Blackstone River Watershed Hydropower Feasibility Study

Phase 1 Report

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Introduction

Conservation Law Foundation (CLF) is pleased to submit the following report on Phase 1 of a joint feasibility study designed to explore the feasibility of hydropower projects at five existing dams on the Blackstone River to generate renewable energy for the benefit of its neighboring municipalities. This report addresses Phase 1 tasks as summarized in the following sections, including detailed technical appendices which support the Phase 1 findings. Phase 1 efforts included preliminary investigations in the following areas:

1. Title Research and Site Control
2. Preliminary Dam Inspections
3. Site Hydraulics
4. Preliminary Energy Analysis
5. Preliminary Economic Analysis
6. Municipal Energy Collaborative

The results of this preliminary investigation demonstrate that four of the five dams show sufficient promise in terms of energy generation and associated development, operation and maintenance costs to warrant proceeding with Phase 2 of the feasibility study. The viable dams include: Elizabeth Webbing, Ashton, Albion and Manville (see Figure 1). We have concluded that the restoration of the Pratt dam for hydropower is not feasible for two reasons: 1) the generation potential is too low; and 2) there are anticipated impacts on surrounding properties from redevelopment, including potential impacts to the Peterson Puritan Superfund Site (as discussed in more detail below). While technically feasible and economically attractive, re-powering the Roosevelt Hydropower Project (a.k.a. Elizabeth Webbing) could be problematic due to recent actions by FERC to terminate the existing license.

For the purpose of the Phase 1 analysis, the Essex Partnership has identified preliminary turbine equipment options that appear well-suited to the physical characteristics of the sites, particularly hydrology (river flows) and hydraulics (head). Based on the equipment options evaluated we have constructed a screening level energy model and preliminary economic and financial analyses. The Phase 1 results will be further refined in Phase 2 based on equipment and operational optimization and more detailed cost estimates.

All economic results presented in this report are preliminary and are likely to change as a result of new or additional information and further analyses. Preliminary results, however, indicate that there are no fatal technical flaws that would impact the feasibility of hydro development at four of the five sites examined, and that the economics are sufficiently promising to merit further investigation.

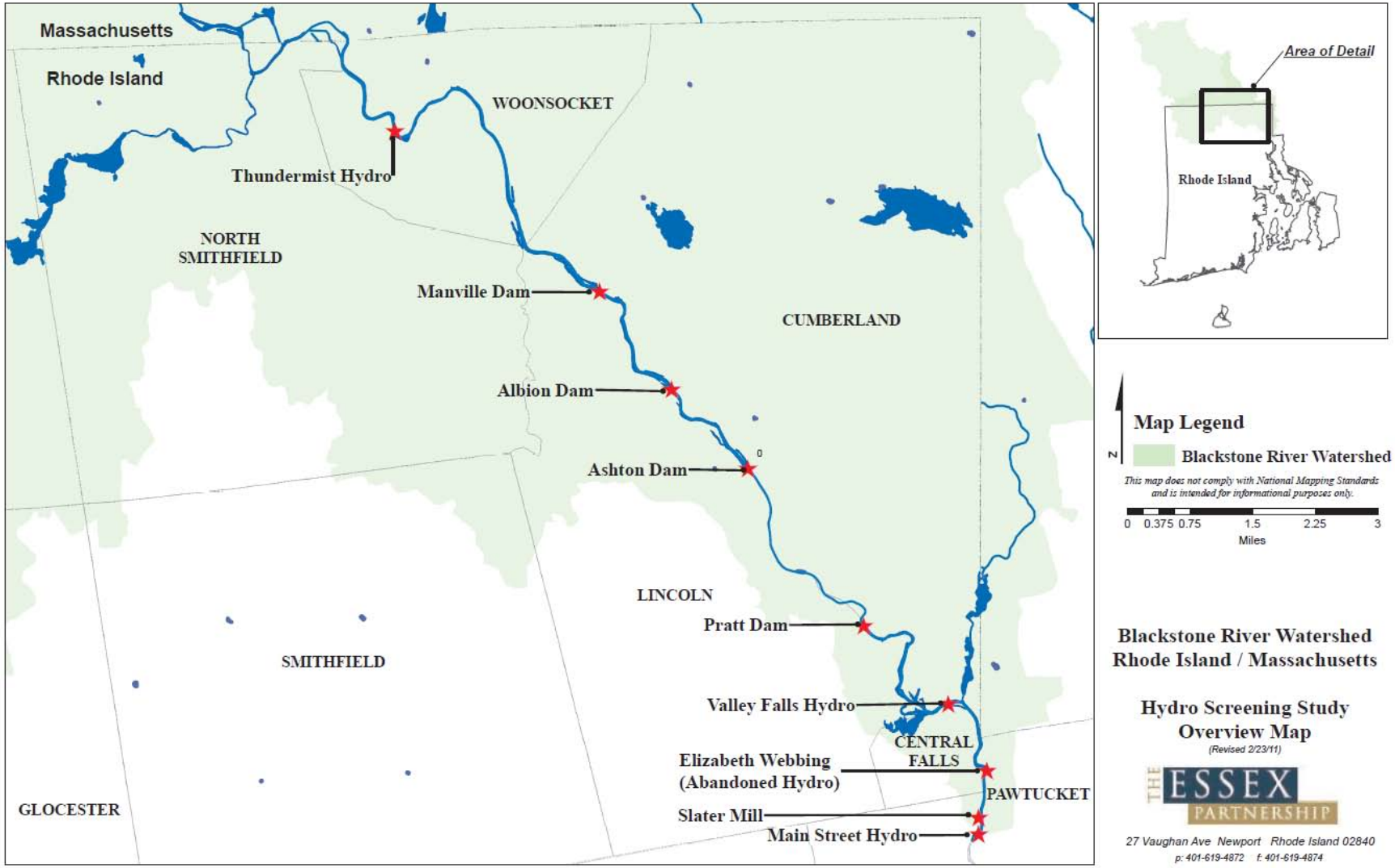


Figure 1. Map of the Blackstone River watershed

Developing Environmentally Sustainable Hydropower

The guiding principal of this investigation is to determine the feasibility of developing environmentally sustainable hydropower resources for public benefit. To that end, this study incorporates provisions that address specific resource protection standards.

All of the projects evaluated have been configured to allow for eventual certification by the Low Impact Hydropower Institute (LIHI). LIHI certification has become an industry standard for hydro as it evaluates candidate projects against ten criteria that assess sensitive environmental resources. In many states LIHI certification is a requirement to participate in Renewable Energy Certificate (REC) markets and therefore provides an economic incentive. Typical issues include, but are not limited to; stream flows, water quality, fish passage and protection, cultural and historic resources, recreation, and consistency with watershed management goals. Additional details on the LIHI certification program is available at http://www.lowimpacthydro.org.

Title Research and Site Control

The Title research and site control task involved inspecting the ownership status of the dams, inquiring with the owners about interest in participating in a collaborative, investigating the towns' energy procurement strategy and appetite for new, renewable energy and conducting a preliminary screening of environmental liabilities to determine whether there are any obvious environmental impediments to redevelopment. Results of these efforts are summarized below.

a. Ownership

As a general matter, in Rhode Island, landowners have rights to use river water abutting their property, called "littoral" rights (which is "riparian" as applied to rivers). Littoral rights run to the center of the river for each abutter at the location of the abutment. Littoral rights have been construed to include the landowner's rights to install dams and Rhode Island case law has long upheld such a dominant use as long as other abutters have no conflicting claim to use of the river water and the dam owner's use is not exclusive. Dyer v. Cranston Print Works Co.,22 R.I. 506 (1901). A 1911 Rhode Island statute codifies the right to construct and maintain dams on one's own property or another's with their consent. R.I. Gen. Laws §46-18-1.

Our investigation indicates that the State of Rhode Island has ownership interests in all four of the viable dams investigated in this feasibility study, as follows:

Albion: RIDOT has a dominant ownership interest. They took the adjacent property on the Lincoln side of the river by eminent domain in 1999 for "highway purposes"and although that taking does not expressly mention the dam, documents in the chain of title for the property taken include any rights, title and interest in and to water rights and the dam. Property records (Plat 33, Lot 431) indicate that RIDEM owns the adjacent parcel on the Cumberland side of the river but DEM's records indicate that its title is to the land and not to the dam.

Ashton: RIDEM owns the land on both sides of this dam and therefore owns the dam itself. Owens Corning once applied for a FERC preliminary permit under the name of Hydro Watt Associates but the preliminary permit was terminated on December 28, 1993, and RIDEM has since taken the property.

Elizabeth Webbing: RIDEM recently acquired this dam and even more recently announced its intent to issue a request for proposals to redevelop the existing, but dilapidated adjacent hydropower facility. This facility has an existing FERC license, which is scheduled for termination due to an extended period of non-operation. In collaboration with RIDEM we have

been working with our Congressional delegation (principally Senator Whitehouse's staff) to delay termination until the feasibility study is complete. RIDEM filed a request for a stay of termination, which is pending.

Manville: RIDOT took the parcel on the Lincoln side of the river (Plat 37, Lot 226) in November 2004, including the grantors right title and interest in the dam and riparian rights. The Town of Cumberland appears to also have an interest in this dam. The property on the Cumberland side of the Blackstone (Plat 53, Lot 1781) was deeded to Cumberland, including any of the grantor's interests in the dam even to the extent the dam is located in Lincoln.

We have discussed Albion and Manville with RIDOT and have been encouraged to complete our technical study of the property needs associated with these dam restoration projects and return to them with a specific proposal for consideration.

RIDEM intends to request proposals for redevelopment of the existing hydro facility at Elizabeth Webbing and we will continue to work with them on exploring the prospect of hydropower at Ashton. We will continue to coordinate with RIDEM regarding the status of the existing FERC license at the Elizabeth Webbing dam and associated strategy for hydropower redevelopment.

The Town of Cumberland is our partner in this project so we do not anticipate any control-related difficulties with regard to their interest in the Manville dam.

b. Energy Procurement Issues

Our municipal partners have provided an energy procurement contract negotiated on behalf of a coalition of Rhode Island's municipalities by the RI League of Cities and Towns with Gexa Energy (see Appendix 1). The contract commits the municipalities to obtaining their full electricity requirements from Gexa for specified accounts at a negotiated rate. It requires notice for the initiation of any demand side management or renewable energy initiatives subject to renegotiation of the contract's energy rate based on reduction of the anticipated energy supply (because the rate was evidently established based on a presumed demand volume). The Gexa contract we have reviewed expires in December 2011 and then continues on a month-to-month basis unless renewed or terminated.

We believe that if we can leverage net metering benefits or perhaps a Power Purchase Agreement (discussed in more detail in subsequent sections), then our partners' benefits from energy generated by the contemplated hydro projects would not risk price escalation per the Gexa contract, since there would be no actual reduction in energy demand. Nevertheless, we intend to discuss this contract with our municipal partners and the League of Cities and Towns with the hope of getting a commitment not to raise rates based on the development of any

renewable energy projects. If we are unable to negotiate for such a commitment, we will consider other options.

We know of no other obstacles to this proposed method of energy sourcing, except as otherwise discussed herein.

c. Preliminary Environmental Review

We have done a preliminary review of RIDEM files and discussed these dams with RIDEM and USEPA as deemed necessary for a preliminary environmental assessment. There are fundamentally three environmental issues: 1) potential site remediation associated with restoration work; 2) fish passage issues; and 3) instream flows as they relate to, dissolved oxygen and water quality.

1) Pratt: Most notably, we have resolved that the Pratt Dam is not a good candidate for restoration due to concerns raised from EPA (David Newton – Region 1) regarding impact on the Peterson/Puritan Superfund site to which it provides a significant piece of the southern boundary. Pratt is part of Peterson/Puritan Superfund site (Operating Units 2 – 3), and includes an uncapped landfill area just to its north of the dam (JM Mills, Nunes and the "unnamed island"). Trucks formerly crossed Pratt Dam to get fill from the unnamed island for the landfill; subsequently dumping occurred there. The dam's water control gates are currently fixed in an open position (and have been for a long time) therefore the dam is not impounding water. Restoration of the dam's impoundment would raise upstream water levels significantly impacting existing remediation caps associated with the Superfund site. The Superfund's responsible parties would be likely to claim they are not responsible for added costs resulting from restoration of the dam's impounding capabilities that would be necessary to develop a hydro facility. EPA has noted that such arguments by responsible parties may have meritbecause the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) only contemplates waste remediation based onexisting conditions. Restoring thePratt dam's impoundment could also result in upstream flooding including the operating Hope Global facility, which is on another part of the Peterson/Puritan Superfund site (Operating Unit 1).

2) Manville: DEM files indicate that several contaminants were discovered adjacent to the Manville Dam during the development of riverside recreational amenities. The discovery was recorded in January 2010; we will actively monitor subsequent site characterization and remediation activities to determine what, if any, impact soil contaminants might have on hydropower development at this site.

3) Other: We have reviewed DEM files and discussed these dams with staff from DEM waste remediation and water quality and the US Fish and Wildlife.

We have not found obvious site remediation impediments at any dams other than Pratt, but our scope does anticipate more investigation in Phase 2 of this project.

Our preliminary analysis of these projects contemplates fish ladders at all of the restored dams based on preliminary feedback from DEM and US Fish & Wildlife and our interest (shared with the community) to integrate the objective of fish passage with comprehensive planning for this watershed. We intend to investigate the practicality of fish ladders (successful passage potential and economics, particularly at upstream dam locations) more with further investigation and collaboration in Phase 2.

We intend to work closely with DEM and environmental stakeholders on water quality concerns raised by these proposed restoration projects as we optimize project design proposals and explore permitting requirements reserved for Phase 2.

We expect to conduct additional environmental analysis in Phase 2 of this feasibility study including permitting requirements, water quality issues and fish passage and protection requirements. Moreover, we will refine existing investigations and possibly include some sampling to characterize sediments in areas that have the potential to be disturbed by site development.

Efforts to designate portions of the river corridor as a National Park will be monitored to identify potential implications of dam restoration on the historical character of the river and the role for potential future hydropower development in a National Park context.

Preliminary Dam Inspections

The Essex Partnership, with assistance from MBP Consulting (MBP), conducted preliminary engineering inspections of the Pratt, Ashton, Albion and Manville dams. Analysis of the Elizabeth Webbing dam was added following removal of the Pratt dam from consideration and was not a subject site for the preliminary engineering inspections.

Findings indicate that most of the dams are no longer being used for their originally intended purposes and show signs of neglect. However, with repair and proper maintenance there were no apparent conditions that would preclude any from consideration for hydropower development.

The dams include a combination of significant and high hazard dams (based on existing RIDEM classifications). Dams with these hazard classifications would be subject to comply with Part 12 of the Federal Power Act (concerning dam safety) if they were to be developed for hydropower. More detailed analysis would be required to determine if remedial measures would be needed to meet Part 12 safety criteria or if the dams could be reclassified to a lower hazard rating (thus avoiding Part 12 requirements).

Typical recommendations related to operation and maintenance of the dams include removalof brush and trees from water retaining structures and re-pointing of joints and voids in masonry components. Additional recommendations included repair of deteriorated spillways and retaining walls and restoration of inoperable low-level outlets.

A complete copy of the Preliminary Inspection report is provided as Appendix 3.

Site Hydraulic Characteristics

Initial information on the study sites for the pre-feasibility study was obtained from the National Inventory of Dams and RIDEM. More refined site-specific data were collected to verify and update the publically available data during the course of Phase I investigations. Specific attention was given to site hydraulics as it relates to the elevation differential of water surfaces above (headwater) and below (tailwater) the study sites (hydraulic head, or head).

In order to determine the relationship between river flows and head, monitoring stations for head and tailwater were established in the field at each of the study sites. Working with project partners, Essex recorded these data under various flow conditions from April through June of 2010. Results indicate that the sites did not have the hydraulic head characteristics reported in the publically available literature. A comparison of published and field collected head data are tabulated below.

Dam Name	Published Dam Height (ft)	ActualHead (avg. ft)	Delta(ft)	% Change
Pratt	12	1.9	-10.1	-84%
Manville	22	13.4	-8.6	-39%
Albion	18	10.8	-7.2	-40%
Ashton	18	7.9	-10.1	-56%

Hydroelectric energy potential is a function of the head and flow characteristics at any given site. The above field measured data were used to develop rating curves for each site and refine energy estimates for the study site, copies of the rating curves are provided in Appendix 2.

Energy Analysis

The following summarizes the turbine equipment evaluated as part of Phase 1, the economic and environmental trade-offs associated with different options, and the expected energy production for each.

a. Equipment Selection

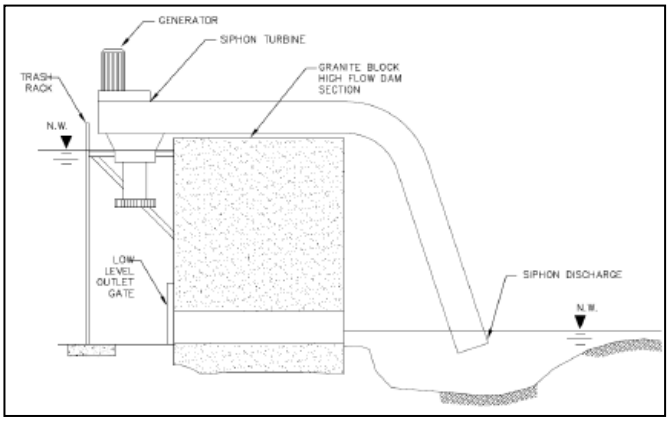
In our pre-feasibility study we assumed installation of three small, fixed-blade siphon units at each site. Although performance (i.e., efficiency) of this equipment is somewhat limited (~70%) as compared to other types of hydropower equipment, it offers a fairly broad operating range (136 cfs – 788 cfs) for relatively low costs. The reduction in available head noted above, however, significantly reduces the energy production potential associated with small fixed-blade siphon units making them a less attractive equipment option from a power production perspective. The reduction is significant enough to question whether or not the projects would generate sufficient revenues to offset threshold costs for development and licensing.

As an alternative to fixed-blade siphon units, we conducted a preliminary analysis of installing larger, more efficient bulb turbine units (3 meters in diameter). These double regulated bulb turbine units are over 15% more efficient than the small fixed-blade units originally considered and have a maximum hydraulic capacity of approximately 1,243 cfs; 58% greater than the combined capacity of the smaller units. The larger bulb turbines help offset the reduced head at each site through efficiency gains and utilizing more of the available river flows. However, these larger units cost more and have greater civil construction requirements.

There are also environmental tradeoffs between the two types of equipment (see discussion below), but in both cases project development would be designed to meet Low Impact Hydropower Institute (LIHI) certification criteria. More refined equipment selection and associated analyses will occur in Phase 2 of the feasibility study, including operational optimization analyses designed to balance energy production, economics and environmental concerns (i.e., fish entrainment mortality, water quality impacts, aesthetic and historical consistency, etc.).

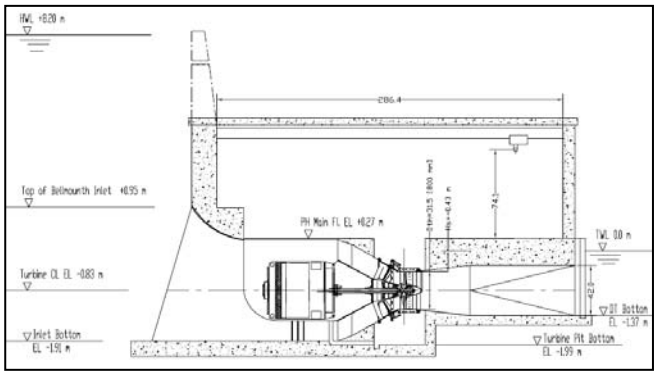
The two equipment options evaluated are described in more detail below followed by a presentation of the modeled annual energy production associated with each option.

Fixed Blade Axial Flow Siphon Turbines –Benefits of this equipment option include; lower capital cost, relatively low civil construction requirements, and the ability to eliminate a bypass reach and associated restrictions on turbine flow. Drawbacks associated with these units include reduced efficiency (~70%), capacity limitations (~110kw/unit), and a smaller hydraulic operating range. A typical cross section of a siphon unit installation is shown at right. Environmental impacts of these types of turbines are typically limited due to the relatively small footprint and the ability to install and operate them with limited ground disturbing activities. The turbines sit on top of the existing dam structure with water passages over the dam (as shown to the right). By returning water directly below the dam there is no bypass reach. Reduced spills over the dam spillway could affect dissolved oxygen levels in the river (i.e. reduced aeration compared to the existing condition) and some entrainment of fish can be expected, but can be minimized with exclusion racks at the intake. The mortality rates associated with entrainment have not been studies with these types of turbines. Because the draft tubes for siphon turbines hang over the existing dam structure, there can also be aesthetic concerns depending on the location and existing visual character of the setting.



Schematic of a typical siphon turbine installation.

