Qualifications for

FRENCH & KEYSER POND WATERSHED-BASED PLAN

For Total Phosphorous Mitigation

Prepared for:

TOWN OF HENNIKER, NH

Prepared by:

GOMEZ AND SULLIVAN ENGINEERS

JUNE 11, 2021

GOMEZ AND SULLIVAN ENGINEERS

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June 11, 2021

VIA EMAIL

Wendy Baker
Henniker Town Hall
18 Depot Hill Road, Henniker, NH 03242
wendy.baker@henniker.org

Re: Qualifications for French and Keyser Pond Watershed-Based Plan for Total Phosphorus Mitigation

Dear Ms. Baker:

Gomez and Sullivan Engineers, DPC (Gomez and Sullivan) is pleased to submit our qualifications develop the French and Keyser Pond Watershed-Based Plan for total phosphorus mitigation. This package includes our understanding of the project, approach, proposed schedule, company profile, key personnel, relevant project experience, and references.

Gomez and Sullivan has been providing specialized engineering and environmental science solutions to the water resources community since 1993. Our staff of approximately 50 engineers and environmental scientists are based right here in Henniker as well as in several offices in New York. We utilize our in-depth understanding of hydrology, hydraulics, water quality, and ecology, as well as the regulatory environment, to evaluate, plan, and design ecosystem-based restorations in lacustrine, riverine, and wetland environments. We have developed similar watershed plans for other New Hampshire water bodies, including Partridge Lake in Littleton and Beaver Lake in Derry. These projects have included development of US Environmental Protection Agency-approved site-specific Quality Assurance Project Plans, identification of pollution sources, development of water quality monitoring plans, evaluation of potential best management practices to improve water quality, field surveys and inventories, and public outreach.

We have worked in all the major New Hampshire watersheds and have a long history of collaborating with municipal, state, and federal agency partners on restoration projects, including the New Hampshire Department of Environmental Services. We have extensive experience in communicating controversial and complex information to a non-technical audience and understand the need for effective public outreach throughout a project to ensure its success. We are well versed in the preparation of grant and loan applications as tools to successfully identify and secure funding for mitigation projects. We offer a local presence that will be invaluable for collaborating with the Town and community partners.

We appreciate the opportunity to submit our qualifications and are excited about the prospect of working with the Town and project partners on this important project in our own backyard. If you have any questions, please do not hesitate to contact me at (603) 428-4960 or jgriffiths@gomezandsullivan.com.

Sincerely,

Jill Griffiths, PE, Water Resources Engineer

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I. Background

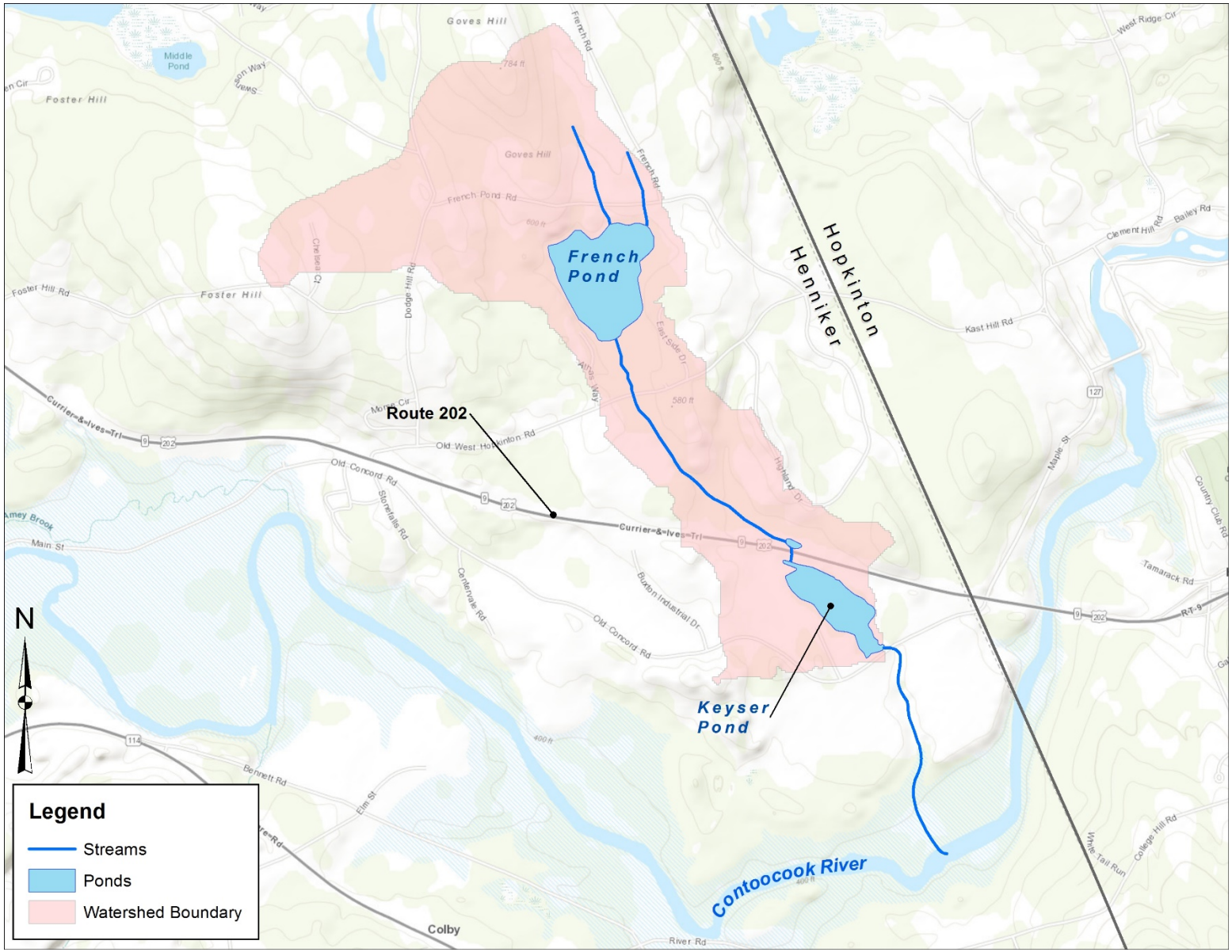
It is understood that the Town of Henniker intends to develop a watershed management plan that meets the United States Environmental Protection Agency (USEPA) requirements to mitigate phosphorus loading in the watershed of French and Keyser Ponds in Henniker, NH. A map of the watershed is provided in Figure 1 on the following page. The goal of this project is to address external and internal phosphorus loading to the ponds and develop a management plan that identifies necessary steps to reduce loading from each of the subwatersheds.

