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MASTER

GOOSE RIVER, MAINE

DEMONSTRATION PROJECT

JANUARY, 1978 - OCTOBER, 1978

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Author: Maine Hydro-Electric Development Corporation
Belfast, Maine 04915

November 24, 1978

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Note

The topographical character of the immediate vicinity of the River and Pond is exceedingly favorable for manufacturing purposes, inasmuch as the pond being surrounded by high hills, can be raised, at a trifling expense, by a dam at its outlet, and a large quantity of water thus derived without detriment to the lands of individuals bordering thereon. The banks of the river from its entrance into Belfast Bay, to the meadows above Whiting's axe factory, are very steep, the waters between these points flowing over ledges of rock, laying generally perpendicular to the direction of the stream, so that the most solid foundations for dams can be found at any part of the river. The river may be considered a natural canal conveying the water from the large pond to tide waters with a fall of nearly 200 feet, or 185.6 feet from the river above Mason's dam to high water mark at Belfast Bay.

N.B. The heights of the water at the different points on the stream above highest tides at Belfast Bay, are written in red figures.

SCALE

From Map by
R.H. Eddy, C.E.
1835

1 Mile

Goose River Demonstration Project Supporters

U.S. Department of Energy Grant No. ET-78-G-01-3006.

State of Maine, Office of Energy Resources Grant #4026-1100.

Delco Products, Division of General Motors Corporation,
Dayton Office.

Allis-Chalmers Corporation, Hydro-Turbine Division,
York, Pennsylvania.

Monroe Cycle Works, Monroe, Maine.

The Depositors Trust Company, Augusta, Maine.

Sherman and Company, and Janet S. Lord, Belfast, Maine.

Joseph Sawyer, Camden, Maine.

Richard W. Havens, Gladwyne, Pennsylvania.

Collin M. Moller, Washington, D.C.

Congressman David F. Emery, 1st District, Maine.

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- B. Swan Lake Storage Usage Plans / Storage Value
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Inhabitants of the Town of Swanville, Maine
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I. Project Scope and Summary of Conclusions

Project Scope

DOE participation was received under grant No. ET-78-G-01-3006 for the purpose of sharing the experience of development and operation of a small site, hydroelectric project, utilizing existing dams. Grant No. 4026-1100, awarded by the Maine Office of Energy Resources, supported initial site surveys. The reporting period covered activities between June, 1977, and October, 1978, with emphasis on the period following initial, commercial operation beginning in January, 1978.

The Goose River Project, FERC Project No. 2804, is a privately owned development which wholesales energy to the Central Maine Power Company, an investor owned utility. The proposed project includes the existing Mill Dam development, three proposed redevelopments at existing dams and an existing storage impoundment, Swan Lake.

The planned capacity is 430 KW, of which 380 KW would be firm; the expected annual output is 2,700 MWH. The net annual energy benefit, in terms of fossil fuel capacity alternatives, would be \$45,000 per year, a 13% return on investment.

Summary of Conclusions

- Protective legislation is required
- Recreational usage is compatible with power usage.
- A commercial, hydroelectric project of 55 KW is feasible.
- Human factors are an important consideration.
- Goose River experiences have broad applicability.

II. Description

The proposed Goose River Project, FERC Project No. 2804, is a commercial power development consisting of four power dams and one storage dam. All available energy is wholesaled to the Central Maine Power Company (CMP), the utility holding the franchise for the area.

The Goose River drains approximately 20 square miles of coastal Maine, falling approximately 202 feet from Swan Lake to its mouth at Belfast Bay. At one time, there were ten power dams on the river; the last mill to be so powered, under a 20 foot head, burned down in December, 1976. A 425 KW power plant was operated for approximately 60 years at the lower dam, under a 101 foot head; this was discontinued around 1960.

The continued use of this small river as a source of energy was due to its advantages of extensive storage, primarily at Swan Lake (+600,000,000 ft.³), and of a sharp fall over the last mile to its mouth, some 189 feet.

Theoretically, the energy potential of the Goose River is the equivalent of more than 9,700 barrels of imported oil, worth more than \$145,500 per year in foreign exchange. Taking into account reasonable losses, such as those due to efficiencies and other design constraints, we could still expect to produce the energy equivalent of 4,500 barrels of imported oil or 2,700,000 KWH's per year. Operation of the four proposed

II. Description (cont.)

power dams, without the benefit of storage at Swan Lake, would reduce output by about 40% or 1,100,000 KWH's each year.

Extensive recreational development has occurred at Swan Lake while the lake has also been supporting power usage. This development now includes about 400 lakeside cottages. Other uses include commercial fisheries and water supply.

All proposed developments in the Goose River project are within several hundred feet of 12 KV, 3 phase distribution lines owned by CMP. Energy is delivered to these lines.

An induction generator is used at the Mill Dam site; an inexpensive, motor starter panel is also used and the turbine is operated without a governor.

Because of the regulation possible, 380 KW of the 430 KW proposed capacity would be considered firm. The existing turbine at the Mill Dam development would eventually be replaced by a wheel designed for a 40 cfs flow, reducing capacity to 380 KW; all of which would then be firm.

The Goose River Project is further described in the FERC license application included as Appendix E. The Goose River Project Map, following, shows the location of Goose River developments.

Map and Illustrations

<u>Page</u>	<u>Map</u>
II-3a	Goose River Project
	<u>Illustrations</u>
II-3b	Swan Lake Dam
II-3c	Swan Lake Mill Dam Site
II-3d	Kelley Dam CMP Dam
II-3e	Mill Dam Powerhouse Inside Powerhouse

GOOSE
RIVER
PROJECT
~MAP~

(MHEO)
1978

SWAN LAKE DAM

SWAN LAKE

MILL DAM SITE
BEFORE POWER HOUSE CONSTRUCTED

KELLEY'S DAM

CMP DAM WITH GATES OPEN

MILL DAM POWER HOUSE

INSIDE POWER HOUSE

TURBINE DRIVE WHEEL, GENERATOR, ELECTRICAL PANEL

III. Economic Feasibility

The economic feasibility of the Goose River Project has been presented in terms of a fossil fuel alternative; the energy value is \$32/MWH and the value of firm capacity is \$60/KW per year.

The construction cost, including site acquisition, is \$340,000 or about \$790/KW.

Of the 430 KW capacity, 380 KW would be considered firm.

The cost of capital is assumed to be 7%.

The value of Goose River capacity to its customer, the Central Maine Power Company, has not been determined at this time.

The net, annual, energy benefit is \$45,000, and the return on investment 13%. TABLE #1 "Annual Cost/Benefits Analysis - Goose River Project" outlines the derivation of these results.

The value of storage is described in Appendix B, Swan Lake Storage Usage Plans / Storage Value.

TABLE #1 ANNUAL COST / BENEFITS ANALYSIS - GOOSE RIVER PROJECT

1. Value of Energy Benefits

(a) Value of Energy (\$32/MWH x 2,700 MWH)	\$ 86,000
(b) Value of Capacity (\$60/KW x 380KW firm cap.)	<u>23,000</u>
(c) Total Annual Value of Energy Benefits	\$109,000

2. Fixed Costs

(a) Cost of Capital (7% of \$340,000)	\$ 24,000
(b) Tax & Insurance (3.5% of \$340,000)	12,000
(c) Depreciation (S.L.@ 2.5% of \$340,000)	<u>9,000</u>
(d) Total Fixed Costs	\$ 45,000

3. Variable Costs

(a) Operations & Maintenance (\$7/MWH x 2,700MWH)	<u>\$ 19,000</u>
(b) Total Variable Costs	\$ 19,000

4. Total Costs (2.(d) and 3.(b)) \$ 64,000

5. Net Annual Energy Benefits (1.(c) minus 4.) \$ 45,000

6. Return on Investment

$$= \frac{\text{Net Annual Energy Benefits (5.)}}{\text{Construction Costs}}$$

$$= \frac{\$ 45,000}{\$340,000} = 13\%$$

Return on Investment = 13%

207-338-2121

Dick,

28/nov/78

More Good Reading,

MAINE HYDRO-ELECTRIC *Larry*
DEVELOPMENT CORPORATION

LAWRENCE GLEESON
PRESIDENT

MILL LANE, P. O. Box 402
BELFAST, MAINE 04915

File

PRELIMINARY
FINANCIAL FEASIBILITY ANALYSIS
FOR THE
GOOSE RIVER PROJECT
FERC PROJECT NO. 2804

MAINE HYDRO-ELECTRIC
DEVELOPMENT CORPORATION
NOVEMBER, 1978

GOOSE RIVER - FINANCIAL FEASIBILITY

Description

The Goose River Project includes the redevelopment of five existing dams on the Goose River in Belfast, Maine. The proposed project would include the redevelopment of four of the dams for commercial power production, and the fifth as a storage dam for stream regulation use only. All energy produced is to be wholesaled to the Central Maine Power Company, the area's franchised electrical utility. This report describes the economic feasibility of the proposed project.

Conclusion

The proposed project is expected to produce more than 2,700 MWH annually, and have a firm capacity of 380 KW. From the perspective of a fossil fuel alternative, the value of annual energy benefits is approximately \$109,000, and the net annual return on an investment of \$340,000 would be 13%. Following is the Summary Annual Cost/Benefit Analysis. It should be noted that the comparison to a fossil fuel alternative does not reflect the terms of an existing power contract.

Economic feasibility, particularly in the case of these low head power developments, is dependent upon the ability to distribute fixed costs over the combined capacity of the entire project. The co-dependency relationship for this project includes both river management and business aspects.

SUMMARY

ANNUAL COST / BENEFITS ANALYSIS

1. Annual Value of Energy Benefits	
(a) Value of Energy (\$32/MWH x 2,700 MWH)	\$ 86,000
(b) Value of Capacity (\$60/KW x 380KW firm cap.)	<u>23,000</u>
(c) Total Annual Value of Energy Benefits	\$109,000
2. Annual Fixed Costs	
(a) Cost of Capital (7% of \$340,000)	\$ 24,000
(b) Tax & Insurance (3.5% of \$340,000)	12,000
(c) Depreciation (S.L.@ 2.5% of \$340,000)	<u>9,000</u>
(d) Total Annual Fixed Costs	\$ 45,000
3. Annual Variable Costs	
(a) Operations & Maintenance (\$7/MWH x 2,700MWH)	<u>\$ 19,000</u>
(b) Total Annual Variable Costs	\$ 19,000
4. Total Annual Costs (2.(d) and 3.(b))	\$ 64,000
5. Net Annual Energy Benefits (1.(c) minus 4.)	\$ 45,000
6. Return on Investment	

$$= \frac{\text{Net Annual Energy Benefits (5.)}}{\text{Construction Costs}}$$

$$= \frac{\$ 45,000}{\$340,000} = 13\%$$

Return on Investment = 13%

Project Characteristics

The keys to the economic feasibility of this project are the CMP and Swan Lake developments. The stream regulation capability provided by Swan Lake will account for 40% of the expected energy output and for the high proportion of firm to total capacity. The CMP development, at a head of 79 feet, will generate more than 50% of the firm capacity of the project.

Even with today's value of energy, the proposed redevelopment of this small drainage (20 mi.²) stream could not be considered realistic, were it not for the high degree of stream regulation possible, the sharp fall of the stream over its lower 1.5 miles and the ability to operate the river as a co-dependent business system.

The mean flow available is assumed to be 40 cfs for more than 80% of the year. Chart #1 illustrates the estimated, natural flow of the stream and the proposed, regulated flow.

Following Chart #1 is the concise general description of the project included in the FERC license application.

MEAN DAILY FLOW, CUBIC FEET PER SECOND

GOOSE RIVER PROJECT

CHART #1 FLOW DURATION

$\bar{Q} = 40 \text{ CFS}$

← ESTIMATED NATURAL FLOW

← PROPOSED REGULATED FLOW

COMPONENT OF FLOW
ORIGINATING BELOW SWAN LAKE

CHART #1

MHED 1978

Concise General Description

A concise general description of the project is as follows, and plans of the principal project works are shown on Exhibit L, which is submitted herewith and made a part of this application:

The project described is known as the Goose River Project, and has been designated the FERC Project No. 2804. The project would include developing 430 KW total capacity at five dams, which would produce, approximately, 2,700 MWH's annually. The project is described in sequence by dam, beginning with the uppermost and proceeding down stream.

The Swan Lake Dam will not have electric generation capabilities of itself. This dam is used to maintain water levels in Swan Lake and to regulate downstream flow to the other dams. The dam is of gravity type construction consisting of stone with cemented seams, faced with 12" of concrete. It is approximately 250' long including abutments; maximum height at the center is 10'. It has three 1/4 turn release gates, high, medium and low. A spillway is not used, the high level release gate is the maximum pool elevation giving a gross head of 8'. The gateworks sit on a granite sill with concrete in front. The storage capacity is approximately 7,500 acre-feet; general appearance and condition of the dam are good.

(from FERC license application)

The next downstream dam is Mason's Dam. It is approximately 86' across and 15' high at the spillway. It is of gravity type construction consisting of rock dry masonry with a planked upstream face. The impounding capacity is 1,621 acre-feet with 12" flashboards. A 31' head would be developed with a 160' penstock, utilizing the existing tailrace and wheelpit. Flow through the dam is controlled by two butterfly gates in the center of the dam. The powerhouse would be located 160' downstream from the dam. Construction would include a masonry foundation, wooden frame, with log or metal siding, and asphalt shingle or metal roof. The powerhouse dimensions would be, approximately, 14' by 20' and 12' high. Planned capacity is 75 KW, at an overall 80% efficiency at the normal operating head of 28'.

The next downstream dam is the Kelley Dam. It is, approximately, 135' across with a height of 15' at the spillway; approximate capacity available is 200 acre-feet. Type construction is gravity, built of rock dry masonry on rock ledge with an upstream plank face. Flow is controlled by high, medium and low 1/4 turn butterfly gates. A 22' head would be developed by means of a 305' penstock. The powerhouse would be of same construction and materials as the one at Mason's Dam, with dimensions of, approximately, 15' by 20' and 15' high. Planned capacity is 55 KW, at an 80% efficiency factor at the normal operating head of 22'.

