

# SCOPE OF WORK

JANUARY 2008

## 1.0 INTRODUCTION

The fate of four dams on the Boardman River in Grand Traverse and Kalkaska Counties is being considered by The Boardman River Dams Committee (BRDC). Environmental Consulting and Technology, Inc. (ECT) was selected to perform an engineering and feasibility study to evaluate possible alternative futures for the dams and to make recommendations to the BRDC on the fate of the dams based upon full consideration of environmental, societal, economic, and engineering considerations. The possible alternative futures range from continued operation of all dams to their removal.

ECT prepared a detailed Scope of Work for the Study which was approved by the BRDC in September 2006. A contract was executed in January 2007 which, recognizing that all required funding was not available, provided for work to be accomplished only in accordance with separately issued individual work orders each with a specified scope and budget.

The approved Scope of Work was subdivided into six major components:

- Communications and Public Education
- Determination and Documentation of Existing Conditions
- Identification of Alternatives
- Evaluation of Alternative Plans
- Recommendation of Preferred Alternative
- NEPA Documentation

All work to date has focused on the determination and documentation of existing conditions with an emphasis on the collection and evaluation of existing data, and the identification of data gaps. This category of work includes the documentation of existing, or baseline conditions as well as the processes that define the relationships between the Boardman River and the environmental, engineering, societal, and economic concerns of the community. Existing conditions have not been fully established, but significant progress has been made with completion of the following work products:

- Plan for the Drawdown of Boardman Pond, May 2007 (only effort not directly related to the establishment of existing conditions).
- Socioeconomic
- Aquatic Habitat
- Fisheries
- Wildlife
- Terrestrial Habitat
- Wetland Identification
- Preliminary Engineering Evaluation
- Survey cross sections to support Corps Hydraulic Modeling effort

The BRDC has acquired additional funding and has requested that ECT develop a new Work Order Proposal, focusing on completing documentation of existing conditions to enhance the knowledge base upon which alternatives can be identified and evaluated. It is the desire of the BRDC to advance this phase of the study. With a budget of \$80,000, ECT proposes the following high priority tasks to achieve the stated desires of the BRDC:

- TASK 1: Boardman River Socioeconomic Analysis: Quantification of Existing Conditions - \$42,000
- TASK 2: Boardman River Cultural Resources: Analysis of Existing Conditions - \$14,000
- TASK 3: Boardman River Engineering Analysis: Establishing the Baseline Condition for Boardman Dam - \$12,000
- TASK 4: Boardman River Sediment Quality: Evaluation of Existing Data - \$4,000
- TASK 5: Support to BRDC - \$8,000

Each of these is discussed in more detail below.

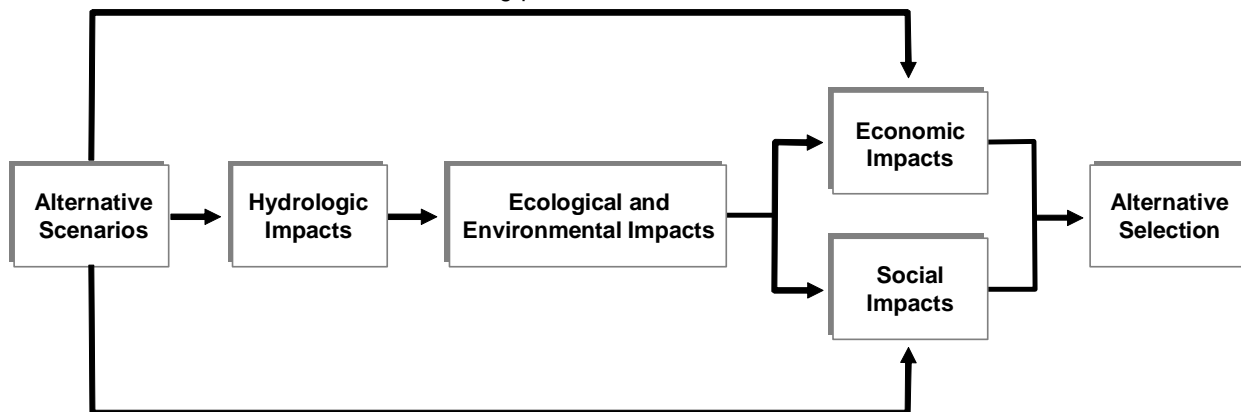
***TASK 1: Boardman River Socioeconomic Analysis: Quantification of Existing Conditions***