Double Regulated Bulb Turbines – Benefits of this equipment option include; potential for eliminating a bypass reach and associated turbine flow restrictions, high energy conversion efficiency (~92%) and the ability to operate efficiently over a broader range of flow conditions. Drawbacks associated with these units include higher equipment costs and typically more civil construction requirements. A typical cross section of a bulb unit installation is shown at right. Environmental impacts of these types of turbines can be slightly greater than the siphon units due to the need for excavation and a slightly larger footprint, but they are still relatively low impact machines. They would be installed at the existing dams and would not create a bypass reach. As with the siphon units, reduced spills over the dam spillway could affect dissolved oxygen levels in the river (i.e. reduced aeration compared to the existing condition) and some entrainment of fish can be expected, but can be minimized with exclusion racks at the intake. Because the bulb turbines are large and



Schematic of a typical bulb turbine installation.

turn relatively slowly, the mortality rates associated with entrainment can be as low as 10% and are typically much lower than other types of turbines.

b. Preliminary Energy Estimates

Daily flow data from the Woonsocket USGS stream gauging station (USGS # 01112500) were obtained, pro-rated for each dam by the ratio of drainage areas and used to generate 100 point site-specific flow exceedance curves. Flow exceedance curves, turbine performance data, hydraulic rating curves, assumptions for headlosses as well as mechanical and electrical losses and provisions for station outages were then used to calculate net annual energy production in one hundred 87.6-hour time steps (100 x 87.6 = 8,760 hours/year) to develop annual estimates for each site. Energy estimates for the Elizabeth Webbing dam were not modeled; rather they were obtained from citations of historic production records. A summary of these estimates are tabulated below, complete energy calculations are provided in Appendix 2.

Preliminary Average Net Annual Energy Estimates

No	Alternative	Installed Capacity (kW)	Average Power (KW)	Net Annual Energy (MWH)
1	*Ashton*	833	359	3,023
2	*Albion*	1,087	472	3,974
3	*Manville*	1,374	591	4,976
4	*Elizabeth Webbing*	700	350	4,360
A	**Ashton, Albion, Manville**	**3,294**	**1,422**	**11,973**
B	**Albion, Manville, Webbing**	**3,161**	**1,413**	**13,310**
C	**Ashton, Albion, Manville, Webbing**	**3,994**	**1,772**	**16,333**

Economic Analysis

a. Preliminary Cost Estimates

Preliminary cost estimates were prepared for developing hydropower facilities at each of the study sitesto reflect the bulb turbine equipment. Allowances for engineering and design, licensing and permitting, equipment procurement, construction, and environmental protection, mitigation and enhancement measures were obtained from the costs for similar projects we are currently working on. Estimated costs for dam repairs and maintenance were developed from our detailed work at each site in Task 3, Dam Stability and Environmental Evaluations (see Appendix 3).

A summary of development costs for each site are provided below. Note that the cost estimate for Elizabeth Webbing assumes that the existing license remains operative and can be utilized in repowering the facility – an allowance for fish passage and project relicensing was included. Itemized cost estimates are provided in Appendix 2, more detailed cost estimates will be developed as part of Phase 2.

Preliminary Development Cost Estimates

No	Alternative	Installed Costs ($1,000s)	Installed Costs ($/kw)
1	*Ashton*	$6,346	$7,622
2	*Albion*	$6,316	$5,811
3	*Manville*	$6,246	$4,546
4	*Elizabeth Webbing*	$1,765	$2,522
A	**Ashton, Albion, Manville**	**$18,909**	**$5,741**
B	**Albion, Manville, Webbing**	**$14,328**	**$4,533**
C	**Ashton, Albion, Manville, Webbing**	**$20,675**	**$5,177**

b. Funding Sources

For the purposes of our analysis we have assumed that 25% of direct costs to develop the projects would be available in the form of grants. There are several potential sources of grant and other incentive funding as well as opportunities for low interest loans or loan guarantees. Potential grant funding sources for the projects include: RIEDC- REF, Rhode Island Office of Energy Resources, United States Department of Agriculture – Rural Energy Assistance Program (REAP), United States Treasury Department, and the United States Department of Energy.

We did not include any low cost bonds, which are typically available to municipalities.

The assumption of 25% of funding from grants represents a significant decrease from our pre-feasibility analysis – which included federal grants equal to 30% of the equipment costs.

c. Preliminary Economic Analysis

A preliminary economic analysis was conducted to gauge the economic impact of the alternative turbine equipment. A discounted cash flow analysis was used to evaluate the economic performance of the projects over a 20 year study period. The following key inputs were used to develop the model:

Key Economic Inputs

	Assumptions
1	O&M: 1¢/KWH escalated at 2.5%
2	Property taxes (or payment in lieu of): 2% of initial investment
3	Major maintenance: $50k in years 5 & 15, $125k in years 10 & 20
4	Wholesale Energy rate: $70/MWH / Net Meter rate: $125/MWH
5	ICAP/Avoided demand: Assume $2.50/kW-month
6	Capacity: Use average power
7	State Grants: 25% of Direct Construction Costs
8	Residual: 50% of initial investment in Year 20
9	Renewable Energy Certificates (RECs): $25/MWH
10	Contingency: 25% of total development costs
11	Discount Rate[1]: 5%
12	Study Period: 20 years

The analysis, which was done on a pre-tax, all equity basis is generally conservative. For this preliminary economic analysis we modeled three different revenue streams as summarized below:

- *Case 1: Wholesale Energy Rate* – includes assumptions noted in the table above where the value of generated energy would be equal to the wholesale market rate. It is unlikely that any new renewable energy project would be developed based on today's wholesale energy rates. We have included this case to provide a point of reference allowing comparison of these hydro projects with other non-renewable generation sources such as oil, coal and natural gas.

[1] *Discount Rate; for purposes of this analysis the discount rate reflects the owner's opportunity cost of money. Typically the discount rate (opportunity cost) for public sector owners is lower than that of private investors.*

- *Case 2: Net-meter/Renewable Energy Rate* – includes all assumptions noted in the table above and increases the commodity value of the energy from $70/MWH to $125/MWH. The $125/MWH figure generally reflects the value of renewable energy in a long-term power purchase agreement (PPA) or a net metering arrangement with the local utility.

- *Case 3: Net-meter/Renewable Energy Rate + Federal Grants* – includes all Case 2 inputs and adds a Federal grant equal to 30% of equipment costs (i.e., reflects potential extension of ARRA programs)

Private investors typically use an 8% discount rate, however municipal investors are more likely to have access to low or no cost capital (i.e., Clean Renewable Energy Bonds). We chose to use a 5% discount rate as a compromise between these two potential capitalization scenarios. Many of the other model inputs; such as the property tax treatment, project life and omission of public funding, are more typical of a private power producer model and may be overly conservative for a municipal owner. The economic input parameters will be refined in Phase 2 based on discussions with the project partners. Results of the analysis are summarized below, and are provided in Appendix 2.

In addition to evaluating each individual development (No.'s 1-4), we also present results for different combinations of developments reflecting a portfolio (i.e., multiple site development) approach (A-C). For Phase 1 we did not attempt to adjust the development cost estimates to reflect potential economies of scale associated with a portfolio approach. This adjustment would be made as part in Phase 2 as more detailed cost estimates are generated.

Under wholesale energy rates (Case 1) the individual projects (with the exception of Elizabeth Webbing) are marginally attractive from a municipal investor perspective. Project portfolio options exhibit similar economic performance with significant advantages when Elizabeth Webbing is part of the development mix.

Case 2 shows that the individual projects and a portfolio of projects would be attractive with energy rates that reflect a net metering arrangement or power purchase agreement for renewable energy. Results demonstrate the significance of commodity rates on project economics and underlie the importance of net-metering or power purchase agreements to encourage the development of renewable energy resources.

Case 3 includes Case 2 inputs as well as an extension of the federal ARRA grant program. With a 30% federal grant for equipment, all of the individual projects become very attractive. Similarly, the portfolio options are projected to produce positive economic benefits on a scale that would be attractive to a private investor.

Case 1: Wholesale Energy Rate($70/MWH)

No	Alternative	*Project IRR[2] (%)*	*Cumulative NPV [3]($1,000s)*	*Discounted Payback Period (yrs)*
1	*Ashton*	4%	($824)	--
2	*Albion*	6%	$526	19
3	*Manville*	8%	$1,987	19
4	*Elizabeth Webbing*	29%	$4,402	3
A	**Ashton, Albion, Manville**	**6%**	**$1,689**	**19**
B	**Albion, Manville, Webbing**	**10%**	**$6,915**	**15**
C	**Ashton, Albion, Manville, Webbing**	**8%**	**$6,091**	**19**

Case 2: Net-Meter/Renewable Energy Rate ($125 MWH)

No	Alternative	*Project IRR (%)*	*Cumulative NPV ($1,000s)*	*Discounted Payback Period (yrs)*
1	*Ashton*	7%	$1,614	19
2	*Albion*	10%	$3,732	13
3	*Manville*	14%	$6,000	9
4	*Elizabeth Webbing*	47%	$7,997	2
A	**Ashton, Albion, Manville**	**11%**	**$11,345**	**13**
B	**Albion, Manville, Webbing**	**16%**	**$17,728**	**7**
C	**Ashton, Albion, Manville, Webbing**	**14%**	**$19,342**	**10**

Case 3: Net-Meter/Renewable Energy Rate + Federal Grants

No	Alternative	*Project IRR (%)*	*Cumulative NPV ($1,000s)*	*Discounted Payback Period (yrs)*
1	*Ashton*	9%	$2,563	16
2	*Albion*	13%	$4,680	10
3	*Manville*	17%	$6,948	7
4	*Elizabeth Webbing*	51%	$8,117	2
A	**Ashton, Albion, Manville**	**13%**	**$14,191**	**10**
B	**Albion, Manville, Webbing**	**27%**	**$22,591**	**4**
C	**Ashton, Albion, Manville, Webbing**	**16%**	**$22,188**	**7**

[2] IRR = Internal Rate of Return is the discount rate at which the NPV of the cashflows is zero. The IRR, which is also called the hurdle rate, is a general indicator of the return on equity of an investment.Typically an investment's internal rate of return has to be greater than the owner's opportunity cost (discount rate) to be attractive.

[3] NPV = Net Present Valueis the value in today's dollars of future cash flows. Financial analysts use the NPV to take into account the time value of money based on the investor's opportunity cost (i.e., the amount an investor would have earned on future cash flows if they had the money today and invested it at their discount rate.

As an additional sensitivity we evaluated the portfolio options using a debt levered after-tax economic model. We assumed various levels of grant funding (0-20%), included a 30% tax credit (assuming an extension of the Investment Tax Credit (ITC)). Interest rates were assumed to be 5% and the model was set to provide an average debt coverage ratio (DCR) of 2.0 (cash on hand is equal to 2x the annual debt service obligation). Results of the 0% grant funding analysis are summarized below, additional sensitivity results are provided in Appendix 2.

Debt LeveredSensitivity: $125/MWH Energy Rate, 0% Grants, 30% ITC, 5% Interest Rate, Avg. DCR 2.0

No	Alternative	*Project IRR (%)*	*Cumulative NPV ($1,000s)*	*Discounted Payback Period (yrs)*
A	**Ashton, Albion, Manville**	**24%**	**$7,648**	**6**
B	**Albion, Manville, Webbing**	**+100%**	**$11,432**	**1**
C	**Ashton, Albion, Manville, Webbing**	**117%**	**$12,947**	**1**

As part of Phase 2 the economic analyses will be adjusted to incorporate more refined cost estimates, more detailed provisions for PM&E measures, and may include a longer study period that would be more typical of a municipal investor. A key element of Phase 2 efforts will be to explore potential development structures to maximize municipal benefits. Further, the results represent only a portion of the revenue potential that would be realized if hydro projects were treated like other renewable energy sources such as solar and wind. We have not attempted to quantify other economic or social benefits (i.e., green job creation, improved dam safety management, etc.) resulting from the development of one or more of the projects.

d. Verified Development Potential

Based on the economic analysis summarized above and presented in Appendix 2 as well as the technical work done to date we believe the four remaining dam restoration projects on the Blackstone River (Elizabeth Webbing, Albion, Ashton, and Manville) show sufficient promise to warrant proceeding to Phase 2 of this planning and feasibility study.

Municipal Energy Collaborative

a. Commitments from Supporting Communities

We have received affirmation of commitment to this initiative from the City of Pawtucket, and the Towns of Lincoln, Cumberland and Glocester. As part of Phase 2 we will finalize a draft resolution to take to the cities and towns after reviewing these Phase 1 results with them to solidify the collaborative. We will also finalize a coalition agreement that we will consider with the cities and towns once the resolutions are passed and we have resolved the best control structure for project implementation (given financing objectives/structure, ownership/liability concerns, etc). Copies of these draft documents are provided in Appendix 4.

b. Policy Objectives, Including Net Metering

Project partners were integral in developing and introducing a net metering reform bill to State legislators. The proposed bill ultimately passed the House (in stripped down form) but not the Senate. We are currently coordinating a stakeholder process to conduct a comprehensive review of the laws, regulations and codes governing the development of renewable energy so that we can propose a more comprehensive reform package in this legislative session. This package will include net metering reform or other means to accommodate these projects.

c. Assembling the Coalition

In addition to regular meetings with our partner towns, we have met with stakeholders representing various interests in the Blackstone River in an effort to establish consensus on a comprehensive watershed management approach that includes dam revitalization for hydro. The meetings have included: The Blackstone River Watershed Council, the John H. Chafee Blackstone River National Corridor Commission (Jan Reitsma) , The Blackstone Valley Tourism Council (Robert Billington), Charles Rosenfield (operator of the Main Street and Thundermist hydro projects on the Blackstone), the Rhode Island Office of Energy Resources (Ken Payne), Rhode Island Economic Development Corporation (Julian Dash), the Rhode Island Foundation (Jennifer Pereira), the National Oceanographic and Atmospheric Administration (Susan Tuxbury), United States Fish and Wildlife Service (Melissa Grader) and RIDEM (Joseph Antonio, Alisa Richardson and Veronica Masson). The responses have generally been positive to date. A few members of the Blackstone River Watershed Council have expressed reservations about the compatibility of hydropower, water quality improvements and impediments to fish passage. We will need to continue respecting and responding to such concerns as we move forward. This interactive process will be enhanced with the initiation of more precise plans (including proposed hydro technologies, fish ladders, etc…) and substantive permitting discussions with RIDEM and FWS in Phase 2.

APPENDIX 1

Gexa Energy Procurement Contract

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BUSINESS ELECTRICITY AUTHORIZATION
RHODE ISLAND COMMERCIAL SALES

SERVICE INFORMATION

Service Type: ☐ New Service ☒ Switching Service Provider ☐ Renewal

Business Name ("Customer"): Town of Lincoln LDU Account No: _____

Service Address: _____ ☒ *See Attached Addendum A For Multiple Account Nos.*

City: _____ State: _____ Zip Code: _____

Billing Mailing Address: Street: See attached Addendum A	City: _____	State: _____	Zip Code: _____

Contact Name: John F. Ward Primary Phone: 401-333-8440 Fax: _____

Tax ID#: _____ Secondary Phone: _____ Email: jward@lincolnri.org

Duns #: _____

Tax Exemption: If a non-renewing customer, a completed tax exemption certificate must accompany this Agreement. If no certificate is attached, Gexa Energy will assume that sales to Customer are subject to Taxes and will process Customer's account accordingly.

Initial Term of service: 36 **Months** **Start Month/Year:** December 2008

Agreement: This Business Electricity Authorization and all addenda attached hereto (the "BEA"), together with the Electric Supply Terms of Service ("TOS") attached hereto as Exhibit A and incorporated herein by reference will form the Electricity Sales Agreement (the "Agreement") between Gexa Energy Rhode Island, LLC ("Gexa Energy") and Customer. Any capitalized terms not defined in this BEA shall have the meanings set forth in the TOS. Any inconsistency between the BEA and the TOS shall be governed by the BEA.

Term: This Agreement shall become effective when the BEA is signed by both Parties (the "Effective Date") and shall continue for the Initial Term (as defined in the TOS). After the Initial Term expires, this Agreement shall continue on a month-to-month basis at the Holdover Price unless and until either Party terminates this Agreement, as provided in the TOS, and the LDU successfully switches Customer's Account(s) to another competitive electricity supplier or to the LDU's generation service.

Termination: If Customer terminates this Agreement before the end of the Initial Term, Customer will be assessed the Early Termination Fee or pay Gexa Energy's damages, as provided in the TOS.

Price: The unit price for electric service offered to Customer by Gexa Energy during the Initial Term (the "Price") is set forth in Addendum B. The total monthly charge for electric service (the "Gexa Energy Electricity Charge") is the sum of (i) the product of Customer's monthly Energy Usage during a Billing Cycle and the Price or Holdover Price, whichever is applicable, (ii) the Monthly Base Charge, (iii) Pass-Through Charges, if applicable, and (iv) Taxes. The Gexa Energy Electricity Charge does not include Delivery Charges.

Billing and Payment: Customer will be billed monthly for the Gexa Energy Electricity Charge. If Customer's bill is not paid when due, Customer will be charged the Late Fee and other charges, as provided in the TOS.

Switching Fee: Gexa Energy does not charge a fee to switch to its service.

Authorization and Acknowledgement: Customer hereby authorizes Gexa Energy, for the duration of this Agreement, to become its electricity supplier and to act as its limited agent to perform the necessary tasks to establish electricity service with Gexa Energy. By signing this BEA (facsimile signature accepted as if it were an original), Customer hereby agrees, as of the Effective Date, that Customer has read the Agreement and agrees to the terms and conditions set forth herein. The undersigned below warrants and represents that he/she is legally authorized to enter into this Agreement on behalf of Customer. **This Agreement is not valid or binding unless and until signed by both Parties.**

Customer - Authorized Signature: _____ Gexa Energy Rhode Island, LLC: _____

Printed Name: T Joseph Almond Effective Date: _____

Title: TOWN ADMINISTRATOR Sales Representative/Code: _____

Date: 11/18/08

20 Greenway Plaza, Suite 600, Houston, TX 77046
Customer Service: 866.960.4392; Fax: 866.902.4392; Email: RI@gexaenergy.com

STATE OF RHODE ISLAND

DEPARTMENT OF ADMINISTRATION — DIVISION OF TAXATION

SALES AND USE TAX

EXEMPTION CERTIFICATE

I hereby certify that Town of Lincoln

is exempt from the Rhode Island Sales or Use Tax pursuant to the Rhode Island Sales and Use Tax Act. This governmental agency is specifically exempted under Section 44-18-30I.

> "There are exempted from the taxes imposed by this chapter the following gross receipts:
>
> "* * * .
>
> "I. State and Political Subdivisions. From the sale to, and from the storage, use or other consumption by this State, any city, town, district, or other political subdivision of this State. Every redevelopment agency created pursuant to Chapter 31 of Title 45 shall be deemed to be a subdivision of the municipality where it is located."

Tangible personal property purchased from: Any vendor

will be used by said agency.

Governmental agencies are not issued exemption certificate numbers, because they are not subject to the qualification stipulation established by the Division of Taxation for other exempt organizations and institutions.

This blanket exemption certificate under the Rhode Island Sales and Use Tax Act shall apply to all future purchases from the above-mentioned retailer.

Authorized R. I. Tax Division Signature

Maurice M Larivière

Title Chief Revenue Agent

Dated: May 9, 1983

Internal Revenue Service

Date: February 1, 2005

TOWN OF LINCOLN
P.O. BOX 100
LINCOLN, RI 02865-0268

Department of the Treasury
P. O. Box 2508
Cincinnati, OH 45201

Person to Contact:
Delores Gaskins 31-07428
Customer Service Specialist
Toll Free Telephone Number:
8:30 a.m. to 5:30 p.m. ET
877-829-5500
Fax Number:
513-263-3756
Federal Identification Number:
05-6000222

Dear Sir/Madam:

This is in response to your request of February 1, 2005, regarding your organization's exemption from Federal income tax.

As a governmental unit or a political subdivision thereof, your organization is not subject to Federal income tax under the provisions of Section 115(1) of the Internal Revenue Code, which states in part:

> "Gross income does not include income derived from ... the exercise of any essential governmental function and accruing to a State or any political subdivision thereof ..."

Because your organization is a governmental unit or a political subdivision thereof, its income is not taxable as explained above. Contributions used exclusively for public purposes are deductible under Section 170(c)(1) of the Code.

Your organization is not liable for the tax imposed under the Federal Unemployment Tax Act (FUTA).

Your organization may obtain a letter ruling on its status under section 115 by following the procedures specified in Rev. Proc. 2004-1 or its successor.

If you have any questions, please call us at the telephone number shown in the heading of this letter.