(from FERC license application)

The next downstream dam is the Mill Dam. It is approximately 70' across including abutments, height at the spillway is 6'. It is of gravity type construction, dry masonry on rock ledge with a concrete spillway and upstream face. The spillway comprises 40' of the total length and has flashboard pinholes. It includes a 4' by 4' dog gate closed off with planking. There is an existing corrugated metal penstock, 4' in diameter and 108' long, providing a usable head of 21'. There is an 8' 10" wide and 6' 8" high steel trash rack at the penstock intake; there is provision for stop log placement in front of the trash rack. The powerhouse foundation is poured concrete; it is a wooden framed structure sheathed with construction board and wooden, asphalt shingled roof. Powerhouse dimensions are 16' by 25' with slant roof 12' at the rear and 8' high at the front wall. Access to the powerhouse is afforded by a 4' by 20' railed wooden walkway over the tailrace. The mill pond has a capacity of 7 acre-feet. The capacity, as constrained by the existing water turbine, is 100 KW. The water turbine, installed in 1887, is a Hunt-Francis 33" wheel in a pressure case capable of developing 146 H.P. at 176 R.P.M. under a 21' net head. The main generator is a 125 H.P. asynchronous unit which is driven from the same shaft as the 6.5 KW, self-exciting, station service generator.

(from FERC license application)

The next downstream dam is the CMP Dam. It is approximately 231' across total length and 21' high at spillway level. It is a gravity/buttress type dam of concrete construction. The spillway is 42' long with pinholes for 8" flashboards. The headworks include two double reduction, rack and pinion hoists attached to the wooden release and head gates; these gates are both low level. The impounding capacity is 72 acre-feet. The planned capacity is 200 KW under a 79' normal operating head. This would require the restoration or replacement of 1,100' of the existing plate steel penstock. The powerhouse would be of masonry construction material with construction similar to Mason's and with dimensions of, approximately, 15' by 22' and 12' high.

The degree of regulation of this stream, which drains 21 square miles of coastal Maine, should permit operation of this project at an annual capacity factor of approximately 80%. With the exception of the existing turbine at the Mill Dam site, unit sizing is based upon the mean stream flow which is estimated to be 40 cubic feet per second.

(from FERC license application)

Cost / Benefits Analysis

The analysis is based upon a fossil fuel alternative where energy is valued at \$32/MWH and capacity at \$60/KW.

Analysis is carried out for both individual power sites and the project in total. The cost of storage is allocated among sites, based upon gross head.

The analysis is displayed on Tables 1 through 4, following, which consist of:

Table #1 - Construction Costs

Table #2 - Output and Annual Energy Value

Table #3 - Annual Cost / Benefits Analysis

Table #4 - Cost / Net Revenues per KWH

Table B illustrates the importance of storage to the project.

Table #1 - Construction Costs

	<u>CMP</u>	<u>Mason</u>	<u>Kelley</u>	<u>Mill*</u>	<u>Total</u>
1. Equipment Installed	\$ 49,000	\$ 40,000	\$ 31,000		\$120,000
2. Powerhouse	15,000	11,000	11,000		37,000
3. Penstock	33,000	5,000	9,000		47,000
4. Dam	1,000	6,000	4,000		11,000
5. Interconnection	5,000	3,000	3,000		11,000
6. Total Construction Cost	<u>\$103,000</u>	<u>\$ 65,000</u>	<u>\$ 58,000</u>	<u>\$ 34,000</u>	<u>\$260,000</u>
7. Other Costs	42,000	16,000	12,000	10,000	80,000
8. Total Project Cost (#6 - #7)	<u>\$145,000</u>	<u>\$ 81,000</u>	<u>\$ 70,000</u>	<u>\$ 44,000</u>	<u>\$340,000</u>
9. Capacity	200 KW	75 KW	55 KW	100 KW	430 KW
10. \$/KW	\$ 725	1,080	1,272	440	791

Notes:

* Mill Development - construction complete, cost, \$34,000

#7. Other Costs include site acquisition, consulting fees and proportional allocation of Swan Lake storage costs.

Table #2 - Output and Annual Energy Value

	<u>CMP</u>	<u>Mason</u>	<u>Kelley</u>	<u>Mill</u>	<u>Total</u>
1. Capacity (KW)	200 KW	75	55	100	430
2. Capacity Factor	0.80	0.80	0.80	0.40	0.71
3. Annual Energy Output (MWH)	1,400 MWH	530	390	350	2,670
4. Firm Capacity (KW)	200	75	55	50	380
5. Annual Value of Energy (@\$32 / MWH)	\$45,000	\$17,000	\$13,000	\$11,000	\$ 86,000
6. Value of Capacity (@\$60 / KW)	12,000	5,000	3,000	3,000	23,000
7. Total Annual Value of Energy Benefits	<u>\$57,000</u>	<u>\$22,000</u>	<u>\$16,000</u>	<u>\$14,000</u>	<u>\$109,000</u>

Table #3 - Annual Cost / Benefits Analysis

	<u>CMP</u>	<u>Mason</u>	<u>Kelley</u>	<u>Mill</u>	<u>Total</u>
1. Total Annual Value of Energy Benefits (Capacity + Energy Value)	\$ 57,000	\$22,000	\$16,000	\$14,000	\$109,000
2. Annual Fixed Costs (13% of Total Project Costs)	19,000	11,000	9,000	6,000	45,000
3. Annual Variable Costs (\$7 / MWH)	10,000	4,000	3,000	2,000	19,000
4. Total Annual Costs (#2 + #3)	<u>\$ 29,000</u>	<u>\$15,000</u>	<u>\$12,000</u>	<u>\$ 8,000</u>	<u>\$ 64,000</u>
5. Net Annual Energy Benefit (#1 - #4)	\$ 28,000	\$ 7,000	\$ 4,000	\$ 6,000	\$ 45,000
6. Return on Investment (#5/Total Project Cost)	<u>\$ 28,000</u>	<u>\$ 7,000</u>	<u>\$ 4,000</u>	<u>\$ 6,000</u>	<u>\$ 45,000</u>
	<u>\$145,000</u>	<u>\$81,000</u>	<u>\$70,000</u>	<u>\$44,000</u>	<u>\$340,000</u>
	= 19%	= 9%	= 6%	= 14%	= 13%

NOTES

#1 - Capacity Fee \$60/KWH, Energy Value \$32/MWH; Reference Table #2.

#2 - Fixed Cost as % of Total Project Cost, total of a, b and c following:

(a) Tax and Insurance	3.5%
(b) Interest	7.0%
(c) Depreciation, 40 yr., S.L.	<u>2.5%</u>
Total	13.0%

#3 - \$7/MWH times Entry #3, Table #2.

Table #4 - Cost / Net Revenues per KWH

	<u>CMP</u>	<u>Mason</u>	<u>Kelley</u>	<u>Mill</u>	<u>Total</u>
1. Annual Energy Output (MWH)	1,400 MWH	530	390	350	2,670
2. Total Annual Costs	\$29,000	\$15,000	\$12,000	\$8,000	\$65,000
3. Net Annual Energy Benefits	\$28,000	\$ 7,000	\$ 4,000	\$6,000	\$45,000
4. Cost / KWH (Value in Mills)	21	28	31	23	24
5. Net Revenue* / KWH (Value in Mills)	20	13	10	17	17

* Net Revenues is equivalent to Net Annual Energy Benefit.

TABLE B - Annual Energy Benefits

	w/o storage	w/ storage (TABLE #1)
(a) Value of Energy (\$32/MWH x (24/36) x 2,700MWH)	\$ 58,000	\$ 86,000
(b) Value of Capacity @70% cap. factor (\$60/KW x (10/40 x 380) KW firm cap.)	\$ 6,000	\$ 23,000
(c) Total Annual Value of Energy	\$64,000	\$109,000

% Reduction in Energy Benefits = \$45,000 reduction/\$109,000
 = 41.3%
 or = 41%

IV. Institutional Concerns and the Need for Protective Legislation

- Background
- What is the Situation at Present?
- Goose River Project - Findings
- Community Relations
- Conflicts in Storage Usage
- Observations

IV. Institutional Concerns and the Need for Protective Legislation

Background

Global type benefits of water power development, such as the reduction of balance of payments deficit, the trading of domestic jobs for overseas oil, the strengthening of the dollar and the reduction of our strategic dependence on overseas energy sources are not yet reflected in the economies of developing small hydro sites. Negative factors are far more real and their impact is both immediate and costly.

It is important to analyze the comparative economic benefits of power and of other uses of water resources in today's environment as the basis for appropriate, legislative action affecting regulatory processes and economic inducements.

The economic benefit of power development, utilizing native energy resources such as water, was at one time given a higher priority than the often competing, leisure time uses of these resources. Protective legislation for and economic incentives to the developers of water power were recognized as necessary and were established as early as 1641 in Massachusetts through the Mill Act. Economic incentives involved the granting of water rights and the abatement of taxes in exchange for developing the energy resource which was the key ingredient in commercial activity through the early part of this century.

The advent of convenient, dependable, and inexpensive energy alternatives, appears to have lessened the relative economic attractiveness of water as an energy resource, and increased the relative value of its leisure time use. Legislation and

IV. (cont.)

consequent regulatory processes, such as Federal Energy Regulatory Commission licensing of even small projects, appear to have reflected this shift in water usage priorities.

The change in energy economics over the past five years has increased the relative attractiveness of domestic energy resources compared to overseas alternatives and, in the case of water resources, increased the relative attractiveness of power compared to leisure time usage.

The Federal Energy Regulatory Commission and other agencies have done much in an attempt to streamline the regulatory process. Unfortunately, these agencies are limited in what they can do by statutory authority. Legislation affecting the power plant licensing process can shift the situation from one of discouraging development as it now does to encouraging development consistent with the increased economic value of domestic energy resources.

What is the Situation at Present?

There are several challenges for those who develop even existing dams and operate them, and these have their roots in the very nature of the resource: you can swim, fish and boat in water; everyone can be a self-professed, instant expert in water resources management; conflicting usage demands exist between such groups as white water canoeists and sailboaters, and downstream fishermen and lakeside cottage owners.

IV. (cont.)

The cost of putting an existing dam back into power usage can be increased significantly if the demands of groups representing non-paying, shared usage interests are fulfilled. In most cases, these demands would not have been made if the dam and impoundment had remained unused.

Intervention in the licensing process, or baseless suits can hurt a small project because of its limited, revenue producing capacity. A small project can support only a minimal allowance for frontend expense overruns such as those due to delays, legal fees, studies and additional impact assessments. As an example of this cost:

Assuming a four year delay, following an outlay of 10% of the total project cost for front end expenses such as licensing and engineering, a cost of capital of 13% per year, and a construction cost escalation of 7% per year, the impact would be a project cost increase of more than 34%.

Goose River Project - Findings

The importance of regulation to the Goose River Project is real. At least 40% of the energy produced will be due to the ability to provide a reliable flow of water.

The Goose River lies below the Swan Lake Dam. Two thirds of the area drained by the river lies above the dam. The project plan will insure that the river is provided a reliable flow of water, at least 80% of the year. If dry weather and low water at the lake dictate a summer cutback in power generation, a

IV. (cont.)

minimum flow will be maintained to lessen the impact on what would otherwise be a dry stream. Recreation usage and commercial fisheries will benefit from this arrangement.

The value of Swan Lake's recreation usage should increase over that of historical and recent experience. The demands upon storage will lessen, and the typical range of drawdown will be reduced to less than 5 feet.

Community Relations

I have received encouragement from officials and individuals in the City of Belfast, location of the 4 power dams. Building permits for the Mill dam and CMP dam stations were issued; the Mill dam station is located in an area which is zoned residential.

The voters of the Town of Frankfort, one of the three towns bordering Swan Lake, authorized their selectmen to negotiate with me. We were to negotiate the terms under which I could develop and operate the town owned dam in the center of Frankfort, located on the Marsh Stream.

The support that the Goose River project has received locally has been a key factor in our ability to put it into operation. The skills and labor of interested individuals was often provided at little or no cost. Liberal trade credit has been advanced at local suppliers. State and local regulatory agencies have been extremely cooperative. CMP, the electric utility, has

IV. (cont.)

provided us technical and business advice, together with displaying great patience during our testing of concepts.

A few objections or concerns were expressed with our operations by individuals living on the Goose River itself, including the ponds. These were from one commercial trapper and two commercial fishermen. Their concerns were with the flow in the river and whether it would be reduced or stopped.

As two thirds the flow comes from above the Swan Lake dam, shutting that dam in summer months was a problem. Regulated river flow would be a benefit to these interests.

Conflicts in Storage Usage

The situation in the Town of Swanville has been somewhat more challenging. Unfortunately, the true nature of the concerns of the parties involved can become obscure and, ultimately, of less importance than the cause for its own sake. This is particularly true when the dispute is over a hundred years old.

The story is somewhat blurred but, apparently, has its roots in the middle of the last century when the privilege to raise the Swan Lake dam by 4 feet was purchased by downstream mill operators. I have been told that some people believed a textile mill was going to be built at the dam. The town was to benefit from the jobs which would be created. For a number of reasons, such a plan is not soundly based. Whether or not there had been any such agreement, the textile mill was not built. Instead, a seasonal sawmill was built at the Swan Lake dam; its operation

IV. (cont.)

was conditional upon non-interference with the stream regulation function of the dam. The chief beneficiaries of the improved stream regulation were the downstream mills in Belfast.

At least three attempts have been made to curtail power storage usage at Swan Lake in favor of recreational usage. Proponents of these attempts will not compromise their objectives, in the slightest, unless other avenues are closed to them. They indicate that they are not opposed to power usage, as long as drawdown is restricted to less than that of established practice. This would further benefit recreational users at the expense of the power user who also happens to be the owner of the water rights. Attempts to effect a compromise, wherein a part of the cost of maintaining the impoundment would be shared by the recreational users in exchange for limiting summer drawdown, have been made by Maine Hydro, but initially, were rejected in the Spring of 1978. It is important to recall that 40% of the project's estimated energy production will be due to the benefits of stream regulation at each power dam downstream.

As of this date, negotiations are underway to equitably resolve the situation. The Appendix contains information regarding the value of the storage to the project, the Petition to Intervene by Swanville residents, and an answer to the petition submitted by Maine Hydro.

IV. (cont.)

Basically, Maine Hydro's proposal is to limit summer drawdown in exchange for some sharing of the costs associated with the Swan Lake development.

The following have enhanced the recreational value of the lake, without cost to its beneficiaries.

- (1) The dam was built and maintained at private expense.
- (2) Taxes on the dam, water rights and property have been paid to the town.
- (3) At the dam, boat launching has been permitted and a recreational area provided.
- (4) A street light has been maintained over the intersection of public roads below the dam at private expense.
- (5) In the driest years, flow from the lake has been reduced during critical summer periods.

