

# **Exeter River Cooperative Study**

**A partnership between the Town of Exeter  
and the  
New Hampshire Department of Environmental Services**

**October 11, 2005**

## **Study Overview**

The Exeter River, within the boundaries of Exeter, currently faces a number of challenging management issues including water quality, flooding, dam operation, fisheries, and water quantity. The issues are integrated and must be addressed together; therefore, a State-Town coordinated management approach involving multiple stakeholders, public input, and scientific research is needed. This approach will include an examination of the issues and recommend cooperative actions to address these and other perceived problems. The ultimate result will be a Management Plan that will guide the actions of those who use the Exeter River watershed. The Plan will be based on scientific studies and information gathered through a public process. The study will follow a multi-year, phased approach (Phase II will focus on a Management Plan for the Exeter River and involve other stakeholders outside the Town, with the State taking the lead role). This Town-State program based partnership is intended to address several issues, which may be impacted by federal, state, and local laws and regulations.

**The following document reflects input from various stakeholders including state and town officials, abutters, property owners, regional agencies, and the Town of Exeter. This information will serve as a starting point for discussions about the project. The issues identified have been grouped according to five categories: 1) dam design, operation and safety, 2) water use and water quantity, 3) water quality, 4) fisheries, and 5) flooding.**

In addition to this “white paper”, a matrix has been developed to identify parties responsible for overseeing each action item, identify potential funding sources and costs, and estimate the phase of the study in which the action will be addressed.

**The “white paper” contained herein is a dynamic document and therefore intended to be updated on a regular basis. The last update was on October 11, 2005.**

**10-11-05**

**Impact Issue: Dam Design, Operation and Safety**

**Status:**

- DES Dam Bureau issued a Letter of Deficiency to the town regarding the Great Dam; the Great Dam has a discharge capacity deficiency and will not pass the DES 50-year flood requirement. An initial letter was issued in July, 2000 and a follow up letter was issued in June, 2004. The new letter asked the town to look at ways to retrofit the dam to pass the 50-year flood and submit the redesign for approval. Although this is not state law at this time, NHDES says it will be sometime soon. (DAMS 1)
- DES Dam Bureau would like the town to address the dam's discharge, operations, and retrofit plans.(DAMS 2)
- Flashboards that were originally installed on the Great dam have been replaced with a concrete structure. It is not known who installed the concrete structure but probably occurred sometime between 1968 and 1975. Prior to the installation of the concrete structure, the flashboards would break in times of heavy flooding. (DAMS 4)
- A voluntary agreement with the State of NH relating to the Great dam and the fish ladder was made prior to the Town's acquisition and prior to enactment of the RSA governing fish ladders and dam owners. It contains language relating to the concrete structure. The language is not clear as to who is responsible for the structure. (DAMS 5)
- The voluntary agreement contains a clause specifically exempting any guarantees of water for operation of the fish ladder. (DAMS 5)
- The voluntary agreement contains an indemnity clause that actions related to the fish ladder structure and operations are not the responsibility of the owner. (DAMS 5)

**Potential action items:**

- Continued implementation and refinement of the Great Dam operations and management plan adopted by DES in the spring of 2005, that will best serve the majority of all stakeholders. (FL 1)
- Development of similar Operation and Maintenance Plans for all dams in the Town of Exeter, where required by state law. (DAMS 2)
- Integration of information from the backwater study into the dam management plan based upon flowage rights. (DAMS 2)
- Operator qualifications for management of a dam water system to obtain all objectives. (DAMS 2)
- Design and modify the Great Dam to be in compliance with the Letter of Deficiency and the Lake Level investigation. (DAMS 1)

**Information needed:**

- What kind of modifications could be done to lower water levels more quickly during flooding, such as re-introducing the sluiceway and installing automatic or

