

Draft Tamworth Energy Committee Meeting Minutes
July 17,2023 9:30 AM
Tamworth Town House

Present: Ted Morgan, Ellen Farnum, David Kunhardt, William Farnum (remote)
Peter Smart, Chocorua Park LLC

Call to Order: 9:35 am

Potential Hydro Power Generation at the Chocorua Dam

Peter Smart presented information to the Tamworth Energy Committee on the potential for Hydro Power generation at the Chocorua Dam. *(Please refer to Peter's handouts, attached at the bottom of the minutes for detailed information.)*

Recent history:

~Peter helped to start a committee called a 'Dam Committee' in 2014 to explore options for repairing and preserving the Dam. He later helped form a private entity called Chocorua Park LLC, and over the course of several years, purchased the properties near the dam, now known as Chocorua Park Chocorua Park LLC, with the idea of preserving the area for a park for the public. He is currently working on a conservation easement for the properties. Local friends David Bowles and David Brooks from Wonalancet helped spark Peter's interest in exploring the possibilities for hydro power.

Improvements:

Repairs were made to the dam with volunteer help in 2015. *(Please refer to Peter's documents for interesting details on this repair!)*

Today, the Chocorua Dam is overall in good shape with no safety issues. Peter identified three repairs that still needed if the dam is used to generate hydro power. The pond would need to be briefly drained and dredged for these repairs. (Peter has authority to lower water levels.)

1. Replacement of the 4x4 wooden gate and repair cracks in the back of the structure,
2. Repair of the trash rack,
3. Repair of the Penstock valve.

~Licensing/Regulation

Any hydro power connected to the grid requires oversight from the Federal Energy Regulatory Commission (FERC). This is a hurdle to developing hydropower as licensing has a burdensome amount of documentation and cost for an Environmental Impact Study would be needed.

Peter explained that FERC is used to licensing large facilities and really does not have a smooth procedure for regulating a small project the size of the Chocorua Dam. (The threshold for licensing is 50 kWh. The Chocorua Dam would only produce 10-20 kWh, so it would make sense to place it in the unregulated category and award a waiver. However, currently, FERC approval is required.)

Independent Energy Generation

The park, dam and water rights are owned by Chocorua Park LLC, Peter Smart, Sole Member. Peter has explored the idea of finding one independent system operator, who would be interested in using the dam for reliable electricity generation. (If power could be used without connecting to the grid, it could bypass regulation.) The Chocorua Dam would provide enough energy to furnish 2 to 4 homes with power. So far, he has not found anyone interested.

Research/Educational Usage

Peter is also exploring the possibility of partnering with an educational institution. Chocorua Dam's wooden structure and size makes it quite unique.

River Flow

Typical water flow over the Chocorua Dam is at least 36 cubic Feet per second (CFS) for 8 months of the year. (The highest recorded flow was in 2014 and 5/1/23. Dry flow can be as low as 3 CFS, mostly in August; dry flow has been seen in May to October as well.)

Typical flow of 36 CFS over the Chocorua Dam allows 18 CFS for power generation for about 50% of the year. (Most typical turbines are idle 40% of the year.)

Water needs to always flow over the dam to preserve the wooden structure. Water flow can be automatically regulated.

David notes that hydro power and solar power are complementary on a seasonal basis. Hydro power has a low energy output in summer when water levels can be lower, while solar power is very productive during this time. During the winter months with less sunlight, hydro power is more efficient and runs both day and night.

Hydro Power Generator Options:

Peter has researched 3 generator options. (*below info is from handout)

*

A) Maximum output

Variable flow, Dual-cell Francis-type turbine, made by Ossberger (Germany)

Single 10-20KW turbine @ 18-36 CFS would run for approx 8 months/year (river flow > 36 CFS)

Average turbine flow approx. 27 CFS = 15KW

yielding about 86,400 KWH/year x \$0.30/KWH = **\$25,920/year**

Approx Cost: \$200k turbine & control system, \$50k site works, \$50k repairs = **\$300k Total**

B) Basic, low-cost installation

Fixed flow, Kaplan-type turbine (purchased directly from China)

Single turbine would operate approximately 7 months each year (river flow > 36 CFS)