The current attempt to restrict power usage began with a fire that, temporarily, did terminate power usage. The ashes had barely cooled following the fire that burned down the Leatherboard Mill in December, 1976, when a petition was prepared by some lakeside residents in Swanville. This was for the purpose of legally establishing water levels at the lake; under Maine Law, this is possible if the river is not in so-called beneficial use. After review of much evidence, the Maine Soil & Water Conservation Commission set the levels which would be applicable when the river was not in power usage. The levels established in the

IV, (cont.)

findings of 4 May, 1977, were:

Maximum - 2.5 feet from the top of the dam

Minimum - 6.5 feet from the top of the dam, except
for accumulating Spring runoff

While under no obligation to do so, Maine Hydro elected to follow these limits which, presumably, were optimal for recreational usage, until relevant issues were clarified and resolved and power stations requiring less water were installed. Maine Hydro's announcement that it intended to put the river back into commercial service followed the setting of the levels by one month.

This change of events has not been well received by those who opposed power usage at the lake. While the proposed project addresses most of the concerns that have been expressed, opposition to the use of the lake continues.

The two newspaper clippings on page IV-9a illustrate:

- (1) An example of the continuing effort, made by Maine Hydro, to allay legitimate concerns with respect to this project.
- (2) An example of a response by one of the most frequently heard opponents to the project.

(1)

Maine Hydro Extends Invitation For Discussion Of Water Issues

Saying that he feels some opponants to his company's proposed hydro-electric power project on Goose River would be "pleasantly surprised if they understood that the project will actually improve recreational usage of the river and Swan Lake," Maine Hydro-Electric Development Corporation President Larry Gleeson has extended an open invitation to anyone interested in discussing the project to visit the Maine-Hydro office this Saturday between 8 a.m. and 4 p.m.

The office is located at the former leatherboard mill office on Mill Lane. Gleeson is inviting people to stop by at their convenience or to telephone the office at 338-2131.

Points To Ponder

Gleeson says that some points which should be considered are that in years of normal rainfall, the lake level will vary by about four and one half feet and that a proposal to safeguard recreational usage at the lake has been made to the Swanville selectmen. That proposal calls for establishing a minimum summer level of five feet below the top of the dam and setting

up a planning committee for future operations.

Gleeson says that the new water wheels that would be installed under Maine Hydro's plan to generate electricity at several of the dams downstream of Swan Lake would use less water than the existing wheel. These would use, "about the same amount of water as the wheel installed in the mill at Sherman's Corner that burned in 1944. That was a day and night operation," Gleeson stated.

Gleeson said that although Maine Hydro closed the gates at the Swan Lake dam for the summer when the level was down just five feet from the top, "a record drought and a vandalized gate caused it to drop much further."

Gleeson said that the gate has recently been overhauled and a third gate has been added for flood protection.

Gleeson said he is looking forward to discussing these and any other aspects of Maine-Hydro's proposed generating project on Goose River this Saturday. No appointment is necessary.

from The Republican Journal 16 November, 1978

(2)

Signs Of Progress

To the Editor:

Goodbye "Give away Bill," so long Senator Greeley, think about it some more Big Jim, drive slow "Mighty Mark," hello some progress for Maine and Waldo County!! Congratulations to the voters of Waldo County, you are finally waking up and voting for the Candidate instead of sticking to party lines like you have since the Year One. This is the way to get rid of the dummies and deadheads who have been bleeding us dry for years, and doing nothing at all for us. Well done!!

After a long dry spell, we are finally going to get something done here in Waldo County; we finally have a team in there that can win for us if we keep in touch with them and keep on coaching them. Let the newly-elected people know what you think, and how you feel about all the issues, and insist that they represent you, like you elected them to do.

By the time this is printed, everyone who wants to will have been given the "Grand Tour" by Maine Hydroelectric; and told of the vast and varied benefits that will be ours by draining Swan Lake completely dry, and using the little outflow to fatten the Gleeson/Thurlow & Co. pockets, at the expense of the property owners and sportsmen who have in the past benefited from having some water in the lake.

When it gets to the point that the water level at the channel at Swan Lake is so low that local drivers use it for a "shortcut," it is a pretty good indication that something is **WRONG** with this use of Public Property. I hope State Senator-elect Melvin Shute can get together with all the interested parties in this matter, and get us some legislation from Augusta that will make them stick to the level that was agreed on at a previous hearing in Swanville. Write to him at Stockton, and let him know how you feel about this gross misuse of water which in truth belongs to the citizens of the State, and not to CMP and their cohorts!

After a few more days of chasing the elusive white tail, there won't be much more doing around here for a while, so if everyone can spare a few minutes a week to check up on their government, and let them know how you feel about things, things will be a hell of a lot better than they have ever been for Waldo County.

I'm Southbound for the winter, but I'll be watching the Journal to see what's going on. Keep up the good work, and if I make it through the mattress, I'll see you in the spring!

Sincerely,

Fred Carroll
Swanville

from the Republican Journal 23 November, 1978

IV. (cont.)

Observations

1. People who purchased the later developed, lake properties which have mud flats for beaches, begin complaining when the lake level is about 3 feet from the top of the dam and continue as the level drops.
2. People who purchased the properties which were first developed and have sandy and/or rocky beaches begin complaining when the level is somewhere around 4 feet from the top of the dam and continue as the level rises.
3. One individual complained that I, on a bright sunny day no less, had caused the level of the lake to rise 2 feet between morning and 2 P.M.
4. Again attesting to the awesome powers of dam operators, one person objected to the time that I, alledgedly, made the lake too shallow at the South end by the dam and too deep at the North end. This poor operating practice was destroying everyone's property values at the same time.
5. The concept of vertical versus slope height has been confused by more than a few, e.g. "the lake is down 30 feet, the lowest I've ever seen it".
6. A massive beaver dam is on the Goose River, less than 1/4 mile below the Swan Lake dam; it backs water right up to the gates of the dam. With only a minimum flow release from the dam, the marsh below it is covered and we receive complaints about flooding the marsh. We have received simultaneous complaints pertaining to the lack of water in the next two miles of marsh and at the leaky Mason's Dam.

IV. (cont.)

7. At times, when I point out that I am following limits established for recreational use of the lake, I have been told that the Soil & Water Conservation Commission doesn't know what it's doing anyway, and that the levels set are no longer good enough.

8. The perceived value of damages to the complaintant is always greater than the comparative value of other uses of the drainage when specific levels or schedules are discussed.

9. The perceived value of the damage to the complaintant is seldom high enough to warrant participation in the expense of maintaining the impoundment or in the expense of compensating for loss of revenues resulting from changes in operating schedules.

10. A highly subjective observation:

The value of the damage to individual complaintants is sufficient to prompt the formation of protest alliances which include groups with incompatible objectives. A sophisticated, special interest group uses its understanding of the nature of water resource projects to form a temporary alliance. This is done for the purpose of magnifying the apparent depth of significant objections. The nature of these projects is such that any realistic design will represent a compromise between several conflicting objectives, and, by definition, will disappoint each individual complaintant to some extent. As long as the need for compromise is not perceived and the examination of specific alternatives is not considered in depth, the protest alliance can be maintained for the benefit of its founders and spokesmen.

V. Operations and Maintenance

- General
- Findings
- O&M Experience
  - Intake/Trash Racks
Figure #1
  - Flume
  - Tail Race
  - Dams
  - People Problems at the Dams
  - Swan Lake Operation
  - Station Logging Procedure
Station Log Description of Entries
Station Log Form
  - Illustrations

V. Operations and Maintenance

General

Few significant problems were encountered during operation of the Mill Dam Station after a two week, or so, run in period. Most problems which did occur were detected while they were still minor. Ironically, the reliable nature of hydroelectric equipment can be dangerous in itself because of its potential for breeding complacency among operators. I would recommend that close attention be paid to the inclusion of control and audit functions, as essential ingredients in an Operations & Maintenance program.

Findings

(1) A station logging procedure, defined in the example following, was established to document operating conditions and exception situations.

(2) A maintenance work order system is necessary and one is being adapted for this operating environment. All work requests are uniquely identified and grouped by station, unit and major component, or the equivalent. Purchase orders, inventory items and man hours can then be tied to work requests and expenses can be distributed in a consistent and auditable manner to plant and equipment. Maintenance planning, maintenance history, budget forecasting and performance analysis functions are facilitated.

(3) Standard and emergency procedures should be planned, documented and easily accessible in the powerhouse, which should be equipped with a telephone.

(4) A small site, starting point, cost assumption is \$7/MWH.

V. (cont.)

O&M Experience

Intake/Trash Racks

The existing wooden trash racks were replaced by steel trash racks in February, 1978. While a somewhat inconvenient time to replace trash racks in Maine, the results were worthwhile.

The wooden rack was vertical and consisted of 1" oak bars on 2" centers. At full gate, the head loss through the rack was about 9". Velocity, with this differential, might have reduced icing but, with the speed, it clogged up with traditional flotsam; it was hard to appreciate the benefit.

Vertical racks have less surface area than inclined racks, increasing their head loss and frequency of their cleaning. Inclined racks seem to collect debris at, or near, the water surface, making cleaning easier.

Deicing the rack was almost always required after the pond dropped. Since only 7 acre-feet are available at the Mill Dam, and the gate adjustments are manual, an ice jam at Kelley Dam, operated just upstream for our daily pondage, would bring the level down rapidly; this occurred about once every two days.

The precipitation in January was snow, but the equivalent of 9.14" of rain, and it was quite chilly. Shortly after midnight in January seems to be the time picked for operations and maintenance incidents by the guiding forces of nature that

V. (cont.)

watch over hydroelectric projects. With the temperature far below zero in the early morning hours, few things are less fun than deicing a vertical wooden trash rack with an 8# hammer. At night, surrounded by snow drifts that white out just about everything, only a black streak of water, extending a foot in front of the frozen rack, is visible.

Seeing the need for an improvement, we designed and welded up the inclined, steel bar rack and installed same in February. Reference Figure #1, the Mill Dam Trash Rack drawing. It works well.

The effective area of the rack was doubled, head loss was reduced to about 3/4", it required less cleaning and cleaned more easily than its predecessor. The top of the rack extends above the operating platform, increasing raking efficiency. The bottoms of the rack sections rest on a piece of R.R. track. Cost of the steel was about \$300.

Trash racks collect many delightful items, and a method for their disposal should be provided. In front of the rack at the Mill Dam is a double float faced with 1" by 12" sheathing. In front of the floats is a chain of 12" logs with one end at the spillway and the other end moored to the upstream bank, forming a shallow angle from streambank to spillway. The objective is to encourage floating debris to go over the spillway (or skimway) rather than

V. (cont.)

into the rack. This arrangement decreases the frequency of rack cleanings.

The geometry of the intake reflects a lack of design experience with such structures. Rather than a bell shaped opening into the penstock, the penstock extends into the forebay. Counter flow turbulence is evident. The end of the penstock should be trimmed back and a concrete bell collar installed in front. Our experience indicates that a lack of expertise in intake design was quite common and that existing intake structures should be reviewed to insure that losses due to hydraulic inefficiencies are minimized.

FIGURE #1

MILL DAM

TRASH RACKS - GOOSE RIVER POWER STATION #1

JAN. 30 1978

V. A. SAWYER

16 BARS END
SECTION ON 1.75" CTRS.

15 BARS OTHER SECTIONS

8'10"
106"

26 1/4"

MATERIAL

H.R. STEEL 1/4" x 1 1/2"

650 LBS

FIGURE #1

V. (cont.)

Flume

Many years ago, a rather short sighted technique was used to patch leaks in flumes, penstocks, etc. This was to lay plank around the inside of the water conduit, then cover the planking with plenty of pitch. The arrangement was secured with bands of wrought iron or, worse, steel. In March, the steel bands let go after half a century, and the turbine attempted to eat the entire arrangement. The controller tripped offline and the cylinder gate would not close off water to the wheel. The Mill dam has no head gate and the operator could not stoplog the intake due to inclement weather and unfamiliarity with the procedure. The Kelley dam was shut and scrap plywood and cardboard used to cut the flow through the rack while the Mill dam pond was lowered.

After dewatering, the inside of the pressure case looked as though six or so old wooden whiskey barrels had found their way inside and then blew up. I climbed in with the eels and, with some effort, removed the mess. The only damage appeared to be three minor chips in the guide vanes. The tailrace contained small blocks of wood, chips and pieces of bitten up steel hoops.

As we had previously placed a reinforced concrete collar around the flume, and pressure case, the interior stave lining had been superfluous and its absence was not a problem.

One should be careful of wooden lined water conduits and remove them at the first opportunity. The head gate can be a useful accessory in the event of lower gate mechanism failure. Operators should be familiar with procedures, including how to get backup assistance.

V. (cont.)

Tail Race

Old tail races should be cleaned and dredged. The expense is minimal and, in the case of low head sites, the effects are significant. We added at least 6" to our net operating head by removing debris from the race. Such maintenance may require permits from state or local authorities, so they should be consulted in advance.

Dams

Repairs to the Mill dam structure have not been required; due to its simplicity and construction, it has few problems. It has neither flood nor head gates, is only 6 feet tall, and sits in a niche about 30 feet wide in ledgerrock. It was faced with concrete on the spillway and upstream face and does not leak badly. The dog gate, used for dewatering during repairs, is closed by 2 x 8 planks laid across its opening in the upstream face; it is a challenge to remove these with any water behind the dam.

Some novel approaches have been used in effecting temporary, low cost repairs to the other dams. Layers of 4 mil plastic covered with fill seem to work well. If the plastic is exposed to sunlight, dark colored plastic should be used to avoid plastic breakdown by ultraviolet radiation.

Two sets of ancient, 1/4 turn release gates were overhauled and reinstalled with new gate frames at the Swan Lake dam. We added a third gate to this dam and now can release about 500 cfs, equivalent to 8"/day during flood threats.

V. (cont.)

Old dams should be inspected by a qualified engineer and recommendations attended to. The operator of a small dam has a clear responsibility to correct deficiencies where these affect the safety of others.

The dams on the Goose River are dry masonry, gravity dams and, with the exception of the one at Swan Lake, are built into ledge rock. The dams are faced with either plank or concrete which is intended to actually hold back the water. A plank water stop is used at the Swan Lake dam, and it appears to be in good shape.

The original construction and early maintenance appear to have been expertly accomplished; more recent work at these and other small dams is less consistent. At Mason's dam, a concrete face was poured over existing plank, with little reinforcement used. The dry wood then rotted and the unreinforced face cracked. It is our feeling that the situation was worsened by the use of heavy equipment in cleaning off the upstream concrete sills. We have attempted to patch some areas, but the base of the dam must be grouted to properly secure it.

For a better understanding of old mill dams, I recommend James Leffel's book, Construction of Mill Dams, originally published in 1881, as a reference. It has been reprinted by the Noyes Press, Noyes Building, Park Ridge, N.J. 07656

V. (cont.)

A further note on operation - the working of gates in winter rain and ice storms is a dangerous necessity. Catwalks and railings should be in place, strong and secure. Handrails are needed around gate platforms, since frozen spray and stormy winds combine to make headworks and accesses treacherous.