Sincerely,

Myrna L. Hueber

for Janna K. Skufca, Director, TE/GE
Customer Account Services

Gexa ENERGY™
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BUSINESS ELECTRICITY AUTHORIZATION
RHODE ISLAND COMMERCIAL SALES

Addendum A

CUSTOMER NAME: TOWN OF LINCOLN

ACCOUNTS INCLUDED IN AGREEMENT:

LDU Account No	Service Street Address, City, State, Zip	Billing Street Address, City, State, Zip
5352904007	LINCOLN TOWN OF A ST ALBION RI 2802	PO BOX 100 LINCOLN RI 02865
337109001	TOWN OF LINCOLN RIVER RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
388313004	LINCOLN TOWN OF 19 HEIDI RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
388338001	LINCOLN TOWN OF 10.5 WINGATE RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
388500007	LINCOLN TOWN OF TIMBERLAND DR LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
388927008	LINCOLN TOWN OF WOODLAND ST LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
389279001	TOWN OF LINCOLN SCHOOL ST LINCOLN RI 02865	100 OLD RIVER RD PO LINCOLN RI 02865
2860934007	LINCOLN TOWN OF 80 MIDDLE ST LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
2861051007	LINCOLN TOWN OF RIVER RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
2861084006	LINCOLN TOWN OF 5 CIDER-MILL LN LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
2861501002	LINCOLN TOWN OF 1896 OLD-LOUISQUISSE PI LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
2861534001	LINCOLN TOWN OF BELMONT DR LINCOLN RI 02865	100 OLD RIVER RD LINCOLN RI 02865

2861743000	LINCOLN TOWN OF 15 HILLSIDE DR LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
2861926009	LINCOLN RESCUE 115 MAIN ST LINCOLN RI 02865	100 OLD RIV LINCOLN RI 02865
2862050004	LINCOLN TOWN OF SAYLES-HILL RD LINCOLN RI 02865	100 OLD RIVER RD LINCOLN RI 02865
4058497004	LINCOLN TOWN OF 100 OLD-RIVER RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
4106507004	LINCOLN TOWN OF 6.5 ASHLEY DR LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
4106653001	LINCOLN TOWN OF 669 GREAT RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
4106758001	LINCOLN TOWN OF 40 MOUNT AVE LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
4106926009	LINCOLN TOWN OF 13 BARBETTE DR LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
5304526006	LINCOLN TOWN OF 100 OLD-RIVER RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
5334766009	LINCOLN TOWN OF 1792 LOUISQUISSET PIK LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
5352137006	LINCOLN TOWN OF GREAT RD LINCOLN RI 02865	100 OLD RIVER RD LINCOLN RI 02865
5352715000	LINCOLN TOWN OF 6 NEWLAND AVE LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
5352868006	LINCOLN TOWN OF ALBION RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
5353238002	TOWN OF LINCOLN MCDUFF ST LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
6508601005	TOWN OF LINCOLN 538 GREAT RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
6597995005	LINC OLN TOWN OF 975 LOWER-RIVER RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
6598162000	LINC OLN TOWN OF 11 PADDOCK DR LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
6598404003	LINC OLN TOWN OF 201A RIVER RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
6598423008	LINC OLN TOWN OF 25 WELLINGTON RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865

6598703001	LINC OLN TOWN OF 333 ALBION RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
6598913007	LINC OLN TOWN OF 35 SCHOOL ST LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
6599381009	TOWN OF LINCOLN GREAT RD LINCOLN RI 02865	100 OLD RIVER RD LINCOLN RI 02865
6599427000	TOWN OF LINCOLN RIVER-FT4 RD LINCOLN RI 02865	100 OLD RIVER RD LINCOLN RI 02865
7796639003	LINCOLN TOWN OF 100 OLD-RIVER RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
7843847000	LINCOLN TOWN OF 1169 GREAT RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
7843868009	LINCOLN TOWN OF 2 APPLEWOOD LN LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
7843918004	LINCOLN TOWN OF 677 GREAT RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
7843945001	LINCOLN TOWN OF 7.5 JASON DR LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
7844091002	LINCOLN TOWN OF 12 LORI-ELLEN DR LINCOLN RI 02865	100 OLD RIVER RD LINCOLN RI 02865
7844316004	LINCOLN TOWN OF RIVER RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
7844813008	TOWN OF LINCOLN JENCKES-HILL RD LINCOLN RI 02865	100 OLD RIVER RD LINCOLN RI 02865
5353098008	MANVILLE MEMORIAL SAYLES-HILL RD MANVILLE RI 2838	100 OLD RIVER RD LINCOLN RI 02865
7796815003	LINCOLN TOWN OF LYON ST PAWTUCKET RI 2860	PO BOX 100 LINCOLN RI 02865
1601008003	TOWN OF LINCOLN LONDSDALE SCHOOL 100 ANGELL RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
1618940007	LINCOLN TOWN OF 40 GREENWOOD LN LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
1619299009	LINCOLN TOWN OF 40 CHAPEL ST LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
1619332009	LINCOLN TOWN OF 14 EDGE-HILL AVE LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865

1619425009	LINCOLN TOWN OF LEICESTER DR LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
9043551005	LINCOLN TOWN OF 29.5 MARIA ST LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
9073516005	LINCOLN TOWN OF 487 ANGELL RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
9090677007	LINCOLN TOWN OF GREAT RD LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
9090762001	LINCOLN TOWN OF 1 BUTTERFLY WAY LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
9091109008	LINCOLN TOWN OF RIVER RD LINCOLN RI 02865	145 OLD RIVER RD LINCOLN RI 02865
9091497003	LINCOLN TOWN OF 24 EAGLE-NEST DR LINCOLN RI 02865	PO BOX 100 LINCOLN RI 02865
9091871009	TOWN OF LINCOLN LOWER-RIVER RD LINCOLN RI 02865	100 A OLD RIVER RD LINCOLN RI 02865
7845301007	LINCOLN TOWN OF LOWER RIVER ROAD 19-00 LINCOLN, RI 02865	PO BOX 100 LINCOLN, RI 02865
6599514008	LINCOLN TOWN OF 24 BERSHIRE DRIVE POLE 2 ALBION, RI 02802	PO BOX 100 LINCOLN, RI 02865
4782339015	LINCOLN TOWN OF 270 RIVER ROAD LINCOLN, RI 02865	PO BOX 100 LINCOLN, RI 02865
4106711017	LINCOLN TOWN OF 1575 OLD LOUISQUISETT PIKE ER BTOW POLE 40A4 LINCOLN, RI 02865	PO BOX 100 LINCOLN, RI 02865

Customer Initials: _____ Date: 11/20/07

Gexa Energy Initials: _____ Date: _____

Gexa ENERGY™
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BUSINESS ELECTRICITY AUTHORIZATION
RHODE ISLAND COMMERCIAL SALES
Fixed Price Product

Addendum B

CUSTOMER NAME: Town of Lincoln

PRICING DETAILS:

Price:

- $0.094632 per kWh, which amount shall be increased by the charge per kWh for the purchase of additional renewable energy credits selected by Customer, if any, as described below.
- Price is fixed for the duration of the Initial Term.
- Price excludes Taxes and any Pass-Through Charges checked below, which will vary monthly based on charges by ISO-NE.

Component	Included in Price	Pass-Through Charges Excluded From Price
energy	x	____
Capacity	x	____
ancillary services	x	____
renewable resources	See options below	____
Congestion Costs	x	____
Rmr (Reliability Must Run)	x	____
locational forward reserves	x	____

Monthly Base Charge: $0.00 per meter per month

Renewable Energy Credits:

Please check only one of the alternatives below, and, if applicable, the percentage of Customer's usage:

☑ 1) Customer does not elect to purchase renewable energy credits in addition to Gexa Energy's obligation to meet the State of Rhode Island Public Utilities Commission's Rules and Regulations Governing the Implementation of a Renewable Energy Standard promulgated pursuant to Title 39 Chapter 26 of the General Laws of Rhode Island (the "Rhode Island Renewable Energy Standard"), with no additional charges; or

☐ 2) In addition to Gexa Energy's obligation to meet the requirements of the Rhode Island Renewable Energy Standard, Customer elects to purchase renewable credits representing electricity obtained from New Renewable Energy Resources (as defined in Section 3.23 of the Rhode Island Renewable Energy Standard) in the following amounts (as a percentage of Customer's anticipated usage, as reasonably determined by Gexa Energy), and agrees to the following charges:

☐ 5% of Customer's usage, for an additional charge of $0.0021/kWh for all of Customer's usage, or
☐ 10% of Customer's usage, for an additional charge of $0.0042/kWh for all of Customer's usage, or
☐ 15% of Customer's usage, for an additional charge of $0.0063/kWh for all of Customer's usage, or
☐ 20% of Customer's usage, for an additional charge of $0.0084/kWh for all of Customer's usage, or
☐ 25% of Customer's usage, for an additional charge of $0.0105/kWh for all of Customer's usage, or
☐ 30% of Customer's usage, for an additional charge of $0.0126/kWh for all of Customer's usage, or
☐ 40% of Customer's usage, for an additional charge of $0.0168/kWh for all of Customer's usage, or
☐ 50% of Customer's usage, for an additional charge of $0.0210/kWh for all of Customer's usage, or

☐60% of Customer's usage, for an additional charge of $0.0252/kWh for all of Customer's usage, or
☐70% of Customer's usage, for an additional charge of $0.02940/kWh for all of Customer's usage, or
☐80% of Customer's usage, for an additional charge of $0.03360/kWh for all of Customer's usage, or
☐90% of Customer's usage, for an additional charge of $0.03780/kWh for all of Customer's usage, or
☐100% of Customer's usage, for an additional charge of $0.0420/kWh for all of Customer's usage; or

☐ 3) In addition to Gexa Energy's obligation to meet the requirements of the Rhode Island Renewable Energy Standard, Customer elects to purchase national voluntary renewable credits representing electricity obtained from renewable energy resources in the United States in the following amounts (as a percentage of Customer's anticipated usage, as reasonably determined by Gexa Energy), and agrees to the following charges:

☐5% of Customer's usage, for an additional charge of $0.00025/kWh for all of Customer's usage, or
☐10% of Customer's usage, for an additional charge of $0.00050/kWh for all of Customer's usage, or
☐15% of Customer's usage, for an additional charge of $0.00075/kWh for all of Customer's usage, or
☐20% of Customer's usage, for an additional charge of $0.0010/kWh for all of Customer's usage, or
☐25% of Customer's usage, for an additional charge of $0.00125/kWh for all of Customer's usage, or
☐30% of Customer's usage, for an additional charge of $0.00150/kWh for all of Customer's usage, or
☐40% of Customer's usage, for an additional charge of $0.0020/kWh for all of Customer's usage, or
☐50% of Customer's usage, for an additional charge of $0.0025/kWh for all of Customer's usage, or
☐60% of Customer's usage, for an additional charge of $0.0030/kWh for all of Customer's usage, or
☐70% of Customer's usage, for an additional charge of $0.0035/kWh for all of Customer's usage, or
☐80% of Customer's usage, for an additional charge of $0.0040/kWh for all of Customer's usage, or
☐90% of Customer's usage, for an additional charge of $0.00450/kWh for all of Customer's usage, or
☐100% of Customer's usage, for an additional charge of $0.0050/kWh for all of Customer's usage; or

☐ 4) In addition to Gexa Energy's obligation to meet the requirements of the Rhode Island Renewable Energy Standard , Customer elects to purchase renewable credits representing electricity obtained from hydro electric facilities in Maine in the following amounts (as a percentage of Customer's anticipated usage, as reasonably determined by Gexa Energy), and agrees to the following charges:

☐5% of Customer's usage, for an additional charge of $0.00015/kWh for all of Customer's usage, or
☐10% of Customer's usage, for an additional charge of $0.00030/kWh for all of Customer's usage, or
☐15% of Customer's usage, for an additional charge of $0.00045/kWh for all of Customer's usage, or
☐20% of Customer's usage, for an additional charge of $0.00060/kWh for all of Customer's usage, or
☐25% of Customer's usage, for an additional charge of $0.00075/kWh for all of Customer's usage, or
☐30% of Customer's usage, for an additional charge of $0.00090/kWh for all of Customer's usage, or
☐40% of Customer's usage, for an additional charge of $0.00120/kWh for all of Customer's usage, or
☐50% of Customer's usage, for an additional charge of $0.00150/kWh for all of Customer's usage, or

☐60% of Customer's usage, for an additional charge of $0.00180/kWh for all of Customer's usage, or
☐70% of Customer's usage, for an additional charge of $0.0021/kWh for all of Customer's usage, or
☐80% of Customer's usage, for an additional charge of $0.0024/kWh for all of Customer's usage, or
☐90% of Customer's usage, for an additional charge of $0.00270/kWh for all of Customer's usage, or
☐100% of Customer's usage, for an additional charge of $0.0030/kWh for all of Customer's usage

Customer – Authorized Signature:	For Internal Use ONLY: Gexa Energy Rhode Island, LLC:
Printed Name: T Joseph Memoli	Effective Date:
Title: Town Administrator	Sales Representative/Code:
Date: 11/18/08	

Rhode Island
League of Cities and Towns

MEMBERSHIP PARTICIPATION AGREEMENT
FOR THE
RHODE ISLAND ENERGY AGGREGATION PROGRAM (RIEAP)

THIS MEMBERSHIP PARTICIPATION AGREEMENT ('Agreement") is made as of this 18th day of November, 2008, by and between the Rhode Island League of Cities and Towns (the "League" or "RILCT"), a voluntary association of municipalities within the State of Rhode Island with an office at One State Street, Suite 502, Providence, Rhode Island, 02908 and the **Town of Lincoln**, a municipality incorporated under the laws of the State of Rhode Island, with an address of **100 Old River Road, Lincoln, Rhode Island 02865.**

WITNESSETH THAT

WHEREAS, the League has established a program, the Rhode Island Energy Aggregation Program ("RIEAP"), to assist municipalities in the aggregation of their purchases of electricity; and

WHEREAS, the League has evaluated the RFP responses of various power suppliers and has determined Gexa Energy submitted the best offer considering, among other things, price, reliability and financial risk, and the League has chosen Gexa Energy as its recommended supplier to the members of RIEAP; and

WHEREAS, Municipality desires to participate in the RIEAP;

NOW THEREFORE, in consideration of the foregoing and the mutual promises contained herein, and other good and valuable consideration, the receipt of which is hereby acknowledged by the parties, the League and Municipality agree as follows:

Article 1. Membership

1.1 Municipality shall be a member in good standing of the League and shall remain a member in good standing of the League throughout the term of this Agreement and understands that execution of this Agreement is a prerequisite to participation in the RIEAP.

Article 2. Agency

2.1 Municipality hereby authorizes the League to act as its agent to negotiate for Energy Purchases for and on behalf, and in the name of, Municipality for the term and purpose as specified herein, provided that Municipality, unless otherwise specified herein, shall have the right to accept or reject contract proposals negotiated by the League. Municipality will consider the League's contract proposal in good faith. All rights, obligations and responsibilities of the League under this Agreement may be delegated by the League to an energy consultant hired by the League and approved by the League's Executive Board.

Article 3. Services Provided by the League

3.1 The League, acting in consultation with Municipality, is authorized to: a) develop a strategy and business plan pursuant to which members of the League will be able to aggregate their purchasing power to make Energy Purchases from utility suppliers; b) make needs assessments or representative needs assessments for Municipality; c) obtain usage and load information with regard to Municipality and analyze representative load profiles, current rates, applicable tariffs and various supply options; d) create educational materials and, from time to time, plan and produce educational forums; e) create a Request for Proposals (the "RFP") for Energy Purchases to utility suppliers, distribute the RFP, and disclose Municipality's usage and load information in connection therewith; f) negotiate supply contracts for Energy Purchase that are advantageous to Municipality; and g) monitor performance of suppliers under contracts entered into as a result of this Agreement, including contracts providing for the sale of electricity, Municipality hereby ratifies and approves actions taken by the League in establishing the REAP.

3.2 From time to time during the term of this Agreement, the League may develop programs for energy efficiency, consideration of renewable energy generating sources and technologies to replace existing energy sources, financing of street lights, and so on; provided, however, that the League may negotiate for additional fees prior to and in connection with the implementation of any of these programs, and provided further that the League may recover its fees, costs and expenses incurred in connection with the promotion of these additional services, and provided further that the League may employ other contractors and consultants in connection with these additional services. The League may also provide other services and programs to cities and towns involving the management and use of utility resources as may be requested by Municipality and agreed to by the League.

Article 4. Municipality Cooperation

4.1 In order to allow the League to negotiate effectively with electricity providers, Municipality has an affirmative obligation to cooperate with the League during the pendency of all negotiations between the League (or its consultant) and the providers of Energy Purchases. Municipality may be required to furnish certain documents and information to the League pertaining to electricity and other utility costs incurred by Municipality, including but not limited to, actual utility invoices, load and usage data, contracts and other information which details the actual usage and cost incurred by Municipality for electric and/or other utility consumption.

Municipality authorizes League to obtain such information by the local utility or other supplier to the League. Municipality shall be available to work with the League in preparation of items for negotiation and to discuss issues as they arise throughout the negotiation. The League may rely upon the accuracy of all information that is provided to the League by Municipality under this Agreement or in connection with services to be provided by the League pursuant to this Agreement, without any independent verification by the League.

4.2 If requested by the League, and if such information is available, Municipality will provide the League with information for Municipality's accounts, including account name, address, LDC rate class, annual peak demand (kW), annual consumption (kWh), most recent 12 months of interval load data in electronic form when possible (primary metered and time-of-use accounts only) or monthly billing data including all billing determinants for non-time-of-use accounts. Municipality further authorizes the League to obtain such information from the local utility, and authorizes Gexa Energy to obtain such information (either directly from the local utility or through the League) provided that such information is reasonably necessary to Gexa Energy performance of its agreements with the League or Municipality. Municipality understands that Gexa Energy agrees to keep such information confidential as provided in its agreement with Municipality.

4.3 Municipality also authorizes Gexa Energy to disclose to the League, and the League to receive from Gexa Energy information collected or generated by Gexa Energy in connection with REAP, including any Summary Billing Report; Customer's usage and load information and billing and payment information (but not Customer's credit history); other information received from the local utility in accordance with Section 4.2; information regarding the calculation, collection and payment of the fee owed to RILCT; and any other information reasonably necessary to facilitate RILCT's monitoring of Gexa Energy performance under Municipality's agreement with Gexa Energy and the Energy Services Agreement between Gexa Energy and RILCT, or RILCT evaluation of further proposals for Energy Services. Municipality authorizes the disclosure of such information to RILCT, and the receipt of such information by the League, on an individual customer basis and, if such information is aggregated by Gexa Energy on an aggregate basis. RILCT may use such information for the benefit of the REAP including monitoring Gexa Energy performance, evaluating proposals, and so on, and will keep such information confidential except when disclosure is reasonably necessary for the benefit of the REAP members.

Article 5. Compensation

5.1 Municipality acknowledges and agrees to pay RILCT an administrative fee with respect to electricity service provided under RILCT's agreement with Gexa Energy and that Gexa Energy is RILCT's agent with respect to billing and collection of the fee. Municipality agrees to pay such administrative fees, together with any late charges thereon, to Gexa Energy for further payment to RILCT.

5.2 Municipality agrees, that for electricity delivered during all billing periods covered by its Electricity Supply Agreement with Gexa Energy an administrative fee of $0.000532 per kilowatt hour for each kilowatt hour shall be paid to Gexa Energy for further payment to RILCT, and Municipality understands that such administrative fees to be collected by Gexa Energy when it collects its charges for electricity shall be in addition to such charges.

5.3 Municipality understands that it is required by this Membership Participation Agreement between it and RILCT to remain a member in good standing of RILCT during the term of this Agreement, and acknowledges and agrees that should Municipality no longer remain a member in good standing of RILCT the fees collected by Gexa Energy and paid to RILCT pursuant to Section 5.2 of this Agreement shall each be increased to $0.00212 per kilowatt hour for each billing period after the month after the Municipality no longer remains a member in good standing in RILCT, in addition to other remedies which may be available to RILCT.

Article 6. Additional Services

6.1 In addition to the base program offering of savings below the standard offer rates or last resort service rates for electricity offered by Gexa Energy, the League or its agent may offer additional value-added services. These services may include but are not limited to the following: acquisition of streetlights, energy efficiency programs, green energy or the aggregation of natural gas. If Municipality seeks to include these or other initiative in their program, the specific services and the fees for those services will be governed by a separate agreement which shall be executed by the parties in addition to this Agreement.

Article 7. Term

7.1 This Agreement shall commence as of the date hereof, and it shall continue subject to the terms hereof, until December 2011 unless otherwise extended by mutual agreement. Thereafter this Agreement shall terminate. This Agreement shall be null and void if RILCT does not approve pricing offered by Gexa Energy within the time frame agreed to by RILCT and Gexa Energy.

Article 8. Authorization

8.1 Municipality authorizes RILCT to act on its behalf as the coordinator and ongoing organizer of Municipalities who are participating in the REAP, and if Municipality and RILCT agree, authorizes RILCT to assist Municipality in its specific dealings with Gexa Energy including without limitation acting as its agent in dealings with Gexa Energy.

8.2 Unless otherwise agreed to in a signed writing signed by Municipality, Municipality shall not be liable for any of the obligations of the League or the obligation of any other participant in the REAP to Gexa Energy or its Affiliates.

