

February 1, 2005

Jon Kachmar
State Planning Office
38 State House Station
Augusta, ME 04333

Re: New Meadows Lake Tidal Restoration Feasibility Study – application to the Gulf of Maine Council on the Marine Environment/NOAA Habitat Restoration Grants Program Year Four Supplemental – 2005-2005

Dear Jon,

The Casco Bay Estuary Project is pleased to submit the attached proposal, *New Meadows Lake Tidal Restoration Feasibility*, at the Bath Road Causeway in Bath and Brunswick, Maine. This coastal wetland restoration project has the enthusiastic support of the federal, state and local partners of the Casco Bay Habitat Restoration Committee as well as the strong support of the New Meadows River Watershed Project.

We are seeking grant funding to develop and evaluate the feasibility of specific alternatives for increasing tidal exchange beneath the Bath Road causeway, thereby improving water quality and restoring intertidal and salt marsh habitat in the New Meadows Lake. In recent years, the Lake has experienced diminished water quality, loss of intertidal habitat, and expansion of invasive species. Habitat impairment in New Meadows Lake is indicated by bio-chemical factors such as hypoxia, and physical factors including the extensive loss of inter-tidal habitat and the presence of *Phragmites australis*, an invasive species. The study will develop numerical hydrodynamic models suitable for assessing existing and proposed conditions associated with proposed restoration alternatives. In addition, the study will incorporate stakeholder input solicited during three public forums. We anticipate that the study will result in three “feasible alternatives,” which will be evaluated in detail to assess their ability to achieve restoration goals.

We will work closely with the New Meadows River Watershed Project and will subcontract with Woodlot Alternatives, Inc., a consulting firm with expertise in coastal wetland restoration, to ensure that project objectives are met. The project will be managed by the Casco Bay Estuary Project and the Casco Bay Habitat Restoration Committee will provide guidance and throughout the project.

Thank you for your consideration of this important proposal.

Best regards,

Karen Young
Director

APPENDIX A: Project Scope

ORGANIZATION: Casco Bay Estuary Partnership

PROJECT NAME & LOCATION: ***New Meadows Lake Tidal Restoration Feasibility Study***
Bath Road Causeway, Bath and Brunswick, Maine

PROJECT CONTACT: Matt Craig, *Technical Program Coordinator*, Casco Bay Estuary Partnership
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PROJECT TYPE: Coastal Wetlands Restoration.

PROJECT GOALS & OBJECTIVES: In 2002, the Casco Bay Estuary Partnership (CBEP) initiated the Habitat Restoration Program with the goal of restoring priority habitats identified in the *Casco Bay Plan*, including degraded marine, estuarine, and freshwater habitats of the Bay and its watershed. CBEP has worked closely with the New Meadows River Watershed Project (NMRWP), a collaborative effort initiated in 1999 between the municipalities of Bath, Brunswick, Harpswell, Phippsburg, and West Bath, as well as academic, non-profit, state and federal partners, to protect, improve and maintain the vitality of the ecological and economic resources of the New Meadows River and its watershed. Historically, the New Meadows River was a tidal system with minimal fresh-water inputs. Due to the construction of two road causeways across the river, however, tidal exchange in the upper river is now restricted, creating what is known as New Meadows Lake ("Lake"). The U.S. Route 1 causeway was constructed across the Lake in the late 1960's, and resulted in bisection of the Lake into 'upper' and lower reaches.

Although salinities in the Lake are typically above 25 parts per thousand (ppt), the Lake has experienced diminished water quality (e.g., hypoxia), loss of intertidal habitat, and expansion of invasive species.

The goal of this study is to develop and evaluate restoration alternatives at the Bath Road Causeway to improve water quality and enhance inter-tidal and salt marsh habitat in New Meadows Lake. The study is based on a two-phase process, with an initial phase associated with the development and evaluation of conceptual alternatives, and the second phase associated with a more detailed evaluation intended to provide for the selection of a "feasible" alternative. The proposed study is not intended to address all ecological, engineering, social, and economic issues related to the health and potential restoration of New Meadows Lake. Rather, it is intended to provide critical information that will inform the ultimate decision-making process for the future implementation of a selected, feasible alternative. The following objectives will implement progress toward the project goal:

Objective 1: Solicit and incorporate stakeholder input.

