Executive Summary

ES-1 Background

The Great Dam is located in the Exeter River at the center of Exeter's business district, just upstream of where the river flows into the tidal Squamscott River. The dam impounds the river about 4.5 miles upstream, including a portion of the Little River.

The dam is a reinforced concrete run-of-river[1] dam consisting of a spillway, a fish ladder including a small lower dam or "weir" structure, a low level outlet and a penstock. The dam is approximately 136 feet long by approximately 16 feet high measured from its highest point to the streambed at its downstream face. The fish ladder was installed by the NH Fish and Game Department in the late 1960's to help restore upstream passage for certain fish that live in the ocean, but swim upstream to freshwater in order to spawn.

The New Hampshire Department of Environmental Services (NHDES) Dam Bureau has identified safety problems with the Great Dam. Most notably, the dam does not meet dam safety regulations which require low-hazard[2] dams to safely withstand a 50-year storm event without overtopping the abutments. The town was notified of these problems in a Letter of Deficiency (LOD) issued by NHDES on July 25, 2000.[3] The NHDES has given the Town deadlines to either modify or remove the dam to meet this legal requirement. The most recent deadline passed on December 31, 2011, but NHDES is aware that the town is in the process of making a decision on how best to address the dam safety issue.

Various alternatives have been considered to solve this safety problem, including the permanent modification of the dam and removing the dam entirely. Previous studies indicate that the Great Dam would require significant modifications to increase its discharge capacity to meet NHDES requirements. The current report is intended to determine the feasibility of removing the Great Dam from the Exeter River and to compare the impacts, benefits and costs of dam removal to other options such as modifying the dam to increase its discharge capacity.

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1 "Run of the river" dams allow all of the natural river flow to pass over the dam in a relatively consistent and steady flow as opposed to other dams which may divert, store, or release water flow for various reasons.

2 "Low hazard is used in the regulatory sense. See NH Administrative Rule Env-Wr 101.07 for the regulatory definition of a "low hazard" structure.

3 The original LOD was amended on June 1, 2004 and March 2, 2009 to allow the Town more time to study potential solutions.

This study will supplement previous studies and is not meant to be the sole piece of information on which to base a final decision. This report is not intended to make a specific recommendation regarding whether the dam should be modified or removed. Rather, the intent of this study is to provide specific information to allow the Town to choose an alternative at a future date.

ES-2 Alternatives Considered

A total of eight alternatives were considered during this study. Three of these alternatives were discarded due to issues related to regulatory, cost or constructability considerations. Five alternatives were brought forward for further analysis including:

- **Alternative A - No Action (Existing Conditions).** Under this scenario, the existing dam and fish ladder would remain as is, with no modifications. However, this alternative was eliminated based on safety and regulatory concerns. Nevertheless, its inclusion in the study provides a baseline against which other alternatives can be evaluated.

- **Alternative B - Dam Removal.** This alternative involves the removal of the entire existing dam structure, including the fish ladder and lower dam, and reshaping of the river channel within the footprint of the existing dam and immediately upstream and downstream. This alternative substantially changes river elevations upstream from the existing dam site and river hydraulics both upriver and at the former dam site.

- **Alternative F - Partial Removal.** Under this alternative, the dam spillway would be permanently lowered by 4 feet. Because this would permanently lower the water level upstream of the dam, the existing fish ladder will no longer work properly. Therefore, this alternative also involves construction of a new fish ladder on the other side of the reconfigured dam.

- **Alternative G - Stabilize in Place.** During this study, it was determined that one potential solution would be to better anchor the existing dam to its underlying bedrock. Engineering calculations indicate that the dam could be made stable even if it is overtopped by a flood. This is a very different approach than trying to increase the hydraulic capacity of the dam. Thus, Alternative G would keep the dam more or less in its current configuration, with no changes to the spillway elevation, abutments or fish ladder. Based on the conceptual design developed as part of this study, ten "post-tension rock anchors" would be installed through the dam to anchor it.[4] While this information has yet to be fully reviewed by the

[4] All of the conceptual designs presented in this report are preliminary and have yet to be fully reviewed by technical staff at the NHDES. They are therefore subject to change during final design.

NH Department of Environmental Services Dam Bureau, preliminary indications are that this alternative meets dam safety rules.

- **Alternative H – Dam Modification – Inflatable Flashboard/Gate System.** This alternative would lower the spillway by 4.5 feet then replace this portion of the spillway with a 4.5 ft tall adjustable flashboard system. The existing low-level gate would be replaced with a 14 ft long by 7 ft tall adjustable gate. The recommended adjustable flashboard and gate would be an "Obermeyer" system, which has been installed on numerous dams around the world and relies on an inflatable bladder to support the flashboard/gate structure. Because the removal of so much concrete from the dam would impact its stability, this alternative also would require installation of 13 rock anchors.[5] The Obermeyer flashboard and gate will have the same crest elevation as the existing dam (i.e., Elev. 22.5 ft) under normal flow conditions, so would therefore maintain the functionality of the fish ladder. However, the flashboard and gate could be lowered in the event of a flood. This alternative would also require the construction of a compressor building adjacent to the dam (presumably in Founders Park) to control the flashboard and gate.