Single 10 KW turbine @ 18 CFS yields 50,000 KWH/year x \$0.30/KWH = **\$15,000/year**

Approx Cost \$30k turbine & control system, \$50k site works, \$50k repairs = **\$130k Total**

C) Double-turbine, low-cost installation

Dual Fixed flow, Kaplan-type turbine (purchased directly from China)

First turbine would operate approximately 7 months each year (river flow > 36 CFS)

Second turbine would operate approximately 3.5 months each year (river flow > 54 CFS)

Dual 10KW turbines @ 18-36 CFS yields about 75,000 KWH/year x \$0.30/KWH = **\$22,500/year**

Approx Cost \$50k turbine & control system, \$60k site works, \$50k repairs = **\$160K Total**

After exploring many options, Peter believes that hydro power would need strong local interest and support to be viable. The small Chocorua Dam would not pay the cost for operations without a dedicated volunteer(s).

Publicizing the Project:

Could TEC co-host a talk about the Chocorua Dam with another organization such as the library or the Chocorua Lake Conservancy (CLC)? This might be a good way to find volunteers

interested in supporting hydropower. David suggested that an interview about the Chocorua Dam might be a good format to get information out to the public.

Other Questions/Suggestions

~ David also discussed deepening a partnership with CLC.

Since some repair work is needed for the dam at Chocorua Lake, coordinating repair work could be advantageous to both Peter and CLC. The dam at Chocorua Lake could also have its gate adjusted during periods of low water flows to boost the hydro facility in Chocorua Village.

~Ellen asked about the noise associated with running a turbine to generate power.

Peter said that the sound from generating power would be less than is currently heard. (There is already a noisy rumble of water as it flows over the even surface. This sound is magnified by the hollow 'boom box' under the wooden dam.)

~ Long Term Repairs: ultimately, Peter believes the wooden timber struts could be replaced with cement. This would require help from a consulting engineer. (The original white oak struts and the hemlock replacement struts currently in place are very durable, so no repair is needed in the near future.) Peter also believes a recording gauge (such as used by the US Geologic Survey) would be a beneficial purchase.

Other Business:

Potential Solar Installation:

David reported on a potential site for a solar panel installation at Ski and Beach. He has been meeting with local resident Dick Lennon and has advised Dick to contact ReVision Energy.

Obtaining permission for Interconnection Study would help determine the feasibility of a solar facility. *David will continue to help support this idea.*

Meeting two times a month:

Ted is hoping to meet briefly before TEC members meet with the Tamworth Selectboard on July 27th. Ted noted that the TEC is regularly busy enough to hold two meetings per month.

Ellen supported this idea, as it would be easier to schedule 2 meetings a month at regular times.

Ellen will send out a When2meet link.

Approval of Minutes for three meetings:

6/19/23, 6/29/23, 6/30/23

Motion to approve all three sets of minutes: Ted M, Second Ellen F

Vote: Unanimous approval

Button Up Workshop Handout

Ted shared a draft handout/poster developed for the NH Saves Home Energy Workshop on September 18th. He asked that the TEC members carefully review the paper and contact him with necessary changes. TEC will also need to discuss how to advertise the event.

Ted will send a copy of the flyer to Gabrielle,

Ted will ask Robbyn if he is prepared to handle all technology (sound amplification, projector? Technology for a hybrid meeting).

Meeting adjourned: 11:20 am

Minutes E Farnum

Chocorua Dam Report to Tamworth Energy Commission, July 2023

Prepared and presented by Peter Smart

(1) Overview

Dam originally built in late 1800's, penstock and gate valve added approx. 1930

Dam is approximately 100 feet long by 15 feet wide by 15 feet high

Spillway is 65 feet long, with an 10 foot drop and will accommodate 3 feet of water over spillway

Pond area is approximately 4 acres, with an estimated storage of 17 acre-feet.

Trash rack of 10x10 feet supplies water to a 30" gate valve.

The pond can be drained by way of a 4x4 foot gate at the bottom of the dam.

Repairs to trash rack, penstock, and gate are needed for hydro-power but do not present a safety issue.

