



Stantec

June 08, 2009

Nat Tupper
Town of Yarmouth
Main Street
Yarmouth, ME 04096

Subject: Royal River Restoration Project, Yarmouth, Maine

Dear Nat,

This proposal presents a scope of work to prepare an alternatives analysis for restoration of natural riverine function within two dam-affected reaches of the Royal River in Yarmouth, Maine, including restoration of resident and diadromous fish communities. The proposed work is focused on evaluating impacts to the Royal River resulting from the East Elm Street and Bridge Street Dams and the development of alternatives to mitigate these impacts, such as removal of one or both of the dams.

Resident and diadromous fish species that would benefit from increased upstream fish passage efficiency and/or restoration of natural riverine conditions within the project area include alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), "salter" brook trout (*Salvelinus fontinalis*), American shad (*Alosa sapidissima*), sea lamprey (*Petromyzon marinus*), and the American eel (*Anguilla rostrata*). If this scope of work does not meet your project needs, or if we have misunderstood your requirements, please contact us.

Project Understanding

Stantec understands that the objective of the Town of Yarmouth (Town) is to improve diadromous fish passage and restore natural riverine function within the Royal River at the East Elm Street (upper dam) and Bridge Street Dam (lower dam) locations. The Bridge Street Dam is located approximately 0.25 miles upstream from the head-of-tide on the river, and the East Elm Street Dam is approximately 0.5 miles further upstream. Both dams currently have fish passage facilities (Denil fishpasses), but our understanding is that these facilities are not suitable for upstream passage of all of the target fish species.

The Royal River has been identified by the Gulf of Maine Council and the Maine State Planning Office (SPO) as a restoration priority, with the removal of these two dams being identified as restoration sub-projects by the SPO restoration inventory conducted in 2005. Restoration and protection of the Royal River estuary has also received previous support from the National Oceanic & Atmospheric Administration's (NOAA) Coastal and Estuarine Land Conservation Program (CELCP) for land acquisition. The 1.5-mile section of the Royal River corridor between the East Elm Street Dam and the town harbor is also currently the focus of a Town planning project evaluating natural resources, recreational use, zoning, and future development along the Royal River.

This proposal represents the initial phase (Phase 1) of work as part of a larger project that would include permitting, implementation, and subsequent monitoring. The deliverable for Phase 1 of this project will be a report detailing relevant and practical "Project Alternatives." We propose that the "Project Alternatives" be defined as follows:

- Project Alternative 1: Removal of the dams and restoration of the natural stream channel;
- Project Alternative 2: Installation/renovation of fish passage structures; and,
- Project Alternative 3: No action.

Specific components of the restoration approaches to be considered include 1) restoration of fish passage at the East Elm Street and Bridge Street dams, and 2) restoration of fish habitat. A salient and relevant difference between these two approaches is that restoration of fish passage alone does not necessarily restore habitat or riverine function (i.e., sediment transport).

Scope of Work

Task 1: Initial Planning and Stakeholder Identification

Stantec will conduct a kick-off meeting with the project partners to finalize project tasks and schedules, and identify stakeholders to be consulted during the Phase 1 of the project. Potential project stakeholders include such entities as the Royal River Conservation Trust, Trout Unlimited, the Coastal Conservation Association, Yarmouth Historical Society, Yarmouth High School Physical Education Program, Yarmouth Community Services, the Yarmouth Water District, state and federal regulatory and natural resource agencies, and abutting landowners. Stantec will develop a schedule for stakeholder consultation in concert with the Town.

The deliverable item for this task will be a list of stakeholders to be contacted during subsequent project tasks and a schedule for stakeholder consultation.

Task 2: Natural Resource Delineation and Characterization

Initial reconnaissance-level wetland and habitat surveys were conducted in 2007 as part of the Town's Royal River Corridor Study. We propose to perform additional natural resource surveys in the vicinity of the dams and impoundments to facilitate our evaluation of impacts associated with project alternatives. Identified impacts to mapped natural resources will provide information for the determination and comparison of impacts associated with the evaluated alternatives. Obtaining this information in the summer of 2009 will provide information for initial regulatory coordination and provide an opportunity for additional surveys later in 2009, if required.

