NEW ENGLAND POWER COMPANY

VERNON UNIT REPLACEMENTS
PROJECT NO. 1904

EXHIBIT E

AN ENVIRONMENTAL REPORT

DRAFT

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EXHIBIT E - AN ENVIRONMENTAL REPORT

INTRODUCTION

This report describes the environmental setting of New England Power Company's (NEP) Vernon Project (FERC L.P. No. 1904) , which is located on the Connecticut River between Hinsdale, New Hampshire, and Vernon, Vermont (Figure 1). The emphasis of the report is on the environmental resources which would be affected by the proposed Vernon unit replacements. A further emphasis is on the provisions for the mitigation of impacts to the downstream passage of Atlantic salmon and American shad at the project. The extent of the information presented herein is commensurate with the scope of the proposed amendment. Since the proposed unit replacements would take place entirely within the existing powerhouse, impacts would be limited to the immediate river environment. Minor negative impacts resulting from construction work would be offset by long-term positive benefits resulting from the enhancement of the downstream passage of anadromous fishes.

Based upon NEP's own review of the project's impacts, and information and comments received from the appropriate resource agencies through consultation, NEP believes that the primary scope of this Environmental Report is to present a full discussion of the relevant fisheries, water quality and stream flow concerns. There would be no changes to the wildlife, botanical, cultural and recreational resources in or near the project area. Available information on other environmental resources in the project area is presented in order to describe the environmental setting of the project.

1.0 GENERAL DESCRIPTION OF THE PROJECT LOCALE

1.1 Geology and Topography

An extensive geological investigation of the Connecticut Valley was carried out in conjunction with the design and construction of the Vermont Yankee Nuclear Power Station. The valley bedrock is composed of quartz diorite gneiss (granite-like rock) and has a long and complex history. The original bedrock in the area was composed of early Paleozoic sedimentary rocks (over 230 million years old). These rocks were strongly folded from east to west to form a structure referred to as a nappe, in which the fold was not only overturned and recumbent, but may also have been displaced to the west by faulting.

This recumbent fold was in its turn intruded from below by a number of domes or plutons of quartz diorite. The Vernon dome, the rocks of which actually underlie the site, is eight miles long and two miles wide and is one of a series of similar structures which extend northward into northern New Hampshire and southward into Connecticut. Further downfolding of the rocks on a smaller scale produced a synclinal area between the Vernon and the Westmoreland dome to the north.

At the beginning of the Triassic period, some 70 million years ago, the area was further deformed by downfaulting. A large block of land extending from Long Island Sound on the south to somewhat north of the plant site was downfaulted. Similar graben areas, many still filled with Triassic red beds and basalts, are found along the eastern coast of the United States. There has been no apparent movement, however, of these structures during the past several million years.

The northern two-thirds of the Connecticut River Valley is bordered by two mountain ranges - the White Mountains of New Hampshire on the east, rising to heights of over 6,000 feet, and the Vermont's Green Mountains to the west with peaks of over 4,000 feet.

The Connecticut River at the site lies within the New England upland physiographic region. The basin is maturely dissected with the river flowing throughout most of its course in an open valley with well-developed flood plains above which rise glacial terraces tiered on the valley walls. The main river in the upland section winds between rounded, irregular hills and ridges.

The topography of the entire basin has been modified by glaciation which scraped the tops from the bedrock hills and filled the valleys with glacial detritus with, however, little actual diversion of drainage. The major effect of the glacial fill was to raise the streams from their old beds, thereby permitting the development of present channels. The presence of natural rock outcrops on the river has been exploited for power dam construction at Vernon, Turners Falls and Bellows Falls.

1.2 Climate

The climate of the Connecticut River Basin (Basin) varies considerably from the lower southern elevations to the higher northern elevations during the four distinctive seasons of the year. The average annual temperature in the Basin is about 45°F. Daily temperatures range from a maximum in the upper 90's in the summer to a minimum of minus 25°F in the winter.

Normally, the annual rainfall in the Basin varies from an average of 43 inches in the southern region to about 49 inches in the northern reaches. The extremes range from less than 38 inches in the main River Valley to over 60 inches in the higher elevations of the drainage area. The winter snowfall is heavy and varies from 30 to 40 inches in the south to 80 to 100 inches in the north.

1.3 Hydrology and Project Flows

Hydrology

The natural runoff pattern in the Connecticut River Basin is very irregular and varies from freshets and flood flows generally in the spring and fall months to relatively low flows during the summer and winter months. The flow which reaches Vernon results from the runoff from a drainage area of 6,266 square miles, which is about 55% of the total Basin. The average annual runoff from the drainage area is 21.8 inches, which is approximately 53% of the mean annual precipitation.

The major tributaries of the Connecticut River in and just above Vernon Pond, are the West River and the Saxtons River from the west and the Cold River from the east. During dry seasons, the flows in these streams are reduced to a fraction of their average value. Except for flood periods, the timing of inflow to Vernon Pond is strongly controlled by releases from upstream storage. NEP owns and operates power storage capacity above Vernon of about 255,900 acre-feet. NEP also utilizes 99,300 acre-feet of storage from the State of New Hampshire's Lake Francis and also benefits from the stream flow regulation provided by other reservoirs with a combined usable capacity of about 310,000 acre-feet.

Local groundwater level fluctuations depend upon direct precipitation and natural water level changes in the Connecticut River. Subsurface drainage from precipitation or flooding in the area occurs between the bedrock and the thin layer of overburden. Some of the nearby communities obtain drinking water entirely from stream water, other than the river, and some get their water supply partly from wells. There are many private wells in the area. Although some of the wells have yields of several hundred gallons per minute, such yields may be obtained only where glacial deposits are unusually thick and permeable. Some of the wells go into bedrock, which in this area yields relatively low flows of water.

There are no deep artesian aquifers (water-permeable rock, sand or gravel) in the area. In general, the water table slopes toward the river, into which the groundwater discharges; however, when the river stage is rising rapidly, the slope of the water table adjacent to the river may be reversed, in which case the river will recharge the groundwater.

There are only two small wetland areas near the Vernon pond. The first, about an acre in size, is located on the west shoreline 0.1 mile upstream of the dam on the New Hampshire side of the river. The other wetland, of similar size, is located 0.9 mile upstream of the dam on the Vermont shoreline.

Project Flows

The dam forms an impoundment with a surface area of 2,500 acres, a length of 27 miles and a shoreline of 69 miles. The impoundment has a total volume of about 40,000 acre-feet at full pond. Backwater effects raise the full pond levels to about elevation 227 (NGVD) at the upstream end of the impoundment. The spillway crest elevation is 212.1 and maximum normal pond elevation is 220.1 formed by wooden flashboards and tainter gates mounted on the dam crest.

The Station has a maximum discharge rate of about 15,400 cubic feet per second (cfs). There are ten main generating units consisting of three groups of similar units (Figure 2). Unit Nos. 1-4 are 2 MW vertical, single runner Francis units operated at 113.3 rpm, with maximum discharge capacity of 1,480 cfs. Unit Nos. 5-8 are 2 MW vertical three-runner Francis units operated at 133.3 rpm, with maximum discharge of 1,360 cfs. Unit Nos. 9 and 10 are 4.2 MW vertical single runner Francis units operated at 75 rpm, with maximum discharge of 2,025 cfs. Unit Nos. 1-8 were in operation in 1910, and Unit Nos. 9 and 10 were added in 1921.

In addition to Station discharge, the Vernon Project has sufficient gate capacity to pass up to approximately 85,000 cfs under controlled conditions. From west to east on the crest of the dam (Figure 2) are four 50 feet by 10 feet high tainter gates, ten 10 feet by 10 feet high hydraulic panels, three sections of 50 feet by 8 feet high pin flashboards and two 50 feet by 20 feet high tainter gates.

There are also ten sluice gates in the base of the spillway section, each 9 feet by 10 feet. Two of these sluices (the most easterly) have been plugged with concrete. There is one skimmer sluice located between Unit No. 1 and the spillway which has a hydraulically operated downward opening gate with a width of 13 feet which can be opened to a maximum of 13 feet. The skimmer sluice passes logs and other debris which is deflected away from the powerhouse by the log and ice boom in the Station forebay. Located on the west abutment is another sluice which has been modified to provide 50 cfs of attraction flow to the upstream fish ladder. It has a hydraulically operated upward opening gate and bar racks to keep out debris.

Project features also include a fish ladder which has been installed and operated to provide upstream passage over Vernon dam for Atlantic salmon and American shad. The Vernon fish ladder is a combination of Ice Harbor and vertical slot designs approximately 984 feet long and rises 35 vertical feet (Figure 3). A fish collection gallery lies over the Station draft tubes with a series of entrance weirs. There are viewing windows in the sides of the fishway at two locations; a public viewing room and a biologist's viewing room. A fish trap is used for the capture of fish for study or other purposes. The Ice Harbor portion of the ladder is periodically evaluated for American shad passage. The Vernon ladder was designed to pass 40,000 Atlantic salmon and 750,000 American shad. The fish ladder was completed in May 1981 in accordance with the Commission's Order Approving Settlement Agreement Concerning Fish Passage Facilities, dated October 5, 1978. A copy of the Settlement Agreement is in Appendix A. (See Section 3.2.1. for further discussion of the fish ladder's operation.)

The constructed project operates as a general run-of-the river project in that Station discharges are determined by the amount of water which flows into the impoundment and not by storage. Continuous operation at normal efficient maximum discharge (about 11,000 cfs) is typically possible for only short periods of time since usable storage volume is limited to the water between the dam crest and the top of the wooden flashboards. During periods of low river flows, the Station's daily operation is restricted to peak demand periods which typically occur between the daylight and early evening hours Monday through Friday. The Station then draws on the previous night's inflow into in the impoundment. While in this mode of operation and not running to meet peak demand, the Station discharges a continuous minimum flow of 1,250 cfs (0.20 cfs per square mile of drainage area) or a flow equal to project inflow, whichever is less, in accordance with Article 34 of the current Vernon Project License. The minimum flow is typically supplied by running either one of Unit Nos. 9 or 10. On a yearly basis, the Station is at minimum flow about 32 percent of the time. During periods of high river flows, the Station operates in a more continuous base load mode and passes water as it receives it.

Spillage occurs at the Project whenever river flows exceed the Station's ability to discharge. This condition exists about 14 percent of the time on a yearly basis, the majority of which is during the spring freshet. Spillage also occurs when the fish ladder and its attraction water system is operated during periods of upstream migration, and the skimmer sluice is operated during periods of downstream migration. The yearly schedules for the operation of the fish ladder and skimmer sluice are based on recommendations made by the Connecticut River Atlantic Salmon Commission (CRASC) and the individual State and Federal fisheries agencies.

1.4 Land Use, Transportation and Population

The land abutting the project area is predominately wooded slopes, terraced by multi-level plateaus running parallel to the river. Part of the abutting land is agricultural and is used for pasture or crops.

