

Fairbank's Mill Contracting

NORTH DANVILLE VILLAGE
R.F.D. 2 ST. JOHNSBURY, VT. 05819
(802) 748-8084

February 14, 1984

The Delahaye Fund
c/o Mr. William May
Bank Building
Barton, VT. 05822

Dear Mr. May:

We are pleased to present the completed "Initial Hydro Site Evaluation" for the Crystal Lake Falls site in Barton, Vermont. Included are the following:

- Historical Context
- Topographic and Hydrologic Characteristics
- Initial Site Layout Diagram
- Flow Duration Curve
- Watershed Map
- Power and Income Analysis
- Cost and Expense Analysis

These table and charts contain nearly all of the information that you will need in order to make an informed decision regarding the property. If you decide to proceed, various portions can be revised and upgraded to better reflect new information or a change of plans.

The physical characteristics of the hydro site are very attractive. The nearly 24 square miles of drainage area provides a very good flow which is tempered by the presence of Crystal Lake, as well as the many smaller ponds dotting the watershed. This type of situation will result in much better utilization of the water than could otherwise be obtained. There is a total drop of nearly 90 feet from the lake level to the proposed powerhouse location, which could be developed with 550 feet of penstock. Access for construction of the headworks, powerhouse, penstock, and transmission lines is very good. The cost per kilowatt of installed capacity is excellent.

Equipment for a facility of this size is readily available from a variety of domestic and foreign suppliers. Actual turbine type and mix will depend upon the restrictions that will be imposed upon variations in the lake level, minimum bypass flow requirements, and your own voluntary releases for aesthetic reasons. As equipment for these small plants becomes more sophisticated, totally automatic operation becomes possible, so that day to day maintenance and supervision requirements are minimal.

Although the physical characteristics of the site are excellent and make the development of the project appear very attractive, there are several unknowns that should be addressed:

1. Water Rights. There may be as many as half a dozen riparian owners along the stretch of river in question. Quit claim deeds for any outstanding water rights should be obtained from every one before committing to the project.
2. Municipal Complications. In the process of placing a

penstock, public roads will be crossed as well as sewer lines and possibly water lines and other utilities. These should be identified early on.

3. Fisheries and Water Quality Questions. These include the two big environmental questions, the allowable variation in the lake level and the amount of water required to flow unharnessed down the falls.
4. Aesthetics Considerations. These will be self imposed restrictions on water usage.

Once these questions have been settled, then the project can be modified to suit the changes.

After investigating the hydropower potential of the site and reviewing the historical considerations, we feel that a project could be designed that would not only benefit the Town of Barton economically, but would also give the community the opportunity to refocus on its splendid cascade of water which has been ignored for so long.

If you decide to proceed further with the project, Fairbanks Mill Contracting stands willing and able to assist you in whatever capacity required. From licensing through construction, we can offer you a variety of hydropower and landscape services.

Sincerely,

Robert F. Desrochers

Robert F. Desrochers

Mark E. Desrochers

Mark E. Desrochers

HISTORICAL CONTEXT
OF THE
CRYSTAL LAKE FALLS HYDRO SITE

History of the Site

The presence of Crystal Lake and its falls has exerted much influence on the settlement patterns of the village of Barton through the decades. The charter members of the community, Col. William Barton, Asa Kimball et al arrived from Rhode Island to first clear land at the outlet of La Belle Lac in the 1790's. They located there perhaps because they saw clearly the potential in the magnificent set of falls dropping in cadence from the lake to the Barton River, some ninety feet below.

During the next two decades, this natural source of energy was harnessed by Kimball and Barton. Water power fueled the growth of industry and commerce in the community that steadily grew outward along the hillside, from the falls at the center. Water powered mills performed various stages of manufacture on wood products, textiles and metals. Kimball, Barton and later Col. Ellis Cobb all founded their prosperity, and that of the community as well, upon the potential of water falling downhill.

John Murkland manufactured the long clevis plow, sugar arches and high quality stoves in the mills along the Crystal Lake Falls. As late as the 1920's, products as diverse as candy machines and cast iron door stops were being fashioned in the mills and transported throughout the North East.

Unfortunately, depression era economics, among other factors of course, slowed the wheels of industry in Barton. Taxes for a milling operation at the Crystal Lake Falls were last paid in 1939. Energy networks that were both more accessible and more versatile than water power branched out into the community. The mills closed, and the focus of the town shifted down the hillside to Main and Church Street. The community turned its back on the very resource around which the town had originally focused. Very quickly the mills fell into disrepair. They remain today as the ruins of an earlier era in Barton, one in which the town drew it's energy for industry, commerce, and most importantly, community, from water power.

