

LOW-IMPACT HYDROPOWER POWER INSTITUTE CERTIFICATION APPLICATION

**ARNOLD FALLS
(FERC No. P-2399)**



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LOW-IMPACT HYDROPOWER POWER INSTITUTE CERTIFICATION APPLICATION

ARNOLD FALLS (FERC No. P-2399)

1.0 FACILITY DESCRIPTION

The Arnold Falls Project (FERC No. 2399) (Project), owned and operated by Green Mountain Power Corporation (GMP) (formerly Central Vermont Public Service Corporation), is located in northeastern Vermont near St. Johnsbury, at river mile (RM) 9.5, on the Passumpsic River (Figure 1 and Figure 2). The Passumpsic River is a major tributary to the Connecticut River. The Arnold Falls Project is the fourth most downstream of seven dams located on the Passumpsic River.



FIGURE 1 ARNOLD FALLS HYDROELECTRIC PROJECT OVERVIEW

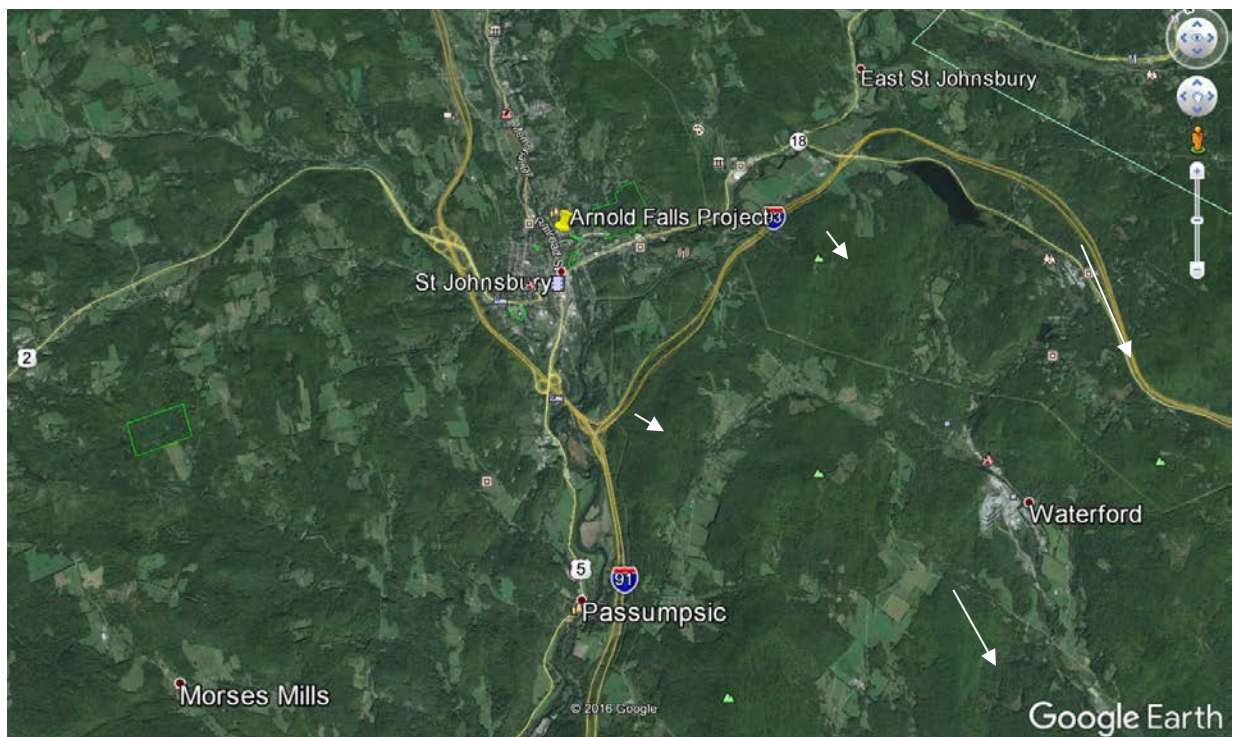


FIGURE 2 GEOGRAPHIC OVERVIEW OF THE ARNOLD FALLS HYDROELECTRIC PROJECT

The Arnold Falls Project is approximately 5.4 miles downstream from the GMP owned and operated Pierce Mills Hydroelectric Project (FERC No. 2396). Downstream of Arnold Falls, are three additional projects owned and operated by GMP: Gage Hydroelectric Project (FERC No. 2397), Passumpsic Hydroelectric Project (FERC No. 2400), and East Barnet Hydroelectric Project (FERC No. 3051). The Passumpsic River joins the Connecticut River just downstream of the East Barnet Dam. The drainage area for the Arnold Falls Project is 254 square miles.

The Arnold Falls Project was built in 1928 by the Twin State Gas & Electric Company following the 1927 flood which did extensive damage to a “small and old station” on the north bank of the river. The falls bear the surname of Dr. Johnathon Arnold, an early settler and entrepreneur who constructed the first sawmill there in 1787 and a gristmill the following year.

The Project impounds a 10-acre reservoir (with no storage capacity) that extends about 2,900 feet upstream with a water surface elevation of 574.3 feet mean sea level (msl) ¹. In 2009, the

¹ Within GMP’s filing dated September 23, 2016 (http://elibrary.ferc.gov/0/idmws/file_list.asp?document_id=14499057), revised Exhibit A and Exhibit G were submitted to FERC as recommended within FERC’s letter dated August 25, 2016 (http://elibrary.ferc.gov/0/idmws/file_list.asp?document_id=14489165).

existing timber crib dams were abandoned in place and replaced with reinforced concrete gravity dams immediately downstream of the timber crib dams.

The Project has two concrete gravity dams consisting of a North Dam and a South Dam (Figure 1). The North Dam is 180-feet-long by 18-feet-high, with a dam crest elevation of 573.0 msl. It is topped with 20.4-inch hinged steel flashboards. The South Dam is 64-feet-long by 15-feet-high, with a crest elevation of 572.0 feet msl, topped with an inflatable flashboard system 32.4-inches-high. The intake is 20-feet-wide with trashracks and a manually operated bulkhead gate. The powerhouse contains one vertical shaft turbine rated at 335 kW and a generator rated at 350 kW. A substation is located adjacent to the intake. The downstream fish passage facility is located in the sluiceway of the spillway adjacent to the intake. The bypassed reach is about 300-feet-long. The project has a hydraulic range of 150 to 262 cfs and an average annual generation of about 1,484 MWh. Approximately 10.6 acres is located within the FERC project boundary.

The Project operates in a run-of-river mode to preserve water quality, aquatic and riparian habitats, and aesthetic and recreational flows in the Passumpsic River. The Project releases into the bypassed reach a minimum flow of 78 cfs (excluding fish passage flows), or inflow when operating, whichever is less. When not operating there is also a minimum flow of 33 cfs (including fish passage flows) into the south channel. When inflow is less than 139 cfs, 26% of inflow is released to the south channel, with the remainder to the north channel.

TABLE 1 FACILITY DESCRIPTION INFORMATION FOR ARNOLD FALLS PROJECT (LIHI # 93)

| INFORMATION TYPE | VARIABLE DESCRIPTION | RESPONSE (AND REFERENCE TO FURTHER DETAILS) |
|------------------------------------|--|--|
| <i>Name of the Facility</i> | Facility name (use FERC project name if possible) | Arnold Falls Hydroelectric Project FERC Project No. 2399 |
| <i>Location</i> | River name (USGS proper name) | Passumpsic River |
| | River basin name | Passumpsic River Basin |
| | Nearest town, county, and state | Located in the Town of St. Johnsbury Caledonia County, Vermont |
| | River mile of dam above next major river | River Mile 9.5 |
| | Geographic latitude | 44.4245 degrees N |
| | Geographic longitude | -72.0136 degrees W |
| <i>Facility Owner</i> | Application contact names (IMPORTANT: you must also complete the Facilities Contact Form): | Jason Lisai– Green Mountain Power Corporation John Greenan - Green Mountain Power Corporation Andy Qua—Kleinschmidt Associates Katie Sellers—Kleinschmidt Associates Please see Section 4.0 for the Facility Contacts Form. |
| | - Facility owner (individual and company names) | Green Mountain Power Corporation (GMP or Licensee) |
| | - Operating affiliate (if different from owner) | N/A |
| | - Representative in LIHI certification | John Greenan, GMP |
| | | |
| <i>Regulatory Status</i> | FERC Project Number (e.g., P-xxxxx), issuance and expiration dates | FERC Project No. 2399 40-year License issued on December 8, 1994 and expires on November 30, 2034 |
| | FERC license type or special classification (e.g., "qualified conduit") | Minor Project License |
| | Water Quality Certificate identifier and issuance date, plus source agency name | Water Quality Certificate (WQC) was issued by the Vermont Department of Environmental Conservation on June 16, 1994. |
| | Hyperlinks to key electronic records on FERC e-library website (e.g., most recent Commission Orders, WQC, ESA documents, etc.) | 1994 FERC License: http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13711081 1994 Water Quality Certificate: Please see Appendix C (not available online). |

| INFORMATION TYPE | VARIABLE DESCRIPTION | RESPONSE (AND REFERENCE TO FURTHER DETAILS) |
|---------------------|----------------------|---|
| | | <p>1995 Order Modifying and Approving Downstream Fish Passage Facilities: http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10748550</p> <p>1996 Order Modifying and Approving Recreation Plan: http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10753301</p> <p>1996 Order Modifying and Approving Plan to Monitor Effectiveness of Downstream Fish Passage Facilities: http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10757431</p> <p>1997 Order Modifying & Approving Flow Management Plan: http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10780026</p> <p>2000 Order Approving Cultural Resources Management Plan: http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10850860</p> <p>2002 Environmental Inspection Report: http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=9733371</p> <p>2010 Order Modifying and Approving Study of Recreational Use: http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12493373</p> <p>2013 Environmental Inspection Report: http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13378666</p> <p>2015 FERC Order Approving Study of Recreational Use: http://elibrary.ferc.gov/0/idmws/file_list.asp?document_id=14403636</p> |

| INFORMATION TYPE | VARIABLE DESCRIPTION | RESPONSE (AND REFERENCE TO FURTHER DETAILS) |
|---|---|---|
| <i>Power Plant Characteristics</i> | Date of initial operation (past or future for operational applications) | 1928 |
| | Total name-plate capacity (MW) | 0.350 MW |
| | Average annual generation (MWh) | Average annual generation from years 2010/2011 – 2014/2015 is 1,484.16 MWh. |
| | Number, type, and size of turbines, including maximum and minimum hydraulic capacity of each unit | The Project has one vertical shaft S. Morgan Smith fixed-blade, propeller-type turbine rated at 335 kw. The Project has a hydraulic range of 150 cfs to 262 cfs. |
| | Modes of operation (run-of-river, peaking, pulsing, seasonal storage, etc.) | Run-of-river operation with a minimum flow of 78 cfs (excluding fish passage flows) or inflow when operating, whichever is less. When not operating there is also a minimum flow of 33 cfs (including fish passage flows) into the south channel. When inflow is < 139 cfs, 26% of inflow is released to the south channel with the remainder to the north channel. |
| | Dates and types of major equipment upgrades | N/A |
| | Dates, purpose, and type of any recent operational changes | N/A |
| | Plans, authorization, and regulatory activities for any facility upgrades | There are no plans at this time for Project upgrades. |
| <i>Characteristics of Dam, Diversion, or Conduit</i> | Date of construction | 1928 timber crib dam. In 2009 the timber crib dam was abandoned in place and replaced with concrete gravity dam immediately downstream. |
| | Dam height | North Dam 18 feet South Dam 15 feet |
| | Spillway elevation and hydraulic capacity | The south dam crest elevation is 572.8 feet mean sea level (msl) and the north dam crest elevation is 572.72 feet msl. The spillway's hydraulic capacity number is not readily available. |
| | Tailwater elevation | 556.12 feet msl. |
| | Length and type of all penstocks and water conveyance structures between reservoir and powerhouse | N/A |
| | Dates and types of major, generation-related infrastructure improvements | No new generation-related infrastructure improvements have occurred since the 2012 LIHI submission. |

| INFORMATION TYPE | VARIABLE DESCRIPTION | RESPONSE (AND REFERENCE TO FURTHER DETAILS) |
|---|--|---|
| | Designated facility purposes (e.g., power, navigation, flood control, water supply, etc.) | The purpose of this facility is to generate power to be supplied to the local power grid. |
| | Water source | Passumpsic River |
| | Water discharge location or facility | Passumpsic River |
| <i>Characteristics of Reservoir and Watershed</i> | Gross volume and surface area at full pool | At full pool the Project has a 10.0-acre impoundment with no net storage capacity. |
| | Maximum water surface elevation (ft. MSL) | The maximum surface water elevation within the impoundment is 574.3 feet msl. |
| | Maximum and minimum volume and water surface elevations for designated power pool, if available | No power pool is present. This is a run-of-river Project. |
| | Upstream dam(s) by name, ownership, FERC number (if applicable), and river mile | The Pierce Mills Hydroelectric Project (FERC No. 2396), owned and operated by GMP, is located upstream of the Arnold Falls Project at RM 14.9. The Village of Lyndonville owns and operates the Great Falls Hydroelectric Project (FERC No. 2839) located at RM 16.0 and the Vail Hydroelectric Project (FERC No. 3090) located furthest upstream at RM 17.7. See Appendix B for a map of Passumpsic River dam locations. |
| | Downstream dam(s) by name, ownership, FERC number (if applicable), and river mile | Downstream of the Project, there are three projects owned and operated by GMP. The Gage Hydroelectric Project (FERC No. 2397) is located at RM 7.2. The Passumpsic Hydroelectric Project is located at RM 5.5. The East Barnet Hydroelectric Project (FERC No. 3051) is located just before the Passumpsic River's confluence with the Connecticut River. See Appendix B for a map of Passumpsic River dam locations. |
| | Operating agreements with upstream or downstream reservoirs that affect water availability, if any, and facility operation | No operating agreements are in effect with other surrounding facilities. |
| | Area inside FERC project boundary, where appropriate | Approximately 10.6 acres is located inside of the FERC Project boundary. |

| INFORMATION TYPE | VARIABLE DESCRIPTION | RESPONSE (AND REFERENCE TO FURTHER DETAILS) |
|-----------------------------------|--|--|
| Hydrologic Setting | Average annual flow at the dam | There is an average annual flow of 490 cfs at the dam as stated in the 1994 Water Quality Certificate. This flow is calculated by using estimates from the three following gaging stations: USGS Gage 01135500 Passumpsic River at Passumpsic, VT; USGS Gage 01133000 East Branch Passumpsic River Near East Haven, VT; and USGS Gage 01135000 Moose River at St. Johnsbury, VT. |
| | Average monthly flows | Average monthly flows (2010-2015) as measured at the downstream USGS Gage 01135500 Passumpsic River at Passumpsic, VT: Jan: 708 cfs Feb: 410 cfs March: 813 cfs April: 2,360 cfs May: 1,480 cfs June: 995 cfs July: 620 cfs Aug: 413 cfs Sept: 421 cfs Oct: 792 cfs Nov: 617 cfs Dec: 832 cfs |
| | Location and name of relevant stream gauging stations above and below the facility | Flow at the dam is calculated by using estimates from the three following gaging stations: USGS Gage 01135500 Passumpsic River at Passumpsic, VT; USGS Gage 01133000 East Branch Passumpsic River Near East Haven, VT; and USGS Gage 01135000 Moose River at St. Johnsbury, VT. |
| | Watershed area at the dam | 254 square miles |
| Designated Zones of Effect | Number of zones of effect | Three Zones of Effect (ZOE): Impoundment ZOE Bypassed Reach ZOE Downstream ZOE |

| INFORMATION TYPE | VARIABLE DESCRIPTION | RESPONSE (AND REFERENCE TO FURTHER DETAILS) |
|------------------|---|---|
| | Upstream and downstream locations by river miles | Impoundment ZOE: RM 9.5 to RM 10.0 Bypassed Reach ZOE: RM 9.5 to RM 9.45 Downstream ZOE: RM 9.5 to RM 7.2 |
| | Type of waterbody (river, impoundment, by-passed reach, etc.) | Impoundment ZOE: Impoundment Bypassed Reach ZOE: Bypassed Reach Downstream ZOE: Riverine |
| | Delimiting structures | Impoundment ZOE: RM 9.5 (Dam) to RM 10.0 (Hwy 5 Bridge over Passumpsic River) Bypassed Reach ZOE: RM 9.5 (Arnold Falls North Dam) to RM 9.45 (End of Bypassed Reach) Downstream ZOE: RM 9.5 (Dam) to RM 7.2 (Gage Dam) |
| | Designated uses by state water quality agency | <p>All three ZOEs are designated as Class B Waters by the Vermont Department of Environmental Conservation² (Vermont DEC). Class B waters are managed by the state to achieve a high level of quality compatible with certain beneficial values and uses. Values are high quality habitat for aquatic biota, fish and wildlife, and a water quality that consistently exhibits good aesthetic value; uses are public water supply with filtration and disinfection, irrigation and other agricultural uses, swimming, and recreation.</p> <p>The three ZOEs are located in the upper end of a waste management zone extending 4.8 miles from the upstream limit of St. Johnsbury to the Passumpsic Dam. Waste management zones, although Class B waters, present an increased level of health risk to contact recreational users due to the discharge of treated sanitary wastewater.</p> <p>The three ZOEs are also designated as cold water fisheries habitat. The dissolved oxygen standards for coldwater streams are 6mg/l or 70 percent saturation. The temperature standard limits increases from background to 1.0 degrees Fahrenheit.</p> |

² The Vermont DEC is a branch within the Vermont Agency of Natural Resources.

| INFORMATION TYPE | VARIABLE DESCRIPTION | RESPONSE (AND REFERENCE TO FURTHER DETAILS) |
|--|---|--|
| <i>Additional Contact Information</i> | Names, addresses, phone numbers, and e-mail for local state and federal resource agencies | Please see Section 4.0 for the Project Contacts Form |
| | Names, addresses, phone numbers, and e-mail for local non-governmental stakeholders | Please see Section 4.0 for the Project Contacts Form |
| <i>Photographs and Maps</i> | Photographs of key features of the facility and each of the designated zones of effect | Please see Appendix A for photographs of key features of the facility and identification of each designated ZOE. |
| | Maps, aerial photos, and/or plan view diagrams of facility area and river basin | Please see Appendix B for aerial photos of facility area and river basin. |