Once maintenance is current, the annual maintenance expense per dam should be less than \$1,000.

People Problems at Dams

Projects, particularly when unattended, attract a variety of unofficial shared users. Most projects have an immediate environment which is scenic, relatively secluded and has room to park cars. We have had comparatively few problems at our sites, considering the apparent guest count. However, on those occasions, when minds become pickled and aggression bared, the target of opportunity seems to be the project works. These must be able to withstand considerable abuse without becoming an attractive challenge for more skillful and intensive assaults. Stations should be able to absorb smallarms fire with minor damage.

It is important that projects be visited on a daily basis, and in a manner which establishes the presence of an active interest by its owners. Normally respectable people can behave differently if they feel that a facility is abandoned. At least a second visit, at random times during the night, is helpful in breaking up dangerous patterns at problem locations. A clearly marked vehicle tends to establish your authority at the site and lessens the appeal of its seclusion. All parked vehicles' license numbers should be recorded openly, by date. This is done both for future reference in the event of problems and for the deterrent effect generated by your open ability to identify visitors.

Local law enforcement officials should be contacted immediately in uneasy situations. Many people assume that sites, whether privately owned or not, are community property that they have every right to visit. They may respond to aggressive actions in kind.

V. (cont.)

and be successful in rationalizing their actions. Being right may turn out to be an ineffectual weapon if a confrontation is provoked behind ad hoc enemy lines.

Dangerous areas are not fully understood by people who are unfamiliar with dams. They must be constantly warned away; as soon as you leave, they are back for more. We do not allow swimming or boating from the dams and do not keep this a secret. For drunks and small children, dams can be extremely dangerous places to blunder. Almost every time we inspect one dam we must caution people from swimming from it; they dive, head first, into the few clearly visible rocks just below the surface. In recent years, two people have drowned at these dams and many have been injured. A midnight swim claimed one celebrant; another went swimming between the trash racks and the flood gates and somehow emerged a distance downstream with a few minor scrapes. I cautioned an indignant parent who was teaching a small child how to swim under water. The objective was to swim under the length of a raft he had tied to the bars of the intake screen. What a spoil sport,

This section may be taken lightly by those who have not been exposed to these risks. These situations reflect our actual experience and appear to be common among operators of unmanned, secluded facilities and construction sites almost anywhere. Costs can rapidly escalate, if these risks are improperly managed.

v. (cont.)

Swan Lake Operation

We operated the dam, while testing equipment, from June, 1977, to January, 1978, so as to keep a 6 inch margin below the upper bound established. The gates at the lake were shut in 1978, between June 15th and Labor Day. The east gate leaked, the result of a cracked, cast iron gate frame, due to the unauthorized closing of the gate in the Spring. The operating handle was worked free of the lock and chain by using extreme force and bending the gate shaft to one side on several occasions. The level was close to 5 feet from the top of the dam when we shut the gate; but a record drought and leakage caused the level to drop about 3 feet over the summer. The gates were repaired in October during low water.

From the beginning of our operations in the Summer of 1977, until August, 1978, the water level at Swan Lake was within the limits, legally established as proper for the time when recreational usage was the only consideration.

V. (cont.)

Station Logging Procedure

The Station Log is the basic Operations and Maintenance document for the small site, hydroelectric, generating station. It is used to document all actions taken by authorized personnel, situations which may require maintenance attention, station operating parameters, and maintenance activity referenced to a specific work order identification.

Audit and Control tasks are not specified in this outline procedure but should be defined as per the extent of the users operations.

This procedure is based upon the one used at the Mill Dam, an experimental site. The entries could be simplified for routine operation.

The "Description of Entries" following, describes what is entered on the form and an example, filled in on the form, is referenced; the form is titled "Station Log Form".

STATION LOG - DESCRIPTION OF ENTRIES

(Reference example form)

<u>Reference</u>	<u>Entry</u>	<u>Description</u>
1	Station	This entry identifies station/site for which the log is being kept, e.g. "Mill Dam"
2	Page	Page numbers are sequential for each station, assisting in log Audit & Control function, example "3"
3	Date/Time	Entry establishes when and by whom reading was taken, e.g. 1978 - year 4/18 - month and day 0900 - hour and minute on 24 hour clock i.e. 1800 is 6 P.M. W.B. - initials of recorder
(Powerhouse)		
4	°C	Temperature in powerhouse in degrees celcius; high temperature can indicate an overload condition in generator without internal sensors, e.g. 21°C
5	Head	This entry indicates the measured head at the turbine, at the mid point of the turbine inlet; and can indicate a clogged trashrack condition, the need for a power setting change or for additional upstream releases. This gage reads in pounds per square inch, e.g. 6.5 psi.
6	Vac	This entry indicates the vacuum in the draft tube just below the throat ring; loss of vacuum in our system means that the tail water is partially below the rusty bottom of the draft tube or that a new leak in the upper part of the tube has developed. The readings are in inches of mercury, e.g. 6.
7	Volts/Amps	This metering is from a point between the main disconnect breaker and the magnetic breaker; e.g. 500/120, 500 Volts and 120 Amps; only one phase is metered for current.

STATION LOG - DESCRIPTION OF ENTRIES (cont.)

<u>Reference</u>	<u>Entry</u>	<u>Description</u>
8	Meter #1 KWH DMD	Meter #1 is the power sales meter, the multiplier is written above the meter identifier, e.g. 160; change in readings of this meter are multiplied by this factor, which depends upon the current transformer used, to obtain actual kwh's and kw's. The entry under KWH is reading from the accumulating watt meter, e.g. 0112. The entry under DMD is the highest power level, maintained over a 20 minute period, since the last meter reset; e.g. 0.49, which is 0.49 x 160 or 78 kw.
9	Meter #3 KWH DMD	This meter is the station power meter, indicating power consumed within the generating station; entries are the same described under Meter #1, e.g. 0010/0.01.
10	°C	Temperature outside the powerhouse in degrees celcius, e.g. 19.
11	Presip./ Barom.	Significant precipitation measured at the Mill Dam rain gage is logged here, measured in inches; barometric pressure measured at the site is also logged here, measured in inches of mercury; e.g. 0/30.01 is 0 precipitation and 30.01 barometric pressure.
12	Calculations	(a) The average output since the previous meter reading is calculated here as follows: $\frac{(\text{current reading} - \text{previous reading}) \times \text{multiplier}}{\text{time interval between readings}}$ = output in kwh's this is divided by the time interval between readings to obtain average, hourly output. e.g. 4/17 reading was 0102 4/18 reading was 0112 the difference was 10, therefore: 10 x 160 = 1600 kwh for 24 hours, or 67kw avg.output

STATION LOG - DESCRIPTION OF ENTRIES (cont.)

<u>Reference</u>	<u>Entry</u>	<u>Description</u>
12	Calculations	(b) Any problems encountered or actions taken by the operator are also logged here; the maintenance work order is used to record the details of maintenance activities; in addition, chronic problems can be documented for follow-up. e.g. Restarted unit, tripped during storm.
13	Pond Level	The status of available pondage is entered here as is wasted water information; e.g. SP - the pond is at spillway elevation.

STATION LOG

STATION LOG FORM

STATION:

MILL DAM ①

Page 3

L

X 160

X 160

Date / Time	°C	POWERHOUSE			METER #1		METER #3		°C	Precip./ Barom.	CALCULATIONS		Pond Level
		Head	Vac	Volts/Amps	KWH	DMD	KWH	DMD			KWH sold/avg.	KW output	
1978 4/18 0900 W.B.	21	6.5	6.0	500/120	0112	0.49	0010	0.01	19	0/30.01	4/17 = 0102 @ 0900		SF
4/19 0855 W.B.	23	6.3	6.0	500/120	0119	0.49	0010	0.01	20	0.5"/ 29.95	10 X 160 = 1600 KWH / 24 hrs = 67 KW		SF
4/19 1830 W.B.				0/0							7 X 160 = 1120 KWH 1120 X (1/23.9) = 47 KW		SF
											Restarted Unit - Tripped During Storm		4" water on S
③	④	⑤	⑥	⑦	⑧		⑨		⑩	⑪	⑫		⑬

MHED

Illustrations

- V-19a Mill Development Mechanical Components - Sketch #1
- V-19b Mill Development Mechanical Components - Sketch #2
- V-19c Interior of Mill Development Powerhouse
- V-19d Outboard Thrust Bearing Arrangement

MILL DEVELOPMENT MECHANICAL COMPONENTS - SKETCH #1

MILL DEVELOPMENT MECHANICAL COMPONENTS - SKETCH #2

V-19c

INTERIOR OF MILL DEVELOPMENT POWERHOUSE

OUTBOARD THRUST BEARING ARRANGEMENT

VI. Conclusions

1. Protective legislation and supportive regulatory processes are required if a broad scale development of small sites is to be carried out.

It is clear that individual power developments must be viewed from a broader perspective than they were at the turn of the century and, that power projects must co-exist with other, economically important uses of water resources. Sharing the resource is one thing, but the cost of subsidizing other uses could restrict power development.

Swan Lake's recreational development, including 400 lakeside cottages, took place while the lake was supporting power usage as a storage reservoir. A significant proportion of recreational users are not prepared to accept a compromise to optimal recreational usage if it can be avoided. The limited, revenue producing capacity of small projects translates into the limited ability of these projects to counter even minor and, sometimes, baseless challenges by opponents. This weakness is well understood by legal specialists and can only be countered by legislation and supportive regulatory process. The burden of proof must be shifted from the power project, and the public benefit of hydro capacity must be adequately represented in regulatory proceedings.

Provision to protect power development against the cost of land speculation must also be addressed.

VI. (cont.)

2. Commonly accepted figures as to the minimum capacity of feasible projects did not prove valid in the case of the developments on the Goose River. The results, here, indicate that those figures can be downwardly adjusted under certain operating assumptions. These assumptions include co-dependent systems of stations; the proximity to three phase distribution lines; the use of inherently simple, technical approaches such as induction generators; and the availability of low cost, utility interface equipment.

3. Human factors and operating techniques are important considerations proportionally greater for small hydro site developments than for larger power generation projects. This is due to the lower generating capacity of smaller units combined with the relatively fixed labor requirements shared by both large and small stations. Small site hydro is, comparatively, labor intensive and attention must be given to the allocation of this cost factor.

VI. (cont.)

4. Goose River project experiences have broad applicability. The Goose River is a relatively small stream which drains about 20 square miles of coastal Maine. Unlike most, similar sized streams, the Goose has provided energy almost continuously since before 1835. For some time, the water rights on the river have been operated under the control of a single owner.

In recent years, some residents at the storage lake, opposed to shared power usage, have launched three efforts to restrict lake storage usage.

River operation includes run-of-the-river developments, and also management of daily, weekly, and storage type impoundments.

Sophisticated protests and management of varied types of impoundments will be encountered many redevelopments.

APPENDIX A

Comparison to Former Developments

The proposed project will utilize other existing sites and dams, in addition to the Mill Dam site; wheels of a capacity of 40cfs are proposed, with operation at, approximately, an 80% capacity factor. This would be equivalent to an annual mean flow of 32cfs. The former wheel at Mason's Dam drew 38.4cfs at a 31 foot head; in downstream order from Swan Lake, Mason's is the first power dam in the proposed project. Tax data, circa 1912, indicated that this mill operated day and night, assumed to be two 10 hour shifts, 6 days a week. Under full power, this would be equivalent to an annual mean flow of 32cfs; this equals the proposed project's annual mean flow requirements.

The remaining proposed plants would be downstream and, presumably, would benefit from additional runoff. Former developments at the proposed power dam sites follow as Chart A-1.

CHART A-1

Head	Power Dam	Past Development of Power Dams Included in the Goose River Project
31'	Mason Dam	<u>Sherman & Company Upper Mill</u> Power: Rodney-Hunt, Hunt Francis type 21", installed 1895; 38.4 cfs @ 31' head; burned down 1944 - wheel gone; Circa 1912 tax data: Mill ran day and night.
22'	Kelley Dam	(a) <u>Mason's Pond & Dam</u> was used for pondage only in 20th century had wheel in 19th century (10' head) (b) <u>Robinson's Sawmill & Dam</u> Power: Leffel 52", 40HP @ 12' head per PUC data.
	Unused	<u>B. Kelley & Co.</u> not used since early 20th century sold to Sherman & Company
20'	Mill Dam	<u>Sherman & Company Middle Mill</u> Power: Rodney-Hunt, Hunt Francis 33" installed in 1887; 72 cfs @ 20' head burned down 1976, wheel used today.
79'	CMP Dam	<u>Central Maine Power Company Dam</u> Power: S.M. Smith 27"; installed in 1912 650 HP @ 103' head; water est. 63 cfs; 3,500' penstock; 450 KVA generator; Sold to Sherman & Company in early 1960's, powerhouse at tidal dam not included in sale.

APPENDIX B

Swan Lake Storage Usage Plans / Storage Value

The value of the right to use Swan Lake to provide a constant, reliable flow of water to the downstream power dams has the same basis today as it did in 1854. The right to increase the dam from 6 to 10 feet was purchased back then for \$8,000, which seems like a lot of money for only 4 additional feet. If the same owners were operating all their mills at the downstream dams today, the ability to store extra water at the lake, until it was needed, would mean more energy could be produced each year, reliably, whenever it was needed, using the same water wheels as before. Based upon the retail electrical energy cost today, it would be worth it for them to pay more than \$200,000 for the water rights at the lake.

Chart B-1 illustrates the importance of Swan Lake storage usage to the project. An average yield of 36 cfs is dependent upon an average flow from storage of 12 cfs, about 1/3 the total average yield.

Chart B-2 illustrates a simulation of the effect of an operating plan which includes a summer, minimum level condition. The assumption is that the minimum level is reached on the 1st day in August. Swan Lake drainage assumptions in the simulation are described on Chart B-3.

APPENDIX B (cont.)

Loss of the storage usage at Swan Lake, with installed equipment as per design, would reduce annual energy benefits by about 41%, i.e. \$45,000 annual loss of revenues.

TABLE B - Annual Energy Benefits

	w/o storage	w/ storage (TABLE #1)
(a) Value of Energy (\$32/MWH x (24/36) x 2,700MWH)	\$ 58,000	\$ 86,000
(b) Value of Capacity @70% cap. factor (\$60/KW x (10/40 x 380) KW firm cap.)	\$ 6,000	\$ 23,000
(c) Total Annual Value of Energy	\$64,000	\$109,000

% Reduction in Energy Benefits = \$45,000 reduction/\$109,000
 = 41.3%
 or = 41%

Chart B-4 outlines relevant data concerning Swan Lake storage usage.

Chart B-5 illustrates an example of the Swan Lake storage plan with beneficial usage allocated.

