MASTER

HYDROELECTRIC FEASIBILITY STUDY

CHUBB RIVER SITES

VILLAGE OF LAKE PLACID , N.Y.

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NEW YORK STATE
ENERGY RESEARCH AND DEVELOPMENT AUTHORITY
ALBANY, NEW YORK

SUBCONTRACT NO. 1 TO PRIME CONTRACT NO. EW-F-07-1771

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JANUARY 1979

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HYDROELECTRIC FEASIBILITY STUDY
CHUBB RIVER SITES
VILLAGE OF LAKE PLACID, NEW YORK

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HYDROELECTRIC FEASIBILITY STUDY
CHUBB RIVER SITES
VILLAGE OF LAKE PLACID, NEW YORK

SECTION 1 - INTRODUCTION

1.01 Historical Background

The Village of Lake Placid in Essex County, New York, owns an Electric Power system which serves residential, commercial, and industrial customers in the Village of Lake Placid and portions of the Town of North Elba. All electrical power is presently purchased from the Power Authority of the State of New York and the Village benefits from the relatively inexpensive hydroelectric power generated at the Power Authority's St. Lawrence Power Project. The Power Authority has informed the Village, however, that no additional hydroelectric power will be made available to the Village, and that all increases in the Village's power requirements will be met by the Power Authority's Fitzpatrick Nuclear Plant. The cost of the Fitzpatrick power will be substantially greater than the cost of the St. Lawrence Hydro power, and the Village of Lake Placid has been considering installing its own hydroelectric generating facilities. The Village owns two dams located on the Chubb River, a tributary to the West Branch of the Ausable River. These dams are known as the Mill Pond and Power Pond dams. Photographs of the two dams are included as Figures 1-1 and 1-2. Both dams were once the sites of hydroelectric generating stations, however the stations and equipment fell into disrepair and most of the equipment has been sold or discarded.

Encouraged by recent federal and state programs relating to low head hydropower, the Village applied for funds for a feasibility study regarding the installation of new generating equipment at its two dams. Funds were awarded and have culminated in this study.

1.02 Scope

The principal objective of the feasibility study is to determine if the reinstallation and reactivation of hydroelectric generating facilities at the two Village owned dams is technically, environmentally, and economically feasible. The study includes a description and evaluation of the conditions of the existing facilities, an estimate of the potential generation at the two sites, a review of regulatory requirements, an economic analysis, and an implementation schedule for installing the facilities. The results of the study are summarized in Section 9.

1.03 Funding

In December, 1977, the Department of Energy, Idaho Operations Office, issued a Program Research and Development Announcement (PRDA) relating to hydroelectric feasibility studies at existing dams with heads of less than 20 meters. The two dams owned by the Village of Lake Placid met the requirements of the PRDA and a Proposal was prepared. The Proposal was a group effort involving the New York State Energy Research and Development Authority (NYSERDA), the Village of Lake Placid, and O'Brien & Gere Engineers, Inc. NYSERDA coordinated the Proposal preparation and prepared the final submittal, O'Brien & Gere Engineers prepared the technical Proposal, and the Village furnished legal and historical information. Funds for the feasibility study were granted

by the Department of Energy, and additional funding was furnished by
NYSERDA. Thirty-seven percent of the project was funded by the
Department of Energy, sixty-three percent was funded by NYSERDA.

SECTION 2 - HYDROLOGY

2.01 General

The Mill pond and Power Pond Dams are located about one third of a mile apart on the Chubb River. The drainage area upstream of the dams is approximately 40 square miles and lies within the "High Peaks" region of the Adirondack Mountains, which is typified by steep, tree-covered terrain. The Chubb River drainage basin is divided into two sub-basins with different hydrologic characteristics. The southern part of the basin has an area of approximately 21 square miles and contributes runoff and groundwater flows directly into the Chubb River. The northern portion of the basin has an area of about 19 square miles and is dominated by Lake Placid, which has a surface area of about 3.5 square miles. Discharge from the two sub-basins is combined at the Mill Pond reservoir and continues down the Chubb River to its confluence with the West Branch of the Ausable River about 2 miles to the east. (See Figure 2-1)

2.2 Flow-Duration Curves

Two indirect methods were used to determine the flow-duration curves for the Chubb River at the dams, since there are no stream gages located on the Chubb River. The first method was to evaluate stream flow records at a nearby location and transpose the results to the Chubb River at the dams. A United States Geological Survey stream flow gage, located about 2 miles downstream from the confluence of the Chubb River and the West Branch of the Ausable River, was in continuous use from 1919 to 1968. The drainage area of the West Branch of the Ausable River

upstream of this gage is about 116 square miles. Average daily discharges from this gage were used to develop a Flow-Duration Curve at this location. A Flow-Duration Curve for the Chubb River at the dams was then developed from this curve based on a direct relationship of the drainage areas (Curve B, Figure 2-2).

The second method involved the use of monthly power production records for the Village electric system hydroelectric plant downstream of the Power Pond Dam which was in operation from 1905 to 1957. The available records covered the years 1939 to 1957. Since the hydraulic characteristics of the penstock supplying water to the turbines is known, an equation relating power and discharge was used to calculate discharges (Curve A, Figure 2-2).

Figure 2-2 indicates that Curve B yields about 20% more discharge than Curve A. This difference is attributable to the following factors: (1) Curve A excludes discharges in the Chubb River not used for power generation. (2) The transposed Flow-Duration Curve from the West Branch of the Ausable River gage does not fully reflect the regulating effect of Lake Placid upon the Chubb River. (3) The power generation records are based on average monthly flow, not daily flows, whereas the records for the West Branch of the Ausable River are based on daily flows. The correlation between these curves is reasonable and provides a good basis for determining the availability of flow for the production of power at the two sites. Since Curve A was developed from historical data reflecting the Chubb River flows actually used for power production, it is considered to be more reliable and has been used as a basis of estimating average annual power production.

2.03 Flood Flows

The United States Army Corps of Engineers has established hydrologic guidelines for evaluating the safety of existing dams. According to the "Recommended Guidelines for Safety Inspection of Dams," by the Corps of Engineers, both Mill Pond and Power Pond Dams should be classified as "high hazard" structures because failure of either structure would result in extensive property damage. Therefore, according to the Guidelines, the spillway capacity of each dam should be sufficient to pass 50% of the Probable Maximum Flood (PMF). The PMF is defined as the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The Probable Maximum Precipitation (PMP), which is used as a basis for determining the PMF, was obtained from "Hydrometeorological Report No. 33" prepared by the United States Weather Service. Unit hydrographs were calculated using average basin coefficients. Calculations were made with the assistance of computer program HEC-1, developed by the Hydrologic Engineering Center, U.S. Army Corps of Engineers. PMG runoff hydrographs were computed for each sub-area, and were combined and routed through the Mill Pond and Power Pond Reservoirs. The PMF at the dams has a peak discharge of 8,200 cubic feet per second (cfs), which is reduced only slightly by storage in the reservoirs. This peak discharge would produce a reservoir elevation of about 10 feet over the Mill Pond spillway crest and about 8.5 feet over the Power Pond spillway crest. Since the Mill Pond Dam abutments are overtopped when the flow over the spillway exceeds 5.5 feet and the Power Pond abutments are overtopped when the flow over the spillway exceeds 4 feet, neither spillway is hydraulically adequate to pass one-half of the PMF without affecting the areas adjacent to the dams.

2.04 Existing Water Quality

Water Quality data for the Chubb River is limited to information available from the NYSDEC Water Quality Analysis Unit and the New York State Department of Health. Water Quality criteria and standards have been assigned to all surface waters in the state as defined by Chapter 10 of the Environmental Conservation Law. Classifications and definitions for the Chubb River and tributaries can be found in Tables 1 and 2. The water quality classification for the Mill Pond and Power Pond is C(T) as shown on the biological resources map (Figure 5-5).

In November 1976 the Survey and Analysis Section of DEC conducted a Waste Assimilative Capacity study (WAC) on the Chubb River below the wastewater discharge of the Lake Placid Sewage Treatment Plant (STP). The survey also established New York Pollution Discharge Elimination System (NYPDES) permit effluent limitations for the Village STP discharge. The physical and chemical parameters were analyzed by the laboratories of the NYS Department of Health. Altogether five (5) sites were sampled on the Chubb River and can be located on Figure 2-3 according to station number.

2.05 Water Quality Impact

The New York State Department of Environmental Conservation has established a minimum flow requirement for the Chubb River above the Village of Lake Placid's STP. A critical stream flow of 7 cubic feet per second was assigned to the Chubb River above the STP so that the assimilative capacity of the river with the wastewater discharge from the STP would meet State Pollutant Discharge Elimination System effluent limitations. Operation of the hydroelectric generating facilities at both

dam sites would comply with the minimum stream flow standards set by the State. The DEC has determined that the 7 cfs stream flow regulation includes the discharges from the generators.

Short term water quality impacts can be associated with generator construction and dam repair activities. Construction of generating facilities along the Chubb River stream bank at both Power Pond and Mill Pond Dam sites would cause a disruption of soil layers. Due to the close proximity of the generating sites to the stream bank, it is conceivable that siltation of the river waters might occur which could create turbid water conditions downstream. However, these impacts can be minimized by precautionary reseeding and sod covering techniques.

Permanent alteration of existing water quality will not occur as a result of hydroelectric generating operations on the Chubb River.

SECTION 3 - EXISTING FACILITIES

3.01 Mill Pond Dam and Appurtenances

The new Mill Pond Dam, constructed in 1978, is a rock filled, timber crib, overflow structure with a sheet pile cut-off wall extending into the alluvial river deposits on which the dam is founded. The dam is about 18 feet high, 117 feet long and has top width of about 12 feet (See Figure 3-1). A concrete retaining wall forms the south abutment of the structure and the north abutment consists of the concrete foundation of the gatehouse and a concrete retaining wall. The wood frame superstructure of the gatehouse contains a wooden, manually operated gate which controls discharge into an 84-inch diameter steel penstock. The penstock parallels the Chubb River and extends for about 250 feet downstream of the dam where it terminates at an abandoned concrete hydro plant structure. The penstock has been breached about 30 feet downstream of the gatehouse so that flow in the pipe is diverted into the river.

The Mill Pond Reservoir covers an area of about 28 acres, has a maximum length of 3,000 feet, and an estimated storage volume of 200 acre-feet at the spillway crest elevation.

The new Mill Pond Dam was designed by a Professional Engineer registered in the State of New York and reviewed by the New York State Department of Environmental Conservation within the last two years. Therefore, a review of the stability of this structure was not made for this study.

A visual inspection of the Mill Pond Dam and its appurtenances was performed on November 29, 1978. The timber cribbing appeared to be in good condition with no evidence of displacement, although the ice and

snow restricted visual observations. It was apparent that the material used for backfill in the structure contained a significant quantity of sand and gravel rather than rock. There was no indication that this material had been washed from the timber cribbing, but this might occur in the future. The visual portion of the concrete retaining wall forming the south dam abutment and the concrete retaining wall on the north abutment, appeared to be in good condition. The wood frame gatehouse was in fair condition. The trash racks were in-place and appeared serviceable. The wooden control gate, which was rebuilt in 1955, and its operating mechanism appeared to be in good condition. The gate was not operated at the time of the inspection. The buried steel penstock was inaccessible and not inspected although the exposed section at the breach appeared to be in good condition.