Stantec will identify and characterize wetland characteristics within a 50-foot corridor along both sides of sections of the river impounded by the East Elm Street and Bridge Street dams. Conditions within this area are anticipated to be altered by the removal of the dams and the resulting change in water level. Wetland boundaries under local, state, and federal jurisdiction which are located within 100 feet of the dams that are likely to be impacted during construction (Phase 2) will be determined using the technical criteria described in the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual and any specific criteria contained in the local land use ordinance.

Potential streams and *Wetlands of Special Significance* under the jurisdiction of the Maine Department of Environmental Protection (MDEP) will be identified based on the criteria in the Maine Natural Resources Protection Act. To prepare this proposal and cost estimate, Stantec assumes that the Town will have obtained landowner access permission prior to commencement of fieldwork. Identifying *Wetlands of Special Significance* will also involve contacting natural resource agencies such as the Maine Department of Inland Fisheries and Wildlife and the Department of Conservation Natural Areas Program to determine if there have been any reported occurrences of rare species features at the site since 2007.

Wetland boundary flags and necessary control points will be located using a Global Positioning System (GPS) Trimble® Pro-XR receiver. GPS survey data will be downloaded to AutoCAD and a map will be produced showing the wetland boundaries in relation to control points along the dam, adjacent structures, and other observed features.

Deliverable items for this task include the following:

- Brief narrative report describing the delineation methods, the wetland classifications (i.e., types) and characteristics, and the local, state, and federal wetland regulations that may affect development at the site.
- Copies of agency contact letters and responses.
- AutoCAD electronic file format of wetland boundaries.

Task 3: Topographic and Bathymetric Surveys

Topographic survey work is proposed for the area immediately adjacent to the two dams. The purpose of this work is to provide information for the development and evaluation of project alternatives as part of Phase 1 and for subsequent use in Phase 2.

The total area of the proposed topographic survey is approximately 3 acres. Topographic survey work is anticipated to be performed by Royal River Survey of Yarmouth, Maine, and would include topography at one-foot (ft) contour intervals based on the North American Vertical Datum of 1988 (NAVD88) and location of significant features (dam, buildings, outlet structures, tree line, etc.). The horizontal survey coordinates would be based on the Maine State Plane Coordinate System, West Zone, North American Datum of 1983 (NAD83).

Bathymetric surveys are typically performed as part of dam removal studies due to limited available information on the conditions in the upstream impoundment and the potential for sedimentation. We propose to conduct a limited bathymetric survey of the two impoundment areas using acoustic depth sounders and survey rods with horizontal positions obtained using GPS receivers. Please note that acoustic depth sounders logging directly to a GPS receiver data storage system can be an efficient method of obtaining a relatively large number of data points, but the data readings can be adversely affected by aquatic vegetation. Conversely, use of survey rods to measure depth is labor-intensive and limits the number of points that can be obtained over a given period. We will employ both methods as needed, depending on the presence of vegetation.

Stantec would rectify bathymetric data to the horizontal and vertical coordinate system used for the topographic survey based on visual correlation with existing aerial photography and measurements of elevations on the dam, respectively.

The deliverable item for this task will be an integrated topographic and bathymetric map in paper and electronic file formats.

Task 4: Preliminary Historic and Cultural Resources Assessment

Evaluation of dam removal alternatives will require identification of protected historic or cultural resources at the site, and an initial assessment of potential impacts to those resources. Stantec will retain a subconsultant to perform a rapid site assessment for cultural resources, and will contact the Maine State Historic Preservation Office (SHPO) and appropriate Tribal entities to identify resources and determine any additional studies that may be required. It is assumed that the Yarmouth Historical Society will also be consulted for additional information on historic and cultural resources at the dam sites.

The deliverable item for this task will be a brief narrative report summarizing the findings of the preliminary historic and cultural resources assessment.

Task 5: Sediment Sampling and Analysis

Prior to the sediment sampling work, Stantec will prepare a Sediment Sampling Plan for review by the Town. We suggest that the Town consider having this plan reviewed by relevant agencies as well, as they may review the procedures and results as part of subsequent permitting-related processes.

Stantec will collect sediment samples in the field during a single visit using a stainless steel extendable hand corer and possibly a Petit Ponar grab sampler. Based upon Stantec's prior work experience, we understand that these samples can be collected by wading and/or from a canoe. Sample locations will be documented using a GPS receiver. Stantec will use standard field forms developed for similar work to record relevant information during sample collection in the field.