Chart B-6 is the estimated flow duration curve for the Goose River, the estimated portion of the total flow, originating below the Swan Lake Dam, is identified.

Chart B-7 is a lake survey, indicating depths at Swan Lake.

CHART B-1

Flow Augmentation, Natural Flow and Storage Utilization
Based upon August Shutdown and 5% Unscheduled
Maintenance Downtime

	<u>Percent of Days in Year</u>	<u>Natural Flow Utilized fr. Swan L. and Downstream</u>	<u>Flow fr. Swan L. Storage Utilized</u>	<u>Total Flow fr. Swan L., Natural & Storage Utilized</u>	<u>Total Flow Maintained</u>
	30%	40 cfs	0 cfs	10 cfs	40 cfs
	20	31	9	30	40
	20	17	23	34	40
	17	9	31	37	40
August shutdown	8	6	2	4	8 (min. flow maintained)
Unscheduled Maintenance	5				-0-
	100%	24 cfs (Avg)	12 cfs (Avg)	22 cfs (Avg)	36 cfs (Avg)

Average Anticipated Flow is 40 cfs, less 1 cfs for Belfast
Water District and 2.5 cfs due to excess evaporation at
Swan Lake yields approximately 36 cfs average available.

CHART B-2

Simulation - Change in Levels at Swan Lake with August Releases
to maintain minimum flows only

	<u>June</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Period</u>	<u>Annual</u>
1. Natural Flow Available less evaporation losses (cubic ft. per second - cfs)	28.0 cfs	3.3	-1.7	0.9	7.7	21.5
2. Release from Lake to Augment Downstream Flow, plus natural flow component originating from above Swan Lake (cfs)	-19.1 cfs	-35.2	-4.0	-37.0	-23.8	-22.0
3. Net Flow into or out of Swan Lake; Flow Available Less Releases (cfs)	+8.9 cfs	-31.9	-5.7	-36.1	-16.0	-0.5
4. Change in Lake Level from Previous Month (feet)	+0.4 ft.	-1.4	-0.3	-1.6	-2.9	-0.3
5. Change in Lake Level from the End of May (feet)	+0.4 ft.	-1.0	-1.3	-2.9	-2.9	-0.3

CHART B-3

Simulation - Natural Fluctuations in Swan Lake Levels During Summer

Rates of Change in Storage due to Natural Flows and Evaporation,
no releases or other losses considered

	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept</u>	<u>Period</u>	<u>Annual</u>
1. Natural Flow Available (cubic ft. per second per mi. ²) mean daily flows, Actual	2.6 CFSM	0.6	0.2	0.4	Avg 0.95	Avg 2.0
2. Flow Rate into Swan Lake (cubic ft. per second - cfs)	31.2 cfs	7.2	2.4	4.8	Avg 11.4	Avg 24.0
3. Evaporation Rate (inches per month)	1.7 inch	2.0	2.1	2.0	Total 7.8	Total 16.0
4. Equivalent Flow out of Swan Lake due to Evaporation (cubic ft. per second - cfs)	3.2 cfs	3.9	4.1	3.9	Avg 3.7	Avg 2.5
5. Net Rate of Change, Natural Flows and Evaporation (cubic ft. per second - cfs)	+28.0 cfs	+3.3	-1.7	+0.9	Avg +7.7	Avg +21.5
6. Net Change in Lake Level (feet)	+1.2 ft	+0.14	-0.07	+0.04	Total +1.3	Total +11.0

Data Pertinent to Operation of the Proposed Project and
Effects on Swan Lake

Rights to Lake Established

The rights to increase the height of the Swan Lake Dam by 4 feet, to 10 feet in all, were acquired in 1854 in exchange for monetary considerations.

Continuous Use of Rights

Since 1854, the rights have been exercised continuously, with the exception of the period from December, 1976, when the Leatherboard Mill at the Mill dam burned down to April, 1977, when we first tested the damaged wheel.

Drawdown

The extent of Swan Lake drawdown, exercised under the rights, has varied depending upon weather conditions. During years of normal precipitation, only about 50% of the storage would be used, equivalent to less than 5 feet of drawdown.

The Lake

The natural lake is about 80 feet deep; the Swan Lake dam provides an artificial 10 feet of storage on top of this.

The Swan Lake dam is located downstream of the natural lake on the Goose River

SWAN LAKE STORAGE & USAGE PLAN

1. EMERGENCY CONDITIONS MAY REQUIRE MODIFICATIONS TO PLANS - EMERGENCY REPAIRS OR DOWNSTREAM PROBLEMS ARE EXAMPLES.
2. WHEN GATES ARE SHUT A MINIMUM FLOW WILL BE RELEASED INTO THE RIVER - APPROXIMATELY SCFS.

GOOSE RIVER PROJECT

CHART B-6 FLOW DURATION

SWAN LAKE P 1469
 SWANVILLE, SEARSPORT AND FRANKFORT
 TWPS., WALDO CO.
 ELEV 200 FT AREA 1,370 ACRES

SWAN LAKE

Swanville, Searsport, and Frankfort Twps., Waldo Co.

U.S.G.S. Bucksport and Brooks, Me.

Fishes

Salmon	Eel
Lake trout (togue)	White sucker
Brook trout	Minnows
(squaretail)	Lake chub
Smallmouth bass	Creek chub
Yellow perch	Golden shiner
Hornpout (bullhead)	Banded killifish
Smelt	Ninespine stickleback

Physical Characteristics

Area - 1350 acres

Temperatures

Surface - 67° F.

Maximum depth - 87 feet

84 feet - 53° F.

Principal Fishery: Salmon, smallmouth bass

Swan Lake is an intermediate-size lake containing a fair amount of deep, cold, well-oxygenated water. It offers opportunity for both cold water and warm water fish management.

As a result of a long term stocking program, landlocked salmon have become well established and providing reasonably good fishing.

In 1971, togue were introduced to provide an additional cold water fishery. Reports by fishermen indicate the survival and growth of these fish as good. The progress of this new program will be observed and evaluated during the next few years.

The water quality of Swan Lake should be protected by careful local planning to prevent types of developments which could effect the lake.

Surveyed - August, 1941.

(Revised 1953, 1973)

Maine Department of Inland Fisheries and Game

Published under Appropriation No. 4223

CHART B-7
(cont.)

APPENDIX C

Operations Data and Precipitation Analysis

- Chart C-1 1978 Energy Production and KVAR Demand
- Chart C-2 1978 Precipitation by Month - Belfast Water District
- Chart C-3 Cumulative Precipitation - Belfast Water District
- Chart C-4 Swan Lake Dam Water Levels

CHART C-1

1978 Energy Production and KVAR Demand

KVAR	40	0	78	78	78	78	78	6	6	6
KWH sold	18,720	35,360	39,040	46,560	28,800	41,280	15,360	2,400	960	6,080
KWH sta.	3,500	3,500	3,500	3,500	1,800	1,200	500	500	500	1,800
KWH prod.	22,220	38,860	42,540	50,060	30,600	42,480	15,860	2,900	1,460	7,880

CHART C-2

1978 Precipitation by Month - Belfast Water District

	<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>	<u>JUL</u>	<u>AUG</u>	<u>SEP</u>
in./mo.	9.14"	1.45"	3.04"	3.70"	3.12"	2.91"	1.16"	1.38"	0.94"

CHART C-3

Cumulative Precipitation - Belfast Water District

<u>Period</u>	<u>Cumulative Annual Avg</u>	<u>No. of Years</u>	<u>Estimated Variance (s², n-1)</u>	<u>Estimated Std. Dev. (s, n-1)</u>	<u>Cumulative (FEB-SEP)</u>	<u>Avg. Per Month (FEB-SEP)</u>	<u>Avg. Per Month for Year</u>
1952-1977	48.51"	26 yrs	82.25"	9.25"	-----	-----	4.04"
1970-1977	51.83"	8 yrs	79.63"	9.54"	32.40"	4.05"	4.31"
1978 (thru SEP)	26.84"	-----	-----	-----	17.70"	2.21"	2.98 ~~2.54~~ "

1978 SWAN LAKE DAM WATER LEVELS

(JAN - AUG)

Levels at Start of Month

TOP OF DAM

BOTTOM OF DAM

Approximate past upper
& lower water levels
as pictured in the 1977
Svanville Town Report

Soil & Water Conservation Comm.
limits, lake not in beneficial
use (May, 1977)

#1 Maine Hydro reduced
lake water usage

#2 Maine Hydro shut
gates at lake

Leakage & evaporation
losses only since 15 June

(Avg. Storage: 1' =
66,000,000ft.³)

MHED - Aug, 1978

SPEIDEL & CO., INC., FERNWOOD, PENNA.
20X20 TO THE INCH 5, 10, 20TH LINE ACCENTED

CHART C-4

1978

Water Level - Measured as Freeboard from Top of Dam - Feet

JAN FEB MAR APR MAY JUN JUL AUG

Assumptions

1. The average runoff in the Goose River drainage is assumed to be 2.0 cubic feet per second per square mile (CFSM), exclusive of Swan Lake evaporation and Belfast Water District withdraws from wells.
2. The Belfast Water District wells remove approximately 1 cubic foot per second from the drainage area; see also #12 and #15.
3. The drainage area is approximately 20 square miles.
4. The available fall is approximately 202 feet over the length of the river.
5. The drainage above the Swan Lake dam includes about 12 square miles.
6. The drainage above Mason's dam, the power dam at the highest elevation, is assumed to be 20 square miles. The same assumption is used for all downstream power dams.
7. The normal elevation of the Mason's dam impoundment is 189 feet (MSL); the impoundment is called Upper Mason's Pond.
8. The power head, defined as the gross static head, available at each of the power dams in downstream sequence would be:

Mason's	31	feet, pool at spillway elevation
Kelley	22	" " " "
Mill	20	" " " "
CMP	79	" " " "

Total all power dams 152 feet

9. The average volume of water per foot of storage at Swan Lake is assumed to be 60 million cubic feet, or 600 million cubic feet under a ten foot drawdown.
10. The assumed net efficiency of the proposed power plants is 75%, this includes hydraulic, mechanical and electrical efficiency losses to point of energy delivery.
11. Evaporation losses at Swan Lake are assumed to average 16 inches annually, with Summer month evaporation as follows:

June	1.7	inches
July	2.0	"
August	2.1	"
September	<u>2.0</u>	"

Total of Summer months 7.8 inches

12. The average available runoff, net of evaporation and Belfast Water District withdraws is:

<u>From:</u>	20 square miles x 2.0 CFSM =	40 cfs
<u>Take:</u>	Belfast Water District withdraws	1 cfs
	and evaporation at Swan Lake	2.5 cfs
<u>Equals:</u>	Average Available Runoff =	36.5 cfs

13. The evaporation rate, assumed for Swan Lake, was provided in Table #1, page 16, of The Hydroelectric Handbook, 2nd Edition, by Craeger and Justin. The Table was prepared by Adolph F. Meyer and summarizes experimental data collected at Eastport, Maine. While the gaging station readings used for estimating runoff reflected the effects of evaporation in those drainages, the Swan Lake evaporation estimate was applied in its entirety, due to the extent of surface area of the lake.
14. The average runoff data was estimated from a composite of station data from the following U.S.G.S. gages: #01033800, #01021500, #01022500, #01024200. The U.S.G.S. also provided cumulative flow information on these gages. Water Year 1975 was used in the monthly simulation; in this year, flow, averaged between stations, was 12.6% below normal.
15. The Belfast Water District maintains two wells in the Goose River drainage; both are located in the area below Swan Lake dam and above Mason's dam. We have been informed that, due to the nature of the aquifer, from which the water draws, there is no reduction in available surface water. While not wishing to dispute the findings of the engineering study sponsored by the District, we feel it appropriate to risk an error on the safe side and make some allowance for this water loss. We have estimated that withdraws from the wells average 1.8 MGD, annually, equivalent to 2.8 cfs. At this time, we have assumed that the effect of these withdraws would be to reduce available surface water by an average of 1 cfs.

APPENDIX E

BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION
APPLICATION FOR LICENSE FOR MINOR PROJECT
HAVING INSTALLED CAPACITY OF
2,000 HORSEPOWER OR LESS

1. Full name of applicant is Maine Hydro-Electric Development Corporation, a corporation whose post office address is:

Maine Hydro-Electric Development Corporation
P.O. Box 402
Belfast, Maine 04915

Incorporated in the State of Maine with principal office at 72 Winthrop Street, Augusta, Maine 04330, and principal place of business at Mill Lane, Belfast, Maine 04915, which corporation authorizes Lawrence Gleeson, P.O. Box 402, Belfast, Maine 04915 to act as its agent and consents to accept service upon such agent as equivalent to service upon applicant.

2. A concise general description of the project is as follows, and plans of the principal project works are shown on Exhibit L, which is submitted herewith and made a part of this application:

The project described is known as the Goose River Project, and has been designated the FERC Project No. 2804. The project would include developing 430 KW total capacity at five dams, which would produce, approximately, 2,700 MWH's annually. The project is described in sequence by dam, beginning with the uppermost and proceeding down stream.

The Swan Lake Dam will not have electric generation capabilities of itself. This dam is used to maintain water levels in Swan Lake and to regulate downstream flow to the other dams. The dam is of gravity type construction consisting of stone with cemented seams, faced with 12" of concrete. It is approximately 250' long including abutments; maximum height at the center is 10'. It has three 1/4 turn release gates, high, medium and low. A spillway is not used, the high level release gate is the maximum pool elevation giving a gross head of 8'. The gateworks sit on a granite sill with concrete in front. The storage capacity is approximately 7,500 acre-feet; general appearance and condition of the dam are good.

The next downstream dam is Mason's Dam. It is approximately 86' across and 15' high at the spillway. It is of gravity type construction consisting of rock dry masonry with a planked upstream face. The impounding capacity is 1,621 acre-feet with 12" flashboards. A 31' head would be developed with a 160' penstock, utilizing the existing tailrace and wheelpit. Flow through the dam is controlled by two butterfly gates in the center of the dam. The powerhouse would be located 160' downstream from the dam. Construction would include a masonry foundation, wooden frame, with log or metal siding, and asphalt shingle or metal roof. The powerhouse dimensions would be, approximately, 14' by 20' and 12' high. Planned capacity is 75 KW, at an overall 80% efficiency at the normal operating head of 28'.

The next downstream dam is the Kelley Dam. It is, approximately, 135' across with a height of 15' at the spillway; approximate capacity available is 200 acre-feet. Type construction is gravity, built of rock dry masonry on rock ledge with an upstream plank face. Flow is controlled by high, medium and low 1/4 turn butterfly gates. A 22' head would be developed by means of a 305' penstock. The powerhouse would be of same construction and materials as the one at Mason's Dam, with dimensions of, approximately, 15' by 20' and 15' high. Planned capacity is 55 KW, at an 80% efficiency factor at the normal operating head of 22'.