The surge tank has been removed and no indications of its existence were visible.

Little remains of the powerhouse. No maintenance has been performed since cessation of generation in 1955. The galvanized steel superstructure has been removed and the concrete block sub-structure has been partially filled in with gravel and stone. Discharge from the penstock is flowing out windows on the river side of the sub-structure. This condition has existed for several years and it is likely that severe structural damage has occurred as a result of this water freezing during the winter months. The exterior of the sub-structure is deteriorated and portions of the foundation have broken away.

3.02 Power Pond Dam and Appurtenances

The Power Pond Dam, constructed in 1905, is an ogee-shaped, concrete gravity overflow structure. The dam is about 20 feet high, 136 feet long and has a top width of about 6 feet. (See Figures 3-2 and 3-3) A concrete gatehouse with a wood frame superstructure is located at the north abutment of the dam. The gatehouse contains a manually operated wooden gate which controls discharge into a 5'-4" diameter steel penstock. The penstock extends about 800 feet downstream and terminates at the powerhouse, which is presently being used for offices and storage by the Lake Placid Municipal Electric Department. The penstock has been breached about 530 feet downstream of the dam, and flow through the pipe is diverted into the Chubb River by a 30" diameter corrugated metal pipe. A 36" waste tube pipe with an outlet invert about 17 feet below the spillway crest runs through the dam between the spillway section and the gatehouse. Discharge into the pipe is controlled by a sluice gate operated from the dam crest.

The Power Pond reservoir covers an area of about 9 acres, has a maximum length of about 1,200 feet and has an estimated storage volume of 100 acre-feet at the spillway crest elevation.

Visual inspections of the Power Pond Dam and its appurtenances were performed on November 29, 1978 and on December 29, 1978. River discharge over the spillway and ice and snow restricted visual observations during the inspection. The concrete forming the spillway crest contains minor cracks and some irregular-shaped sections about two inches thick have been broken away. Both concrete abutments showed evidence of deterioration with aggregate being exposed over much of their surface area. The abutment adjacent to the south end of the spillway

section has been partially undermined so that spillway discharge cascades onto the blow-off pipe outlet and the stone retaining wall which forms the south stream bank. The operating assembly for the sluice gate controlling discharge into the blow-off pipe was intact but not operated during the inspection. The wood frame gatehouse is in fair condition. Five courses of the clapboard siding have been removed, by vandals, along the entire length of the eastern side of the building. The closed wooden control gate, its operating assembly and the trash racks appeared to be intact and serviceable, although the gate was not operated during the inspection. The interior of the buried penstock was not inspected because of the difficulty in obtaining access to the inside of the pipe. The portion of the penstock in the vicinity of the breach, however, was inspected in 1977 and found to be in excellent condition. The existing powerhouse is in good condition and is being used by the Village of Lake Placid for offices and storage. A riveted steel surge tank is located northwest of the powerhouse. The surge tank appears in good condition, however, pressure tests should be performed to verify its condition. This is particularly important since a major electrical substation owned by the Village is located immediately adjacent to the surge tank. The surge tank is enclosed by a wood frame structure which is in generally good condition. The surge tank was not used during the latter years of generation at the powerhouse and was isolated by a gate valve located at the bottom of the tank.

The powerhouse once contained both a vertical axis turbine and a horizontal axis turbine. The turbine runner and case of the horizontal unit were damaged in 1952. The damage was never repaired and all vestiges of the horizontal unit, with the exception of a gate valve and a

short riser from the penstock, have been removed. The turbine housing, wicket gates, runner, and draft tube for the vertical unit are still in place. A 2' x 3' hole has been cut in the turbine casing and the wicket gates are frozen in the shut position. Heavy and deep rust was noted. The turbine shaft has been cut about 4' above the wicket gates and the opening above the turbine has been covered and concreted. The generator and all control equipment has been removed. The runner was not accessible for inspection. The turbine has not been operated or maintained during the last 10 years.

The stability of the Power Pond Dam was analyzed with the reservoir at the spillway crest, for headwater and tailwater conditions produced by 50% of the Probable Maximum Flood, and for conditions between these extremes. The cross-section for the dam was taken from drawings provided by the Village of Lake Placid (See Figures 3-2, 3-3, and 3-4). Detailed design or as-built information of the dam was not available for our review.

The available drawings for the Power Pond Dam do not indicate the type of foundation on which the dam is based nor what type of seepage barrier, if any, exists beneath the dam foundation. Therefore, a subsurface investigation was undertaken to obtain information regarding the dam foundation. O'Brien & Gere Engineers contracted with Atlantic Testing Laboratories, Limited, of Canton, New York, to make two borings at the Power Pond Dam. Boring B-1, located near the north abutment, was driven to a depth of 50 feet, or about 25 feet below the base of the dam as shown on Figure 3-3. Boring B-2, located near the south abutment, was terminated at a depth of 40 feet, or about 15 feet below the base of the dam. The location of these borings is shown on Figure 3-2.

The soils encountered consisted of dense, well-graded sand and medium to fine gravel with a small fraction of silt. Significantly, neither boring encountered bedrock. The boring logs for this work are included in the Appendix.

It is concluded from the boring program that the Power Pond Dam is founded on overburden, not rock. Therefore, some type of seepage barrier must have been included in the design to prevent the progressive piping of fine-grained soil from underneath the dam. However, there is no record of the type or depth of this barrier.

The results of the stability analysis of the Power Pond Dam are shown on Figure 3-4 and in Table 3-1. This analysis is based on the assumption of full uplift over one hundred percent of the base. The presence of a seepage barrier would reduce the uplift pressures and increase the factors of safety. However, the assumption of full uplift is necessary until further information regarding the type, extent and effectiveness of the seepage barrier is known or until measurements of actual uplift pressures are made.

TABLE 3-1

Height of Pool Above Spillway Crest in Feet	Factors of Safety	
	Overturning	Sliding
0	1.77	1.18
1	1.54	0.95
2	1.42	0.83
3	1.32	0.73
8.5 (1/2 PMF)	0.96	0.34

It is concluded from the results of the dam stability analysis that the Power Pond Dam may be unstable for reservoir elevations greater than one foot above the spillway crest. However, as stated above, the information regarding the construction of the dam is very limited and additional information is required to make definite conclusions regarding the stability of the dam and any remedial measures which may be required.

The additional investigations required, which are outside the scope of this Study, should consist of the following:

1. Borings upstream of the dam to determine whether a horizontal seepage barrier may have been constructed.
2. Borings in the channel downstream of the dam.
3. Borings through the dam to measure uplift pressure at the base of the structure.

SECTION 4 - PROPOSED HYDROELECTRIC FACILITIES

4.01 Plant Locations and Power Production

Average annual Power Production curves were developed for both the Mill Pond and Power Pond sites. Net head versus discharge curves, shown on Figures 4-1 and 4-2, were calculated for various locations along the two existing penstocks. Figure 4-3 shows the average annual power which could be produced from a hydroelectric plant located immediately downstream of the Mill Pond Dam and one located 250 feet downstream (at the end of the existing penstock). Figure 4-4 shows the power which could be produced from a hydroelectric plant located 530 feet downstream of the Power Pond Dam (just upstream of the electric switchyard) and one located 800 feet downstream (at the existing powerhouse). The area under these curves represents the total average annual power production which could be expected from a hydroelectric plant located at the respective locations. It is evident that utilization should be made of the full length and head of the two penstocks to develop the maximum power.

According to this criteria, the best location for the proposed Mill Pond powerhouse, as shown on Figure 4-5, would be at the abandoned plant site, where an average of about 485,000 kilowatt-hours of energy could be produced per year, based on the data described in Section 2. Similarly, the best location for the Power Pond powerhouse would be within the existing powerhouse (Alternative 2, Figure 4-6) where the average annual power production is estimated to be 820,000 kilowatt-hours. An alternative location for the Power Pond powerhouse would be upstream of the switchyard (Alternative 1, Figure 4-6). The estimated average annual power production at this site is 645,000 kilowatt-hours.

4.02 Plant Configuration

The recent development of pre-designed, standardized, or partially standardized low-head hydroelectric generating units has made the development of sites such as the Mill Pond and Power Pond Alternative No. 1 less expensive. This type of unit is adaptable to various site conditions and because of its compactness, the powerhouse size can be minimized to reduce civil construction costs. Standardized generating units would be the most economical units for both the Mill Pond and Power Pond Alternative 1 sites and, therefore, are the basis for the capital costs at these sites. The proposed plant configuration is based on standardized, or partially standardized designs offered by Oy Tampella of Finland, and Allis Chalmers of York, PA. These units have an estimated life of at least 50 years. Other manufacturers and turbine types, such as the Ossberger crossflow turbine, were considered, however, preliminary cost estimates and information furnished by such manufacturers indicated that costs of alternative designs would be comparable to, or more than, the proposed configuration. As part of final design, an optimization study should be performed to select the optimum generator/turbine unit.

A standardized powerhouse design has been developed which would be suitable for both sites. A plan and section of this powerhouse is shown in Figure 4-7. The powerhouse consists of an underground vault which encloses a horizontal, tube turbine unit, a 250 kW generator, and related control equipment. Access to the vault would be through a manhole and ladder, or through a stairway and small access building.

Power Pond Site Alternative 2 makes use of the existing powerhouse. Modifying the existing building to accept a standardized unit was found to be more expensive than purchasing custom designed equipment,

therefore, capital costs for this site are based on customer designed equipment. The manufacturer of the existing vertical turbine, the James Leffel Co., has estimated that a replacement turbine unit would cost \$75,000.

The study assumes that the existing turbine cannot be economically refurbished. Based on the severe rust, cut shaft, and cut casing which would necessitate extensive factory repair of the turbine, coupled with the age of the equipment and parts procurement problems, refurbishing is believed not to be cost effective. Several manufacturers qualified to rebuild the turbine were contacted for cost estimates. However, each indicated a detailed field inspection and disassembly of the turbine would be required for such an estimate. As this alternative was felt not to be economical, this was not pursued further.

Two types of generators, induction and synchronous, are available and are suitable for this application. An induction generator is simplest to operate and requires simpler and less expensive controls. The induction generator must operate in conjunction with a large power system and cannot be used as an isolated emergency power supply. The induction generator cannot be used to improve the power factor of the system. A synchronous generator can run isolated, or connected to a power system, and can be used to supply portions of the electric load during outages of the primary power source. The synchronous generator can also be used to improve system power factor. When acting as generator, the excitation can be varied to control the reactive (var) generation. When insufficient water is available for generation, the generator can be operated as an overly excited synchronous motor, which will improve the system power factor. Control equipment for the

synchronous generator is more complex than that for the induction generator. Synchronous Generators are recommended due to their added versatility.

One line diagrams for induction and synchronous generators are shown in Figures 4-8 and 4-9, respectively. All equipment, with the exception of a pole mounted step up transformer, is located in the vault or powerhouse. This results in an aesthetic and vandal resistant generating station.

4.03 Utilization of Power

The energy available from hydroelectric generation will vary depending on water flow. Economical marketing of such variable energy requires the support from a large bulk power generating and transmission system. Two alternatives are available regarding the use of generated power. (1) The power can be supplied to the Village electric system for distribution over the existing electric distribution lines. (2) The power can be supplied directly to a segregated municipal load, such as the sewage treatment plant, street lighting, or municipal buildings. Back-up power for these municipal loads would be provided by the Village Electric System.