Objective 2: Review previously collected data and identify additional data needs.

Objective 3: Additional site survey work.

Objective 4: Develop and utilize numerical hydrodynamic models to evaluate alternatives.

Objective 5: Development and Evaluation of Restoration Alternatives.

BACKGROUND/PROJECT DESCRIPTION: New Meadows Lake was created by the construction of a roadway embankment across the New Meadows River by the Department of the Army in 1937 at Bath Road, formerly US Route #1. Prior to the construction of this causeway, the hydrology of the New Meadows River experienced semi-diurnal tides and included both inter-tidal and sub-tidal habitats. Due to the restriction imposed by the small opening in the culvert under the Bath Road causeway, the normal tidal range in the Lake is less than one foot. Salinities within the Lake have typically remained above 25 ppt due to the Lake's relatively small freshwater watershed.

Habitat impairment in New Meadows Lake is indicated by bio-chemical factors such as hypoxia, and physical factors including the extensive loss of inter-tidal habitat and the presence of *Phragmites australis*, an invasive species, in an 80-acre salt marsh at the head of the Lake north of the US Route #1. While the Lake currently supports a diverse ecological community, the aforementioned factors

indicate substantial impairments to its ecological functions prior to the restriction of tidal flow. Restoration of the New Meadows Lake could enhance habitat for a variety of marine species, including shellfish, and enhance opportunities for commercial and recreational harvest.

STUDY METHODS: The proposed study methods are intended to provide a framework for the development of alternatives to address potential restoration goals. The study will develop numerical hydrodynamic models suitable for assessing existing and proposed conditions associated with proposed restoration alternatives. Specific requirements of the proposed numerical modeling work would be determined based on the evaluated alternatives, and are discussed in more detail below.

PROJECT ELIGIBILITY: The proposed coastal wetland restoration project will assess alternatives for increasing the tidal exchange in the Lake. Restoration objectives to be considered during development of alternatives may include, but are not limited to, restoring the quality and quantity of sub-tidal and inter-tidal habitat, improving water quality, restoration of native and control of invasive plant species, and restoring conditions conducive to native aquatic and wetland vegetation.

PARTNERSHIPS AND COMMUNITY SUPPORT: The project will be sponsored and guided by a strong interagency/local partnership. CBEP's Casco Bay Habitat Restoration Program is guided by a committee that includes representatives of the Maine Department of Environmental Protection (DEP), Maine State Planning Office (SPO), Natural Resources Conservation Service (NRCS), Maine Department of Marine Fisheries (DMR), U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service Gulf of Maine Project (USFWS), and Friends of Casco Bay, among others. NMRWP is a collaborative effort between the Brunswick, Harpswell, Phippsburg, West Bath, Bath, BEP, DMR, DEP, EPA, Friends of Casco Bay, Maine Coastal Program, Bowdoin College, MER Assessment Corporation, and the New Meadows Lakes Association. In 2003, the NMRWP identified the need for a study to, "Assess the feasibility of increasing tidal exchange in the lakes," in its *New Meadows River Watershed Management Plan*, and a Letter of Support from NMRWP is included in Appendix F. This project is also supported the Army Corps of Engineers (ACOE). ACOE was approached in January, 2004 by the NMRWP, for consideration of the New Meadows Lake restoration under their Section 206 Program. The Corps has agreed to work with the towns. The results of the proposed study will be used by the ACOE as part of their feasibility assessment prior to partnering with the towns of West Bath and Brunswick on any proposed modifications of the existing structures.

PROJECT TEAM/ROLES: CBEP will act as the fiscal agent responsible for project oversight and will collaborate with NMRWP and Woodlot Alternatives, Inc. to implement project objectives. The CBEP's Habitat Restoration Committee will work closely with CBEP staff and the NMRWP Steering Committee to ensure that project objectives are met.

