**

All QA/QC data and project information will be collected according to applicable State and federal regulations. All data will be included in the final Lake Characterization Plan report and will be kept on file by the Investigator for a minimum of five years.

**Data Validation**

Data validation will be performed by the (name of Investigator) and will be provided with the final report. If blank contamination is found in the equipment rinse blank, all water quality data with results less than five (5) times the concentration found in the blank should be flagged “B”. The B qualifier indicates that the reported results may be an anomaly as a result of contamination of the blank.

**Performance and Systems Audits****A. Performance Auditing (example language provided)**

(Name of Lab) is certified by the State of New Jersey (certification #) to perform analyses of water samples. The laboratory participates in performance Evaluation (PE) Studies for each category of certification and accreditation is required to pass these PE studies in order to maintain certification. The Department conducts performance audits of each laboratory that is certified or accredited.

(Name of Lab) also participated in several additional programs to ensure data accuracy. The laboratory participates in US EPA water pollution and water supply studies and the discharge monitoring report (DMR QA/QC) program.

**B. Systems Auditing**

The Department periodically conducts on-site Technical Systems Audits (TSA) of each certified laboratory. The findings of these audits, together with the US EPA Performance Evaluation results, are to be used to update each laboratory’s certification status.

**Corrective Action**

The project QA Officer will ensure that all data for the project are generated in accordance with the procedures outlined in the QAPP. Quality control samples will be analyzed with each sample batch and results will be provided with the data reports. If a QC sample provides unacceptable results during a given day, the sample analysis must be repeated for those parameters affected. All project participants will immediately report deficiencies to the QA Officer. The QA Officer will recommend appropriate corrective action and determine the acceptability of affected data when deficiencies are noted.

The QA Officer will notify the Project Director of any unacceptable data to ensure that it is not included in evaluations of water quality for reporting purposes. The QA Officer shall notify the Project Director in writing anytime a deviation from the approved QAPP occurs. Results of all corrective actions will then be documented.

**Example References**

American Public Health Association, American Water Works and Water Environment Federation, 2005 *Standard Methods for the Examination of Water and Wastewater, 21st Edition*, Washington, D.C.

Maidment, D.R. 1993 *Handbook of Hydrology*. McGraw-Hill, New York

New Jersey Department of Environmental Protection and Energy, 1992. *Field Sampling Procedures Manual*, Trenton, New Jersey

New Jersey Department of Environmental Protection, March 2003. *Technical Manual for Phosphorus Evaluations for NJPDES Discharge to Surface Water Permits*, Division of Water Quality, Trenton, New Jersey

New Jersey Department of Environmental Protection (date) *Amendment to (name) Water Quality Management Plan, Total Maximum Daily Loads for (name)* Division of Watershed Management, Trenton, New Jersey

United States Environmental Protection Agency. 1980 *Clean Lakes Program Guidance Manual*. Report No. EPA 440/5-81-003. USEPA, Washington, D.C.

Wetzel, R.B. and G.E. Likens. 2000 *Limnological Analyses, Third Edition* Springer-Verlag. New York.