The watershed management plan will identify multiple watershed and in-lake pollutant reduction and water quality goals, and outline future planning, scheduling, and additional funding necessary to implement measures that would meet the water quality goals for French and Keyser Ponds.

French Pond

Keyser Pond

Figure 1: French and Keyser Ponds Watershed Map



II. Preliminary Approach

This section presents our preliminary approach for completing the requested services for the project. The tasks were prepared based on the RFQ and our resulting assessment of the work required. The final scope of services would be refined with project partners if Gomez and Sullivan selected for the work.

Objective 1 – Site-Specific Project Plan

Task 1 – Draft Site-Specific Project Plan

A draft Site-Specific Project Plan (SSPP) for the watershed-based plan development work will be prepared. The SSPP will involve compiling data necessary to determine assimilative capacity and watershed load, to perform in-lake response modeling, and to identify expected nonpoint source pollution (NPS) load reduction management measures. In addition to identifying the roles and responsibilities of individuals involved in the project, the plan may also address the following items:

- Existing Site Information – Building off site information available in previous projects, any recent developments will be incorporated. This would generally include any changes in predominant land uses, additional septic systems, etc.
- Project Rationale – Algae (cyanobacteria) blooms, decreased water clarity, increased chlorophyll-I concentrations, and hypolimnetic (bottom layer) oxygen deficits may be of concern. To reverse decreasing water quality trends and eliminate cyanobacteria blooms, watershed and internal phosphorus loading must be reduced.
- Project Description and Schedule – This will include general steps that need to be taken to meet project goals with a timeframe to complete.
- Historical Data Information – This data will encompass not only the information from the previous reports and projects, but also newer monitoring data that may be available.
- Establish Water Quality Goals – A description of the process to be used to determine the water quality goals will be presented. It is anticipated that phosphorus will be the pollutant of most concern.
- Loading Models – Once the pollutants of concern are established, the appropriate methods to model the contaminants will be determined.
- Quality Objectives and Criteria – The quality of the data need to support modeling and environmental decisions will be determined based on the loading model requirements and adequately outlined to ensure that collection requirements can be met.
- Quality Control – A summary of quality control checks to be performed during model calibration/runs to ensure proper estimates will be discussed.
- Data Evaluation of Load Reduction Estimates – This section will address the process that will be used to evaluate the load reduction estimates. For instance, different types of environmental strategies or best management practices (BMPs) that may be applicable to the project site considering their load reduction estimates.
- Final Products and Reporting – A list of final products to be submitted at the completion of the project will be presented.

The draft plan will be submitted to project partners for review and comment. It is assumed that project partners will review, comment, and send comments in tracked changes back to Gomez and Sullivan.

Task 2 – Final Site-Specific Project Plan

Project partner comments on the draft SSPP will be addressed. The SSPP will be finalized and submitted to NHDES. It is assumed that project partners will provide the required signatures on the cover page of the SSPP.

Objective 1 Deliverable: A final SSPP will be prepared, which will include a compilation of data necessary to determine assimilative capacity and watershed load, to perform in-lake response modeling, and to identify expected NPS load reduction management measures.

Objective 2 – Existing Data Compilation & Review

Task 3 – Existing Data Compilation & Review

Historical water quality data will be compiled from previous studies and programs conducted by the NHDES, New Hampshire Volunteer Lake Assessment Program (NHVLAP), and Henniker Conservation Commission. Outstanding data needed to determine phosphorus assimilative capacity will be identified. It is assumed that the Conservation Commission and NHDES will acquire historical water quality data, collect new data in collaboration with the Conservation Commission, and provide all relevant data to Gomez and Sullivan.