2.0 STANDARDS MATRICES

2.1 IMPOUNDMENT ZOE

| CRITERION | | ALTERNATIVE STANDARDS | | | | |
|-----------|---|-----------------------|----------|----------|----------|-------------|
| | | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>Plus</i> |
| A | Ecological Flow Regimes | X | | | | |
| B | Water Quality | | <i>X</i> | | | |
| C | Upstream Fish Passage | <i>X</i> | | | | |
| D | Downstream Fish Passage | | <i>X</i> | | | |
| E | Watershed and Shoreline Protection | X | | | | |
| F | Threatened and Endangered Species Protection | | X | | | |
| G | Cultural and Historic Resources Protection | | X | | | |
| H | Recreational Resources | | X | | | <i>X</i> |

2.2 BYPASSED REACH ZOE

| CRITERION | | ALTERNATIVE STANDARDS | | | | |
|-----------|---|-----------------------|----------|----------|----------|-------------|
| | | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>Plus</i> |
| A | Ecological Flow Regimes | | X | | | |
| B | Water Quality | | <i>X</i> | | | |
| C | Upstream Fish Passage | <i>X</i> | | | | |
| D | Downstream Fish Passage | | <i>X</i> | | | |
| E | Watershed and Shoreline Protection | X | | | | |
| F | Threatened and Endangered Species Protection | | X | | | |
| G | Cultural and Historic Resources Protection | | X | | | |
| H | Recreational Resources | | X | | | |

2.3 DOWNSTREAM ZOE

| CRITERION | | ALTERNATIVE STANDARDS | | | | |
|-----------|---|-----------------------|----------|----------|----------|-------------|
| | | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>Plus</i> |
| A | Ecological Flow Regimes | X | | | | |
| B | Water Quality | | X | | | |
| C | Upstream Fish Passage | X | | | | |
| D | Downstream Fish Passage | X | | | | |
| E | Watershed and Shoreline Protection | X | | | | |
| F | Threatened and Endangered Species Protection | | X | | | |
| G | Cultural and Historic Resources Protection | | X | | | |
| H | Recreational Resources | | X | | | |

3.0 SUPPORTING INFORMATION

3.1 ECOLOGICAL FLOWS STANDARDS: IMPOUNDMENT ZOE

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|---|
| A | 1 | <p><u>Not Applicable / De Minimis Effect:</u></p> <ul style="list-style-type: none">• Confirm the location of the powerhouse relative to other dam/diversion structures to establish that there are no bypassed reaches at the facility.• If Run-of-River operation, provide details on how flows, water levels, and operation are monitored to ensure such an operational mode is maintained.• In a conduit project, identify the water source and discharge points for the conduit system within which the hydropower plant is located.• For impoundment zones only, explain how fish and wildlife habitat within the zone is evaluated and managed – NOTE: this is required information, but it will not be used to determine whether the Ecological Flows criterion has been satisfied. All impoundment zones can apply Criterion A-1 to pass this criterion. |

- The Project powerhouse is located directly adjacent to both the north dam and south dam. There is no bypassed reach within the Impoundment ZOE.
- In 1994 Water Quality Certification (P.L. 92-500) (WQC) Condition B, Vermont DEC required that the Arnold Falls Project be operated in a run-of-river mode where the instantaneous flows below the tailrace equal the instantaneous inflow to the impoundment (see Appendix C for a copy of the WQC). Article 402 of the December 8, 1994 FERC license incorporated Vermont DEC's Water Quality Certification requirements to operate the Arnold Falls as a run-of-river facility (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13711081>).

Per WQC Condition E and License Article 404, a flow management plan was developed in consultation with Vermont DEC and U.S. Fish and Wildlife Service (USFWS), to ensure compliance with run-of-river operations. FERC approved the plan in 1997: <http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10780026>.

A headpond controller system (HPS) was installed to automatically adjust the turbine output to maintain impoundment levels within 1-inch of the top of, or spilling over the top of the flashboards. The system reads turbine output and headpond level every five minutes and raises or lowers the turbine load to maintain the headpond level in the range of 574.25 feet to 574.35 feet. If the turbine load is 25 kW or lower and the headpond level drops to 574.22 feet, the system shuts down automatically, causing all flow to spill over the dam. When the station is shut down, the operator opens the downstream fish passage to provide 33 cfs to the south channel prior to shutting down the station.

- This is not a conduit facility.

- The Project's run-of-river operations create a stable impoundment environment. To protect wetlands and wildlife during occasional impoundment drawdowns past the dam crest, the Licensee undergoes agency consultation prior to drawdowns to ensure protection of the upstream resources.
- Project operations data was provided to Vermont DEC on March 29, 2018 for verification of Project run-of-river and Water Quality Certificate compliance (see Appendix C for email exchange).

3.2 ECOLOGICAL FLOWS STANDARDS: BYPASSED REACH ZOE

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|---|
| A | 2 | <p><u>Agency Recommendation (see Appendix A for definitions):</u></p> <ul style="list-style-type: none"> Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain which is most environmentally stringent). Explain the scientific or technical basis for the agency recommendation, including methods and data used. This is required regardless of whether the recommendation is or is not part of a Settlement Agreement. Explain how the recommendation relates to agency management goals and objectives for fish and wildlife. <p>Explain how the recommendation provides fish and wildlife protection, mitigation and enhancement (including in-stream flows, ramping and peaking rate conditions, and seasonal and episodic instream flow variations).</p> |

- Under Vermont DEC WQC Condition C, a minimum instantaneous flow of 78 cfs, or inflow, whichever is less, is spilled over the north spillway and into the bypassed reach at all times. This spillage requirement, when combined with leakage, is intended to provide a total flow of 103 cfs in the left channel. This flow does not include the flow needed to operate the fish passage facility. If the instantaneous inflow falls below the minimum hydraulic capacity of the turbine unit plus this spillage requirement plus the bypassed flow requirements, all flows (except for those needed for fish passage) are spilled over the dam. When the Project is not generating, a minimum flow of 33 cfs is released into the right (south) channel to protect aquatic habitat. When inflow is below 139 cfs, 26% of inflow is maintained in the south channel with the remaining 74% maintained in the north channel.
- During the fall of 1992 and summer of 1993, the Licensee conducted a study to determine how much habitat is available at alternate minimum flows. This study was completed in consultation with Vermont DEC and USFWS. The results of the study were used by the Vermont DEC to set minimum flow requirements in the 1994 WQC (see Appendix C for a copy of the WQC).
- The Vermont DEC indicated in the 1994 WQC that the management goal, for bypasses at Passumpsic River hydroelectric projects, is to establish and maintain cold water aquatic habitat, including deep aerated pools that are well circulated and serve as adult refugia, steeper gradient areas with high macroinvertebrate production, and fish spawning and nursery areas. The Project provides valuable habitat for juvenile Atlantic salmon (stocking of Atlantic salmon in the area ended in 2012), all life stages of resident salmonids (brown and rainbow trout), and a variety of non-game fishes (see Appendix C for a copy of the WQC).
- The Vermont DEC indicated in the 1994 WQC, that high quality fish habitat exists in both channels downstream of the dams and is in short supply in the main stem of the Passumpsic River. The Arnold Falls bypassed reach also constitutes a major micro-invertebrate production area. The turbulence and air entrainment caused by the rapids also make such

areas very attractive to fish that require water with abundant dissolved oxygen (trout and salmon) especially during hot weather. The bypassed reach at Arnold Falls provides some of the best habitat in this reach of the Passumpsic River. Run-of-river operations and minimum flows ensures this habitat is available for fish and wildlife (see Appendix C for a copy of the WQC).

- In 2013, an Environmental Inspection was completed by FERC to ensure environmental measures in the FERC License were being followed. The report indicated that the “The licensee files annual reports certifying compliance with its minimum flow requirements; the licensee’s 2012 annual minimum flow certification was filed on January 23, 2013. The licensee appears to be in compliance with its requirements with regard to fish and wildlife resources” (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13378666>).
- Project operations data was provided to Vermont DEC on March 29, 2018 for verification of Project operations and Water Quality Certificate compliance (see Appendix C for email exchange).

3.3 ECOLOGICAL FLOWS STANDARDS: DOWNSTREAM ZOE

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|--|
| A | 1 | <p><u>Not Applicable / De Minimis Effect:</u></p> <ul style="list-style-type: none"> • Confirm the location of the powerhouse relative to other dam/diversion structures to establish that there are no bypassed reaches at the facility. • If Run-of-River operation, provide details on how flows, water levels, and operation are monitored to ensure such an operational mode is maintained. • In a conduit project, identify the water source and discharge points for the conduit system within which the hydropower plant is located. • For impoundment zones only, explain how fish and wildlife habitat within the zone is evaluated and managed – NOTE: this is required information, but it will not be used to determine whether the Ecological Flows criterion has been satisfied. All impoundment zones can apply Criterion A-1 to pass this criterion. |

- The Project powerhouse is located directly adjacent to both the north dam and south dam. There is no bypassed reach within the Downstream ZOE.
- In 1994 WQC Condition B, the Vermont DEC required that the Arnold Falls Project be operated in a run-of-river mode where the instantaneous flows below the tailrace equal the instantaneous inflow to the impoundment (see Appendix C for a copy of the WQC). Article 402 of the December 8, 1994 FERC license incorporated Vermont DEC's Water Quality Certification requirements to operate the Arnold Falls as a run-of-river facility (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13711081>). Article 402 and WQC Condition D also require that the Licensee, following the reinstallation of flashboards or an approved special maintenance operation necessitating a drawdown, refill the impoundment by reducing downstream flows, but to no less than 127 cfs from June 1 to September 30 and 254 cfs from October 1 to May 31. During the period of April 1 to May 31 or under circumstances during the other periods when the natural inflow to the Project is insufficient to permit both passage of these minimum flows and refilling the impoundment, the impoundment is to be filled while releasing 90% of instantaneous inflow downstream at all times. Flows in the Downstream ZOE are essentially unregulated unless there is impoundment refill.

Per WQC Condition E and License Article 404, a flow management plan was developed in consultation with Vermont DEC and USFWS, to ensure compliance with run-of-river operations. FERC approved the plan in 1997 (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10780026>).

A HPS was installed to automatically adjust the turbine output to maintain impoundment levels within 1-inch of the top of, or spilling over the top of the flashboards. The system reads turbine output and headpond level every five minutes and raises or lowers the turbine load to maintain the headpond level in the range of 574.25 to 574.35 feet. If the turbine load is 25kW or lower and the headpond level drops to 574.22 feet, the system

shuts down automatically, causing all flow to spill over the dam. When the station is shut down, the operator opens the downstream fish passage to provide 33 cfs to the south channel prior to shutting down the station.

- This is not a conduit facility.
- Project operations data was provided to Vermont DEC on March 29, 2018 for verification of Project run-of-river and Water Quality Certificate compliance (see Appendix C for email exchange).

3.4 WATER QUALITY STANDARDS: IMPOUNDMENT, BYPASSED REACH, AND DOWNSTREAM ZOE_s

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|--|
| B | 2 | <u>Agency Recommendation:</u> <ul style="list-style-type: none">• If facility is located on a Water Quality Limited river reach, provide an agency letter stating that the facility is not a cause of such limitation.• Provide a copy of the most recent Water Quality Certificate, including the date of issuance.• Identify any other agency recommendations related to water quality and explain their scientific or technical basis.• Describe all compliance activities related to the water quality related agency recommendations for the facility, including on-going monitoring, and how those are integrated into facility operations. |

- According to the 2016 State of Vermont 303d List of Impaired Waters, the Passumpsic River from Tremont Street in St. Johnsbury downstream five miles is listed for E-Coli (http://dec.vermont.gov/sites/dec/files/documents/WSMD_mapp_303d_Part_A_2016_final_complete.pdf). The St. Johnsbury wastewater treatment facility passes combined sewer overflows in the area which includes all waters within the Arnold Falls Project ZOE_s.
- Per email dated November 17, 2016, the Vermont DEC confirms that the current operations of the Arnold Falls Project continue to not be a contributing cause of the River's impairment (Appendix C). Project operations data was additionally provided to Vermont DEC on March 29, 2018 for verification of Project Water Quality Certificate compliance (see Appendix C for email exchange).
- Vermont DEC issued a Project WQC on June 16, 1994 (see Appendix C for a copy of the WQC).

3.5 UPSTREAM FISH PASSAGE STANDARDS: IMPOUNDMENT, BYPASSED REACH, AND DOWNSTREAM ZOES

Presently there are no migratory species located within the vicinity of the Project. Resident, non-migratory, managed species found within the Project vicinity include brown trout, brook trout, and rainbow trout. Atlantic salmon were historically stocked within the Passumpsic River under the USFWS Connecticut River Atlantic Salmon Restoration Program. The approximate 40-year stocking program ended in 2012 as poor salmon return rates persisted (Al Jazeera America 2016).

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|--|
| C | 1 | <u>Not Applicable/De Minimis Effect:</u> <ul style="list-style-type: none">• The facility does not create a barrier to upstream passage, or• There are no migratory fish in the vicinity of the facility and the facility is nor the cause of extirpation of such species if they had been present historically |

- The Project area, including the Impoundment, Bypassed Reach, and Downstream ZOEs, does not create a barrier for migratory upstream fish passage. There is no current federal mandatory prescription for the upstream passage of fish at the Project as License Article 407 and WQC Condition G reserve future authority to order such fishways. There has been no request for upstream fish passage facilities by state or federal agencies to date.

Upstream passage to the Passumpsic River is currently blocked by downstream Connecticut River dams and the East Barnet Dam located at Passumpsic River RM 0.5. Although the Wilder Dam (FERC License No. 1892), located at RM 217 on the Connecticut River provides upstream fish passage, two Connecticut River dams located upstream of the Wilder Dam but downstream of the Passumpsic River outlet, do not provide upstream fish passage.

The Dodge Falls Dam (also called the East Ryegate Dam) (FERC Exemption No. 8011, LIHI #42) is located approximately 47 miles upstream of the Wilder Dam at Connecticut River RM 264. The Dodge Falls Dam does not currently provide upstream fish passage. The Fifteen Mile Falls Project (FERC License No. 2077, LIHI #39) McIndoes Development is located upstream of the Dodge Falls Dam at Connecticut River RM 268, approximately 5 miles downstream of the Passumpsic River outlet, does not provide upstream fish passage facilities either. As included within the Fifteen Mile Falls Project 2001 WQC, though, the Project will be required to provide upstream fish passage past the McIndoes Dam after 20 Atlantic Salmon migrating upstream reach the downstream Dodge Falls Dam for two consecutive years and the New Hampshire Fish and Game Department, VTFW, USFWS, and Connecticut River Atlantic Salmon Commission determine that upstream passage is justified.

Per reviews of the LIHI Certificates for the Fifteen Mile Falls Project (effective until December 2021) and the Dodge Falls Project (effective until June 2019) and reviews of the Dodge Falls Dam, Fifteen Mile Falls Project, and East Barnet Dam FERC dockets,

upstream fish passage is not currently required at these facilities. Upstream fish passage to the Passumpsic River is therefore not available at this time and downstream Connecticut River and Passumpsic River barriers are not expected to be removed throughout the duration of the Passumpsic Project's re-certification term.

See Figure 3 for a map of pertinent Passumpsic and Connecticut River dam locations.

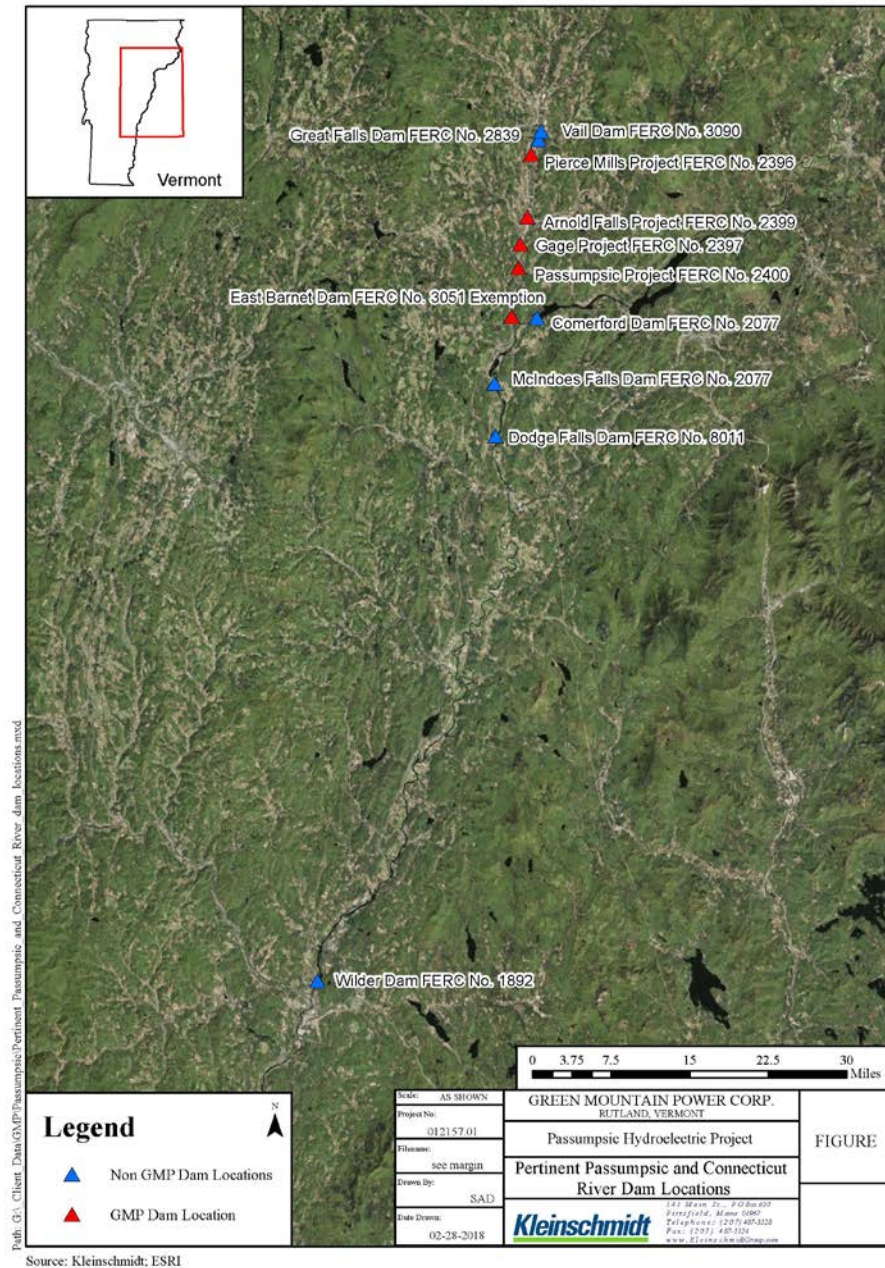


FIGURE 3 PERTINENT PASSUMPSIC AND CONNECTICUT RIVER DAM LOCATIONS.