Article 9. Entire Agreement; Amendment

9.1 This Agreement shall constitute the entire Agreement between the parties, and any prior understandings or representation of any kind preceding the date of this Agreement shall not be binding upon either party. This Agreement may be amended only by an instrument of writing signed by the parties hereto.

Article 10. Successors and Assigns

10.1 This Agreement shall be binding upon and inure to the benefit of the parties hereto, and their respective successors and assigns, provided however, that this Agreement may not be assigned by either party without the prior written consent of both parties.

Article 11. Program Marketing

11.1 The League and Gexa Energy shall have the right to include Municipality's name in the list of clients and other general marketing materials.

Article 12. Notice

12.1 All notices, requests, demands and other communication provided for hereunder shall be in writing, including with limitation, facsimile transmission ("FAX") and Mailed or delivered by certified or registered mail, or transmitted by FAX confirmed in writing mailed to the addressee, to the applicable party to the respective address of each party as set forth above.

Article 13. Governing Law

13.1 This Agreement shall be governed by, construed, and enforced in accordance with the laws of the State of Rhode Island.

Article 14. Severability; Authority

14.1 If any term, condition or provision of this Agreement or the application thereof to any circumstance shall, to any extent, be invalid or unenforceable, the remainder of this Agreement and the application of such term, condition or provision shall not be effected thereby, and each term, condition or provision of this Agreement shall be valid and enforceable to the fullest extent permitted by law.

14.2 The undersigned each certify that they are authorized to execute this Agreement on behalf of their respective party, and that their respective party has duly authorized this Agreement with all required approvals.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, as of the date and year first above written.

Rhode Island League of Cities and Towns

By:_____

Name: Daniel L. Beardsley, Jr

Title: Executive Director

Date:_____

Witnessed by:_____
Name

Associate Director
Title

Municipality: Town of Lincoln

By: T Joseph Almond

Name: T Joseph Almond

Title: Town Administrator

Date: 11/18/08

Witnessed by:_____
Name

Finance Director
Title

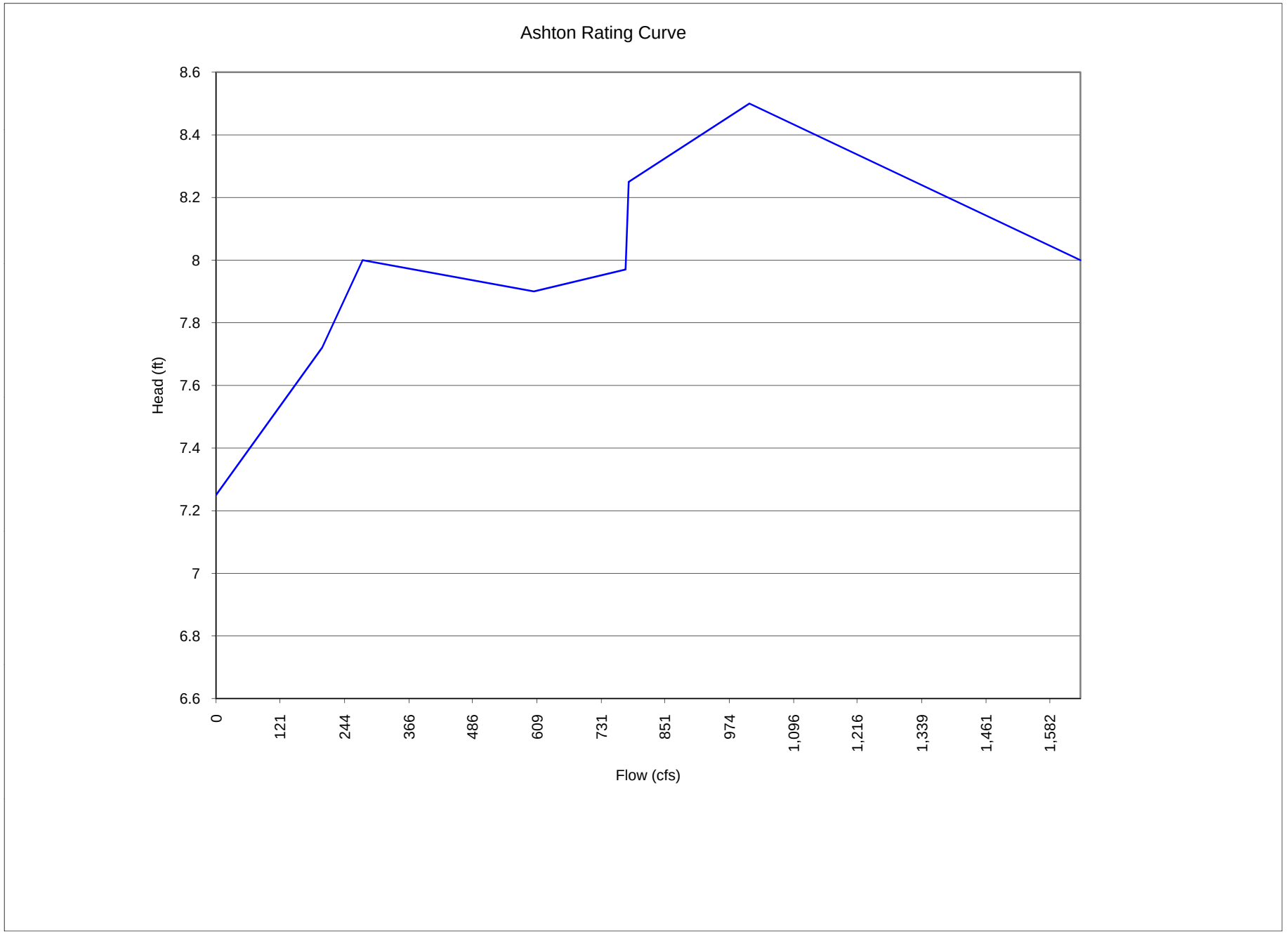
APPENDIX 2

Technical Screening Supporting Materials

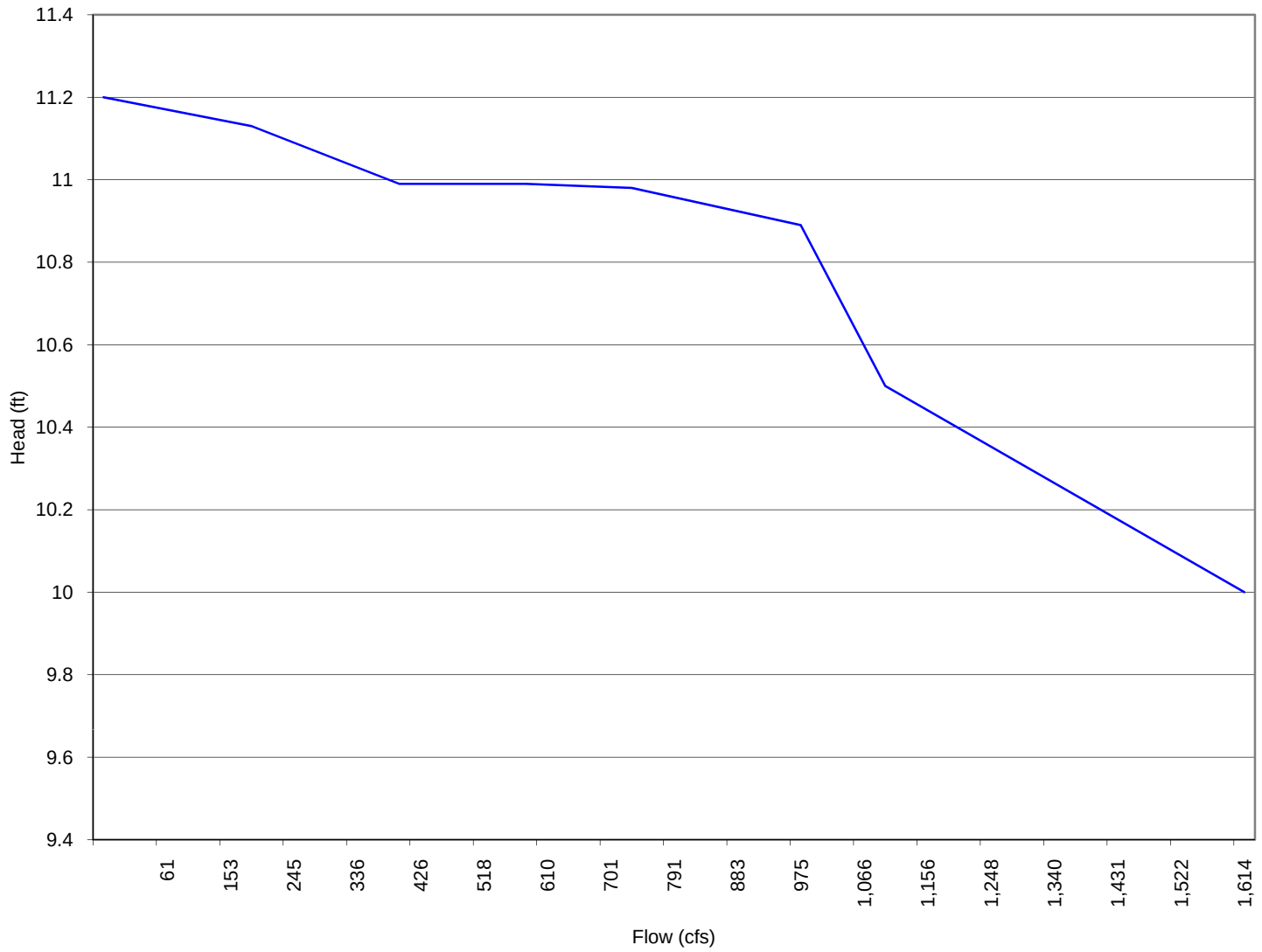
Hydraulic Data

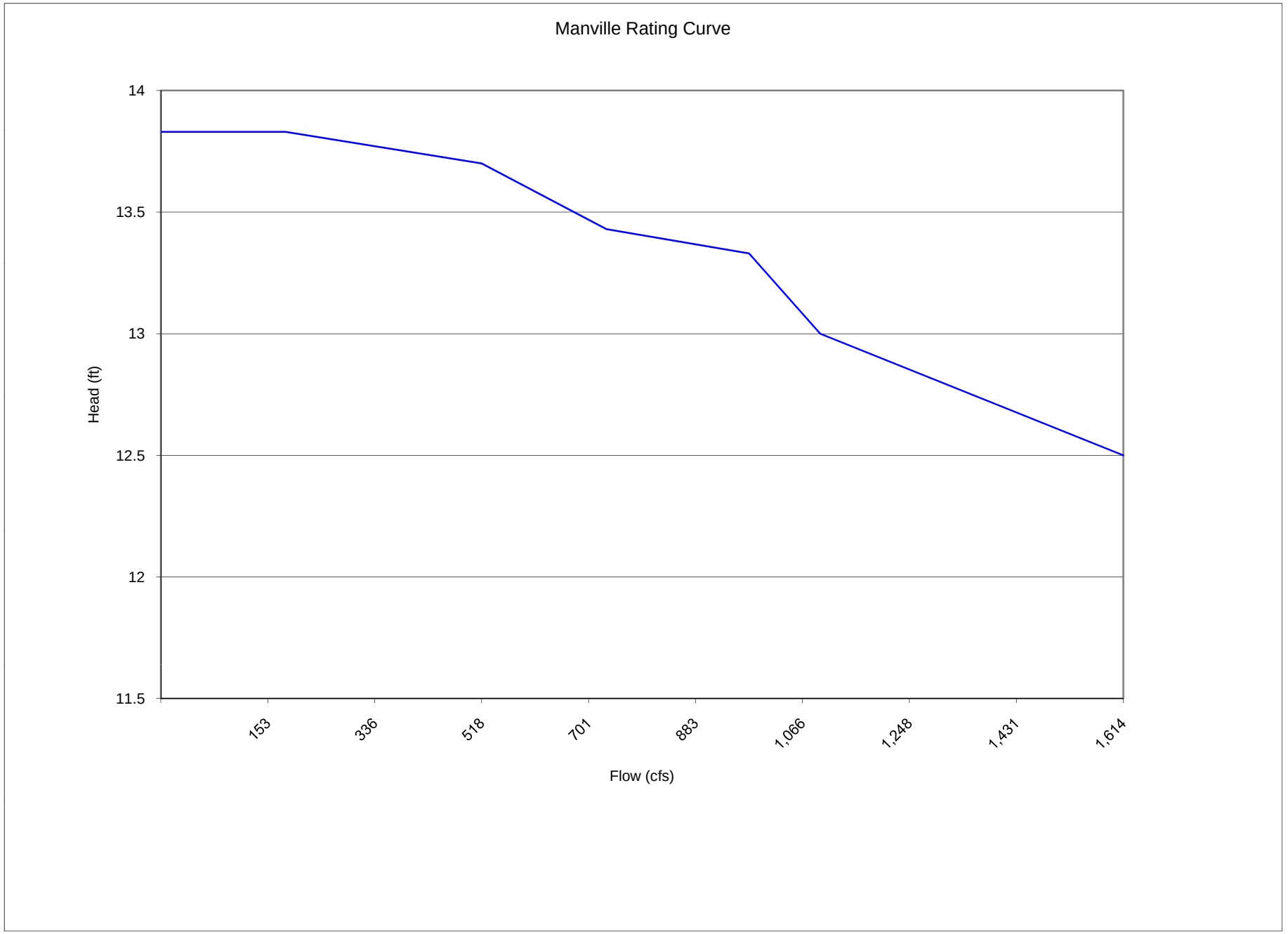
			Ashton					Albion					Manville			
DATE	**TIME**	**FLOW (GAGE)**	**HW1**	**HW2**	**TW**	**GH**	**FLOW (dam)**	**HW**	**TW (raw)**	**TW (corrected)**	**GH**	**FLOW (dam)**	**HW**	**TW**	**GH**	**FLOW (dam)**
4/21/2010	9:50	1,010				0	1,022				0	998			0	991
	10:55	1,000	8.16		16.66	8.5	1,012				0	988			0	981
	12:15	1,000				0	1,012	7.5	1.5	18.39	10.89	988			0	981
	13:00	1,010				0	1,022				0	998	5	18.33	13.33	991
4/26/2010	9:00	774	8.5		16.75	8.25	783				0	765			0	759
	11:22	768		8.78	16.75	7.97	777				0	759			0	753
	13:21	768				0	777	7.71		18.69	10.98	759			0	753
	15:45	758				0	767				0	749	5.4	18.83	13.43	743
5/7/2010	10:30	275	9.2	9.5	17.2	8	278				0	272			0	270
	11:30	417				0	422	8.2	2.3	19.19	10.99	412	6.8	19.6	12.8	409
5/12/2010	13:30	596	9.4	9.6	17.3	7.9	603	8.1	2.2	19.09	10.99	589			0	585
	14:30	551				0	558				0	544	5.5	19.2	13.7	540
7/1/2010	16:30	199	10.17		17.89	7.72	201	8.41	2.65	19.54	11.13	197	6.17	20	13.83	195
						0	-				0	-			0	-
						0	-				0	-			0	-

Inches	Ft
1	0.09
2	0.17


Ashton Rating Curve
8.6
8.4
8.2
8
7.8
7.6
7.4
7.2
7
6.8
6.6
Head (ft)
0
121
244
366
486
609
731
851
974
1,096
1,216
1,339
1,461
1,582
Flow (cfs)

Albion Rating Curve




Manville Rating Curve
14
13.5
13
12.5
12
11.5
Head (ft)
153
336
518
701
883
1,066
1,248
1,431
1,614
Flow (cfs)

Preliminary Energy Estimates

USGS 01112500 BLACKSTONE RIVER AT WOONSOCKET, RI

Drainage area @ Gage 416
Drainage Area @ Ashton 421
Correction Factor 1.01

Capacity Factor 41%
Max Power 833
Average Power 359
Totals 3,183 3,023

% Exceed	Site Flow (cfs)	Turbine Flow (cfs)	Gross Head (ft)	Net Head (ft)	Turbine Eff. (%)	Power (kw)	Gross Generation (MWH)	Net Generation (MWH)
1%	3,937	1,638	8.0	6.5	91%	780	68	65
2%	3,107	1,638	8.0	6.5	91%	780	68	65
3%	2,702	1,638	8.0	6.5	91%	780	68	65
4%	2,459	1,638	8.0	6.5	91%	780	68	65
5%	2,267	1,638	8.0	6.5	91%	780	68	65
6%	2,125	1,638	8.0	6.5	91%	780	68	65
7%	1,994	1,638	8.0	6.5	91%	780	68	65
8%	1,892	1,638	8.0	6.5	91%	780	68	65
9%	1,801	1,638	8.0	6.5	91%	780	68	65
10%	1,720	1,638	8.0	6.5	91%	780	68	65
11%	1,650	1,638	8.0	6.5	91%	780	68	65
12%	1,579	1,579	8.5	7.1	92%	833	73	69
13%	1,518	1,518	8.5	7.3	92%	822	72	68
14%	1,467	1,467	8.5	7.4	93%	813	71	68
15%	1,417	1,417	8.5	7.4	93%	785	69	65
16%	1,366	1,366	8.5	7.5	93%	773	68	64
17%	1,316	1,316	8.5	7.5	93%	744	65	62
18%	1,275	1,275	8.5	7.7	94%	736	64	61
19%	1,235	1,235	8.5	7.7	94%	712	62	59
20%	1,194	1,194	8.5	7.8	94%	701	61	58
21%	1,154	1,154	8.5	7.8	94%	677	59	56
22%	1,123	1,123	8.5	7.9	94%	669	59	56
23%	1,093	1,093	8.5	7.9	94%	651	57	54
24%	1,063	1,063	8.5	7.9	94%	637	56	53
25%	1,042	1,042	8.5	7.9	94%	625	55	52
26%	1,012	1,012	8.5	8.0	94%	610	53	51
27%	986	986	8.3	7.7	94%	575	50	48
28%	959	959	8.3	7.8	94%	565	49	47
29%	933	933	8.3	7.8	94%	549	48	46
30%	909	909	8.3	7.8	94%	535	47	45
31%	885	885	8.3	7.9	93%	523	46	44
32%	860	860	8.3	7.9	93%	509	45	42
33%	840	840	8.3	7.9	93%	497	44	41
34%	818	818	8.3	7.9	93%	486	43	40
35%	798	798	8.3	7.9	93%	474	42	39
36%	777	777	8.0	7.7	93%	445	39	37
37%	758	758	7.9	7.6	93%	430	38	36
38%	740	740	7.9	7.6	93%	420	37	35
39%	722	722	7.9	7.7	92%	409	36	34
40%	704	704	7.9	7.7	92%	400	35	33
41%	687	687	7.9	7.7	92%	390	34	32
42%	670	670	7.9	7.7	92%	380	33	32
43%	654	654	7.9	7.7	91%	370	32	31
44%	638	638	7.9	7.7	91%	361	32	30
45%	623	623	7.9	7.7	91%	353	31	29
46%	607	607	7.9	7.7	91%	344	30	29
47%	592	592	8.0	7.8	91%	340	30	28
48%	577	577	8.0	7.8	91%	331	29	28

49%	564	564	8.0	7.9	90%	322	28	27
50%	549	549	8.0	7.9	90%	313	27	26
51%	534	534	8.0	7.9	90%	305	27	25
52%	520	520	8.0	7.9	90%	297	26	25
53%	506	506	8.0	7.9	90%	289	25	24
54%	492	492	8.0	7.9	90%	281	25	23
55%	478	478	8.0	7.9	89%	269	24	22
56%	465	465	8.0	7.9	89%	262	23	22
57%	451	451	8.0	7.9	89%	254	22	21
58%	439	439	8.0	7.9	89%	248	22	21
59%	427	427	8.0	7.9	89%	241	21	20
60%	415	415	8.0	7.9	89%	234	20	19
61%	402	402	8.0	7.9	86%	221	19	18
62%	390	390	8.0	7.9	86%	214	19	18
63%	377	377	8.0	7.9	86%	208	18	17
64%	366	366	8.0	7.9	86%	202	18	17
65%	355	355	8.0	7.9	86%	196	17	16
66%	344	344	8.0	7.9	86%	189	17	16
67%	333	333	8.0	7.9	86%	183	16	15
68%	323	323	8.0	8.0	82%	170	15	14
69%	313	313	8.0	8.0	82%	165	14	14
70%	305	305	8.0	8.0	82%	161	14	13
71%	296	296	8.0	8.0	82%	156	14	13
72%	286	286	8.0	8.0	82%	151	13	13
73%	278	278	8.0	8.0	82%	147	13	12
74%	269	269	7.7	7.7	82%	137	12	11
75%	261	261	7.7	7.7	82%	133	12	11
76%	254	254	7.7	7.7	82%	129	11	11
77%	247	247	7.7	7.7	82%	126	11	10
78%	239	239	7.7	7.7	74%	109	10	9
79%	232	232	7.7	7.7	74%	106	9	9
80%	225	225	7.7	7.7	74%	103	9	9
81%	218	218	7.7	7.7	74%	100	9	8
82%	211	211	7.7	7.7	74%	96	8	8
83%	204	204	7.7	7.7	74%	94	8	8
84%	198	198	7.3	7.2	74%	85	7	7
85%	192	192	7.3	7.2	74%	83	7	7
86%	186	186	7.3	7.2	74%	80	7	7
87%	180	180	7.3	7.2	74%	77	7	6
88%	174	174	7.3	7.2	74%	75	7	6
89%	169	169	7.3	7.2	74%	73	6	6
90%	163	-	7.3	0.0	0%	-	0	0
91%	158	-	7.3	0.0	0%	-	0	0
92%	152	-	7.3	0.0	0%	-	0	0
93%	145	-	7.3	0.0	0%	-	0	0
94%	138	-	7.3	0.0	0%	-	0	0
95%	132	-	7.3	0.0	0%	-	0	0
96%	122	-	7.3	0.0	0%	-	0	0
97%	113	-	7.3	0.0	0%	-	0	0
98%	102	-	7.3	0.0	0%	-	0	0
99%	84	-	7.3	0.0	0%	-	0	0
100%	21	-	7.3	0.0	0%	-	0	0
							3,183	3,023