(2) Regulation

Dam is licensed by the State of NH as a "Low Hazzard" dam.

Last inspected in 2021, dam in overall good condition.

FERC approval or waiver is required for any hydropower connected to the grid

Park, dam, and water rights are owned by Chocorua Park LLC, Peter Smart, Sole Member

(3) River Flow

Watershed above Chocorua Village is approximately 14 square-miles, extending roughly to the summit of Mt Chocorua.

Nine years of observed flow records, since April 2014, using staff gauge attached to bridge abutment

Typical flow is at least 36 CFS for about 8 months of the year

Highest recorded flow was 361 CFS on 4/16/14 and 5/1/23 (4.5" rain = 25-year storm)

Dry flow can be as low as 3 CFS, most often in August, but can be any months from May to October.

Typical flow of 36 CFS allows 18 CFS for generation, leaving 18 CFS over the dam for aesthetics

(4) Hydro Power Options

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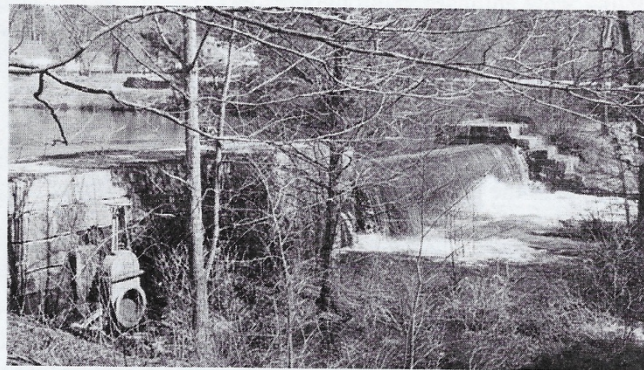
The Story of the Chocorua Dam and Park

Chocorua Village is defined by the pond and waterfall at its center, visible to everyone who drives by on Route 16. Beneath the glassy surface is the historic wooden Dam, which creates a peaceful pond in the otherwise fast-flowing Chocorua River as it tumbles southward to join Tamworth's Swift River and the Bearcamp River before flowing into Lake Ossipee.

This is one of the last A-frame timber dams in New Hampshire. Hidden behind the falling waters are a set of wooden "bents" that hold back the water in the pond. One of the unusual aspects of the structure are the vibrations that can be heard at certain water levels. Sometimes compared to the sound of an idling diesel engine, the sound is actually caused by the vibration of the water falling over the dam, often resulting in a visible standing-wave pattern.

Early History (1889-1946)

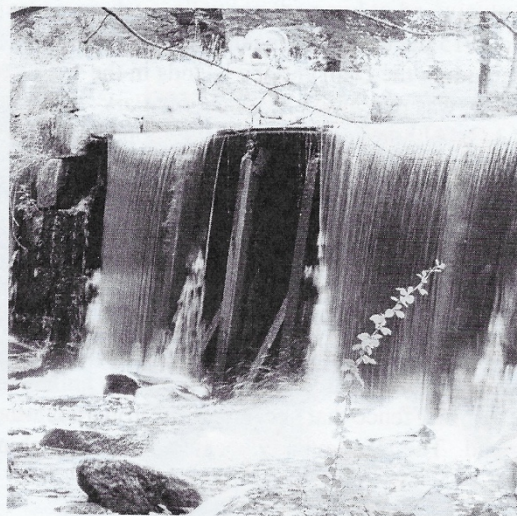
The Dam was constructed in approximately 1889 by Charles P. Bowditch, a Boston investor and anthropologist, who spent summers with his family at Lake Chocorua. He purchased the site in 1888, removing the earlier millworks to eliminate the associated pollution and improve the scenic character of the village. The Bowditch family owned the property for 58 years, operating the dam strictly for aesthetic and recreational purposes. Although a penstock was installed for possible hydroelectric generation, it has never been equipped with a turbine or generator.



Prior to 1889, a series of older dams were located near this site, providing water power for various mills. One of the earliest dams was built around 1785 by the Tamworth Iron Works, which used bog ore dredged from Lake Ossipee to produce iron for the manufacture of chains, augers, and nails.