Alternative No. 1 is preferred from a technical and aesthetic viewpoint. Existing electric distribution lines are located in close proximity to both sites, and the generating plants could be connected to the existing lines with minimal distribution line construction. Alternative No. 1 also provides the electric system with a versatile although small emergency power supply. The primary disadvantage with Alternative No. 1 is the Village's existing contract with its power supplier, the Power

Authority of the State of New York (PASNY). Under Alternative No. 1, the generated power would replace power supplied by PASNY. The Village's contract with PASNY states that if the Village utilizes another source of supply, then a minimum energy charge shall be payable to PASNY. This charge would be calculated by multiplying the total system kWh (including self-generation) by the ratio of the maximum annual system demand to the Village's contract demand (such ratio not to exceed 1). Since the capacity of the proposed generating facilities is less than 3% of the total Village demand, it is likely that the Village's contract demand will exceed its billing demand. The net result will be that, under the present PASNY contract, and under Alternative No. 1, there would be no decrease in purchased power costs if the generated power is used as a direct replacement for power supplied by PASNY.

Alternative No. 2 is available if the Village's contract with PASNY can't be renegotiated. In this alternative, each building or load supplied by the proposed generating facility would be supplied by a distribution circuit connected directly to the generating station. Since the generated power would not be utilized by the electric system, the PASNY minimum energy charge would not apply and there would be a net savings in the cost of purchased power. This alternative has not been pursued further in this study due to the additional costs of installing and maintaining the necessary distribution lines.

SECTION 5 - SOCIO-CULTURAL ENVIRONMENT

5.01 Historical Significance

The social, cultural and economic evolution of the Village of Lake Placid has been greatly influenced by the development of Mill Pond Dam and Power Pond Dam on the Chubb River.

Power Pond Dam--

Settlement at Lake Placid began in the early 1800's by New England farmers. In 1809 the Power Pond dam was constructed on the Chubb River to provide water power to the Elba Iron and Steel Company, the area's first major industry. An elaborate industrial complex was then developed along the shores of Power Pond. By 1817, the supply of local ore to the Iron works proved to be inferior in quality and importing high grade ore from outside the region was economically unfeasible. The industry collapsed and by 1850 all that remained intact was the dam, which was replaced by a concrete structure in 1905 when the Village of Lake Placid began operating a municipal electric power plant.

Mill Pond Dam--

In 1853 a log dam was constructed approximately one-third mile upstream of the Power Pond Dam site on the Chubb River, for the operation of a sawmill. Lumbering became a major industry for the village of Lake Placid and it can be said that the village "grew and flourished on the lumber milled there".⁽¹⁾ Logs were floated to and collected in the Pond from upstream Averyville, and eventually united with great log

⁽¹⁾ Newman, Lake Placid-North Elba Historical Society

drives on the Ausable River. A second mill was also developed on the Mill Pond site for the manufacture of shingles and lath. This mill further served the community as a gristmill.

In the early 1900s acquisition of extensive forestlands by the state gradually phased out the lumber industry utilizing the Mill Pond facilities. A number of individuals have held title to the dam and pond including Paul Smiths Electric Light and Power and Railroad Company, Niagara Mohawk Power Corporation and currently the Village of Lake Placid. In 1970, after years of disrepair, the Mill Pond Dam broke, permitting the water impounded behind the Dam to drain and the Chubb River reverted to a narrow channel. Several years of effort to rebuild the Mill Pond Dam culminated in 1978 as construction neared completion on a new log dam at the same site.

5.02 Recreational Facilities

Historic Recreational Uses--

The impounded waters of Mill Pond and Power Pond Dams have historically provided the Lake Placid community with a unique recreational resource. As previously mentioned, community development centered around the ponds, especially Mill Pond, which played a more significant recreational role than Power Pond. During winter seasons, Mill Pond provided the community's first ice skating rink. Also, one of the pioneer toboggan slides was located at the pond site which was to eventually usher in the development of a great winter sports program at Lake Placid.⁽¹⁾

Summer recreational uses of the ponds included trout fishing, kayaking and canoeing. A small playground was developed along the

⁽¹⁾ History of the Village of Lake Placid, N.Y., 1970, Mary MacKenzie

shore of Mill Pond which provided a community beach for swimming as well. With the deterioration of Mill Pond Dam and its collapse in 1970, the site became a little used recreational resource.

Current and Projected Recreational Developments--

Lake Placid has become a significant winter and summer resort providing vacationers with a wide variety of recreational activities. Present and future developments along the shores of Mill Pond and Power Pond will be conducive to the community's recreational growth. Should it be feasible to construct electrical generating facilities at both sites, they will operate with the provision for maximum recreational utilization of the impoundment area during all seasons.

The restoration of Mill Pond Dam in 1978 was the result of several years of effort by the community to once again revitalize the pond area for recreational purposes.

The Mill Pond Restoration Committee has proposed an upgrading of the present playground and facilities as well as the addition of a planned park and development on the opposite shore of Mill Pond, as shown in Figure 5-1. A sculpture garden is also planned within the confines of the newly developed park. An historical exhibit in the existing gate house at Mill Pond Dam is also planned. Below the Dam, a kayak course is proposed.

Additional recreational developments on the downstream Power Pond dam site have not been planned at this time, however, future recreational use of the site is anticipated and may include fishing, boating and ice skating.

5.03 Aesthetics

The collapse of Mill Pond Dam in April of 1970 released the impounded Pond waters which exposed rubble and debris generated by industrial users of earlier years. The area became aesthetically unattractive and cast a depressing atmosphere on the community of Lake Placid.⁽¹⁾ Contributions from interested local people and businesses resulted in the construction of a new log dam structure in 1978 which is hoped will once again create an aesthetically attractive setting for the Mill Pond area. The use of both Mill Pond and Power Pond Dams for hydroelectric generation can conceivably be considered aesthetically and politically beneficial to the Lake Placid community. Reliance on the Chubb River water shed as a limited power supply can create a greater community appreciation of natural systems and permit the Village's usage of a natural replenishable, non-polluting source of energy.

Perhaps the single most aesthetic impact created by the hydroelectric generating facilities would be the alteration of stream flows over the crest of Mill Pond Dam. This dam was designed and constructed with the idea that water would be constantly flowing over the terraced logs creating a visually aesthetic cascading waterfall effect. The operation of the hydroelectric generator during low stream flow periods could draw the water level of Mill Pond below the dam's crest thereby eliminating any flow over the log structure.

Since considerable cost and effort has gone into creating an aesthetically pleasing dam, and since fairly extensive recreation facilities are planned adjacent to the dam, it is likely that restraints would be placed on generation during low flow periods.

⁽¹⁾ Mill Pond Story, Mill Pond Restoration Committee

5.04 Description of the Physical Environment

Topography--

Lake Placid is surrounded by rugged, mountainous terrain known as the "High Peaks" area of the Adirondak Mountains. Steep slopes are the prominent land features, surrounding the village.

In the vicinity of Mill Pond and Power Pond Dams on the Chubb River, the slope of the land ranges from nearly level land to areas of 15% slope, as shown in Figure 5-2. Areas suitable for most types of development are usually within the 4-12% slope categories.⁽¹⁾

Soil Conditions--

The United States Department of Agriculture Soil Conservation Service (SCS) has identified the soil characteristics of the Lake Placid area. Detailed data from the soil survey is contained in Figure 5-3 which maps the soil types to be found in the Chubb River area. Each soil type is further evaluated by the SCS (Table 5-1) as to its particular limitation or suitability for specific land use purposes.

Revitalizing the hydroelectric generating facilities at Mill Pond and Power Pond sites may require some modification of existing structures, which could produce a disturbance of soil conditions along the north shore of the Chubb River. Soil disruption can, however, be minimized by instituting proper precautions during and after construction activities. Such precautions might include the immediate reseeding of construction areas where original vegetation has been removed.

⁽¹⁾ North Elba Town Plan, 1975

TABLE 5-1
SOIL CHARACTERISTICS
VILLAGE OF LAKE PLACID

Soil	% Slope	Permeability	Suitability for Low Building Foundations	Erosion Hazard
4- Fluvaquentic Dystrochrepts				
5- Fluvaquents				
19A- Adams Loamy	0-3%	Rapid	Unstable	Slight
19B- Adams Loamy	3-8%	Rapid	Unstable	Slight
19C- Adams Loamy	8-15%	Rapid	Unstable	Slight
19EF Adams Loamy	25-45%	Rapid	Unstable	Moderate
23 Naumberg Loamy Sand		Rapid	Poor	Moderate
80B Beckett Bouldery	3-8%	High	Stable	Slight
80C Beckett Bouldery	8-15%	High	Stable	Slight
80DE Beckett Bouldery	15-35%	High	Stable	Slight
96B Herman Bouldery	3-8%	High	Good	Slight
96C Herman Bouldery	8-15%	High	Good	Slight
96D Herman Bouldery	15-25%	High	Good	Slight
97B Berkshire Fine Sandy Loam	3-8%			
97C Berkshire Fine Sandy Loam	8-15%			
97D Berkshire Fine Sandy Loam	15-25%			
99D Herman Very Bouldery	15-25%	High	Good	Slight
101BC Aeris Haplaquods	3-15%			
114B Colton Gravelly	3-8%	Rapid	Adequate	Slight
115 Duane Gravelly	0-3%	Rapid	Fair to Good	Slight
155B Skerry Bouldery	3-8%			
155C Skerry Bouldery	8-15%			
158A Aeris Haplaquods Stony				
164A Waumbek Variant	0-3%			
164B Waumbek Variant	3-8%			
195DE Lithic Haplohumods Very Rocky	15-35%			
160 Typic Humaquepts		To Variable	Severe	To Variable

5.05 Land Use

The Adirondak Park Agency (APA) has classified all land use areas within the Adirondak Park to serve as a guide for all land use planning and development in the park. The Village of Lake Placid and immediate vicinity has been designated as a "Hamlet" area by APA which identifies compatible land uses in the Adirondack Park Land Use and Development Plan. The APA has stated that "All land uses and development are considered compatible with the character, purposes and objectives of hamlet areas". Hamlet areas are to serve as the growth centers of the Adirondak Park.

Land Use Zoning--

The Village of Lake Placid has adopted a set of zoning ordinances for the community. Figure 5-4 identifies zoning districts within the Village boundary. Zoning districts around the Mill Pond and Power Pond Dam sites are listed as R-2 Residence and R-R Resort Residence. Both zoning categories identify public or municipal utilities as one of the principal land uses permitted. The definition of a public or municipal utility as defined by the village zoning ordinance is: "A structure, use of land designed and maintained as a public or municipal utility or service facility in the provision of electric, telephone, radio, television, water or sewer services. Such uses shall not be deemed to include, nor shall a permit be required for, the location of individual service installations."⁽¹⁾

⁽¹⁾Village of Lake Placid Zoning Ordinances, 1967

5.06 Biological Environment

5.06.1 Terrestrial Communities

Wildlife

The New York State Department of Environmental Conservation, Wildlife Unit, has identified several Adirondack fur bearing species likely to inhabit the newly impounded Mill Pond waters. These species include beaver, mink, otter, muskrat and raccoon. Migrating waterfowl may also use the pond as a resting area, to a limited degree. The use of impounded waters at both sites for hydroelectric generation is not anticipated to effect any of the wildlife species characteristic of the area.