Industrial Archaeology

It is an adventure in archaeology to walk around the mill site today. Hampered somewhat by the depth of snow covering the site features, we have tentatively been able to link a building housing a steam driven generator with the shells of a kiln building and the main mill building. We have traced on the site some of the circulation paths, including a network of rails on which carts of furniture stock were moved to and from the kilns. There are

numerous and interesting terraces, retaining walls, steps and bridge abutments which suggest quite clearly a progression of movement whereby raw materials would arrive at the top of the hillside mill site. Various operations of manufacture would be performed upon the increasingly refined material. The finished product would leave the mill site at the bottom of the slope. Again, this is an example of the mill development being influenced by the lay of the land. This is an excellent example of a developer working with, rather than against the grain of the land.

Present Day Possibilities

There are many other artifacts on site that offer clues to the historical uses of the falls in Barton. These clues in turn, clearly reveal opportunities and constraints for the adaptive re-use of the site. Should the Delahaye Fund or another entity be interested in the development of the site, the prudent first step would be to analyse in depth the existing site features. Questions concerning access to the site, circulation paths, buildable areas and open space need to be asked and answered if effective and successful reuse of the site is to ever be realized.

Placed in the larger context of Barton and Orleans County, questions concerning the economic and social rhythms of the area need to be addressed. Does Barton need or desire new development? Of what nature- educational, recreational, industrial, commercial or residential? What would the impact of this development mean to the greater community.

No matter what the answers to the above questions may be, any development of the site will require land use modifications of the site. Hopefully, any development entity would strive to work with the grain of the site, as did the original developers.

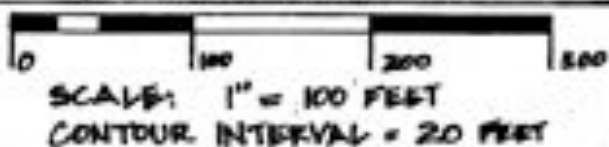
Site Name <u>Crystal Lake Falls</u>	Client <u>The Delahaye Fund</u>
Town <u>Barton</u>	Address <u>c/o Mr. William May</u>
County <u>Orleans</u>	<u>Bank Building Barton, Vt.</u>
State <u>Vermont</u>	Telephone _____
Stream <u>Crystal Lake Outlet</u>	USGS Maps <u>Lyndonville, Memphremagog</u>
Watershed Area <u>23.9 sq. mi.</u>	USGS Gauging Station <u>Clyde River at</u>
Watershed Description <u>Forested,</u> <u>hilly, small ponds, Crystal Lake</u>	<u>Newport, Vt. No. 04296500</u>
Ultimate Watershed <u>St. Lawrence</u>	Period of Record <u>1909 to 1978</u>

Initial Headwater Elevation* <u>945</u>	Proposed Elevation <u>945</u>
Initial Tailwater Elevation <u>856</u>	Proposed Elevation <u>856</u>
Initial Cross Head <u>89</u>	Proposed Cross Head <u>89</u>
Median Flow <u>30.3</u>	Minimum Bypass Flow :
Mean Flow <u>43.6</u>	Proposed <u>10 cfs</u>
Minimum Flow <u>0.44</u>	Required _____
Maximum Flow <u>653</u>	