The next downstream dam is the Mill Dam. It is approximately 70' across including abutments, height at the spillway is 6'. It is of gravity type construction, dry masonry on rock ledge with a concrete spillway and upstream face. The spillway comprises 40' of the total length and has flashboard pinholes. It includes a 4' by 4' dog gate closed off with planking. There is an existing corrugated metal penstock, 4' in diameter and 108' long, providing a usable head of 21'. There is an 8' 10" wide and 6' 8" high steel trash rack at the penstock intake; there is provision for stop log placement in front of the trash rack. The powerhouse foundation is poured concrete; it is a wooden framed structure sheathed with construction board and wooden, asphalt shingled roof. Powerhouse dimensions are 16' by 25' with slant roof 12' at the rear and 8' high at the front wall. Access to the powerhouse is afforded by a 4' by 20' railed wooden walkway over the tailrace. The mill pond has a capacity of 7 acre-feet. The capacity, as constrained by the existing water turbine, is 100 KW. The water turbine, installed in 1887, is a Hunt-Francis 33" wheel in a pressure case capable of developing 146 H.P. at 176 R.P.M. under a 21' net head. The main generator is a 125 H.P. asynchronous unit which is driven from the same shaft as the 6.5 KW, self-exciting, station service generator.

The next downstream dam is the CMP Dam. It is approximately 231' across total length and 21' high at spillway level. It is a gravity/buttress type dam of concrete construction. The spillway is 42' long with pinholes for 8" flashboards. The headworks include two double reduction, rack and pinion hoists attached to the wooden release and head gates; these gates are both low level. The impounding capacity is 72 acre-feet. The planned capacity is 200 KW under a 79' normal operating head. This would require the restoration or replacement of 1,100' of the existing plate steel penstock. The powerhouse would be of masonry construction material with construction similar to Mason's and with dimensions of, approximately, 15' by 22' and 12' high.

The degree of regulation of this stream, which drains 21 square miles of coastal Maine, should permit operation of this project at an annual capacity factor of approximately 80%. With the exception of the existing turbine at the Mill Dam site, unit sizing is based upon the mean stream flow which is estimated to be 40 cubic feet per second.

3. The project is located in the State of Maine, County of Waldo, on the Goose River stream, near the towns of Belfast and Swanville, in no National Forest, as shown on the map submitted herewith as Exhibit K, which map is hereby made a part of this application.

4. The lands of the United States which will be affected are: None.

5. None of the project facilities are located in whole or in part on lands of the United States (dam, reservoir, etc.).

6. Permits obtained authorizing the construction, operation and maintenance of the proposed project are as follows:

Building permits from the City of Belfast, Maine, have been obtained for construction at the Mill and CMP dam sites. These are the first two sites in the project that we intend to develop.

The Maine State Historic Preservation Commission has authorized clearance of the project relative to their concerns. Attached is a copy of the letter from Mr. Shettleworth to Mr. Gleeson, 4/21/78, indicating that the project will have no effect upon any structure or site of historic significance.

The State of Maine Department of Environmental Protection has granted water quality certification to the project. They find the project exempt from permit requirements of the Stream Alteration Act and the Great Ponds Act. Water Quality Certification is attached.

7. The project will produce power for use in the diversified capacities served by the local public utility; of the available power output, it is anticipated that 100% will be sold to Central Maine Power Company for their distribution and 0% will be used by the applicant.

8. It is desired to begin construction of the project, starting at the CMP Dam, within one month. It is estimated that construction will be carried on over a two year period and that full operation will be started within one month of completion of project construction.

9. The applicant hereby designates Lawrence Gleeson, whose address is P.O. Box 402, Belfast, Maine, 04915, as its agent and agrees that service upon such agent shall constitute full service upon it for all purposes in connection with any license issued pursuant to this application.

In witness whereof, the applicant has signed this application on the 1 day of JUNE, 1978.

Maine Hydro-Electric Development Corporation

By:

_____
(Name of Applicant)

OK'd JULY 1977

The Goose River measures, at its extreme, approximately 10.25 miles from the North shore of Swan Lake, its major storage impoundment, to its mouth in Belfast Bay. It drains approximately 21 square miles of mid-coastal Maine. Early power development was concentrated on the river's lowest two miles, over which distance a fall of 189' is realized; this out of a total fall of approximately 202' for the entire river inclusive of Swan Lake. An 1835 engineering map of the Goose River shows nine locations where water power potential had been developed.

Unlike most streams of this size, the status of the Goose River as a working river has remained essentially unchanged for at least 150 years. The process of consolidating essential water rights under a single owner was begun in the 1880's; the result is that, now, the excellent regulation potential of the basin has been developed and is available to this project. Development and operation of a co-dependent system of hydro-electric sites, sized approximately to the stream's mean flow, will quite reasonably produce a beneficial effect upon fish and wildlife resources as opposed to the effects of historic usage. The primary difference will lie in stream flow regulation. The stations are to be operated continuously, at essentially fixed power settings, as contrasted with the historic usage situation in which shift/workday/production schedules dictated highly variable power settings and resultant variations in stream flow.

While steep falls at the lower reach of the river and the warm, sluggish nature of its flow through upstream marsh area would be factors in the Department of Inland Fisheries and Wildlife's decision not to request fishways in this drainage, the regulation of flow is likely to enhance the warm water fisheries that exist.

With reference to hunting on the project lands, all power stations are to be located within the city limits of Belfast where the discharge of firearms is not permitted. The storage dam at Swan Lake is located on a lot of approximately one half acre in a built up area which is neither suitable nor safe for hunting.

There would be no objection to fishing on project lands except in those areas where a potential safety hazard exists, such as on the dam itself. Land surrounding the river has diverse ownership so public access to most of it would be more the province of adjacent property owners.

Swan Lake has a history of recreational usage, fishing swimming and boating among them. Public boat landings exist at the lake and we understand that a state park is to be constructed on the north shore of the lake.

The following describes consultations and cooperative efforts with federal and state regulatory agencies interested in fish and wildlife management.

Mr. Gordon E. Beckett, Supervisor of the Division of Ecological Services of the United States Fish and Wildlife Service came to Belfast for an on-site meeting with us to evaluate the Goose River Project. As indicated in his attached letter of 10/27/77, subjects open to further consideration included the effects of water level fluctuations on waterfowl nesting and salmonid spawning, the potential for anadromous fish restoration, and provisions for public access and use of project lands for hunting and fishing.

We forwarded Mr. Beckett's comments and a request for further evaluation to Mr. Charles Ritzi of the Maine Department of Inland Fisheries and Wildlife (Dept. of IF&W) who had previously reviewed our original FERC license application.

Through a series of telephone discussions with Mr. Ritzi in July and August of 1977, we were aware of the early Fall togo spawning time. Although some regulation was suggested, natural weather patterns coincided with the needs of fish spawning. Levels are lowest in August and September, followed by a rise due to rain and snow in late Fall and Winter. We intend to minimize Swan Lake drawdown after October 1 as recommended, although specific conditions, i.e. no rain, may require a further drawdown of the lake. This is necessary for the benefit of downstream fisheries including a commercial bait facility which utilizes the tidal dam at the mouth of the river as well as for the power project. We have discussed this with Mr. Ritzi who recognizes

that specific conditions may necessitate a compromise in ideal environments. While toge are of the main concern, other major fisheries in Swan Lake are landlocked salmon, smallmouth bass and smelt. Below the lake there are warm water fisheries, mainly smallmouth bass and yellow perch.

In late March we contacted the Planning Division of the Dept. of IF&W in relation to waterfowl nesting times on the river. They directed us to Mr. Skip Spencer, a biologist at the University of Maine, who identifies such parameters for the Dept. of IF&W. Mr. Spencer recommended that a high water level be established around April 15th and maintained through mid June; this would discourage nesting within a temporarily stabilized, nesting/brooding, dry marsh perimeter. In mid April the high water level was established for the nesting area which exists in the marsh above the Mason Dam and has been maintained since that time.

MAINE HISTORIC PRESERVATION COMMISSION
242 State Street
Augusta, Maine 04333

Earle G. Shettleworth, Jr.
Director

Telephone:
207-280-2133

April 21, 1978

Mr. Lawrence Gleeson, President
Maine Hydro-electric Development Corporation
P.O. Box 402, Mill Lane
Belfast, Maine 04915

Dear Mr. Gleeson:

In response to your request, I have reviewed your proposed projects relating to five dams on the Goose River near Belfast, Maine, one dam on the Cobbosseecontee Stream in Gardiner, Maine, and one dam on the Little Androscoggin River in Auburn, Maine.

I find that these projects will have no effect upon any structure or site of historic, architectural, or archaeological significance as defined by the National Historic Preservation Act of 1966.

Sincerely,

Earle G. Shettleworth, Jr.
Earle G. Shettleworth, Jr.
State Historic Preservation Off

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Division of Ecological Services
P. O. Box 1518
Concord, New Hampshire 03301

October 27, 1977

Mr. Lawrence Gleeson
Maine Hydro-Electric Development Corporation
P. O. Box 402
Belfast, Maine 04915

Dear Mr. Gleeson:

This letter follows up our on-site meeting of October 13, 1977, with your representative concerning your applications to the Federal Power Commission for licenses for minor projects on the (1) Goose River in Belfast, Maine, (2) Little Androscoggin River in Auburn, Maine, and (3) Cobbosseecontee Stream in Gardiner, Maine. We appreciate your efforts to coordinate with us at this stage in project planning and your willingness to listen to our concerns for the fish and wildlife values involved.

Major subjects that should receive further consideration in project planning and be discussed in the Exhibit "S" include:

1. Effects of project-caused water level fluctuations on fish and wildlife (especially on the Goose River in relation to waterfowl nesting and in Swan Lake in relation to salmonid spawning).
2. Potential for anadromous fish restoration in the river systems involved.
3. Provisions for public access and use of project lands for hunting and fishing.

Please contact us if we can be of any further assistance.

Sincerely yours,

Gordon E. Beckett
Supervisor

PLEASE NOTE ATTACHED SHEET FOR APPEAL PROCEDURES....

Henry E. Warren

COMMISSIONER
289-2811

STATE OF MAINE

Department of Environmental Protection

MAIN OFFICE: RAY BUILDING, HOSPITAL STREET, AUGUSTA
MAIL ADDRESS: STATE HOUSE, AUGUSTA 04333

April 26, 1978

ADMINISTRATIVE SERVICES:
289-2691

BUREAUS:

AIR QUALITY CONTROL
289-2437

LAND QUALITY CONTROL
289-2111

WATER QUALITY CONTROL
289-2591

LABORATORY SERVICES
289-3866

OIL POLLUTION CONTROL
289-2591

REGIONAL OFFICES:

31 CENTRAL STREET
BANGOR 04401
947-6746

415 CONGRESS STREET
PORTLAND 04101
775-6587

634 MAIN STREET
PRESQUE ISLE 04769
764-3737

OIL POLLUTION CONTROL
40 COMMERCIAL STREET
PORTLAND
773-6491

OIL SPILL REPORTS ONLY
(TOLL FREE) 1-800-482-0777

CITIZENS' ENVIRONMENTAL
ASSISTANCE SERVICE
289-2691
(TOLL FREE) 1-800-452-1942

Lawrence Gleeson
Mill Lane, P.O. Box 402
Belfast, Maine 04915

Re: Maine Hydro-Electric Development Corporation
Goose River
Cobbosseecontee Stream
Androscoggin River

Dear Mr. Gleason:

Attached please find Water Quality Certification for the following projects:

Goose River:

Swan Lake - Repair gates
Masons Dam - Rebuild penstock and powerhouse, replank upstream
dam face
Kelley Dam - Install penstock
CMP Dam - Reline penstock, repair Jacks

Androscoggin River:

Barkers Mill Dam - Construct new intake tail race

The Swan Lake and Masons Dam projects are exempt from permit requirements of the Great Ponds Act (38 M.R.S.A. Section 386-396).

The Kelley and CMP Dam projects appear to be exempt from permit requirements of the Stream Alteration Act (12 M.R.S.A. Sec. 2206-12), however, the dredging of the tail race at Mill Dam on the Goose River may require a Stream Alteration Permit.

Project plans should be submitted to the Department of Inland Fish and Wildlife.

The American Tissue Dam on Cobbosseecontee Stream does not require certification because no construction on the streambank or in the streambed is proposed.

Please let me know if I can be of further help.

Sincerely,

Teco Brown
Bureau of Land Quality Control

MAINE

HYDRO-ELECTRIC DEVELOPMENT CORPORATION

Augusta • Belfast

Mill Lane P.O. Box 402, Belfast, Maine 04915
Tel: 338-2131

28 April, 1978

Teco Brown
Department of Environmental Protection
State House
Augusta, Maine 04330

In reference to our Mill Dam site on the Goose River, we will be cleaning sludge and debris out of the tailrace. Most of this accumulated following the fire that previously had destroyed the leatherboard mill at this site.

Our operations will be confined to one bank of the tailrace for a distance of slightly less than one hundred feet.

Langdon Chandler, the game warden in this area, visited the site last summer, reviewed our plans for the site and pointed out the limits within which we may work near the stream bank.

The tailrace is rock lined and we will not be increasing its original depth. Most of the debris and sludge has been removed manually since grease and oil from destroyed equipment, which was accumulating in silt, was creating a pollution problem. Any further removal carried on, whether by hand or machine, would be confined to less than one hundred feet of the south bank.

Please let us know if this will require a Stream Alteration Permit.

Thank you for your assistance.

Yours truly,

Catherine Gleeson

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
AUGUSTA, MAINE 04333

STAFF ORDER

IN THE MATTER OF

MAINE HYDRO-ELECTRIC DEVELOPMENT CORP.   )
Belfast   )
GENERATING STATIONS   )
#08-4287-27010   )   SUMMARY, FINDINGS OF FACT AND ORDER

After review of the request and related materials submitted by the applicant under the provisions of Section 401 of P.L. 92-500, the Federal Water Pollution Control Act Amendments of 1972, the Department finds that:

1. Applicant proposes to remove sludge and debris from tailrace of Mill Dam on the Goose River in Belfast, Maine.
2. The project is exempt from permit requirements of the Stream Alteration Act M.R.S.A. 12, Sec. 2206-12.
3. Water Quality Standards will be adversely affected during the construction stages only.

Therefore, the Department orders that this project be granted certification that there is reasonable assurance that the activity will not violate applicable Water Quality Standards, subject to the following conditions:

1. This certification is conditional upon the applicants continual compliance with all laws, statutes and regulations of the State of Maine, its agencies, municipalities or quasi-municipal organizations relating to the enhancement and protection of the environment.