Vegetation

Vegetative coverage along the shores of Mill Pond and Power Pond sites is of a disturbed and developed nature.⁽¹⁾ Disruption of the vegetation during the construction of generating facilities would be minimal and of short duration. Operation of the generators is not expected to effect terrestrial vegetation.

5.06.2 Rare and Endangered Species

The United States Bureau of Sport Fisheries and Wildlife has developed a listing of rare and endangered species whose ability to survive is seriously threatened. One such species, has been identified by the NYSDEC to inhabit the headwater area of the Chubb River. DEC has also compiled a listing of rare wildlife species within the State, to be fully protected. Rare species identified by DEC in the Chubb River area include migratory birds which are likely to utilize the area as a stopover.

The operation of hydroelectric generating units at the two dam sites is not anticipated to cause any disturbance to rare or endangered wildlife species.

⁽¹⁾Vegetative Mapping - Adirondack Park Agency

5.06.3 Wetlands

Official wetland areas have been defined by the APA which is charged with the responsibility of protecting these resources. The biological resources map, Figure 5-5, identifies the wetland areas of the Chubb River. Discussions with the APA have indicated that hydroelectric generation at the Mill Pond and Power Dam Sites will not alter these wetland areas.

5.06.4 Aquatic Communities

Existing Resources

The most recent fisheries resource inventory for the Chubb River area was performed in 1954 by the New York State Department of Environmental Conservation Fisheries Unit. Results of the 1954 Chubb River and Mill Pond survey can be found in Table 5-2, which lists the fish species present and their relative abundance.

TABLE 5-2

1954, NYSDEC STREAM AND POND SURVEY

<u>Fish Species</u>	<u>Relative Abundance</u>
Brown Trout	Common
Brook Trout	Common
White Sucker	Abundant
Yellow Perch	Common
Small mouth Bass	Rare
Horneyhead Chub	Common
Creek Chub	Common
Lake Chub	Common
Blacknose Dace	Common
Longnose Dace	Common
Pearl Dace	Common
Pumpkin seed	Common
Slimy Sculpin	Common

The New York State DEC presently conducts a fish stocking policy on the Chubb River. Approximately 1,800 Brown Trout yearlings are stocked below Mill Pond Dam annually while another 3,300 Brook Trout yearlings are released in the waters above Mill Pond.

Further biological sampling of the Chubb River was conducted in 1976 by NYSDEC, which published its findings in the Water Quality and Quantitative Macroinvertebrate Survey. In this survey, biologists identified the macroinvertebrate communities of the River as well as other pertinent data including stream vegetation.

5.06.5 Anticipated Alterations to Aquatic Communities

The generating facilities at both dam sites would be located downstream of the dam structures. During intervals of low stream flow it is conceivable that the generators when operating would draw the impounded waters down below the dam's crest. This would mean that for a short duration until the impounded water levels increased, no water would be flowing over the crest of each dam, although stream flow would be maintained through the penstock and generator discharge. The structure of the aquatic communities existing from the base of each dam to the generators' discharge might be expected to change from those species characteristic of a total immersion habitat to those of an intermittent type of environment.

Operation of the hydroelectric generators and the possible creation of intermittent flows over the dams' crest could alter fish spawning activities in the spring by removing the area at the immediate base of each dam from spawning activities.

DEC currently stocks the Chubb River, above and below the impoundments, with a number of yearling brown and brook trout. It is possible that a small number of these fish might find their way to the intake of the generators and be destroyed. This however, can be minimized by developing an intake design modification which might include reducing the intake velocity of each generator so that fish can swim from the current and the building of a screen over the intake small enough to keep fish out.

A short term impact to aquatic communities could occur from the generator construction activities and possible associated siltation to the Chubb River. Sedimentation and runoff from the stream bank work next to the dams could create turbid water conditions and suffocate fish eggs and vegetation with silt. These short duration impacts, however, can be minimized by instituting precautionary stream bank protection measures and by scheduling generator construction activities to occur during the non-spawning seasons.

Another short term impact to the aquatic community might be developed from the repair work on the Power Pond Dam. The repair work might require the draining of approximately 1 to 2 feet in elevation of water from the Power Pond so that access to the back of the dam could be obtained. This would create a short term loss of existing aquatic shoreline habitat for the pond. Vegetation which would normally be submerged would die off during repair operations, however, after completion of dam repairs and subsequent refilling of the impoundment waters, the vegetation could be expected to reestablish itself in the submerged areas.

SECTION 6 - REGULATORY REQUIREMENTS

6.01 General

The Federal Energy Regulatory Commission (FERC), formerly the Federal Power Commission (FPC), is authorized under the Federal Power Act (FPA) of 1920 to issue a license for the construction, operation and maintenance of dams, powerhouses and other physical structures of a hydroelectric power project. In 1978 the FERC issued an order which simplified the procedures for licensing of minor water power projects for which the Commission may waive certain provisions of the FPA. The only eligibility requirement for a minor water power project license is that project generating capacity could not exceed 1.5 megawatts. The FERC also requires, as part of the license, that a minimum flow requirement be established by the DEC so that State water quality criteria can be met.

Applications for the short form license can be obtained from FERC. The FERC also requires applicants to consult with appropriate Federal, State and local agencies during the preparation of the license application to provide the agencies an opportunity to comment on the proposal. A listing of agencies to be consulted is provided by the FERC and is included in the following sections.

6.02 Federal Agencies

The United States Army Corps of Engineers is charged with the responsibility to maintain and protect the navigable waterways of our nation. Under the Corps regulatory program, a permit is required prior

to initiating certain activities on a navigable body of water. The Chubb River has been defined by the Corps as a navigable waterway. The proposed action on the river involves the repair and/or rehabilitation of previously used hydroelectric facilities and would therefore require a Section 404 Permit under the Water Pollution Control Act. This permit would allow the repair of Power Pond Dam and the construction of new generating facilities at both dam sites. The applicant must send a letter to the Corps for minor hydroelectric power projects asking that the Corps review the proposal, as part of the FERC licensing procedures.

The United States Environmental Protection Agency (EPA) does not have any regulatory requirements for hydroelectric facilities such as those proposed for the Chubb River. EPA issues permits for wastewater discharges under the National Pollutant Discharge Elimination System. In New York State, the NYSDEC has taken over the responsibility of issuing these permits. Discharges from hydroelectric generators are not considered by EPA to be in the wastewater category.

The Department of Interior Heritage and Conservation Service serves the FERC in an advisory capacity. The Agency reviews the proposed hydroelectric project as it relates to outdoor recreation and historic significance and comments to the Commission as to the projects' suitability for potential recreation oriented activities.

The United States Department of Interior, Bureau of Sport Fisheries and Wildlife recommends that an Exhibit S be prepared by the applicant. Under the Fish and Wildlife Coordination Act, applicants whose projects involve federal licensing are required to consult with the U.S. Bureau of Sport Fisheries and Wildlife Service, to ensure the protection and

enhancement of wildlife resources. Exhibit S is an identification of existing fish and wildlife resources of the Chubb River area along with a discussion of possible alterations or impacts the proposed hydroelectric generating facilities may have on those resources.

6.03 State Agencies

The New York State Department of Environmental Conservation (DEC) Environmental Analysis Unit, has determined that under Article 15 of the Environmental Conservation Law, two permits would be required by the applicant. A stream protection permit is necessary should the stream bed or bank be disturbed during the installation of hydroelectric generators. The stream protection permit is also required for the proposed reconstruction or repair of the Power Pond Dam. The second permit required by DEC requires a detailed description of the proposed dam repair or reconstruction work to be performed and should be completed by an engineer. DEC would also require that a minimum stream flow be established and maintained for the Chubb River during hydroelectric generating operations. Criteria for establishing minimum stream flow standards have been developed from the Waste Assimilative Capacity Study for the Chubb River by the DEC.

The Adirondak Park Agency has determined from the Jurisdictional Handbook that DEC would serve as the lead agency in the Adirondak Park for the proposed action on the Chubb River. APA would therefore require no permits from the applicant, however, the agency would review the permit applications required by DEC.

The New York State Fish and Wildlife Management Board reviews the applicants' proposal to insure that proper fish and wildlife management practices have been observed. Although the Board does not issue permits, their comments are directed to the lead agencies involved so that fish and wildlife resources can be afforded protection.

New York State Office of Parks and Recreation serve in an advisory capacity directing comments on recreational resources to the applicant. Should any Federal monies or licenses be involved, the office would require project approval from the State Historic Preservation Officer to ensure that any adverse impacts to historic sites would be minimized.

The State through the Federal Office of Management and Budget requires that an A95 Circular be completed by the applicant should the project involve any Federal monies or permits. The circular would contain a description of the project which would be sent to appropriate interested agencies for review and comment to the clearinghouse. Should the agencies feel more information is required, the clearinghouse responds by requesting more detailed information from the applicant.

The New York State Public Service Commission (PSC) Office of Environmental Planning represents the major utility review and regulatory agency in the state. To reactivate the Chubb River hydroelectric facilities, the PSC has stated that no permits would be required, however, the agency would review and comment on the proposal and provide technical assistance whenever needed.

6.04 Local Agencies

Local agencies or organizations concerned with the construction and operation of hydroelectric generating facilities include the municipal electric system, Niagara Mohawk Power Corporation, and the local zoning board. The municipal electric system would operate and maintain the facilities and would need to approve all design drawings and specifications related to the facilities. The requirements of the municipal electric system would be consistent with good engineering practice and would ensure that the generating facilities would be compatible with the electric system.

The Niagara Mohawk Power Corporation is the wheeling agent which presently serves the bulk power requirement of the Village's electric system. Discussions with Niagara Mohawk have indicated that installation of generating facilities would be encouraged, and that Niagara Mohawk's only requirement, if any, would relate to generator protective and control devices.

Public utilities are specifically excluded from the requirements of the zoning laws, and the Village has indicated that no other local organization has jurisdiction over the proposed generating facilities.

6.05 Summary

Although the FERC has simplified licensing procedures for "minor" hydroelectric power projects, a great deal of time is involved in the Commission's application review and approval process. Completion of the license application includes circulation to appropriate State, Federal and local agencies for their review and comments. The review period may take

from 3 to 6 months. The applicant then submits the license application along with agency responses to the FERC. FERC staff technicians review the application and make their recommendations to the Commission for license approval or denial which may involve a period of 6-12 months. The FERC may also determine that an environmental impact statement is necessary by the applicant which could require an additional 10 months.

Total time involvement from the initial license application preparation to final licensing could span a period of 10-29 months depending upon the requirement of an environmental impact statement. Actual time invested by the applicant for the preparation of a minor hydro license application would be 40-60 days. Costs for the preparation of a license application may range from \$8,000 to \$16,000, the higher figure reflecting the additional cost of an environmental impact statement.

SECTION 7 - ECONOMIC ANALYSIS

7.01 General

The economic feasibility of a hydroelectric generating project is determined by the net profit the Owner can realize during the life of the installed equipment. In this section, the total Project costs, including licenses and permits, construction costs, and financing costs were determined and the 1979 present worth of these costs were calculated. The annual value of the power generated was determined based on 1979 incremental purchased power costs and the estimated future increases in the cost of purchased power. The 1979 present worth of the generated power was calculated and compared to the present worth of costs. Similar comparisons were also made using cost-benefit ratios.