NEP holds fee ownership of 287 acres of land in the Vernon Project. Of this, 16 acres are used for plant and related facilities, 34 acres are being developed for public outdoor recreational use as part of NEP's continuing recreation program, 14 acres have been leased for agricultural and other uses, 98 acres have been set aside as "natural" lands and the remaining 125 acres are managed by NEP as forest land.

Interstate Route 91, U.S. Route 5 and Vermont Route 142 run in a north-south direction along the Vermont side of the Valley and New Hampshire Routes 119 and 63 run along the New Hampshire side. The Boston and Maine Railroad runs along the New Hampshire side, crossing into Vermont at Brattleboro. The Central Vermont Railroad runs along the Vermont side.

The project lands are situated in parts of nine communities. The communities are: Hinsdale, Chesterfield, Westmoreland and Walpole in New Hampshire; and Vernon, Brattleboro, Dummerston, Putney and Westminster in Vermont. The estimated total population in 1980 was 10,790 for the four New Hampshire communities and 19,900 for the five Vermont communities. The City of Brattleboro, Vermont, is the largest of the nine communities having had 11,886 persons in 1980. It is estimated that more than 500,000 people live within a 40-mile radius and slightly more than 1,000,000 people live within a 50-mile radius of the Project.

1.5 Flood Plains and Flood Events

Major floods in the Connecticut River Basin have been caused primarily by rainfall and melting snow in the spring season and occasional hurricanes in summer and fall. The largest basinwide flood occurred on March 19, 1936, when Vernon recorded flows of 176,000 cfs. Since the 1936 flood occurrence, the U.S. Army Corps of Engineers and the U.S. Department of Agriculture have constructed several flood retention reservoirs on tributaries which have substantially reduced the probability of large floods.

The area upstream of the Vernon Dam up to elevation 227 (NGVD) is classified as being within the 100-year flood boundary. Downstream of Vernon Dam, the 100-year flood boundary is identified as elevation 215. The upstream flood boundary elevation is the same as the maximum Vernon pond elevation due to backwater effect.

1.6 Erosion and Sedimentation Factors

Bank erosion has been a historical issue of major concern to riparian landowners along the Connecticut River. In 1974, the U.S. House of Representatives authorized the Connecticut River Streambank Erosion Study to identify the factors causing erosion and recommend erosion control measures. After holding a public meeting in April of 1975, the U.S. Army Corps of Engineers (ACOE) conducted an extensive investigation of the streambank erosion problem and its social and economic damages. Among the various factors associated with bank erosion, the ACOE specifically addressed the effect on erosion of four hydroelectric projects, including the Vernon Project. (The others were the projects at Turners Falls, Bellows Falls and Wilder.) The study was completed and published by the ACOE in 1979 as the "Report on: Connecticut River Streambank Erosion Study, Massachusetts, New Hampshire and Vermont."

The following material from the report's discussion section clearly expresses the ACOE's conclusions regarding the effect of hydro-pool operation on bank stability (emphasis added):

> Impact of Hydro-Pool Operation on Bank Stability
>
> "The operation of the hydro-pools increases bank erosion in the pools and, to a limited extent, downstream of the pools. Referring to Table 7, shows that erosional forces acting on the banks due to pool fluctuation are on the order of 15-18 percent of the shear stresses caused by the flowing water in the unrestricted reaches of the river.

In general:

a. Complete elimination of hydro-pool fluctuations would increase bank stability in the pools on the order of 15-18 percent.

b. Reduction of bank erosion as related to pool fluctuations is assumed to be linear. Hence, reducing pool fluctuations by 50 percent would reduce bank erosion on the order of 7-9 percent.

As one considers the adverse impacts of hydro-pool fluctuations on bank erosion, it is essential to simultaneously consider the favorable impacts of pools on bank stability. Referring to Table 2, it may be noted that within the pools, velocities and shear stresses are reduced. Figure 53 demonstrates that on the average, the computed velocity in the pools is 20 percent smaller than in the natural river. This results in a reduction of shear stress on the order of 40 percent. These reductions may increase the stability of the material, location in the pools, etc. Based on Table 2, the relative magnitude of bank erosion for different conditions (natural river, pools, high banks, low banks, etc.) is summarized in Table 8. This table shows that factors causing bank erosion in the pools are on the order of 5-41 percent less than for the natural river. Hence, the benefits outweigh the adverse aspects. Also, upstream storage provides an effective means of reducing peak flows during periods of flooding, which further reduces bank erosion in the study reach.

An analysis of the data at the test sites established by the ACOE verifies that bank erosion is at least as severe in the non-pool reaches as within the limits of the pools. In fact, the measured data indicates that the natural river is 1.30 times more susceptible to bank erosion than are the pools (Table 9). This is very close to the theoretical evaluation, which yielded a value of 1.34. In other words, the presence of pools reduces bank erosion on the order of 34 percent compared to the natural river.

By altering the operation of the hydro-pool in order to maintain selected pool levels for extended periods of time (for example, 30 days plus), the pool fluctuation at most will be reduced about 50 percent. This will reduce the bank erosion on the order of 7-9 percent as mentioned earlier. This

> may represent an insignificant gain in erosion control compared to the loss of power generation. A similar conclusion applies to a complete elimination of hydro-pool fluctuations. It should be stressed here that the pool fluctuations at most contribute approximately 18 percent of the bank erosional forces. This quantity is much smaller than the determined 34 percent increase in bank stability due to reduction of shear stresses in the pools as compared to the natural river. Hence, a total elimination of hydro-pool fluctuations will not eliminate bank erosion in any river system."

From the above statement, which applies to all four hydro ponds, it can be inferred that the Vernon pool by itself does not have a significant effect on bank erosion. Collectively, the four hydro ponds and the upstream storage which tends to reduce flooding, provide more positive benefits than adverse effects.

As stated in the ACOE Erosion Study, except for during flood periods, the river channel is in a form of "pseudo-equilibrium," wherein accretion occurs along with erosion as part of the natural dynamic process of river formation. The process of accretion is particularly well developed near the mouths of smaller tributaries which drop waterborne silt as their currents slow upon dispersion into the river. An example of this process is at the mouth of the West River where it enters the Vernon pond. At this location, there has been a gradual buildup of sediment over the years leading to an extensive shallow flat area which rapidly becomes exposed as mud flats when the pond is lowered. It has been NEP's experience based on field observations that this mud flat building process has accelerated following the construction of flood control projects on the West River. These projects have had the effect of shaving peak flood flows which previously scoured the river mouth of its sediment deposits.

2.0 REPORT ON WATER USE AND QUALITY

2.1 Consumptive Water Use

There are no diversions of project water for power production, irrigation, reclamation or municipal water supply purposes. There is no commercial navigation on the river at this point and the Vernon pond is too small to be a significant factor in flood control. The only industrial use of impoundment waters is as cooling water for the 540 MW Vermont Yankee Atomic Electric Station located 0.5 mile upstream of Vernon dam on the Vermont shore.

2.2 Existing Water Quality and Minimum Flows

The water quality of the entire surface water drainage of the Basin has been classified. In order to improve the quality of all the waters in the upper Basin, the states of Vermont and New Hampshire adopted water quality standards to upgrade waters from Class C, D and below to Class C and B. Class C is not suitable for swimming, but is defined as suitable for recreational boating, irrigation of crops, habitat suitable for aquatic biota, fish and wildlife and industrial cooling and most industrial process uses. Class B is defined as suitable for public water supply after treatment, irrigation and other agricultural uses, swimming and recreation, and provides high quality habitat for aquatic biota, fish and wildlife. State of New Hampshire and Vermont water quality standards are in Tables 1 and 2, respectively.

The established water quality standard for the project area is Class B with the exception of three Class C areas as follows: A 0.9 mile reach below Bellows Falls, a 0.7 mile reach near Black Mountain Brook and a 2.3 mile reach from Whetstone Brook to Broad Brook.

In 1970, the Commission set a minimum flow release of 1,200 cfs for the Vernon Project, to prevent heat buildup in the reservoir from cooling system discharges from the Vermont Yankee Atomic Electric Station. Article 34 of the Vernon license issued by the Commission June 25, 1979 (see Appendix B) requires a continuous minimum flow of 1,250 cfs (0.20 cfs per square mile of drainage basin) or a flow equal to the inflow of the reservoir, whichever is less, from the project into the Connecticut River.

2.3 Effects on Water Quality and Minimum Flows

Construction work involved for the proposed unit replacements would take place in the New Hampshire portion of the powerhouse (Figure 3) which would be isolated from the river during construction. The work would include removal of the existing Units No. 5, 6, 7 and 8, modifications of the concrete water passages and installation of the two new units. The work area would be isolated from the river by use of upstream and downstream structurally supported sheet pile cofferdams immediately outside the powerhouse which will affect only the water passages for the units being replaced. Structurally supported sheet pile cofferdams would be used specifically to minimize environmental disturbances. The use of other types of cofferdams would likely have greater impacts. In order to avoid siltation and sedimentation, all work would take place completely within the area behind the cofferdams and inside the powerhouse. Dewatering discharges would be clarified to meet allowed downstream water quality standards. The New Hampshire office of the U.S. Soil Conservation Service (USSCS) has expressed the opinion that the proposed construction would not have offsite impacts. The USSCS letter is in Appendix C.

Other Station units would remain operational during the construction period. Construction is expected to take 30 months. (See Exhibit C for the detailed construction schedule.)

The operation of the Vernon Project after the proposed unit replacements would not be significantly altered from the present conditions since the amount of water available daily for generation would still be dependent upon project inflow. The Vernon Station would still operate to meet peak power demands during periods of low river flows, and it would operate in a more continuous base load mode when river flows were high enough to meet generation needs.

The proposed unit replacements would increase Station maximum generating capacity and maximum discharge. Station generating capacity would increase from 24.4 MW to 44.4 MW due to the greater capacities and efficiencies (estimated to be about 90% plus) of the new units. Total Station yearly generation would increase by approximately 62,000 MWh. Station maximum discharge would increase from 15,400 cfs to 20,700 cfs and normal efficient maximum discharge would increase from 11,000 cfs to about 17,800 cfs. Continuous operation at the higher normal efficient maximum discharges, however, would be dependent on the amount of time river flows would be sufficient to meet this need; primarily this would occur during high runoff periods (spring freshet, storm events, etc.) As a result of the larger Station discharge capability, gate spillage would be reduced from about 14% to about 10.5% of the time on a yearly basis. The time at which the Station would be at the minimum flow discharge would increase from about 32% to about 36% on a yearly basis. Due to improvements in the Station's electrical equipment as part of the proposed unit replacements, the 1,250 cfs minimum flow could be provided by any of Unit Nos. 1-4, as well as by either Unit Nos. 9 or 10.

The current minimum flow release would be maintained during and following construction. The operation of the Station's fish ladder would not be affected by construction. NEP will continue to operate the fish ladder in cooperation with the Federal and State fisheries agencies.