Task 4 – Determination of Historical & Current Phosphorus & Chlorophyll-a Levels

Using the collected data, the historical and current total phosphorus and chlorophyll-*a* levels will be determined for French and Keyser Ponds. It is assumed that project partners will provide historical water quality monitoring studies and reports and additional data that will be collected to Gomez and Sullivan.

Task 5 – Determination of Assimilative Capacity of Ponds & Summary of Water Quality Criteria

The assimilative capacity of French and Keyser Ponds for phosphorus will be determined in accordance with the Standard Operating Procedure for Assimilative Capacity Analysis for New Hampshire Waters. A summary of water quality criteria will be prepared. The resulting chlorophyll-*a* and dissolved oxygen levels will be examined as they relate to existing impairments.

Objective 2 Deliverable: A memo will be prepared detailing the data and review of previous studies and any additional data needed to complete the watershed-based plan for French and Keyser Ponds, as well as the calculation of the current assimilative capacity for phosphorus.

Objective 3 – Establishment of Phosphorus Water Quality Goals

Task 6 – Establishment of Process for Determining Goals

A process for determining the water quality goal for phosphorus will be established. Guidance will be provided to project partners for collecting ice-out and sediment samples to inform this process and modeling efforts. It is assumed that project partners will establish a Water Quality Goal Committee (WQGC) and work with Gomez and Sullivan to develop a current goal-setting process and final phosphorus goal. It is also assumed that the WQGC will collect in-lake and sediment samples and provide data to Gomez and Sullivan.

Task 7 – Facilitation of Project Partner Meeting to Adopt Goals

A meeting will be facilitated among project partners to formally adopt the water quality goals for French and Keyser Ponds. It is assumed that project partners will provide support for meeting planning, hosting, and facilitation. A presentation, agenda, and notes will be prepared for the meeting.

Objective 3 Deliverable: Documentation and technical guidance will be provided for the process required to formally arrive at the water-quality goal for phosphorus and set the goal through cooperation with project partners.

Objective 4 – Identification of Current & Future Pollution Sources

Task 8 – Determination of Annual Pollution Source Loans

The annual pollution source loads will be determined for the watershed using the ENSR-developed Lake Loading Response Model (LLRM) or other approved method as detailed in the SSPP. Aerial photography and Landsat imagery (from sources including NOAA, C-CAP, NH GRANIT, etc.) will be used as a starting point to characterize the watershed. A summary memo of the current annual pollution source load will be prepared.

Task 9 – Determination of Additional Data Needs

Additional data needed to update the French Pond 2011 TMDL Report will be identified. Additional inputs for analysis using the LLRM typically include updated precipitation, waterfowl, and septic system data.

Task 10 – Watershed Pollutant Source, Land Use, & Septic Survey

Watershed pollutant source, land use, and septic system surveys will be conducted to identify and document potential pollution sources in the watershed for each pond and ground-truth the available imagery. It is assumed the project partners will work with consultant to acquire historical data and resources.

Task 11 – Estimation of In-Lake Water Quality Parameters

In-lake phosphorus concentrations and associated chlorophyll-*a* concentrations, Secchi transparency, and probability of algal blooms will be estimated using in-lake response model(s) referenced in the approved SSPP. Determination of the internal loading contribution will be included.

Task 12 – Watershed Build-Out Analysis

A watershed build-out analysis will be conducted. It is assumed that the project partners will assist with data acquisition.

Task 13 – Watershed Modeling for Future Pollutant Loading Scenarios

Modeling scenarios will be run to predict future pollutant loading, including natural background, build-out under current zoning, near-term development, projected future development based on a set of conditions (e.g., zoning regulations, environmental constraints) and assumptions (e.g., population growth rate), and others to meet water quality goals under those scenarios.

Objective 4 Deliverable: A technical memo will be prepared to identify historical, current (including in-lake internal loading), and future pollution source loads by land use type and source group by subwatershed for each parameter. Refined/revised pollution source loads will be determined for each subwatershed based upon site-specific knowledge using field ground-truthing methods.

Objective 5 – Estimation of Pollution Reductions & Required Actions

Task 14 – Determination of Pollutant Load Reductions

Pollutant load reductions needed to achieve water quality goals will be determined.

Task 15 – Identification of BMPs

Based on current and predicted future pollution source loads, locations needing BMPs and recommend technologies and practical solutions to achieve pollutant load reductions sufficient to achieve goals will be identified. Project partners will be consulted for consideration of recommended BMPs.

Task 16 – Conceptual BMP Designs & Cost Estimates

Conceptual BMP designs and cost estimates will be prepared for each identified watershed NPS pollutant reduction site. It is assumed that project partners will provide information relative to property ownership and potential for letters of commitment to allow BMPs to be installed on private properties.

Task 17 – Identification of In-Lake Treatment Options & Cost Estimates

In-lake treatment options will be identified and evaluated relative to phosphorus inactivation, sequestration, filtration, etc., including cost estimates needed to achieve water quality goals. Potential restoration methods could include artificial circulation, hypolimnetic aeration/oxygenation, and/or phosphorus binding with aluminum (i.e., alum treatments). It is assumed that NHDES representatives will work with Gomez and Sullivan relative to in-lake treatment policies and procedures within the agency.