Cost estimates were prepared for the Mill Pond site and for Alternatives 1 and 2 at the Power Pond site. These estimates are included in Tables 3, 4, and 5, and are summarized in Table 7-1 on the following page. The estimates are based on total 1979 construction costs. Table 7-1 indicates that a savings of up to 5% of project cost, resulting from reductions in the permit, engineering, legal, and miscellaneous costs, may be realized by simultaneously constructing facilities at both the Mill Pond and the Power Pond sites.

The costs for the permits and license applications recognize the fact that a large portion of the information required for the Project has been obtained and evaluated as part of this study. There is a possibility that an environmental impact statement will be required, which would increase the costs of permits and license applications by approximately \$8,000.

The small size and minimal environmental effects of this Project, however, should not warrant an environmental impact statement and such costs have not been included in the cost summary.

TABLE 7-1
COST ESTIMATE SUMMARY

	<u>Mill Pond Site</u>	<u>Power Pond Site Alt. 1</u>	<u>Power Pond Site Alt. 2</u>	<u>Combined Sites Alt. 1</u>	<u>Combined Sites Alt. 2</u>
Permits, license applications	\$ 8,000	\$ 8,000	\$ 8,000	\$ 12,000	\$ 12,000
Repair of existing facilities	80,000	115,000	115,000	195,000	195,000
New facilities and equipment	650,000	600,000	445,000	1,250,000	1,095,000
Engineering, legal, miscellaneous	<u>139,000</u>	<u>137,000</u>	<u>90,000</u>	<u>200,000</u>	<u>200,000</u>
Total 1979 Cost	\$877,000	\$860,000	\$658,000	\$1,657,000	\$1,502,000

The stability analysis performed for the Power Pond dam indicated a potential that the dam may not be stable. The dam is not constructed on bedrock and available drawings do not indicate seepage barriers. The cost estimates include funds for additional investigation of dam stability and redesign. If the dam is actually unstable, an additional investment of \$100,000-\$200,000 may be required for dam modifications. It should be noted that the stability problem is not related to the dam's condition, but rather to the design criteria which may have been used at the time of the dam construction.

7.02 Annual Income and Expenses

Gross annual income for each of the sites was estimated based on an average current value of equivalent purchased power of \$.0312 per kWh and estimated power generation at each site. This cost per kWh is equal to the estimated cost to the Village of Lake Placid if this power were to be purchased from PASNY's Fitzpatrick Nuclear Plant, and is also close to rates currently being negotiated for sale of firm hydroelectric power at other facilities. It is expected that the cost of power will continue to escalate and the value of generated power in each year during the life of the facilities was calculated based on escalation of power rates of 5%, 7%, and 9% per year compounded.

Annual expenses were calculated based on the following:

1. The 1979 cost of the Project
2. Equal annual payments of principle and interest, with interest at 6.5%
3. The estimated 1979 operation and maintenance expense
4. Escalation of operation and maintenance expense at an annual rate equal to that of purchased power (5, 7, and 9%)

The difference between the annual income and annual expense over the lifetime of the Project was determined and the 1979 present worth calculated. The differences between total annual income and total annual expenses for the alternatives analyzed in Section 4, are summarized in Table 6. The values were calculated using a small computer and the general procedure indicated in Table 7. Similar results, based on average annual costs and benefits, are presented in Table 8, Benefit-Cost Ratios.

7.03 Results

The results of the analysis are summarized in Tables 6 and 8. The total present worth of the costs at the Mill Pond site exceeded the value of the purchased power under all conditions evaluated. This represents a negative rate of return and it is extremely doubtful that it would be economic to install generators at the Mill Pond site.

Power Pond site Alternative 1 becomes economic if purchased power escalates at an average rate of 9% over the life of the Project and may also become economic if financing rates lower than 6.5% can be obtained.

Power Pond site Alternative 2 becomes economic if the escalation rate of purchased power averages 4% or greater over the life of the Project. A total initial investment of \$658,000 results in a total net savings of \$369,000 for a 7% escalation rate of purchased power, and a 50-year equipment life. As shown in Table 8, this site has a cost benefit ratio of 1.48.

Power Pond Site Alternative 2 is the most feasible site for the installation of hydroelectric generating equipment. Based on the assumptions included in this study, it would be economical for the Village of Lake Placid to install hydroelectric generating equipment within the existing powerhouse. Before the Village actually initiates a design or construction program, however, several assumptions made in the study should be verified.

1. A detailed inspection and evaluation of the Power Pond dam should be made to determine its stability. Potential costs for stabilization, if required, could severely impair the economic viability of this site.

2. The currently being negotiated revisions to the wheeling rate, the method of allocation of hydroelectric versus nuclear generated power and the resultant cost to the Village of purchased power, when finalized and announced by PASNY, should be compared to the rate of \$.0312 per kWH assumed in this study. Purchased power costs lower than \$.0312/kWH would make the investment in generating facilities less economical for the Village of Lake Placid.
3. The Village should verify that its power contract with PASNY can be changed to delete the present economic restrictions on self generation.
4. The Village bonding cost is equal to or less than 6.5%.

In addition to the above, it should be recognized that, if constructed, the facilities would operate at a loss for a period of 15 to 20 years. During this period, payments for operation and maintenance, interest, and amortization of capital would exceed income. If purchased power escalates at a rate lower than 7%, the period during which the facilities would operate at a loss would be extended. Table 7 indicates typical income and expenses over the life of the Project.

Present worth factors can be used to compare the cost per kWH of generated power with the cost per kWH of purchased power. A summary of these costs, based on a 7% inflation rate and 50-year life, are as follows:

Mill Pond Site	\$.044/kWH
Power Pond Site, Alt. 1	\$.033/kWH
Power Pond Site, Alt. 2	\$.021/kWH
Combined Sites, Alt. 1	\$.036/kWH
Combined Site, Alt. 2	\$.029/kWH
 Purchased Power	 \$.0312/kWH

SECTION 8 - IMPLEMENTATION SCHEDULE

The orderly and timely completion of a construction project requires advance planning and an early definition of all possible impediments to the project's completion. An implementation schedule has been prepared which lists the major steps involved in installing hydroelectric generating facilities. The schedule is presented in Figure 8-1, and is based on regulatory requirements and equipment lead times as of the date of this study. As indicated in the figure, more than half of the total project time consists of coordinating with regulatory agencies and obtaining the necessary permits and licenses. A description of the major events listed in Figure 8-1 follows:

1. The starting point of the Implementation Schedule is the time of project funding and project authorization.
2. The existing power supply contract between the Village and PANSY effectively prevents the Village from installing hydroelectric facilities. Negotiations and an agreement to revise this contract would be necessary before any substantial investment could be made in hydroelectric facilities.
3. The first step in the licensing procedure is the preparation of the FERC short form license application. Concurrently with the preparation of the above application, a Section 404 Permit would be prepared for the U.S. Corps of Engineers; and Article 15 Permit for the New York State Department of Environmental Conservation, and an Exhibit 5 for the U.S. Department of the Interior.

4. The second step in the licensing procedure is to circulate the FERC application to the appropriate agencies, and to submit the appropriate additional forms and permit requests as noted above. The agencies which review the application include the following:
 - a. U.S. Corps of Engineers
 - b. New York State Department of Environmental Conservation
 - c. U.S. Department of the Interior
 - d. Adirondack Park Agency
 - e. N.Y.S. Health Department
 - f. N.Y.S. Public Service Commission
 - g. N.Y.S. Parks and Recreation
 - h. N.Y.S. Fish and Wildlife Management Board
5. Upon receipt of comments from the above agencies, review by the FERC can begin. The FERC has indicated that its review would be completed within 6-12 months after the submittal of the application.
6. Based on the data contained in the application, the FERC may require a complete environmental impact statement. The preparation and approval of such a statement would take about 10 months.
7. In order to begin design of the facilities, a preliminary inspection of the existing facilities would be required. This would essentially be an updating of the inspection performed in this study, since it may be 3 years or more from now before final design can commence.

8. In order to minimize project time, two contracts are proposed. This permits the Village to advertise contracts, for the long lead time electrical equipment, within 1.5 months of the final regulatory approval.
9. The electrical contract would be advertised for 3 weeks, with an additional 3-week period reserved for bid evaluation and award.
10. Generator manufacturers have indicated that fabrication of electrical equipment would take between 6-9 months.
11. The basic civil work should be completed by the time fabrication of the electrical equipment has been completed. Installation of electrical equipment and completion of the civil work would take place simultaneously.
12. The project is deemed complete after energization of the equipment, and after all final touch-up civil work has been completed.
13. Additional soil borings will be necessary to adequately determine the stability of the Power Pond dam. Preliminary borings and analysis indicate that the dam is unstable and it would not be prudent to install generating equipment without first accurately determining the dam stability, and taking corrective measures, if necessary.
- 14-18. Civil design, contract preparation, contract award, and civil construction would take place approximately concurrently with electrical design. Since lead times for the equipment contained in the civil contract are relatively short, and since most of the

facilities can be constructed within a 2-month period, the major concern regarding the civil work would be to make the work coincide with good weather.

- 19,20. Since the existing penstocks and control equipment have been out of service for several years, complete equipment tests, including pressure testing the penstocks, should be performed, and repairs made as required. The time frame of this work is not critical, but should be completed well in advance of the energization of the generating plants.

SECTION 9 - SUMMARY AND RECOMMENDATIONS

9.01 Summary

This Study was prepared as a direct result of the Federal Department of Energy's program to stimulate the utilization of lowhead hydropower, and New York State's "action program" for the development of hydropower in New York State. Funding was provided by the Department of Energy, and the New York State Energy Research and Development Authority. The principal objective of the Study was to determine if the re-installation and re-activation of hydroelectric generating facilities at the Mill Pond and Power Pond dams in the Village of Lake Placid would be technically, environmentally, and economically feasible.

Three sites were selected and evaluated: a site downstream of the Mill Pond dam, a site 530 feet downstream of the Power Pond dam (Power Pond Site, Alternative 1), and a site 800 feet downstream of the Power Pond dam (Power Pond Site, Alternative 2). Power Pond Site Alternative 2 would consist of new equipment within an existing powerhouse. The other two sites would require construction of a powerhouse. An analysis of stream flows and available head indicated that the annual power which could be generated at the three sites would be as follows:

Mill Pond Site	485,000 kWH
Power Pond Site, Alternative 1	645,000 kWH
Power Pond Site, Alternative 2	820,000 kWH

The total value of the generated power was calculated, and adjusted for operating and maintenance expenses, capital costs, and financing costs. Based on the bonding costs and purchased power costs assumed in the Study, generating stations located at the Mill Pond or Power Pond Site, Alternative 1 would not be economical. Total costs of ownership were greater than total savings. Power Pond Site, Alternative 2 may be economical depending on method of financing, and the rate of escalation of the costs of purchased power. 1979 costs per kWH were developed, for the three sites, which would result in a break even situation if inflation occurs at 7% over the life of the Project. These costs can be compared with the 1979 value of incremental purchased power of \$.0312/kWH.

Mill Pond Site, Alternative 1	\$.044/kWH
Power Pond Site, Alternative 1	\$.033/kWH
Power Pond Site, Alternative 2	\$.021/kWH

Only the Power Pond Site, Alternative 2 is competitive with alternative sources of power.