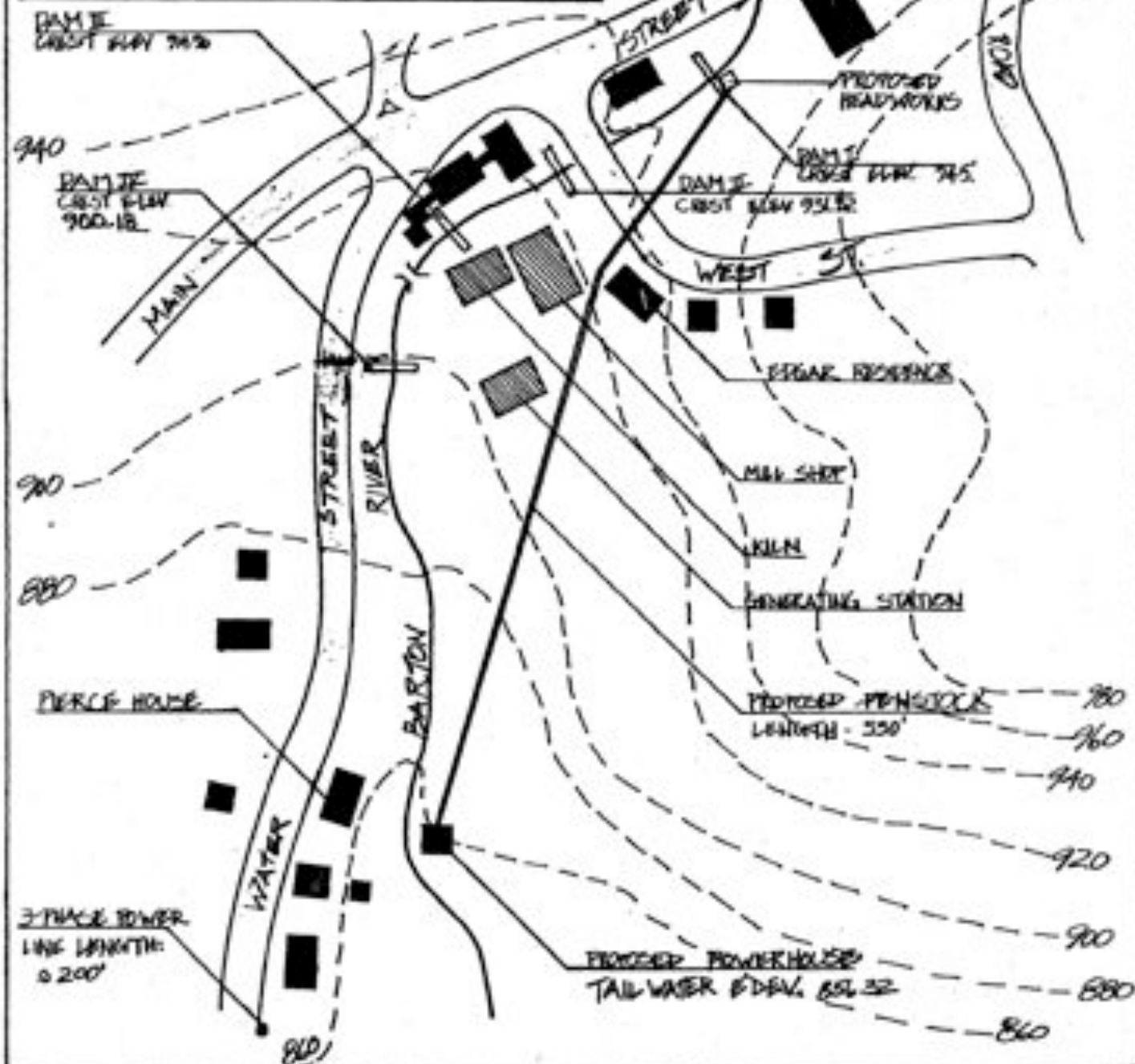
Mean Monthly Discharge		Flow Duration Data		Low Flow Data	
Jan	28.8	Q05	132	1Q10	1.69
Feb	30.4	Q10	90.8	3Q10	2.46
Mar	49.5	Q25	50.5	7Q10	2.52
Apr	102	Q50	30.3	14Q10	6.02
May	101	Q70	20.2		
Jun	42.2	Q75	18.5	<u>Floods</u>	
Jul	27.9	Q90	10.8	2 year	425
Aug	21.7	Q95	7.2	10 year	589
Sep	20.0			25 year	653
Oct	27.4			50 year	695
Nov	36.6			100 year	732
Dec	38.0				

* Elevations are in feet above mean sea level, head measurements are in feet, and flow figures are in cubic feet per second.