The main difference among the alternatives relates to their potential effects on the size and depth of the dam impoundment. Alternatives B and F would lead to the elimination of the impoundment, whereas Alternative G would maintain the impoundment at its current level. Alternative H would allow the impoundment to be raised and lowered depending on flow conditions.

ES-3 Impacts and Benefits

The safety problems associated with the Great Dam are a significant challenge, and the Town faces an important decision. This study attempts to provide enough information to allow the community to make an informed decision on how to move forward. Below, we summarize the key findings that have developed over the course of the study.

ES-3.1 Changes in Flooding and Hydraulics

There would be no changes in river depths, widths or velocities downstream of the dam under any of the alternatives.

The Great Dam is a "run of the river" dam. The existing dam allows all of the natural river flow to pass over the dam in a relatively consistent and steady flow; it does not

[5] All of the conceptual designs presented in this report are preliminary and therefore subject to change during final design.

divert, store, or release water flow. Therefore, the water levels and velocities downstream of the dam would remain unchanged, except in the immediate vicinity of the dam. Tidal forces within the Squamscott River will continue to exert a much greater influence on the downstream portion of the river than the dam.

Dam Removal and Partial Removal would substantially lower water levels in the river under normal flow conditions.

The removal of Great Dam would lower water levels and river widths substantially near the Great Dam. The changes would be less significant further upstream until they diminish to zero at the limits of the existing impoundment near the Amtrak (Boston & Maine) Railroad Bridge. For example, if the dam were removed or partially removed, the following changes are predicted to occur under the median annual flows:

- **Between the Dam and the Little River Confluence:** Current average depths would decrease from about 5.2 ft to about 2.5 to 2.6 ft and maximum depths of roughly 10 feet would drop to about 5.4 ft. Average river width is predicted to decrease 59 feet from 134 ft to 75 ft for the Dam Removal Alternative to about 100 ft for the Partial Removal Alternative.

- **From the Little River Confluence to NH 108 Bridge:** During the median annual flow, the average depth in this reach is predicted to drop 2.1 ft from about 6.2 ft to about 3.8 ft if Great Dam were removed either fully or partially. River width is predicted to decrease 15 feet from 75 ft to 60 ft wide under typical flows.

- **NH 108 Bridge to Railroad** Bridge**:** In the upper reach of the Great Dam impoundment on the Exeter River, from NH 108 to the impoundment limit, the hydraulic control of the Great Dam steadily diminishes. At the Linden Street Bridge, for example, the river depth would drop about 1.9 ft from 4.2 ft to 2.3 ft. The width of the river would also decrease, from about 40 ft wide to about 28 ft.

- **Little River, Confluence to Impoundment Limit:** The impact of dam removal or dam modification on river hydraulics is not limited to the Exeter River; the Little River reach from its mouth to Linden Street is also predicted to decrease in depth and width.

For flood flows, the Dam Removal, Partial Removal and Dam Modification Alternatives would all have similar effects, reducing the depth of flooding substantially.

While Dam Removal or Partial Removal would generally lower flood depths more than the Dam Modification Alternative, the differences between the two are not very significant. They would both be effective at reducing flood depths, generally by similar amounts.

The Dam Modification Alternative could maintain the river in more or less its current state under normal flow conditions, but allow for management of river levels during floods.

The main feature of the Dam Modification Alternative would be a tall adjustable flashboard/gate system in place of the current static spillway. The system would be upright under normal conditions so that the normal river level is maintained. Under higher flows, the gate could be lowered to allow for higher flows to pass without as much upstream flooding.

The Stabilize in Place Alternative would not mitigate future flooding damage, nor would it improve water quality in the river or provide enhanced fish passage.

Because Alternative G – Stabilize in Place would not change the dam elevations, future flooding conditions would not change. Additionally, water quality in the river would not improve (i.e., improved dissolved oxygen levels, decreased thermal stratification, etc.), as is expected for partial or full dam removal. This alternative also would not provide enhanced fish passage and the associated benefit to habitat in the river.

The modification or removal of the dam is not expected to create hazards due to ice jams.

Ice dynamics can be important for rivers in New Hampshire. However, based on the lack of documented ice jams on the Exeter River and the lack of field evidence of ice jamming in the impoundment, the modification or removal of the Great Dam should have no effect of river ice dynamics.

ES-3.2 Sediment Transport and Potential Erosion

Removal of the Exeter Dam is unlikely to initiate a significant upstream migrating headcut, but could create some erosion of streambanks, as is normal for a free-flowing river.