Task 18 – Estimation of BMP Pollutant Load Reductions

Pollutant load reductions attributable to each site-specific watershed-based BMP and in-lake treatment method(s) will be estimated.

Objective 5 Deliverable: A technical memo will be prepared to describe and prioritize the NPS management measures that will be used to achieve the estimated load reduction, as well as other watershed goals identified in the watershed-based plan, and to identify the critical areas where those measures will be needed to implement the plan.

Objective 6 – Public Education/Outreach Plan

Task 19 – Public Education/Outreach Plan

Gomez and Sullivan will work with project partners and the NHDES Education/Outreach Coordinator to build an education and outreach strategy for the Watershed Management Plan (WMP). The intent of the outreach plan will be to foster support for the adoption and implementation of recommendations made in the WMP. The outreach plan may provide a project narrative for issuance to the public, suggest talking points, key milestones at which to solicit public input, and a framework for public presentations via social media and public hearings.

Objective 6 Deliverable: An education/outreach and social media plan will be developed to run concurrently with development of the Watershed Management Plan.

Objective 7 – Watershed Management Plan

Task 20 – Draft Watershed Management Plan

Work completed in the above tasks will be incorporated into a draft Watershed Management Plan and distributed to project partners for review and comment. The plan will:

- Quantify the mechanisms of phosphorus loading to the ponds by examining tributary and internal lake sources of total phosphorus and land use sources (direct runoff, septic systems, etc.) that may be contributing total phosphorus in direct runoff;
- Identify land use strategies for mitigating loading from direct runoff to the ponds;
- Update the 2011 TMDL report on French Pond with measured stream flow measurements to be used in calculating tributary phosphorus loading;
- Incorporate detailed measurements of dissolved oxygen and total phosphorus in the water columns of each pond into lake models for calculating phosphorus loading dynamics;
- Measure total phosphorus content in pond sediments to compare with measurements collected in 1985 to examine sediment storage and release of phosphorus;
- Calculate a total phosphorus budget for each watershed; and
- Complete TMDL calculations for Keyser Pond.

The draft plan will be submitted to project partners for review and comment. It is assumed that project partners will review, comment, and send comments in tracked changes back to Gomez and Sullivan.

Task 21 – Incorporation of Project Partner Comments on Draft Plan

Project partner comments on the draft WMP will be addressed. Preparations will be made for a public meeting to present the WMP.

Task 22 – Public Meeting & Incorporation of Public Comments

A public meeting will be facilitated to present the updated draft WMP. Public comments on the WMP will be addressed and the WMP will be finalized.

It is assumed that logistical management and co-facilitation of the meeting will be the responsibility of the project partners.

Task 23 – Final Watershed Management Plan

The final WMP will be submitted to the Town of Henniker, the Henniker Conservation Commission, the French Pond Association, the Friends of Keyser Pond, and other interested members of the Community.

Object 7 Deliverable: An updated, revised, and fully USEPA-compliant (a-i) watershed-based plan will be prepared that incorporates watershed and in-lake nutrient sources and measures, costs, and resources to control them. The plan will be submitted to, and subsequently approved by, NHDES and the USEPA.

III. Schedule

Below is a tentative schedule detailing major project milestones. Shaded timeframes represent the range of time over which the task may occur, not necessarily the length of time required to complete the task. This schedule was based on the RFQ which indicated a contract start date in summer 2021 with the goal of a year-long study. It is anticipated that the schedule will be refined in collaboration with project partners.

Objective/Deliverable	2021					2022						
	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
1 – Site-Specific Project Plan												
2 – Existing Data Compilation & Review												
3 – Establishment of Phosphorus Water Quality Goals												
4 – Identification of Current & Future Pollution Sources												
5 – Estimation of Pollution Reductions & Required Actions												
6 – Public Education/Outreach Plan												
7 – Watershed Management Plan												

IV. Company Profile

Gomez and Sullivan has been providing specialized engineering, environmental science, and data management solutions to the water resource and energy sectors since 1993. Our staff of approximately 50 individuals based in New Hampshire (Henniker) and New York (Utica, Buffalo, Albany) includes water resource, civil, structural, geotechnical, electrical, and environmental engineers, as well as environmental scientists, regulatory specialists, ecologists, fisheries biologists, hydrogeologists, geologists, geomorphologists, and GIS specialists. Several key staff members are licensed Professional Engineers in New Hampshire.

We utilize our in-depth understanding of hydrology, hydraulics, water quality, and ecology, as well as the regulatory environment, to evaluate, plan, and design ecosystem-based restorations in lacustrine, riverine, and wetland environments. We have developed similar watershed plans for other New Hampshire water bodies, including Partridge Lake in Littleton and Beaver Lake in Derry. These projects have included development of EPA-approved site-specific QAPPs, identification of pollution sources, development of water quality monitoring plans, evaluation of potential BMPs to improve water quality, field surveys and inventories, and public outreach.