USGS 01112500 BLACKSTONE RIVER AT WOONSOCKET, RI

Drainage area @ Gage	416			Capacity Factor	42%
Drainage Area @ Albion	411			Max Power	1,087
Correction Factor	0.99		Totals	Average Power	472
				4,184	3,974

% Exceed	Site Flow (cfs)	Turbine Flow (cfs)	Gross Head (ft)	Net Head (ft)	Turbine Eff. (%)	Power (kw)	Gross Generation (MWH)	Net Generation (MWH)
1%	3,843	1,638	10.0	8.5	91%	1,020	89	85
2%	3,033	1,638	10.0	8.5	91%	1,020	89	85
3%	2,638	1,638	10.0	8.5	91%	1,020	89	85
4%	2,401	1,638	10.0	8.5	91%	1,020	89	85
5%	2,213	1,638	10.0	8.5	91%	1,020	89	85
6%	2,075	1,638	10.0	8.5	91%	1,020	89	85
7%	1,946	1,638	10.0	8.5	91%	1,020	89	85
8%	1,848	1,638	10.0	8.5	91%	1,020	89	85
9%	1,759	1,638	10.0	8.5	91%	1,020	89	85
10%	1,680	1,638	10.0	8.5	91%	1,020	89	85
11%	1,610	1,610	10.5	9.1	92%	1,087	95	90
12%	1,541	1,541	10.5	9.3	92%	1,063	93	88
13%	1,482	1,482	10.5	9.3	92%	1,022	90	85
14%	1,433	1,433	10.5	9.4	93%	1,008	88	84
15%	1,383	1,383	10.5	9.5	93%	990	87	82
16%	1,334	1,334	10.5	9.5	93%	955	84	79
17%	1,284	1,284	10.5	9.7	94%	935	82	78
18%	1,245	1,245	10.5	9.7	94%	906	79	75
19%	1,205	1,205	10.5	9.8	94%	890	78	74
20%	1,166	1,166	10.5	9.8	94%	861	75	72
21%	1,126	1,126	10.5	9.9	94%	841	74	70
22%	1,097	1,097	10.9	10.3	94%	852	75	71
23%	1,067	1,067	10.9	10.3	94%	829	73	69
24%	1,037	1,037	10.9	10.3	94%	809	71	67
25%	1,018	1,018	10.9	10.4	94%	797	70	66
26%	988	988	10.9	10.4	94%	774	68	64
27%	962	962	11.0	10.5	94%	765	67	64
28%	937	937	11.0	10.5	94%	745	65	62
29%	911	911	11.0	10.5	94%	724	63	60
30%	887	887	11.0	10.6	93%	707	62	59
31%	863	863	11.0	10.6	93%	688	60	57
32%	840	840	11.0	10.6	93%	669	59	56
33%	820	820	11.0	10.6	93%	653	57	54
34%	798	798	11.0	10.7	93%	637	56	53
35%	780	780	11.0	10.7	93%	622	54	52
36%	759	759	11.0	10.7	93%	605	53	50
37%	740	740	11.0	10.7	93%	591	52	49
38%	722	722	11.0	10.8	92%	575	50	48
39%	704	704	11.0	10.8	92%	561	49	47
40%	688	688	11.0	10.8	92%	547	48	46
41%	671	671	11.0	10.8	92%	534	47	44
42%	654	654	11.0	10.8	91%	519	45	43
43%	638	638	11.0	10.8	91%	506	44	42
44%	622	622	11.0	10.8	91%	494	43	41
45%	609	609	11.0	10.8	91%	483	42	40
46%	593	593	11.0	10.8	91%	470	41	39
47%	578	578	11.0	10.8	91%	458	40	38
48%	563	563	11.0	10.9	90%	443	39	37

49%	550	550	11.0	10.9	90%	433	38	36
50%	535	535	11.0	10.9	90%	422	37	35
51%	522	522	11.0	10.9	90%	411	36	34
52%	508	508	11.0	10.9	90%	400	35	33
53%	494	494	11.0	10.9	90%	389	34	32
54%	480	480	11.0	10.9	89%	373	33	31
55%	466	466	11.0	10.9	89%	362	32	30
56%	453	453	11.0	10.9	89%	352	31	29
57%	441	441	11.0	10.9	89%	342	30	28
58%	429	429	11.0	10.9	89%	333	29	28
59%	417	417	11.0	10.9	89%	324	28	27
60%	405	405	11.1	11.1	86%	311	27	26
61%	392	392	11.1	11.1	86%	301	26	25
62%	380	380	11.1	11.1	86%	292	26	24
63%	369	369	11.1	11.1	86%	283	25	24
64%	358	358	11.1	11.1	86%	274	24	23
65%	347	347	11.1	11.1	86%	266	23	22
66%	336	336	11.1	11.1	86%	258	23	21
67%	325	325	11.1	11.1	82%	239	21	20
68%	315	315	11.1	11.1	82%	232	20	19
69%	305	305	11.1	11.1	82%	224	20	19
70%	297	297	11.1	11.1	82%	218	19	18
71%	288	288	11.1	11.1	82%	212	19	18
72%	280	280	11.1	11.1	82%	205	18	17
73%	272	272	11.1	11.1	82%	200	17	17
74%	263	263	11.1	11.1	82%	193	17	16
75%	255	255	11.1	11.1	82%	187	16	16
76%	248	248	11.1	11.1	82%	182	16	15
77%	241	241	11.1	11.1	74%	159	14	13
78%	233	233	11.1	11.1	74%	154	13	13
79%	226	226	11.1	11.1	74%	149	13	12
80%	219	219	11.1	11.1	74%	145	13	12
81%	212	212	11.1	11.1	74%	140	12	12
82%	206	206	11.1	11.1	74%	136	12	11
83%	200	200	11.1	11.1	74%	132	12	11
84%	194	194	11.2	11.2	74%	129	11	11
85%	188	188	11.2	11.2	74%	125	11	10
86%	182	182	11.2	11.2	74%	121	11	10
87%	176	176	11.2	11.2	74%	117	10	10
88%	170	170	11.2	11.2	74%	113	10	9
89%	165	165	11.2	11.2	74%	110	10	9
90%	159	-	11.2	0.0	0%	-	0	0
91%	154	-	11.2	0.0	0%	-	0	0
92%	148	-	11.2	0.0	0%	-	0	0
93%	141	-	11.2	0.0	0%	-	0	0
94%	134	-	11.2	0.0	0%	-	0	0
95%	128	-	11.2	0.0	0%	-	0	0
96%	120	-	11.2	0.0	0%	-	0	0
97%	111	-	11.2	0.0	0%	-	0	0
98%	100	-	11.2	0.0	0%	-	0	0
99%	82	-	11.2	0.0	0%	-	0	0
100%	21	-	11.2	0.0	0%	-	0	0
							4,184	3,974

USGS 01112500 BLACKSTONE RIVER AT WOONSOCKET, RI

Drainage area @ Gage 416
Drainage Area @ Manville 408
Correction Factor 0.98

Capacity Factor 41%
Max Power 1,374
Average Power 591
Totals 5,238 4,976

% Exceed	Site Flow (cfs)	Turbine Flow (cfs)	Gross Head (ft)	Net Head (ft)	Turbine Eff. (%)	Power (kw)	Gross Generation (MWH)	Net Generation (MWH)
1%	3,815	1,638	12.5	11.0	91.1%	1,319	116	110
2%	3,011	1,638	12.5	11.0	91.1%	1,319	116	110
3%	2,619	1,638	12.5	11.0	91.1%	1,319	116	110
4%	2,383	1,638	12.5	11.0	91.1%	1,319	116	110
5%	2,197	1,638	12.5	11.0	91.1%	1,319	116	110
6%	2,060	1,638	12.5	11.0	91.1%	1,319	116	110
7%	1,932	1,638	12.5	11.0	91.1%	1,319	116	110
8%	1,834	1,638	12.5	11.0	91.1%	1,319	116	110
9%	1,746	1,638	12.5	11.0	91.1%	1,319	116	110
10%	1,667	1,638	12.5	11.0	91.1%	1,319	116	110
11%	1,599	1,599	13.0	11.6	91.7%	1,374	120	114
12%	1,530	1,530	13.0	11.8	92.4%	1,340	117	111
13%	1,471	1,471	13.0	11.9	92.9%	1,310	115	109
14%	1,422	1,422	13.0	11.9	92.9%	1,266	111	105
15%	1,373	1,373	13.0	12.0	93.3%	1,240	109	103
16%	1,324	1,324	13.0	12.0	93.3%	1,196	105	100
17%	1,275	1,275	13.0	12.2	93.7%	1,168	102	97
18%	1,236	1,236	13.0	12.2	93.7%	1,132	99	94
19%	1,197	1,197	13.0	12.3	94.0%	1,109	97	92
20%	1,157	1,157	13.0	12.3	94.0%	1,073	94	89
21%	1,118	1,118	13.0	12.4	94.1%	1,047	92	87
22%	1,089	1,089	13.3	12.7	94.1%	1,047	92	87
23%	1,059	1,059	13.3	12.7	94.1%	1,022	90	85
24%	1,030	1,030	13.3	12.7	94.1%	994	87	83
25%	1,010	1,010	13.3	12.8	94.1%	978	86	81
26%	981	981	13.4	13.0	93.9%	961	84	80
27%	955	955	13.4	13.0	93.9%	936	82	78
28%	930	930	13.4	13.0	93.9%	911	80	76
29%	904	904	13.4	13.0	93.9%	886	78	74
30%	881	881	13.4	13.1	93.4%	864	76	72
31%	857	857	13.4	13.1	93.4%	841	74	70
32%	834	834	13.4	13.1	93.4%	818	72	68
33%	814	814	13.4	13.1	92.9%	799	70	66
34%	792	792	13.4	13.1	92.9%	777	68	65
35%	774	774	13.4	13.1	92.9%	759	66	63
36%	753	753	13.4	13.1	92.9%	739	65	61
37%	735	735	13.7	13.5	92.1%	732	64	61
38%	717	717	13.7	13.5	92.1%	715	63	59
39%	699	699	13.7	13.5	92.1%	697	61	58
40%	683	683	13.7	13.5	92.1%	680	60	57
41%	666	666	13.7	13.5	92.1%	664	58	55
42%	649	649	13.7	13.5	91.2%	644	56	54
43%	634	634	13.7	13.5	91.2%	628	55	52
44%	618	618	13.7	13.5	91.2%	613	54	51
45%	604	604	13.7	13.5	91.2%	599	52	50
46%	588	588	13.7	13.5	91.2%	584	51	49
47%	574	574	13.7	13.5	91.2%	569	50	47
48%	559	559	13.7	13.6	90.2%	550	48	46

49%	546	546	13.7	13.6	90.2%	537	47	45
50%	532	532	13.8	13.7	90.2%	528	46	44
51%	518	518	13.8	13.7	90.2%	514	45	43
52%	504	504	13.8	13.7	90.2%	501	44	42
53%	490	490	13.8	13.7	88.6%	480	42	40
54%	477	477	13.8	13.7	88.6%	467	41	39
55%	463	463	13.8	13.7	88.6%	453	40	38
56%	450	450	13.8	13.7	88.6%	441	39	37
57%	437	437	13.8	13.7	88.6%	428	38	36
58%	426	426	13.8	13.7	88.6%	417	37	35
59%	414	414	13.8	13.7	88.6%	405	36	34
60%	402	402	13.8	13.8	86.2%	384	34	32
61%	389	389	13.8	13.8	86.2%	372	33	31
62%	378	378	13.8	13.8	86.2%	360	32	30
63%	366	366	13.8	13.8	86.2%	349	31	29
64%	355	355	13.8	13.8	86.2%	339	30	28
65%	344	344	13.8	13.8	86.2%	329	29	27
66%	333	333	13.8	13.8	86.2%	318	28	26
67%	323	323	13.8	13.8	82.3%	295	26	25
68%	313	313	13.8	13.8	82.3%	286	25	24
69%	303	303	13.8	13.8	82.3%	277	24	23
70%	295	295	13.8	13.8	82.3%	270	24	22
71%	286	286	13.8	13.8	82.3%	262	23	22
72%	278	278	13.8	13.8	82.3%	254	22	21
73%	270	270	13.8	13.8	82.3%	246	22	20
74%	261	261	13.8	13.8	82.3%	238	21	20
75%	253	253	13.8	13.8	82.3%	231	20	19
76%	246	246	13.8	13.8	82.3%	225	20	19
77%	239	239	13.8	13.8	73.8%	196	17	16
78%	231	231	13.8	13.8	73.8%	190	17	16
79%	225	225	13.8	13.8	73.8%	184	16	15
80%	218	218	13.8	13.8	73.8%	179	16	15
81%	211	211	13.8	13.8	73.8%	173	15	14
82%	204	204	13.8	13.8	73.8%	167	15	14
83%	198	198	13.8	13.8	73.8%	163	14	14
84%	192	192	13.8	13.8	73.8%	158	14	13
85%	186	186	13.8	13.8	73.8%	153	13	13
86%	180	180	13.8	13.8	73.8%	148	13	12
87%	175	175	13.8	13.8	73.8%	143	13	12
88%	169	169	13.8	13.8	73.8%	138	12	12
89%	164	164	13.8	13.8	73.8%	134	12	11
90%	158	-	13.8	0.0	0.0%	-	0	0
91%	153	-	13.8	0.0	0.0%	-	0	0
92%	147	-	13.8	0.0	0.0%	-	0	0
93%	140	-	13.8	0.0	0.0%	-	0	0
94%	133	-	13.8	0.0	0.0%	-	0	0
95%	128	-	13.8	0.0	0.0%	-	0	0
96%	119	-	13.8	0.0	0.0%	-	0	0
97%	110	-	13.8	0.0	0.0%	-	0	0
98%	99	-	13.8	0.0	0.0%	-	0	0
99%	81	-	13.8	0.0	0.0%	-	0	0
100%	21	-	13.8	0.0	0.0%	-	0	0
							5,238	4,976

Preliminary Cost Estimates

No.	Item	Unit	Qty	Rate	Amount ($1,000's)	Comments
1	**General**					
a	Mob/Demob		1	25,000	25	Allowance
b	Site Prep		1	10,000	10	Allowance
c	Clear & Grub	acre	0.5	6,200	3	Allowance
d	E&S Control	ft.	100	10	1	Allowance
e	Dam Repairs		1		0	Included in Individual Proformas
f	Subtotal, General				39	
2	**Powerhouse/Intake**					
a	Coffer dam, Pond				100	Allowance
b	Coffer dam, Tailrace				25	Allowance
c	Excavation		0		0	
i	Structure	cy	100	100	10	From Cargill Falls
ii	Intake	cy	500	100	50	From Cargill Falls
iii	Tailrace	cy	602	100	60	From Cargill Falls
d	Demolition		1	10,000	10	Allowance
e	Dewatering	week	10	1,000	10	From Cargill Falls
f	Concrete	cy	267	750	200	Allowance
g	Superstructure, Decking	sf	1000	100	100	Assume 40'x25' from Cargill Falls
h	Trashracks	sf	500	400	200	Check sizing for approach velocity target of 2 fps
i	Trashrake		1	150,000	150	Allowance for automatic rake
j	Draft Tube gates		1	15,000	15	Allowance
k	Sluice gate		0	20,000	0	
l	Misc. metals		1	5,000	5	Allowance
m	HVAC		1	10,000	10	
n	Auxilliary Mechanical		1	10,000	10	Allowance
o	Lighting, auxilliary electrical		1	5,000	5	Allowance
p	Intake concrete	cy	100	500	50	Allowance
q	Subtotal, Powerhouse				1,010	
3	**Equipment**					
a	Turbine, generator, governor, controls, breaker & protection		1	2,500,000	2,500	Canadian Hydro Components (1/09) 1700mm 1,295kw. 3/09 Mavel 1.8m: $1.125mm
b	Shipping Handling & Installation		1	527,000	527	20% of equipment costs
c	Switchgear		1	40,000	40	Pro-Rate from VT Project
d	I&C		1	50,000	50	Pro-Rate from VT Project
e	Station Service, MCC		1	20,000	20	Pro-Rate from VT Project
f	Draft Tube extension		1	25,000	25	Miscellaneous
g	Subtotal, Equipment				3,162	
8	**PM&E Measures**					
a	Water Quality		1	20,000	20	Allowance
b	D/S fish passage		1	20,000	20	Allowance
c	Min flow verification		1	5,000	5	Allowance
d	Wetlands	acre	0.5	60,000	30	Allowance
e	Recreation		1	7,500	8	Allowance
f	Cultural		1	7,500	8	Allowance
g	Subtotal, PM&E				90	
9	**FERC Licensing**					
a	Consultation	year	1	50,000	50	Allowance
b	Studies	year	1	75,000	75	Allowance
c	Draft Application		1	50,000	50	Allowance
d	Final draft Application		1	25,000	25	Allowance
e	Legal review		1	5,000	5	Allowance
f	Other		1	20,000	20	Outside Services, Post filing
g	Multiple projects, 50% of Subtotal, FERC Lic.				113	
10	**Land & Land Rights**					
a	Flowage rights		1	5,000	5	Allowance
b	Project works, land in fee		1		0	
c	Interconnection R.O.W.		1	5,000	5	Allowance
d	Legal		1	10,000	10	Allowance
e	Other				0	
f	Subtotal, Land				20	

No.	Item	Unit	Qty	Rate	Amount ($1,000's)	Comments
11	**Interconnection**					
a	Clear & Grub	acre	0.5	6,200	3	Allowance
b	New Line		13	5,000	65	Allowance, 1/2 mile (13 poles) @ $5,000/pole
c	Metering		1	10,000	10	Allowance
c	Switchyard		1	25,000	25	Allowance, pole XFmr & disconnect
d	Other		1	50,000	50	Allowance for miscellaneous improvements
f	Subtotal, Interconnection				153	
12	**Indirect Costs**					
a	A/E		1	362,452	362	8% of Direct Costs
b	Construction Management		1	25,000	25	Allowance
c	Testing		1	20,000	20	geo-tech, concrete
d	FERC submittals		1	35,000	35	Design Report, Status Reports
e	Owner's Admin & Overhead				0	
f	Other				0	
g	Subtotal, Indirects				442	
	Totals					
1	General				39	
2	Powerhouse/Intake				1,010	
3	Equipment				3,162	
8	PM&E Measures				90	
9	FERC Licensing Multiple Sites, 50% Discount				56	
10	Land & Land Rights				20	
11	Interconnection				153	
	Subtotal, Directs				4,531	
12	Indirect Costs				442	
	Subtotal				4,973	
13	Contingency		$4,973,102	25%	1,243	
	Grand Total				**6,216**	