MILL SITE PLAN
FOR
CRYSTAL LAKE FALLS
BARTON, VERMONT



FAIRBANKS MILL CONTRACTING
NORTH DANVILLE VILLAGE
RFD #2
ST. JOHNSBURY, VERMONT 05771

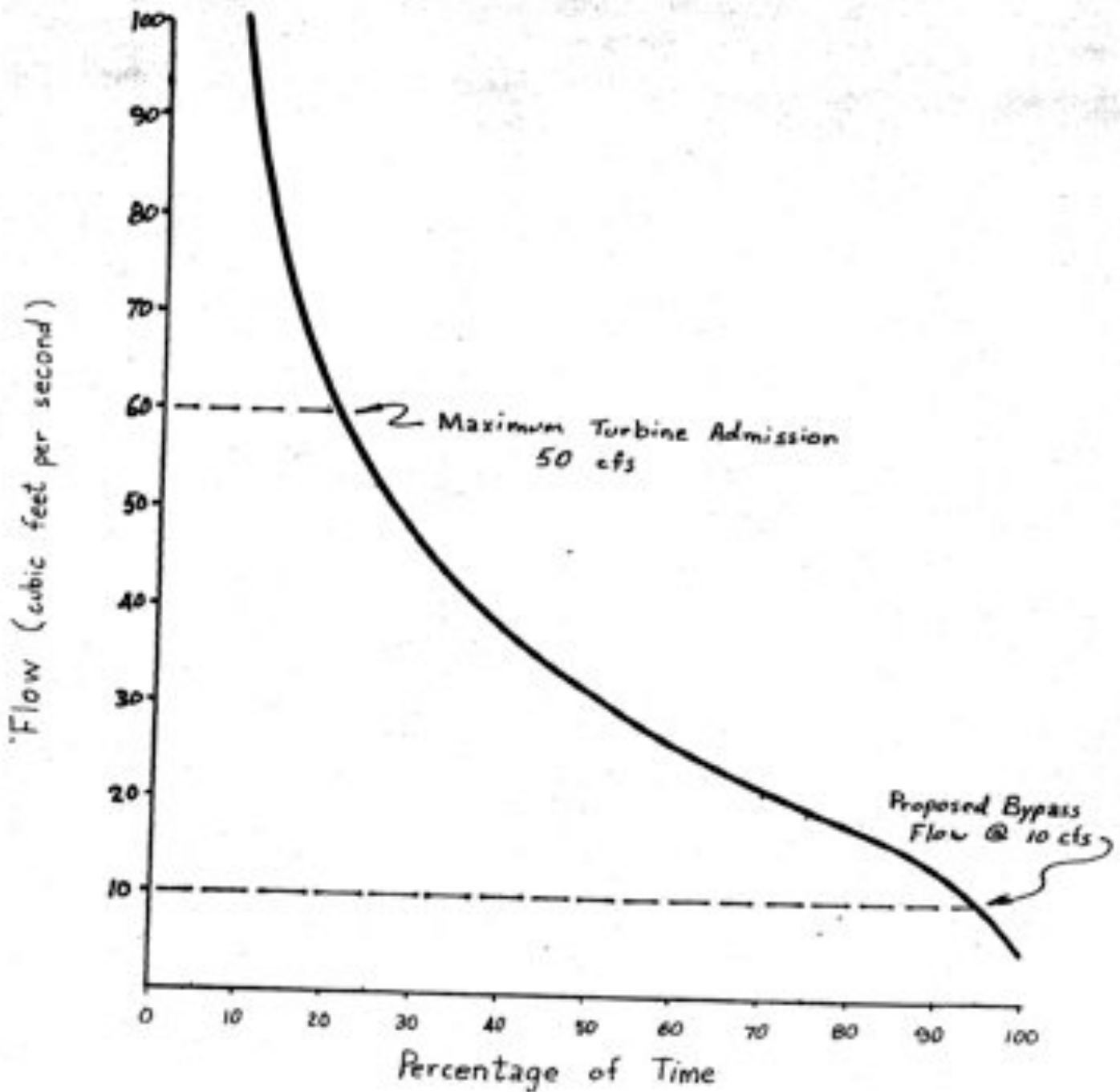


Flow Duration Curve

Crystal Lake Falls
Site

Barton, Vermont
Location

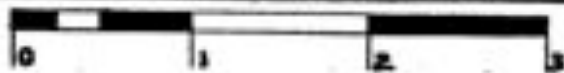
Feb 10, 1984
Date



Project Crystal Lake Falls Date Feb. 10, 1984 Preliminary (X) }
 Final }

Construction Costs:	Initial	Revised
Clearing, access _____	10,000	_____
Dam _____	_____	_____
Headworks, intake structure _____	15,000	_____
Penstock, material 550' 36" @ \$45/ft _____	24,750	_____
Penstock, installation 550' @ \$50/ft _____	27,500	_____
Penstock, custom fabrications _____	5,000	_____
Powerhouse, foundation _____	25,000	_____
Powerhouse, superstructure _____	10,000	_____
Turbine _____	80,000	_____
Speed increaser _____	15,000	_____
Generator _____	10,000	_____
Governor _____	20,000	_____
Machinery installation _____	5,000	_____
Electrical, Protection and control _____	10,000	_____
Electrical, metering _____	1,000	_____
Utility interconnection _____	2,000	_____
Other Contingency _____	?	_____
Other _____	_____	_____
Sub-total Construction Costs:	260,250	_____
Other Start-up Costs:		
Licenses and permits _____	10,000	_____
Engineering _____	20,000	_____
Legal _____	10,000	_____
Accounting _____	10,000	_____
Financing _____	?	_____
Consulting _____	2,000	_____
Other Water rights, Right of Way, Land Acquisition _____	?	_____
Other Municipal Complications - Roads, Sewer _____	?	_____
Sub-total Other Start-up Costs:	52,000	_____
Total On Line Costs:	312,250	_____
Estimated On Line Cost per Kilowatt of Capacity	1323	_____
Estimated On Line Cost per Kilowatt-hour	_____	_____
Annual Costs:		
Principal payments _____	_____	_____
Interest _____	_____	_____
Maintenance _____	_____	_____
Repairs & Replacement fund _____	_____	_____
Taxes _____	_____	_____
Insurance _____	_____	_____
Total Annual Costs:	_____	_____

WATERSHED MAP FOR CRYSTAL LAKE FALLS BARTON, VERMONT



SCALE: 1" = 1 MILE
CONTOUR INTERVAL = 20 FEET

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