Our proposed approach is to collect four sediment samples for laboratory analysis, including;

- a) One sample from the Royal River in the East Elm Street Dam impoundment;
- b) Two samples from within the impoundment between the two dams,
- c) One sample downstream from the Bridge Street Dam.

All samples will be obtained from depositional areas of fine-grained materials identified during or prior to the sediment sampling work. This is particularly important in the impoundments, where the location of sedimented materials is likely variable. Based on our prior experience, we anticipate that the downstream sample would be obtained from depositional bars. Similarly, we anticipate that suitable samples of fine-grained samples can be obtained in the vicinity of 1) the margins of the upstream end of the impoundments, and/or 2) in the deepest areas of the impoundments immediately upstream from the dams.

Laboratory analyses will be performed to determine physical and chemical characteristics including grain size, organic content, and chemical constituents. The samples will be collected in accordance with the United States Environmental Protection Agency's (EPA) Clean Water Act Section 401 water quality specifications. The samples will be collected in a manner deemed most representative of the site. Sample analysis will be performed by a laboratory certified by the National Environmental Laboratory Accreditation Program (NELAP) using EPA-approved methods for selected target analytes. Chemical analyses will include volatile petroleum hydrocarbons (VPHs), polynuclear aromatic hydrocarbons (PAHs), pesticides, polychlorinated biphenyls (PCBs), total organic carbon, and select total metals (including arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc).

Stantec anticipates subcontracting with Katahdin Analytical Services, Inc. (Katahdin) to perform sediment analytical analyses, and will ship samples to Katahdin in containers provided by them in accordance with their standard procedures. Katahdin is a NELAP-certified laboratory and therefore will be assumed to use all of the proper analytical methods accordingly.

Sediment probes will be conducted utilizing a steel rod pushed down through the sediment until refusal at impoundment transects selected in the field to obtain information required to provide an estimate of sediment volume. Transect locations will also be documented using a GPS receiver.

Deliverable items for this task include the following:

- Sediment Sampling Plan (draft for review and final).
- Laboratory analysis results.
- A brief letter report presenting the laboratory analysis results and a comparison with relevant MDEP criteria.
- A brief memo report on estimated sediment volume and visual characterization.

Task 6: Hydrology, Hydraulics, and Hydropower Analysis

Hydrologic and hydraulic analyses will be performed based on Stantec's understanding of the project need. The objective of these analyses is to provide information relevant to the development and evaluation of various alternatives, including potential beneficial and adverse impacts associated with each alternative. Because an aging small-scale hydropower facility is located in the Sparhawk Mill, a preliminary analysis of the site's power generation potential and economics will also be performed, based on the hydrologic information.

Hydrology

The basis of the hydrologic analyses will be the development of annual and seasonal flow parameters in the river in the vicinity of the dams. Hydrologic parameters will be developed using regional regression equations and "gage-transfer" methods based on U.S. Geological Survey (USGS) stream gaging stations in northern New England. We will develop relevant information for using these methods, such as watershed area, slope, and aerial-fraction.

The hydrologic work will emphasize the development of flow-duration statistics for migration periods of target diadromous fishes. Migration periods for the target species will be developed based on discussions with relevant agencies, including the Maine Department of Inland Fisheries and Wildlife, Department of Marine Resources, NOAA, and the U.S. Fish and Wildlife Service. Based on our recent work in the region, we are very familiar with seasonal migration periods and other factors affecting movement of diadromous fish in the Royal River area.

High-flow statistics (e.g., 100-year return-interval hydrologic event) will also be calculated from daily statistical data collected by the United States Geologic Survey (USGS) surface water gage (USGS 01060000 Royal River at Yarmouth, Maine) that was located on the Royal River in Yarmouth, Maine from October, 1949 until September, 2004. PeakFQ hydrologic calculation software will be used to calculate these high-flow statistics (per Bulletin 17B).

Deliverable items for this task include the following:

- Memo report presenting seasonal flow statistics relevant to diadromous fish usage of the Royal River.
- Memo report on high-flow statistics in Royal River.

Hydraulics

Hydraulic evaluations for dam removal projects are typically used to evaluate existing and potential conditions, such as water surface elevations during flood events, flow speeds in restored channels for dam removal alternatives, and to provide information for evaluating sediment mobility. A variety of hydraulic modeling approaches are suitable for evaluating these conditions.