No.	Item	Unit	Qty	Rate	Amount ($1,000's)	Comments
1	**General**					
a	Mob/Demob		1	10,000	10	Allowance
b	Site Prep		1	10,000	10	Allowance
c	Clear & Grub	acre	0.5	6,200	3	Allowance
d	E&S Control	ft.	100	10	1	Allowance
e	Dam Repairs		1		0	Included in Individual Proformas
f	Subtotal, General				24	
2	**Powerhouse/Intake**					
a	Coffer dam, Pond				25	Allowance
b	Coffer dam, Tailrace				25	Allowance
c	Excavation		0		0	
i	Structure	cy	20	25	1	Allowance
ii	Intake	cy	100	100	10	Allowance
iii	Tailrace	cy	100	100	10	Allowance
d	Demolition		1	10,000	10	Allowance
e	Dewatering	week	6	1,000	6	Allowance
f	Concrete	cy	10	750	8	Allowance
g	Superstructure, Decking	sf	0	100	0	
h	Trashracks	sf	500	50	25	Allowance for Repair
i	Trashrake		1	15,000	15	Allowance for repairs
j	Draft Tube gates		1	15,000	15	Allowance
k	Sluice gate		0	20,000	0	Allowance
l	Misc. metals		1	5,000	5	Allowance
m	HVAC		1	5,000	5	Allowance
n	Auxilliary Mechanical		1	10,000	10	Allowance
o	Lighting, auxilliary electrical		1	2,500	3	Allowance
p	Intake concrete	cy	0	500	0	Allowance
q	Subtotal, Powerhouse				172	
3	**Equipment**					
a	Turbine, generator, governor, controls, breaker & protection		1	400,000	400	Verbal Estimate from Putnam Hydropower (6/10)
b	Shipping Handling & Installation		0	80,000	0	See above
c	Switchgear		0	25,000	0	See above
d	I&C		0	25,000	0	See above
e	Station Service, MCC		0	15,000	0	See above
f	Draft Tube extension		0	20,000	0	See above
g	Subtotal, Equipment				400	
8	**PM&E Measures**					
a	Water Quality		1	20,000	20	Allowance
b	D/S fish passage		1	20,000	20	Allowance
c	Min flow verification		1	5,000	5	Allowance
d	U/S Fish Passage		1	500,000	500	Elizabeth Webbing Mills Dam Hydroplant - Appraisal Assessment of Demolition/Rehabilitation Options, Technical Memorandum, USDA-NRCS
e	Recreation		1	7,500	8	Allowance
f	Cultural		1	7,500	8	Allowance
g	Subtotal, PM&E				560	
9	**FERC Licensing**					
a	Consultation	year	1	25,000	25	Allowance
b	Studies	year	1	25,000	25	Allowance
c	License Maintenance		1	25,000	25	Allowance
d	Ammendment		1	15,000	15	Allowance
e	Legal review		1	5,000	5	Allowance
f	Other		1	20,000	20	Outside Services, Post filing
g	Multiple projects, 50% of Subtotal, FERC Lic.				58	
10	**Land & Land Rights**					
a	Flowage rights		1	5,000	5	Allowance
b	Project works, land in fee		1		0	
c	Interconnection R.O.W.		1	5,000	5	Allowance
d	Legal		1	5,000	5	Allowance
e	Other				0	
f	Subtotal, Land				15	

No.	Item	Unit	Qty	Rate	Amount ($1,000's)	Comments
11	**Interconnection**					
a	Clear & Grub	acre	0.5	6,200	3	Allowance
b	New Line		4	1,000	4	Allowance, 4 poles
c	Metering		1	5,000	5	Allowance
c	Switchyard		1	25,000	25	Allowance, pole XFmr & disconnect
d	Other				0	
f	Subtotal, Interconnection				37	
12	**Indirect Costs**					
a	A/E		1	98,916	99	8% of Direct Costs
b	Construction Management		1	10,000	10	Allowance
c	Testing		1	20,000	20	geo-tech, concrete
d	FERC submittals		1	15,000	15	Design Report, Status Reports
e	Owner's Admin & Overhead				0	
f	Other				0	
g	Subtotal, Indirects				144	
	Totals					
1	General				24	
2	Powerhouse/Intake				172	
3	Equipment				400	
8	PM&E Measures				560	
9	FERC Licensing Multiple Sites, 50% Discount				29	
10	Land & Land Rights				15	
11	Interconnection				37	
	Subtotal, Directs				1,236	
12	Indirect Costs				144	
	Subtotal				1,380	
13	Contingency		$1,380,366	25%	345	
	Grand Total				**1,725**	

Preliminary Economic Analysis

Instructions: Cells highlighted in yellow are for user inputed data

Grants State **25%** of Direct Costs Federal **0%** of Equipment costs
Discount Rate **5%** Escalation Rate **2.5%**

Name	Alternative	Installed Capacity (kW)	Average Power (KW)	Installed Costs ($1,000s)	Installed Costs ($/KW)	Grant Value ($1,000s)	Net Annual Energy (MWH)	Project IRR (%)	Cumulative NPV ($1,000s)	Discounted Payback Period (yrs)	Revenues Wholesale (W) or Net Meter (NM)
Case 1: Wholesale Energy Rate											
A	**Ashton, Albion, Manville**	**3,294**	**1,422**	**$18,909**	**$5,741**	**$3,398**	**11,973**	**7%**	**$3,346**	**19**	**W**
B	**Albion, Manville, Webbing**	**3,161**	**1,413**	**$14,328**	**$4,533**	**$2,697**	**13,310**	**10%**	**$8,224**	**15**	**W**
C	**Ashton, Albion, Manville, Webbing**	**3,994**	**1,772**	**$20,675**	**$5,177**	**$3,829**	**16,333**	**8%**	**$7,937**	**19**	**W**
1	Ashton	833	359	$6,346	$7,622	$1,133	3,023	5%	($355)	30	W
2	Albion	1,087	472	$6,316	$5,811	$1,133	3,974	7%	$1,452	29	W
3	Manville	1,374	591	$6,246	$4,546	$1,133	4,976	9%	$3,394	19	W
4	Elizabeth Webbing	700	350	$1,765	$2,522	$431	4,360	29%	$6,092	3	W
	energy estimate from fish passage EA / assume 50% of installed capacity for avg. power										
Case 2: Net-Meter/Renewable Energy Rate											
A	**Ashton, Albion, Manville**	**3,294**	**1,422**	**$18,909**	**$5,741**	**$3,398**	**11,973**	**11%**	**$11,345**	**13**	**NM**
B	**Albion, Manville, Webbing**	**3,161**	**1,413**	**$14,328**	**$4,533**	**$2,697**	**13,310**	**16%**	**$17,728**	**7**	**NM**
C	**Ashton, Albion, Manville, Webbing**	**3,994**	**1,772**	**$20,675**	**$5,177**	**$3,829**	**16,333**	**14%**	**$19,342**	**10**	**NM**
1	Ashton	833	359	$6,346	$7,622	$1,133	3,023	7%	$1,614	19	NM
2	Albion	1,087	472	$6,316	$5,811	$1,133	3,974	10%	$3,732	13	NM
3	Manville	1,374	591	$6,246	$4,546	$1,133	4,976	14%	$6,000	9	NM
4	Elizabeth Webbing	700	350	$1,765	$2,522	$431	4,360	47%	$7,997	2	NM
	energy estimate from fish passage EA / assume 50% of installed capacity for avg. power										
Case 3: Net-Meter/Renewable Energy Rate + State & Federal Grants											
A	**Ashton, Albion, Manville**	**3,294**	**1,422**	**$18,909**	**$5,741**	**$6,244**	**11,973**	**13%**	**$14,191**	**10**	**NM**
B	**Albion, Manville, Webbing**	**3,161**	**1,413**	**$14,328**	**$4,533**	**$4,714**	**13,310**	**27%**	**$22,591**	**4**	**NM**
C	**Ashton, Albion, Manville, Webbing**	**3,994**	**1,772**	**$20,675**	**$5,177**	**$6,795**	**16,333**	**16%**	**$22,188**	**7**	**NM**
1	Ashton	833	359	$6,346	$7,622	$2,081	3,023	9%	$2,563	16	NM
2	Albion	1,087	472	$6,316	$5,811	$2,081	3,974	13%	$4,680	10	NM
3	Manville	1,374	591	$6,246	$4,546	$2,081	4,976	17%	$6,948	7	NM
4	Elizabeth Webbing	700	350	$1,765	$2,522	$551	4,360	51%	$8,117	2	NM
	energy estimate from fish passage EA / assume 50% of installed capacity for avg. power										

Alternative	Projects in Portfolio
A	Ashton, Albion, Manville
B	Albion, Manville, Webbing
C	Ashton, Albion, Manville, Webbing

Denotes cells for user input

Alt	Installed Cost ($1,000's)	Installed Capacity (kW)	Installed Costs ($/kw)	Energy (MWH)	RI Grants	Fed Grant	ITC	Energy Rate $/MWH	% Debt	Interest Rate	Equity ($1,000s)	Min DCR	AVG DCR	IRR	NPV ($1,000s)	EDC Costs ($/installed kw)
A	18,909	3,294	5,741	11,973	0%	0%	30%	$125	54%	5.0%	$3,017	1.65	2.00	24%	$7,648	$ -
B	14,328	3,161	4,533	13,310	0%	0%	30%	$125	76%	5.0%	($877)	1.73	2.00	#DIV/0!	$11,432	$ -
C	20,675	3,994	5,177	16,333	0%	0%	30%	$125	66%	5.0%	$778	1.73	2.00	117%	$12,947	$ -
A (2)	18,909	3,294	5,741	11,973	10%	0%	30%	$125	59%	5.0%	$1,840	1.68	2.00	36%	$8,773	$ 574.09
B (2)	14,328	3,161	4,533	13,310	10%	0%	30%	$125	83%	5.0%	($1,685)	1.73	2.00	#DIV/0!	$12,085	$ 453.27
C (2)	20,675	3,994	5,177	16,333	10%	0%	30%	$125	72%	5.0%	($399)	1.72	2.00	#DIV/0!	$13,917	$ 517.68
A (3)	18,909	3,294	5,741	11,973	20%	0%	30%	$125	65%	5.0%	$694	1.71	2.00	91%	$9,850	$ 1,148.19
B (3)	14,328	3,161	4,533	13,310	20%	0%	30%	$125	92%	5.0%	($2,495)	1.72	2.00	#DIV/0!	$12,738	$ 906.53
C (3)	20,675	3,994	5,177	16,333	20%	0%	30%	$125	80%	5.0%	($1,573)	1.71	2.00	#DIV/0!	$14,861	$ 1,035.35

All Alts — Escalation Rate: 2.5% — Discount Rate: 8% — REC's ($//MWH): $25 — Term (Yrs): 20

Notes:

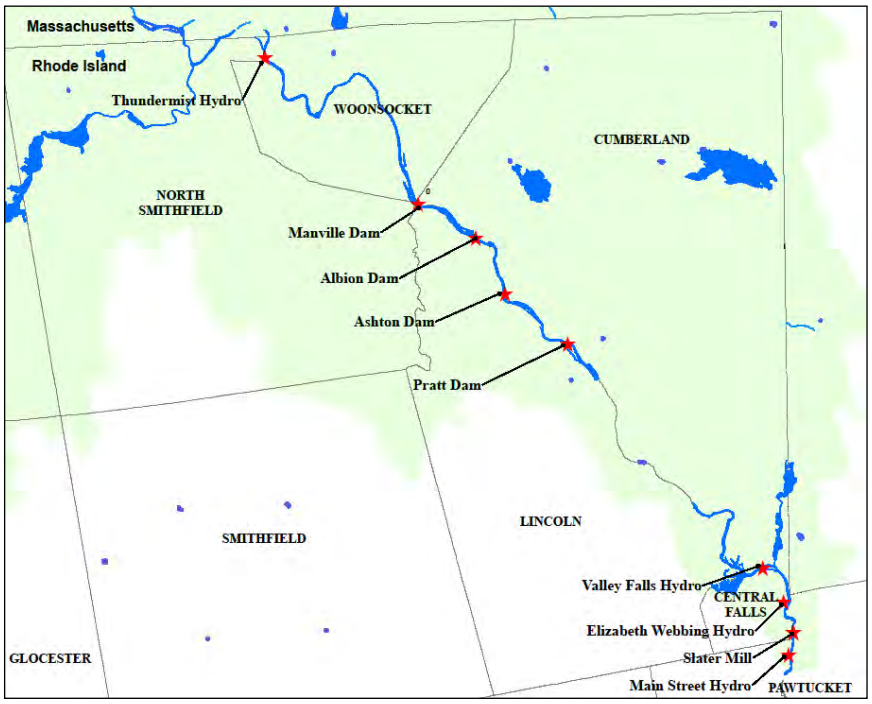
1. All projects assume installation of bulb turbines
2. RI (State) Grants: defined % of Direct Costs
3. Fed Grant: Placeholder for potential future federal incentives
4. ITC (Federal Tax Credit): Energy Investment Tax Credit (ITC) - see 26 USC § 45
5. Energy Rate: assumes pricing for distributed renewable energy
6. DCR: Debt Coverage Ratio. Min & Avg are calculated over 20 years
7. IRR: Internal Rate of Return
8. NPV (Net Present Value): values given represent NPV at end of study period
9. Estimates based on 20 year study period.
10. REC (Renewable Energy Certificate): additional commodity value for energy derived from qualified renewable sources
11. % Debt was calculated to create a minumum DCR of 1.50 without exceeding 100%
12. Elizabeth Webbing performance assumes:
    a) Existing license can be preserved
    B) Includes provisions for re-licensing in Years 8-13 ($225k)
    c) Performance based on historic production records

APPENDIX 3

Dam Inspection Report

Blackstone River Watershed, Rhode Island
Hydropower Feasibility Study-Phase I

Preliminary Inspection of Existing Dams



The Essex Partnership LLC
Newport, Rhode Island

June 2010

MBP Consulting
planning & engineering

Blackstone River Watershed, Rhode Island
Hydropower Feasibility Study – Phase I

Preliminary Inspection of Existing Dams

Prepared for:

The Essex Partnership LLC
Newport, Rhode Island

Prepared by:

MBP Consulting
Portland, Maine

June 2010

TABLE OF CONTENTS

1.0 SUMMARY

Visual inspection of Manville, Albion, Ashton, and Pratt dams located on the Blackstone River, Rhode Island was performed on April 26, 2010 to evaluate their condition in relation to potential hydropower development and public safety. The inspection was conducted by MBP Consulting (MBPC), Portland, Maine acting as a subcontractor to the Essex Partnership LLC, (Essex), Newport, Rhode Island. All inspected dams are classified by the State as small size structures with significant hazard potential.

The preliminary results indicate that all dams, inspected under overflow condition (except Pratt Dam which was in non-overflow condition), appear to be safe and suitable for reliable operation. There are no major structural, maintenance or operational deficiencies in the dam projects requiring immediate remedial actions. No significant changes in dam condition since the 1999 inspection conducted by the Rhode Island Department of Environmental Management (RIDEM) were found. All inspected dams appear to have performed adequately during the historic March 2010 flood event.

Results suggest that all of the dams would likely be subject to Part 12 compliance if they were to be redeveloped for hydropower under a Federal Energy Regulatory Commission (FERC) license. More detailed analyses would have to be performed to determine if remedial measures would be required to meet FERC safety criteria.

Based on the inspection findings, major recommendations pertaining to public safety include reactivation of abandoned low level outlet structures at Albion and Ashton Dams, reinstallation of an access walkway to the outlet structure at Ashton Dam, reinstallation of flashboards or stoplogs on the crest of the auxiliary spillway at Ashton Dam, and replacement of missing or deteriorated sections of the caplog on the spillway crest of Manville Dam.

Recommendations related to operation and maintenance items typical for each dam include brush and tree removal, removal of river deposits from spillway or outlet discharge channels, and repointing of joints in stone masonry structures.

It is also recommended that the dams be re-inspected during a low flow period to observe the crest, downstream face, and toe of water retaining structures for signs of deterioration, structural distress, and undermining.

The report includes an opinion of construction cost for recommended remedial measures (Section 6) and comparison of dam safety regulations adopted by the RIDEM and Federal Energy Regulatory Commission (FERC) (Section 7).

2.0 INTRODUCTION

A brief inspection of four dams on the Blackstone River Watershed, Rhode Island was conducted by MBPC on April 26, 2010 to assess the adequacy of existing water retaining structures and identify any deficiencies which could affect their potential for hydropower development, operation, integrity, and public safety. The inspections were performed as a part of a screening level hydropower feasibility study undertaking by the Conservation Law Foundation and other project partners under grant assistance from the Rhode Island Renewable Energy Fund.

The Blackstone River Watershed includes the Blackstone River Valley National Heritage Corridor established by Congress in 1986 for the purpose of preserving the historic and cultural lands, waterways, and structures within the Valley - the birthplace of the American Industrial Revolution - where water power has historically played a central role in the economic development of the region. The Valley also contains remarkable natural stretches and scenic areas for recreational opportunities.

The four dams selected for the hydropower feasibility study and subjects of this inspection include Manville Dam, Albion Dam, Ashton Dam, and Pratt Dam. A map of the Blackstone River Watershed showing location of the dams is included in Figure 1.

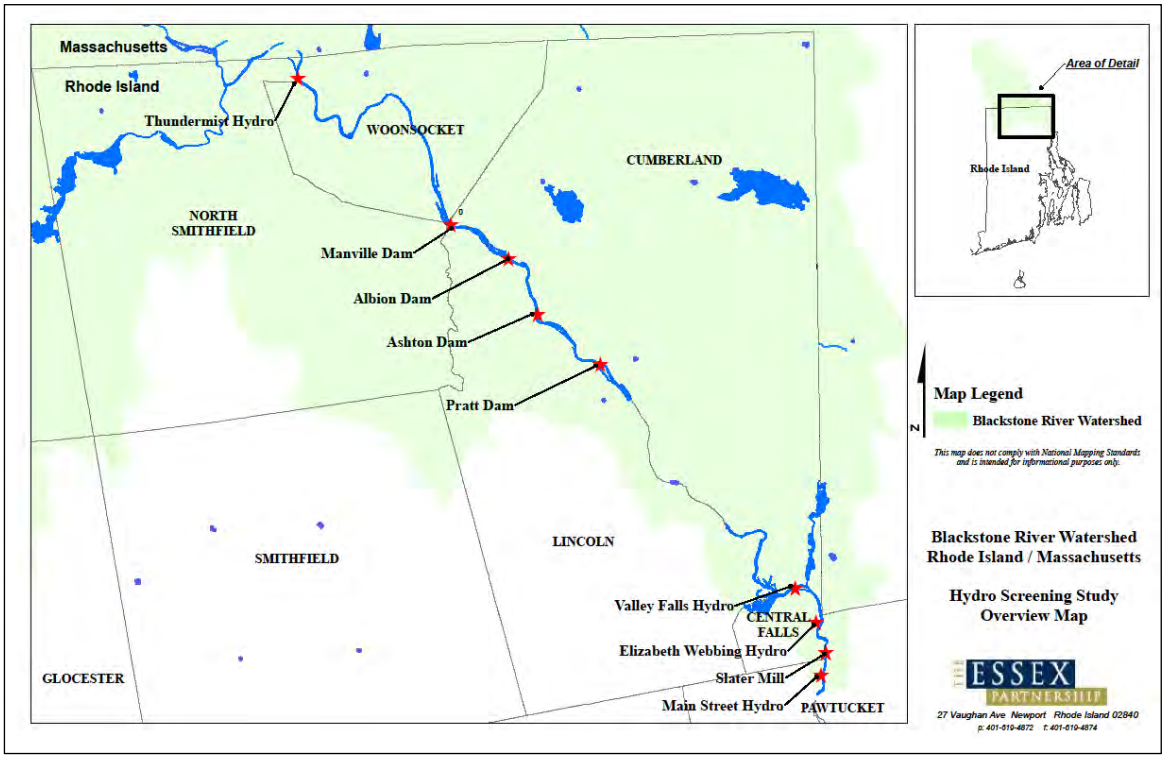


Figure 1. Blackstone River Watershed. Location of Manville, Albion, Ashton and Pratt Dams.

3.0 INSPECTION

Prior to site visits, available data including the RIDEM and National Inventory of Dams (NID) records, aerial maps, historic photographs, previous FERC preliminary permits for proposed hydropower development, and other pertinent information were reviewed and customized checklists for each dam were developed.

The inspection included visual observation of the dams from both abutments for signs of misalignment, movement, settlement, sinkholes, cavities, cracking, leakage or seepage, excessive deterioration, erosion, scouring, undermining, and vegetation growth. Pond water level control equipment, such as gates, stoplogs, flashboards, were observed for serviceability and access. A photo record was made at each dam site to document findings and for later reference.

Prior to the inspection, a record flood occurred in the State on March 31, 2010 resulting in widespread damage. Therefore, in addition to regular dam safety items to observe, the inspection also included interview with available dam owners to collect information on dam performance during the flood, flood damage, and high water marks.

The RIDEM inspection sketches showing a plan view of the site, if available, were used as a reference for quick identification and orientation of the project facilities during site visits. If not available, the site sketches were developed for the purpose of project description. The spillway crest shape and width and pond condition immediately upstream of the dam (sediment, siltation, old timbercribs) were observed. A maximum, non-overtopping spillway head (freeboard) was measured from the top of abutment walls. Where available, inspection observations were compared with the findings from the previous inspections conducted by RIDEM in 1999 which served as a baseline for comparison and identification of any abnormal trends or unusual changes in behavior of water retaining structures. Representative photographs showing the condition of dams at the time of the inspection are included in Appendix A. The inspection was performed by Myron Petrovsky of MBPC assisted by Jon Petrillo of Essex.

The following is a description of, and inspection findings for, each dam site arranged in order from the upstream to downstream reaches of the river. All general project data used in description of dam, such as length, height, reservoir area and storage, year of completion, were adopted from the State and NID records.

3.1 Manville Dam

3.1.1 Description

The Manville Dam (State No. 59, National No. RI00809) is located on the Blackstone River, in the Towns Lincoln and Cumberland, Providence County, Rhode Island. The dam consists of an overflow spillway confined between retaining walls at each abutment. The spillway is of stone masonry construction, curved in plan, 160 feet long with hydraulic height[1] of 19 feet and structural height[2] of 22 feet. The spillway crest contains a wooden sill (caplog) to raise the pond level. In the past, the left[3] dam abutment contained a gate control structure and headrace to convey the pond water to the nearby mill for hydropower generation. These water conveying facilities were abandoned in the middle of the last century. A sketch from the RIDEM inspection report depicting a plan view of the dam is included in Figure 2.