**A. Overview**

An important input to informing recommendations for decision making is evaluating the socioeconomic impacts of various dam management alternatives. The ECT Economic Team, led by Matt Bingham of Veritas Economic Consulting (Veritas) completed the first step of the socioeconomic analysis, evaluating existing information, in July 2007, and the associated report identified information needs and availability for the economic and social analyses.

This proposed scope of work builds upon the earlier effort and involves conducting a detailed quantification of the existing conditions on the Boardman River and developing mathematical linkages between current conditions (baseline) and usage. The following sections provide an overview of this step, place it within the context of the overall assessment, and describe the specific tasks for its completion

The socioeconomic impacts associated with alternative outcomes for the Boardman River dams will ultimately be evaluated using a simulation model that examines changes in the dams' baseline conditions resulting from various disposition alternatives and quantifies the associated changes in societal welfare.<sup>1</sup> Figure 1 presents an overview of the socioeconomic modeling process.



Boardman-0001

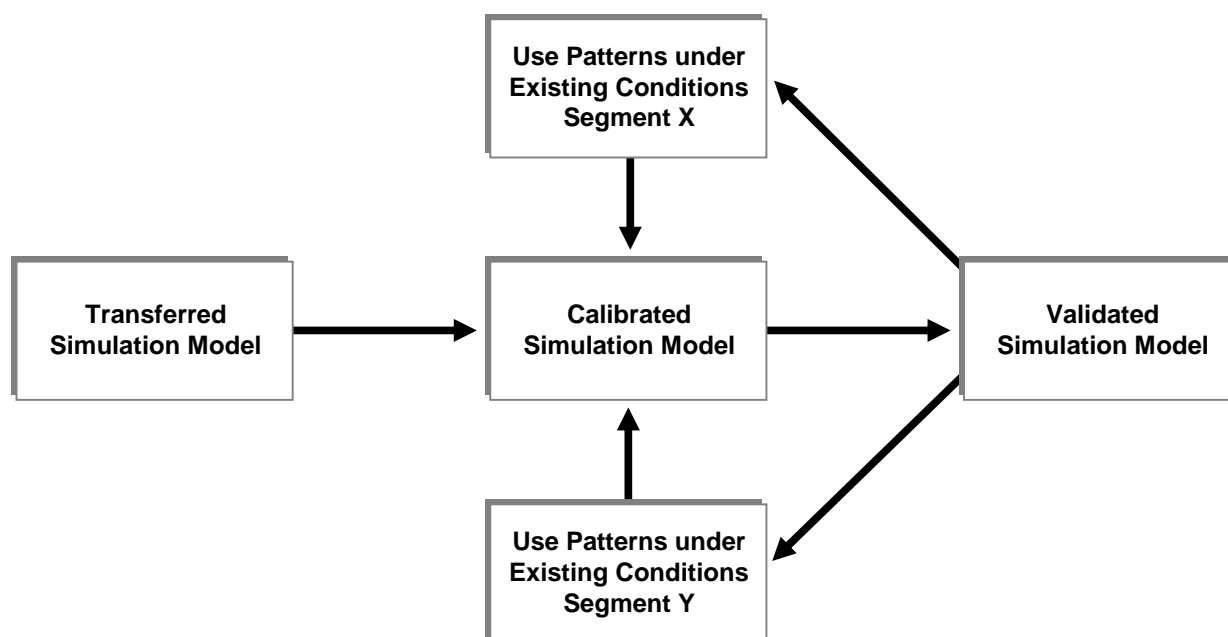
<sup>1</sup> By baseline we mean the conditions of the dams that will exist into the future but for the initiation of any individual planned alternative. By changes in societal welfare we mean changes in the well being of various individuals or stakeholders (e.g., property owners, or recreators) who will be made either better or worse off as a result of an individual alternative.