The Study indicates that construction of generating facilities would have minimal environmental effects, but that regulatory requirements could delay construction for 13-35 months, and that obtaining the necessary permits and license, would cost between \$8,000 and \$16,000.

A possible impediment to the construction of the facilities is a clause which has been historically included in the Village's contract with the Power Authority of the State of New York (PASNY). The clause effectively prevents the economic installation of hydroelectric facilities.

With the emphasis on lowhead hydroelectric power development, however, it is believed that PASNY would be agreeable to a reasonable modification of the clause such as to make the Project economically viable.

The analysis of the existing Power Pond dam indicated possible stability problems. Additional investigation is necessary to accurately determine the stability of the dam. If the dam is shown to be unstable, additional expenditures of up to two hundred thousand dollars may be required for repairs.

9.02 Recommendations

The installation of new generating equipment within the existing powerhouse may be economically advantageous. Installation of generating facilities at the Mill Pond site would be uneconomical due to low head, aesthetic, environmental constraints, therefore, it is recommended that no facilities be installed at Mill Pond. The benefits which would be realized by installing equipment at the powerhouse are long term and station operation would initially have to be subsidized for a number of years. The exact amount of the subsidy would depend on the method of financing and first cost and could vary from \$5,000 to \$80,000 per year in the early years.

The recommendations regarding installation of hydroelectric generating facilities are as follows:

1. Hydroelectric power is a clean energy source which has relatively constant costs of generation. Reactivation of hydroelectric facilities is encouraged by both state and federal governments. Therefore, the Village should pursue methods of economically reactivating its hydroelectric facilities.
2. Zero interest, low-cost loans, or demonstration grants should be pursued for the financing of the construction of the Power Pond Site, Alternative 2, generating facilities. Such financing should be pursued on the basis that the Project would provide an excellent demonstration of the feasibility of a lowhead hydroelectric installation which would be economically viable over the life of the Project.
3. If financing is available, negotiations should be begun with PASNY regarding the generation clauses in the contract.
4. Upon successfully modifying the contract with PASNY, permits and license applications should be prepared.
5. Upon receipt of approval of regulatory agencies, authorization should be given for final design and construction.
6. The procedure and schedule outlined in the implementation schedule should be followed.

9.03 Personnel

This Hydroelectric Feasibility Study has been prepared in accordance with the agreement between O'Brien & Gere Engineers and the New York State Energy Research and Development Authority, dated November 1, 1978. The personnel which contributed to the Study are as follows:

Coordination:

Russell L. Sutphen, Group Vice President, P.E.

Curt A. Schwalbe, Managing Engineer, P.E.

Robert A. Cherry, Project Engineer, P.E.

Hydrology and Civil Work

Lee DeHeer, Managing Engineer, P.E.

Steve Snider, Design Engineer

I.E. Onaral, Design Engineer

Socio-Cultural, Environmental, Regulatory Requirements

Edwin C. Tifft, Ph.D., Managing Engineer

Ralph E. McClurg, Senior Researcher

Robert Halbritter, Researcher

Electrical

Curt A. Schwalbe, Managing Engineer, P.E.

Robert A. Cherry, Project Engineer, P.E.

Respectfully submitted,

O'BRIEN & GERE ENGINEERS, INC.

Russell L. Sutphen
Russell L. Sutphen
Vice President

TABLE 1

CLASSIFICATIONS AND STANDARDS FOR FRESH SURFACE WATERS.

Classification	Best Usage	Conditions of Best Usage	DISSOLVED OXYGEN STANDARDS					COLIFORM STANDARD ¹			pH	Total Dissolved Solids	Phenolic Compounds	RADIOACTIVITY STANDARDS		
			Trout Waters		Non Trout Waters			Monthly Median Value	20% of Sample	Monthly Geometric Mean				Gross Beta	Radium 226	Strontium 90
			Trout Waters Spawning	Min. Daily Average	Min.	Min. Daily Average	Min.									
Class AA	Water supply for drinking or food processing	Waters will meet Health Department standards	7 mg/l	6 mg/l	5 mg/l	5 mg/l	4 mg/l	Less than 30/100ml coliforms	Less than 240/100ml coliforms	-----	6.5-8.5	As low as practicable. Less than 500 mg/l	Less than 0.001 mg/l (phenol)	Less than 1000pc/l (in absence of Sr90 and alpha emitters)	Less than 3pc/l	Less than 10pc/l
Class A	Water supply for drinking or food processing	Waters will meet Health Department standards for drinking water with approved treatment	7 mg/l	6 mg/l	5 mg/l	5 mg/l	4 mg/l	Less than 500/100ml coliforms	Less than 20,000/100ml coliforms	Less than 260/100ml fecal coliforms	6.5-8.5	As low as practicable. Less than 500 mg/l	Less than 0.005 mg/l (phenol)	Less than 1000pc/l (in absence of Sr90 and alpha emitters)	Less than 3pc/l	Less than 10pc/l
Class B	Contact recreation and other uses except water supply and food processing	-----	7 mg/l	6 mg/l	5 mg/l	5 mg/l	4 mg/l	Less than ² 2,400/100 ml coliforms	Less than ² 5,000/100 ml coliforms	Less than ² 200/100ml fecal coliforms	6.5-8.5	None detrimental to aquatic life. Waters currently less than 500mg/l shall remain below this limit.	-----	-----	-----	-----
Class C	Fishing and other uses except water supply, food processing and contact recreation	-----	7 mg/l	6 mg/l	5 mg/l	5 mg/l	4 mg/l	-----	-----	Less than ² 10,000/100ml coliforms and 2,000/100ml fecal coliforms	6.5-8.5	None detrimental to aquatic life. Waters currently less than 500mg/l shall remain below this limit.	-----	-----	-----	-----
Class D	Secondary contact recreation. Waters are not suitable for propagation of fish	Waters must be suitable for fish survival	-----	-----	-----	-----	3 mg/l	-----	-----	-----	6.0-9.5	-----	-----	-----	-----	-----
Class E	Enjoyment of water in its natural condition for whatever compatible purposes	No waste discharges whatsoever permitted without approved filtration through 200' of unconsolidated earth	Natural	Natural	Natural	Natural	Natural	Natural	Natural	Natural	Natural	Natural	-----	Natural	Natural	Natural

NOTES:

- 1) A minimum of five examinations are required.
- 2) Standard to be met during all periods of disinfection.
- 3) Additional standards applicable to the above classifications: Turbidity-no increase that will cause a substantial visible contrast to natural conditions; Color-None from man-made sources that will be detrimental to the specified best usage of waters; Suspended, colloidal or other solids-None from any waste discharge which will cause deposition to the best usage of water; Oil and floating substances-No residue attributable to a waste discharge nor visible oil film nor globules of grease; Taste and odor-producing substances, toxic wastes and deleterious substances-None that will be injurious to fish life or which will adversely affect the flavor, color or odor, thereof, or impair the waters for the specified best usage of water; Thermal discharges-No discharge which will be injurious to fish life or to make the waters unsafe or unsuitable for any classified use.
- 4) With reference to certain toxic substances affecting fish life, the establishment of any single numerical standard for waters of New York State would be too restrictive. There are many waters, which because of poor buffering capacity and composition will require special study in determining safe concentrations of toxic substances. However, most of the non-trout waters near industrial areas in this state will have an alkalinity of 80 milligrams per liter or above. Without considering increased or decreased acidity from possible combinations, the following may be considered as safe stream concentrations for certain substances to comply with the above standard for this type of water. Water of lower alkalinity must be specifically considered since the toxic effect of most pollutants will be greatly increased. Ammonia or Ammonium Compounds-Not greater than 2.0 milligrams per liter expressed as NH₃ at pH of 8.0 or above; Cyanide-Not greater than 0.1 milligrams per liter expressed as CN⁻; Ferrous or Ferricyanide-Not greater than 0.4 milligrams per liter expressed as Fe²⁺; 6; Copper-Not greater than 0.2 milligrams per liter expressed as Cu²⁺; Zinc-Not greater than 0.3 milligrams per liter expressed as Zn²⁺; Lead-Not greater than 0.1 milligrams per liter expressed as Pb²⁺.

TABLE 2

WATER QUALITY CLASSIFICATIONS & STANDARDS
LAKE PLACID REGION

Classification	Item No.	Water Item Number	Name	Description	Map Ref.	Class	Standards
C	273	C-25-26-35 portion as described.	Chubb River	Enters West Branch Ausable River from northwest 0.7 mile upstream from trib. 34 and 1.3 miles north-east of John Browns Grave. Mouth to a point on river located 1.1 miles upstream from mouth and 0.2 mile upstream from outfall of Lake Placid sewage treatment plant.	C-24	C	C
C(T)	274	C-25-26-35 portion as described	Chubb River	From a point 0.2 mile upstream from Lake Placid sewage treatment plant outfall upstream to source.	C-24 C-23 C-23	C	C(T)
C(T)	275	C-25-26-35-1 including P 248	Tributary of Chubb River	Enters Chubb River from north 0.6 mile upstream from mouth and 1.5 miles north of John Browns Grave. P 248 is located at source and 0.4 mile upstream from mouth.	C-24	D	D
C(T)	276	C-25-26-35-2 and tribs.	Tributary of Chubb River.	Enters Chubb River from southwest 0.2 mile upstream from trib. 1 and 1.4 miles south of John Browns Grave.	C-24	C	C(T)
C(T)	277	C-25-26-35- P 249	Pond on Chubb River	Located on Chubb River beginning 0.7 mile upstream from trib. 2 and extending upstream for a distance of approximately 0.7 mile.	C-24	C	C(T)
C(T)	278	C-25-26-35-3	Mirror Lake Outlet	Enters Chubb River from north 0.8 mile upstream from trib. 2 and 1.5 miles southwest of peak of Cobble Hill	C-24	C	C(T)
B(T)	279	C-25-26-35-3- P 250	Mirror Lake	Located at source of Mirror Lake Outlet 0.4 mile upstream from mouth and in Village of Lake Placid.	C-24	B	B(T)
C(T)	280	C-25-26-35-3 P 250-1 including P 251	Tributary of Mirror Lake	Enter easterly side of Mirror Lake from east 0.6 mile west of Cobble Hill. P 251 is located 0.4 mile upstream from mouth and 0.2 mile north of peak of Cobble Hill.	C-24	C	C(T)
B(T)	283	C-25-26-35-5	Lake Placid Outlet	Enters Chubb River from north 0.4 mile upstream from trib. 4 and 2.2 miles northwest of John Browns Grave.	C-24 C-23	B	B(T)
AA	285	C-25-26-35-5- P 254 and tribs.	Lake Placid	Located at source of Lake Placid Outlet 1.9 miles upstream from mouth and to north of Village of Lake Placid.	C-24 C-23	AA Special	AA Apecial

(T) trout - waters suitable for trout habitation.