- manual flashboards at Great Dam, alterations to the Little River channel. (DAMS 4)
- What is the cost to perform dam modifications and what kinds of funding sources are available? (DAMS 2)
  - What is the true cost-benefit to performing certain types of dam modifications? (DAMS 2)
  - What modifications will create best management practices for future management of the Exeter River? (DAMS 4)
  - What alternatives are available, if any to dam modifications? (DAMS 4)
  - What is the role of DES with respect to the Phillips Dam and its impoundments? (WQN 3)
  - Should the Phillips Dam be part of any solution or modification plan to dams within the Town of Exeter? (DAMS 3)
  - What would the impact(s) be from the removal or reconfiguration of the Colcord Pond dam? (DAMS 2)
  - What are the exact elevation, location and extent of the Town's current flowage rights? (WQN 2)
  - Legal determination on the concrete crest (located on the dam), and the state and town's fiscal liability for impacts from potential changes to the dam structure and/or operation. (DAMS 5)
  - How would breaching the dam affect the environment upstream and downstream of the Great Dam? (DAMS 4)

**10-11-05**

**Impact Issue: Water Use and Water Quantity**

**Status:**

- The Town of Exeter and Phillips Exeter Academy are the only registered water users in the impoundment. (WQN2, WQN3)
- The Exeter Mill is not in the DES large water user database. (WQN2, WQN3)
- The water treatment plant's average daily withdrawal from the Exeter River is approximately 1.2 mgd to produce about 1.0 mgd for Town water users that are part of the Exeter public water system. (WQN2, WQN3)
- During peak demand periods, typically in the middle of the summer, withdrawals by the Town from the Exeter River can approach 2.0 mgd, enough raw water to produce about 1.6 mgd for Town water users. (WQN2, WQN3)
- The current water treatment plant's process wastes about 20% of the raw water that is pumped from the river which is well above accepted industry standards and shows a deficiency in the current plant. (WQN1)
- At peak times, the Exeter Mill can withdraw about 1 million GPD of river water for cooling (air conditioning), fire suppression and irrigation. (WQN3)

**Potential action items:**

- All major users become certified and water withdrawal agreements will be developed. (WQN6)
- Support a water supply and treatment solution that brings wasted water ratios currently in place more in line with typical industry standards of 4%. (WQN3)
- Review the 1984 Water Study (Drinkwater Road and Watson Road wells) for a potential alternative and/or supplement water supply. (WQN1)
- Participate in a regional water analysis to inventory potential drinking water sources. (WQN1)
- Increase enforcement of existing shoreland and wetland buffer land use regulations to protect forested buffers along surface waters. (WQ7)
- Review past reports (including report authored by Pierce Atwood) regarding Town's right to withdraw water and determine if further work is needed. (WQN2)
- Refine estimated yield and population projections for town and watershed. (WQN1)
- Secure additional water and flowage rights for current and anticipated future water needs. (WQN2)

**Information needed:**

- Do water withdrawals from tributaries, such as the Little River, affect instream flow? (WQN1)
- What impact does groundwater withdrawal in the watershed have on instream flow? (WQN1)
- What are projected water demands? (WQN 1)
- What are the expected future water withdrawals, and is this accurately reflected in the current new Water Treatment Facility design? (WQN7)

- Can other sources of water be used for water treatment if flow is needed over the dam? (WQN7)
- Should the Exeter River be the town's primary water supply source? (WQN7)
- What would the rationale be for no longer utilizing the Exeter River as a water supply source? (WQN7)
- Has the Town secured flowage rights since dam modifications beginning in the '70's and the changes in operation beginning in the 80's? (WQN2)
- What are the impacts of growth in upstream communities on water quantity and quality? (WQN8)
- Which sections of the Exeter River are on the state's impaired river list, and what does this imply? (WQN1, WQN5, WQN6)
- Does water use affect known impairments? (WQN1)
- How much water is the High School pumping out of the Little River for irrigation? (WQN3)
- Document the relationship between the Exeter River and Squamscott River; how the water quality and quantity in the Exeter impacts the Squamscott. (WQ3)
- What are the Mill's rights to withdraw water? (WQN2)
- Is the river getting "flashier"? (WQN8, WQ1)
- Is base flow decreasing? (WQN8)
- Is a significant amount of water leaving the watershed (i.e, recharge issues)? (WQN4)
- What is the relationship between water supply sources in the Town of Exeter taking into account basin "dynamics"? (WQN5)
- Are deep bedrock wells a viable water supply alternative? Are they accurately described as an "alternative?" (WQN5)
- Are the stormwater and sewer systems changing the flow and recharge of precipitation? (WQN1)
- Should the Town of Exeter add the rest of the Exeter River into the River Management and Protection Program? (WQN7)
- Should the Town actively seek to expand the current water system within the Town and tie in new users for 1) economic reasons; and/or 2) environmental reasons. (WQN6)