## Figure 1: Overview of Modeling Process for Evaluating Socioeconomic Impacts of Alternative Dam Disposition Scenarios

As Figure 1 illustrates, the analysis begins by examining the technical changes to the dams and the river associated with the potential alternative scenarios. This entails evaluating the specific engineering changes to the dams and the river as well as a specification of how the changes will be financed and how any negative implications will be mitigated. These technical changes generate hydrologic impacts. These expected hydrological impacts in turn impact the local aquatic and ecological systems. Changes in river hydrology and the related ecosystem may impact certain individuals such as anglers and riparian property owners directly. They may also impact a broader group of individuals indirectly through changes in the performance of the economic system. The social impacts and the value of the hydrological, ecological, and economic impacts reflect individuals' preferences for simulated outcomes, supporting effective decision-making.

As the figure illustrates, conducting this ultimate evaluation first requires the availability of the set of alternative scenarios. In addition, to accurately evaluate the socioeconomic impacts associated with each scenario, the baseline conditions must be characterized and quantified so that changes to that baseline resulting from the initiation of each potential alternative can be evaluated. The next step of the analysis is to properly characterize the baseline conditions in anticipation of a BRDC- recommended list of alternatives for detailed evaluation..

Therefore, in this next step of the assessment, we will collect detailed quantitative baseline information and compile it within a mathematical modeling structure that is validated spatially based on existing conditions. For example, different types of recreators (i.e., anglers versus campers versus canoers) from various locations (i.e., towns and counties) will have varying trip-taking frequencies to each section of the Boardman River. Changes to the baseline conditions of the Boardman River will affect these individuals differently depending upon the type of recreator they are, the type of alternative evaluated, and their proximity to the altered section of river. The role of this second step in the analysis is to collect the necessary data to properly characterize the current activity types and visitation rates, as well as other potential impact types such as property values, to be able to characterize the baseline conditions of each. Calibrating and validating a transferred simulation model across river segments develops mathematical linkages capable of identifying use impacts related to extant river characteristics. Figure 2 depicts this approach.



Boardman-0007

Figure 2: Overview of Quantitative Baseline Characterization and Model Calibration

The following statement of work describes the specific tasks to undertake this effort.

## B. Statement of Work

Task 1.1: Quantify Existing Conditions for Recreational Use of the Boardman River. In this task, we will develop detailed estimates of the current level of recreational usage along the various stretches of the Boardman River. As identified in the July 2007 report, the potentially affected recreational activities include fishing, canoeing, camping, and trail activities (such as hiking, biking, and walking). Based on the available information (also described in the July 2007 report), we will quantify the existing level of usage for each of these four recreational activities, for each stretch of the Boardman River. This task responds at least in part, but not necessarily in whole, to items C2, C12, C19, C20, D6, D7, D11, D14, D15, and D19 of the BRDC's original RFQ. For example, item C12 states "Determine the economic gains for restoring high quality trout water." This task responds in part to that item by quantifying the level of trout fishing in the various stretches of the Boardman River under existing conditions. After the detailed analysis of the selected dam disposition alternatives are completed, the amount of trout fishing that would occur under the selected dam disposition alternatives can be estimated. By subtracting the current level of trout fishing from the level of trout fishing that would occur under various alternatives, we can then move forward with estimating the gains and respond to this item in full.

Task 1.2: Quantify Existing Levels of Expenditures for Recreational Users of the Boardman River.<sup>2</sup> This task follows from the previous task. Once the current level of recreational usage is

<sup>2</sup> This task responds at least in part, but not necessarily in whole, to items C18, C20, and C25 of the BRDC's original RFQ.

established, we can estimate the associated expenditures for that level of activity. Like the recreational usage estimates, this quantification will be specific to each activity to each stretch. This task responds at least in part, but not necessarily in whole, to items C18, C20, and C25 of the BRDC's original RFQ.