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for the 1980 Winter Olympic Games

TABLE 3
COST ESTIMATE
MILL POND SITE

A.	Permits, License Applications		
1.	FERC Short License	\$ 5,500	
2.	Exhibit S	1,000	
3.	U.S. Army Corps Permits	500	
4.	DEC Stream Protection Permits	1,000	
5.	Environmental Impact Statement	<u>8,000</u>	
	Sub-Total		\$ 8,000 ¹
B.	Inspection and Repair of Existing Facilities		
1.	Clean, inspect and repair penstock	\$ 15,000	
2.	Penstock pressure test	20,000	
3.	Removal of existing facilities	15,000	
4.	Penstock modifications	15,000	
5.	Gatehouse modifications	<u>15,000</u>	
	Sub-Total		80,000
C.	Powerhouse-Civil Works		
1.	Structure and foundation	\$250,000	
2.	River channel, bridge and building protection	50,000	
3.	Site work	<u>20,000</u>	
	Sub-Total		320,000
D.	Powerhouse-Mechanical and Electrical		
1.	Turbine, generator and controls	\$260,000 ²	
2.	Miscellaneous electric equipment	15,000	
3.	Shipping	20,000	
4.	Installation	30,000	
5.	Start-up	<u>5,000</u>	
	Sub-Total		330,000
E.	Engineering		
1.	Design	\$ 58,000	
2.	Construction Inspection	<u>45,000</u>	
	Sub-Total		103,000
F.	Legal and Administrative		<u>36,000</u>
	Estimated total 1979 cost		\$877,000

¹Assumes Environmental Impact Statement will not be required.

²Estimate based on synchronous generators. Can be reduced by \$15,000 if induction generator is specified.

TABLE 4
COST ESTIMATE
POWER POND SITE
ALTERNATIVE 1 - UPPER SITE

A. Permits, License Applications			
1.	FERC Short License	\$ 5,500	
2.	Exhibit S.	1,000	
3.	U.S. Army Corps Permits	500	
4.	DEC Stream Protection Permits	1,000	
5.	Environmental Impact Statement	<u>8,000</u>	
	Sub-Total		\$ 8,000 ¹
B. Inspection and Repair of Existing Facilities			
1.	Clean, inspect and repair penstock	\$ 20,000	
2.	Penstock pressure test	25,000	
3.	Detailed dam investigation and redesign ²	25,000	
4.	Gatehouse modifications	25,000	
5.	Penstock modifications	<u>20,000</u>	
	Sub-Total		115,000
C. Powerhouse-Civil Works			
1.	River channel protection	\$ 20,000	
2.	Structure and foundation	<u>250,000</u>	
	Sub-Total		270,000
D. Powerhouse-Mechanical and Electrical			
1.	Turbine, generator and controls	\$260,000 ³	
2.	Miscellaneous electric equipment	15,000	
3.	Shipping	20,000	
4.	Installation	30,000	
5.	Start-up	<u>5,000</u>	
	Sub-Total		330,000
E. Engineering			
1.	Design	\$ 57,000	
2.	Construction Inspection	<u>45,000</u>	
	Sub-Total		102,000
F. Legal and Administrative			
			<u>35,000</u>
	Estimated total 1979 cost		\$860,000

¹ Assumes Environmental Impact Statement will not be required.

² Costs of remedial measures, if any, required for dam are unknown until the detailed dam investigation is completed.

³ Estimate based on synchronous generators. Can be reduced by \$15,000 if induction generator is specified.

TABLE 5
COST ESTIMATE
POWER POND SITE
ALTERNATIVE 2 - POWER HOUSE SITE

A.	Permits, License Applications		
1.	FERC Short License	\$ 5,500	
2.	Exhibit S	1,000	
3.	U.S. Army Corps Permits	500	
4.	DEC Stream Protection Permits	1,000	
5.	Environmental Impact Statement	<u>8,000</u>	
	Sub-Total		\$ 8,000 ¹
B.	Inspection and Repair of Existing Facilities		
1.	Clean, inspect and repair penstock	\$ 20,000	
2.	Penstock pressure test	25,000	
3.	Detailed dam inspection and redesign ²	25,000	
4.	Gatehouse modifications	25,000	
5.	Penstock modifications	<u>20,000</u>	
	Sub-Total		115,000
C.	Powerhouse-Civil Works		
1.	River channel protection	\$ 20,000	
2.	Stores & Office Space ⁴	25,000	
3.	Existing powerhouse modifications	50,000	
4.	Additional penstock modifications	<u>50,000</u>	
	Sub-Total		95,000
D.	Powerhouse-Mechanical and Electrical		
1.	Turbines, generator and governor	\$150,000 ³	
2.	Switchboard & control	100,000	
3.	Shipping	20,000	
4.	Installation	50,000	
5.	Start-up	5,000	
6.	Contingencies	<u>25,000</u>	
	Sub-Total		350,000
E.	Engineering		
1.	Design	\$ 35,000	
2.	Construction inspection	<u>35,000</u>	
	Sub-Total		70,000
F.	Legal and Administrative		<u>20,000</u>
	Estimated total 1979 cost		\$658,000

¹ Assumes Environmental Impact Statement will not be required.

² Costs of remedial measures, if any, required for dam are unknown until the detailed dam investigation is completed.

³ Estimate based on synchronous generators. Can be reduced by \$15,000 if induction generator is specified.

⁴ Generating equipment will take space presently utilized by Village Electric Department. Amount shown is estimated cost of equivalent storage area.

TABLE 6
ECONOMIC EVALUATION SUMMARY
PRESENT WORTH OF INCOME MINUS PRESENT WORTH OF EXPENSES

	Life Years		Inflation Rate <u>5%</u> <u>7%</u> <u>9%</u>
<u>Mill Pond Site</u>	30	-780,000	-588,000 -448,000
\$877,000 Project Cost in 1979	50	-635,000	-373,000 -205,000
485,000 Annual kWh			
 <u>Power Pond Site Alt. 1</u>	30	-609,000	-421,000 -284,000
\$860,000 Project Cost in 1979	50	-363,000	-106,000 + 58,000
645,000 Annual kWh			
 <u>Power Pond Site Alt. 2</u>	30	-196,000	-52,000 + 53,000
\$658,000 Project Cost in 1979	50	+173,000	+369,000 +495,000
820,000 Annual kWh			
 <u>Combined Sites, Alt. 1</u>	30	-1,290,000	-927,000 -663,000
\$1,657,000 Project Cost in 1979	50	-894,000	-939,000 - 82,000
1,130,000 kWh			
 <u>Combined Sites, Alt. 2</u>	30	-935,000	-606,000 -367,000
\$1,502,000 Project Cost in 1979	50	-420,000	+ 29,000 +317,000
1,305,000 kWh			

TABLE 7
SAMPLE ECONOMIC EVALUATION
POWER POND SITE ALTERNATIVE 2

Purchased Power Escalation Rate	7%
Operation and Maintenance Escalation Rate	7%
Bond Rate	6.5%
1979 Purchased Power Cost	\$.0312/kWH
1979 O&M Cost	\$5,000
Project Cost	\$658,000
Annual Power Generated	820,000 KWH
Life	50 Years

Year	Income	Expenses		Surplus	1979 Present Worth of Surplus
		O&M	Financing		
1979	25,584	5,000	44,687	-24,103	-24,103
1980	27,375	5,350	44,687	-22,662	-21,180
1981	29,291	5,725	44,687	-21,121	-18,448
1982	31,342	6,125	44,687	-19,471	-15,894
1983	33,535	6,554	44,687	-17,706	-13,508
1984	35,883	7,013	44,687	-15,817	-11,277
1985	38,395	7,504	44,687	-13,796	- 9,193
1986	41,082	8,029	44,687	-11,634	- 7,245
1987	43,958	8,591	44,687	- 9,320	- 5,424
1988	47,035	9,192	44,687	- 6,845	- 3,723
1989	50,328	9,836	44,687	- 4,196	- 2,133
1990	53,851	10,524	44,687	- 1,361	- 647
1991	57,620	11,261	44,687	+ 1,672	+ 742
1992	61,653	12,049	44,687	4,917	2,040
1993	65,969	12,893	44,687	8,389	3,253
1994	70,587	13,795	44,687	12,105	4,387
1995	75,528	14,761	44,687	16,080	5,447
1996	80,815	15,794	44,687	20,334	6,437
1997	86,472	16,900	44,687	24,835	7,363
1998	92,525	18,083	44,687	29,755	8,228
1999	99,002	19,348	44,687	34,966	9,036
2000	105,932	20,703	44,687	40,542	9,791
2001	113,347	22,152	44,687	46,508	10,497
2002	121,282	23,703	44,687	52,892	11,157
2003	129,771	25,362	44,687	59,722	11,774
2004	138,855	27,137	44,687	67,031	12,350
2005	148,575	29,037	44,687	74,851	12,889
2006	158,976	31,069	44,687	83,219	13,392
2007	170,104	33,244	44,687	92,172	13,863
2008	182,011	35,571	44,687	101,753	14,303
2009	194,752	38,061	44,687	112,003	14,714
2010	208,385	40,726	44,687	122,972	15,098
2011	222,971	43,576	44,687	134,708	15,457
2012	238,579	46,627	44,687	147,265	15,792
2013	255,280	49,891	44,687	160,702	16,105
2014	273,150	53,383	44,687	175,079	16,398
2015	292,270	57,120	44,687	190,463	16,672
2016	312,729	61,118	44,687	206,924	16,928
2017	334,620	65,396	44,687	224,536	17,167
2018	358,043	69,974	44,687	243,382	17,391
2019	383,107	74,872	44,687	263,547	17,600
2020	409,924	80,113	44,687	285,123	17,795
2021	438,619	85,721	44,687	308,210	17,977
2022	469,322	91,722	44,687	332,913	18,148
2023	502,175	98,142	44,687	359,345	18,307
2024	537,327	105,012	44,687	387,627	18,456
2025	574,940	112,363	44,687	417,889	18,595
2026	615,185	120,229	44,687	450,269	18,726
2027	658,248	128,645	44,687	484,916	18,847
2028	704,326	137,650	44,687	521,989	18,961
Total					369,311

TABLE 8

BENEFIT - COST RATIOS

SUMMARY OF COSTS

<u>Site</u>	<u>Project Cost</u>	<u>Amortized¹ Cost</u>	<u>Annualized O&M²</u>	<u>Average Annual Cost</u>
Mill Pond	\$ 877,000	\$ 60,000	\$18,000	\$ 78,000
Power Pond Alt. 1	860,000	58,000	18,000	76,000
Power Pond Alt. 2	658,000	45,000	18,000	63,000
Combined Alt. 1	1,657,000	113,000	36,000	149,000
Combined Alt. 2	1,502,000	102,000	36,000	138,000

SUMMARY OF BENEFITS

<u>Site</u>	<u>Annualized Income²</u>
Mill Pond	\$ 55,000
Power Pond Alt. 1	73,000
Power Pond Alt. 2	93,000
Combined Alt. 1	128,000
Combined Alt. 2	147,000

BENEFIT - COST RATIOS

<u>Site</u>	<u>B/C Ratio</u>
Mill Pond	.71
Power Pond Alt. 1	.96
Power Pond Alt. 2	1.48
Combined Alt. 1	.86
Combined Alt. 2	1.06

¹Based on 6.5% Bond Rate and 50-Year Life (CRF = .0679)²Based on 7% Inflation, 50-Year Life, 1979 O&M Expense & Income

**Mill Pond Dam
and Gatehouse**

**Mill Pond Dam,
Chubb River Channel**

Power Pond Dam

FIGURE 2-1

CHUBB RIVER
DRAINAGE BASIN

O'BRIEN & GERE
ENGINEERS

FIGURE 2-2

LEGEND:

- Adjusted total stream flow from W. Br. Ausable River.
- - - Calculated power discharge from Lake Placid Village Electric power production records.