- Per Vermont Department of Fish and Wildlife email dated March 16, 2017 (Appendix D), the Department commented that American eel passage will not be required at the Project within the next five years. Although the USFWS was contacted for review of fishway compliance and eel passage, no comments have been received (Appendix D).
- Although the Connecticut River Basin once had naturally occurring Atlantic salmon runs, the salmon were extirpated from the river system due to the construction of downstream Connecticut River dams and river pollution (NMFS 1999). In an effort to reintroduce salmon to the river basin, the USFWS and surrounding states including Massachusetts, Vermont, and New Hampshire facilitated a more than 40-year Atlantic salmon stocking program that ended in 2012 due to poor salmon return rates.

3.6 DOWNSTREAM FISH PASSAGE STANDARDS: IMPOUNDMENT ZOE

Presently there are no migratory species located within the vicinity of the Project. Resident, non-migratory, managed species found within the Project vicinity include brown trout, brook trout, and rainbow trout. Atlantic salmon were historically stocked within the Passumpsic River under the USFWS Connecticut River Atlantic Salmon Restoration Program. The approximate 40-year stocking program ended in 2012 as poor salmon return rates persisted (Al Jazeera America 2016).

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|--|
| D | 2 | <u>Agency Recommendation:</u> <ul style="list-style-type: none">• Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain which is most environmentally stringent).• Explain the scientific or technical basis for the agency recommendation including methods and data used. This is required regardless of whether the recommendation is part of a Settlement Agreement or not.• Describe any provisions for fish passage monitoring or effectiveness determinations that are part of the agency recommendation, and how these are being implemented. |

- In accordance with 1994 FERC License Article 405 and WQC Condition F, the Licensee developed, in consultation with Vermont DEC and USFWS, a downstream fish passage facility. The fishway is a sluiceway located in the south dam spillway adjacent to the station intake. As prescribed, the facility is operated from April 1 to June 15 and September 15 to November 15 each year. Fish enter the sluiceway and pass down a 3-foot-wide chute constructed of concrete and discharge into a 3-foot-deep plunge pool. Stoplogs control flow in the sluiceway to pass 25 cfs.

On December 5, 1995, the Licensee submitted Downstream Fish Passage Facility Operation & Maintenance Plan as well as permanent downstream design drawings developed in coordination with USFWS and Vermont DEC

(http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=69346). FERC approved of the plan in the February 7, 1996 Order Modifying and Approving Downstream Fish Passage Facilities

(<http://elibrary.ferc.gov:0/idmws/common/opennat.asp?fileID=10748550>). Final FERC authorization for extension of time to construct the fish passage was granted on November 12, 1998

(http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=1900300). The downstream fishway construction was completed on August 26, 1999 and FERC acknowledged receipt of completion information on September 27, 1999

(http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=2012671).

- Article 406 of the 1994 FERC license requires the Licensee to file a plan for a post construction study to monitor the effectiveness of the downstream fish passage facilities after consultation with Vermont Agency of Natural Resources (VANR) and USFWS. The Licensee filed a Downstream Fish Passage Effectiveness Testing Plan on June 14, 1996 (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=115435). Under this plan, developed in consultation with the USFWS and Vermont Division of Fish and Wildlife (VTFW), the Licensee, USFWS, and VTFW would visually inspect the downstream Gage Project (FERC No. 2397) and Passumpsic Project (FERC No. 2400) forebays for the presence of salmon smolts during the period when smolts should be passing downstream. Observations at the Arnold Falls Project was not included within the finalized study plan as the configuration of the Project's fish passage was not expected to be problematic. The plans were approved by FERC in the September 25, 1996 Order Modifying and Approving Plan to Monitor Effectiveness of Fish Passage Facilities (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10757431>). A November 1997 report on the results of the observations at the Gage Project and Passumpsic Project was issued to the VANR and USFWS. Discussions regarding Passumpsic River downstream fishways have largely concentrated on the Passumpsic Project fishway since this study.
- Approximately 20 years ago, Len Gerardi of VTFW noticed salmon fry within the downstream Gage Project forebay. GMP quickly responded by draining the forebay and releasing fish out the Project bypassed. It was determined that the salmon were entering into the forebay because of a gap that emerged due to deteriorated concrete between the trashracks and forebay. To remedy the situation, GMP installed a steel cover over the concrete gap so to prevent entrance of fish into the forebay. Len Gerardi visited the site after installation of the steel cover and was happy with the status of the forebay. GMP is additionally pursuing intake maintenance and repair work at the Gage Project in 2018. This work will involve concrete resurfacing which will include concrete repairs to the deteriorated concrete gap between the trashracks and the forebay. This long-term seal will further enhance conditions at Gage. VTFW did not express any comments or suggested enhancements for the Pierce Mills Project or the Arnold Falls Project.

Per VTFW email dated March 16, 2017 (Appendix D), the Department reported that they worked with GMP to improve downstream fish passage at the Gage Project. The Department reported that fish passage had improved after GMP implemented recommendations and did not require further studies. The VTFW additionally commented within the March 16, 2017 email that American eel passage will not be required at the Gage, Pierce Mills, or Arnold Falls Projects within the next five years.

Although the USFWS was contacted for review of fishway compliance and eel passage, no comments have been received (Appendix D).

- Because of the presence of the USFWS Atlantic salmon stocking program during Project relicensing (program was decommissioned in 2012), stocked Atlantic salmon needed a way to make an outmigration past the Project. In addition to aiding the Atlantic salmon smolt passage, it was concluded that downstream passage would also benefit resident trout species.
- As stated within the Project License and WQC, the downstream fish passage also benefits resident trout species. Aside from providing a downstream fish passage facility and installing a trashrack system with 1-inch clear bar spacing to prevent entrainment, no

further protections are required by resource agencies for resident fish passage at the Project.

- A 2013 FERC Environmental Inspection indicated that “The licensee maintains downstream fish passage via the sluiceway in the project forebay which transports fish along a concrete chute into a three-foot plunge pool. The fish passage facility appeared to be in good condition. The licensee files annual reports certifying compliance with its minimum flow requirements; the licensee’s 2012 annual minimum flow certification was filed on January 23, 2013. The licensee appears to be in compliance with its requirements with regard to fish and wildlife resources (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13378666>).

3.7 DOWNSTREAM FISH PASSAGE STANDARDS: BYPASSED REACH ZOE

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|--|
| D | 2 | <u>Agency Recommendation:</u> <ul style="list-style-type: none">• Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain which is most environmentally stringent).• Explain the scientific or technical basis for the agency recommendation including methods and data used. This is required regardless of whether the recommendation is part of a Settlement Agreement or not.• Describe any provisions for fish passage monitoring or effectiveness determinations that are part of the agency recommendation, and how these are being implemented. |

- Downstream fish passage is provided in the Bypassed Reach ZOE via the downstream fishway and its associated plunge pool. See answer to Impoundment ZOE above for further information.

3.8 DOWNSTREAM FISH PASSAGE STANDARDS: DOWNSTREAM ZOE

Presently there are no migratory species located within the vicinity of the Project. Resident, non-migratory, managed species found within the Project vicinity include brown trout, brook trout, and rainbow trout. Atlantic salmon were historically stocked within the Passumpsic River under the USFWS Connecticut River Atlantic Salmon Restoration Program. The approximate 40-year stocking program ended in 2012 as poor salmon return rates persisted (Al Jazeera America 2016).

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|--|
| D | 1 | <p><u>Not Applicable / De Minimis Effect:</u></p> <ul style="list-style-type: none">• Explain why the facility does not impose a barrier to downstream fish passage in the designated zone, considering both physical obstruction and increased mortality relative to natural downstream movement (e.g., entrainment into hydropower turbines).• For riverine fish populations that are known to move downstream, explain why the facility does not contribute adversely to the sustainability of these populations or to their access to habitat necessary for successful completion of their life cycles.• Document available fish distribution data and the lack of migratory fish species in the vicinity.• If migratory fish species have been extirpated from the area, explain why the facility is or was not the cause of this. |

- There are no barriers to downstream fish passage in the Downstream ZOE. Once fish cross past the Impoundment and Bypassed Reach ZOE's with the use of the sluiceway, the fish do not have any further impediments to passage through the Downstream ZOE. Once fish approach the downstream Gage Dam, they are then allowed once again to pass over the dam via the use of another downstream fish passage facility.
- Although the downstream fish passage facility was mainly intended to facilitate downstream passage for stocked Atlantic salmon smolt, the USFWS stocking program for Atlantic salmon ended in 2012. As stated within the Project License and WQC, the downstream passage also benefits resident riverine species. Downstream fish passage is currently and primarily provided to local riverine species including brown trout, brook trout, and rainbow trout that are known to utilize downstream passage facilities to access different river areas. By using the downstream fish passage facility, local riverine species are able to access new habitat that may be necessary for them to complete necessary life cycle stages. Aside from providing a downstream fish passage facility and installing a trashrack system with 1-inch clear bar spacing, no further protections are required by resource agencies for resident fish passage at the Project.
- As stated in the December 23, 1993 VANR comment letter, (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=1632958), brook, brown, and

rainbow trout are all found in the Passumpsic basin. VTFW studies conducted in the early 1970s indicate the Passumpsic River drainage basin contained a higher percentage of brook trout than any other drainage basin studies throughout the state. The Agency stocks the stream from the upstream Vail Dam to the downstream Gage Dam with brown trout and rainbow trout. No further studies on fishes of the Passumpsic River are available for this application.

The latest data for all monitored upstream migrating species in the downstream Connecticut River is included in the two reports below. There are presently no upstream fish ladders above the above Wilder Dam (FERC No. 1892) located at RM 264 and this is where migratory assessments stop. Opening of the Wilder Dam fish ladder only occurs if triggers are met for returns at downstream dams. Therefore, anadromous fish passage is unlikely to be an issue on the Passumpsic River.

2017:

https://www.fws.gov/r5crc/pdf/2017_counts/CT_River_Fishway_Count_Rpt_11_07_17.pdf

2016:

https://www.fws.gov/r5crc/pdf/CT_River_Fishway_Count_Rpt_12_30_16.pdf

The latest VANR Passumpsic and Upper Connecticut River Tactical Basin Plan (June 2014) does not note presence of American eel within the Passumpsic River (http://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/mapp_b15-16tbp.pdf). Recent FERC relicensing studies conducted at the downstream Wilder Dam in 2015 (<https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14580050>) showed that a small number of eels exist within the Connecticut River:

1. No eels identified at the Wilder Dam during night time upstream passage surveys.
 2. Very low numbers of eels used the upstream fish ladder.
 3. No eels identified within the Wilder impoundment which extends up to Connecticut RM 262.
- Although the Connecticut River Basin once had naturally occurring Atlantic salmon runs, the salmon were extirpated from the river system due to the construction of downstream Connecticut River dams and river pollution (NMFS 1999). In an effort to reintroduce salmon to the river basin, the USFWS and surrounding states including Massachusetts, Vermont, and New Hampshire facilitated a more than 40-year Atlantic salmon stocking program that ended in 2012 due to poor salmon return rates.

3.9 SHORELINE AND WATERSHED PROTECTION STANDARDS: IMPOUNDMENT AND BYPASSED REACH ZOE

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|---|
| E | 1 | <p><u>Not Applicable / De Minimis Effect:</u></p> <ul style="list-style-type: none"> • If there are no lands with significant ecological value associated with the facility, document and justify this (e.g., describe the land use and land cover within the project boundary). • Document that there have been no Shoreline Management Plans or similar protection requirements for the facility. |

- There are only limited lands within the Project boundary. The majority of those hold project facilities including the powerhouse and dam. There are no requirements for a buffer zone, shoreline protection fund, or shoreline management plan for the Project in the 1994 FERC License (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13711081>). As stated within the 1994 WQC, monitoring of shoreline erosion appears to be unnecessary at this Project (see Appendix C for a copy of the WQC).
- The area surrounding the Impoundment ZOE and Bypassed Reach ZOE consists of mixed industrial, and commercial buildings on the river right and left. Land cover units, with non-significant ecological value, identified in the vicinity of the Project can be found in Table 2 (based on National Land Cover Database 2011: http://www.mrlc.gov/nlcd11_leg.php). A map of the land cover can be found in Appendix E.
- No Shoreland Management Plan or equivalent plan was required for the Arnold Falls Project.

TABLE 2 PROJECT LAND COVER CLASSIFICATION

| CLASS/VALUE | CLASSIFICATION DESCRIPTION |
|--------------------|--|
| 11 | Open Water- areas of open water, generally with less than 25% cover of vegetation or soil. |
| 21 | Developed, Open Space- areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. |
| 22 | Developed, Low Intensity- areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units. |
| 23 | Developed, Medium Intensity -areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units. |
| 24 | Developed High Intensity-highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover. |
| 41 | Deciduous Forest- areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change. |
| 42 | Evergreen Forest- areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage. |
| 43 | Mixed Forest- areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover. |
| 71 | Grassland/Herbaceous- areas dominated by graminoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing. |
| 82 | Cultivated Crops -areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled. |
| 90 | Woody Wetlands- areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water. |
| 95 | Emergent Herbaceous Wetlands- Areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water. |

3.10 SHORELINE AND WATERSHED PROTECTION STANDARDS: DOWNSTREAM ZOE

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|---|
| E | 1 | <u>Not Applicable / De Minimis Effect:</u> <ul style="list-style-type: none">• If there are no lands with significant ecological value associated with the facility, document and justify this (e.g., describe the land use and land cover within the project boundary).• Document that there have been no Shoreline Management Plans or similar protection requirements for the facility. |

- There are only limited lands within the Project boundary. The majority of those hold project facilities including the powerhouse and dam. There are no requirements for a buffer zone, shoreline protection fund, or shoreline management plan for the Project in the 1994 FERC License (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13711081>). As stated within the 1994 WQC, monitoring of shoreline erosion appears to be unnecessary at this project (see Appendix C for a copy of the WQC).
- Rural residential housing occurs on both river left and right with increasing farmland and wetland areas on river left and right at the downstream section of the boundary. Land cover units, with non-significant ecological value, identified in the vicinity of the project can be found in Table 2 (based on National Land Cover Database 2011: http://www.mrlc.gov/nlcd11_leg.php). A map of the land cover can be found in Appendix E.
- No Shoreland Management Plan or equivalent plan was required for the Arnold Falls Project.

3.11 THREATENED AND ENDANGERED SPECIES STANDARDS: IMPOUNDMENT, BYPASSED REACH, AND DOWNSTREAM ZOES

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|---|
| F | 2 | <u>Finding of No Negative Effects:</u> <ul style="list-style-type: none">• Identify all listed species in the facility area based on current data from the appropriate state and federal natural resource management agencies.• Provide documentation of a finding of no negative effect of the facility on any listed species in the area from an appropriate natural resource management agency. |

- An official USFWS list populated on December 12, 2016 (Appendix F), identified that the federally threatened Northern long-eared bat (*Myotis septentrionalis*) may occur within the Project vicinity. The species list also identified that the bald eagle protected under the Migratory Bird Treaty Act and Bald and Golden Eagle Act may potentially occur within the Project area. Within the state of Vermont, the Northern long-eared bat and bald eagle are listed as state endangered species.

- State listed Fish and Wildlife:

<http://www.vtfishandwildlife.com/common/pages/DisplayFile.aspx?itemId=268519>

Per emails dated October 19 and 21, 2016, the Vermont Fish and Wildlife Department confirmed that continued Project operations do not negatively affect the northern long-eared bat or the bald eagle (Appendix F).

- Within the 1994 WQC and Environmental Assessment, the bald eagle was considered a potential transient, but had not been observed in the Project vicinity. The Environmental Assessment notes that the VANR indicated that the Project's continued operation would not adversely affect populations of species inhabiting unique habitat at any of the Passumpsic River projects.

3.12 CULTURAL AND HISTORIC RESOURCE STANDARDS: IMPOUNDMENT, BYPASSED REACH, AND DOWNSTREAM ZOE

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|--|
| G | 2 | <p><u>Approved Plan:</u></p> <ul style="list-style-type: none"> • Provide documentation of all approved state, provincial, federal, and recognized tribal plans for the protection, enhancement, and mitigation of impacts to cultural and historic resources affected by the facility. • Document that the facility is in compliance with all such plans. |

- Article 408 of the 1994 FERC license requires the Licensee to implement the November 25, 1994 Programmatic Agreement among FERC, the Advisory Council on Historic Preservation, and the Vermont State Historical Preservation Officer (SHPO) and file a Cultural Resource Management Plan (CRMP) for mitigating the Project's effects on historic properties. The CRMP was developed in close consultation with the SHPO and Advisory Council on Historic Preservation. The initial CRMP was filed with FERC on September 25, 1998 (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=1886133) and a final CRMP was filed with FERC on September 24, 1999 (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=1992509). The CRMP was approved by FERC in the February 28, 2000 Order Approving Cultural Resources Management Plans (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10850860>). Documentation of consultation with the SHPO and Advisory Council on Historic Preservation is described in the Plan submissions and within the FERC Order.

In accordance with the CRMP, the Licensee conducts annual monitoring of the Project shoreline and other Passumpsic River project shorelines to evaluate erosion and the possible uncovering of cultural or archaeological resources. Since the 2012 LIHI Certification, GMP filed with the FERC and SHPO the 2013 Annual CRMP Report (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14167093), 2014 Annual CRMP Report (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14278079), 2015 Annual CRMP (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14066571>), 2016 Annual CRMP Report (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14418931>), and 2017 Annual CRMP Report (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14773159>).