- Task 1.3: Quantify Current Property Values for Potentially Affected Properties Along the Boardman River.<sup>3</sup> As identified in the July 2007 report, the value of some (but not necessarily all) properties along the Boardman River may change under some of the dam disposition alternatives. We will quantify the current value of the existing properties that could be affected by changes in dam disposition scenarios. Like the recreational usage estimates, this quantification will be specific to each stretch. This task responds at least in part, but not necessarily in whole, to items C1, C11, C21, and D5 of the BRDC's original RFQ.
- Task 1.4: Specify Linkages with Models. The July 2007 report contained some information on the models and analytical methods that will be used to eventually estimate economic impacts under various dam disposition alternatives. In this task we will finalize these models and calibrate them across river segments under baseline conditions.
- Task 1.5: Prepare Report that Describes the Existing Conditions. In this task, we will pull together the results of Tasks 1 through Task 4 above and prepare a report that contains the results of the quantification of existing conditions. The existing conditions will be quantified in tables, specific to each river reach where appropriate. The report will describe the source of the information and any underlying assumptions. The report will also contain a description of the specific models and methods that will be used in a subsequent phase of work.

As our July 2007 report revealed, some of the required information may not be available. However, in the interim, additional information, such as the Watershed Center survey, has become available. If additional research and review of available information does not uncover all of the necessary data, this report will identify the data gaps and propose next steps.

### **C. Deliverable**

The deliverable for this task is a written report that will complete the analysis of social and economic baseline conditions by collecting detailed data and information, and compiling it within a mathematical modeling structure validated spatially on the basis of existing conditions. The report will describe existing conditions associated with recreational usage, the current level of economic expenditures related to Boardman River recreators, and the current property values, consistent with all activities described in Tasks 1.1 through 1.4.

### **D. Schedule**

Work will begin upon written approval of this proposed scope of work and will conclude within six months of that approval.

### **E. Budget**

This task will be completed for a fixed amount of \$ 42,000.

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<sup>3</sup> This task responds at least in part, but not necessarily in whole, to items C1, C11, C21, and D5 of the BRDC's original RFQ.

## ***TASK 2: Boardman River Cultural Resources: Analysis of Existing Conditions***

In addition to being a stated concern of the BRDC, State and Federal legislation requires that proposed projects, such as the removal or modification of the Boardman River dams, must consider the historic and cultural significance of the site, and take actions to avoid, minimize and or mitigate any adverse impacts. Proposed projects must be reviewed and approved by the State Historic Preservation Office (SHPO). Required mitigation plans could be costly and thus impact the range of alternatives that are considered to be viable. Further, the documentation and coordination is an integral and necessary component of the NEPA process, and is commonly referred to as Section 106 coordination in reference to Section 106 of the National Historic Preservation Act of 1966, as amended.

An ECT Team led by Don Weir of Commonwealth Cultural Resources Group, Inc. (CCRG) will initiate the process of determining if the Boardman River dams, either individually or as a system, are formally considered to be historic, and thus subject to State and Federal review. A historic structure is minimally defined to be at least 50 years old and must exhibit integrity of location, design, setting, materials, workmanship, feeling, or association. This effort will provide the historic background or context of significance for each of the dam structures. Additional work at each dam site will be required to meet the Section 106 requirements by producing a property description; completing an evaluation of historic integrity; and determining which, if any, of the National Register of Historic Places (NRHP) Criteria for Evaluation are met by the resources.

This first step will provide sufficient information on each of the dams to determine what the next steps in the Section 106 process will be required. If it can be shown through the documentation process that a property has lost its historic integrity, the report will indicate this and suggest that additional work may not be necessary. In the case where historic materials suggest that the resource retains its historic integrity, the resulting report will clearly indicate suggested next steps and the need for additional work. This report will be provided to the SHPO for review and concurrence.

Because the formal Section 106 process also requires an evaluation of the archaeological potential for each of the resources, additional work at each of the dams and the associated waterway will be required. While some of the development of the historic contexts can be carried over to the archaeological evaluation of the dams, additional work on the historic and prehistoric use of the land will be required in this evaluation.

Within the Section 106 process, the determination of the dams as NRHP eligible properties will require the identification of alternatives to protect or mitigate changes in the area.. This process involves consultation with the SHPO. The SHPO will also be involved with the process much earlier, and will review and comment on the CCRG reports and its determination of eligibility...