CHUBB RIVER

FLOW DURATION CURVES

O'BRIEN & GORE
ENGINEERS

FIGURE 2-3

LAKE PLACID HYDROELECTRIC REACTIVATION STUDY
N.Y.S.D.E.C. Stream Sampling Locations
On The Chubb River

FIGURE 3-1

MILL POND DAM
PLAN AND ELEVATION

FIGURE 3-2

Boring
B-2
12/30/78

PLAN

POWER POND DAM - PLAN

O'BRIEN & GERE
ENGINEERS

FIGURE 3-3

FIGURE 3-4

NOTE
R = Resultant Foundation Reaction.

BASE PRESSURE DIAGRAM FOR 50% PMF

BASE PRESSURE DIAGRAM FOR 3FT. ABOVE CREST

BASE PRESSURE DIAGRAM FOR NORMAL POOL

POWER POND DAM

STABILITY ANALYSIS
POWER POND DAM

MILL POND DAM
84" DIA. PENSTOCK

NET HEAD VS. DISCHARGE CURVES
MILL POND DAM

POWER POND DAM

NET HEAD VS. DISCHARGE CURVES
POWER POND DAM

FIGURE 4-3

MILL POND DAM

POWER PRODUCTION CURVES
MILL POND DAM

FIGURE 4-4

POWER POND DAM

POWER PRODUCTION CURVES
POWER POND DAM

FIGURE 4-5

PROPOSED LOCATION OF
MILL POND POWERHOUSE

FIGURE 4-6

FIGURE 4-7

FIGURE 4-8

VILLAGE OF LAKE PLACID, N.Y.
HYDROELECTRIC FEASIBILITY STUDY

ONE LINE DIAGRAM
INDUCTION GENERATORS

FIGURE 4-9

VILLAGE OF LAKE PLACID, N.Y.
HYDROELECTRIC FEASIBILITY STUDY

ONE LINE DIAGRAM
SYNCHRONOUS GENERATORS

FIGURE 5-1

LAKE PLACID HYDROELECTRIC REACTIVATION STUDY

Present & Planned Recreational Developments For Mill Pond Area

O'BRIEN & GERE

scale in feet

FIGURE 5-2

LAKE PLACID HYDROELECTRIC REACTIVATION STUDY

Topography

This is a detailed topographic map of the Lake Placid area in New York. The map features numerous contour lines and elevation points. Key features include:

- LAKE PLACID**: The central body of water.
- Mill Pond Dam**: Located on the eastern shore of Lake Placid.
- Power Pond Dam**: Located further east, near the landfill.
- LANDFILL**: Situated to the east of the Power Pond Dam.
- Elevation Points**: Various points are labeled with numbers and letters, such as 96C, 97B, 97C, 97D, 97E, 97F, 97G, 97H, 97I, 97J, 97K, 97L, 97M, 97N, 97O, 97P, 97Q, 97R, 97S, 97T, 97U, 97V, 97W, 97X, 97Y, 97Z, 98A, 98B, 98C, 98D, 98E, 98F, 98G, 98H, 98I, 98J, 98K, 98L, 98M, 98N, 98O, 98P, 98Q, 98R, 98S, 98T, 98U, 98V, 98W, 98X, 98Y, 98Z, 99A, 99B, 99C, 99D, 99E, 99F, 99G, 99H, 99I, 99J, 99K, 99L, 99M, 99N, 99O, 99P, 99Q, 99R, 99S, 99T, 99U, 99V, 99W, 99X, 99Y, 99Z, 100A, 100B, 100C, 100D, 100E, 100F, 100G, 100H, 100I, 100J, 100K, 100L, 100M, 100N, 100O, 100P, 100Q, 100R, 100S, 100T, 100U, 100V, 100W, 100X, 100Y, 100Z.
- Water**: Other areas of water are labeled, including Mill Pond and Power Pond.

The map is oriented with North at the top. The contour lines indicate the elevation of the terrain, with higher elevations generally to the north and west of Lake Placid.

Soils

19B Soil Number (Corresponds to numbers on Table 5-1)

FIGURE 5-4

LAKE PLACID HYDROELECTRIC REACTIVATION STUDY

Land Use Planning & Zoning

Village of Lake Placid

O'BRIEN & GERE

LEGEND

R-1	Residence
R-1-A	Residence
R-2	Residence
R-H	Resort Hotel
R-R	Resort Residence
C-1	Commercial
C-2	Commercial
M-L	Mirror Lake
P-D	Planned Development

FIGURE 5-5

LAKE PLACID HYDROELECTRIC REACTIVATION STUDY

Biological Resources

LEGEND

- Wetland
- Streams
- intermittent
- State Stream Standards
- Pine Plantation
- Special Interest Area
- Native & Stocked Trout Streams

scale in feet

FIGURE 8-1

VILLAGE OF LAKE PLACID, N.Y.
HYDROELECTRIC FEASIBILITY STUDY

IMPLEMENTATION
SCHEDULE

Appendices

ATLANTIC TESTING LABORATORY

CANTON, NEW YORK

APPENDIX
PAGE 1 OF 3

SUBSURFACE INVESTIGATION

Report No. L283-1-1-79

CLIENT: O'Brien & Gere Engineers, Inc.

Location of Boring: See Plan

Justin & Courtney Division

PROJECT: Power Pond Dam

Village of Lake Placid

Date, start 12/27/78 Finish 12/29/78

Boring No. B-1 Sheet 1 of 2

Ground Water Observations

Casing Hammer

Sampler Hammer

Wt. _____ lbs.

Wt. 140 lbs.

Fall _____ in.

Fall 30 in.

☐ I.D. Casing

Ground Elev. 3-1/4' D. H.S. Auger

Date	Time	Depth	Casing at
12/27	4:30	11.0'	13.0'
11/28	5:00	13.0'	40.0'
11/29	8:00	20.0'	40.0'

DEPTH	CASING BLOW/FT.	SAMPLE NO.	DEPTH OF SAMPLE		TYPE SAMPLE	BLOWS ON SAMPLER PER SAMPLER O.D.	DEPTH OF CHANGE	CLASSIFICATION OF MATERIAL	DEPTH
			FROM	TO					
			0.0	1.0		Auger		1.0' Frost Penetration	
		1	1.0	3.0	ss	6-8-19-21		Brown cmf SAND; little mf GRAVEL; trace SILT (dry, non-plastic)	
			5.0	5.2	ss	20/0.2		No Recovery - Spoon bouncing on cobble; several cobbles from 3.0' to 5.0'	
		2	6.0	6.5	ss	110		Brown cm SAND; trace SILT; trace mf GRAVEL (moist, non-plastic)	
		3	10.0	11.5	ss	42-49-57		Dark Brown cmf SAND; little mf GRAVEL; trace SILT (wet, non-plastic)	
			13.0	14.0			13.0	Boulder	
		4	15.0	16.5	ss	41-34-67		Ditto (wet, non-plastic) Flowing Sand at 17.0'	
		5	20.0	21.5	ss	45-73-85		Brown cmf SAND; trace mf GRAVEL; trace SILT (wet, non-plastic) Rock Frags Flowing Sand at 20.0'	
		6	25.0	26.5	ss	55-61-87		Brown cmf SAND; trace f GRAVEL; trace SILT (wet, non-plastic)	
			30.0	31.0	ss	85-100		No Recovery - cobble Flowing Sand at 30.0'	
		7	35.0	36.5	ss	3-4-41		Brown mf SAND; trace SILT (wet, non-plastic)	
		8A	40.0	41.0		67-85	41.0	Ditto (moit, non-plastic)	
		8B	41.0	41.5		110		Dark Grey SILT; and f SAND (moist, non-plastic)	

SS - SPLIT SPOON SAMPLE
U - UNDIS. SHELBY TUBE
P - PISTON TYPE SAMPLE

DRILLERS

Lewis Rice

Patrick Sullivan

SUBSURFACE INVESTIGATION.

Report No. L283-1-1-79

Location of Boring: See Plan

Date, start 12/27/78 Finish 12/29/78

Ground Water Observations			
Date	Time	Depth	Casing at

Sampler Hammer

Fall _____ in. Fall _____ 30 _____ in.

Ground Elev. _____ ☒ 2-1/4" I.D.H.S. Auger

SS — SPLIT SPOON SAMPLE.
 U — UNDIS. SWELLY TUBE.
 P — PISTON TYPE SAMPLE.

DRILLERS Lewis Rice

Patrick Sullivan

atl ATLANTIC TESTING LABORATORY

CANTON, NEW YORK

SUBSURFACE INVESTIGATION

Report No. L283-1-1-79

CLIENT: O'Brien & Gere Engineers, Inc. Location of Boring: See Plan
Justin & Courtney Division
PROJECT: Power Pond Dam
Village of Lake Placid Date, start: 12/29/78 Finish: 12/30/78

Boring No. B-2 Sheet 1 of 1

Ground Water Observations

Casing Hammer Sampler Hammer
Wt. lbs. Wt. 140 lbs.
Fall in. Fall 30 in.
☐ I.D. Casing
Ground Elev. ☒ 2-1/4" I.D. H.S. Auger

Date	Time	Depth	Casing at
12/29	4:00	18.0'	40.0'
12/29	4:15	Caved in at 17' Out	

DEPTH	CASING BLOW/FT.	SAMPLE NO.	DEPTH OF SAMPLE		TYPE SAMPLE	BLOWS ON SAMPLER PER SAMPLER O.D.	DEPTH OF CHANGE	CLASSIFICATION OF MATERIAL		MASS
			FROM	TO				F — FINE M — MEDIUM C — COARSE	AND — 35-60% SOME — 20-35% LITTLE — 10-20% TRACE — 0-10%	
		1A	0.0	0.5	ss	16	0.5	TOPSOIL and ORGANIC Material (wet non-plastic) Frozen		
		1B	0.5	1.5	ss	12-10		Brown cmf SAND; trace mf GRAVEL; trace ORGANICS; trace SILT (moist, non-plastic)		
		2	5.0	6.5	ss	41-50-55		Light Brown cmf SAND; trace f GRAVEL; trace SILT (moist, non-plastic)		
		3	10.0	11.5	ss	21-32-37		Brown cm-f SAND; trace SILT (moist non-plastic)		
		4	15.0	15.5	ss	34/0.4'-100/0"	40.0	Greyish Brown c-mf SAND; trace SILT; (moist, non-plastic)		
	AUGER		18.0	24.0				Unable to sample due to continuous cobbles and boulders		
		5	26.0	26.5	ss	103-100/0"		Brown cmf SAND; little mf GRAVEL with 1/2" to 1/2" pockets of SILT (wet, non-plastic)		
		6	30.0	31.0	ss	56-97		Ditto		
		7	35.0	35.5	ss	41-100/0"	40.0	Ditto		
		8	40.0	40.5	ss	38-100/0"		Greyish Brown c-mf SAND; little SILT (wet, non-plastic)		
								Bottom Boring 40.5'		

SS — SPLIT SPOON SAMPLE.
U — UNDIS. SHELBY TUBE.
P — PISTON TYPE SAMPLE.

DRILLERS Lewis Rice

Patrick Sullivan