Within the 2016 and 2017 Annual CRMP Reports, it was recommended that due to the documented lack of potential threats to historic properties, the frequency of monitoring actions be reduced. Instead of conducting annual field inspections to inspect condition of archaeological properties as described in the CRMP, it was recommended that the field inspection schedule be altered to occur once every three years. GMP inquired with the Vermont SHPO about this altered timeline on March 7, 2017 and on April 7, 2017 but has not received feedback (Appendix G). GMP plans to continue conducting Annual CRMP Reports unless it hears differently from Vermont SHPO.

- An environmental inspection was completed by FERC on October 25, 2013. The inspection report stated, “The licensee conducts annual surveys of the project shorelines and files a report documenting its findings. The 2012 annual cultural resource monitoring report, filed December 27, 2012, concluded that the project shorelines are stable and, currently, no known archaeological sites are threatened by identified erosion within the project. The licensee appears to be in compliance with its requirements regarding cultural resources” (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13378666>).

3.13 RECREATIONAL RESOURCES STANDARDS: IMPOUNDMENT ZOE

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|---|
| H | 2 | <p><u>Agency Recommendation:</u></p> <ul style="list-style-type: none"> • Document any comprehensive resource agency recommendations and enforceable recreation plan that is in place for recreational access or accommodations. • Document that the facility is in compliance with all such recommendations and plans. |

- Article 411 of the 1994 FERC License and WQC Conditions K and L require the Licensee to file a recreation plan for constructing, operating and maintaining recreational facilities. Recreational facilities installed within the Impoundment ZOE as prescribed include warning signs, interpretative signage, and a canoe/kayak take-out that leads to a portage trail. The Recreation Plan was initially filed with FERC on June 5, 1995 (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=1739056) and later supplemented on May 16, 1996 (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=106182). The recreation plan was approved by FERC in their 1996 Order Approving Recreation Plan (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10753301>). The recreation plan was prepared in consultation with the Recreation Section of the Vermont Department of Forests and the Town of St. Johnsbury.
- Under Article 413 of the upstream Pierce Mills Hydroelectric Project License (FERC No. 2396), the Licensee is required to evaluate the recreational uses of all GMP hydropower projects located on the Passumpsic River within six months of the 10th and 20th year anniversaries of license issuance. On September 7, 2010, the Licensee filed the 10-year study of recreational uses at GMP's licensed hydropower projects located on the Passumpsic River (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=13845617). FERC approved of this Recreational Use Study on November 23, 2010 (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12493373>). No improvements for recreation areas within the Impoundment ZOE or Bypassed Reach ZOE were included within FERC's November 23 approval.

GMP's 20-year study of recreational uses was submitted to FERC on August 27, 2015 (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14370875) and approved by FERC Order issued on November 30, 2015 (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14058508>). Within the November 30, 2015 order, it was identified that GMP installed an interpretative/informational sign near the Project powerhouse, installed new directional signage along the portage route, as well as a new picnic bench at the neighboring LeClair site. Condition B of the November 30, 2015 order required that GMP file photographic evidence of these installations as well as an updated recreation plan map. GMP filed a letter with FERC on November 30, 2016 that includes photographic evidence as well as an updated recreation plan map to depict sign installations as well as the picnic bench installation: http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14516332. FERC Order dated March 30, 2017 approved of GMP's recreation improvements at the Project (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14539473>).

In an email dated January 19, 2018, the Vermont DEC confirmed Project compliance with the approved recreation plan (Appendix H).

- In 2013, a FERC Environmental Inspection was completed. The report indicated that the Licensee appeared to be in compliance with its requirement with regard to recreation resources (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13378666>).

Bonus:

| | | |
|---|------|--|
| H | PLUS | <p><u>Bonus Activities:</u></p> <ul style="list-style-type: none"> • Document any new public recreational opportunities that have been created on facility lands or waters beyond those required by agencies (e.g., campgrounds, whitewater parks, boating access facilities and trails). • Document that such new recreational opportunities did not create unmitigated impacts to other resources. |
|---|------|--|

- As part of the upstream Pierce Mills Recreation Plan and in accordance with Pierce Mills Project License Article 412, GMP has produced and makes available to the public, the Passumpsic River Canoeing and Recreation Guide. This publication was developed with the cooperation of groups and individuals in the Passumpsic Valley and with assistance from the Vermont Agency of Natural Resources. In 1996, Central Vermont Public Service Corporation (CVPS) published the first edition of the Passumpsic River Canoeing and Recreation Guide. A revision was made to the Guide in 1999, which placed a focus on the seven hydroelectric generating stations along the river's 23-mile mainstem. For the 1999 version, CVPS worked with the recreation section of the Vermont Department of Forests, Parks, and Recreation; the Town of St. Johnsbury; the Passumpsic River Watch; and other interested groups and individuals to develop the Guide which was distributed free of charge throughout the local area and region.
- On August 27, 2015, GMP filed its 20-year study of recreational use of its four hydropower projects on the Passumpsic River pursuant to Article 413 of the Pierce Mills Project license. Within the study, GMP voluntarily committed to updating the Passumpsic River Canoeing and Recreation Guide in consultation with the Vermont Agency of Natural Resources and other area stakeholders. GMP initiated consultation with Vermont Department of Forests, Parks and Recreation, Vermont Department of Environmental Conservation, Vermont Fish and Wildlife Department, Northwoods Stewardship Center, Vermont River Conservancy, and a historian knowledgeable about the history of the river. GMP conducted multiple conference calls and coordinated with the participants in adding new sections and updated information to the Guide. GMP enlisted the services of Vermont River Conservancy to prepare detailed riverway maps, highlighting both the recreational opportunities, as well as the historically significant features of the Passumpsic River. GMP also enlisted the services of Northwoods Stewardship Center and the local historian to develop updated text, and provide additional historical information and photographs for the Guide.

The resulting revised Guide includes collaboratively developed descriptive text of the boating opportunities and riverway features, photographs and historical images of key riverway features, detailed river segment maps, and additional information pertaining to the Passumpsic River. The additional information includes descriptions of: regional

recreation opportunities, geologic features and common vegetation along the riverway, the history of hydroelectric development on the river, paddling safety considerations, and measures to control the spread of aquatic invasive species. In addition to information about the East Branch of the Passumpsic River, GMP (at the request and with input from the consulted parties) included additional information about the upstream reaches of the west branch of the Passumpsic River as well as a reach of the Moose River tributary. On June 8, 2017, GMP published an updated Guide which is available electronically at http://www.greenmountainpower.com/wp-content/uploads/2016/12/001-Passump-Rec-Guide_06082017_FINAL-web-print.pdf. In addition, GMP printed 500 color copies of the updated Guide for free distribution to the public. A hardcopy of this publication has been separately mailed to LIHI for review.

- GMP’s efforts to publish the revised Guide went over and beyond the scope of License Article 412 requirements and also over and beyond the stakeholder consultation scope agreed upon with VANR during 2015 consultations. GMP worked closely with local stakeholders to create a revised Guide that offers in-depth descriptions and explanations to the river’s paddlers. GMP worked with Vermont River Conservancy and the North Woods Stewardship Center in not only the creation of the Guide but also supported a Community Meeting held jointly by the Vermont River Conservancy and the North Woods Stewardship Center to allow the public an opportunity to help craft a shared vision for Passumpsic River recreation stewardship and gain community input for Guide updates (see Appendix G for Community Meeting details). The 20-year assessment study did not necessarily require an update to the Guide. GMP could have created a lesser product than what has been published so to meet FERC and agency standards, but instead dedicated substantial effort and time to the Guide update.

Additionally, GMP voluntarily provides guided facility tours to college students or other interest groups as they are desired. On November 16, 2017, GMP provided a tour of the Passumpsic River hydroelectric facilities to four students from Lyndon State College. GMP additionally worked with a Lyndon State College student in October 2017 to provide a tour of the Passumpsic Hydroelectric Project (FERC No. 2400) and coordinated with the student to allow the opportunity to film construction of the Passumpsic downstream fishway for a school assignment. GMP is committed to continuing to allow for these types of “open door” opportunities as they arise.

In an email dated January 19, 2018, the Vermont DEC voiced its support for the Project’s qualification for this H-PLUS Standard (Appendix H).

3.14 RECREATIONAL RESOURCES STANDARDS: BYPASSED REACH ZOE

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|---|
| H | 2 | <u>Agency Recommendation:</u> <ul style="list-style-type: none">• Document any comprehensive resource agency recommendations and enforceable recreation plan that is in place for recreational access or accommodations.• Document that the facility is in compliance with all such recommendations and plans. |

- In accordance with Article 411 and WQC Conditions K and L, GMP maintains a canoe/kayak portage trail in the Bypassed Reach ZOE.
- The Recreation Plan as well as the 10-year and 20-year studies include the Bypassed Reach ZOE. See answer to the Impoundment ZOE above for further information.

3.15 RECREATIONAL RESOURCES STANDARDS: DOWNSTREAM ZOE

| CRITERION | STANDARD | INSTRUCTIONS |
|-----------|----------|--|
| H | 2 | <u>Agency Recommendation:</u> <ul style="list-style-type: none"> Document any comprehensive resource agency recommendations and enforceable recreation plan that is in place for recreational access or accommodations. Document that the facility is in compliance with all such recommendations and plans. |

- In accordance with Article 411 and WQC Conditions K and L, GMP maintains a canoe/kayak portage and put-in as well as a bank fishing and viewing platform in the Downstream ZOE.
- The Recreation Plan includes the Downstream ZOE. See answer to the Impoundment ZOE above for further information on the Recreation Plan.
- Under Article 413 of the upstream Pierce Mills Hydroelectric Project License (FERC No. 2396), the Licensee is required to evaluate the recreational uses of all GMP hydropower projects located on the Passumpsic River within six months of the 10th and 20th year anniversaries of license issuance. On September 7, 2010 the Licensee filed the 10-year study of recreational uses at GMP's licensed hydropower projects located on the Passumpsic River (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=13845617). FERC approved of this Recreational Use Study on November 23, 2010 (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12493373>).

In the November 23, 2010 FERC Order Modifying and Approving Study of Recreational Use, the Licensee was asked to provide a plan and schedule for installation of a bank fishing and viewing platform at the Arnold Falls Project, as the initially prescribed platform was never installed as intended. Two extensions to complete a plan and schedule for the platform were received from FERC. Orders granting extensions of time to complete the facility were issued on June 4, 2012

(<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13000149>) and July 24, 2013 (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13000149>). On May 13, 2014 GMP filed with FERC plans and schedule for construction of the platform (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14215686). FERC approved the plan and schedule for the platform in their July 3, 2014 Order Approving Bank Fishing Platform (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14231460).

Pursuant to the July 3, 2014 FERC Order Approving Bank Fishing Platform, GMP submitted information regarding as-built drawings showing the new bank fishing and viewing platform on January 26, 2016

(<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14126852>). On March 30, 2016 FERC issued a letter on as-built site plan drawing deficiencies and Exhibit G (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14183541>). On June 23, 2016 FERC issued GMP an extension of time to update Exhibit G so to incorporate the new bank fishing platform into the project boundary

(http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14472204). On August 1, 2016 GMP submitted a revised Exhibit G including the new bank fishing platform

(http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14481972). On August 25, 2016 FERC issued a letter requesting additional information for the updated Exhibit G and requesting submission of a Revised Exhibit A

(http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14489165). GMP provided FERC with revised Exhibit G and a revised Exhibit A on September 23, 2016

(http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14499057). GMP's completion of the bank fishing and viewing platform meets and completes the requirements included in Condition B of the 2012 LIHI Certification.

- GMP's 20-year study of recreational uses was submitted to FERC on August 27, 2015 (http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14370875) and approved by FERC Order issued on November 30, 2015 (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14058508>). Per Condition B of the November 30, 2015 order, GMP has installed new directional signage along the portage route located in the Downstream ZOE. A GMP letter filed with FERC on November 30, 2016 includes photographic evidence as well as an updated recreation plan map to depict installation of the signs: http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14516332. FERC approved of GMP's recreation filing on March 30, 2017 (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14539473>).
- In 2013, a FERC Environmental Inspection was completed. The report indicated that the Licensee appeared to be in compliance with its requirement with regard to recreation resources (<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13378666>).

4.0 CONTACTS FORMS

1. All applications for LIHI Certification must include complete contact information to be reviewed.

| | |
|--|--|
| Project Owner: | |
| Name and Title | Jason Lisai, Generation Manager |
| Company | Green Mountain Power Corporation |
| Phone | (802) 655-8723 |
| Email Address | Jason.Lisai@greenmountainpower.com |
| Mailing Address | 163 Acorn Lane, Colchester, Vermont 05446 |
| Consulting Firm / Agent for LIHI Program (if different from above): | |
| Name and Title | Andy Qua and Katie Sellers |
| Company | Kleinschmidt Associates |
| Phone | (207) 416-1246; (207) 416-1218 |
| Email Address | Andy.Qua@KleinschmidtGroup.com , Katie.Sellers@KleinschmidtGroup.com |
| Mailing Address | PO Box 650, Pittsfield, Maine 04967 |
| Compliance Contact (responsible for LIHI Program requirements): | |
| Name and Title | John Greenan, Environmental Engineer |
| Company | Green Mountain Power Corporation |
| Phone | (802) 770-3213 |
| Email Address | John.Greenan@greenmountainpower.com |
| Mailing Address | 2152 Post Road, Rutland, Vermont 05701 |
| Party responsible for accounts payable: | |
| Name and Title | John Greenan, Environmental Engineer |
| Company | Green Mountain Power Corporation |
| Phone | (802) 770-3213 |
| Email Address | John.Greenan@greenmountainpower.com ; invoices@greenmountainpower.com |
| Mailing Address | Accounts Payable Processor, 2152 Post Road, Rutland, Vermont 05701 |

2. Applicant must identify the most current and relevant state, federal, provincial, and tribal resource agency contacts (copy and repeat the following table as needed).

| | |
|--|---|
| Agency Contact (Check area of responsibility: Flows <u>X</u> , Water Quality <u>X</u> , Fish/Wildlife Resources __, Watersheds <u>X</u> , T/E Spp. __, Cultural/Historic Resources __, Recreation <u>X</u>): | |
| Agency Name | Vermont Department of Environmental Conservation |
| Name and Title | Jeff Crocker, Streamflow Protection Coordinator |
| Phone | (802) 490-6151 |
| Email address | jeff.crocker@vermont.gov |
| Mailing Address | Watershed Management Division, Main Building-2 nd Floor, One National Life Drive, Montpelier, VT 05620 |

| | |
|--|---|
| Agency Contact (Check area of responsibility: Flows <u>X</u> , Water Quality <u>X</u> , Fish/Wildlife Resources __, Watersheds <u>X</u> , T/E Spp. __, Cultural/Historic Resources __, Recreation <u>X</u>): | |
| Agency Name | Vermont Department of Environmental Conservation |
| Name and Title | Eric Davis, River Ecologist |
| Phone | 802-490-6180 |
| Email address | eric.davis@vermont.gov |
| Mailing Address | Watershed Management Division, Main Building – 2 nd Floor, One National Life Drive, Montpelier, VT 05620 |

| | |
|---|--|
| Agency Contact (Check area of responsibility: Flows __, Water Quality __, Fish/Wildlife Resources __, Watersheds __, T/E Spp. __, Cultural/Historic Resources <u>X</u> , Recreation __): | |
| Agency Name | Vermont Division for Historic Preservation |
| Name and Title | Scott Dillon, Survey Archaeologist |
| Phone | (802) 272-7358 |
| Email address | scott.dillon@vermont.gov |
| Mailing Address | One National Life Drive, Deane C. Davis Building, 6 th Floor, Montpelier, VT 05620-0501 |

| | |
|--|--|
| Agency Contact (Check area of responsibility: Flows __, Water Quality __, Fish/Wildlife Resources <u>X</u> , Watersheds __, T/E Spp. <u>X</u> , Cultural/Historic Resources __, Recreation __): | |
| Agency Name | US Fish and Wildlife Service |
| Name and Title | Melissa Grader, Wildlife Biologist |
| Phone | (413) 548-8002 |
| Email address | Melissa_Grader@FWS.gov |
| Mailing Address | New England Field Office, 70 Commercial Street, Suite 300, Concord, NH 03301 |

| | |
|--|--|
| Agency Contact (Check area of responsibility: Flows __, Water Quality __, Fish/Wildlife Resources <u>X</u> , Watersheds __, T/E Spp. <u>X</u> , Cultural/Historic Resources __, Recreation __): | |
| Agency Name | U.S. Fish and Wildlife Service |
| Name and Title | Brett Towler, Hydraulic Engineer |
| Phone | 413-253-8727 |
| Email address | brett_towler@fws.gov |
| Mailing Address | 300 Westgate Center Drive Hadley, MA 01035 |

| | |
|--|--|
| Agency Contact (Check area of responsibility: Flows___, Water Quality ___, Fish/Wildlife Resources <u>X</u> _, Watersheds ___, T/E Spp. <u>X</u> _, Cultural/Historic Resources ___, Recreation ___): | |
| Agency Name | Vermont Division of Fish and Wildlife |
| Name and Title | Jud Kratzer, Fisheries Biologist |
| Phone | 802-751-0486 |
| Email address | jud.kratzer@vermont.gov |
| Mailing Address | 1229 Portland St. Suite 201 St. Johnsbury, VT 05819 |

| | |
|--|--|
| Agency Contact (Check area of responsibility: Flows___, Water Quality ___, Fish/Wildlife Resources <u>X</u> _, Watersheds ___, T/E Spp. <u>X</u> _, Cultural/Historic Resources ___, Recreation ___): | |
| Agency Name | Vermont Division of Fish and Wildlife |
| Name and Title | Scott Darling, Wildlife Management Program Manager |
| Phone | 802-786-3862 |
| Email address | scott.darling@vermont.gov |
| Mailing Address | 271 North Main Street Suite 215 Rutland, VT 05701 |

| | |
|--|--|
| Agency Contact (Check area of responsibility: Flows___, Water Quality ___, Fish/Wildlife Resources <u>X</u> _, Watersheds ___, T/E Spp. <u>X</u> _, Cultural/Historic Resources ___, Recreation ___): | |
| Agency Name | Vermont Division of Fish and Wildlife |
| Name and Title | John Buck, Wildlife Biologist, Migratory Birds Biologist |
| Phone | 802-476-0196 |
| Email address | john.buck@vermont.gov |
| Mailing Address | 5 Perry Street Suite 40 Barre, VT 05641 |

5.0 SWORN STATEMENT

Sworn Statement and Waiver Form

All applications for LIHI Certification must include the following sworn statement before they can be reviewed by LIHI:

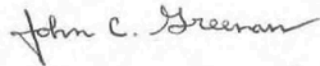
SWORN STATEMENT

As an Authorized Representative of Green Mountain Power Corp., the Undersigned attests that the material presented in the Arnold Falls application is true and complete.