Assessment of the Exeter River by a river scientist found that removal of the dam would not create a severe erosion feature known as a "headcut," because of the presence of ledge across the channel at the dam. A headcut is a type of erosional feature seen in flowing waters where a deep incision of the streambed forms, lowering the streambed and usually causing the riverbanks to eroded and collapse. However, increased flow velocities are likely to increase channel migration along the meandering channel in the unconfined portion of the impoundment where a wide floodplain is present between the area where the Little River flows into the Exeter and the NH 108 Bridge. With little infrastructure in this marshy area, the increase in channel dynamics that might accompany dam removal or modification would have a positive impact on restoring normal river processes and improving aquatic habitat.

Dam Removal, Partial Removal and Dam Modification would restore sediment transport to the river to normal or near normal conditions.

River velocities would increase significantly near the dam, but that portion of the river bed is formed by bedrock which should be stable. Velocities and shear stress near Gilman Park and in other portions of the river will increase moderately. An engineering model of the river was constructed that suggests that sediment carried from the Exeter/Little River would increase from about 2,000 - 3,000 cubic yards over a five year period to about 10,000 cubic yards over the same period. This could affect ecological or recreational resources downstream, although these impacts would be temporary and are not expected to be very significant.

Testing of the sediment in the Exeter and Little River indicates the presence of some environmental contamination, but not at levels that would cause ecological or health risks.

Samples were taken from a total of six stations up- and downstream of the dam and tested for a wide variety of chemicals. While some chemicals were detected, the levels found do not raise serious issues that would eliminate any of the alternatives from consideration.

ES-3.3 Infrastructure

Bridges, walls and foundations upstream of the Great Bridge and downstream of the dam should not be affected by the Dam Removal or Modification.

Changes in water surface elevations, water depths and water velocities can change scour potential and hydraulic loading conditions and therefore affect the foundations of buildings or other structures. These potential effects on existing infrastructure are reduced upstream of the Great Bridge and considered relatively minor. Additionally, there would be no risk to downstream structures.

Regardless of the alternative chosen, additional investigation is needed to ensure that structures in the immediate vicinity of the dam are properly founded and not damaged.

Some of the structures just above the dam may be adequately anchored to resist the increased loading and scour, while others may not. Further investigation is recommended for the Great Bridge abutments, northeast and southeast wing-walls, and the building foundations for the Loaf and Ladle and 11 Water Street Restaurant. This analysis is recommended for all alternatives. Additional monitoring of exposed foundations may also be necessary after implementation of either alternative.

Surface water intakes may be adversely affected by the Dam Removal, but these impacts could likely be mitigated.

As documented in the Water Supply Alternatives Study (Weston & Sampson, 2010a), after some modifications to the existing river intake, the Town should still be able to utilize the river as a water supply source. However, Phillips Exeter Academy utilizes the river for their steam heating system and irrigation, and their intake appears to be too high to capture river water under normal flow conditions if the dam were to be removed. Similarly, the intake associated with the Exeter Mills Apartments would be impacted by the elimination of the impoundment, as could be fire hydrants at Founder's Park. Because no good plans of the Exeter Mills or hydrants were found during this study, the precise impact cannot be determined. However, it is likely that all three of the impacted systems could be retrofit. Further engineering analysis would be required during final design of the selected alternative. However, the cost of retrofitting these intakes could be very substantial - possibly as costly as the Dam Removal or Partial Removal Alternatives themselves. Further information on costs is provided below. If Dam Removal is the selected alternative, then the timeline of the dam removal will need to be closely coordinated with retrofits of these intakes. The intakes should be addressed prior to the permanent lowering of the impoundment.

Public and private wells are not likely to be impacted.

The Gilman Park Well and the Stadium Well are located on either side of the Exeter River, approximately 500 feet upstream (south) of the confluence of the Exeter River and the Little River. These two wells represent a potential yield of 1.2 million gallon per day. The impact of lowered groundwater levels on the safe yield of these production wells was estimated using the pumping test and river drawdown data. Combined, the two wells are still projected to produce approximately 1.08 million gallons-per-day of safe yield under post-dam removal conditions. Additionally, the only known private water supply wells in the vicinity of the Exeter River are drilled in bedrock. Since these withdrawals are from the deep bedrock aquifer and the river is hydraulically isolated from the bedrock, no impact to private wells is expected as a result of the project. However, as discussed in previous studies sponsored by the Town, there are substantial costs to reactivating these wells.

ES-3.4 Cultural and Social Resources

The Great Dam is a contributing element of Exeter's historic character. Its removal or modification would represent an impact to a historic structure important to downtown Exeter.

The Great Dam has served an important role in the town's industrial history for almost 100 years. Its location just upstream of the Great Falls has been the site of a dam since the 1640s, which provided the source of water power for numerous mills that lined the banks. The dam lies within the Exeter Waterfront Commercial Historic District, which was originally listed in the National Register of Historic Places in

1980, with a boundary increase that added the former Exeter Manufacturing Company property in 1986. The dam has been determined eligible as a contributing resource to this district.

Dam Modification would also create an adverse effect on Exeter's historic nature.