**10-11-05**

**Impact Issue: Water Quality**

**Status:**

- A dissolved oxygen (DO) impairment exists in the impoundment just upstream of the Great Dam. (WQ5)
- Under low flow, summer conditions DO drops to or below 5% saturation which is considered to be deadly for aquatic life. (WQ1, WQ5)
- The river reach is impaired and will be listed as impaired on the 2006 303 (d) list.
- Activities that may affect existing conditions will be reviewed as part of the 401-certification process. (WQ5)
- The 401 process integrates the following issues: water quality (including dissolved oxygen), flooding, fisheries, dam operations, and water use and quantity. (WQ5)
- The Town of Exeter 401 water quality certification process is on hold pending further review of the water treatment facility project. (WQ5) It needs to be noted that the Town received its 401 Water Quality Certificate in August, 2005 – may want to re-word a lot of this section to allude to the Water Quality Certification.
- Erosion along the shoreline. (WQ2)
- Encroachment of active land uses in the shoreland buffer. (WQ7)
- Other issues may affect the river reach such as nonpoint source pollution and related water quality problems including pH, turbidity, and road salt runoff. (WQ1)

**Potential action items:**

- Ongoing Water Quality Monitoring program. (WQ6)
- Total maximum daily load (TMDL) study. (WQ1)
- It was established the landfill is registered with the proper agency, and the Town is conducting an ongoing water quality monitoring program at the site through the Public Works Department. (WQ9)
- Sanitary survey to assess risk posed by sanitary wastewater (WQ10)
- Identify sources of non-point source pollution and develop risk assessment for each. (WQ1)
- Conduct a river cleanup (build partnerships to do the cleanup). ((WQ1)

**Information Needed**

- Water quality from Court Street to High Street is not being monitored. This is where Great Brook enters, and flowage from Drinkwater Road. (WQ6)
- Is there leachate from the dump on Powder Mill Road entering the river? (WQ11)
- What is the data from the monitoring wells at the Cross Road landfill showing?)WQ11)
- What is the pipe/culvert at the Linden Street bridge collecting? (WQ8, WQ9)
- Monitor two outfalls and footpath on Little River at High School (bridge and bottom of parking lot). (WQ1, WQ9)

- What are the impacts of road treatment on Rt. 111, Court Street and Linden Street on water quality? (WQ8)
- Is arsenic leaching out of RR ties dumped in the Little River? (WQ11)
- Is dam operation and obstruction of the penstock increasing silt and sedimentation of the river channel? (WQ12)
- How often do low flow events occur in the Exeter River at the noted boundaries? Under what conditions are low flow events occurring? (WQN1, WQN7)

**10-11-05**

**Impact Issue: Fisheries**

**Status:**

- Fish & Game is drafting a letter to the town describing how they want the Town to operate the floodgates during fish ladder operations. (F1)
- The lower dam (weir), located downstream of the main dam, was built as part of the fish ladder. Without this structure, upstream migrating fish would bypass the entrance to the fishway. (F1)
- The New Hampshire Fish and Game Department is responsible for oversight for the fish ladder and lower dam (weir), in accordance with a deed naming New Hampshire Fish & Game and the owner of the Great Dam (Town of Exeter). (F1)
- The fishway does not hold water back, but two feet of water is required in the fishway for fish to pass through the ladder; about 6 inches of water over the dam is required for efficient fish attraction and passage. (F1)
- Downstream fish passage for emigrating diadromous species needs to be maintained. (F1)
- Below Court Street, the Exeter River is a warm water fishery and above Pickpocket Dam it is a cold water fishery. (F2, F3)
- Fish and Game has stated that it could modify the existing fish ladder to make it operate under revised operating levels. (F1)