2.4 State Water Quality Certification

A. Letter from NEP to the State of New Hampshire requesting certification (to be appended).

B. Letter from NEP to the State of Vermont requesting certification (to be appended).

3.0 REPORT ON FISH, WILDLIFE AND BOTANICAL RESOURCES

3.1 Description of Existing Resources

The project area contains a variety of fish species, some of which provide important sportfishing recreation. In the cooler tributary areas, such species as rainbow, brook and brown trout are found. In the main stem, such species as smallmouth bass, largemouth bass, pickerel, yellow perch, bullheads, walleye and northern pike are important sportfish. Smallmouth bass and walleye in particular provide a significant fishery in the tailrace at Vernon dam. With the addition of the Vernon fishway in 1981, the project area on a seasonal basis includes such anadromous fish species as the sea lamprey, blueback herring, white perch, striped bass, American shad and Atlantic salmon. Table 3 is a list of the principal fish species inhabiting the vicinity of Vernon and Bellows Falls, Vermont.

A great variety of wildlife is found throughout the project area. Migrating birds, such as hawks, warblers and waterfowl can be found seasonally. Occasionally, osprey, peregrine falcons and bald eagles are seen passing through the area, but none are known to nest in the project area. For hunters, small game include ruffed grouse, woodcock, snowshoe hare, squirrel, raccoon and cottontail rabbit. Aquatic fur bearing animals such as beaver, muskrat, mink and otter are found and are of economic importance due to the value of their fur. Larger game species, such as the white tailed deer, bobcat and black bear are not commonly seen on project lands; however, they are found occasionally in the surrounding habitat. Table 4 is a list of the principal mammal species inhabiting the vicinity of Vernon. Table 5 includes bird species that may occur throughout the project area.

Botanical resources include typical northern New England riverine flood plain vegetation interspersed with upland forest vegetation. The hillsides are covered with mixed hardwoods interspersed with conifers. Species of hardwood trees include red maple, sugar maple, red oak and white ash; as well as paper birch, yellow birch and black cherry. Conifer species are made up primarily of Eastern white pine and Canadian hemlock. The woodlands are occasionally interrupted with open fields utilized as agricultural pasture land or cropland. Where the slopes are steep, pure stands of second growth woodlands occur. Portions of the land on the lower river plateaus is open cropland or grassland. Aquatic vegetation can be found in coves and shoal areas along the Vernon pond. The more abundant vascular aquatic plants are water-horsetail, bedstraw, cattail, sedge, wood-grass, water smartweed and sweet flag.

Tables 6 and 7 are lists of the threatened and endangered species in the States of Vermont and New Hampshire, respectively. The proposed Vernon unit replacements would have no effect on any of these species.

Several rare plants have been found at two sites on NEP property. One site, which is located above the Vernon dam, contains rare plants in the shallow water near the edge of a pool, on a sandy flat adjacent to the pool and in a marsh landward from the sandy flat. The rare plant species at this site are:

Hypericum pyramidatum	- Great St. Johnswort
Eragnostis frankii	- Frank's lovegrass
Zannichelia palustris	- Horned pondweed
Elatine minima	- Small waterwort
Tillaea aquatic	- Pygmyweed

The other site is located below Vernon dam where two species are found growing in a sandy wash below the tailrace. The rare plant species at this site are:

Scirpus smithii	- Smith's bulrush
Mimulus moschatus	- Muskflower

The presence of some of these rare plant species is due in part to NEP's operation of Vernon. In October 1988, NEP and The Nature Conservancy entered into a "Special Habitats" Cooperative Agreement to protect the two ecologically significant sites at the Vernon project and similar sites at other NEP projects on the Connectiuct River. A copy of the agreement is included in Appendix D.

3.2 Project Impacts

The proposed unit replacements will disturb very little area outside of the existing Vernon powerhouse and adjacent switchyard. The extent of the impact of construction work will be limited to the installation of sheet-pile cofferdams immediately upstream and downstream of the powerhouse, and the installation of electrical equipment inside the switchyard. As such, there is no apparent manner in which the proposed work could adversely affect any wildlife species in the area, with the possible exception of minor disruptions due to noise from construction and the movement of equipment and materials. Confirming this assessment is the fact that during consultations with State and Federal resource agencies, NEP received no comments on the possible effects that the unit replacements might have on wildlife.

Proposed construction work could adversely affect fish and other aquatic life in the immediate area of the powerhouse through the installation of the sheet pile cofferdams, dewatering activities and a resultant short-term increase in turbidity (i.e., total suspended solids in water column). Negative effects associated with the cofferdam installation and dewatering activities would be limited in extent and would be of short duration. NEP will also provide for clarifying dewatering discharges from the cofferdam area. Therefore, NEP expects no local fish species or other aquatic life to be adversely affected as a result of construction.

During consultations, the entrainment of downstream migrating anadromous fishes due to the operation of the proposed units was raised by the fisheries resource agencies as their principle concern. This concern was based upon the increase in maximum unit flows. Existing flows through the four units to be replaced totals about 5,400 cfs, while the total flow through the two proposed units would be about 11,000 cfs.

NEP agrees that the increased potential for entrainment due to higher unit flows is the major environmental concern associated with the proposed unit replacements. NEP had perceived this entrainment potential to be the major environmental concern prior to consultation and had originally proposed during initial agency consultations to investigate, design and build a downstream passage system for Atlantic salmon and American shad. (See Appendix C for initial consultation letters sent to agencies.) The original NEP proposal has been reviewed by the agencies and revised by NEP in response to agency comments. As a result of the consultation process, NEP has reached agreement with the agencies on the process by which a downstream passage system will be identified and built at Vernon and its construction time table.

The agreement to provide a downstream passage system at Vernon is discussed further in Section 3.3.2.1 below.

3.3 Mitigation of Project Impacts

3.3.1 Existing Mitigation

A principle environmental impact of the existing Vernon Project was that it formed a barrier to the migration of anadromous fishes to upstream spawning and nursery habitats. With the installation and operation of the Vernon fish ladder in 1981, passage to upstream habitats by sea-run Atlantic salmon and American shad was assured. NEP has operated the Vernon fish ladder during each spring migration period in cooperation with State and Federal fisheries agencies according to the annual recommendations made by the Connecticut River Atlantic Salmon Commission (CRASC). Table 8 reports the numbers of anadromous fishes which have passed through the Vernon fish ladder between 1981-1989. NEP will continue to work with CRASC and the individual fisheries agencies to operate the Vernon fish ladder in a manner to optimize upstream passage.

NEP has also cooperated with CRASC and the state and Federal fisheries agencies since the installation of the fish ladder in 1981 to investigate ways to provide seasonal downstream passage at the Vernon Project for Atlantic salmon smolt (spring), spent American shad (summer) and juvenile American shad (fall). Anadromous fishes passing downstream can bypass the Vernon Station by several existing routes; over the spillway, through the spillway sluice gates, down the skimmer sluice or down the fish ladder. Under the current conditions, availability of any particular bypass route is dependent on a combination of seasonal river flow, power demand and Station generation, all of which may vary hourly.

In an effort to improve conditions for downstream fish migration, CRASC issues a recommended schedule to hydroelectric operators on the main stem of the Connecticut River for operating modifications during the fish migration periods. Table 9 contains the 1989 CRASC recommendations, which are representative of this process. NEP has in the past, and would continue to follow in the future, CRASC recommendations for sluiceway operation in an attempt to improve downstream passage until the time more suitable passage facilities would be evaluated, designed and built.

3.3.2 Proposal for Mitigation of Impacts

3.3.2.1 Memorandum of Agreement on Mitigation

Since no physical changes to the environment would occur outside the immediate area of the powerhouse due to the proposed unit replacements, there would be no effects on the wildlife or botanical resources in the project locale. However, due to increases in unit flows, the proposed unit replacements would increase the Project's potential to impact the downstream migration of anadromous fishes, and this impact would need to be mitigated.

In consultation with the Federal and State fisheries agencies, NEP has developed a multi-year program to provide a downstream passage system for anadromous fishes at its Vernon, Bellows Falls and Wilder Projects (Nos. 1904, 1855, 1892, respectively). This program has been incorporated into a voluntary Memorandum of Agreement (the Agreement) which has been signed by NEP and the member agencies of CRASC. A copy of the Agreement is included in Appendix E. The Agreement provides for a scheduled process to provide downstream passage systems for Atlantic salmon at each of the projects, and for American shad at Vernon only by 1994. (No historic American shad spawning grounds exist above Bellows Falls, and by agreement, NEP does not need to provide shad passage beyond Vernon.) NEP and the consulting agencies agree that the implementation of the downstream passage program which is contained in the Agreememt will provide mitigation of adverse impacts the unit replacements might have on fish passage at the Vernon Project.

3.3.2.2 Other Mitigating Features

In addition to the eventual improvements for downstream fish passage which will result from the Agreement, two design characteristics of the new replacement units should improve the safe passage of fish which may enter the units.

The new units will have wicket gates approximately four times larger and runner openings approximately six times wider than the existing units. The new units will have a single runner instead of the triple runners on each existing unit. These modifications should significantly enhance the safe passage of fish through the units.

4.0 REPORT ON HISTORICAL AND ARCHAEOLOGICAL RESOURCES

The proposed unit replacements would affect only the Vernon powerhouse and the immediate river environment. All changes to the powerhouse would be internal, and there would be no change to its exterior appearance following construction. No known archaeological resources or any historic properties included on, or determined to be eligible for inclusion on the National Register of Historic Places, are present in the area to be affected by the construction and operation of the proposed unit replacements. After initial consultation with NEP, the State Historic Preservation Officers (SHPO) of New Hampshire and Vermont reviewed this undertaking according to the standards contained in 36 CFR 800 (implementing Section 106 of the National Historic Preservation Act). The SHPO of each state has concluded that the proposed unit replacements would not affect any properties of archaeological, historic or architectural significance. The letters containing the SHPO's determinations are in Appendix C.

Based upon the SHPO determinations of no effect, NEP has not been requested to, nor does it propose to, conduct any studies to locate and identify cultural resources in the project area, or to develop proposed cultural resources mitigation or salvage plans.

5.0 REPORT ON RECREATIONAL RESOURCES

The proposed unit replacements would affect only the existing powerhouse and immediate river environment. No recreational facilities or uses currently exist in the area to be affected. Therefore, the construction work associated with the unit replacements would not affect any recreational resources. The operation of the Vernon Project following the unit replacements would not differ significantly from the current project operation and would not affect any existing recreational resources in the project area. Table 10 lists the number of annual visitors to the Governor Hunt Picnic Area and the Fish Ladder Display for the years 1985-1989. Visitor counts are not made at the other project recreation areas.

NEP has consulted with the New Hampshire Department of Resources and Economic Development, Division of Parks, and the Vermont Department of Forests, Parks and Recreation. NEP's correspondence to the agencies is in Appendix C. The two agencies have not commented in writing on the project, and NEP believes that the agencies have no concerns that the unit replacements would affect project-related recreational resources.

NEP has neither been requested to, nor does it propose to, conduct new recreation studies. For information purposes, the existing "Exhibit R - Recreational Use Plan" for the Vernon Project is included as Appendix I.