Under Alternative H – Dam Modification, very significant modifications would need to be made to the dam in order to meet safety regulations, including removal of a large portion of the dam and the installation of a highly-engineered modern adjustable crest gate. The modified dam would not resemble the current dam. The impact of dam modification on the aesthetics of the dam would be significant, and would detract substantially from its historic nature.

The area around the Great Dam is considered sensitive for archaeological resources which could be impacted by either removal or modification of the dam.

Based on historical and environmental review and information gathered from the NHDHR archaeological site files, the area around the Great Dam should be considered archaeologically sensitive for Pre-Contact and Euro-American archaeological sites. Because of the level of construction expected during either alternative, steps should be taken to further investigate these resources and minimize impact if confirmed. Additionally, if the dam is removed, monitoring of archaeologically sensitive areas along upstream river banks is recommended.

ES-3.5 Recreation

The Stabilize in Place and Dam Modification Alternatives would not change the recreational experience on the river.

Because these two alternatives would maintain the current pool under typical flow conditions, there would be no change to the river and recreation opportunities and facilities that exist now would continue unaltered.

Dam Removal or Partial Removal would alter the recreational experience on the river, but opportunities would still be plentiful.

Both Dam Removal and Partial Removal would lower river elevations upstream from the existing dam site under low and normal flows which may alter recreational opportunities. The reduced river width would affect, but not eliminate, access at existing formal and informal launch sites. The river would continue to be navigable to non-motorized watercraft, but portage around shallows or bars may be necessary under low flow conditions. Cooler and faster flowing water may enhance opportunities for coldwater fishing for trout species and provide more insect forage for all game species. Generally speaking, the Partial Removal Alternative would have less impact on these resources relative to the Dam Removal Alternative.

ES-3.6 Natural Resources

Removing the dam would have a substantial net benefit on water quality in the river. This same benefit would not occur if the dam were to be Stabilized in Place or Modified.

A decrease in residence time and surface area with a smaller impoundment would reduce the thermal gain that occurs in the reaches above the dam, which should improve dissolved oxygen conditions. Full dam removal, as proposed under Alternative B, would result in the greatest reduction in residence time and, would therefore have the greatest potential to improve dissolved oxygen levels relative to the other alternatives. In addition to the estimated reduction in residence time, the shallower water depths that would result from dam removal would allow for greater mixing and less temperature stratification at lower flows. Faster flow velocities could also lessen the accumulation of oxygen-consuming organic material and debris within the channel, and thus, reduce a source of oxygen demand. The Dam Modification Alternative would result in minimal change in the residence time for the typical flow conditions and would therefore not be expected to improve water quality.

The removal of the Great Dam would have a significant benefit to important fish populations.

The dam is a significant barrier to the upstream passage of fish, such as river herring, as well as other aquatic organisms. Removal of the dam would allow the fish to pass upstream to spawn, which would have a substantial benefit to the Exeter and Squamscott Rivers. Although the fish ladder currently allows some level of upstream passage, it is far less efficient than a free-flowing river.

The project is not expected to result in significant adverse impacts to wildlife populations.

The largest threat to wildlife habitat in the northeast is the excessive fragmentation of undisturbed blocks of land associated with increased urbanization, which is not a significant factor in the decision to remove or modify the dam. Minor indirect effects could occur based on changing flood regimes or hydrology of wetland adjacent to the impoundment which could create shifts in plant communities. Whatever minor indirect impacts may occur would likely be offset by beneficial changes associated the presence of increased numbers of forage fish, including adult and juvenile river herring.

The full or partial removal of the Great Dam could affect wetlands and floodplain forests which rely to some degree on flooding, including a rare swamp white oak forest community upstream.

Elimination of the impoundment could affect the existing wetlands within and adjacent to the impoundment by lowering surface and ground water elevations such that wetlands with a direct hydraulic connection to the river would be affected.

Indirect effects to wetlands could also occur by falling local groundwater levels that are predicted to occur with removal or modification of the dam. Additionally, flood events would be shallower and would inundate less of the floodplain forests along the impoundment including a floodplain forest dominated by swamp white oak (*Quercus bicolor*). It is impossible to quantify precisely the effects that these changes might have on wetlands and forest community dynamics. However, it seems unlikely that these changes would cause a sudden shift in community composition. Rather, gradual changes may occur which could allow plant species typically occurring in drier sites to colonize the forest. Ultimately, the areal extent of the swamp white oak forest community could decrease.

ES-3.7 Technical and Cost Considerations

Removal, Partial Removal, Stabilize in Place and Dam Modification are all feasible from a technical perspective.

The study confirmed that all of the alternatives carried forward would be feasible from an engineering perspective and found no technical reason to eliminate any of these alternatives except the "No Action." Any of the five alternatives could be designed and constructed. Additional engineering would need to be completed prior to implementation of the selected alternative, and any alternative would require permitting through state and federal resource agencies.