### **B. Statement of Work**

Task 2.1: Undertake the background research on the four dams/powerhouses associated with the Boardman River Dams project. This research will identify any previous documentation completed on each of the dams/powerhouses, and provide basic context development for the properties. Among the sources to be consulted during the investigation process include the local historical society and library collections, the collections of the former owner of the dams and powerhouses, the archives in the Clark Historical Library Collection housed at Central Michigan University, Mount Pleasant, and the collections of the Library of Michigan and the Archives of Michigan, Lansing. Sources such as written histories, published plat maps, and specific collections relating to the dams and development of hydro-electric power will be investigated.

The proposed historic documentation of the Boardman River Dams and Powerhouses will begin the process to meet a number of the concerns enumerated in the Boardman River Dams Concerns document. Specifically addressed will be item number A17 addressing the environmental issues involving transportation and other infrastructure. Historic documentation may also provide additional avenues of grant sources as is enumerated under C17. Finally, researching the historic background of the four dams/powerhouses will also address the issue raised in D10, which requires that the project ascertain the historic values of the dams or powerhouses.

Task 2.2: The results of the background research will be summarized in a letter report and coordinated with the SHPO for the purpose of determining the potential eligibility of each dam/powerhouse for the Register of Historic Places. The letter will also indicate suggested next steps for the project, further providing an opportunity to gain insight from the SHPO on their specific areas of concern.

### **C. Deliverable**

The deliverable for this scope of work is a written report that describes the background research, recommendations on eligibility, results of SHPO coordination, and any recommended next steps relevant to analysis of dams disposition alternatives..

### **D. Schedule**

Work will begin upon written approval of this proposed scope of work and will conclude within three months of that approval.

### **E. Budget**

This task will be completed for a fixed amount of \$ 14,000.

## ***TASK 3: Boardman River Engineering Analysis: the Baseline Condition for Boardman Dam***

### **A. Overview**

A joint work effort by ECT and the U.S. Army Corps of Engineers has been recently completed to review the engineering aspects of the Boardman River dams to include a review of previous engineering reports as well as onsite inspections of each structure (Preliminary Engineering Review of Existing Structures). The purpose of this effort was to identify any conditions that would impact either the identification of baseline conditions or the formulation of potential alternatives. The baseline is the condition that would be expected during the planning assuming no alternative changes are implemented. Establishing the baseline condition is critical for two reasons. First, it serves as the expected condition from which impacts of proposed alternatives can be measured. Second, the identification of a baseline could have a significant impact on implementation costs for alternatives, as well as having a significant impact on the financing options (i.e., the determination of actual implementation costs exclusive of owner maintenance and major repair costs.)

The Boardman Dam currently does not meet the State of Michigan dam safety criteria. The existing spillway capacity is not sufficient and Michigan Department of Environmental Quality (MDEQ) has directed action to bring the structure into compliance with the State's legislative dam safety requirements. The Preliminary Engineering Review identified four potential options for satisfying the State's dam safety requirements:

- Modifications to emergency spillway, which will allow the original water level to be restored.
- Limited modifications to emergency spillway, which will require that the current water level be maintained.
- Raise embankments to provide adequate freeboard and maintain the water level at the current (reduced) level.
- Modify main spillway to reduce crest elevation so that 200-year flood pool elevation will be less than 40-feet above toe of dam; additional reduction to pool elevation

An ECT engineering team under the lead of James Hegarty, P.E., of Prein & Newhof will develop each of the alternatives, determining specific performance criteria and presenting cost estimates.

## B. Statement of Work

Task 3.1: The State determined design flood will be routed through the reservoir for each of the alternatives to define the specific modifications that will be required to meet the safety criteria for each of the identified alternatives. Existing mathematical models will be used for this effort.