In July 1988, personnel from the Commission's Atlanta Regional Office and the National Park Service inspected the Vernon Project for its recreation and wildlife resources and public safety aspects. The resultant inspection report contained four specific recommendations to correct certain conditions found at the project. Three of those recommendations concerned the need for additional boating and boat access signs and the fourth concerned the removal of downed trees. NEP responded to the recommendations in October 1988; and those responses were determined to be satisfactory by the Director of the New York Regional office. The correspondence exchanged on this matter precede the Exhibit R in Appendix I.

LPS:gv/5061/0067
Enclosures

LIST OF LITERATURE

LICENSE

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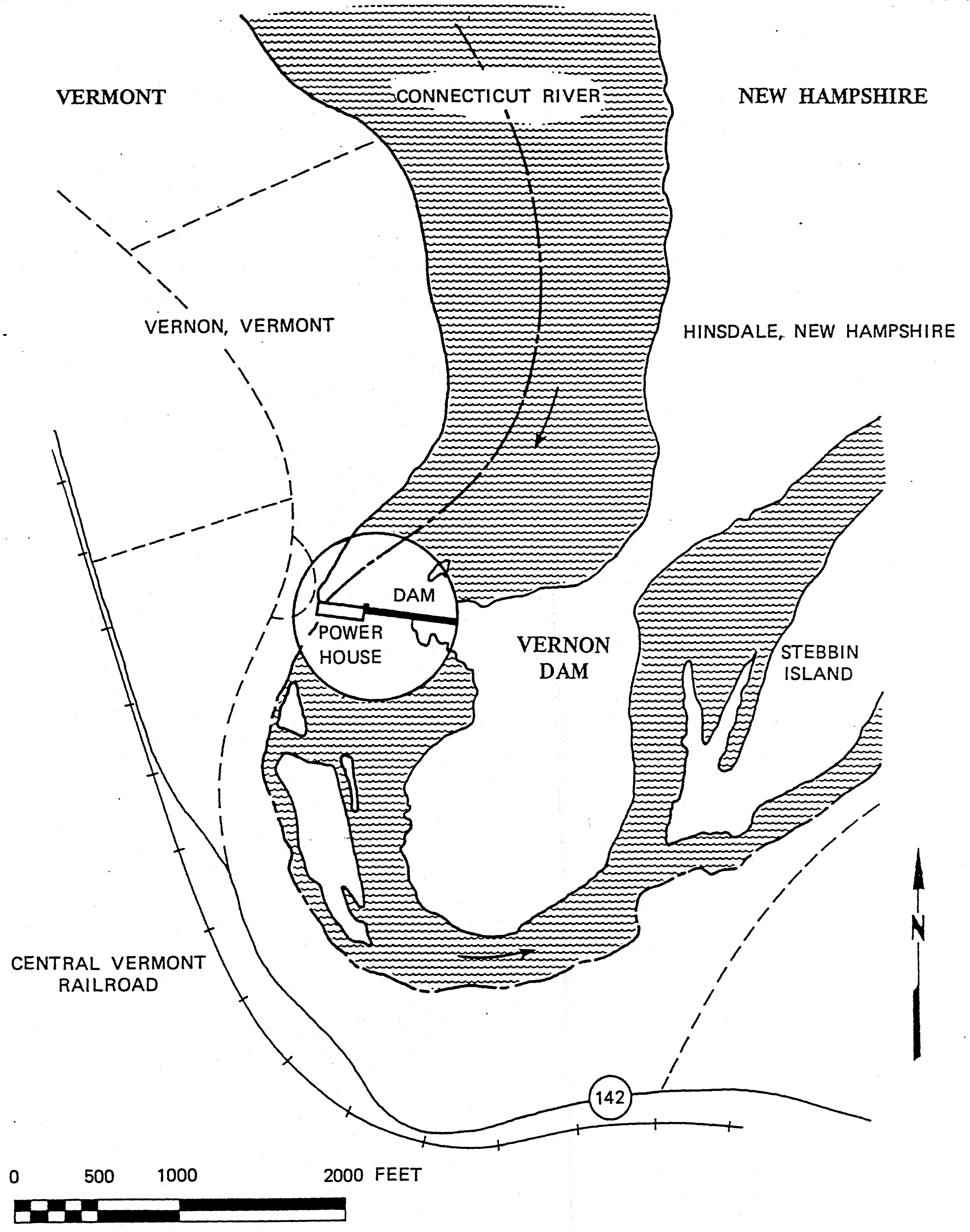
Vernon Physical Modeling Scope In Proceedings of the Meeting of July 6, 1989. Alden Research Laboratory, Inc., July 1989.

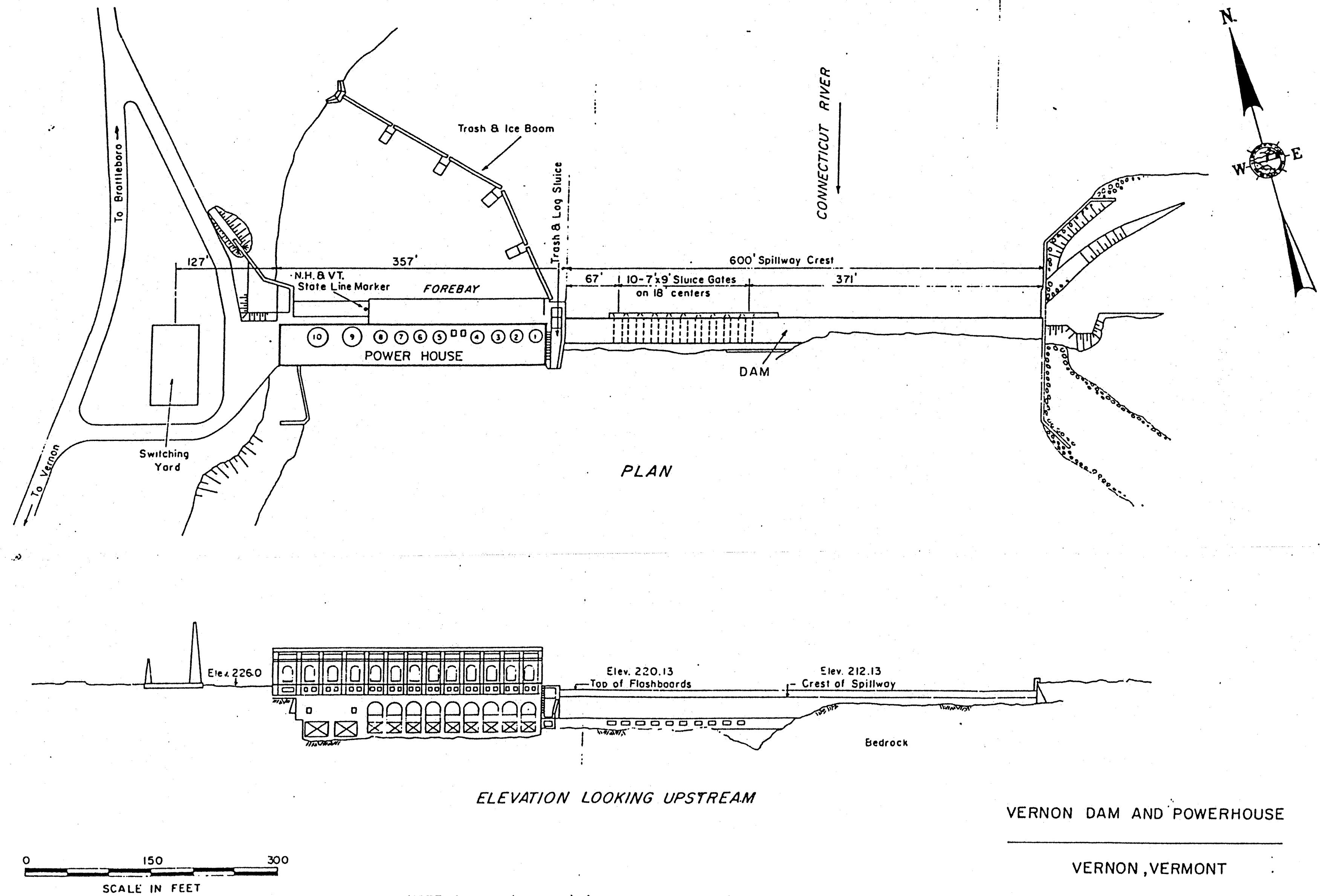
LPS:gv/5059/0067

FIGURE 1



VERNON DAM, VICINITY MAP
VERNON, VERMONT – HINSDALE, NEW HAMPSHIRE

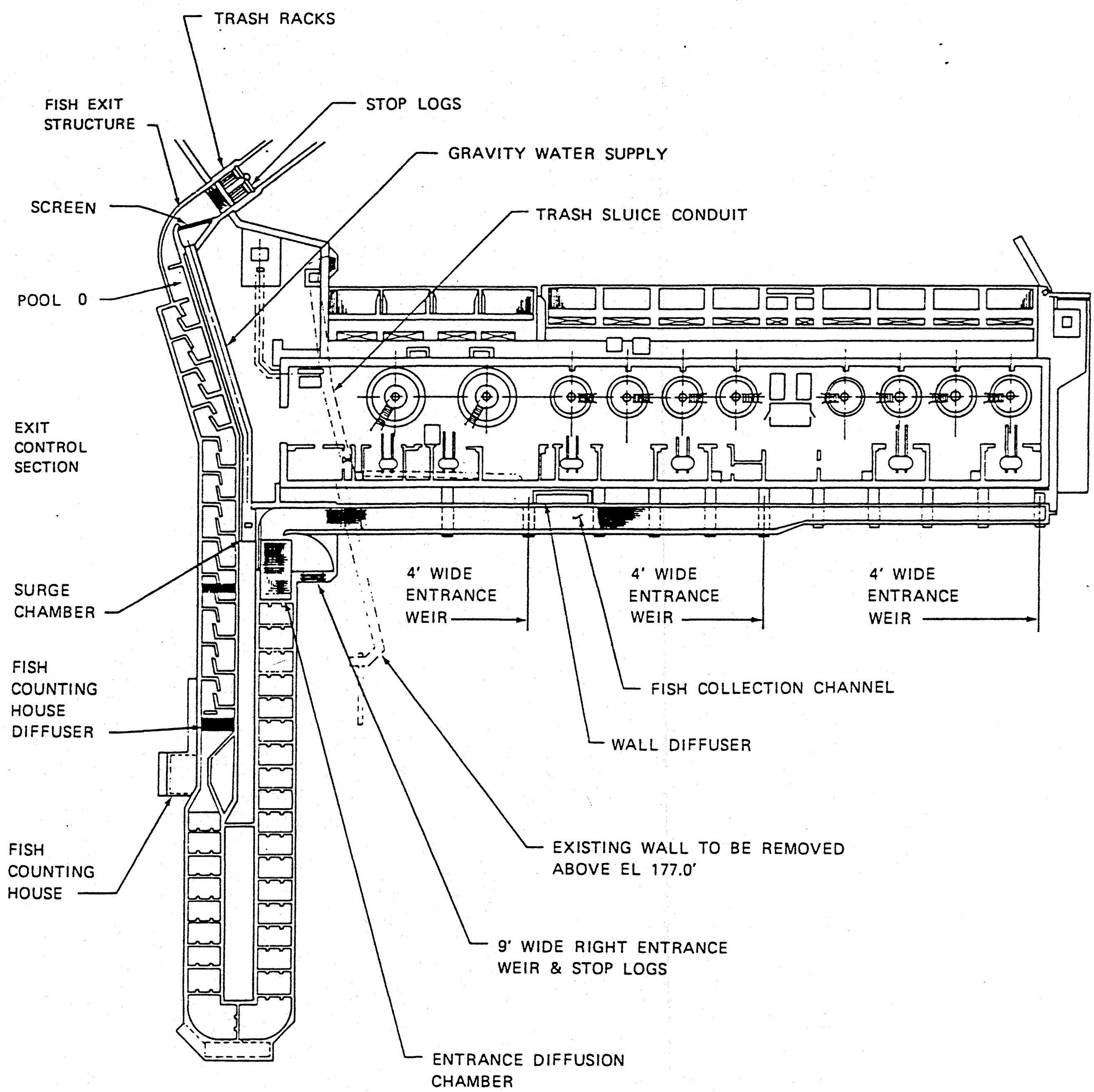
FIGURE 2.