We have worked in all the major New Hampshire watersheds and have a long history of collaborating with municipal, state, and federal agency partners on restoration projects, including the NHDES. We have extensive experience in communicating controversial and complex information to a non-technical audience and understand the need for effective public outreach throughout a project to ensure its success. We are well versed in the preparation of grant and loan applications as tools to successfully identify and secure funding for mitigation projects.

Relevant services include the following:

- stormwater management (including stormwater pollution prevention plans & BMP designs)
- watershed studies & restoration planning
- shoreline erosion & shoreline management
- fluvial geomorphic studies & river corridor management plans
- river & floodplain restoration design (bank stabilizations, wetland restorations, habitat improvements, etc.)
- topographic and bathymetric surveys
- sediment studies (including quantity/quality assessments, transport modeling, scour analyses, management plans, etc.)
- water quality monitoring and modeling
- engineering design (conceptual through final)
- development of design drawings, cost estimates, technical specifications, & bid documents
- permitting for a variety of federal and state regulatory processes
- grant & loan application development
- bidding & construction phase services
- public outreach and education

V. Key Personnel

The following paragraphs highlight the relevant experience of key individuals who would form our team for this project. Full resumes can be provided upon request.

Since the project start date and schedule has yet to be established, staff availability is difficult to forecast at this time. We propose that once a start date and timeframe have been established, we will work with the Town to determine a more definitive schedule and provide staffing availability. Staff will be made available and dedicated to ensure the completion of the project according to the agreed-upon schedule.

Jill Griffiths, PE, CFM

Water Resources Engineer/Ecologist | Project Manager

Ms. Griffiths is a New Hampshire Professional Engineer (PE) and Certified Floodplain Manager (CFM) with B.S. degrees in both civil engineering and biology. Her background is in hydrology and hydraulics with a focus on ecologically sustainable restoration. She has a wide range of experience with projects to restore watersheds, such as dam removals, fish passage and habitat restorations, flood studies, and culvert replacements. She is experienced with stream geomorphic assessments, flood inundation and fluvial erosion hazard zone mapping, stormwater management, river corridor planning, and sediment analyses. She also has a strong background in environmental science and has conducted various habitat assessments, vegetation surveys, and water quality monitoring studies. She has prepared stormwater reports and designed and inspected BMPs to mitigate stormwater during construction of restoration projects. Through this work, Ms. Griffiths has been involved in project management, field assessment, hydrologic and hydraulic studies, alternatives analyses, cost estimating, design drawings and specifications, permitting, grant applications, reporting, and public outreach. For this assignment, Ms. Griffiths will serve as the Project Manager responsible for coordination of the project team, communication with project partners, review of all deliverables, and management of the project budget and scope.

Michele Stottler, PE

Senior Water Resources Engineer | Project Director

Ms. Stottler is a senior water resources engineer and Project Manager at Gomez and Sullivan and is licensed as a professional engineer. Over her 30-year career, she has been involved with numerous site development and water resources projects that have entailed the design and permitting of stormwater management systems, stormwater master planning, and water quality monitoring and modeling. Her experience has included not only the design of new stormwater projects but also the retrofitting of stormwater management systems with various restoration measures to decrease pollutant loadings and/or attenuate flows. Ms. Stottler's duties have included hydrologic and hydraulic modeling, stormwater management (modeling and Stormwater Pollution Prevention Plans), water quality monitoring and modeling, preparation of regulatory permits and reports, agency negotiation, construction plans and specifications, quantity and cost estimates, and construction administration. Ms. Stottler served as the lead engineer for the Partridge Lake Watershed Plan and the Conowingo Nutrient Reduction Plan. For this assignment, Ms. Stottler will serve as the Project Director responsible for ensuring that the appropriate resources are dedicated to the project and for providing QA/QC.

Kevin Cassidy, PE
Civil/Water Resources Engineer

Mr. Cassidy is an NH PE with 10 years of experience in civil engineering design and hydrologic and hydraulic analyses in support of water resources projects. He has served as the lead technical designer and project engineer on 10 dam removal projects with designs involving streambank stabilizations, natural stream channel design, and sediment management. He has received formal training in fish passage and aquatic organism passage at road-stream crossings and his designs have incorporated fish passage and aquatic habitat components. Mr. Cassidy is experienced in preparing design plans, cost estimates, technical specifications, and permit applications. He has experience as an owner's engineer providing bidding and construction services including facilitation of pre-bid/pre-construction meetings, evaluation of contractor bids, preparation of daily construction field reports, review of contractor submittals and requests for information, engineering evaluations during construction, and permit compliance services. He is certified as a Qualified Compliance Inspector of Stormwater. For this assignment, Mr. Cassidy will support the conceptual design and cost estimates of BMPs.