The Flanagan Years

From 1946 to 2015 the Dam was owned and maintained by Raymond and Edna Flanagan, who repaired the spillway in 1978 and 1989. After Edna's death in 2010 the family attempted to sell the property, but prospective home buyers were not willing to accept responsibility for the Dam, which was located on the same property. The Flanagans also asked the Town and State to take over the Dam, but neither had the resources nor interest to maintain and operate the structure, which was in need of significant repairs. The Dam had become a liability, and there was growing concern that the Dam might be removed in order to eliminate the ongoing costs and risks.



Preserving the Dam

In 2014, a number of Tamworth residents with an appreciation for the Dam's scenic, historic, and engineering qualities formed a "Dam Committee" to explore options for repairing and preserving the Dam. Since a number of the struts that support the lip of the dam had already fallen away, it was clear that the structure needed urgent care. The group undertook negotiations to acquire the dam but faced the challenge of having to acquire the Flanagan residence along with the Dam.

Meanwhile, the former Ice Cream Shop (on Route 16 just downstream of the Dam) had ceased operation and was on the market. The Daigles, who had operated a number of businesses at the site since the 1970's, were enthused about the prospect of selling the property so that it could become the nucleus for a Park that might ultimately span the river and include the Dam itself.

This led to the purchase of the Daigle property by local resident Peter Smart and the formation of Chocorua Park LLC, a private entity that would own and maintain the park for the purpose of public enjoyment and recreation.



In July of 2014 the Daigle's building was razed, with salvageable materials donated to Habitat for Humanity and other local causes. Removal of the building immediately opened up views of the river that were previously hidden from public view, and new landscaping provided a new green space along the busy highway. Old foundation stones were used for benches and "stonehenges", and a picnic table was installed. A gazebo was donated by neighbors and moved to the site on a snow-mobile trailer. A ramp was built, allowing easy access down to the river and providing a close-up view of the Dam. Although full access to the Dam was not yet possible, the Park quickly became a popular spot for residents and visitors alike to enjoy the river.

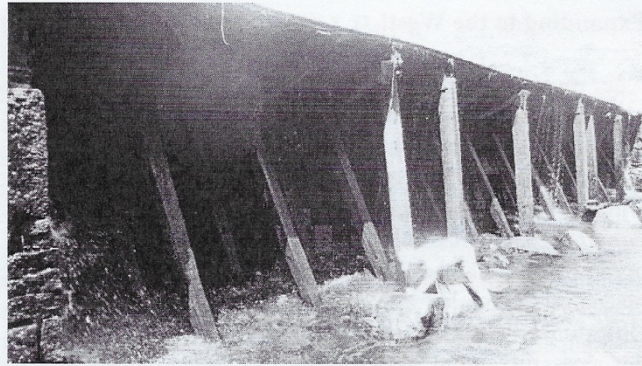
In 2015 the entire Flanagan property, including the Dam and the islands in the river, was purchased by Chocorua Park LLC. Although it was originally hoped to purchase the Dam *without* the house, this proved impractical, necessitating the purchase of the entire property. Community volunteers spent several days clearing brush and thorns from the property. A second picnic table was placed on the island and the foot bridges were repaired and reinforced. The chainlink fence that separated the properties was removed, restoring public access to the dam and the pond. The Dam quickly became a popular fishing spot, as it had been decades ago.



Repairing the Dam

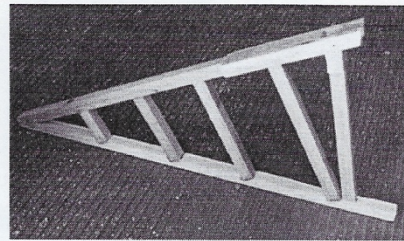
To preserve the structural integrity of the Dam, the Park owner and others on the Dam Committee developed a plan to replace the missing upright timbers (struts) that support the lip of the dam.

On June 10, 2015, the penstock was opened half way, lowering the water level in the pond approximately six inches, which allowed inspection and measurement of the wooden structure that



is normally hidden behind the waterfall. With this information, and the assistance of a professional engineer, detailed repair plans were formulated. Since the NH Dam Bureau agreed that the work could proceed as a “repair”, the considerable time and cost associated with any “reconstruction” work was avoided. And because the water level in the pond would only be lowered about four feet, and there would be no digging or machinery in the river, no further permits were necessary, allowing the design and planning to proceed rapidly so the work could be performed while the river was at its lowest in mid-summer.