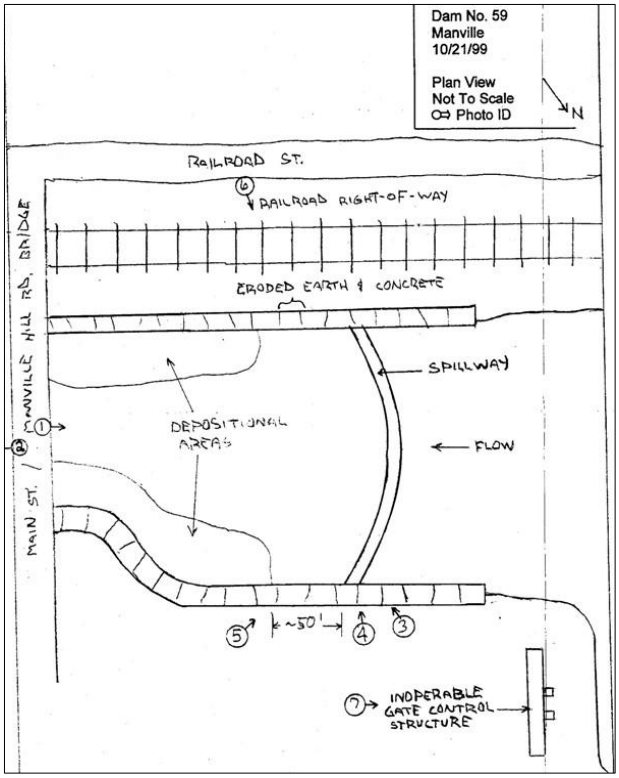


Figure 2. Plan View of Manville Dam

The dam was built circa 1860, has reservoir storage and surface area of 349 acre-feet and 58 acres, respectively, and provides recreational opportunities and wildlife refuge along its shores. The dam is classified by the State as a small size structure with significant hazard potential[4].

The dam was previously inspected by RIDEM in September 10, 1991 and October 21, 1999. Both inspections rated the dam to be in fair condition. The inspection findings included missing sections of the spillway crest caplog, vegetation growth on the abutment walls, and debris accumulation in the spillway discharge channel.

3.1.2 Site Visit

The dam site visit was conducted on April 26, 2010. The weather was mostly cloudy with ambient temperature around 60° F. During the time of the inspection, the spillway was discharging approximately 8 inches of flow impeding a thorough inspection of the spillway face and toe (Photos 1, 2). The maximum spillway freeboard measured at the left abutment wall was 6.1 feet.

[1] Hydraulic height is a dam height above the original streambed.
[2] Structural height is a dam height above the excavated foundation level.
[3] The terms "left" and "right" refer to an orientation looking in the downstream direction.
[4] Failure of dams with significant hazard potential classification can result in no probable loss of human life but can cause economic loss, environmental damage, and disruption of lifeline facilities.

The spillway appeared to be true to the original alignment. No visible signs of movement, sagging, or large areas with missing masonry were observed through a moving sheet of water. The spillway crest formed by cut stone blocks appeared to be intact when observed from the dam abutments. The flow over the crest was uneven apparently caused by gaps in the crest caplog. At least four sections of caplog, comprising about 40 percent of the spillway length, were missing (Photos 1, 2). The condition of the toe of the dam was not possible to assess due to inundation. A rocky outcrop was observed on the right side of the river channel about 50 feet downstream of the spillway suggesting that the dam was founded on bedrock. Further downstream, the river channel on both sides was narrowed by deposition fill of sand, gravel, and rounded stone. These areas were vegetated with brush and trees. No ashlar stone, which was likely used for construction of the dam, was observed in the depositional areas.

The left and right spillway abutment walls, approximately 4.5 feet wide at the top, were made of mortared cut granite blocks. The walls appeared plumb, stable and showed no signs of budging outward, separation from backfill, or seepage related to the pond water (Photos 1, 2). Some mortar on vertical wall surfaces was missing exposing open masonry joints. A moderate amount of brush was growing on the retaining walls extending upstream and downstream of the spillway.

The gate control structure and headrace which previously supported hydropower generation in the left bank abutting the spillway were filled with soil and dirt. Remnants of the abandoned headworks (Photo 3) near the pond and headrace stone arched tunnels located about 200 feet further downstream were visible. The area surface was uneven but appeared firm and contained no depressions or sinkholes which could be associated with seepage and piping around the dam. We understand that this area is in the process of being developed for public recreation.

3.2 Albion Dam

3.2.1 Description

The Albion Dam (State No. 60, National No. RI00808) is located on the Blackstone River, in the Towns Lincoln and Cumberland, Providence County, Rhode Island. The 400-foot long dam was completed in 1850 and consists of an overflow spillway and gate control structure. Figure 3 includes a sketch showing a plan view of the dam taken from the RIDEM inspection files.

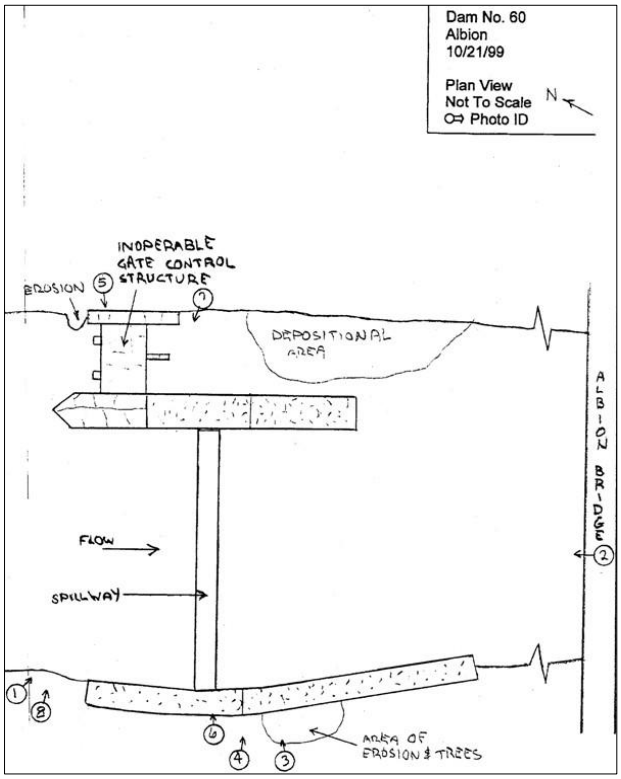


Figure 3. Plan View of Albion Dam

The spillway is 300 feet long with hydraulic height of 12 feet, structural height of 21 feet and extends from the right abutment wall spanning a major part of the river channel. The gate structure adjacent to the left abutment contains two gated openings. A massive training wall separates both water retaining structures. All project facilities were originally constructed of stone masonry.

The dam reservoir is used for recreation and has storage and surface area of 347 acre-feet and 18 acres, respectively. The dam is classified by the State as a small size structure with significant hazard potential.

The dam was last inspected by RIDEM on October 21, 1999. At that time, the spillway and gated outlet were rated to be in fair and poor condition, respectively. The major inspection findings included vegetation growth at the right spillway abutment wall, inoperable outlet gates, leakage in the left gate opening, and debris in the outlet discharge channel.

3.2.2 Site Visit

The dam site visit was conducted on April 26, 2010. The weather was mostly cloudy with ambient temperature around 60° F. During the time of the inspection, the pond level was about 11 inches above the spillway crest impeding the inspection. The maximum spillway freeboard measured at the right abutment wall was about 9 feet.

The spillway appeared to be true to the original alignment. The sheet of water flowing over the crest and downstream face was generally uniform (Photos 4, 5). No visible signs of dam movement or areas with missing masonry were observed through moving water. The spillway crest formed by cut stone blocks appeared to be intact when observed from the abutting walls. The downstream spillway face constructed in a stair-stepped fashion was visible near the right

abutment. The spillway flow at the toe of the left section was gradual and smooth likely due to the presence of an apron (Photo 4). The estimated length and width of the apron were approximately 50 feet and 15 feet, respectively. The pond was clear of debris. Remnants of an old timbercrib dam, about 30 feet wide, were observed below the water surface immediately upstream of the structure.

The right spillway abutment wall, 3.5 feet wide at the top, was made of cut granite blocks and covered with concrete for most of its length. The wall appeared stable and in reasonable condition. The concrete top of the downstream wall section was deteriorated exposing course aggregate. The upstream wall section where a concrete cover was not installed showed presence of voids above the pond waterline (Photo 5). The right, relatively low lying river bank downstream of the wall was protected with dry stone masonry. The downstream end of the protective cover was falling apart likely the result of high river flows and root penetration from nearby large trees (Photo 6). No signs of seepage from the pond bypassing the right abutment wall were found.

The left spillway wall bordering the outlet structure was built of mortared stone masonry. Central and downstream sections of the wall were later encased with concrete (Photo 5). The 10 feet-wide wall appeared stable. The concrete cover was significantly weathered resulting in rounded wall edges. The concrete erosion was surficial and no stone masonry was exposed. The top of the wall appeared to be about 2 feet below the top of the right abutment wall.

The low level outlet structure was in poor condition. The outlet timber gates were permanently lowered, gate operators removed, and openings sealed with concrete on the downstream side. The top of the gates and gate stems were visible. The gate operating deck was composed of 18 inch-thick stone blocks spanning two 8.5 feet square gate openings (Photo 7). The deck, about 4 feet wide by 25 feet long, was supported by stone walls and a stone central pier. The left outlet abutment wall had some stone missing at the downstream end but the deck appeared to be stable, with no signs of movement or sagging. Small saplings were growing in the deck joints and upstream at the gate area. Both gate openings were leaking from the left top corner of the concrete enclosure with an estimated flow of 1-2 cfs (cubic feet per second) at the left opening and 50 gpm (gallons per minute) at the right opening (Photo 8). The concrete enclosure was weathered exposing large aggregate but showed no signs of cracking or spalling. The outlet discharge channel contained a significant amount of debris composed of gravel, cobbles, and boulders overgrown with brush and large trees (Photo 9). This accumulated debris can reduce the discharge channel capacity if the outlet was in operation. The left, steep river bank abutting the outlet structure contained numerous rock outcrops with some loose stones. It is plausible that the stone fill in the discharge channel had partially come from the left bank.

3.3 Ashton Dam

3.3.1 Description

The Ashton Dam (State No. 61, National No. RI00807) is located on the Blackstone River, in the Towns Lincoln and Cumberland, Providence County, Rhode Island. The 400-foot long dam, completed in 1885, consists of a main overflow spillway, outlet structure, and auxiliary spillway. All water retaining structures are built of mortared ashlar masonry including abutting retaining walls. The project also includes a barge canal on the right river bank with an entrance about 100 feet upstream of the main spillway. Figure 4 shows a plan of the dam which is referenced in the application for FERC preliminary permit dated February 4, 1982.

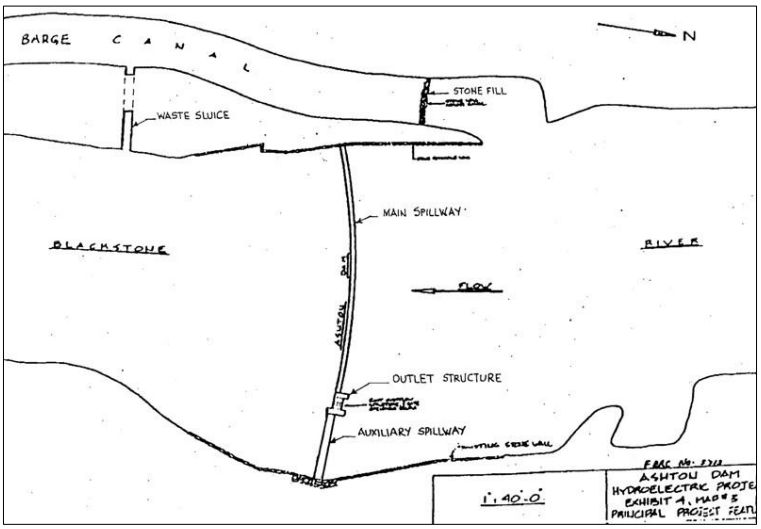


Figure 4. Plan View of Ashton Dam.

The main spillway is a 250 feet-long curved gravity structure with hydraulic height of 10 feet, structural height of 20 feet spanning a major part of the river channel between the right abutment and outlet structure. The outlet structure located between main and auxiliary spillways contains two gated openings. The auxiliary spillway is an overflow weir abutting the left river bank. The barge canal is sealed at the inlet with a rockfill barrier and contains a waste sluice to discharge excess flow back into the river.

The dam reservoir with storage and surface area of 200 acre-feet and 35 acres, respectively, is used for recreation. The dam is classified by the State as a small size structure with significant hazard potential.

3.3.2 Site Visit

The site visit to observe the dam and appurtenances was conducted on April 26, 2010. Representatives from the Town of Lincoln, Messrs. Al Ranaldi, Mike Gagnon, and Ray Gendron, were present at the beginning of the inspection. The weather was mostly cloudy with ambient temperature around 60° F. During the time of the inspection, the pond level was about 2-3 inches above the main spillway crest impeding the inspection. The maximum spillway freeboard measured at the right abutment wall was about 8.5 feet.

The main spillway appeared to be true to the original alignment. A pattern of water flowing over the crest and downstream face was generally uniform (Photos 10, 11). The spillway crest was about 3.5 feet wide pitching approximately 4H:1V (horizontal to vertical) upward in a

downstream direction. The stone blocks forming the crest appeared to be in place. The downstream face was close to vertical which corroborates closely with photos taken in 1980 when the dam was exposed. About six stone tiers were visible on the downstream face through moving water and appeared to be intact. According to the owner's personnel present at the site, the downstream spillway face, when exposed, contained no loose or missing stone and no significant seepage when last observed.

The auxiliary spillway crest was estimated to be about 2 feet below the crest of the main spillway resulting in 2.5 feet deep overflow concealing the structure (Photos 11, 12). The spillway flow pattern was uniform indicating no significant change in the original alignment of the structure. The vertical walls at each spillway end contained steel slots apparently intended for installation of flashboards or stoplogs which were likely used for limited control of the pond.

The outlet structure was abandoned with both gates permanently lowered and an access walkway removed. The structure was in fair condition and showed no visible weathering or structural offsets in the masonry (Photo 12). The hoists and gate stems were visible on the top of the outlet. Both outlet openings, each estimated 3.5 wide by 7 feet high, exhibited moderate leakage.

The dam abutment walls made of mortared cut stone and extending about 30 feet downstream of the main and auxiliary spillways appeared stable and intact. Some brush and few saplings were observed growing on vertical surfaces. Further downstream, the walls were made of dry, irregular stone and were apparently installed for river bank slope protection. The downstream end of these walls contained loose and missing stone exposing eroded bank areas (Photos 13, 14).

The barge canal, lined with cut granite, was in fair condition. The canal inlet located about 100 feet upstream of the dam appeared to be deteriorating on both sides and was overgrown with vegetation. The canal near the dam was sealed with up to 2 to 4 feet size stone fill apparently to limit the inflow from the reservoir (Photo 15). The stone fill was loose and discharging a moderate amount of leakage. A steep rock slope rising at the area of the rockfill barrier appeared stable. The waste sluice, laid with cut stone, contained recently installed wooden stoplogs.

3.4 Pratt Dam

3.4.1 Description

The Pratt Dam (State No. 62, National No. RI01705) is located on the Blackstone River, in the Towns Lincoln and Cumberland, Providence County, Rhode Island. The dam, completed in 1893, consists of an overflow spillway and outlet structure. All water retaining structures were built of mortared ashlar masonry. Figure 5 shows a plan of the dam referenced in the RIDEM inspection report dated October 21, 1999.

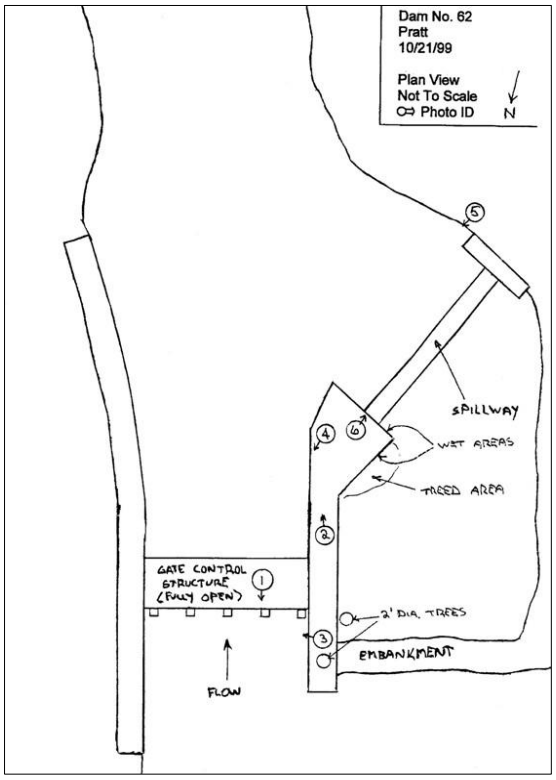


Figure 5. Plan View of Pratt Dam

The 10 feet-high spillway is 324 feet wide and contains 5 bays separated by masonry piers. The piers provided support for an old railroad steel bridge. The piers are now used for a pedestrian bridge that is a part of the watershed trail system. The outlet structure includes 5 arched openings, each about 9 feet high, 7.5 feet wide. The spillway is not currently impounding water due to placement of an earthen dike upstream diverting the river flows through the ungated openings of the outlet structure. The 1999 RIDEM inspection found the spillway and outlet structure in fair condition.

The historic dam reservoir had a storage of 393 acre-feet. The dam is classified by the State as a small size structure with significant hazard potential.

3.4.2 Site Visit

The site visit to observe the dam and appurtenances was conducted on April 26, 2010. The weather was mostly cloudy with ambient temperature around 50° F. During the time of the inspection, all 5 bays of the outlet structure were open and discharging all river flows.

No significant change in dam condition since the 1999 inspection conducted by the RIDEM was observed. The spillway being dewatered permitted a thorough visual inspection. The structure appeared intact and sound (Photo 16). There was accumulation of silt in the dewatered section of the impoundment behind the spillway (Photo 17). The earthen river diversion dike was overgrown and eroded with about the top 2 feet above the river waterline. It appeared that the dike was overtopped during the March 2010 storm causing water to be impounded behind the spillway. No structural distress or significant masonry deterioration was observed in the outlet structure. The outlet openings with gates removed were clear of debris and operational (Photo 18).

4.0 CONCLUSIONS

Based on review of project information and observations made during the April 26, 2010 dam site visits, the inspected dams appear to be safe and suitable for reliable operation after over 100 years in existence. There are no major structural, maintenance or operational deficiencies in the dam projects requiring immediate remedial actions. All water retaining facilities inspected are gravity structures built of stone masonry, which, with proper maintenance, can continue to provide sufficient resistance against erosion, seepage, and impact of water flows, ice and floating debris in the long term. No significant changes in dam condition inspected by RIDEM in October 1999 were found. All inspected dams performed well during the recent, March 2010 historic flood.

Because all four dams are currently classified as "significant" hazard potential dams by the State, it is likely that they would be subject to Part 12 regulations under the Federal Power Act if they were to be licensed for hydropower by the Federal Energy Regulatory Commission (FERC). These requirements would include development of an Emergency Action Plan (EAP) and a formal FERC dam safety inspection every 5 years. Depending on the results of the formal Part 12 evaluation (generally conducted by a FERC approved independent consultant after a license or exemption is issued), specific remedial measures could be required to meet FERC dam safety criteria.

4.1 Manville Dam

- The dam observed with water flowing over the spillway appeared true to the original alignment and stable.
- The spillway crest flow was irregular due to the missing sections of the wooden crest caplog comprising about 40 percent of the crest length. The irregular flow pattern may cause additional water turbulence and increase erosive impact of the falling water jet at the toe. The gaps in the caplog may also result in premature lowering of the pond level and reduction in overall hydraulic head during the periods of low flow.
- The Manville spillway with a vertical downstream face provides a minimal energy dissipation of the overflow, thus, increasing the potential of toe scour and base undermining.
- The dam is likely founded on bedrock which was observed on the right side of the downstream river channel. The rock foundation can provide additional stability to the dam against sliding and erosion resistance to the overflow impact.
- The alluvial, heavily vegetated deposits formed on both sides of the spillway discharge channel and located in close proximity to the dam may reduce the river flow evacuation capacity and raise the tailwater, therefore, decreasing a hydraulic head particularly during periods of high flow.
- Brush, trees, open joints and voids in stone masonry of the retaining walls, if not controlled, can reduce the life of the facilities and increase maintenance cost in the future.