DONE AND DATED AT AUGUSTA, MAINE, THIS 17TH DAY OF MAY, 1978.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Henry E. Warren

Henry E. Warren, Commissioner

PLEASE NOTE ATTACHED SHEET FOR APPEAL PROCEDURES....

DEPARTMENT OF
INLAND FISHERIES AND WILDLIFE

284 STATE STREET
AUGUSTA, MAINE 04333

MAYNARD F. MARSH
Commissioner

WILLIAM PEPPARD
Deputy Commissioner

May 18, 1978

Mr. Lawrence Gleeson
Maine Hydro-Electric Development Corporation
P. O. Box 402, Mill Lane
Belfast, Maine 04915

Dear Mr. Gleeson:

Our field biologists have reviewed your hydroelectric projects and we would like to make the following comments:

Goose River

Fisheries:

Major fisheries in Swan Lake are landlocked salmon, togue (lake trout), smallmouth bass and smelt. Below Swan Lake warmwater fisheries only of significance, principally smallmouth bass and yellow perch.

We are concerned that water level in Swan Lake is not lowered after togue spawn - drawdown should be completed by October 1. Water level should then not be lowered further prior to May 1.

We do not plan to request any fishways in this drainage and we know of no Department of Marine Resources plans for fishways.

Erosion and sedimentation should be minimized during any construction.

Wildlife:

Primary concern with waterfowl areas. Water levels should be stabilized as near ice-out as possible and held stable until June 15. This is period of nesting and brood rearing.

Sincerely,

Maynard F. Marsh
Commissioner

MFH/CFR:cs

cc: Augusta Headquarters
David Peppard, District Warden
Norman Dean, District Warden
Department of Marine Resources

SWAN LAKE DAM

USGS 15"
Brooks +
Bucksport
Quads.

scale: 1:62500

EXHIBIT K SHEET 1

This map is a part of the application
for a license made by the undersigned
this 1st day of June, 1978

Maine Hydro-Electric Development Corp.

(Name of Applicant)

WANVILLE

USGS 7.5"
Belfast +
Searsport
Quads.

QUADRANGLE LOCATION
scale: 1:24000

EXHIBIT K SHEET 2
This map is a part of the application
for a license made by the undersigned
this 1st day of June, 1978.
Maine Hydro-Electric Development Corp.

[Signature]
(Name of Applicant)

EXISTING
SWAN LAKE DAM
FACING UP STREAM
SCALE 1"=30'

NOTE: ALL ELEVATIONS REF.
TO MEAN SEA LEVEL

THIS DRAWING IS PART OF THE
APPLICATION FOR A LICENSE
MADE BY THE UNDERSIGNED
THIS 1st DAY OF JUNE 1978
BY: James Allen
PRESIDENT

MAINE HYDRO ELECTIC
DEVELOPMENT CORP
BELFAST MAINE

SWAN LAKE DAM

DWN. BY: J. A. SAWYER DATE: 7-16-1978

EXHIBIT L SHEET 1	SHEET
	1 OF 1

FERC No. 2804-3

NOTE: ALL ELEVATIONS REF.
TO MEAN SEA LEVEL

THIS DRAWING IS PART OF THE
APPLICATION FOR A LICENSE
MADE BY THE UNDERSIGNED

THIS DAY JUNE 1978
BY: [Signature]
PRESIDENT

MAINE HYDRO-ELECTRIC DEVELOPMENT CORP.
CMP DAM AND WORKS No. 2 POWER STATION
EXHIBIT L SHEET 5

GENERAL PLAN No 2 POWER STATION

SCALE 1"=5'0"

NOTE: ALL ELEVATIONS REF.
TO MEAN SEA LEVEL

THIS DRAWING IS PART OF THE
APPLICATION FOR A LICENSE
MADE BY THE UNDERSIGNED

THIS 1 DAY JUNE 1978

BY: *[Signature]*
PRESIDENT

SECTION A-A
SCALE 1"=5'0"

0 10 15 20

MAINE HYDRO ELECTRIC DEVELOPMENT CORP BELFAST MAINE	
CMP DAM AND WORKS No 2 POWER STATION	
DESIGNED BY: J.A. SANTORI	DATE: 8-23-1978
EXHIBIT L SHEET 6	SHEET 2 OF 8

FERC No. 2804-B

APPENDIX F

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Maine Hydroelectric
Development Corporation

Project No. 2804

Petition to Intervene
in
Application for Minor License
for Hydroelectric Project

By: Inhabitants of the Town of Swanville, Maine

The Inhabitants of the Town of Swanville, Maine, by and through their attorney, Clifford H. Goodall, Esq., of Lund Wilk Scott and Goodall of Two Central Plaza, Augusta, Maine 04330, upon whom service is to be made, hereby petition to intervene and to be granted the status of a party in these proceedings for the following reasons:

1. The petitioners constitute the municipality of Swanville, in Waldo County, State of Maine.

2. The application requests a license for the rehabilitation of five consecutive hydroelectric developments on the Goose River including developments in the Town of Swanville.

3. Swan Lake, the major reservoir for the five proposed hydroelectric projects is located with a majority of its surface area and volume, in the Town of Swanville and the outlet dam is within the Town of Swanville as well as a portion of Goose River.

4. The perimeter of Swan Lake is intensely developed with primary residential dwellings and seasonal dwellings with the bulk of this development being within the Town of Swanville.

5. Swan Lake is used intensively by its inhabitants, residents, and property owners of the Town of Swanville including but not limited to, recreational boating, swimming, fishing, waterskiing, sailing, and general recreation during the spring, summer and fall months; fishing, skating and snowmobiling during the winter months.

6. Swan Lake is the only lake of any importance in the greater Belfast area.

7. Swan Lake, with its impounded waters supports a ground water table which is utilized by the inhabitants and property owners of the Town of Swanville as their primary source of potable water and in addition this ground water table within the Town of Swanville is also the source of water for the public water system serving the City of Belfast. If the proposed hydroelectric projects unreasonably draw down the water levels of Swan Lake, these sources of public and private water supplies will be destroyed.

8. The inhabitants of the Town of Swanville who live around the perimeter of Swan Lake also use the lake water for domestic purposes. If the water level of the lake is unreasonably drawn down, their water systems will be destroyed.

9. The drawing down of the water levels of Swan Lake during the periods of intensive recreational uses will destroy the public recreational values of Swan Lake and the property values of the residential property on its perimeter.

10. The Town of Swanville receives sixty percent of its property tax revenues from the residential developments around the perimeter of Swan Lake. If these properties are degraded in value by the draw down of the water levels of Swan Lake, the property tax basis of the Town of Swanville will be substantially reduced.

2-F

11. There are privately owned and operated marinas located on Swan Lake and their economic survival is threatened by the proposed hydroelectric projects and resulting water level changes.

12. The Swan Lake - Goose River water shed, located within the limits of the Town of Swanville, supports and maintains an active wildlife population including, but not limited to, fisheries and waterfowl. The lowering and raising of the levels of the water in Swan Lake - Goose River, and the wetlands abutting the lake and river threatens these fisheries and waterfowl habitats.

13. The Goose River watershed is not sufficient in size and volume to support the proposed hydroelectric projects assuming the unlimited availability of all its water nor is it sufficient to support the proposed hydroelectric projects in a manner which will not unreasonably interfere with the other private and public uses and benefits of the watershed by the inhabitants of the Town of Swanville.

14. The application is for "the rehabilitation" of five consecutive developments on the Goose River suggesting that there are former and still existing hydroelectric developments. In fact, the proposal is for the conversion of some developments which were hydropower projects used for mechanical power to operate small mills on a limited basis and this applicant is proposing to convert them to hydroelectric generating facilities and to utilize the watersheds' waters in a manner and volume for which it has never been used and for which it does not have the capacity to be used.

15. The applicant has not provided a reasonable and objective comprehensive plan for optimum coordinated development of the entire waterway with existing and future uses as required by 16 USCA §797 and 803(a)..

16. The applicant has not provided an adequate evaluation of the impact of the proposed projects on the fish and wildlife of the area as required by 16 USCA §797.

17. The applicant has not and cannot demonstrate that the proposed hydroelectric power project will be in the public interest, including but not limited to, alternate sources of power, public interest in perserving recreational uses of fisheries and the protection of wildlife as required by 16 USCA §797.

18. The applicant does not and cannot provide for an adequate regulating of the flow in the streams below the projects dams for the reasonable and adequate protection of riparian property owners, fisheries and wildlife, and the inhabitants of the Town of Swanville as required by 16 USCA §797.

19. The Swan Lake - Goose River currently provides a unique recreational use which is greater in public benefit than the proposed use of the lake and river for water power development and hence this license should be denied pursuant to 16 USCA §797.

20. Goose River is a navigable river pursuant to the 16 USCA §791 et seq. and the applicant has not made adequate provision for the navigation of the river by the public and riparian owners.

WHEREFORE, the Inhibants of the Town of Swanville petition to be granted the status of a party in these proceedings and that a public hearing be held in order that the issues raised in this

petition can be fully heard in opposition to the granting of the application as applied for.

DATED: November 3, 1978
Augusta, Maine

LUND WILK SCOTT & GOODALL

Clifford H. Goodall,
Attorney for the
Inhabitants of the Town
of Swanville

CERTIFICATE OF SERVICE

I certify that I have this day served the foregoing document upon the Maine Hydroelectric Development Corporation, c/o Lawrence Gleeson, Mill Lane, P. O. Box 402, Belfast, Maine 04915 and the Federal Energy Regulatory Commission at its office located at 825 N. Capital Street, N.E., Washington, D.C. 20436 by depositing in the United States Mail, postage prepaid, certified mail, return receipt requested.

Dated at Augusta, Maine this third day of November, 1978.

LUND WILK SCOTT & GOODALL

Clifford H. Goodall

Of counsel for
Inhabitants of the Town of Swanville

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Maine Hydro-Electric
Development Corporation

Project No. 2804

Answer to
Petition to Intervene
in
Application for Minor License
for Hydroelectric Project
Submitted by
Inhabitants of the Town of Swanville, Maine

By: Maine Hydro-Electric Development Corporation

Maine Hydro-Electric Development Corporation (MHED Corp.) objects to the granting of intervention because (1) the proposed improvements to this long existing project will not only increase domestic energy supplies, but will improve the project's recreational usage as well; (2) intervention proceedings are likely to increase, unnecessarily, the cost of the improvements without offering any reasonable potential for compensating public benefit; and (3) the project conforms with all State laws.

In addition, MHED Corp. offers the following points in support of its objection to this action:

1. Recreational usage at Swan Lake has been compatible with power usage. The intensive recreational development of Swan Lake has been accomplished with the lake under long established power usage, serving primarily as a storage reservoir for downstream power developments, including one commercial hydroelectric project. The period between December, 1976,

and June, 1977, was, to our knowledge, the only break in continuity of power usage since 1854. The existence of intensive recreational development at Swan Lake should amply demonstrate its compatibility with power usage.

2. An equitable proposal has been made to the Swanville Selectmen which should safeguard recreational interests.

The proposal includes establishing a minimum summer level and a process for handling future concerns. A copy of the proposal is attached as Exhibit #1. It also requests that a portion of the cost of maintaining the impoundment be shared by beneficiaries of its recreational usage. The assumption is that the cost of a modification in storage usage should be assumed by the beneficiary of the modification when it reduces the value of the storage to its owner. The alternative to this assumption being confiscation of property without just compensation.

3. The water requirements of the proposed project are consistent with successful, conservative past practice for similar operations.

The new wheels, to be installed at each power development, will utilize water at approximately the same rate as did the wheel formerly used at the Mason's dam site, uppermost of the proposed power developments. This mill, which burned in 1944, operated round the clock, six days a week. A commercial hydroelectric project operated for more than 50 years at the CMP dam site, lowermost of the proposed developments. The

wheel at this former hydroelectric development could utilize water at one and a half times the rate assumed in the proposed project. Past developments of the project sites are described in Exhibit #2.

4. Swan Lake is but one of several freshwater recreational developments in the Belfast area; the lake's recreational benefit, therefore, is not unique.

A significant example lies within fifteen miles of Belfast; this is the Megunticook recreational area. It is more intensively developed than Swan Lake, and it has long supported both recreational and power usage; it has about the same size drainage area as Swan Lake. The outlet of Megunticook Lake is controlled by the Knox Woolen Company which uses the lake for storage in order to regulate the flow of water to the company's water powered mill in Camden. Exhibit #3 describes some freshwater impoundments supporting significant recreational usage in the Belfast area.

5. MHED Corp.'s operating policy has been to observe the levels set by the Maine Soil & Water Conservation Commission until issues concerning the proposed project have been resolved.

The effects of a vandalized gate and a record drought caused the lake to fall below the minimum level of 6.5 feet from the top of the dam in August, 1978. Up until that time, levels remained within the limits set by the State. In anticipation of a dry summer, the lake was shut in the middle of June with the level 5 feet below the top of the dam; at the

start of commercial operations in January, 1978, the level was about 3 feet below the top of the dam. The levels set, presumably optimal for recreational usage only, were: maximum, 2.5 feet from the top of the dam; minimum, 6.5 feet from the top of the dam. A copy of comments made by the executive director of the Maine Soil & Water Conservation Commission is included as Exhibit #4.

6. Environmental Impact Statements are not required in applications for projects of less than 1,500 KW capacity.

Exhibit S in the license application deals with environmental concerns and indicates MHED Corp.'s compliance with requirements of appropriate State agencies. Recent requirements for adequate sewage facilities, however, have affected the value of lakeside properties. The Maine Department of Inland Fisheries & Game had expressed concern about the need for careful local planning to prevent types of developments which would adversely affect the water quality of the lake. Marine Resources officers have investigated recent complaints of illegal waste discharge into the lake; evidence of raw sewage has been noted near the south end of the lake. It is felt that this situation has been aggravated by the increased number of conversions of seasonal vacation properties to year round residences. Such conversions can overload sewage facilities and affect the lake shore, even though these facilities may not discharge directly into the lake.

DATED: November 17, 1978
Belfast, Maine

MAINE HYDRO-ELECTRIC
DEVELOPMENT CORPORATION

Lawrence Gleeson
President

MAINE HYDRO-ELECTRIC

DEVELOPMENT CORPORATION

MILL LANE, P. O. BOX 402

BELFAST, MAINE 04915

207-338-2131

6 November, 1978

Robert Osborne
1st Selectman
Town of Swanville
Swanville, Maine

I hope that the following will clarify our perspectives on river operations. Perhaps, we will be close enough on some points to reach agreement in the near future, and can agree on a method of resolving the more difficult issues later.