VERNON DAM AND POWERHOUSE

VERNON, VERMONT

NOTE: All elevations are in feet above mean sea level.



FISH PASSAGE FACILITIES - GENERAL ARRANGEMENT

TABLE I

USE CLASSIFICATIONS[1] AND WATER QUALITY STANDARDS

AS OF NOVEMBER 1, 1976

BASED ON CHAPTER 149 REVISED STATUTES ANNOTATED AND REGULATIONS

OF THE

NEW HAMPSHIRE WATER SUPPLY AND POLLUTION CONTROL COMMISSION

OPTIMUM USES

	Class A	Class B	Class C
	Potentially acceptable for water supply uses after disinfection. No discharge of sewage, wastes or other polluting substances into waters of this classification. (Quality uniformly excellent.)	Acceptable for swimming and other recreation, fish habitat, and, after adequate treatment, for use as water supplies. No disposal of sewage or wastes unless adequately treated. (High aesthetic value.)	Acceptable for recreational boating, fishing, and industrial water supply with or without treatment, depending on individual requirements. (Third highest quality.)
Dissolved Oxygen	Not less than 75% of saturation, nor less than 6 ppm[2] in cold water fisheries.	Not less than 75% of saturation, nor less than 6 ppm[2] in cold water fisheries unless naturally occurring.	Not less than 5 ppm[2] in warm water fisheries, nor less than 6 ppm[2] in cold water fisheries unless naturally occurring.
Coliform Bacteria	Not more than 50 coliforms per 100 ml unless naturally occurring.	Not more than 240 coliforms per 100 ml in fresh water, unless naturally occurring. Not more than 70 coliforms per 100 ml in waters used for growing or taking of shellfish for human consumption.	Not to exceed an average value of 1000 coliforms per 100 ml in any group of samples, nor shall any single sample exceed 2500 coliforms per 100 ml except when such waters are subject to overflow from a combined sewer system or as naturally occurs.
pH (acidity-alkalinity)	As naturally occurs.	6.5 - 8.0 or as naturally occurs.	6.0 - 8.5 or as naturally occurs.
Substances potentially toxic	None unless naturally occurring.	Not in toxic concentrations or combinations.	Not in toxic concentrations or combinations.
Sludge Deposits	None.	No unreasonable kinds or quantities unless naturally occurring.	No unreasonable kinds or quantities, unless naturally occurring.
Oil and Grease	None.	No unreasonable kinds or quantity.	No unreasonable kinds or quantity.
Color	Not in unreasonable quantities, unless naturally occurring.	Not in unreasonable quantities, unless naturally occurring.	Not in unreasonable quantities, unless naturally occurring.
Turbidity	Not to exceed 5 standard turbidity units unless naturally occurring.	Not to exceed 10 standard turbidity units in cold water fisheries. Not to exceed 25 standard turbidity units in warm water fisheries unless naturally occurring.	Not to exceed 10 standard turbidity units in cold water fisheries. Not to exceed 25 standard turbidity units in warm water fisheries unless naturally occurring.
Slicks, Odors and Surface-Floating Solids	None unless naturally occurring.	No unreasonable kinds, quantities or duration unless naturally occurring.	No unreasonable kinds, quantities or duration unless naturally occurring.

1, 2 - See Over

Continued Over

(Continued from other side)

USE CLASSIFICATIONS[1] AND WATER QUALITY STANDARDS

AS OF NOVEMBER 1, 1976

BASED ON CHAPTER 149 REVISED STATUTES ANNOTATED AND REGULATIONS

OF THE

NEW HAMPSHIRE WATER SUPPLY AND POLLUTION CONTROL COMMISSION

OPTIMUM USES

	Class A	Class B	Class C
	Potentially acceptable for water supply uses after disinfection. No discharge of sewage, wastes or other polluting substances into waters of this classification. (Quality uniformly excellent.)	Acceptable for swimming and other recreation, fish habitat, and, after adequate treatment, for use as water supplies. No disposal of sewage or wastes unless adequately treated. (High aesthetic value.)	Acceptable for recreational boating, fishing, and industrial water supply with or without treatment, depending on individual requirements. (Third highest quality.)
Temperature	No artificial rise.	NHF&GD, NEIWPCC, or NTAC-DI[3] requirements - whichever provides most effective control.	NHF&GD, NEIWPCC or NTAC-DI[3] requirements - whichever provides most effective control.
Phosphorus	None, except as naturally occurs.	None in such concentrations[4] that would impair any usages assigned to this class, unless naturally occurring.	None in such concentrations[4] that would impair any usages assigned to this class unless naturally occurring.
Gross Beta Radioactivity	Not greater than 1000 picocuries[5] per liter.	Not greater than 1000 picocuries[5] per liter.	Not greater than 1000 picocuries[5] per liter.
Strontium-90	Not greater than 10 picocuries[5] per liter.	Not greater than 10 picocuries[5] per liter.	Not greater than 10 picocuries[5] per liter.
Radium-226	Not greater than 3 picocuries[5] per liter.	Not greater than 3 picocuries[5] per liter.	Not greater than 3 picocuries[5] per liter.
Phenol	Not to exceed .001 ppm.[2]	Not to exceed .001 ppm.[2]	Not to exceed .002 ppm.[2]

1 The waters in each classification shall satisfy all provisions of all lower classifications.

2 ppm = parts per million.

3 NHF&GD - New Hampshire Fish and Game Department
NEIWPCC - New England Interstate Water Pollution Control Commission
NTAC-DI - National Technical Advisory Committee, Department of Interior.

4 Generally less than 0.015 ppm.

5 One picocurie is one trillionth of a curie, which is a standard measure of radioactivity.

NOTE:
(a) RSA 149 in initial enactment provided for Class D, however, no waters in the State are so classified, nor currently are any being contemplated for such classification.
(b) Obviously, "acts of God" are exempt from control.
(c) The preceding shall apply to all times except during periods when the receiving stream flows are less than the minimum average ten-day low flow which occurs once in twenty years.

Table 2

VERMONT WATER QUALITY CLASSIFICATIONS

Class A	Waters of a quality which is suitable for public water supply with disinfection when necessary. Character uniformly excellent.
Class B	Waters suitable for bathing and recreation, irrigation, and agricultural uses; good fish habitat; good aesthetic value, acceptable for public water supply with filtration and disinfection.
Class C	Waters suitable for recreational boating, irrigation of crops not used for consumption with cooking, habitat for wildlife and for common food and game species indigenous to the region; and such industrial uses as are consistent with other class uses.

Ref: Rule 5: Regulations Governing Water Quality Classification and Control of Quality, State of Vermont Agency of Environmental Conservation, Water Resources Board. 1976.

Table 2 (Continued)

VERMONT STREAM TYPE SPECIFICATIONS

Type I	Streams and rivers sustaining natural populations of brook trout, salmon, rainbow trout, and brown trout. Dissolved oxygen content of these waters at and near spawning areas shall not be less than 7 mg/l, and not less than 6 mg/l in non-spawning areas, and normal seasonal, daily and diurnal variations above these limits will be maintained. There shall be no wastes discharged to such waters at any time which, after suitable treatment, raise the temperature of the receiving waters more than 1°F at the perimeter of a designated thermal mixing zone.
Type II	Streams and rivers containing mixed populations of such fish as rainbow trout, brown trout, and smallmouth bass. Dissolved oxygen shall not be less than 6 mg/l, and normal seasonal, daily and diurnal variations above these limits will be maintained. There shall be no wastes discharged to such waters at any time which, after suitable treatment, raise the temperature of the receiving waters more than 1°F at the perimeter of a designated thermal mixing zone.
Type III	Streams and rivers having mixed populations of such warm water species of fish as smallmouth bass, perch, and bluegills, etc. Dissolved oxygen shall not be less than 5 mg/l and normal seasonal, daily and diurnal variations above these limits will be maintained. Heated wastes may be discharged into these waters in accordance with the requirements of the following table, which sets forth in the first column a range of maximum temperatures during any 24-hour period as they may occur immediately upstream of the discharge and in the second column sets for the maximum increase in the stream temperature, resulting from such discharges, that will then be permitted during the subsequent 24-hour period as measured at the downstream perimeter of the designated thermal mixing zone:

Column 1 Maximum River Temp.	Column 2 Allowable Increase in Temp.
Above 66°F	1°F
63°F to 66°F	2°F
59°F to 62°F	3°F
55°F to 58°F	4°F
Below 55°F	5°F

The rate of temperature change associated with the discharge of heated wastes, upward or downward shall not exceed 0.5°F per hour from May through October 31 nor 1.0°F from November 1 through April 30.

Ref: Rule 18: Regulations Governing Water Classification and Control of Quality. State of Vermont Agency of Environmental Conservation, Water Resources Board. 1976.