The project consultant team will include John Lortie, Michael Chelminski, and Stephanie Lindloff of Woodlot Alternatives, Inc. (Woodlot), and Dr. John Richardson of Blue Hill Hydraulics, Inc. (BBH). John Lortie, the president of Woodlot, has over 20 years experience working as a biologist in and along the estuaries of the Gulf of Maine. Michael Chelminski is a licensed engineer and the director of Woodlot's Ecological Restoration Division. His work experience includes planning and analysis of restoration designs for riverine and estuarine systems, with an emphasis on numerical hydrodynamic modeling. Stephanie Lindloff is nationally recognized for her previous work as New Hampshire's River Restoration and Dam Removal Coordinator, where she oversaw the scoping, design, and implementation of numerous restoration projects. Dr. John Richardson's is the President of BHH, and has performed multi-dimensional numerical hydrodynamic modeling studies of estuarine systems throughout North America and Europe. Mr. Chelminski and Dr. Richardson have collaborated professionally since 1999, including work in 2003 and 2004 on a project with Ms. Lindloff during her tenure as New Hampshire's River Restoration and Dam Removal Coordinator. Further information on the Woodlot team is included in Appendix G.

PROJECT TASKS:

TASK 1: SOLICIT AND INCORPORATE STAKEHOLDER INPUT

Public involvement is an important component of this study. To encourage stakeholder participation in the decision-making process, CBEP and NMRWP will hold public forums at the beginning, middle, and end of the study. These forums will inform stakeholders and help to streamline anticipated future work to be conducted through the Corps Section 206 Aquatic Ecosystem Restoration Project. The first forum, a scoping meeting, will occur soon after the Notice to Proceed. The Project Team will introduce study objectives, reasons for addressing specific technical issues, and proposed methods for analyzing technical issues. The second forum will present an interim progress report and solicit stakeholder comments. A draft report presenting the methods and results of the proposed study will be developed for public review prior to the third and final public forum, where the Project Team will summarize results and present the range of evaluated restoration alternatives. It is anticipated that these alternatives will largely be drawn from the ideas discussed in the second public forum. Ample time will be provided for public comment and questions. Written comments will also be accepted. All comments will be considered in the development of the final report.

Task 1 Cost Estimate: \$7,275.00

TASK 2 - REVIEW PREVIOUSLY COLLECTED DATA AND IDENTIFY ADDITIONAL DATA NEEDS

Sources of existing data will include a number of previously developed reports and studies on the New Meadows River system, including evaluations of water quality and sediments in the Lake. As part of this task, existing information will be cataloged for future use.

Task 2 Cost Estimate: \$3,360.00

TASK 3: ADDITIONAL SITE SURVEY WORK

Survey work will develop anticipated additional data needs, including the geometry of the existing culvert and outlet works under Bath Road, the geometry of the channel under the U.S. Route 1 Bridge separating the upper and lower segments of New Meadows Lake, additional bathymetry data in the Lake, and tidal stage data on each side of the Bath Road causeway.

A survey of the geometry of the openings under the Bath Road and U.S. Route 1 Bridge is necessary for the development of numerical hydrodynamic models, as reliable data for these features are not available. Although some bathymetric data are available for the Lake, additional data are needed to accurately delineate shallow areas that could revert to inter-tidal habitat following the implementation of an evaluated alternative. Tidal stage data will be obtained in the New Meadows River and Lake on each side of the Bath Road causeway using automated monitoring equipment. These data will be used to determine the existing tidal flux in New Meadows Lake and to provide tidal information for use in the development and evaluation of potential alternatives.

Task 3 Cost Estimate: \$8,890.00

TASK 4: DEVELOP AND UTILIZE NUMERICAL HYDRODYNAMIC MODELS TO EVALUATE ALTERNATIVES.

The proposed study will include the development and evaluation of alternatives for achieving the study goals. Evaluated alternatives will consider both existing conditions (“No Action Alternative”) and pre-1937 (“Pre-1937 Alternative”) conditions as bounds within which to assess the likely efficacy of the other alternatives. These two cases will provide bounds or standards within which other restoration alternatives can be evaluated.