The Undersigned acknowledges that the primary goal of the Low Impact Hydropower Institute's Certification Program is public benefit, and that the LIHI Governing Board and its agents are not responsible for financial or other private consequences of its certification decisions.

The undersigned further acknowledges that if certification of the applying facility is issued, the LIHI Certification Mark License Agreement must be executed prior to marketing the electricity product as LIHI Certified.

The undersigned Applicant further agrees to hold the Low Impact Hydropower Institute, the Governing Board and its agents harmless for any decision rendered on this or other applications, from any consequences of disclosing or publishing any submitted certification application materials to the public, or on any other action pursuant to the Low Impact Hydropower Institute's Certification Program.



Company Name: Green Mountain Power Corp.

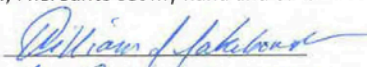
Authorize Representative Name: John C. Greenan Title: Engineer

State of Vermont

County of Rutland

On this, the 22nd day of November, 2017, before me a notary public, the undersigned officer, personally appeared John C. Greenan, known to me to be the person whose name is subscribed to the within instrument, and acknowledged that he executed the same for the purposes therein contained. In witness hereof, I hereunto set my hand and official seal.

Notary Public


My Commission Expires: FEB. 10, 2019



LIHI Handbook 2nd Edition – Sworn Statement and Waiver Form

6.0 REFERENCES

- Al Jazeera America. 2016. Presumed Dead, Wild Atlantic Salmon Return to the Connecticut River. <http://america.aljazeera.com/articles/2016/2/23/presumed-dead-wild-atlantic-salmon-return-to-connecticut-river.html>. February 23, 2016.
- NMFS. 1999. 1999 Biological report on the status of Atlantic salmon. Available at <http://www.nmfs.noaa.gov/pr/pdfs/statusreviews/atlanticsalmon1999.pdf>. Accessed November 29, 2017.

APPENDIX A

PROJECT ZOE AND PHOTOS

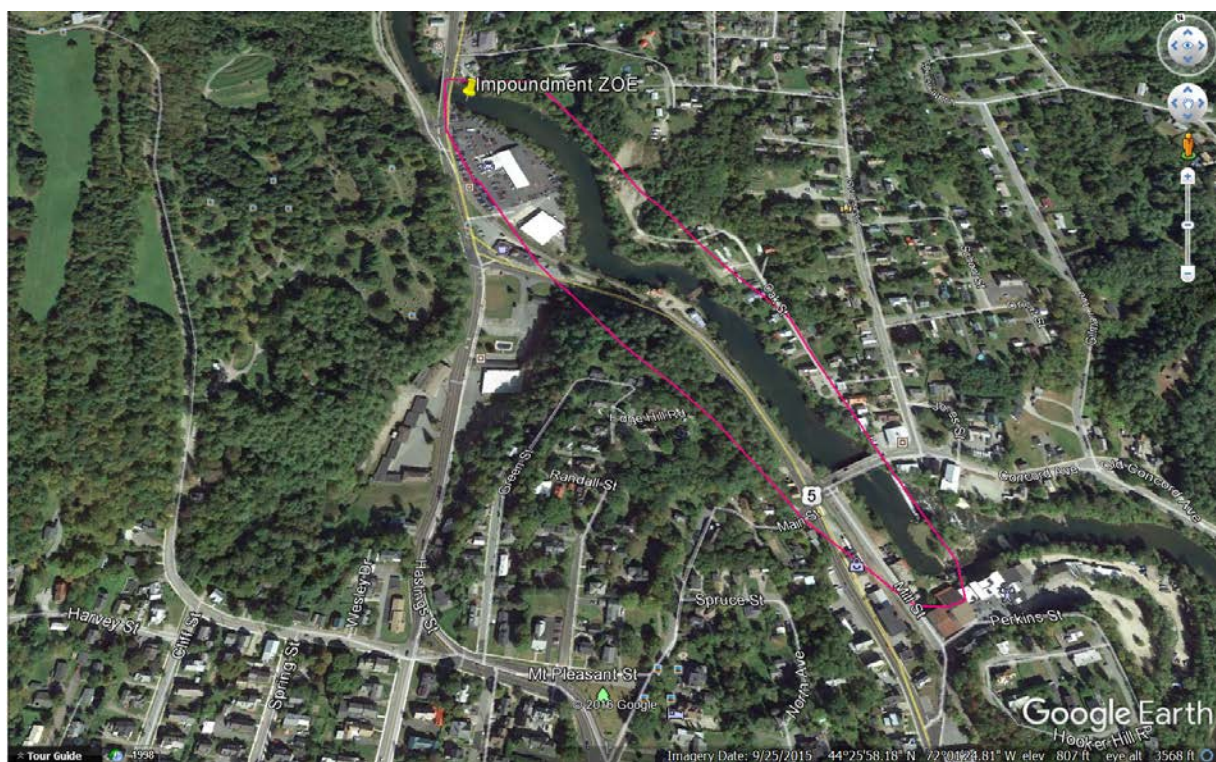


PHOTO 1 IMPOUNDMENT ZOE

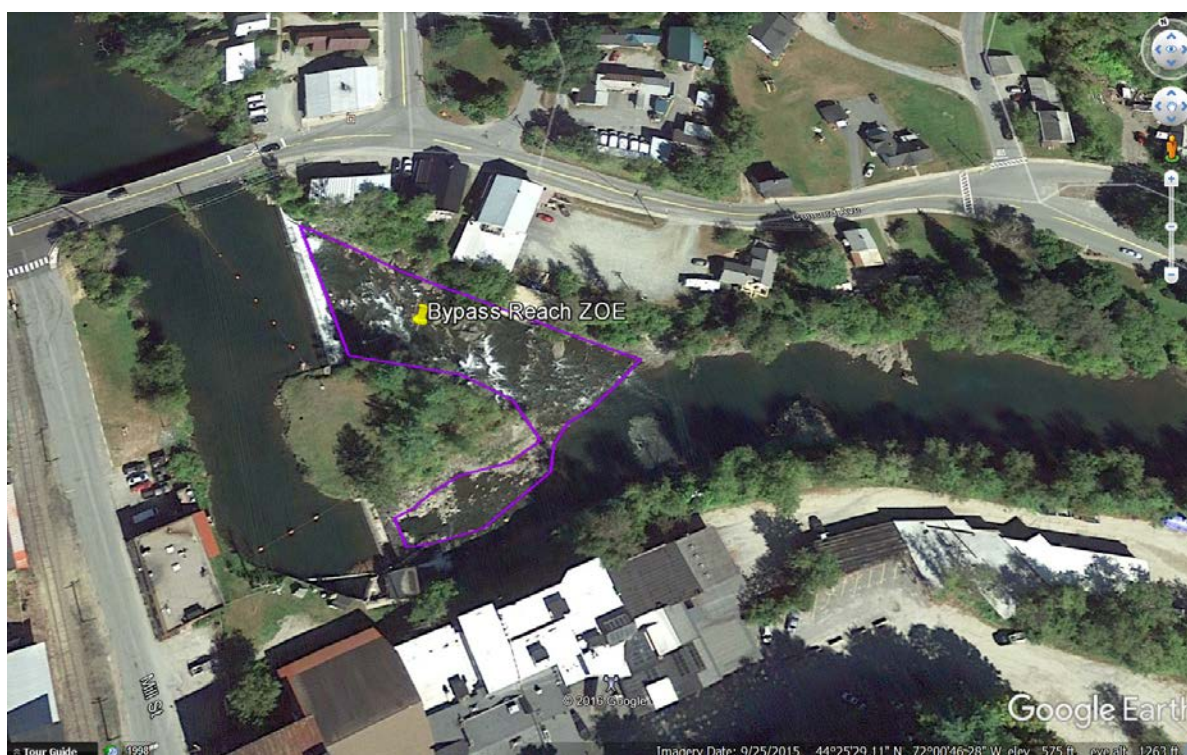


PHOTO 2 BYPASSED REACH ZOE

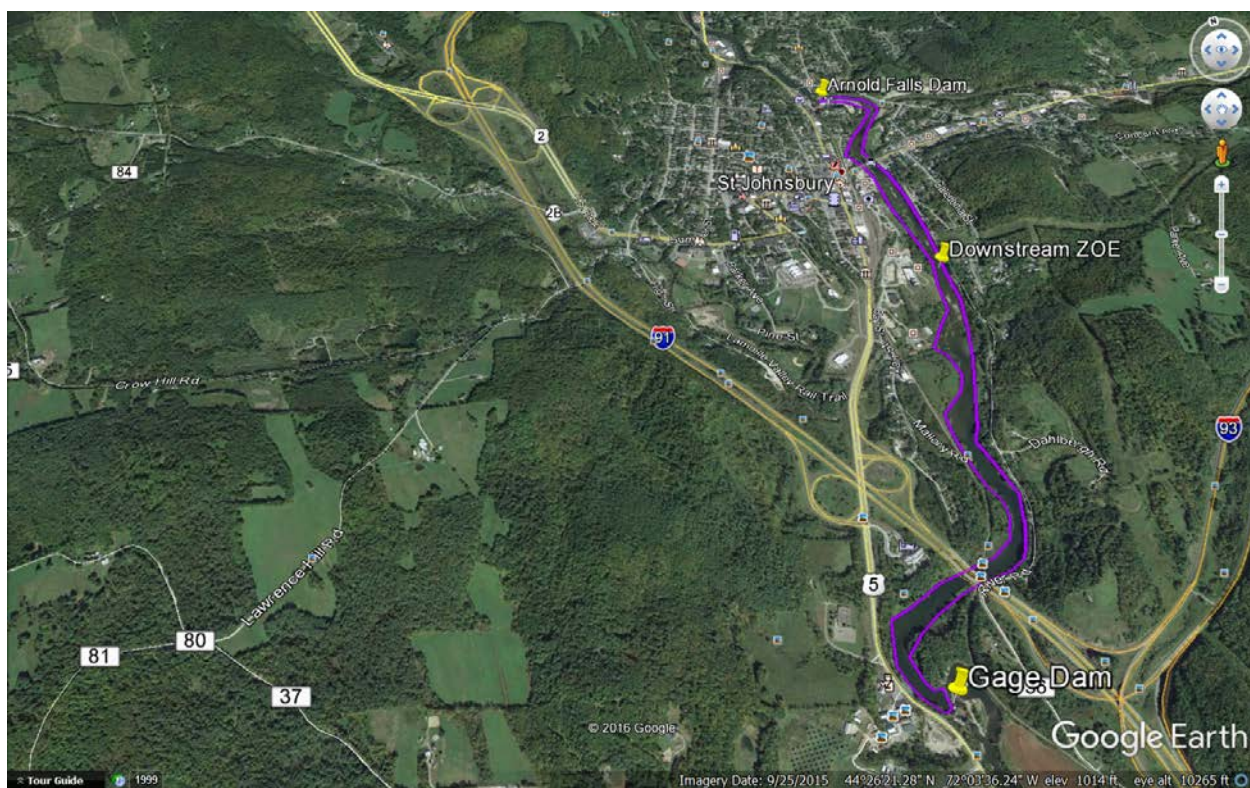


PHOTO 3 DOWNSTREAM ZOE



PHOTO 4 AERIAL VIEW OF PROJECT AREA



PHOTO 5 ARNOLD FALLS DAM (SOUTH DAM IS LOCATED ON THE LEFT SIDE, NORTH DAM IS LOCATED ON RIGHT SIDE)



PHOTO 6 **SOUTH DAM AND POWERHOUSE (NOTE SLUICeway BETWEEN SPILLWAY AND POWERHOUSE FOR DOWNSTREAM FISH PASSAGE AND MINIMUM FLOW RELEASES)**