We recognize the concerns of the people who have invested in properties around Swan Lake and the importance of the taxes that these people pay to the towns with frontage on the lake. We trust that these people, in turn, will respect the purchased rights under which the Swan Lake dam has been operated since the middle of the last century and will understand their value to us.

The lake's dam is operated for the purpose of increasing the reliability of the river's flow. Reliability is almost as important to a power project as the actual amount of water that comes downstream in a year. In 1854, the privilege of increasing the height of the dam by four feet was purchased by the downstream mill operators for \$8,000; in 1978, the rights to the lake would be worth more than \$200,000 to the operators of running mills downstream.

Any plan which is to work must equitably address the interests involved.

In advance of more suitable arrangements, Maine Hydro might agree to limit its usage of Swan Lake waters next year, between June 15th and Labor Day, if the lake level fell lower than 5 feet from the top of the dam. This is about 4 feet higher than it is at present. A minimum flow, only, would be released from the lake under these conditions which would amount to about 5 cubic feet per second.

EXHIBIT #1

(cont.)

Robert Osborne

11/6/78

Page 2

A minimum flow of 5 cfs, combined with normal evaporation and weather conditions, would be expected to cause the level to drop less than a foot over the period.

Alternatives might include limiting the range of drawdown all year or suspension of our operations during August.

In return, other parties to benefit might assume responsibility for the street light which Maine Hydro has provided at the intersection of the public roads immediately below the dam, and they might lease the dam in the summer for the equivalent of the taxes levied on the Swan Lake dam and water rights which would amount to less than \$1.25 per lakeside cottage.

In the long run, we feel that the development of an effective plan should include the participation of a committee of interested parties. The objectives would be to:

- (1) Plan the operation of the river with equitable consideration given to all its users.
- (2) Compensate and assess parties fairly to insure implementation of the plan.
- (3) Inform all concerned as to:
  - (a) the plan, what's going to happen and why
  - (b) the schedule, including changes caused by such things as weather and emergencies
  - (c) how to get their questions answered.

I would like to meet with you in the near future to discuss this.

Yours truly,

Lawrence Gleeson

LG:cg

EXHIBIT #2

Comparison to Former Developments

The proposed project will utilize other existing sites and dams in addition to the Mill dam site; wheels of a capacity of 40 cfs are proposed, with operation at approximately an 80% capacity factor. This would be equivalent to an annual mean flow of 32cfs. The former wheel at Mason's dam drew 38.4 cfs at a 31 foot head; in downstream order from Swan Lake, Mason's is the first power dam in the proposed project. Tax data, circa 1912, indicated that this mill operated day and night, assumed to be two 10 hour shifts, 6 days a week. Under full power, this would be equivalent to an annual mean flow of 32 cfs; this equals the proposed project's annual mean flow requirements.

The remaining proposed plants would be downstream and, presumably, would benefit from additional runoff. Former developments at the proposed power dam sites follow as Chart A-1.

CHART A-1

<u>Head</u>	<u>Power Dam</u>	<u>Past Development of Power Dams Included in the Goose River Project</u>
31'	Mason Dam	<u>Sherman & Company Upper Mill</u> Power: Rodney-Hunt, Hunt Francis type 21", installed 1895; 38.4 cfs @ 31' head; burned down 1944 - wheel gone; Circa 1912 tax data: Mill ran day and night.
22'	Kelley Dam	(a) <u>Mason's Pond & Dam</u> was used for pondage only in 20th century had wheel in 19th century (10' head) (b) <u>Robinson's Sawmill & Dam</u> Power: Leffel 52", 40HP @ 12' head per PUC data.
Unused		<u>B. Kelley & Co.</u> not used since early 20th century sold to Sherman & Company
20'	Mill Dam	<u>Sherman & Company Middle Mill</u> Power: Rodney-Hunt, Hunt Francis 33" installed in 1887; 72 cfs @ 20' head burned down 1976, wheel used today.
79'	CMP Dam	<u>Central Maine Power Company Dam</u> Power: S.M. Smith 27"; installed in 1912 650 HP @ 103' head; water est. 63 cfs; 3,500' penstock; 450 KVA generator; Sold to Sherman & Company in early 1960's, powerhouse at tidal dam not included in sale.

EXHIBIT #3

Some Freshwater Impoundments Supporting Significant
Recreational Usage within 20 Miles of Belfast ..

<u>Lake or Pond</u>	<u>Surface Area *</u>
Megunticook Lake	2.40 mi. ²
Swan Lake	2.36
St. George Lake	1.60
Quantabacook Pond	1.24
Pitcher Pond	1.04
Alford Lake	0.96
Crawford Pond	0.90
Sennebec Pond	0.79
Stevens Pond	0.60

* Source: State Water Storage Commission's Fourth Annual Report

SWCC Doesn't Have Jurisdiction Over Swan Lake Water Levels

To the Editor:

It has come to my attention that several articles on the Swan Lake drainage and recent water level problems have appeared in the Republican Journal.

As you know, the Soil and Water Conservation Commission, under the Neglected Dams Act (MRSA, Title 12, Chapter 6) held a hearing and established a water level for Swan Lake on May 4, 1977 (copy of finding of fact and order enclosed). Under the provisions of the Neglected Dams Act, the Commission has jurisdiction over all dams 2 feet or more in height, but dams used for a beneficial use are clearly defined as not being under the jurisdiction of this law (copy enclosed). Once the owner or his agent uses the dam for a beneficial purpose, generating hydroelectric power being one such purpose stated in the law, the legal jurisdiction of the Commission is ended.

I have received several telephone calls from littoral owners and one from State Representative Melvin A. Shute and explained the Commission's position to them.

On June 9, 1977, Mr. Laurence Gleeson, President of Maine Hydroelectric Development Corporation, informed us of his intention to make commercial use of the Goose River Dams. He also stated at that time that he would observe the Commission's water level until after Labor Day. To the best of my knowledge, he did that.

In my conversations with the littoral owners and Mr. Shute, I offered to sit down with Mr. Gleeson and try to work out a solution beneficial to all parties and Mr. Gleeson's commercial operation. The Commission has no legal authority to force Mr. Gleeson to do anything, but I am willing to discuss the matter with him in an attempt to reach an agreeable solution. Just thought I would attempt to set the record straight.

APR 13 1978

Frank W. Ricker
Executive Director
Maine Soil & Water
Conservation Commission

CERTIFICATE OF SERVICE

I certify that I have this day served the foregoing document upon the Inhabitants of the Town of Swanville, c/o Clifford H. Goodall, Lund Wilk, Scott & Goodall, Two Central Plaza, Capitol & Sewall Streets, Augusta, Maine 04330, their Attorney, and the Federal Energy Regulatory Commission at its office located at 825 North Capitol Street, N.E., Washington, D.C. 20426 by depositing in the United States Mail, postage prepaid, certified mail, return receipt requested.

Dated at Belfast, Maine, this seventeenth day of November, 1978.

MAINE HYDRO-ELECTRIC
DEVELOPMENT CORPORATION

Lawrence Gleeson
President

Swan Lake Dam Fire Regarded Typical Of Unwillingness To Discuss Issues

11/5/79

The motive for an apparent act of arson at the Swan Lake dam in Swanville may never be known for certain, but Larry Gleeson, president of Maine Hydro Electric Development Corp., lessee of the dam, believes the

incident is related to the continuing controversy over control of water rights of the lake and Goose River.

Fire Chief James Richards told the Journal that the Belfast Fire Department responded to a telephone call from a "Mrs. Newcomb" at 9:35 p.m. Friday that the dam was afire.

Quickly Extinguished

A tanker and the department's new pumper were dispatched to the dam, where firemen were able to quickly douse a blaze on the wooden trestlework above the dam gates.

Richards said that by the time he arrived on the scene himself the fire had been extinguished. A fireman reported that the odor of a flammable material, possibly kerosene, was evident when they arrived at the fire, Richards said.

Richards said the fire caused little or no damage to the dam.

Asked if the fire was being classified as arson, Richards said yes, but that no report had been made to the State Fire Marshal's Office as of Wednesday morning.

Reports are not made to that agency "unless the property owner or the insurance company requests it. Up to now, I haven't heard anything from anyone," Richards explained.

Last To Know

Gleeson, who had been unexpectedly called out of state early Saturday, heard nothing of the incident until he returned to Belfast on Tuesday afternoon.

In a conversation with the Journal Tuesday evening, Gleeson said the act was typical of Maine Hydro's critics' attitude of

unwillingness to discuss the issue of use of the water with the company.

Maine Hydro has been generating electricity at the former Sherman and Co. mill site on Goose River for nearly a year and is presently in the process of applying to the Federal Energy Regulatory Commission for a license to install generators at three additional dams on Goose River.

Some residents of Swanville and property owners around Swan Lake have blamed Maine Hydro's operation for excessively low water levels at the lake last summer and fall, and the Town of Swanville has been requested to formally intervene in Maine Hydro's license application consideration.

Damage Slight

Gleeson said that when he inspected the dam on Tuesday afternoon, it did not appear that any serious damage had been done by the fire. "The gate handles were blackened, but the wood itself is pretty well soaked with water and frozen and apparently didn't burn very much," he reported.

He did notice that someone has thrown more rocks in front of the gate, however, which is a recurring problem. He said that on one occasion when he was removing rocks that had been thrown in front of the dam, he had had rocks thrown at him, as well.

Gleeson said he feels the tone was set for his critics by a remark at a town meeting on the subject made by Selectman Ron Woods to the effect that "there are only two possible solutions" to the controversy — either through the courts or through the legislature.

Gleeson feels that an obvious third

alternative — that of negotiation and compromise — has been totally ignored by his opponents, though he has suggested it repeatedly.

"I haven't heard any level-headed voices from among those people yet," he stated. "It doesn't seem like we're able to get to first base."

The fire, he said, perpetuates the "Let's not negotiate" attitude of his opponents. "But," he added, "That's not the way to get solutions, that's the way to get problems."

Requests Investigation

When contacted again on Wednesday morning, Gleeson said he was surprised that the fire was not being investigated as arson as a matter of course, but that he would request Chief Richards to do so immediately.

"This definitely needs to be followed up. Not only is there the question of destruction of commercial property, but if the gates in the dam become inoperable, there would be a grave threat to the safety of people living downstream," he remarked.

Other Fires

Belfast firemen also responded to two fires at commercial properties in Belfast during the past week.

Shortly before midnight last Wednesday, January 3, Mike's Appliances & Miscellaneous Sales on Waldo Avenue sustained serious fire, smoke and water damage when a fire broke out in the workshop of the building.

Chief Richards reported that the fire apparently started in a work area, near the floor on a back wall. A console television set in that location was severely burned and

(See FIRES, Page 2)

There's A Lot More Inside The Journal ...

Home Births

An increasing number of parents, wanting more control over the birth of their children, are planning to have babies at home. Denise Goodman talks to one couple who recently had a baby at home and to area doctors who have varied thoughts on the subject. Page 11.

Marketbasket

Local food prices held steady this month and actually showed a decrease over costs six months ago, largely the result of major drops in the price of produce which is now in season. Page 11.

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REPUBLICAN JOURNAL

MAINE, THURSDAY, JANUARY 18, 1979

Swan Lake Update

Dam Fire Being Investigated; Town To Hold Powwow Monday

As the Waldo County Sheriff's Department and State Fire Examiner's Office investigate the January 5 arson incident at Swan Lake Dam, other developments in the controversy over control of the water levels of Swan Lake and Goose River continue to unfold.

Maine Hydro-Electric Development Corp. president Larry Gleeson and Belfast Fire Chief James Richards visited the dam last Thursday, where an inspection led them to conclude that the blaze there had been caused by some sort of incendiary device.

Richards told the Journal this week that the fire involved the use of "some type of flammable material," and that State Fire Inspector Ron Evans has been called in to investigate the incident, along with the local sheriff's office. "We have just a few leads, but nothing definite at this point," Richards said.

Gleeson said that the fire apparently was the result of a gasoline explosion, set off with some sort of detonating device — possibly gunpowder.

Clarified Position

Although Gleeson does feel that the incident is likely linked with opposition to his present and future plans for utilization of the watershed for hydroelectric generation, he stated that he wishes to clarify the impression some readers of last week's ac-

count in the Republican Journal may have formed.

Gleeson said he did not feel the incident in itself is typical of the thoughts or actions of the people of Swanville as a group, as the Journal story may have implied. "I'm not taking on the entire town. A lot of people up there have been pretty straightforward with me," Gleeson said, adding, "I wasn't putting them all in the same bucket."

Gleeson went on to say that he believed the environment created by the town's failure to respond to alternative solutions to the differences of opinion between Swanville and Maine Hydro, as suggested by him, increases the likelihood of such an incident.

(A further explanation of Gleeson's position, in his own words, appears in a letter to the editor on page 4.)

Swanville Selectman Robert Osborne has condemned the incident, saying the selectmen "are very definitely opposed to this sort of act. It is very irresponsible, unnecessary and it certainly isn't going to help our cause at all."

Meeting Called

The "cause" of the Swanville selectmen is basically to assure a minimum level below which the waters of Swan Lake may not be drawn.

To that effect, Osborne announced that the town is taking action on two fronts.

1/18/79
To the Editor:

Any implication that I consider an illegal firebombing typical of the acts of Swanville residents is incorrect.

I do believe that the nature of the continued controversy has increased the likelihood of such incidents and, also, that rumor and sometimes, misleading information about our attitudes and intentions have not helped us to resolve water issues.

Many residents who value their usage of the lake have taken the time to reasonably discuss their concerns with us.

It appears that arson was committed with an incendiary device and should be investigated. Chief Richards has been most cooperative in this effort and for this receives my thanks.

Lawrence Gleeson
Maine Hydro-Electric
Development Corp.

Wrong Impression (from page 4)

First, the town has been granted official status as an intervenor in Maine Hydro's application to the Federal Energy Regulatory Commission for a license to install generators at three additional sites on Goose River.

Osborne said he was informed of the decision by the town's attorney, Clifford Goodall, late last week. To update citizens, Osborne said, a special informational meeting has been set for June 22, 7 p.m. at the Kermit Nickerson School.

Goodall and hydrologist Robert Gerber will be present at the meeting to explain the town's planned course of action and to answer questions from the public, Osborne said.

Gerber has completed a survey of the lake and its watershed which indicates, Osborne said, that there is insufficient water flow to support the hydroelectric installations as described in Maine Hydro's license application.

The second route being pursued by the town is through the Maine Legislature, Osborne said. At the request of the town, Senator Melvin Shute of Stockton Springs has introduced a bill which would limit drawdown of the lake waters to a point no lower than six feet from the top of the dam, he reported.