Partially removing the dam would be the most expensive option, while stabilizing it in place would be the least expensive.

The initial investment required for each alternative would include the design, permitting and construction of the alternative plus the cost of mitigating various infrastructure and environmental effects. These costs, shown in Table ES-1, would total $2,550,100 for *Alternative B – Dam Removal. Alternative F - Partial Removal,* perhaps counter intuitively, would cost substantially more, about $3,556,580, due to the fact that it would require demolition of the existing fish ladder and installation of a new one. Of the two alternatives that could maintain current water levels upstream of the dam, the *Alternative G - Stabilize in Place* would be the less expensive option, at about $983,000, while *Alternative H - Dam Modification* would cost just over $1,761,000.

However, construction costs are only one component of the total cost of an alternative. Therefore, the cost estimates also considered operation and maintenance as well as 30-year capital replacement costs for each alternative and are reported in Table ES-2.

Table ES-1. Initial Construction and Mitigation Costs

Alternative	Design, Permitting and Construction	Infrastructure and Environmental Mitigation	Total
Alt A - No Action	-	$550,000	**$550,000**
Alt B – Dam Removal	$732,150	$1,817,950	**$2,550,100**
Alt F – Partial Removal	$1,338,630	$2,217,950	**$3,556,580**
Alt G – Stabilize in Place	$418,000	$565,000	**$983,000**
Alt H – Dam Modification	$1,016,000	$745,000	**$1,761,000**

Table ES-2. Total Costs including O&M and Replacement (30 Year Analysis)

Alternative	Initial Cost	O&M and Replacement Costs	Total
Alt A - No Action	$550,000	-	**$550,000**
Alt B – Dam Removal	$2,550,100	$0	**$2,550,100**
Alt F – Partial Removal	$3,556,580	$385,170	**$3,941,750**
Alt G – Stabilize in Place	$983,000	$181,894	**$1,164,894**
Alt H – Dam Modification	$1,761,000	$616,724	**$2,377,724**

While cost estimates based on conceptual engineering are considered a reliable way of assessing the relative economic impact of each option, the actual cost can be expected to change as additional engineering is completed on the selected alternative or as the cost of energy or other factors change in the future.

Great Dam Removal Feasibility and Impact Analysis
Response to Comments Received at the May 23, 2012 Public Information Meeting

Introduction:
During a public meeting for the Great Dam Removal Feasibility and Impact Analysis (the Study) on May 23, 2012, comments and questions from the public about various aspects of the Study were recorded. Also, additional written comments were submitted after the meeting. The following table contains a summary of each question and provides responses from the Project Partners and the Study's consultants.

Public Comments made at the Meeting

	Question/Comment	Project Team Response
1	During the drawdown in November 2010, was water spilling over the Pickpocket Dam?	Yes. The Pickpocket Dam is a run off the river dam, meaning that all of the flow in the river passes over the dam under normal conditions. Based on observations made by the consultants during the drawdown study, water was spilling over the Pickpocket Dam so conditions were similar to those we would expect to encounter if the dam were to be removed.
2	The previous drawdown lasted a month, and there was some rain during this period. Will the river really look the same as during the drawdown?	The river drawdown began on November 2, 2009. The photographs used in the presentation were taken between November 8 and November 13, 2009, when the water level at the Great Dam was approximately 4.5 feet lower than the Dam's normal pond level (Elev. 22.75 ft). This is approximately equal to the predicted water level decrease under the Dam Removal Alternative. Thus, the photographs are a good approximation of what the river would look like immediately following dam removal.
3	How tall is the dam? And how much will the depth of the river change if it is removed?	The dam spillway crest is at Elev. 22.5, which is about 8 to 12 feet above the streambed measured on the downstream side, and about 5 to 6 feet above the streambed measured on its upstream side. (In terms of understanding how the river depth would change, it is the upstream height that is most important.) The dam removal would decrease the depth of the river to a varying degree, depending on two primary factors: **1) River flow** – The change would be most noticeable during normal and low flows, and less noticeable during higher flows. **2) Distance upstream** - Immediately above the dam, depths would change substantially, whereas the change would become less noticeable further upstream. Considering normal flows, the predicted changes in the river depths are as follows: • **Downstream of the dam** - No substantial effect. • **Pool Immediately Upstream of Dam to Great Bridge** – Water depths would decrease substantially, dropping about 5 ft (from about 6-7 feet deep to about 1-2 feet). • **Upstream to the Little River Confluence** – Water depths would drop about 3 feet (from about 5 feet deep typically, to about 2