Anna Lampman, EIT
Civil/Water Resources Engineer

Ms. Lampman has a BS degree in environmental engineering and a background in water resources with a focus in hydrology and hydraulics. She is experienced in hydraulic analyses of culverts and hydrologic analyses associated with ecological rehabilitation efforts. She has developed feasibility and study reports and consulted with resource agencies. She is experienced in various field methods, including topographic and bathymetric surveying and stream flow measurements. She routinely installs, surveys, maintains, and collects data from water level and water quality loggers; processes and analyzes continuous water level and water quality data; and utilizes water level data to develop continuous time series of water levels, hydrologic rating curves, and hydraulic models. For this assignment, Ms. Lampman will serve as a project engineer to support all tasks, including data collection, analyses, modeling, conceptual design of BMPs, and reporting.

Jason George
Senior Environmental Scientist

Mr. George has over 20 years of experience as an environmental scientist, and has served as the project manager and lead field scientist related to a wide range of environmental studies across the Northeast in disciplines such as fluvial geomorphology, water quality, flow and water level management, instream and riparian habitat studies, sediment management, and fisheries. He has developed flood hazard mitigation alternatives, channel management and river corridor protection plans. He has served as the Project Manager and lead scientist to develop USEPA-approved watershed-based plans and QAPPs for New Hampshire lakes, and has successfully led public outreach efforts to implement these plans. In addition to his technical background, Mr. George has a strong regulatory background in environmental assessments and associated state and federal regulations. For this assignment, Mr. George will oversee the development of water quality sampling procedures and related environmental assessments.

Betsy O'Malley, PhD
Environmental Scientist

Dr. O'Malley has a strong background in ecology and aquatic biology. She has worked on several projects that combine field studies, laboratory studies, and computer modelling, and has a strong analytical background in a wide range of topics such as water quality, nutrient balance, aquatic ecology, and freshwater biology. She has extensive experience with data analysis, database management, and

interpreting and presenting project results. As part of her graduate degree research, she evaluated the balance of phosphorus and nitrogen inputs from adult migratory fish entering the St. Croix River system from the ocean and export from juvenile migratory fish leaving the river system. A model was also developed to determine the net balance of nitrogen and phosphorous inputs due to migratory fish for specific lakes within the basin. For this project, Dr. O'Malley will support water quality and environmental assessment and modeling tasks.

VI. Relevant Project Experience

The following selected projects demonstrate the experience of our staff in areas relevant to the proposed project.

WATERSHED PLANS

Partridge Lake Watershed-Based Plan & QAPP

Partridge Lake Property Owners Association (Littleton, NH)

Gomez and Sullivan developed a watershed-based plan for Partridge Lake in Littleton, NH, with the ultimate goal of delisting the lake from the impaired waterbodies list. Recent trends observed in the lake implicated phosphorus loading as the primary contributor to a decline in water quality as evidenced by spring and fall algal blooms and low dissolved oxygen levels during the summer. Gomez and Sullivan developed an EPA-approved Quality Assurance Project Plan to detail the methods of the pollutant loading analysis, which provided the basis for determining what types and at what locations BMPs could be implemented to prevent further degradation and/or improve future water quality in Partridge Lake. The plan was developed in accordance with EPA's nine criteria for watershed-based plans in accordance with EPA's Section 319 grant requirements. Potential BMPs included both non-structural and structural measures including filtration boxes, bioretention and stormwater wetlands for major sub-watersheds, and modifications to onsite wastewater treatment systems. The study also included an inventory of shoreline erosion sites and drainage culverts.

Beaver Lake Watershed Plan & QAPP

Beaver Lake Watershed Partnership (Derry, NH)

Gomez and Sullivan served on a watershed coordination team enlisted to facilitate the development of a watershed plan for the Beaver Lake Watershed Partnership. Tasks included characterizing the watershed, identifying pollution sources, formulating a water quality monitoring strategy, and recommending actions to mitigate problems to the lake and the watershed. An EPA-approved Quality Assurance Project Plan was prepared to detail the water quality sampling methods and included provisions to train student volunteers in rapid stream assessment techniques. The plan was presented to the public and implemented in collaboration with the local high school.

Cayuga Creek Watershed Assessment

New York Power Authority for Buffalo Niagara Riverkeeper (Niagara County, NY)

Gomez and Sullivan conducted a watershed assessment and developed a "report card" summarizing the current environmental condition of the Cayuga Creek watershed in Niagara County, NY. Assessment methods included a literature review, outreach, GIS analysis, and field verification. Input was solicited from a steering committee that included local, state, and federal officials as well as volunteers that live in the watershed. The report card assigned grades for many resources in the watershed including water quality, fish and wildlife, public access, stewardship, contamination, land use, and cultural heritage. For each category, recent successes and improvements were listed and steps needed to work towards problem

resolution were outlined. The report card offers a useful resource to residents who want to know more about the issues and positive aspects of the watershed and streams that flow through it. A full watershed assessment report was also prepared.