Our proposed approach is to develop and use a one-dimensional, steady-state hydraulic model developed within the U.S. Army Corps of Engineers HEC-RAS software system. This model will be developed using geometry data obtained from the site topographic and bathymetric surveys and information obtained from the existing topographic plan of the impoundment area. Flow data for this model will developed from the project hydrologic analyses.

This model will be used to evaluate relevant aspects of each of the evaluated Project Alternatives, including water surface elevations, flow speeds, and potential sediment mobility, as deemed necessary. Specific examples of this work would be a "preliminary" assessment of effects on the regulatory flood plain limits relative to the existing conditions, as removal or lowering of the dam would result in a reduction in the area of the 100-year floodplain as defined by the Federal Emergency Management Agency.

Deliverable items for this task include the following:



- Memo report documenting the HEC-RAS model.
- HEC-RAS model in electronic file format.
- Results of the hydraulic analyses for each alternative.

Hydropower Analysis

A preliminary hydropower analysis will be conducted for the Bridge Street dam site. This study will draw upon results of the hydrology and hydraulic study, and will incorporate flow evaluations, current generation capability, and economic analyses of the power generation potential.

Deliverable items for this task will be a memo report documenting the hydropower analysis.

Task 7: Analysis of Impacts to Local Groundwater Resources

Groundwater analyses will be performed based on our understanding of the project needs. The objective of these analyses is to determine if removal of the dams and subsequent restoration of the natural stream channel or the installation of fish passage structure(s) will significantly alter and/or potentially create undesirable impacts to the groundwater and/or at residential homeowner wells located in close proximity to the Royal River.

Hydrogeologic Data Review

Hydrogeologic data sources such as surficial geology, bedrock geology, and significant sand and gravel aquifer maps will be reviewed. Surficial geologic contacts (sand, till, clay, marsh, etc.) will then be superimposed onto site maps developed by Stantec. This information will be used to interpret/estimate the potential for groundwater levels in various areas of the subject site to be lowered due to the removal or lowering of the dam.

Other important data sources will include State and Town files to understand the locations and types of residential drinking wells (if any) located in close proximity to the Royal River. If Town files are not available on-line, they can be reviewed during the proposed site visit described below.

Deliverable items for this task include the following:

- Drinking water well data, such as well owner name, Tax ID (i.e. Map and Lot Number), type of well (dug, well point, bedrock), and depth will be documented and provided in a table.
- A letter report discussing and interpreting the data obtained, field events, and results. An estimate of the potential decrease in groundwater levels due to lowering or removing the dam will be presented and superimposed onto a topographic map.

Task 8: Agency and Stakeholder Coordination

Up to four meetings will be held with resource and regulatory agencies and with previously-identified stakeholders to seek input on issues and alternatives. It is assumed that this process will be conducted in parallel to other data collection tasks, and will help to inform the subsequent alternatives analysis process. Public meetings and input would generally be deferred to the project evaluation stage where the results of feasibility study and alternatives would be presented and discussed in public outreach forums.

Task 9: Project Evaluation and Reporting

This section describes work associated with evaluation of alternatives and data collected in prior tasks, as well as production of the feasibility report.

Evaluation of Alternatives

Project Alternatives will be evaluated using information developed in prior tasks. The alternatives analyses will include descriptions of the potentially-affected environment and alternative-specific impacts. The following Project Alternatives are anticipated to be evaluated, which may be revised based on project work:

Project Alternative 1: Dam Removal(s)

Project Alternative 1 (with possible sub-alternatives) would evaluate full removal of one or both dams. The potential benefits of this alternative include restoration of upstream fish passage in the Royal River as well as restoring riverine flow conditions, natural sediment transport regime, and riparian corridor connectivity present within the river prior to dam construction.

Project Alternative 2: Replacement or Enhancement of Fish Passage Structures

Project Alternative 2 would include enhancement or replacement of the existing fish passage structures at the dams. Specific scenarios that would be developed and evaluated would include installation of fish passage structures for existing and modified dam geometries.

Project Alternative 3: No Action Alternative

A “No Action” alternative will be evaluated based on the project goals and constraints. The purpose of this alternative is to provide a baseline condition for evaluation of the action alternatives.

Deliverable items for this task include the following:

- A brief memo discussing alternatives that were not considered for detailed evaluation.
- Descriptions of all considered alternatives for additional evaluation.
- Conceptual plan and profile drawings of the evaluated Project Alternatives.