		feet). • **From the Little River Confluence to the NH 108 (Court Street) Bridge** - Water depths would drop about 2 feet (from about 6 feet deep typically, to about 4 feet). • **Upstream of the NH 108 Bridge to Linden Street** – Water depths would drop about 2 feet (from about 4 feet deep typically, to about 2 feet). • **Upstream of Linden Street** – Changes would be negligible, on the order of a few inches. Section 3.2 of the draft Feasibility and Impact Analysis contains a detailed discussion of the specific changes that could be expected from dam removal as well as various options for modifying the dam.
4	Is there anything in the study about costs regarding amendments to the Town's public supply?	The study provides a summary of impacts to the Town's water supply, based information contained in a study entitled *Water Supply Alternatives Study - Final Report*, published in January 2010. This study found that the removal or modification of the dam could affect two water supply sources: 1) A Town-owned **River Intake** near Gilman Park which takes water from the Exeter River to supply the Exeter Reservoir. 2) A drop in the river could affect the yield of the existing groundwater wells adjacent to the river which may be reactivated by the Town. It was determined that, while modifications to the River Intake might be required if Great Dam were removed, these modifications would not be as substantial as once hypothesized. It is very likely that normal water withdrawals would still be possible for much of the year even without any modifications. In fact, the Town pumped between 1.0 and 1.3 million gallons a day from the River throughout the entire drawdown period in November 2009. The study estimated that the cost to retrofit the River Intake would be approximately $750,000 to $1,000,000. A 2012 Town vote approved the construction of a new groundwater treatment facility, which would serve two new wells along the river adjacent to the impoundment. While removal or modification of the dam could decrease the yield from these wells by approximately 11%, they would still be reliable sources and there would be no additional costs incurred as a result of dam removal. With these wells back online, the Town will not be as reliant on the river to meet a majority of their water demand as has been the case since the early 70's. Please see the *Water Supply Alternatives Study – Final Report* for additional information.
5	One person stated that he believes the river looks beautiful and that a drop in the river level could affect its appearance and therefore the value of the abutting properties. He asked if the Town would issue a rebate on property	The Town will continue its current property assessment process. The tax assessor does not assess riverfront property any differently than other property and the market dictates the value of property. Therefore, if the dam is removed, there would be no reassessment of the properties along the river.

	taxes if the dam were removed. The commenter noted that he is from Newmarket, where another dam is being considered for removal.	
6	What is the implication of listing the dam on the National Register of Historic Places?	The Great Dam is already listed as a "contributing element" of the Exeter Waterfront Commercial Historic District. As such, the dam is already afforded protection under the National Historic Preservation Act, and the project is under review by the NH Division of Historical Resources.
7	It was noted that the Town has heard that there could be grant assistance for dam removal. But, are there grants available for its repair?	There are no known grant programs directly related to the repair/modification of the dam. Presumably, the Town would be required to fund the entire amount of these costs.
8	Referring to photographs of the river taken during the drawdown study, one commenter noted that vegetation will grow on the banks after a period of time. The commenter asked that the Town produce computer visualizations of what this would look like before making a decision.	Views of the river under drawdown conditions have been produced and will be presented at the Public Informational Meeting in June and provided in the final study report.
9	The gentlemen from Newmarket suggested that a survey of those who live along the river should be conducted, especially with regard to what they think regarding the aesthetics of the river.	While such a survey has not been conducted, photo-simulations of the river under the Dam Removal Alternative have been completed and will be made available for public comment.
10	Will reports be available for making decisions at Town meeting?	Yes. The current study, as well as all previous river studies, will be available prior to any final decision making. These studies will be available on the internet and hard copies will be made available at the Town Offices and the Library.
11	It was noted that flooding upstream of the dam has a substantial economic cost. The study should attempt to describe and estimate these costs.	The final Feasibility and Impacts Analysis provides a summary of publicly-available information on the costs related to upstream flooding. According to the NH Office of Emergency Management, there have been 88 claims filed under the National Flood Insurance Program in Exeter since 1978, with payments totaling $1,198,416.
12	Over the past ten years we've had four major flood events. What were the river flow rates during those events?	According to the USGS, peak flows at the Haigh Road stream gage on the Exeter River peaked at 3,520 cfs on May 15 (Olsen, 2007) during the "Mothers Day Flood." This was the highest flow ever recorded at the gage, which had been in operation since 1996. This meant that the flow at the Great Dam was approximately 5,950 cfs, or roughly the equivalent to the 50-year design storm discussed in the draft Feasibility and Impact Analysis. The other flood flows recorded in the last decade measured about 3,000 cfs or less at the gage.

13	Would dam removal alleviate flooding at Court Street?	Yes. Removal of the dam is expected to decrease flooding at Court Street. For example, where Court Street crosses the Little River, the 50-year flood would decrease in depth about 1.8 feet. Where Court Street crosses the Exeter River, the 50-year flood depth would decrease about 1.3 ft.