4.2 Albion Dam

- The spillway discharging about 11 inch-deep flow at the time of the inspection appeared in good alignment and stable. The stair-stepped downstream face of the structure was providing overflow energy reduction, thus, mitigating the impact of water jet impingement at the toe.
- The left spillway section appeared to include an apron at the toe which was probably installed to protect the structure against undermining.
- The old timbercrib dam observed in the pond immediately upstream of the spillway can reduce a hydraulic capacity of the facility.
- The abandoned outlet structure located at the left dam abutment was in poor but stable condition. Two outlet openings permanently sealed with concrete were leaking. The continuing leakage may cause the concrete seal to deteriorate and fail. The outlet deck and walls were overgrown with brush and small trees which over time will weaken the masonry.
- The steep left abutment slope at the outlet contained numerous blocky rocks which appeared to be loose and may create a rock slide a hazard. The deposition area formed in the outlet discharge channel may be partially formed with rocks falling from this slope. The rock slope was overgrown with brush and large trees obstructing observation.
- The retaining wall at the right dam abutment contained voids in the upstream section not overlaid with protective concrete. The dry masonry cover protecting the right river bank had partially failed at the downstream end. This area is located relatively far from the dam and presents no immediate safety concern.

4.3 Ashton Dam

- The main spillway observed with 3 inch-deep overflow appeared well aligned and stable. No missing stones or seepage were reportedly observed by the owner during recent exposure of the downstream spillway face.
- The auxiliary spillway observed with 2.5 feet-deep overtopping flow appeared to be in operational condition. There are indications that the spillway was equipped in the past with about 2 foot-high flashboards or stoplogs to partially control the pond level. The auxiliary spillway is reported to operate year-round including the low flow periods when the pond drops at or below the main spillway crest elevation.
- The abandoned 2-gate outlet structure appeared to be in fair and stable condition. Leakage observed in the gate openings could be the result of deterioration of the gates or sealing barriers.
- The dam retaining walls abutting both river banks appeared solid, stable, and watertight. The wall surfaces included a number of open masonry joints with missing mortar and were moderately vegetated. The river banks protected with dry masonry downstream of the walls contained areas with erosion where the masonry failed. These erosion areas are located relatively distant from the dam and present no immediate safety concern.
- The barge canal appeared to be in reasonable condition for its age. The shallow flow in the canal was due to leakage through the loose rockfill barrier installed at the head of the structure. No signs of seepage from the canal into the river were observed. The steep and high rock outcrop near the canal barrier may endanger the right dam abutment if slid.

However, the exposed rock surfaces appeared stable, dry, and had no significant vegetation.

4.4 Pratt Dam

- The spillway did not impound any water due to placement of an earthen diversion dike upstream redirecting river flows toward the outlet structure.
- The exposed overflow masonry spillway with silted, dry impoundment behind was in good order.
- The outlet structure discharging the river flow (with gates removed) appeared stable and operational.

5.0 RECOMMENDATIONS

The following measures are recommended to improve safety of the dams and prolong their useful life. These proposed measures include structural improvements to the dams and operation and maintenance (O&M) items.

The structural remedial measures, which require an assistance of an engineer and/or a general contractor, are specific for each dam, need obtaining the State permits, and usually involve a considerable cost to a dam owner. The examples of structural remedial measures may include:

- Restoration of an inoperable or abandoned low level outlet which would involve cofferdamming, concrete replacement, and installation of new guide slots, gate(s), and an access walkway.
- Replacement of missing or deteriorated sections of the spillway crest caplog which would involve cofferdamming, crest adjustment, and anchoring work.
- Installation of spillway crest flashboards which would involve cofferdamming, crest restoration, drilling work, and furnishing of flashboards and operating deck/walkway.

The O&M items are applied to all dams and should be performed regularly to retain, extend, or restore their safe and functioning condition. The O&M activities are typically include:

- Removal of trees, brush, and woody growth from earthen embankments, concrete and stone masonry structures such as spillways, outlets, nonoverflows, and retaining/training walls, abutments, and approach and discharge channels.
- Removal of debris from reservoir, spillway crest, outlet works, and discharge channel.
- Mowing high grass, reseeding bare areas, and filling burrow holes and sinkholes in earthen dikes and embankments.
- Upkeep of erosion protection measures such as restoration of missing or displaced riprap, eroded slopes to grade, or stone walls protecting banks at a dam.
- Repointing areas of stone masonry with missing mortar.
- Reinforcing loose or replacing missing stone in masonry works.
- Resurfacing deteriorated concrete structures.

5.1 Manville Dam

1. Restore the sections with the missing and deteriorated timber caplog on the spillway crest.
2. Remove the downstream, vegetated river deposits located in close proximity to the dam.
3. Remove vegetation and repoint open joints and voids in masonry retaining walls.
4. Inspect the crest, downstream face and toe of the spillway during a low flow period for signs of offsets, leakage, undermining, and structural distress. Provide a bathymetric and/or dive survey of the submerged toe as required.

5.2 Albion Dam

1. Restore operation of the abandoned outlet structure including installation of new gates.
2. Remove the downstream vegetation and river deposits from the outlet discharge channel.

3. Cut and remove brush and trees from the left abutment adjacent to the outlet structure. Loose rock fragments on the steep abutment slope should be removed or stabilized.
4. Repoint open joints and voids in the right abutment masonry wall and cut and remove brush and trees adjacent to the wall.
5. Inspect the crest, downstream face and toe of the spillway during a low flow period for signs of offsets, leakage, undermining, and structural distress. Conduct a bathymetric and/or underwater survey of the submerged areas of the toe as required.
6. Visually monitor the eroded stone armoring cover on the river bank downstream of the right abutment retaining wall for change in condition and stabilize it as necessary.

5.3 Ashton Dam

1. Restore operation of the abandoned outlet structure including reinstallation of an access walkway and potentially new gates.
2. Reinstall flashboards or stoplogs on the crest of the auxiliary spillway. The top of the flashboards/stoplogs should match the crest elevation of the main spillway.
3. Repoint open joints and voids in the right and left abutment masonry walls and cut and remove brush and trees adjacent to the walls.
4. Inspect the crest, downstream face and toe of the main spillway, outlet structure and auxiliary spillway during a low flow period for signs of offsets, leakage, undermining, and structural distress. Conduct a bathymetric and/or underwater survey of the submerged areas of the toe as required.
5. Visually monitor the erosion areas on the right and left river banks downstream of the abutment retaining walls for change in condition and provide stabilization as necessary.
6. Visually monitor the steep slope of rock outcrop at the barge canal stone barrier for signs of instability.

5.4 Pratt Dam

- None

6.0 OPINION OF CONSTRUCTION COST OF REMEDIAL MEASURES

The opinion of remedial cost for each dam is based on: the inspection findings, recommendations as presented in Section 5 of this report, limited dimensions and survey information, and our experience with similar repair projects. The remedial measures considered include items which are related directly to dam safety. Other project deficiencies like brush and tree removal, removal of alluvial deposits from discharge channels, masonry repointing, or restoration of deteriorated concrete surfaces were considered to be maintenance items and were not included in the cost estimate.

6.1 Manville Dam

- Replace deteriorated and missing sections of spillway crest caplog $10,000

6.2 Albion Dam

- Restore operation of the abandoned low level outlet structure. This item would include removal of existing timber gates and concrete enclosure from the outlet openings and installation of two stainless steel slide gates with gate operators $80,000

6.3 Ashton Dam

- Restore operation of the abandoned low level outlet structure. This item would include removal of existing gates and installation of two stainless steel slide gates with gate operators $70,000
- Reinstall a walkway to access the outlet gates $30,000
- Reinstall flashboards/stoplogs on the auxiliary spillway crest $10,000

TOTAL $110,000

6.4 Pratt Dam

- None

6.5 Reclassification

Owners have the option of submitting a request to the state or FERC to lower the hazard classification of their dam. Lowering the hazard classification usually reduce the safety factors and reporting requirements for the dam; and in some instances exempt the dam from significant safety reporting requirements. Requests for reclassification typically involve detailed evaluations including breach analyses and inundation studies to assess the hazard potential. Based on recent experience with similar projects the cost of these studies can range from $20,000 to $40,000.

7.0 COMPARISON OF RIDEM AND FERC DAM SAFETY REGULATIONS

A brief comparison was made between the RIDEM and FERC dam safety regulations based on RIDEM Rules and Regulations for Dam Safety adopted in December 2007 and FERC Engineering Guidelines for Evaluation of Hydropower Projects (2003) and Operating Manual for Inspection of Projects and Supervision of Licenses for Water Power Projects.

Hazard Classification. Both agencies use high, significant, and low hazard potential classification for dams based on the guidelines established by the U.S. Army Corps of Engineers for the National Program for the Inspection of Non-Federal Dams in 1976. The hazard dam rating in Rhode Island is established based on dam size (small, intermediate, high) and evaluation of downstream population and major infrastructure at risk. The FERC approach to dam hazard is based on hydrologic analysis of watershed and incremental impact of downstream flooding with no-failure and failure of the dam.

Spillway Design Flood. There are apparently no State regulations for the spillway design flood (SDF) to be used for different dam hazard ratings. FERC requires that the probable maximum flood (PDF) and the inflow design flood (IDF) for the dam to be determined. The IDF for the project is defined as the flood, up to the PMF, when combined with a dam failure will cause no significant incremental impact to downstream areas.

Stability Analysis. There are no State regulations for stability of dams. FERC requires that dams with high and significant hazard potential be analyzed for stability for at least four different loading cases. FERC requires different safety factors for each loading case depending upon the dam hazard potential classification

Emergency Action Plan (EAP). The State has apparently no EAP regulations. FERC requires that EAP be developed for dams with high and significant hazard potential.

Inspection Frequency. The State requires that high hazard dams to be inspected every 2 years and significant and low hazard dams every 5 years. FERC mandates that dams with high and significant hazard potential be inspected by a FERC approved independent consultant every 5 years and all dams by a FERC engineer annually.

As described above, the differences in the State and FERC dam regulations are significant. An owner of a dam considering an engagement into the service for hydropower is obliged to comply with a certain set of rules and requirements which may involve a considerable financial burden, risk, and responsibilities to maintain the dam in operational and safe condition. The uncertainties, which may carry out a potential risk to the owner, are primarily associated with the condition of an existing dam. During the permitting process or immediately after obtaining the permit for hydropower development at the site, an owner would be required to bring the dam in compliance with FERC regulations for stability and spillway adequacy. The following study and rehabilitation work would require a significant investment making potentially the benefits of hydropower generation are marginal. Considering this, better understanding of the condition of an existing dam prior to involvement into hydropower feasibility study and permitting process would reduce the uncertainty and associated risk to the owner.

Appendix A

Inspection Photographs

Photo 1. Manville Dam. Spillway view from left abutment. Note spillway crest areas with missing caplog (arrows) and brush on right abutment masonry wall (4/26/10).

Photo 2. Manville Dam. Spillway view from right abutment. Note spillway crest areas with missing caplog (arrows) and brush on left abutment masonry wall (4/26/10)

Photo 3. Manville Dam. Upstream view of remains of headrace gate control structure. Note downstream area of headrace filled with soil (4/26/10).

Photo 4. Albion Dam.
Spillway and left training wall from right abutment. Note apron at left section of spillway toe (arrow) and wall concrete deterioration. (4/26/10)

Photo 5. Albion Dam.
Spillway and right abutment wall from left training wall. Note voids in right wall above waterline (arrow) and tree growth. (4/26/10)

Photo 6. Albion Dam.
Deterioration of bank protection cover downstream of right spillway abutment wall. (4/26/10)

Photo 7. Albion Dam.
Outlet structure from left abutment. Note vegetation growth on top of structure. (4/26/10)

Photo 8. Albion Dam.
Downstream view of outlet structure. Note leaking concrete barriers in gate openings. (4/26/10)

Photo 9. Albion Dam.
Debris accumulated in outlet discharge channel. (4/26/10)

Photo 10. Ashton Dam.
View of main spillway, outlet structure, auxiliary spillway, and left abutment wall. (4/26/10)

Photo 11. Ashton Dam.
View of auxiliary spillway, outlet structure, main spillway, and right retaining wall from left abutment. (4/26/10)

Photo 12. Ashton Dam.
Close-up of outlet structure, auxiliary spillway, and left abutment wall. (4/26/10)

Photo 13. Ashton Dam. Deterioration of bank protection cover and erosion area downstream of left retaining wall. (4/26/10)

Photo 14. Ashton Dam. Deterioration of bank protection cover and erosion area downstream of right retaining wall. (4/26/10)

Photo 15. Ashton Dam. Upstream view of rockfill barrier at barge canal entrance. Note steep rock slope on right. (4/26/10)

Photo 16. Pratt Dam.
Downstream view of spillway.
(Essex, 4/21/10)

Photo 17. Pratt Dam.
View of empty reservoir with
spillway in background. (4/26/10)

Photo 18. Pratt Dam.
Upstream view of outlet structure.
(Essex, 4/21/10)

APPENDIX 4

Partner Letters, Draft Resolution and Coalition Agreement

TOWN OF LINCOLN
Incorporated 1871
100 Old River Road
P.O. Box 100
Lincoln, Rhode Island 02865

(401) 333-8433

OFFICE OF THE
TOWN PLANNER

October 26, 2009

Jennifer Paolino
Program Manager for the Renewable Energy Fund
RI Economic Development Corporation
315 Iron Horse Way. Suite 101
Providence, RI 02908

Re: CLF/ Cities and Towns Application for Planning Grant to Assess Potential for Hydropower on the Blackstone River

Dear Ms. Paolino –

The Town of Lincoln is pleased to be a part of the coalition that is applying to the Rhode Island Economic Development Corporation for a technical feasibility planning grant to study the potential for generating renewable energy from the Blackstone River for the benefit of its adjacent cities and towns.

We are looking forward to working with the Conservation Law Foundation and its team to explore new models for generating and sharing renewable energy among our partners in this innovative coalition.

The planning grant will allow us to assess our dams and to learn more about this important resource we have in the Blackstone River.

Very truly yours,

Albert V. Ranaldi, Jr.
Town Planner

Cc: Tricia K. Jedele, Conservation Law Foundation

CITY OF PAWTUCKET
RHODE ISLAND

DEPARTMENT OF PLANNING AND REDEVELOPMENT

JAMES E. DOYLE
MAYOR

MICHAEL D. CASSIDY
DIRECTOR

November 19, 2009

Jennifer Paolino
Program Manager
Renewal Energy Fund
RI Economic Development Corporation
315 Iron Horse Way, Suite 101
Providence, RI 02908

SUBJECT: Technical Feasibility Grant from Municipal Hydro Technical Feasibility Study

Dear Ms. Paolino:

I am writing on behalf of the City of Pawtucket in support of the application for funding under the Rhode Island Renewable Energy Fund that was submitted to the Conservation Law Foundation in partnership with the municipalities. The City of Pawtucket is prepared to participate in this project with the Conservation Law Foundation if the funding is made available from RIEDC. The City of Pawtucket is interested in any efforts that can provide alternative energy, particular additional hydropower from the Blackstone River, which might be beneficial, not only Pawtucket, but to other communities in Rhode Island who have access to the water power of the Blackstone River. I am sending this letter on behalf of the Mayor with our wholehearted endorsement of this application for a grant for this study.

Sincerely,

Michael D. Cassidy
Director

MDC:mb

EXECUTIVE CHAMBER, CITY OF PAWTUCKET, RHODE ISLAND

JAMES E. DOYLE
MAYOR

January 28, 2010

Mr. Kenneth Payne
Administrator
RI Office of Energy Resources
One Capital Hill
Providence, RI 02908

Dear Mr. Payne:

The City of Pawtucket supports the application submitted by the Conservation Law Foundation and its partners to the Office of Energy Resources for a Non-Utility Scale Renewable Energy Project of investigating the possibility of restoring existing dams on the Blackstone River for the benefit of adjacent municipalities. This work is an important first step in the broader goal of exploring a potential regional, municipal energy strategy for maximization of benefits from energy efficiency and distributed generation, and that broader goal will also be studied and planned as part of the scope funded by this application.

The City of Pawtucket is a partner participating in this planning work that could ultimately bring many benefits including everything from reduced energy costs and greater energy independence to enhanced dam safety measures and mitigation of the impacts of climate change.

We ask that you please fund this application.

Sincerely,

Mayor James E. Doyle

JED:mb

CITY HALL • PAWTUCKET, RHODE ISLAND 02860
(401) 728-0500 EXT. 281 • FAX (401) 723-8620 • TDD (401) 722-8239

Northern Rhode Island Renewable Energy Collaborative

Memorandum of Understanding

&

Operating Agreement

_____ 2010

THIS MEMORANDUM OF UNDERSTANDING AND OPERATING AGREEMENT ("Agreement") is entered into this ____ day of_____, 2010, by and among The City of Pawtucket, The Town of Cumberland, the Town of Lincoln, and the Town of Glocester, all municipal corporations in the State of Rhode Island (collectively, the "Parties").

RECITALS

WHEREAS, the Parties are all burdened significantly by their energy costs; and

WHEREAS, the Parties share an interest in reducing their energy costs while minimizing any detrimental impacts resulting from their energy use and sourcing decisions, including environmental and climate impacts;

WHEREAS, Rhode Island has adopted a Renewable Portfolio Standard committing our State to generate an increasing amount of electricity from renewable sources and we recognize our important role in making that change;

WHEREAS, our federal and state governments are providing new incentives for the Parties to plan for and implement progressive energy strategies including energy efficiency and more sustainable sourcing; and

WHEREAS, we believe we will be better able to leverage funding, expertise and other resources and to implement effective energy strategies if we do so in collaboration.

AGREEMENT

NOW, THEREFORE, the parties hereto agree as follows:

1. Formation. The Parties agree to form The Northern Rhode Island Renewable Energy Collaborative as a Rhode Island non-profit corporation with the interlocal contracting and joint enterprise powers contemplated in Rhode Island General Laws §45-40.1-4.

2. Purpose. The purpose of the collaborative is to facilitate and enhance energy planning and implementation for all municipalities in northern Rhode Island, particularly the Blackstone Valley region in order to reduce energy-related costs while producing a more sustainable source of energy supply.

3. Board of Directors. The Collaborative will be governed by a board of directors including appointed representatives from each municipality and additional members as those representatives shall deem appropriate.

4. Bylaws. The Board of Directors shall develop and approve by-laws for the management of the Collaborative. The bylaws shall include authorization to exercise the following powers in the furtherance of the Collaborative's purpose:

a) to prepare and update a business plan and a regional clean energy plan for the Collaborative to achieve its purpose;

b) to apply for and hold funding including but not limited to working with our State and federal delegations to garner support for this initiative;

c) to acquire interests in and manage real and personal property, including but not limited to, interests in real estate, property and facilities owned by the State pursuant to Rhode Island General Laws §37-7-9;

d) to plan, budget for and administer energy projects that are eligible for net metering pursuant to Rhode Island General Laws §;

e) to establish a funding formula for capital contributions from the parties;

f) to establish a distribution formula for proceeds and/or benefits from projects funded and managed by the Collaborative (including but not limited to renewable energy credits ("RECs"); net metering; the value of audited savings from the implementation of energy efficiency measures and the value of energy savings realized from new energy sources established by the Collaborative), which formula may or may not be the same or similar to the funding formula;

g) to contract for services including but not limited to a performance contract with an energy service company (ESCO) to conduct comprehensive energy audits and implement recommendations funded through the resulting energy savings;

h) to use a percentage of the proceeds to establish a set aside fund for reinvestment in energy projects or related initiatives approved by the Directors which may include establishment of a revolving loan fund to support projects serving the Collaborative's purpose;

i) to propose State and local laws that help the Collaborative fulfill its purpose including but not limited to amendments to our comprehensive plans and building codes;

j) to become an ICLEI Local Governments for Sustainability Cities for Climate Protection (CCP) member either individually or through the Collaborative;

5. Duration. The Collaborative shall exist perpetually unless otherwise dissolved by the Board of Directors.

6. Termination. Upon termination of the Collaborative any remaining assets of the Collaborative shall be liquidated and the proceeds shall be distributed to the Parties pursuant to the distribution formula.

7. Participant Commitments. In support of the purpose of this Collaborative, the Parties make the following commitments:

a) to authorize the signatories below to execute this Agreement on behalf of each Party;

b) to share historic energy data with the collaborative as well as any previous research or plans regarding energy use and conservation within the municipality;

b) to share information about past, present and future municipal energy procurement commitments and strategies;

c) to provide reasonable staff support to support the purpose of the Collaborative, including but not limited to preparation of documentation for funding applications and facilitating access to property records and other pertinent information;

d) to appoint one representative to actively serve on the Collaborative's Board of Directors with authority to represent the municipality in that capacity.

8. Entire Agreement. This constitutes the entire agreement between the Parties and any amendment to this Agreement must be in writing signed by the Parties.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date first written above.

THE TOWN OF CUMBERLAND:

By:_____

Title:_____

WITNESS: _____

THE TOWN OF GLOCESTER:

By:_____

Title:_____

WITNESS: _____

THE TOWN OF LINCOLN:

By:_____

Title:_____

WITNESS: _____

THE CITY OF PAWTUCKET:

By:_____

Title:_____

WITNESS: _____