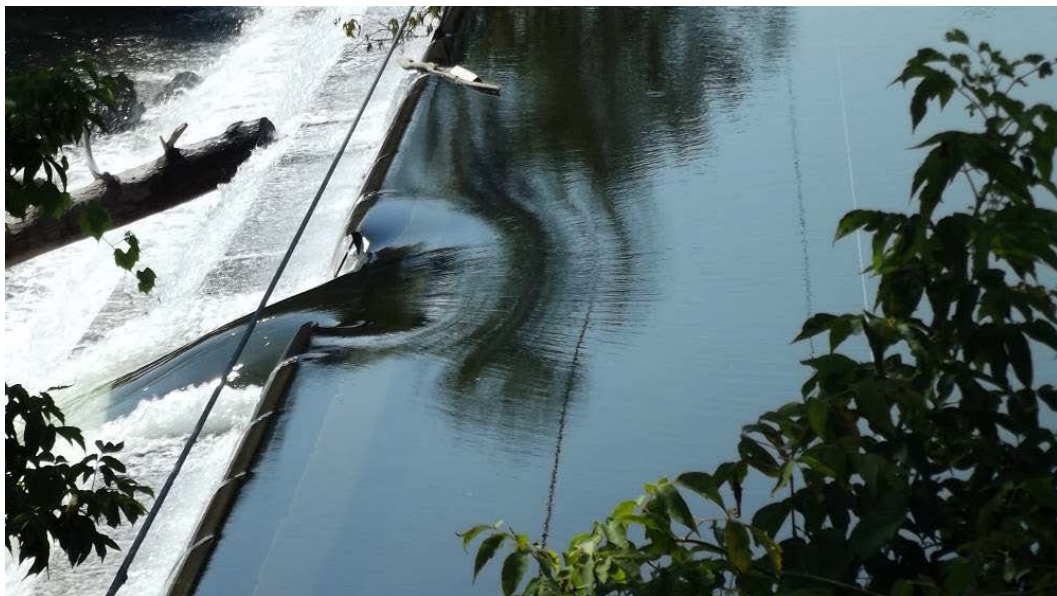


PHOTO 7 **NORTH DAM SPILLWAY (NOTE NOTCH IN HINGED FLASHBOARDS FOR MINIMUM FLOW RELEASES)**

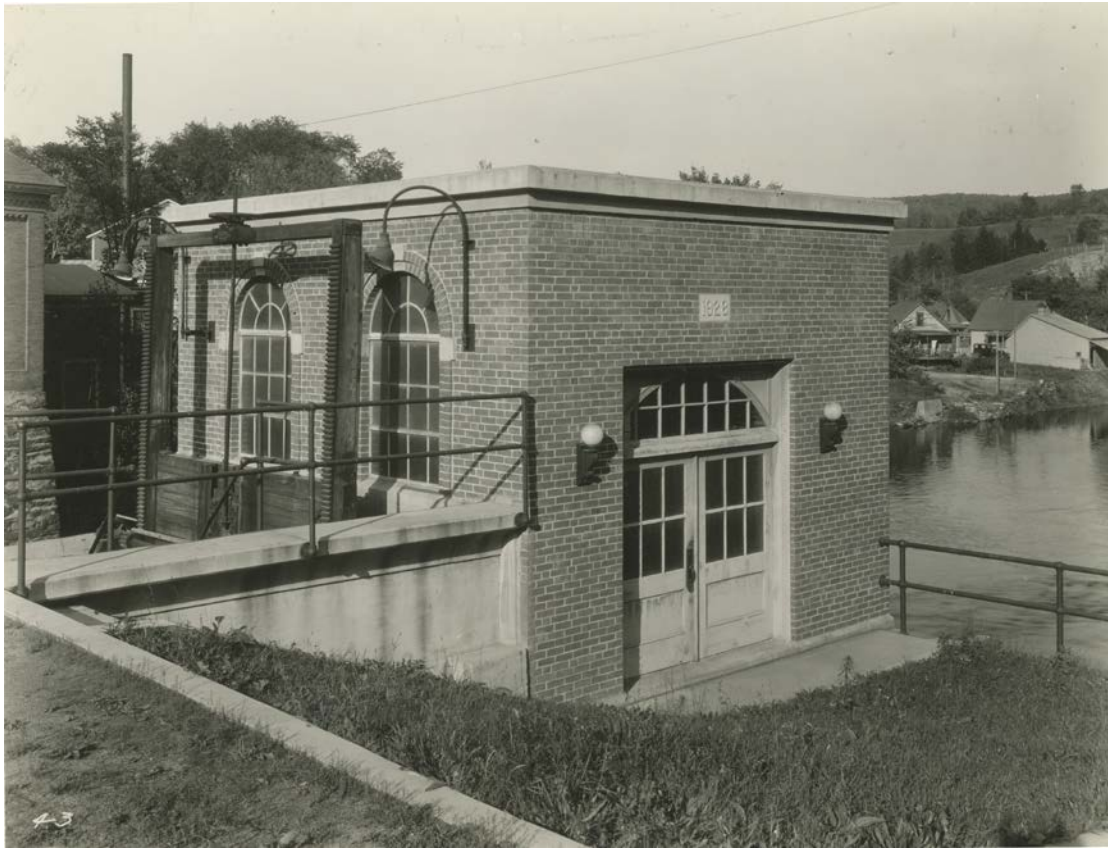


PHOTO 8 ARNOLD FALLS POWERHOUSE

APPENDIX B

RIVER BASIN

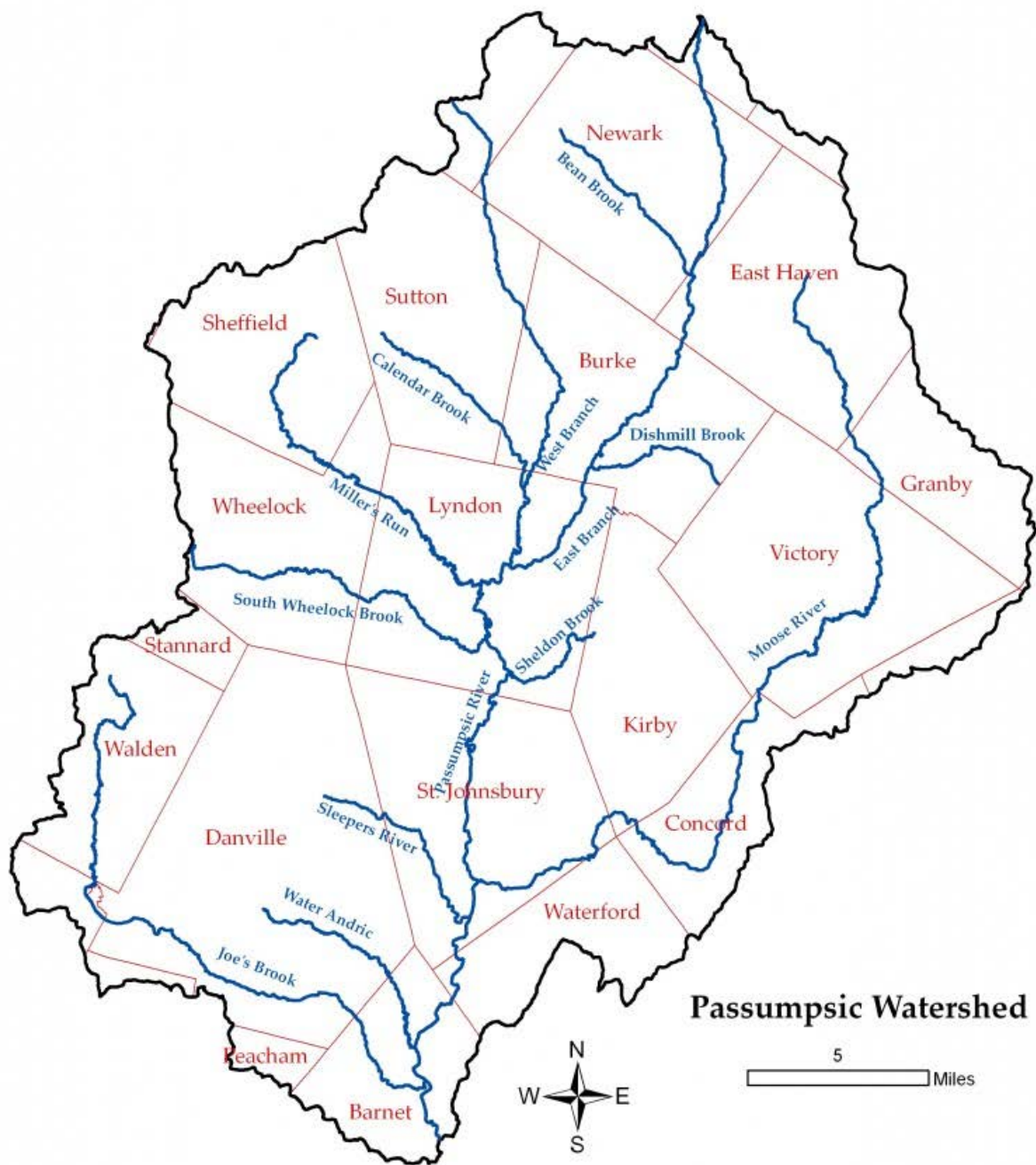


FIGURE 4 **PASSUMPSIC RIVER BASIN**

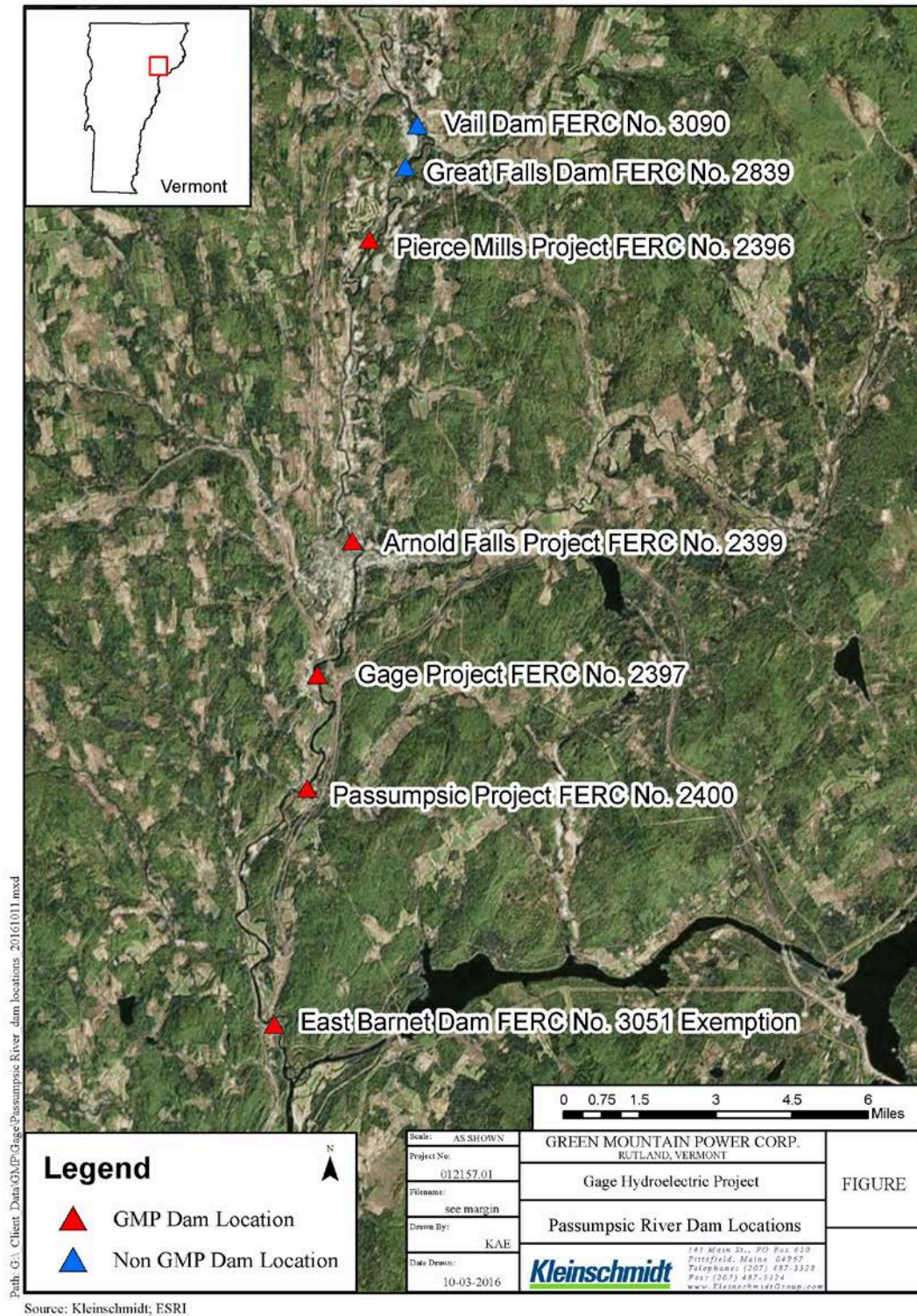


FIGURE 5 PASSUMPSIC RIVER DAM LOCATIONS

APPENDIX C
WATER QUALITY

Water Quality Certification
(P.L. 92-500, Section 401)

In the matter of: Central Vermont Public Service Corporation
77 Grove Street
Rutland, Vermont 05701

APPLICATION FOR ARNOLD FALLS
HYDROELECTRIC PROJECT

The Water Quality Division of the Vermont Department of Environmental Conservation (the Department) has reviewed a water quality certification application filed by Central Vermont Public Service Corporation (the applicant) and dated June 21, 1993. This application has been supplemented by a copy of the Federal Energy Regulatory Commission (FERC) license application filed with the FERC on December 31, 1991; an October 1992 certification application; and subsequent submittals from the applicant, including a September 1993 FERC Additional Information Request (AIR) response to FERC. The Department held a public hearing on April 26, 1994 under the rules governing certification and received testimony during the hearing and, as written filings, until May 13, 1994; attached is a copy of the Department's responsiveness summary, which shall be incorporated into this certification as findings by reference. The Department, based on the application and record before it, makes the following findings and conclusions:

I. Background/General Setting

1. The applicant has applied to FERC for relicensure of the Arnold Falls Hydroelectric Project located at river mile 9.7 on the Passumpsic River in the Town of St. Johnsbury.
2. The Passumpsic River drains 507 square miles of area, including the major portion of Caledonia County and minor portions of Essex, Orleans, and Washington Counties. The mainstem of the river begins at the confluence of the West and East branches just north of Lyndonville, and the river flows south to the Connecticut River in Barnet. The West Branch headwater is the south slope of Mt. Pisgah east of Lake Willoughby. The East Branch originates in Brighton, south of Island Pond. The topography of the basin is most rugged in the area of the eastern headwaters and less so in the western portion of the basin. The length of the mainstem is 22.6

miles with an approximate total fall of 230 feet. The average gradient is 13.8 feet per mile from Lyndonville to the river's mouth in the Town of Barnet.

3. Two of the major tributaries of the Passumpsic River, the Moose and Sleepers rivers, enter downstream of the Arnold Falls Project. The applicant operates five projects in succession on the mainstem of the Passumpsic River. Two hydroelectric facilities, owned by the Town of Lyndonville, located at Vail Dam and Great Falls Dam, are upstream of the Arnold Falls Project. Below these projects, but upstream of Arnold Falls is the Pierce Mills facility operated by Central Vermont Public Service. Downstream of the project are the Gage, Passumpsic, and East Barnet hydroelectric projects, all owned by the applicant.
4. Half of the river length, or almost ten miles, is impounded from the head of the Vail Project to the Connecticut River. Of the 230-foot drop in the river from Vail to the Connecticut River, 81% is harnessed for electrical generation.
5. The headwaters of the Passumpsic comprise pristine streams that flow through wildland areas that are predominantly woodlands and wetlands with only sparse settlements. The village centers of Lyndonville and St. Johnsbury are located in the central part of the basin, along the mainstem, and are the commercial and industrial centers for village residents and the surrounding rural population. The lower portion of the basin is again rural with small villages such as Passumpsic and East Barnet along the main stem.
6. The site was first developed for hydroelectric generation by the St. Johnsbury Electric Light and Power Company in 1926. After damage during the 1927 flood, the facilities were repaired and returned to service by the Twin State Gas and Electric Company.

II. Project and Civil Works

7. The existing dam structures consist of north and south timber crib dams founded on rock and separated by an island. The integral intake powerhouse is located between the south timber crib dam and the right river bank serving as a continuation of the south dam. The south dam is approximately 66 feet in length extending from the intake powerhouse to the island. The north dam is approximately

189 feet in length, extending from the island to the left bank of the river. The south dam crest elevation is 572.80 feet (msl) and about 15 feet above the foundation. The north dam crest elevation is 572.72 feet (msl) and is about 18 feet above the foundation. The normal headwater elevation is 574.3 feet (msl), and the normal tailwater elevation is 556.12 feet (msl), providing a gross head of about 18 feet.

8. The dam is fitted with 1.5 feet of flashboards, creating an impoundment with a surface area of 7.2 acres; a usable storage capacity of about 11 acre-feet; and a backwater influence of 2,400 feet.
9. Under historic operation, the headwater elevation fluctuates within the range of the project flashboards.
10. Flashboards are always removed by winter ice and normally reinstalled in late May. Storm events seldom cause flashboard failure during the summer.
11. The powerhouse contains a single S. Morgan Smith vertical shaft, fixed blade propeller-type turbine with a 335 kw capacity generator. The average annual generation for the twenty year period through 1990 was 1,580,000 kwh. (applicant's response to FERC AIR No. 9) Except for routine monitoring, inspection and maintenance, the plant operates automatically and unattended. The turbine is a fixed-blade unit and not under remote control from the applicant's dispatch center in Rutland.
12. A powerhouse substation is located on the right bank adjacent to the substation. A 12.5 kv transmission line carries output from the facility to the Bay Street substation in St. Johnsbury.

III. River Hydrology and Streamflow Regulation

13. The drainage area at the dam is 254 square miles. Gaging stations have been operated by the U.S. Geological Survey on the mainstem below Passumpsic Dam since October 1928; on the East Branch near East Haven from water years 1940 to 1979; and on the Moose River at St. Johnsbury from water years 1929 to 1984. The drainage area at the gages are 436 square miles, 53.8 square miles, and 128 square miles, respectively. Several of the flow parameters for the

project have been estimated by Department staff based on gage data and are shown in the following table. All three gages were used in estimating these parameters. Some of the parameters may be influenced by the artificial flow regulation caused by upstream hydroelectric facilities.

Table 1. Hydrologic Parameters at Project.

| Parameter | Value |
|----------------|--------------------------|
| Mean runoff | 490 cfs (26.20 in/yr) |
| 7Q10 | 65 cfs |
| 95% Exceedance | 91 cfs |
| 50% Exceedance | 255 cfs |
| 10% Exceedance | 955 cfs |

14. The hydraulic capacity of the single turbine is 150 cfs to 262 cfs. All flows in excess of 262 cfs are released over the spillways.
15. Present operation of the project is as a daily peaking plant with headpond drawdown from storage of 1.5 feet. Currently, when water is being placed in storage, the only flow downstream of the powerhouse is leakage and local drainage.
16. The project as described in the application will operate in an true run-of-the-river mode.¹
17. Routine monitoring, inspection and maintenance will continue as in the past. The plant will operate in a semi-automatic and unattended mode.
18. The applicant proposes to maintain a bypass flow of 20 cfs. (original license application and response to FERC AIR No. 3) To provide this flow, CVPSC would adjust the project headwater sensors so that 1.25 inches of water will spill at all times over the 189 foot north

¹A true run-of-river project is one which does not operate out of storage and, therefore, does not artificially regulate streamflows below the project's tailrace. Outflow from the project is equal to inflow to the project's impoundment on an instantaneous basis. The flow regime below the project is essentially the river's natural regime, except in special circumstances, such as following the reinstallation of flashboards and project shutdowns. Under those circumstances, a change in storage contents is necessary, and outflow is reduced below inflow for a period.

spillway section of the dam. For this proposal, the targeted minimum headwater elevation will be 574.40 feet. The flashboards on the south spillway section would be increased in height by 1.25 inches to accommodate this proposal. (AIR No. 12) The flow sensor will automatically and continually adjust the generator load so that the spillage is prerequisite to generation. As river flows diminish, the flow sensors will reduce generation slowly to keep the required amount of water spilling over the flashboards. As the flow continues to diminish, the flow sensors will remove the unit from the line and all water will spill over the dam.

19. The project automation (SCADA) system has an accuracy of ± 1.0 inch. To provide the applicant's targeted minimum headwater elevation, the SCADA system would have to be set to a fixed level 2.25 inches above the top of the flashboards on the north spillway, providing a spillage of 1.25 to 3.25 inches, and the boards on the south spillway would have to be further increased in height. This would result in a variable bypass flow of approximately 20 cfs to 88 cfs, plus leakage, even assuming the south-spillway boards are raised.
20. To allow workers access for the reinstallation or repair of flashboards, the impoundment is drawn to the crest of the log crib using the plant turbine when inflows first drop to plant capacity of 262 cfs. When the work is complete, the plant discharge is reduced to refill the impoundment; the applicant proposes to release about half of inflows, or 130 cfs, downstream during the refill period of about one hour. In cases when the inflows are substantially less than 262 cfs, the refill time would become more extended.
21. A release of 130 cfs (0.51 csm) is essentially equal to the summer aquatic base flow of 0.5 csm prescribed by the U.S. Fish and Wildlife Service Flow Recommendation Policy for the New England Area (USF&WS Flow Policy) and the Agency of Natural Resources Interim Procedure for Determining Acceptable Minimum Stream Flows, July 1993 (Agency Flow Procedure). Brook, brown and rainbow trout may spawn in the mainstem of the Passumpsic River below the project. The USF&WS Flow Policy and the Agency Flow Procedure prescribe 1.0 csm for the fall/winter period and 4.0 csm for the spring period to protect spawning and incubation.

22. Flashboard leakage would not be sealed until after the impoundment refills. However, no provision is made for maintaining the proposed bypass flow during flashboard replacement.
23. The project will not be cycled for audits nor for local emergency energy demands.

IV. Bypass

24. The bypass is made up of two channels, one on each side of an island that divides the dam and spillway into separate sections. The channel on the powerhouse side (south) quickly merges with the tailrace and is basically a moderate to low gradient gravel/cobble riffle with limited bedrock at the base of the dam and draft tube. The channel on the Concord Avenue side (north) is about 300 feet long by 100 feet wide. It is a rapids of moderate gradient. Its substrate includes irregular bedrock, boulders, cobble and gravel.
25. The bypass is virtually dewatered for much of the year by the present operating mode of the project, receiving only leakage from the dam. No dam leakage estimates have been made available.

V. Standards Designation

26. The Passumpsic River in the project-affected reach is designated by the Water Resources Board as Class B waters. The project impoundment is in the upper end of a waste management zone extending 4.8 miles from the upstream village limit of St. Johnsbury to Passumpsic Dam. The Board has also designated the entire Passumpsic River as cold water fisheries habitat.

The lengths of waste management zones are being reviewed by the Department and will be reset based on rules to be promulgated by the Water Resources Board. The Agency plans to reset waste management zones for streams at the time discharge permits for treatment facilities located on those streams come up for renewal. The existing discharge permit for the Town of St. Johnsbury wastewater treatment facility came up for renewal in March of 1993; however, due to an issue related to how the village would be dealing with combined sewer overflows, the waste management zone for the treatment facility will not be reset until sometime after June 1994.

27. Waste management zones, although Class B waters, present an increased level of health risk to contact recreational users due to the discharge of treated sanitary wastewater.
28. Class B stream reaches are managed to achieve and maintain a high level of quality compatible with certain beneficial values and uses. Values are high quality habitat for aquatic biota, fish and wildlife and a water quality that consistently exhibits good aesthetic value; uses are public water supply with filtration and disinfection, irrigation and other agricultural uses, swimming, and recreation. (Standards, Section 3-03)
29. The dissolved oxygen standards for cold water streams are 6 mg/l or 70 percent saturation unless higher concentrations are imposed for areas that serve as salmonid spawning or nursery areas important to the establishment or maintenance of the fishery resource. The temperature standard limits increases from background to 1.0°F. (Standards, Section 3-01 (B)) The turbidity standard is 10 ntu. (Standards, Section 3-01 (B)(5))
30. Under the general water quality criteria, all waters, except mixing zones, are managed to achieve, as in-stream conditions, aquatic habitat with "[n]o change from background conditions that would have an undue adverse effect on the composition of the aquatic biota, the physical or chemical nature of the substrate or the species composition or propagation of fishes." (Standards, Section 3-01(B)(5))
31. Section 2-02 Hydrology of the Vermont Water Quality Standards requires that "[the] flow of waters shall not be controlled or substantially influenced by man-made structures or devices in a manner that would result in an undue adverse effect on any existing use, beneficial value or use or result in a level of water quality that does not comply with these rules." The project dam is a man-made structure that artificially regulates streamflow.