Written Comments Received after the Meeting

	Question/Comment	Project Team Response
14	Referring to the document entitled "Response to Public Comments" dated May 23, 2012, Item 1-4: Will the information, to be in the final report, address the ability to discontinue the penstock and replace it with ductile iron pipe and still satisfy the deed restrictions and requirements and will it outline the costs for such a change?	Assessing the impact on the Exeter Mill water intake is complicated by the fact that there are no technical drawings of the structure and the fact that it is submerged, making observations difficult. If dam removal is the selected alternative, then the intake will likely be impacted due to the substantial decrease in water depths at its location. At this time, it is unclear whether the intake can be retrofitted to allow continued withdrawal under all flow conditions. However, it is possible that the existing intake can be retrofitted in a way that allows it to remain functional during normal or high flows. The cost to accomplish this retrofit could be approximately $250,000 to $500,000, according to the *Water Supply Alternatives Study*, published in 2010. One other option is for the Exeter Mill to access the Exeter public water distribution system, which may be less expensive.
15	Referring to the document entitled "Response to Public Comments" dated May 23, 2012, Item 1-5: The Town previously did conduct a legal review of the mill's withdrawal rights, the fire department did an analysis of those requirements and the Town Manager/Selectmen chose to allow the mill to continue to draw water exceeding that right. Is the Town now stating that they are willing to reopen this issue and take the mill to court?	At the appropriate time, the Town will work with the Mill owner to address any concerns regarding their water withdrawal practices and rights.
16	Referring to the document entitled "Response to Public Comments" dated May 23, 2012, Item 2-2: I suspect that this legal opinion is in error. PEA acquired the lands along the river (1880's?) post transfer of rights to the two corporate entities by the owners (1828). The Gilmans were both the land owners and incorporators of the two entities and I recall their deeds to the corporations transferred those rights.	Legal research has been conducted, and the issue will be further addressed after the decision has been made about which alternative to pursue.
17	Referring to the document entitled	Yes. This factor is incorporated into the Rainfall Runoff Model that was

	"Response to Public Comments" dated May 23, 2012, Item 3-3: Will this factor be scientifically be quantified so it may be incorporated into the models offsetting the "climate change" factors now being added and used in the modeling?	used to calculate the design flow for the dam safety analysis. A summary of the hydrological analysis is provided in Section 3.2 of the Draft Feasibility and Impact Study, and a full technical report is appended to the report.
18	Referring to the document entitled "Response to Public Comments" dated May 23, 2012, Item 3-8: This statement is false and based upon a "general" statement covering impacts at the extent of the study range, namely the Court Street Bridge. Based upon sworn testimony of Grace Levergood during the Water Council Hearing in December 2011, the plotted flooding impacts caused by the just the one foot concrete solid flash-board and the fish and game modifications were clearly shown to be over 1 foot directly above the Great Bridge and the Franklin St. area. There is definitive proof that the fish ladder structure does contribute to increased flood levels both below and above Great Bridge in the developed areas.	Our response quoted from the Wright-Pierce study entitled "Exeter River Study Phase I Final Report" dated March 2007. This report bears the stamps of two professional engineers licensed by the state of New Hampshire, and we consider it to be a reliable source of information.
19	If the dam is not removed, based upon the new CFS calculations including the "Climate Change Factor", are there projections that flooding frequency, volume and elevations will increase?	The "Climate Change Factor" is simply using current empirical rainfall data from the northeast that shows that large rainfall events are occurring more frequently and that the intensity of rainfall events has increased relative to older data. A similar trend is seen in stream gage data which shows that high flow events have increased in frequency and magnitude over the last several decades. Our study is focused on the changes that would occur if the dam is to be removed and is not a study of climate change. But, given these data, if the current trend continues, flooding frequency, volume and depths could increase over time.
19	Will these calculations result in FEMA enlarging the flood zones within Exeter necessitating and increasing the number of businesses and homeowners required to purchase flood insurance?	The FEMA flood insurance program is independent of this study. Our study would have no direct effect on the currently effective flood mapping in Exeter which is used by the flood insurance program.
20	Will premiums be raised due to the projected flood increases, and if so, by how much?	The FEMA flood insurance program is independent of this study, so would have no direct effect on flood insurance premiums.
21	Will Town property valuations be reduced to reflect the lower values of	The Town will continue its current property assessment process. The tax assessor does not assess riverfront property any differently than other

	the flood prone structures?	property and the market dictates the value of property. Therefore, if the dam is removed, there would be no reassessment of the properties along the river.
22	If dam is modified, with the new "climate change" CFS calculations, won't the proposed modifications design alternatives have to be re-engineered and designed to meet the State Regulations?	The current dam modification alternative was designed to pass the 50-year design flow based on the revised hydrological analysis, so no redesign would need to occur.
23	Will this [redesign] not increase the costs of modifications?	No. The current dam modification alternative was designed to pass the 50-year design flow based on the revised hydrological analysis so the corresponding cost estimate already accounts for this factor.
24	What are the projected estimated cost increases for a modified dam?	See above.
25	With these changes and increased expenses, would it not be easier, cheaper and more costs effective to replace the present dam with a 2 foot dam, eliminate the fish structures as being unnecessary and eliminate the penstock/gate structure allowing extension of the dam/spillway to the original length? Then, couldn't the mill withdrawals be maintained by just extending the existing 12 ductile iron pipe?	The purpose of the study is to look at reasonable alternatives, but is focused on describing the likely impacts of the possible removal of the dam relative to the repair/modification of the dam. Engineers are currently considering a number of dam modification options, including the extension of the spillway by removal of the penstock and sluice gate headworks and lowering the spillway permanently.
26	Would this design meet the new flooding calculations and leave a minimum 2 foot pool elevation for both maintaining the historic character of the area and aesthetics?	The draft Feasibility and Impact Analysis provides a description of the impacts and benefits of a "partial removal" alternative.