TABLE 3

FISHES OF THE CONNECTICUT RIVER IN
THE VICINITY OF VERNON AND BELLOWS

Sea lamprey	Petromyzon marinus Linnaeus
American eel	Anguilla rostrata (Lesueur)
Blueback herring	Alosa aestivalis (Mitchill)
American shad	Alosa sapidissima (Wilson)
Atlantic salmon	Salmo salar Linnaeus
Brown trout	Salmo trutta Linnaeus
Rainbow trout	Oncorhynchus mykiss
Brook trout	Salvelinus fontinalis (Mitchill)
Rainbow smelt	Osmerus mordax (Mitchill)
Northern pike	Esox lucius Linnaeus
Chain pickerel	Esox niger Lesueur
Lake chub	Couesius plumbeus (Agassiz)
Carp	Cyprinus carpio Linnaeus
Eastern silvery minnow	Hybognathus regius Girard
Golden shiner	Notemigonus crysoleucas (Mitchill)
Common shiner	Notropis cornutus (Mitchill)
Spottail Shiner	Notropis hudsonius (Clinton)
Mimic Shiner	Notropis volucellus (Cope)
Blacknose Dace	Rhinichthys atratulus (Hermann)
Fallfish	Semotilus corporalis (Mitchill)
Longnose sucker	Catastomus catastomus (Forster)
White sucker	Catastomus commersoni (Lacepede)
Yellow bullhead	Ictaluras natalis (Lesuer)
Brown bullhead	Ictaluras nebulosus (Lesuer)
Banded killifish	Fundulus diaphinus (Lesuer)
Striped bass	Morone saxatilis (Walbaum)
White perch	Morone americana (Gmelin)
Rock bass	Ambloplites rupestris (Rafinesque)
Redbreast sunfish	Lepomis auratus (Linnaeus)
Pumpkinseed	Lepomis gibbosus (Linnaeus)
Bluegill	Lepomis microchirus Rafinesque
Smallmouth bass	Micropterus dolomieui Lacepede
Largemouth bass	Micropterus salmoides Lacepede
Black crappie	Pomoxis nigromaculatus (Lesuer)
Tessellated darter	Etheostoma olmstedi Storer
Yellow perch	Perca flavescens (Mitchill)
Walleye	Stizostedion v. vitreum (Mitchill)

TABLE 4

MAMMAL SPECIES THAT MAY OCCUR THROUGHOUT THE PROJECT AREA*

MARSUPIALIA	
Virginia Opposum	*Didelphis virginiana*
INSECTIVORA	
Masked Shrew	*Sorex cinereus cinereus*
Water Shrew	*Sorex palustris albibarbis*
Smoky Shrew	*Sorex fumeus*
Long-tailed Shrew	*Sores dispar dispar*
Short-tailed Shrew	*Blarina brevicauda*
Hairy-tailed Mole	*Parascalops breweri*
Star-nosed Mole	*Condylura cristata*
CHIROPTERA	
Little Brown Bat	*Myotis lucifugus*
Keen's Bat	*Myotis keenii*
Silver-haired Bat	*Lasionycteris noctivagans*
Eastern Pipistrelle	*Pipistrellus subflavus*
Big Brown Bat	*Eptesicus fiscus*
Red Bat	*Lasiurus borealis*
Hoary Bat	*Lasiurus cinereus*
LAGOMORPHA	
Eastern Cottontail	*Sylvilagus floridanusl*
New England Cottontail	*Sylvilagus transitionalis*
Snowshoe Hare	*Lepus americanus*
RODENTIA	
Eastern Chipmunk	*Tamias striatus*
Woodchuck	*Marmota monax*
Gray Squirrel	*Sciurus carolinensis pennsylvanicus*
Red Squirrel	*Tamiasciurus hudsonicus*
Southern Flying Squirrel	*Glaucomys volans*
Northern Flying Squirrel	*Glaucomys sabrinus macrotis*
Beaver	*Castor canadensis*
Deer Mouse	*Peromyscus maniculatus*
White-footed Mouse	*Peromyscus leucopus*
Gapper's Red-backed Mouse	*Clethrionomys gapperi*

TABLE 4 (Continued)

MAMMAL SPECIES THAT MAY OCCUR THROUGHOUT THE PROJECT AREA*

RODENTIA	
Meadow Vole	*Microtus pennsylvanicus*
Rock Vole	*Microtus chrotorrhinus*
Pine Mouse	*Microtus pinetorum*
Muskrat	*Ondatra zibethicus*
Southern Bog Lemming	*Synaptomys cooperi*
Northern Bog Lemming	*Synaptomys borealis*
Norway Rat	*Rattus norvegicus*
House Mouse	*Mus musculus*
Meadow Jumping Mouse	*Zapus hudsonius*
Woodland Jumping Mouse	*Napaeozapus insignis*
Porcupine	*Erethizon dorsatum dorsatum*
CARNIVORA	
Coyote	*Canis latrans*
Red Fox	*Vulpes vulpes*
Gray Fox	*Urocyon cinereoargenteus*
Black Bear	*Ursus americanus*
Raccoon	*Procyon lotor*
Marten	*Martes americana americana*
Fisher	*Martes pennanti pennanti*
Ermine	*Mustela erminea cicognanii*
Long-tailed Weasel	*Mustela frenata*
Mink	*Mustela vison*
Striped Skunk	*Mephitis mephitis nigra*
River Otter	*Lutra canadensis*
Bobcat	*Lynx rufus*
ARTIODACTYLA	
White-tailed Deer	*Odocoileus virginianus borealis*
Moose	*Alces alces americana*

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* Adapted from: Godin, A.J., 1977. Mammals of New England. The Johns Hopkins University Press, Baltimore, Maryland. 304 pp.

TABLE 5

BIRD SPECIES THAT MAY OCCUR THROUGHOUT THE PROJECT AREA*

Species		Habitat Type: Hardwood	Softwood	Open	Wetland	Other
Common Loon	*Gavia immer*				x	x
Pied-billed Grebe	*Podilymbus podiceps*				x	
Great Blue Heron	*Ardea herodias*				x	
Green Heron	*Butorides striatus*				x	
Black-crowned Night Heron	*Nycticorax nycticorax*				x	
American Bittern	*Botaurus lentiginosus*				x	
Least Bittern	*Ixobrychus exilis*				x	
Canada Goose	*Branta canadensis*			x	x	
Snow Goose	*Chen caerulescens*			x	x	
Mallard	*Anas platyrhynchos*				x	
Black Duck	*Anas rubripes*				x	
Gadwall	*Anas strepera*				x	
Wood Duck	*Aix sponsa*				x	
Common Goldeneye	*Bucephala clangula*				x	
Hooded Merganser	*Lophodytes cucullatus*				x	
Common Merganser	*Mergus merganser*				x	
Turkey Vulture	*Cathartes aura*	x		x		
Goshawk	*Accipiter gentilis*	x	x	x		
Sharp-shinned Hawk	*Accipiter striatus*	x	x	x		
Cooper's Hawk	*Accipiter cooperii*	x	x	x		
Red-tailed Hawk	*Buteo jamaicensis*	x		x		
Red-shouldered Hawk	*Buteo linaetus*	x		x		
Broad-winged Hawk	*Buteo platypterus*	x		x		
Rough-legged Hawk	*Buteo lagopus*			x	x	
Golden Eagle	*Aquila chrysaetos*	x	x	x	x	
Bald Eagle	*Haliaeetus leucocephalus*	x	x		x	
Marsh Hawk	*Circus cyaneus*			x	x	
Osprey	*Pandion haliaetus*				x	
Peregrine Falcon	*Falco peregrinus*	x	x	x		
American Kestrel	*Falco sparverius*	x		x		

TABLE 5 (Continued)

BIRD SPECIES THAT MAY OCCUR THROUGHOUT THE PROJECT AREA*

Species		Habitat Type: Hardwood	Softwood	Open	Wetland	Other
Ruffed Grouse	*Bonasa umbellus*	x	x	x		
Bobwhite	*Colinus virginianus*	x		x		
Ring-necked Pheasant	*Phasianus colchicus*			x		
Turkey	*Meleagris gallopavo*	x		x		
King Rail	*Rallus elegans*				x	
Virginia Rail	*Rallus limicola*				x	
Sora	*Porzana carolina*				x	
Common Gallinule	*Gallinula chloropus*				x	
American Coot	*Fulica americana*				x	
Killdeer	*Charadrius vociferus*			x		
American Woodcock	*Philohela minor*	x		x	x	
Common Snipe	*Capella gallinago*			x	x	
Spotted Sandpiper	*Actitis macularia*			x	x	
Herring Gull	*Larus argentatus*				x	x
Ring-billed Gull	*Larus delawarensis*				x	x
Rock Dove	*Columba livia*			x		
Mourning Dove	*Zenaida macroura*	x		x		
Yellow-billed Cuckoo	*Coccyzus americanus*	x		x		
Black-billed Cuckoo	*Coccyzus erythropthalmus*	x		x		
Barn Owl	*Tyto alba*			x	x	
Screech Owl	*Otus asio*	x	x	x	x	
Great Horned Owl	*Bubo virginianus*	x	x	x	x	
Barred Owl	*Strix varia*	x	x	x	x	
Long-eared Owl	*Asio otus*	x	x	x	x	
Saw-whet Owl	*Aegolius acadicus*	x	x	x		
Whip-poor-will	*Caprimulgus vociferus*	x	x	x		
Common Nighthawk	*Chordeiles minor*					x
Chimney Swift	*Chaetura pelagica*					x
Ruby-throated Hummingbird	*Archilochus colubris*	x		x		
Belted Kingfisher	*Megaceryle alcyon*				x	
Common Flicker	*Colaptes auratus*	x	x	x		

TABLE 5 (Continued)

BIRD SPECIES THAT MAY OCCUR THROUGHOUT THE PROJECT AREA*

Species		Habitat Type				
		Hardwood	Softwood	Open	Wetland	Other
Pileated Woodpecker	Dryocopus pileatus	X	X			
Red-headed Woodpecker	Melanerpes erythrocephalus	X		X		
Yellow-bellied Sapsucker	Sphyrapicus varius	X	X			
Hairy Woodpecker	Picoides villosus	X	X			
Downy Woodpecker	Picoides pubescens	X	X			
Eastern Kingbird	Tyrannus tyrannus	X				
Great Crested Flycatcher	Myiarchus crinitus	X				
Eastern Phoebe	Sayornis phoebe			X		
Willow Flycatcher	Empidonax traillii	X		X		
Alder Flycatcher	Empidonax alnorum	X	X	X		
Least Flycatcher	Empidonaz minimus	X		X		
Eastern Wood Pewee	Contopus virens	X		X		
Olive-sided Flycatcher	Nuttallornis borealis		X			
Horned Lark	Eremophila alpestris			X		
Tree Swallow	Iridoprocne bicolor			X	X	
Bank Swallow	Riparia riparia			X	X	
Rough-winged Swallow	Stelgidopteryx ruficolllis				X	
Barn Swallow	Hirundo rustica			X	X	
Cliff Swallow	Petrochelidon pyrrhonota			X	X	
Purple Martin	Progne subis	X	X			
Blue Jay	Cyanocitta cristata	X	X			
Common Raven	Corvus corax	X	X			
Common Crow	Corvus brachyrhynchos	X	X	X		
Black-capped Chickadee	Parus atricapillus	X	X	X		
Tufted Titmouse	Parus bicolor	X	X			
White-breasted Nuthatch	Sitta carolinensis	X	X			
Red-breasted Nuthatch	Sitta canadensis	X	X			
Brown Creeper	Certhia familiaris	X				
House Wren	Troglodytes aedon	X		X		
Winter Wren	Troglodytes troglodytes	X	X		X	
Long-billed Marsh Wren	Cistothorus palustris				X	

TABLE 5 (Continued)