Actual repairs occurred during the week of July 28th, 2015, with the replacement of all sixteen of the primary struts that support the lip of the dam. Local lumber mills produced the new 8x8 inch struts from locally-harvested Eastern Hemlock. The actual timber work was conducted by experienced timber framers, cutting a tenon at the base of each new strut that fit into the existing slots (mortises) in the existing sills. With the assistance of Dam Committee members and other volunteers, the timbers



were raised into place and held between two hemlock “repair plates”, which in turn were fastened to the existing structure using substantial 3/4 inch bolts. Five of the secondary struts were also replaced, and a new “wear plate” was installed along the lip, helping to reinforce and straighten the edge of the dam and produce a more uniform waterfall. While the pond was lowered, a number of holes were plugged in the upstream face of the dam, eliminating most of the water that previously leaked through the stonework. This intensive effort was completed in just seven days, allowing the pond to be quickly refilled for the continued enjoyment of residents and visitors alike.

Current Condition

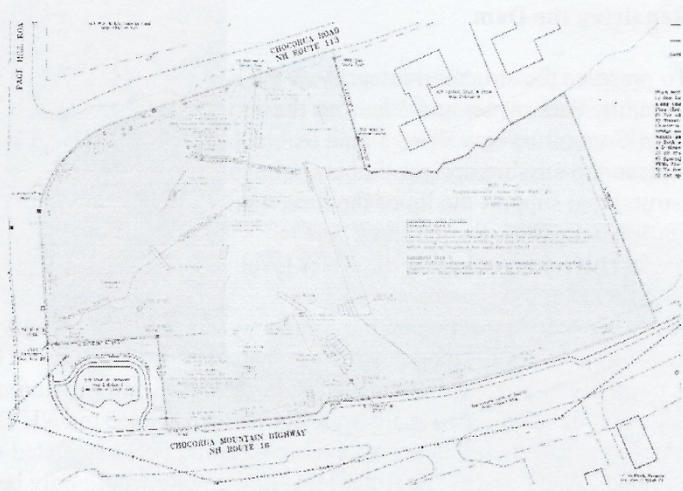
Although the 2015 repairs were originally seen as a temporary measure, the overall condition of the structure turned out to be very good, so a near-term replacement of the dam is no longer seen as a necessity. However, there are still a number of other repairs to be performed, including replacement of the 4x4 wooden gate and repair of the trash rack and penstock valve. A survey of hydroelectric potential is also underway, but preliminary results suggest that the payback period would be over 20 years, making a full-scale installation unfeasible. However, a demonstration or educational installation is still being considered.



Expanding to the West!

After repairing the Dam, efforts turned to finding an owner for the Flanagan house. In an attempt to bring new activity and energy to the Village, the building was offered for *donation* to a compatible non-profit organization. The house was also placed on the market in 2016.

Unfortunately, these efforts were unsuccessful, and in 2018 it was decided that removal of the house would allow the land to be fully integrated into a larger park, thus providing maximum public benefit from the entire project. With landscaping now complete you can cross the foot bridges and enjoy views of the dam from both sides of the river.



Who Owns the Park?

The Park is privately owned by Chocorua Park LLC, which encourages public use and enjoyment of the property. Over the long term, our goal is to transfer the Park to a suitable non-profit organization that is willing to undertake the unique responsibilities associated with the property and ensure ongoing public access to this unique resource.



How is the Park Funded?

The Park is privately owned, funded, and supported. It receives no financial support from local, state, or federal governments. Essential maintenance (such as the recent repairs) is supported by local volunteers and organizations such as the Chocorua Community Association.

We welcome your donations to the “**Dam Fund**” maintained by the **Chocorua Community Association**, P.O. Box 185, Chocorua, NH 03817. The Association is a registered 501(c)3 organization that works to enhance the livability of Chocorua Village.

For the latest information, photographs, upcoming events, and donation details please visit

www.chocoruepark.org



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