SUMMARY OF ALTERNATIVES
Great Dam Removal Feasibility and Impact Analysis
Exeter River, Exeter, New Hampshire

Resource	Alternative A No Action		Alternative B Dam Removal		Alternative F Partial Removal		Alternative G Stabilize in Place		Alternative H Dam Modification	
Construction Costs	N/A		$732,150		$1,338,630		$418,000		$1,016,000	
Mitigation Costs	$550,000		$1,817,950		$2,217,950		$565,000		$745,000	
30-year Operations & Maintenance Costs	N/A		N/A		$385,170		$181,894		$616,724	
Total Direct and Indirect Cost	**$550,000**		**$2,550,100**		**$3,941,750**		**$1,164,894**		**$2,377,724**	
Achieve Dam Safety?	No		Yes		Yes		Yes		Yes	
Reduce Flooding?	No		Moderate Benefit		Moderate Benefit		No		Moderate Benefit	
Improve Fish Passage?	No		Major Benefit		No		No		No	
Improve Water Quality?	No		Major Benefit		Moderate Benefit		No		No	
Resource/Issue	**Negative Impacts**	**Positive Impacts**	**Negative Impacts**	**Positive Impacts**	**Negative Impacts**	**Positive Impacts**	**Negative Impacts**	**Positive Impacts**	**Negative Impacts**	**Positive Impacts**
Upstream Erosion	Interupts natual sediment transport processes	Impoundment slows water, limits erosion	Minor	Minor	Minor	Minor	Negligible	-	Minor	Minor
Downstream Sedimentation	Interupts natual sediment transport processes	-	Moderate	-	Moderate	-	Negligible	-	Minor	-
River Ice	-	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Bridges, Walls, Foundations	-	Impoundment slows water, limits erosion	Minor	-	Minor	-	Negligible	-	Negligible	-
Water Intakes	-	Maintains impoundment for withdrawals	Moderate	-	Minor	-	-	Major	-	Major
Public Wells	-	Impounded river provides 11% more available water	Minor	-	Minor	-	-	-	Negligible	-
Private Wells	No known private dug wells	No known private dug wells	-	-	-	-	-	-	-	-
Cultural Resources	-	Dam contributes to surrounding historic district	Major	-	Major	-	Negligible	-	Moderate	-
Recreation	Adversely affects coldwater angling opportunities	Creates flatwater boating environment	Minor	Minor	Minor	Minor	-	-	-	-
Fisheries	Dam prevents upstream migration of important fish species	Favors warm water species	Negligible	Major	Negligible	Minor	Major	-	Major	-
Wildlife	Dam limits availability of anadromous fish species as food source	Favors species preferring pond/lake environment	Minor	Moderate	Minor	Minor	Minor	Minor	Minor	Minor
Wetlands	-	Artificial water level creates wetlands along river	Moderate	-	Moderate	-	-	Moderate	Negligible	Moderate
Invasive Species	Creates conditions favoring aquatic invasives	-	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Minor
Rare Species/Exemplary Natural Communities	-	High water supports swamp white oak	Moderate	Negligible	Moderate	Negligible	Negligible	Moderate	Moderate	Negligible
Freshwater Mussels	Dam adversely impacts mussel habitat/ conectivity	-	Minor	Major	Minor	Moderate	Moderate	Negligible	Moderate	Negligible
Visual/Aesthetics	Eliminates views of riffle/pool complexes	Falling water at dam scene and impoundment considered picturesque	Moderate	Moderate	Moderate	Moderate	-	-	Moderate	Moderate

Description of Intensity Levels
Negligible: Impacts would not be detectable, measurable, or observable.
Minor: Impacts would be detectable, but not expected to have an overall effect on the resource.
Moderate: Impacts would be clearly detectable and could have short-term, appreciable effects on the resource.
Major: Long-term or permanent, highly noticeable effects on the resource.

Comment Form
Great Dam Removal Feasibility and Impact Analysis
Exeter River

You may use this form to provide written comments on the Town of Exeter on the Great Dam Removal Feasibility and Impact Analysis. You may also make verbal comments during the public meeting, or you may submit comments via electronic mail to Mimi Larsen Becker mimilarsenbecker@comcast.net. Comments made by email should include the commenter's full name and address. ***Please print clearly.***

Name: _____ Date: _____

Address: (Street, City, State): _____

Telephone: _____ Email: _____

Comment: _____

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