Task 3.2: Using the information obtained above, we will prepare a narrative description of the alternatives as well as an associated cost estimate that will be appropriate for use in the Engineering and Feasibility study for recommending the appropriate baseline condition for Boardman Dam. This effort will address in full or in part the following community concerns contained in the original RFQ :C5, C6, C23, C24, and C26,

## C. Deliverable

The deliverable for this task is a written report which will include a description of each alternative to satisfy the State dam safety criteria for Boardman Dam including a cost estimate for implementation of each alternative. The report will also include a recommendation of which alternative should be established as the baseline condition for Boardman Dam.

## D. Schedule

Work will begin upon written approval of this proposed task and will conclude within three months of that approval.

## E. Budget

This task will be completed for a fixed amount of \$12,000.

## *TASK 4: Boardman River Sediment Quality: Evaluation of Existing Data*

### A. Overview

One topic that requires careful scrutiny in assessing alternatives for the dams is an evaluation of the chemical quality of sediment in the impoundments. In 2005, sediment samples were collected from each of the impoundments and analyzed for heavy metals, grain size and organic chemicals. ECT reviewed this data for Boardman Pond as part of the Drawdown Plan and found that some of the samples exceeded the environmental screening levels for four heavy metals.

The chemical quality of the sediment will have a significant impact on the formulation of alternatives, particularly the sediment management aspect of any alternative that involves a change in the water surface profile along the Boardman River system. The natural response to such a change will be the redistribution of sediment within the system. Consideration will have to be given to sediment management options to control the movement of sediment. The level of required control will be significantly impacted by the nature of the sediment.

Consistent with previous components of the Engineering and Feasibility Study, we propose an incremental approach to the evaluation of the existing sediment quality within the Boardman River system which starts with the identification, collection, and evaluation of existing data.

### ***B. Statement of Work***

Task 4.1: ECT will evaluate the sediment chemistry and grain size analysis for the sediment samples collected in 2005. We will map the location of the samples, review the laboratory data and summarize the data. We will compare the results to Michigan standards for sediment quality and identify samples that would be considered contaminated by state standards. We will summarize the sampling effort and determine if the sampling meets current standards for sediment evaluation.

This task will address, either in total or in part, the following concerns expressed by the BRDC in the original RFQ: A4, A5,A8, A9, B7,C10, C16, and C24.

Task 4.2: Based upon the above and our understanding of the types of measures that may be appropriate for sediment management, ECT will identify additional data needs and provide a rationale for the need for those data. We will provide a recommendation regarding future sampling of sediment, if any.

### **C. Deliverable**

The deliverable for this scope of work is a written report that describes the existing sediment analysis data, evaluates the adequacy of that data for the identification and evaluation of alternative futures as part of the Engineering and feasibility study, and recommends additional studies, if necessary.

### **D. Schedule**

Work will begin upon written approval of this proposed task and will conclude within two months of that approval. We will provide an interim report describing the existing sediment analysis within the first month.

### **E. Budget**

This task will be completed for a fixed amount of \$4,000.

## **TASK 5: BRDC Support**

### **A. Overview**

A contract between the BRDC and ECT for the Engineering and Feasibility Study recognized that all required funding was not available, and provided for work to be accomplished only in accordance with separately issued individual work orders each with a specified scope and budget.

All funding received to date has been provided for the accomplishment of specific studies to support the Engineering and Feasibility Study. ECT proposes to establish a separate Task to provide for general support to the BRDC.

We will prepare information as requested by the BRDC and/ or Project Team and attend the BRDC meetings. We will be available to provide technical information and advice to the BRDC as requested at times other than the BRDC meeting.

## **B. Statement of Work**

Task 5.1: At least one of the ECT co-directors of this study effort will attend each of the regularly scheduled monthly BRDC meetings during the six month duration of this Work Order. We will be able to provide technical information and advice to the BRDC, including assistance with proposal development to the extent resources will allow. We will prepare work orders for consideration of the BRDC as additional funding becomes available. We will continue general coordination of overall study efforts with the U.S. Army Corps of Engineers and other interested parties to maximize the synergy among similar study objectives and to avoid duplication of efforts

## **C. Schedule**

The work will begin upon written approval of this task and the support effort will continue through the completion of all tasks identified above....

## **E. Budget**

This work will be completed at a fixed cost of \$8,000.