BIRD SPECIES THAT MAY OCCUR THROUGHOUT THE PROJECT AREA*

Species		Habitat Type: Hardwood	Softwood	Open	Wetland	Other
Short-billed Marsh Wren	*Cistothorus platensis*				x	
Mockingbird	*Mimus polyglottos*	x		x	x	
Gray Catbird	*Dumatella carolinensis*	x		x	x	
Brown Thrasher	*Toxostoma rufum*	x		x		
American Robin	*Turdus migratorius*	x	x	x		
Wood Thrush	*Hylocichla mustelina*	x				
Hermit Thrush	*Catharus guttata*	x	x			
Swainson's Thrush	*Catharus ustulata*	x	x			
Veery	*Catharus fuscescens*	x				
Eastern Bluebird	*Sialia sialis*	x		x		
Blue-gray Gnatcatcher	*Polioptila caerulea*	x				
Golden-crowned Kinglet	*Regulus satrapa*	x	x			
Northern Shrike	*Lanius excubitor*	x	x	x		
Starling	*Sturnus vulgaris*	x		x		
Yellow-throated Vireo	*Vireo flavifrons*	x				
Solitary Vireo	*Vireo solitarius*		x			
Red-eyed Vireo	*Vireo olivaceus*	x				
Warbling Vireo	*Vireo gilvus*	x				
Black and White Warbler	*Mniotilta varia*	x				
Golden-winged Warbler	*Vermivora chrysoptera*	x		x		
Nashville Warbler	*Vermivora ruficapilla*	x	x		x	
Yellow Warbler	*Dendroica petechia*	x		x	x	
Magnolia Warbler	*Dendroica magnolia*	x	x			
Black-throated Blue Warbler	*Dendroica caerulescens*	x				
Yellow-rumped Warbler	*Dendroica coronata*		x			
Black-throated Green Warbler	*Dendroica virens*	x	x			
Blackburnian Warbler	*Dendroica fusca*	x	x			
Chestnut-sided Warbler	*Dendroica pensylvanica*	x		x	x	
Pine Warbler	*Dendroica pinus*		x			
Prairie Warbler	*Dendroica discolor*			x		
Ovenbird	*Seiurus aurocapillus*	x				
Northern Waterthrush	*Seiurus noveboracensis*	x	x		x	

TABLE 5 (Continued)

BIRD SPECIES THAT MAY OCCUR THROUGHOUT THE PROJECT AREA*

Species		Habitat Type Hardwood	Softwood	Open	Wetland	Other
Louisiana Waterthrush	Seiurus motacilla				X	
Mourning Warbler	Oporornis philadelphia			X	X	
Common Yellowthroat	Geothlypis trichas	X		X	X	
Yellow-breasted Chat	Icteria virens			X		
Canada Warbler	Wilsonia canadensis	X	X		X	
American Redstart	Setophaga ruticilla	X				
House Sparrow	Passer domesticus			X		X
Bobolink	Dolichonyx oryzivorus			X	X	
Eastern Meadowlark	Sturnella magna			X		
Red-winged Blackbird	Agelaius phoeniceus			X	X	
Northern Oriole	Icterus galbula	X		X		
Common Grackle	Quiscalus quiscula			X	X	
Brown-headed Cowbird	Molothrus ater			X		
Scarlet Tanager	Piranga olivacea	X				
Cardinal	Cardinalis cardinalis	X		X		
Rose-breasted Grosbeak	Pheucticus ludovicianus	X				
Indigo Bunting	Passerina cyanea			X		
Evening Grosbeak	Hesperiphona vespertina		X			
Purple Finch	Carpodacus purpureus		X			
House Finch	Carpodacus mexicanus	X	X			
Pine Grosbeak	Pinicola enucleator		X			
Common Redpoll	Carduelis flammea	X		X		
Pine Siskin	Carduelis pinus	X	X	X		
American Goldfinch	Carduelis tristis	X		X		
Rufous-sided Towhee	Pipilo erythrophthalmus	X	X			
Savannah Sparrow	Passerculus sandwichensis			X	X	
Grasshopper Sparrow	Ammodramus savannarum			X	X	
Vesper Sparrow	Pooecetes gramineus			X	X	
Northern Junco	Junco hyemalis	X	X	X		
Tree Sparrow	Spizella arborea			X		

TABLE 5 (Continued)

BIRD SPECIES THAT MAY OCCUR THROUGHOUT THE PROJECT AREA*

Species		Habitat Type				
		Hardwood	Softwood	Open	Wetland	Other
Chipping Sparrow	*Spizella passerina*	x	x			
Field Sparrow	*Spizella pusilla*			x		
White-throated Sparrow	*Zonotrichia albicollis*	x	x	x		
Swamp Sparrow	*Melospiza georgiana*				x	
Song Sparrow	*Melospiza melodia*			x		
Lapland Longspur	*Calcarius lapponicus*			x		
Snow Bunting	*Plectrophenax nivalis*			x	x	

* Adapted from: DeGraff, R.M., G.M. Whitman, J.W. Lanier, B.J. Hill, and J.M. Keniston. Forest habitat for birds of the Northeast. U.S. Department of Agriculture, Forest Service, Washington, D.C. 598 pp.

TABLE 6

STATE OF VERMONT

ENDANGERED AND THREATENED SPECIES

JUNE 1989

ENDANGERED

PLANTS

SPHAGNACEAE	SPAGNUM FAMILY
Sphagnum subfulvum	A peat moss
BRYACEAE	BRYACEAE FAMILY
Plagiobryum zierii	A moss
OPHIOGLOSSACEAE	ADDER'S-TONGUE FAMILY
Botrychium lunaria (L.) Sw.	Moonwort
SCHIZAEACEAE	CURLY-GRASS FAMILY
Lygodium palmatum (Bernh.) Sw.	Climbing fern
POLYPODIACEAE	FERN FAMILY
Woodsia alpina (Bolton) Br.	Alpine woodsia
GRAMINEAE (POACEAE)	GRASS FAMILY
Ammophila champlainensis Seymour	Champlain dune grass
Sporobilus asper (Michx.) Kunth	Rough rush-grass
CYPERACEAE	SEDGE FAMILY
Cyperus diandrus	Low cyperus
Carex Buxbaumii Walenb.	Buxbaum's sedge
Carex Richardsonii R. Br.	Richardson's sedge
ORCHIDACEAE	ORCHID FAILY
Listera australis Lindl.	Southern twayblade
Listera auriculata Wieg.	Auricled twayblade
SALICACEAE	WILLOW FAMILY
Salix Uva-ursi Pursh	Bearberry willow
RANUNCULACEAE	CROWFOOT FAMILY
Anemone multifida Poir.	Much-cleft anemone
Hydrastis canadensis L.	Golden-seal

TABLE 6 (Continued)

LEGUMINOSAE (FABACEAE)	PULSE FAMILY
Astragalus robbinsii (Oakes) Gray var. Jesupi Egglst. & Sheld.	Jesup's milk-vetch
RHAMNACEAE	BUCKTHORN FAMILY
Ceanothus ovatus Desf.	Smaller red-root
CISTACEAE	ROCKROSE FAMILY
Hudsonia tomentosa Nutt.	False heather
ONAGRACEAE	EVENING PRIMROSE FAMILY
Ludwigia polycarpa Short & Peter	Many-fruited ludwigia
PYROLACEAE	WINTERGREEN FAMILY
Pyrola minor L.	Small wintergreen
DIAPENSIACEAE	DIAPENSIA FAMILY
Diapensia lapponica L.	Diapensia
SCROPHULARIACEAE	FIGWORT FAMILY
Veronicastrum virginicum (L.) Farw.	Culver's-root
VALERIANACEAE	VALERIAN FAMILY
Valeriana uliginosa (T.&G.) Rydb.	Marsh valerian
COMPOSITAE (ASTERACEAE)	COMPOSITE FAMILY
Prenanthes boottii (DC.) Gray	Boott's rattlesnake-root
FISH	
ACIPENSERIDAE	
Acipenser fulvescens	Lake sturgeon
AMPHIBIANS	
HYLIDAE	
Pseudacris triseriata	Striped chorus frog
REPTILES	
SCINCIDAE	
Eumeces fasciatus	Five-lined skink
VIPERIDAE	
Crotalus horridus	Timber rattlesnake

TABLE 6 (Continued)

BIRDS	
GAVIIDAE	
Gavia immer	Common loon
LARIDAE	
Sterna hirundo	Common tern
TETRAONIDAE	
Canachites canadensis	Spruce grouse
ACCIPITRIDAE	
Haliaeetus leucocephalus	Bald eagle
PANDIONIDAE	
Pandion haliaetus	Osprey
FALCONIDAE	
Falco peregrinus	Peregrine falcon
LANIIDAE	
Lanius ludovicianus	Loggerhead shrike
FRINGILLIDAE	
Ammodramus henslowii	Henslow's sparrow
MAMMALS	
VESPERTILIONIDAE	
Myotis sodalis	Indiana bat
MUSELIDAE	
Martes americana	Marten
FELIDAE	
Lynx canadensis	Lynx
Felis concolor cougar	Eastern mountain lion

TABLE 6 (Continued)

THREATENED

PLANTS

EQUISETACEAE	HORSETAIL FAMILY
Equisetum palustre L.	Marsh-horsetail
LYCOPODIACEAE	CLUBMOSS FAMILY
Lycopodium sitchense Rupr.	Sitkan clubmoss
ISOETACEAE	QUILLWORT FAMILY
Isoetes engelmannii A. Br.	Engelmann's quillwort
POLYPODIACEAE	FERN FAMILY
Asplenium montanum Willd.	Mountain speenwort
Asplenium viride Huds.	Green spleenwort
Dryopteris filix-mas (L.) Schott	Male fern
Woodwardia virginica (L.) Sm.	Virginia chain-fern
PINACEAE	PINE FAILY
Juniperus horizontalis Moench	Creeping savin
Pinus banksiana Lamb.	Jack pine
JUNCAGINACEAE	ARROW-GRASS FAMILY
Scheuchzeria palustris L.	Scheuchzeria
GRAMINEAE (POACEAE)	GRASS FAMILY
Hierochloe alpina (Sw.) R. & S.	Alpine holy grass
Panicum xanthophysum Gray	Slender panic-grass
CYPERACEAE	SEDGE FAMILY
Carex atratiformis Britt.	Blackish sedge
Carex capillaris L.	Sedge
Carex garberi Fern.	Garber's sedge
Carex livia (Wahlenb.) Willd.	Livid sedge
Carex muhlenbergii Schk.	Muhlenberg's sedge
Cyperus houghtonii Torr.	Houghton's umbrella-sedge
Eleocharis pauciflora (Lightf.) Link	Spike rush
Rhynchospora capillacea Torr.	Capillary beak-rush
Scirpus ancistrochaetus Schuyler	Bulrush
Scirpus verecundus Fern.	Bashful bulrush
ARACEAE	ARUM FAMILY
Arisaema dracontium (L.) Schott	Green dragon
XYRIDACEAE	YELLOW-EYED GRASS FAMILY
Xyris montana H. Ries.	Northern yellow-eyed grass

TABLE 6 (Continued)