**Potential action items:**

- Fisheries issues incorporated into other aspects of the management scenario. (F1)
- Develop Best Management Practices for fisheries and other species. (F1)
- Seek input from US Fish and Wildlife Service and others regarding all impacted species. (F1)
- Educate public on the importance of good stewardship for fisheries. (F1)

**Information needed:**

- How much water do fish species of concern need to survive and thrive? (F1)
- List of potential alternatives to reconfiguring the dam for better fish passage. (F1)
- Habitat assessment upstream in the Exeter River watershed – is habitat quality declining elsewhere? (F2)
- Does the operation of the heat exchanger by PEA impact the Little River due to discharge of warm water? (F2, F3)
- How would diadromous and resident fish react to various scenarios of changes to dam, fish ladder and operation? (F1)
- Where are the fish spawning? (F1)
- How many cfs are needed over the dam for fish? (F1)
- When do fish return to the river? (F1)
- Is the fish ladder size adequate? (F1)
- Why are fish populations declining? (F2)



- What is the impact of dam height on fish run? (F1)
- Water level management for fish ladder efficiency vs. flood control. (F1)
- Does the sluiceway discharge impact the ability of fish to access fish ladder? (F1)
- What would be the environmental impacts of past changes in operation and structure of the Great Dam and Colcord Pond Dam and impacts of proposed future operations and structural modifications to same as they relate to all species of aquatic life, amphibian and upland species. (F1)
- How are federal and state agencies involved in changes to dam level? (WQN2)

**10-11-05**

**Impact Issue: Flooding**

**Status:**

- Residents, especially those along the shoreline of the impounded rivers and tributaries, are concerned about increased periodic flooding and rise in water table. Some residents have stated that the effects and frequency of flooding have increased over the past 5 years. (WQ4)
- Flooding also takes place in upstream communities in areas not associated with the Great Dam or its impoundment. (WQN4)
- Flooding may be controlled if the Town of Exeter would better manage a 4' x 4' gate located on the dam. (FL1)
- The gate at the Great Dam was not designed for flood control. (FL2)
- The Great Dam has had a series of owners/operators that used it for various purposes. The dam was given to the town in 1981. The Town has retained ownership since this time. (FL2)
- A penstock runs through the adjacent Mill, but its capacity is probably not enough to control flooding and the penstock is blocked at the end. A small pipe carries water back to the river. (FL3)
- The mill currently uses river water for cooling (air conditioning), fire suppression, and irrigation. (WQN3, FL3)
- The loss of riparian buffers and flood retention areas may affect issues related to flooding. (WQ7)
- The State of New Hampshire Dam Bureau is conducting a Lake Level investigation to determine the past legal operating levels of Great and Colcord Pond dams and will determine the future operations level if required. The study also looks at the issue of flowage rights. (FL4)

**Potential action items:**

- Conduct a backwater study to evaluate the dam's effect on river heights under varied conditions; integrate flooding concerns with other issues in the study area. (FL1)
- Examine operation of other dams in the watershed, especially Pickpocket, Little River, Phillips and Turner dams to determine their impact on flooding and water table and develop a coordinated operations plan for regulated water levels, water use, and flood control. (FL4)
- Updated hydraulic and hydrologic studies to better understand the impact of the dam on flooding under different flow regimes. (FL2)
- Examine the impacts of stormwater on the river and consider potential management actions. (WQ8)
- Reduction in height of dam to compensate for NH Fish and Game request to increase flowage height over the dam structure.(F1)

**Information needed:**

- Status of various river and impoundment abutters relative to flowage rights. (WQN2)
- Effects of current dam operations (Great Dam, Pickpocket Dam, Colcord Dam, Phillips Dam) if any, on upstream flooding? (FL4)
- What are the impacts, financial and structural, of flooding and higher water and groundwater levels on road infrastructure, such as frost heaves? (WQ8)
- What is the appropriate role(s) of FEMA and the EPA in Town operations of any and/or all dams in the Town of Exeter? (FL1)
- Would the relocation of the utilities under Great Bridge impact flood control? (FL2)
- Could the penstock be used as a flood management tool? (FL2, FL3)