The development and evaluation of alternatives will be performed using a variety of numerical hydrodynamic modeling (“modeling”). Two phases of modeling will evaluate tidal exchange in the Lake for existing conditions and for project alternatives. The initial phase of modeling will be performed using a relatively simple model suitable for the efficient evaluation of potential restoration alternatives. Information obtained in the initial phase will then be used in the second phase of modeling to perform a more detailed analysis for selected restoration alternatives, with an emphasis on evaluating mixing in the Lake upstream of the Bath Road causeway. It is anticipated that up to five “conceptual” alternatives, including the No Action Alternative and Pre-1937 Alternative, will be developed as part of the initial evaluation. It is anticipated that three “feasible alternatives” will subsequently be evaluated in

more detail as part of the second phase to assess their ability to achieve the restoration goals and a preliminary determination of their constructability.

The initial phase of modeling work will be performed using the Corps' HEC-RAS software system. An unsteady flow model with one spatial dimension will be developed using this model to evaluate general hydrodynamic conditions in the Lake for the existing condition and for the proposed alternatives. Information obtained from this initial modeling phase will include tidal flux and stage in both the upper and lower regions of the Lake for all cases evaluated. This model will also be used to provide information, such as boundary conditions, for the second phase of the modeling work.

The second phase of the modeling work will be implemented, as needed, to address inherent limitations associated with the one-dimensional HEC-RAS model, such as the inability to evaluate circulation, turbulent jet dissipation, sediment transport, and density currents in the lake. This work will be performed using a variety of tools suitable for evaluating mixing upstream of the causeway, including numerical models with two and three spatial dimensions and turbulent jet models. The primary goal of the second phase of modeling is to determine the efficacy of the evaluated alternatives at achieving project goals. The second phase of modeling will also determine whether additional survey work, such as sediment sampling, should be performed as part of future studies associated with the implementation of a specific alternative.

Task 4 Cost Estimate: \$35,100.00

TASK 5: DEVELOPMENT AND EVALUATION OF RESTORATION ALTERNATIVES / PROJECT REPORTING

Draft and final project reports will be developed as part of this task. The draft report will be developed for distribution to the public prior to the second public forum. The draft report will include a summary of the objectives of the study, methods used, model development, assessment and evaluation process, additional data collected (as an addendum), study area maps, and an overview of each restoration alternative. The final report will be developed prior to the third public meeting and will reflect technical and editorial comments from the Casco Bay Habitat Restoration Program committee and the NMRWP.

Task 5 Cost Estimate: \$14,140.00

PROJECT SCHEDULE: A detailed project schedule is provided in Appendix E.

CONTINGENCY: The estimated total cost for Tasks 1 through 5 is \$67,965.00. To account for unforeseen work that may need to be performed by Woodlot as part of the proposed study, a contingency cost equivalent to 10% of the project budget, \$6,797.00, is included in the total estimated project cost. Including this cost with the estimated total cost for Tasks 1 through 5 and CBEP project coordination costs of \$4,876.00 results in a total proposed project cost of \$79,638.00.

CONCLUSION: The purpose of the proposed study is to develop, evaluate, and present information on restoration alternatives suitable for achieving restoration goals of improved water quality and habitat restoration in the New Meadows Lake. The results will be used by ACOE to determine whether alteration of the existing structures is advisable prior to initiation of proposed restoration activities.

DELIVERABLES:

1. Preliminary Scoping Report for presentation at initial scoping meeting.
2. Conceptual Alternatives Report, for presentation at the second public forum.
3. Feasibility Study Report, to be completed at the project's conclusion.
4. Six-month Progress Reports (to be delivered every 6 months from the start-date of the contract, estimated at April 1, 2005).
5. Compilation of Public Comments, to be completed at the project's conclusion.
6. Financial report (due 18 months after the start-date of the contract).

The results and products of this study will be made available in hardcopy and electronic formats to the Army Corps of Engineers, the Gulf of Maine Council on the Marine Environment, the New Meadows

River Watershed Project, the New Meadows Lakes Association, and other interested stakeholders. Final deliverables will be made available to state and Federal agencies and interested parties upon completion and within 18 months of receipt of Notice to Proceed.

PAYMENT SCHEDULE: As suggested, schedule to include three payments with 15% upfront.