Conowingo Pond Nutrient Reduction Plan

Exelon Generation (Susquehanna River near the PA/MD border)

Gomez and Sullivan developed a Nutrient Reduction Plan for Conowingo Pond, the impoundment formed by Conowingo Dam on the Susquehanna River, which has a surface area of 9,000 acres and is approximately 14 miles long, straddling Pennsylvania and Maryland. Since its construction in 1929, Conowingo Dam has acted as a BMP by trapping sediment and nutrients, thereby preventing their discharge to the Chesapeake Bay. However, its ability to continue to do so in the future has been diminished, as reservoir sediment storage capacity is almost depleted. As a result, Exelon was issued a Clean Water Act Section 401 Water Quality Certification that required the reduction of 6 million pounds of nitrogen and 262,000 pounds of phosphorus. The Chesapeake Basin Program's official Chesapeake Assessment Scenario Tool (CAST) was used to quantify the effectiveness and costs of various BMPs at specific locations. A variety of CAST BMP scenarios were assessed, including forested riparian buffers, grassed riparian buffers, stream restoration, wetland restoration, agricultural land management practices, agricultural land conversion to meadow or forest, stormwater management upgrades, septic system retirement, and waste-to-energy projects. BMPs not in CAST were also reviewed, including five different stormwater BMPs (i.e., bioswales, infiltration practices, permeable pavement, filter strip runoff reduction, and filter practices) at multiple locations. Also, the replacement of septic systems with holding tanks, which would be periodically pumped and transported to a wastewater treatment plant, was investigated for over 200 cottages on project lands. The results of the CAST analysis and recommendations of the most cost-effective BMPs to reduce nutrient loadings were summarized in the Nutrient Reduction Plan.

Water Quality, Nutrient Loading, & Streamflow Monitoring Studies

Salmon Falls River (Rollinsford & Lower Great Falls Impoundments) Trophic State & WQ Studies

Green Mountain Power (Rollinsford and Somersworth, NH)

Gomez and Sullivan performed water quality studies in the Rollinsford and Lower Great Falls Impoundments, which straddle the NH/ME border on the Salmon Falls River near Rollinsford and Somersworth, NH. Sampling was extensive, as the studies were designed to accommodate requests from both the NHDES and Maine Department of Environmental Protection. The study methodologies utilized a combination of methods, including handheld multiparameter meters, continuous dataloggers, and sample collection to gather water quality data across an entire summer/fall period. Parameters included vertical profiles of dissolved oxygen and temperature, Secchi disk depth readings, and a combination of integrated core and grab (Kemmerer) samples. Sample analytes included total alkalinity, color, pH, chlorophyll-a, total phosphorus, total Kjeldahl nitrogen, and nitrate/nitrite. An additional sample was collected from each impoundment during the mid-summer, and was analyzed for chloride, sulfate, specific conductance, total calcium, total iron, total magnesium, total potassium, total silica, total sodium, total aluminum, and dissolved aluminum. In addition to the discrete measurements and samples, pH, dissolved oxygen, and temperature were monitored continuously in the impoundment, and dissolved oxygen, and temperature were monitored continuously in free-flowing areas upstream and downstream of the impoundment. Rigorous QA/QC procedures were implemented, including field calibrations, spot checks from

independent sensors, adherence to sample storage and holding times, and a thorough data review. Study reports were prepared for each impoundment to document the results of the trophic state and water quality studies. The studies identified elevated nutrients in the Rollinsford impoundment, with eutrophic conditions based on phosphorus levels and Secchi depth readings, whereas the Lower Great Falls impoundment was identified as mesotrophic overall.

Umbagog Lake Trophic State & Water Quality Study

Brookfield Renewable Energy Group (Errol, NH)

Gomez and Sullivan performed a water quality study in Umbagog Lake near Errol, NH. Sampling was extensive, as the study spanned a large area and was designed to accommodate requests from both the NHDES and Maine Department of Environmental Protection. The study methodology utilized a combination of methods, including handheld multiparameter meters, continuous dataloggers, and sample collection to gather water quality data across an entire summer/fall period, at nine sites throughout various areas of the lake, within major tributaries (i.e., the Magalloway and Rapid Rivers), and downstream of the lake in the Androscoggin River. Sampling included vertical profiles of dissolved oxygen and temperature, Secchi disk depth readings, and a combination of integrated core and grab (Kemmerer) samples. Sample analytes that were evaluated several times over the course of the study period included total phosphorus, chlorophyll-a, total Kjeldahl nitrogen, and nitrate/nitrite. In addition to the discrete measurements and samples, dissolved oxygen, temperature, and pH were monitored continuously at several locations in the lake, tributaries, and downstream areas. Rigorous QA/QC procedures were implemented, including field calibrations, spot checks from independent sensors, adherence to sample storage and holding times, and a thorough data review. An extensive study report was prepared, which concluded that, based on a combination of nutrient and chlorophyll-a criteria, the lake is mesotrophic and water quality typically meets Maine and New Hampshire standards, as applicable.

Salmon Falls River (Milton Impoundment) Water Quality Study

SFR Hydro (Salmon Falls River, NH)

Gomez and Sullivan conducted a water quality monitoring study at the Milton Hydroelectric project along the Salmon Falls River bordering NH and ME. The goal of the study was to collect water temperature, dissolved, chlorophyll-a, total phosphorus, and flow measurements to confirm that the hydropower facility was meeting the NH Water Quality Standards. Dissolved oxygen and water temperature data were collected continuously for five weeks at three locations within the project vicinity, vertical profiles were collected weekly in the impoundment, and flows were recorded in the bypass reach on three separate occasions. Water samples were collected and analyzed for total phosphorus and chlorophyll-a on a weekly basis. Resulting water quality conditions were assessed by comparing them to the NH Water Quality Standards, operations data, weather, and flow conditions. Data analyses and reporting were necessary for the project's Low Impact Hydropower Institute (LIHI) renewal.