LILIACEAE	LILY FAMILY
Allium canadense L.	Wild garlic
Tofieldia glutinosa (Michx.) Pers.	False asphodel
ORCHIDACEAE	ORCHID FAMILY
Aplectrum hyemale (Muhl.) Torr.	Putty-root
Arethusa bulbosa L.	Swamp-pink
Calypso bulbosa (L.) Oakes	Calypso
Corallorhiza odontorhiza (Willd.) Nutt	Autumn coral-root
Cypripedium areitinum R. Br.	Ram's head lady's-slipper
Isotria verticillata (Willd.) Raf.	Large whorled pogonia
Liparis lilifolia (L.) Richard	Lily-leaved twayblade
Malaxis brachypoda (Gray) Fern.	White adder's mouth
Platanthera (Habenaria) flava (L.) Lindl.	Pale green orchis
Platanthera (Habenaria) hookeri (Torr.) Lindl.	Hooker's orchis
Triphora trianthophora (Sw.) Rydb.	Nodding pogonia
SALICACEAE	WILLOW FAMILY
Salix planifolia Pursh.	Flat-leaved willow
MORACEAE	MULBERRY FAMILY
Morus rubra L.	Red mulberry
CARYOPHYLLACEAE	PINK FAMILY
Minuartia (Arenaria) marcescens (Fern.) House	Marcescent sandwort
Minuartia (Arenaria) rubella (Wahlenb.) Hiern.	Vernal sandwort
PAPAVERACEAE	POPPY FAMILY
Corydalis aurea Willd.	Golden corydalis
CRUCIFERAE (BRASSICACEAE)	MUSTARD FAMILY
Arabis lyrata L.	Lyre-leaved rock-cress
Armoracia aquatica (Eat.) Wieg.	Lake-cress
Braya humilus (C.A. Mey) Robins.	Northern rock-cress
Draba glabella Pursh	Smooth whitlow-grass
Draba lanceolata Royle	Lanceolate whitlow-grass
CRASSULACEAE	ORPINE FAMILY
Sedum rosea (L.) Scop.	Roseroot
ROSACEAE	ROSE FAMILY
Prunus americana Marsh.	Wild plum

TABLE 6 (Continued)

LEGUMINOSAE (FABACEAE)	PULSE FAMILY
Astragalus canadensis L.	Canadian milk-vetch
Cassia hebecarpa Fern.	Wild senna
Crotalaria sagittalis L.	Rattlebox
Desmodium rotundifolium DC.	Prostrate tick-clover
Lathyrus japonicus Willd.	Beach-pea
Lathyrus palustris L.	Vetchling
Lespedeza violacea (L.) Pers.	Bush-clover
Lupinus perennis L.	Wild lupine
GUTTIFERAE (HYPERICACEAE)	ST. JOHN'S-WORT FAMILY
Hypericum pyramidatum Ait.	Great St. John's-wort
CISTACEAE	ROCKROSE FAMILY
Helianthemum bicknellii Fern.	Frostweed
VIOLACEAE	VIOLET FAMILY
Viola lanceolata L.	Lance-leaved violet
MELASTOMATACEAE	MELASTOMA FAMILY
Rhexia virginica L.	Meadow-beauty
UMBELLIFERAE (APIACEAE)	PARSLEY FAMILY
Sanicula canadensis L.	Short-styled snakeroot
Taenidia integerrima (L.) Drude	Yellow pimpernel
CORNACEAE	DOGWOOD FAMILY
Cornus florida L.	Flowering dogwood
ERICACEAE	HEATH FAMILY
Rhododendron maximum L.	Great laurel
PRIMULACEAE	PRIMROSE FAMILY
Primula mistassinica Michx.	Bird's-eye-primrose
GENTIANACEAE	GENTIAN FAMILY
Gentiana amarella L.	Felwort
Gentiana andrewsii Griseb.	Closed gentian
Gentiana quinquefolia L.	Stiff gentian
ASCLEPIADACEAE	MILKWEED FAMILY
Asclepias amplexicauplis Sm.	Blunt-leaved milkweed
Asclepias tuberosa L.	Butterfly-weed
CONVOLVULACEAE	CONVOLULUS FAMILY
Convolvulus spithamaeus L.	Upright bindweed
POLEMONIACEAE	POLEMONIUM FAMILY
Polemonium van-bruntiae Britt.	American Jacob's ladder

TABLE 6 (Continued)

HYDROPHYLLACEAE	WATERLEAF FAMILY
Hydrophyllum canadense L.	Broad-leaved waterleaf
BORAGINACEAE	BORAGE FAMILY
Cynoglossum boreale Fern.	Northern wild comfrey
Hackelia americana (Gray) Fern.	Nodding stickseed
LABIATAE (LAMIACEAE)	MINT FAMILY
Agastache nepetoides (L.) Ktze.	Yellow giant hyssop
Agastache scrophulariaefolia (Willd.) Ktze.	Purple giant hyssop
Blephilia hirsuta (Pursh.) Benth.	Wood-mint
Dracocephalum parviflorum Nutt.	Dragonhead
Physostegia virginiana (L.) Benth.	Obedient plant
SCROPHULARIACEAE	FIGWORT FAMILY
Castilleja septentrionalis Lindl.	Northern painted-cup
LENTIBULARIACEAE	BLADDERWORT FAMILY
Utricularia gibba L.	Humped bladderwort
Utricularia resupinata B.D. Greene	Reclined bladderwort
RUBIACEAE	MADDER FAMILY
Galium labradoricum Wieg.	Labrador bedstraw
CAPRIFOLIACEAE	HONEYSUCKLE FAMILY
Viburnum edule (Michx.) Raf.	Mooseberry
COMPOSITAE (ASTERACEAE)	COMPOSITE FAMILY
Helianthus strumosus L.	Harsh sunflower
Petasites palmatus (Ait.) Gray	Palmate sweet coltsfoot
Polymnia canadensis L.	Small-flowered leafcup
Solidago odora Ait.	Sweet goldenrod
Solidago ulmifolia Muhl.	Elm-leaved goldenrod
INSECTS	
CICINDELIDAE	
Cicindela marginipennis	Cobblestone tiger beetle
MOLLUSCS	
UNIONIDAE	
Alasmidonta heterodon	Dwarf wedge mussel

TABLE 6 (Continued)

FISH	
PETROMYZONTIDAE	
Ichthyomyzon fossor	Northern brook lamprey
Lampetra appendix	American brook lamprey
CATOSTOMIDAE	
Carpiodes cyprinus	Quillback
PERCIDAE	
Ammocrypta pellucida	Eastern sand darter
REPTILES	
EMYDIDAE	
Clemmys guttata	Spotted turtle
TRIONYCHIDAE	
Trionyz spiniferus	Spiny softshell
BIRDS	
SCOLOPACIDAE	
Bartramia longicauda	Upland sandpiper
TROGLODYTIDAE	
Cistothorus platensis	Sedge wren
MAMMALS	
VESPERTILIONIDAE	
Myotis leibii	Small-footed bat

TABLE 7.

ENDANGERED AND THREATENED WILDLIFE SPECIES IN NEW HAMPSHIRE

Common Name	Scientific Name
Endangered	
Sunapee trout	*Salvelinus aureolus*
*Short nose sturgeon	*Ascipenser brevirostrum*
*Bald eagle	*Haliaeetus leucocephalus*
*Peregrine falcon	*Falco peregrinus*
Canada lynx	*Lynx canadensis*
*Indiana bat	*Myotis sodalis*
Threatened	
Common loon	*Gavia immer*
Cooper's hawk	*Accipiter cooperii*
Northern harrier	*Circus cyaneus*
Red-shouldered hawk	*Buteo lineatus*
Osprey	*Pandion haliaetus*
Upland sandpiper	*Bartramia longicauda*
Common tern	*Sterna hirundo*
Arctic tern	*S. paradisaea*
Roseate tern	*S. dougallii*
Whip-poor-will	*Caprimulgus vociferus*
Purple martin	*Progne subis*
Eastern bluebird	*Sialia sialis*
Pine marten	*Martes americana*

NOTE:

* On federal list.

Source: Smith and Choate 1985.

TABLE 8

ANADROMOUS FISH PASSAGE AT VERNON FISHWAY 1981-1989

Year	American Shad	Blueback Herring	Atlantic Salmon	Striped Bass	Sea Lamprey
1981	97	20*	8	11	306
1982	9	56*	0	1	5
1983	2,597	53*	0	2	379
1984	335	7*	0	0	195
1985	833	21*	4	0	1,257
1986	982	94*	4	0	573
1987	3,460	0	13	0	667
1988	1,370	0	5	0	281
1989**	2,915	51	0	0	195

* Blueback herring counts from these years are suspect because temporary personnel had difficulty differentiating blueback herring from small American shad.

** Preliminary counts, may be subject to minor changes.

Data from Vermont Department of Fish and Wildlife.

TABLE 9

SCHEDULE OF DOWNSTREAM FISH PASSAGE OPERATIONS

Location (Project)	Downstream Fish Passage Exit	Species	Life Stage	Dates of Operation	Hours of Operation
Wilder	Log Sluice (1)	Salmon	smolt	April 1 - May 31	24 hrs/day
Bellows Falls	Log Sluice (1)	Salmon	smolt	April 1 - May 31	24 hrs/day
Vernon	Log Sluice (1)	Salmon	smolt	April 1 - May 31	24 hrs/day
	Log Sluice (2)	Shad	adult	June 15 - July 15	1000 - 1200, 1600 - 1800
	Log Sluice (3)	Shad	juvenile	September 1 - October 31	1400 - 2000
Turners Falls	Log Sluice	Salmon	smolt	April 1 - May 31	24 hrs/day
	Log Sluice	Shad	adult	June 15 - July 1	1000 - 1200, 1600 - 1800
	Log Sluice	Shad	juvenile	September 1 - October 31	1400 - 2000
Holyoke (4)	Boatlock Station Bypass	Shad	adult	June 1 - July 15	24 hrs/day
	Boatlock Station Bypass	Shad	juvenile	September 1 - October 31	1200 - 2400
	If needed canal drawdown	Shad	adult	June 1 - July 15	
	Bascule Gate	Shad	adult	June 1 - July 15	As needed
	Bascule Gate	Shad	juvenile	September 1 - October 31	1200 - 2400
	Bascule Gate	Salmon	smolt	April 1 - May 31	24 hrs/day

(1) A minimum gate opening of 3.5 feet
(2) Observations made in 1989 will determine if the existing sluice is adequate
(3) Operation to begin only after reproduction is documented
(4) Final FERC Articles may supersede these requests

Table 10

VERNON STATION RECREATION ATTENDANCE DATA 1985 – 1989

YEAR	GOVERNOR HUNT PICNIC AREA			FISH LADDER DISPLAY	
	CARS	BOATS	VISITORS	CARS	VISITORS
1985	1034	49	3041	2619	7878
1986	2001	90	6078	5259	15787
1987	3998	326	11995	2257	6789
1988	2731	145	8366	2304	6893
1989	4241	263	12759	2511	7543
5-YR AVE	2801	175	8448	2990	8978