VI. Water Quality - Water Chemistry

32. The application presents data from limited water quality sampling done by the applicant in 1986 and 1988. Subsequent to these sampling periods, the Town of St. Johnsbury upgraded its wastewater treatment facility from primary to secondary. The

earlier data cannot, therefore, be used in assessing the project's impact on river's dissolved oxygen regime.

33. The Town of St. Johnsbury wastewater treatment facility, with a design capacity of 1.6 mgd has the largest discharge on the river and is an important influence on the river's dissolved oxygen regime. Based on 1993 records, the facility is at 68% of its design capacity.
34. The application includes a supplemental report for 1991 water quality sampling and analysis done by Aquatec, Inc.. The report concludes that the project under the proposed configuration will not violate the minimum water quality standards for dissolved oxygen.

Data for the 1991 study was collected from July 16-19. Of the 15 sampling sets for the three-day study, no samples were less than 90% saturation; substantial algal influence was apparent, however, as more than three-quarters of the samples were supersaturated. The generally supersaturated conditions demonstrate substantial algal influence, which will become a very important influence on dissolved oxygen levels as the St. Johnsbury wastewater plant loading increases in the future.

35. The Aquatec study's analysis of reaeration coefficients demonstrated a significant aeration efficiency for spillage at the Arnold Falls Dam. Spillage at Arnold Falls removed 70% of the dissolved oxygen deficit from saturation. (Diurnal Dissolved Oxygen and Temperature Study, Passumpsic River from St. Johnsbury Center to East Barnet, Vermont, July 16-19, 1991, September 1991, page 5)

VII. Water Quality - Aquatic Biota and Habitat

36. Aquatic biota are defined in Standards Section 1-01(B) as "organisms that spend all or part of their life cycle in or on the water." Included, for example, are fish, aquatic insects, amphibians, and some reptiles, such as turtles.
37. Wild and hatchery-origin brook, brown and rainbow trout occur in the Passumpsic basin. Vermont Department of Fish and Wildlife studies conducted in the early 1970's indicate the Passumpsic River drainage basin contained a higher percentage of brook trout than any other drainage basin studied throughout the state. The Department of Fish and Wildlife currently supplements natural

populations by stocking one or more of the three species in reaches of the mainstem and tributaries. Also occurring in the Passumpsic basin are sucker and minnow species, sculpins, darters, yellow perch, sunfish species, and brown bullhead. The latter three are mostly found in mainstem impoundments.

Below Project

38. A free-flowing reach of about 1 1/2 miles exists between the project tailrace and the Gage impoundment. The Moose River enters the Passumpsic about 1/4 mile downstream of the project.
39. Flows below the tailrace will essentially be unregulated. This proposed flow regime will optimize conditions for fish life downstream of the project powerhouse.
40. Artificial flow regulation below the tailrace is only anticipated to occur during impoundment refilling following flashboard reinstallation. The applicant proposes to release 130 cfs (0.51 csm) during the refill period.

Bypass

41. The Agency's management goal for the bypasses at the Passumpsic River projects is to establish and maintain cold water aquatic habitat, including deep aerated pools that are well circulated and serve as adult fish refugia, steeper gradient areas with high macroinvertebrate production, and fish spawning and nursery areas. (Comprehensive River Plan for the Passumpsic River Watershed, Vermont Department of Environmental Conservation, August 1992) The project bypass provides valuable habitat for juvenile Atlantic salmon, all life stages of resident salmonids (brown and rainbow trout) and a variety of non-game fishes. Cover and velocity refuges, in the form of large substrate objects and pockets of moderate depth, are abundant. (Memorandum from Leonard Gerardi, District Fisheries Biologist, to Department, October 21, 1991)
42. High quality fish habitat of the caliber that exists in both channels of the bypass is in extremely short supply in the mainstem of the Passumpsic, principally due to hydroelectric project impoundments. The Arnold Falls bypass also constitutes a major macroinvertebrate

production area.² The turbulence and air entrainment caused by the rapids also make such areas very attractive to fish that require water with abundant dissolved oxygen (trout and salmon), especially during hot weather when the oxygen-carrying capacity of water otherwise diminishes. Although short in length relative to the total river length below the dam, the bypass at Arnold Falls represents some of the best habitat in this reach of the Passumpsic River.

43. The large pool below the bypass may hold adult trout. During plant operation, these trout may move into the right bypass to spawn, and subsequent dewatering or inadequate flow after plant shutdown could imperil these fish or reduce spawning success, due to egg or fry mortality. Macroinvertebrate production would also be affected.
44. Full consideration of the issue of bypass minimum flows must include a determination of the appropriate minimum flow for each of the channels and a method for partitioning of the bypass release between the two channels. The issue of partitioning depends on the amount of water necessary for habitat purposes in each channel and how the flow regime will be affected by plant operations/shutdown (conditions in the right channel are largely influenced by project operation). During plant operation, all of the bypass flow can be discharged into the left channel. During periods when the plant is off line, spillage is necessary to support the right-channel habitat that is available during operation.
45. During fall 1992 and summer 1993, the applicant, in consultation with the Agency and the U.S. Fish and Wildlife Service, conducted a study to determine how much habitat is available at alternate minimum bypass flows. The results of this study are presented in the applicant's response to FERC AIR No. 3 (September 1993). The study approach is patterned after the U.S. Fish and Wildlife Service Instream Flow Incremental Methodology, which quantifies physical habitat based on organism preference for certain conditions of stream depth, velocity, substrate, and cover.
46. The bypass as described in the study is comprised of three separate reaches. The first reach is the approximately 250 foot long **north bypass channel** between the main dam spillway and the powerhouse tailrace. The upper section is shallow pocket pools in ledge

²Aquatic insects are an important food source for fish and other aquatic organisms.

substrate (represented by Transect 1); the middle section is moderate to steep runs through ledge (represented by Transect 2); and the lower section is shallow riffle with ledge/boulder substrate (represented by Transect 3). The second reach is the approximately 40 foot long **south bypass channel** between the dam spillway section and the confluence with the powerhouse tailrace. Most of this short reach is steep gradient ledge. The third reach is described as the approximately 150 foot long **tailrace channel** between the powerhouse and the junction with the north bypass channel. This is predominantly a cobble riffle represented by Transect 4.

47. Juvenile Atlantic salmon and adult rainbow trout were selected as the target species and life stages for the north bypass channel evaluation. For the tailrace channel, brown trout spawning and incubation was selected. The scope of the study was to conduct assessments of the suitability of habitat at flows of 20 cfs, 44 cfs, 67 cfs, 106 cfs, and 145 cfs. All of these target flows were assessed except 145 cfs. These flows were apportioned between the two channels based on spillway length; 74% was spilled into the north channel and the remainder into the south channel. Necessary depth of flow over the spillways were estimated using the standard weir equation; no adjustments were made to correct for the substantial leakage at the dam. The applicant recommended that the headpond elevation be prescribed instead of the minimum flow rate for regulatory purposes.
48. By letter dated March 24, 1993, the Agency requested that flows be measured in the bypass using wading measurements where physically possible and that the head on the dam be monitored but not be used as the exclusive means of estimating flow. Estimation of flow using the weir formula is imprecise and does not account for leakage.
49. The applicant indicated that it would be difficult to measure flows as requested by the Agency due to the irregular characteristics of the bypass; the nature of the substrate with its ledge and large boulders; and the lack of opportunity to measure laminar flow regardless of where a transect is located. The applicant did measure total river flow on a transect located 100 yards downstream of the bypass. The comparative study target flows and actual river flow measurements were:

Table 2. Flow measurement comparison.

| STUDY TARGET FLOW (cfs) | MEASURED RIVER FLOW (cfs) |
|----------------------------|------------------------------|
| 20 | 91 |
| 44 | 67 |
| 67 | 69 |
| 106 | 99 |

The target flows were released over the spillway on alternate days. The measured river flow should reflect an addition of dam leakage and turbine discharge. It is unclear why the total river flow is not substantially higher. The data is, therefore, unuseable.

50. The Agency had requested that the study include habitat measurements in the tailrace channel under low river flow conditions when the plant is off line. Unfortunately, the only data available was collected when the plant was operating, and under those conditions the turbine discharge was variable. It is, therefore, impossible to determine a biologically based minimum flow for the tailrace channel.
51. The Department analyzed the flow data from the north-channel transect information to estimate leakage through the log crib and flashboards and to adjust the flow estimates for the north channel. It is recognized that the transect data may be less than ideal for flow measurement; however, sufficient data is available to support estimation of leakage. A fixed rate of leakage of 25 cfs was assumed from a review of the data. Additionally, the second target spillage rate (74% of 44 cfs = 33 cfs) was reduced to 25 cfs to make the data set consistent.
52. Weighted usable area (WUA) was used as the measurement unit to describe the habitat/flow relationships for juvenile salmon and adult rainbow trout in the north channel. WUA is expressed in units of square feet. The results are shown in the following table, with WUA combined for the three habitat types.

Table 3. Results of habitat study in the north bypass channel.

| North Channel Flow (cfs) | Wetted Area (s.f.) | Habitat (s.f.) | |
|--------------------------|--------------------|-----------------|-------------------|
| | | Juvenile Salmon | Adult Rainbow Tr. |
| 40 | 18,690 | 7,850 | 5,790 |
| 50 | 20,540 | 9,450 | 6,980 |
| 75 | 21,860 | 10,710 | 8,090 |
| 103 | 23,200 | 12,300 | 9,050 |

Note: Flow is the total of spillage (15,25,50,78 cfs) and estimated leakage (25 cfs).

53. As shown in the above table, the habitat availability for both target organisms increases substantially when bypass flows are increased over the range of flows studied. In large part, this change is due to enhanced quality of the habitat; the area of streambed wetted increases by 24%, while habitat increases by 56% for juvenile salmon and 56% adult rainbow trout.
54. With respect to the habitat data provided for the north channel, the habitat/flow curves suggest that habitat continues to improve as flows increase beyond 103 cfs, the highest study flow measured in the north channel.
55. The applicant argues that the potential production or support of fish is not warranted by the cost in lost energy production. The applicant estimates that the salmon smolt production capability of the north bypass channel would provide virtually no sea returns to the Connecticut River and that the production capacity for rainbow trout adults are only 8 fish for 15 cfs (spillage) and 13 fish for 78 cfs (spillage). The applicant also states that competition between the trout and salmon would further limit the value of the bypass. Sea returns are low primarily due to the assumed marine mortality of 99.5%.

Impoundment

56. Fisheries habitat that was formerly riverine (lotic) has been transformed into lacustrine habitat due to the impounding of water by the dam. The quality of the impoundment as lacustrine habitat is marginal.

57. Major drawdowns below the dam crest can cause dewatering of the riparian-zone habitat. Fish and other aquatic organisms that use the impoundment would be subject to stranding or freezing when such major drawdowns occur.

Fish passage

58. A Strategic Plan for the Restoration of Atlantic Salmon to the Connecticut River Basin (1982) identified the Passumpsic River as potential non-natal smolt production habitat for stocking consideration at such time that the program's hatchery fry production capacity expands to meet the needs of non-natal streams. The plan estimates that there are 6000 units (one unit = 100 sq. yards) of salmon nursery habitat in the Passumpsic basin. However, subsequent to the 1982 restoration plan, the Department of Fish and Wildlife has revised the estimate of available habitat in the Passumpsic basin. The estimated total habitat is about 20,000 units, with about half of the habitat above Arnold Falls.
59. The Department of Fish and Wildlife stocked 15,000 age 0+ Atlantic salmon parr in the Moose River between St. Johnsbury to Concord in fall of 1991. The Moose River was selected for salmon stocking because it has excellent physical habitat conditions and because its warmer-than-average temperature regime is likely to be very favorable for salmon development. Subsequently, parr have been stocked in both 1992 and 1993, and fry have been stocked in spring 1993 in the Moose River and in the East Branch, which is upstream of the applicant's Pierce Mills Project. More extensive basin-wide stocking of fry is planned for spring of 1994.
60. The applicant has agreed to provide downstream passage when and if the Passumpsic River becomes an integral part of the salmon restoration effort supported by a detailed plan documenting location of habitat units, an annual release schedule supported by hatchery capability, and a monitoring plan (license application, Page E-47). The restoration plan was last revised in September 1982 and is once again under revision.
61. Upstream fish passage for returning adult salmon is now provided up to the dam at Dodge Falls on the Connecticut River at East Ryegate (Dodge Falls Hydroelectric Project, FERC No. 8011). When a threshold number of returning adult salmon is reached at

the now-operational fishway at Wilder Dam, construction of a passage facility (either a fish trap-and-truck facility or a fish ladder) at Dodge Falls will be triggered. Salmon will then have access to the Passumpsic River.

62. Upstream passage facilities are not needed as part of the current restoration plan, as the Passumpsic River is not targeted for natural reproduction of salmon. However, the status of all passage needs may be reviewed as part of the revision of the Strategic Plan or annual program (U.S. Fish and Wildlife Service) reviews. Expansion of and/or changes in the plans for the river may necessitate upstream passage facilities in the future. (U.S. Department of Interior letter to FERC, December 23, 1993)

VIII. Water Quality - Wildlife and Wetlands

63. Vermont Water Quality Standards requires the Agency Secretary to identify and protect existing uses of state waters. Existing uses to be considered include wetland habitats and wildlife that utilize the waterbody.
64. No Class I or Class II wetlands exist within the influence of the dam backwater zone. Institution of a run-of-the-river operating mode will protect any downstream wetlands that may exist and Class III wetlands present in the backwater zone.
65. Wildlife that use the riparian zone and river will be better supported by the improved operating regime. Typical wildlife would include furbearers such as otter, beaver, muskrat, mink, and deer and birds such as kingfisher, herons, ducks, and osprey.

IX. Water Quality - Rare and Endangered Plants and Animals; Outstanding Natural Communities

66. Populations of the hare figwort (Scrophularia lanceolata) exist along the Passumpsic River in the vicinity of the project. The figwort is on the Vermont Natural Heritage Program's list of rare plants. According to the Heritage Program, this species is known from five sites, chiefly in southern Vermont. The plants at Arnold Falls are found outside the area influenced by project operations. (License application, Volume III, Appendix B).

67. No endangered or threatened plants are known to inhabit the project reach.

X. Water Quality - Shoreline Erosion and Impoundment Desilting

68. Shoreline erosion occurs along the margin of the impoundment at least in part as the result of elevated water levels in the impoundment. (Appendix F, FERC license application) The applicant indicates that most of the impoundment is bordered by Route 5 on the east and the Canadian Pacific railroad on the west. Rip rap and retaining walls protect the banks.
69. Monitoring of shoreline erosion appears to be unnecessary at this site. The applicant's proposed operating mode will minimize the potential for new problems to develop in the future.
70. Impoundment desilting can result in significant degradation of water quality if not executed properly. The applicant has not disclosed any desilting problems at this project in the past. Development of a desilting plan is unnecessary at this time. Should the need to desilt arise in the future, the applicant should seek review by and approval from the Agency. This has been proposed by the applicant.

XI. Water Quality - Recreation and Aesthetics

71. The river in the project vicinity is popular for several recreational uses, including fishing, swimming, picnicking, boating, photography and viewing. (Comprehensive River Plan for the Passumpsic River Watershed and staff observations)
72. The project is located in a heavily commercialized section of St. Johnsbury. The town has initiated a planning effort to develop a recreation plan for the reach of river between the Gage Dam and the Arnold Falls site.
73. Vermont Water Quality Standards require the protection of existing water uses, including the use of the water for recreation. The Standards also require the management of the waters of the State to improve and protect water quality in such manner that the beneficial values and uses associated with a water's classification is attained.

74. Beneficial values and uses of Class B waters include water that exhibits good aesthetic value and swimming and recreation. Section 2-02 of the Standards prohibits regulation of river flows in a manner that would result in an undue adverse effect on any existing use, beneficial value or use.
75. The river is a navigable and boatable water of the State.
76. As a result of extensive impounding by utility dams along the length of the Passumpsic River, flatwater boating opportunities are created that enable extension of the boating season well into low water periods when other rivers are not canoeable. Referencing the Appalachian Mountain Club River Guide - New Hampshire/Vermont, 2cd ed., 1989, the Passumpsic River has suffered in the past from industrial pollution and consequent bad press in earlier canoeing guides. It does have an excessive number of dams, but it is an attractive river in a rural area. The dams are easier to deal with at low water.
77. The River Guide describes canoeing the river in the project area. According to the guide, "Below the US 5 bridge at St. Johnsbury Center, an island can be seen from the road. It has a ledge on each side...the right may be easier. When the water is medium or high, take out in the vicinity of the next US 5 bridge, above St. Johnsbury, since the Concord Avenue bridge has no access. The dam immediately below the Concord Avenue bridge can be portaged on the island when the dam is not spilling. Pleasant Class I rapids run through town past the confluence of the Moose River on the left. The river gradually slows to the backwater of the next dam, which can be dropped on the left."
78. One of the most limiting factors to boating the river is the lack of provisions for portaging the applicant's dam. The dam impairs boating on a navigable river. Recreation is a designated use for the Passumpsic River. Where designated uses have been impaired or eliminated, all reasonable steps should be taken to restore such uses.
79. Referencing the applicant's March 1991 Site Assessment concept proposal (Appendix G, License application), a portage route is proposed starting at point A' on Arnold Island and following a proposed path to the foot of the island at point A. A proposed

public access area (Site B) affords the optimal view of the Arnold Falls and Arnold Island. This site will also provide for bank fishing. The applicant also proposes a public parking area (Site C) to allow the visitor arriving by car convenient access to the river.