Cold & Warner Rivers Protected Instream Flow Studies

New Hampshire Department of Environmental Services (Southwest NH)

Gomez and Sullivan is performing Protected Instream Flow Studies on the Cold and Warner Rivers in southwest NH on behalf of the NHDES Instream Flow Program. Both rivers are considered Designated Rivers in New Hampshire, and the results of the studies will inform development of their River Management Plans. The purpose of the studies is to determine the flows that will be protective of public instream uses, such as aquatic habitat, riparian habitat, and recreation. The Cold River study has been ongoing since 2019, and the Warner River study is now underway. The Cold River study involved extensive streamflow monitoring at various locations throughout the river. Transects were established, cross-sectional topographic surveys were performed, and water levels were monitored at 19 locations along the river, which allowed the water level and associated habitats to be modeled at a wide range of river flows. Flow measurements were collected at several locations using a digital flow meter to confirm readings at a USGS gage, and water level and flow relationships were developed.

St. Croix River Marine-Derived Nutrient Cycling Study and Model

University of Maine (Orono, ME)

Gomez and Sullivan staff member, Dr. Betsy O'Malley, performed a study on marine derived nutrient cycling in the St. Croix River system in Maine. Alewives are a migratory species that can bring nutrients from the marine environment to freshwater environments when they swim upstream to spawn. Dr. O'Malley sampled the freshwater community (fish, invertebrates, and plankton) in two catchments, one with and one without a large alewife spawning run. Samples were dried and prepared for stable isotope analysis, and results were analyzed to compare catchments and sites within a catchment. Nutrient-diffusing substrates were deployed to record seasonal nitrogen and phosphorous levels at each sampled site. Samples from the diffusers were processed in the lab and results were analyzed to compare nutrient levels between sites with and without a large spawning run. In addition, a model was developed to estimate net balance in lakes within the watershed of nitrogen and phosphorous inputs from adult alewives and export from juvenile alewives. Alewife population growth and net nutrient balance was estimated for all lakes within the watershed given a range of passage scenarios.

Mad River Water Temperature Model

VT Dept. of Fish and Wildlife (Mad River, VT)

Gomez and Sullivan assisted in the development and application of a stream temperature model for the Mad River in Vermont. The SNTEMP model was used to assess the effects of riparian zones, shading, and vegetation on stream temperatures. A characterization of the longitudinal temperature regime in the Mad River was prepared and the suitability of summer water temperatures for coldwater fish was analyzed. Metrics to serve as indicators of habitat suitability for cold water fish species were also developed.

SAMPLING/MANAGEMENT PLANS & QAPPS

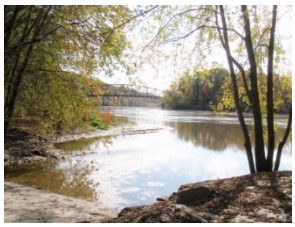
McLane & Goldman Dam Removal Sediment Sampling Plan & QAPP

Town of Milford, NH

Gomez and Sullivan worked with the Town of Milford on a feasibility study for removing two dams on the Souhegan River, separated by approximately 1,300 feet in downtown Milford. As part of the study, the quantity and quality of sediment that has accumulated upstream of the dams was evaluated to inform potential post-removal sediment management alternatives, including a) allowing the sediment to naturally migrate downstream, b) partial or full dredging of impounded sediments, or c) partial dredging of sediments and stabilization of the remaining material in place. This project was complicated by the presence of a Superfund site adjacent to one of the impoundments. Gomez and Sullivan developed a Sediment Sampling Plan and Quality Assurance Project Plan (QAPP) in consultation with the USEPA, NHDES, and other project partners. Following the guidelines of the plan, Gomez and Sullivan collected sediment samples to identify potential contaminants of concern, as well as determine physical properties of the sediment for use in a sediment transport analysis. Results were analyzed and summarized in a report.

Northfield Reservoir Sediment Management Plan & QAPP

FirstLight Power Resources (Northfield, MA)



Gomez and Sullivan developed a Sediment Management Plan to assess sediment dynamics in the Northfield Mountain Pumped Storage Project's upper reservoir and the Connecticut River (which serves as a lower reservoir for the Project) over a four-year period in consultation with the EPA and the Massachusetts Department of Environmental Protection. Gomez and Sullivan subsequently developed an EPA-approved site-specific Quality Assurance Project Plan to describe the quality assurance measures that would be adhered to during sampling and analysis of data collected under the plan. To fulfill the requirements of the plan, Gomez and Sullivan's ongoing responsibilities include managing annual bathymetric surveys in the upper reservoir, installing and maintaining continuous suspended sediment sampling equipment, periodically collecting turbidity and total suspended solids data from the Project area, analyzing the data, and submitting annual reports.

VII. References

The following business references can verify our performance on services relevant to those requested.

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