Our approach to the evaluation of alternatives will follow general approaches used for documents developed in accordance with the National Environmental Policy Act (NEPA), including descriptions of the project need, alternatives, affected environment, impact assessment, and summary of feasibility assessment.

Opinion of Probable Costs

Stantec will develop an opinion of probable costs for additional studies and implementation of removal of the two dams. Specific items presented in the opinion of probable costs will include the following cost elements:

- a. Final engineering design plans for the Preferred Project Alternative (selected by project partners);
- b. Permitting; and,
- c. Implementation and construction oversight.

Feasibility Report Preparation

A project feasibility study report will be developed incorporating information obtained in prior tasks of this proposal, including the opinion of probable costs. A NEPA format will be used to present information developed for the study. We anticipate that a draft study report will be provided to the Project Partners for their comment prior to the development of the final study report.

Deliverable items for this task include the following:

- Draft feasibility study report for review by the project partners.
- Final feasibility study report based on comments by project partners on draft feasibility study.

Task 10: Presentation at Community Outreach Meetings

We have assumed that two community outreach meetings will be required for this work in addition to meetings with stakeholders. Based on our proximity to the project site, we have limited our cost for this work to preparation for each meeting.

It should be noted that the Royal River Conservation Trust (RRCT) currently provides both staff and volunteer stewardship and monitoring of the river corridor. RRCT recently hired a Stewardship Coordinator that is shared 50 percent with the Town of Yarmouth as Land Stewardship Coordinator. We assume that both the RRCT and Town of Yarmouth will provide support for community participation and outreach activities, and that the Town's Parks and Lands Committee may also be available to assist in this outreach effort as appropriate.

The deliverable items for this task include informational materials developed for each meeting.

Please note that this task does not include photosimulations or other photographic renderings of the project site for the dam removal alternative.

Schedule

Stantec will initiate the work described above within 2 weeks of receiving notice to proceed. We anticipate that the schedule will proceed according to the following schedule:

June 2009 – December 2009	Feasibility Study, hydrologic assessment, draw-down study, habitat characterization, bathymetric surveys, topographic surveys, wetland delineation, hydropower evaluation, sediment sampling and analysis, stakeholder/agency consultation
January – February 2010	Alternatives analysis and public outreach
March 2010	Development of Phase II work plan and funding application

Proposed Phase 1 Budget

Expense Category	RAE-NOAA Partnership Request	Non-Federal Match	Match Source (descriptive)	Total Project Cost
Funding Sources:	\$21,000	\$11,000	Town of Yarmouth	
Tasks:				
Initial Planning and Stakeholder Coordination			Town of Yarmouth	In-kind
Topographic surveys				\$2,000
Natural Resource Delineation and Characterization				\$5,000
Preliminary Historic and Cultural Assessment				\$8,000
Sediment Sampling and Analysis				\$8,000
Hydrologic/Hydraulic Modeling				\$7,000
Analysis of Impacts to Local Groundwater Resources				\$2,000
Agency/Stakeholder Consultation				\$3,000
Alternatives Analysis Reporting				\$7,000
Public Outreach			Town of Yarmouth	In-kind
Other		\$10,000	Stantec	
Initial hydropower study, bathymetric surveys, corridor evaluation, hydrologic data compilation		(in kind)		
Totals	\$21,000	\$21,000		\$42,000

Terms and Conditions

Stantec will perform the work described on a time-and-expense basis in accordance with Stantec’s Professional Terms and Conditions, which are enclosed as a part of this proposal. We should be able to perform these tasks for a total estimated cost of \$42,000. Please note that although the total estimated project cost is \$42,000, Stantec intends to contribute up to \$10,000 of these services as an in-kind non-Federal match. This cost estimate is valid for 60 days. We will not perform any work that would result in exceeding the estimated cost without your prior authorization. Invoices, correspondence, and final report will be directed to:

Nat Tupper, Town Manager
 200 Main Street, Yarmouth, Maine 04096
 Ph: (207) 846-9036 Fax: (207) 846-2403

If you wish to proceed with this effort, please sign and return this proposal by fax or mail at your earliest convenience. Please call with any questions or comments. We look forward to working with you on this project.

Best regards,

Stantec Consulting



George Kendrick
 Principal

Proposal Accepted: _____

Date: _____

Authorized Representative Name and Title

Authorized Representative Printed Name and Title