80. The public will become aware of the applicant's proposed facilities through appropriate signage and annual advertising.
81. Disabled visitors to the project area will be enabled access to the parking, picnic, and fishing facilities. Grades along walkways will not be in excess of 8% slope.
82. The applicant had offered to explore river access development at its Bay Street distribution facility 1/2 mile below the project where land and river frontage may offer parking, picnicking, and river access though extensive site work would be required.
83. Provision of a canoe portage across the island requires sufficient safety features to allow paddlers safe access to the portage route, including upstream warning signs for the dam and location of the portage.
84. The applicant does not own the island, but presently holds an easement for access for construction and maintenance of civil structures. The applicant is pursuing the feasibility of relocating the existing boat barriers to allow canoeist access to the island and a portage route across the island. The town has agreed to transfer title to the island to the applicant, and the transaction is pending. Additionally, the applicant has the necessary rights to access the river and use the existing parking area on the east shore of the river (Site B) below the dam. (letter from the applicant to FERC, December 14, 1993)
85. It may also be feasible to provide portage capability through a take out at the upstream bridge, with a carry down the road to below the dam.
86. The project boundary is very limited, encompassing the project civil works, tailrace, dam, and the impoundment flowage.
87. The site has some special visual qualities in a classic New England urban setting with old structures bordering the river prescribing its

character. The hydro plant and dam are focal points of this scene, and important elements in maintaining full aesthetic appreciation of the area. Key aesthetic issues are facilities maintenance and spillage flows. No landscaping of the project area is proposed at this time.

88. Spillage over the dams is extremely important to the setting, providing aural ambience and visual capacity necessary to give meaning to the structures and deliver aesthetic fulfillment. The site lacks context and its attractiveness suffers without sufficient spillage. The amount of spillage needs to be in scale with the size of the project. The applicant documented on video-cassette tape the existing and proposed spillage conditions.

XII. Existing Uses

89. No existing uses, other than those discussed above, have been identified. Existing uses, as defined in the Standards, are provided special protection under the anti-degradation provisions of the Standards (Section 1-03 (B) Protection of Existing Uses).

XIII. Other Applicable State Laws

Vermont Endangered Species Law (Title 10, Sections 5401 to 5403)

90. The Vermont Endangered Species Law (Title 10, Sections 5401 to 5403) governs activities related to the protection of endangered and threatened species. Generally, a person shall not "take, possess or transport wildlife or plants that are members of an endangered or threatened species." Disturbance of an endangered plant is considered a taking. (Title 10, Section 4001)
91. No endangered or threatened plants or animals are known to inhabit the project reach.

Agency Regulatory Powers over Fish and Wildlife

92. Under 10 V.S.A. Chapter 103, "[i]t is the policy of the state that the protection, propagation control, management and conservation of fish, wildlife and fur-bearing animals in this state is in the interest of the public welfare, and that safeguarding of this valuable resource

for the people of the state requires constant and continual vigilance."

93. The water use as proposed, with the conditions imposed below, will be consistent with this state policy.

XIV. State Comprehensive River Plans

The Agency, pursuant to 10 V.S.A. Chapter 49, is mandated to create plans and policies by which Vermont's water resources are managed and uses of these resources are defined. These plans implement the Agency policy. The Agency must, under Chapter 49 and general principles of administrative law, act, when possible, consistently with these plans and policies.

Hydropower in Vermont, An Assessment of Environmental Problems and Opportunities

94. The Department's publication Hydropower in Vermont, An Assessment of Environmental Problems and Opportunities is a state comprehensive river plan. The hydropower study, which was initiated in 1982, indicated that hydroelectric development has a tremendous impact on Vermont streams. Artificial regulation of natural stream flows and the lack of adequate minimum flows at the sites were found to have reduced to a large extent the success of the state's initiatives to restore the beneficial values and uses for which the affected waters are managed.

At the Arnold Falls Project, the plan recommends that minimum flow requirements be established for this project in order to improve the bypass and downstream fishery, water quality, and aesthetics, and that impoundment water levels be stabilized to protect upstream fisheries resources.

Passumpsic River Watershed Comprehensive River Plan

95. The Agency, with extensive public involvement, has completed a comprehensive river plan for the Passumpsic River Watershed. The plan, entitled Passumpsic River Watershed Comprehensive River Plan (August 1992) defines a balance of river uses and values including state hydropower management goals and actions. The state management goals and actions contained in the plan are

derived from state law, written state policies, and the public interest as determined through a three-year public participation process. River basin citizens who participated in the planning process expressed as major issues of concern the restoration of the river's water quality and the fishery.

State hydropower management goals from this report include:

Goal 1 Continue to use the Passumpsic River, Sleepers River, and Joes Brook for the generation of electricity and permit other legitimate commercial uses of river water but make these uses compatible with other river uses and values.

Goal 2 Wherever possible, establish and maintain natural river flows to improve and maintain aquatic habitat, water quality, recreation, and aesthetics.

Goal 3 Establish and maintain minimum flows in the bypass segments of the hydropower facilities to maintain water quality, aesthetic and recreational values, and aquatic habitat, including: deep-aerated pools that are well circulated and serve as adult fish refugia, steeper gradient areas with high macroinvertebrate production, and fish spawning and nursery areas, all of which are limited habitat types, especially in the mostly impounded waters of the Passumpsic River mainstem.

Goal 4 Maintain riverbank stability and enhance river water clarity, aesthetics, and habitat for fish, wildlife, and other aquatic biota by minimizing river flow and pond height fluctuations.

Goal 5 Enhance the ability of fish to negotiate passage of hydro dams. Create downstream passage facilities for resident trout species and Atlantic salmon smolts (from both natal and non-natal production). Create upstream passage facilities when sufficient numbers of adult salmon have returned to the Passumpsic River.

Goal 9 Enhance the Passumpsic River's role in as recreation/tourism based economy, preserve historic and archeological resources, and restore the aesthetics and productivity of local rivers by permitting a continuous vegetation buffer to grow on and near the banks of the river and its tributaries.

Goal 12 Enhance the desirability to live and conduct business in Lyndonville and St. Johnsbury by conserving and beautifying open spaces along the rivers as accessible recreational, cultural, scenic, and educational amenities in the urban corridor.

Goal 13 Maintain existing boating runs, for car-top boats and create a Passumpsic River boating trail where boaters can portage around dams and put-in and take-out at hydroelectric facilities on the mainstem river.

Goal 14 Increase watershed awareness and stewardship and local interest to maintain clean water, safe for swimming and compatible with other existing stream uses and values.

The project as proposed, and with the conditions imposed below, will be in compliance with the plan.

1988 Vermont Recreation Plan

96. The 1988 Vermont Recreation Plan (Department of Forests, Parks and Recreation), through extensive public involvement, identified water resources and access as top priority issues. The planning process disclosed that, while Vermonters and visitors focus much of their recreational activities on surface waters, growing loss of public visual and recreational access to those waters causes substantial concern to the users. The plan projects that access is "likely to become the critical river recreational issue of the 1990s." The need for development of portage trails and canoe access sites is cited as among the major issues relative to canoe trails in Vermont.

97. The Water Resources and Access Policy is:

It is the policy of the State of Vermont to protect the quality of the rivers, streams, lakes, and ponds with scenic, recreational, and natural values and to increase efforts and programs that strive to balance competing uses. It is also the policy of the State of Vermont to provide improved public access through the acquisition and development of sites that meet the needs for a variety of water-based recreational opportunities.

98. Enhancement of access, provision of a portage, and improved flow management would be compatible with this policy and balance competing uses of the river for recreation and hydropower. Nonassurance of access or failure to provide a convenient portage trail would exacerbate a critical state recreational problem.

99. Another priority issue identified in the Recreation Plan is the loss or mismanagement of scenic resources. The plan notes "[few] recreational activities in Vermont would be the same without the visual resources of the landscape," and that protection of those resources is "necessary if the state is to remain a desirable place to live, work, and visit."

100. The Scenic Resources Protection and Enhancement Policy is:

It is the policy of the State of Vermont to initiate and support programs that identify, enhance, plan for, and protect the scenic character and charm of Vermont.

101. Provision of dam spillage, and maintenance of bypass and downstream flows will protect the scenic characteristics of project area and river.

Vermont Comprehensive Energy Plan

102. Pursuant to Executive Order No. 79 (1989), the Department of Public Service produced the Vermont Comprehensive Energy Plan, January 1991. This plan sets out an integrated strategy for controlling energy use and developing sources of energy. Several goals of the plan are to reduce global warming gases and acid rain precursors by 15% by the year 2000 through modified energy usage; to reduce by 20% by the year 2000 the per capita consumption of energy generated using non-renewable energy sources; and to maintain the affordability of energy.
103. Prescription of an appropriate minimum flow for the bypass is important to project economics. The applicant's response to AIR No. 7 (September 1993) provides the energy output losses for a range of minimum bypass flows from 20 to 145 cfs. A continuous special release of 20 cfs would reduce project output by about 128 mwh, or 8% of the average annual energy output, for the 30-year term of the federal license; a special release of 78 cfs year round, would result in about a 400 mwh, or 25%, reduction in output.
104. The loss of electrical power production associated with mitigation needed to meet water quality standards will have a negligible effect on overall power availability and rates.

The expected regional power surplus from the New England and New York power pools is 13,389 megawatts for Winter 2002-2003. Because the facility would be operated in a base-load fashion (run-of-the-river), no operating reserve (storage function) is available. The applicant has large amounts of base-load power at its disposal. (testimony of Robert Howland, Central Vermont Power's Manager of Power Supply, before the State Public Service Board in Docket No. 5171)

105. Continued availability of electricity generated by this renewable source, with proper environmental constraints in place, is consistent with the State energy plan.

XV. Analysis

Operations

Impoundment

106. The conversion of Arnold Falls to a run-of-the-river station will result in a more stable impoundment. Occasional loss or removal of flashboards will cause a lowering of the impoundment by 1.5 feet, but should not significantly impair the upstream aquatic biota in this riverine impoundment. Major drawdowns for construction or repair would have to be reviewed case specifically to insure protection of the upstream resource.

Bypassed reach

107. The Agency Procedure for Determining Acceptable Minimum Stream Flows (July 14, 1993) provides guidance to the Department in setting minimum stream flows at hydroelectric projects. With regard to project bypasses, the procedure states:

Bypasses shall be analysed case-by-case. Generally, the Agency shall recommend bypass flows of at least 7Q10 in order to protect aquatic habitat and maintain dissolved oxygen concentration in the bypass and below the project. In assessing values, consideration shall be given to the length of the bypass; wildlife and fish habitat potential; the aesthetic and recreational values; the relative supply of the bypass resource values in the project area; the public demand for these resources; and any additional impacts of such flows upon citizens of the State of Vermont. Bypass flows shall be at least sufficient to maintain dissolved oxygen standards and wastewater assimilative capacity. Where there are exceptional values in need of restoration or protection, the general procedure shall be followed. In most cases, a portion or all of the bypass flows must be spilled over the crest of the dam to reoxygenate water, provide aquatic habitat at the base of the dam and assure aesthetics are maintained.

108. The applicant proposes to maintain a 20 cfs bypass release, which is only 31% of the 7Q10 drought flow condition (65 cfs, or 0.25 csm) at the project. This will have limited value for reaeration as it represents only a small fraction of the total flow of the river during operation. However, the project will be spilling all inflows during the period of greatest concern, providing full reaeration potential. The project's low-end capacity is 150 cfs, which with the applicant's

proposed operating mode would require about 0.67 csm in order to operate.

109. There is no present need for a special bypass-flow release to meet dissolved oxygen standards downstream. However, algal respiration will become an important influence on dissolved oxygen levels as the St. Johnsbury wastewater plant loading increases in the future. Use of the dam spillage as a point source of reaeration may become necessary at some point in the future to maintain dissolved oxygen standards as wastewater loadings become more significant. However, the spillage required to serve aquatic habitat needs in the bypass is in excess of 7Q10, and will preclude the need to monitor water quality to assure that dissolved oxygen standards are met.
110. The Passumpsic River is heavily dammed and the large majority of its length is under impounded conditions. The bypasses represent a disproportionate amount of the high quality habitat for salmonids on the river mainstem. The Department considers the maintenance of habitat values within the bypasses as very important. The applicant's proposed bypass flow of 20 cfs through the north channel only would cause an undue adverse effect on the composition of the aquatic biota and the species composition and propagation of fish in both bypass channels, and would not support Agency management goals for this reach.
111. The summer aquatic base flow for the project is 127 cfs. Given the lack of specific data for the south channel, a reasonable alternative for flow setting is to apportioning 26% of this flow, or 33 cfs to the tailrace channel for habitat protection for periods when the plant is off line. The 26% is based on the lengths of the north and south spillways.
112. A spillage flow of 78 cfs into the north channel of the bypass reach, combined with a leakage of 25 cfs would be sufficient to support juvenile Atlantic salmon, all life stages of resident salmonids (brown and rainbow trout) and a variety of non-games fishes and provide habitat for macroinvertebrates.
113. When inflow declines below 253 cfs (103 cfs north bypass channel flow requirement plus 150 cfs station minimum hydraulic capacity), the station will cease operation. When flows decline further to below 136 cfs, the standards for the two channels cannot be met,

and flows should be simply apportioned between the two channels in accordance with the spillway lengths (74% of the flow maintained in the north channel and 26% maintained in the south channel).

114. Based on the video assessment completed by the applicant, the proposed spillage of 20 cfs (1.25 inches) would be adequate to support good aesthetic value, a Class B management objective. Higher flows as required for habitat support would further enhance conditions.

Below Project

115. The conversion of the project to a true run-of-river facility is expected to improve water quality below the project, as downstream flows will no longer be subject to artificial drought conditions and concomitant poor water quality. The project as proposed and with Department conditions below related to bypass flows and impoundment refilling will meet dissolved oxygen and temperature standards and the anti-degradation provisions of the water quality regulations.
116. Because natural river flows will be continuously available downstream, the impact of the project on concentrations or levels of the following parameters will not be significant:

Phosphorus
Nitrates
Settleable, floating or suspended solids
Oil, grease, and scum
Alkalinity
pH
Toxics
Turbidity
Escherichia coli
Color
Taste and odor

Flashboard Replacement

117. During special events when water must be placed in storage, the applicant proposes to release 130 cfs (0.51 csm) below the project. The USF&WS Flow Policy and the Agency Flow Procedure

prescribe certain minimum flows for the perpetuation of indigenous fish species. The base flows are 4.0 csm for spring spawning and incubation, 1.0 for fall/winter spawning and incubation, and 0.5 csm for the remaining period and for cases where there is no use for spawning and incubation. When instantaneous inflows are less than these values, the inflow must be passed on an instantaneous basis. At the Arnold Falls Project, these aquatic base flows are 1,016 cfs (4.0 csm), 254 cfs (1.0 csm), and 127 cfs (0.5 csm). Reduction of flows substantially below these minimums for the purpose of refilling the impoundment may imperil fish below the project. Mainstem spawning in the spring and fall is believed to occur downstream.

118. A continuous release of the U.S. Fish and Wildlife Service aquatic base flows, or 90% of inflows, depending on inflow circumstances, will adequately protect downstream fish and other aquatic organisms during the occasional refill periods. During the spring period, the aquatic base flow is higher than project capacity; flashboard replacement will only be possible during lower inflows. The 90% requirement would apply during this periods. For the summer period and the fall/winter period, the 90% requirement would apply to inflow conditions less than the 127 cfs and 254 cfs standards, respectively.

Fish Passage

119. Operational passage facilities will be needed for outmigration in 1995 at Arnold Falls. Passage facilities should include structures or devices to safely convey fish downstream of the dam and may include screening to minimize entrainment and impingement and a conveyance conduit.
120. Adequate flows to operate these facilities will also be required. Passage facilities will also benefit resident trout species. Standard design for downstream passage facilities utilize operating flows equivalent to 2% of the plant hydraulic capacity, or the flow through a 3x2 foot rectangular weir, whichever is greater. For this project, the flow need would equate to about 20 to 25 cfs. It will be necessary to operate these facilities continuously during the periods April 1 through June 15 and September 15 through November 15. These periods are subject to adjustment based on knowledge gained about migration periods for salmon in the Connecticut River basin.

121. Changes to the salmon restoration plan may require the provision of upstream passage facilities within the term of the new license, although such facilities are not envisioned in the existing plan. The U.S. Fish and Wildlife Service has reserved a general passage prescription right under Section 18 of the Federal Power Act. (U.S. Department of Interior letter to FERC, December 23, 1993)
122. Any passage facilities at Arnold Falls Dam must be provided and operated consistent with the most current restoration plan.

Recreation

123. Without the provision of a portage, the project would fail to support the Class B designated use for recreation and boating as an existing use. Access improvement, under investigation by the applicant, will support fishing in the project boundary.

ACTION OF THE DEPARTMENT

Based on its review of the applicant's proposal and the above findings, the Department concludes that there is reasonable assurance that operation of this project as proposed by the applicant and in accordance with the following conditions will not cause a violation of Vermont Water Quality Standards and will be in compliance with sections 301, 302, 303, 306, and 307 of the Federal Clean Water Act, P.L. 92-500, as amended, and other appropriate requirements of state law:

- A. The applicant shall operate and maintain this project as set forth in the findings of fact and conclusions above and these conditions.
- B. Except as allowed in Condition D below, the facility shall be operated in a true run-of-the-river mode where instantaneous flows below the tailrace shall equal instantaneous inflow to the impoundment at all times. When the facility is not operating, all flows shall be spilled at the dam.

The applicant shall, within 90 days of issuance of this certification, furnish a description, hydraulic design calculations, and plans for the measure to be used to maintain true run-of-river flows below the project tailrace.

- C. Whenever the project is operating, a minimum instantaneous flow of 78 cfs shall be spilled over the left-section crest at the dam at all times. If the instantaneous inflow falls below the hydraulic capacity of the turbine unit plus this spillage requirement, all flows shall be spilled at the dam. This spillage requirement, when combined with leakage, is intended to provide a total flow of 103 cfs in the north (left) channel; should leakage diminish substantially from 25 cfs, spillage will have to be adjusted accordingly.

When the project is not generating, a minimum flow of 33 cfs shall be released into the south (right) channel at the dam, unless inflows have declined below 139 cfs, in which case 26% of inflow shall be maintained in the south channel and the remainder maintained in the north channel.

Within 90 days of the issuance of this certification, the applicant shall furnish a description, hydraulic design calculations, and plans for the measure to be used to pass these minimum flows. The filing

shall address conditions with and without flashboards in place, including conditions when the impoundment is being drawn for flashboard replacement and subsequent refilling.

- D. Following the reinstallation of flashboards or an approved special maintenance operation necessitating a drawdown, the impoundment shall be refilled by reducing downstream flows, but to no less than 127 cfs from June 1 to September 30 and 254 from October 1 to May 31. During the period April 1 to May 31 or under circumstances during the other periods when the natural inflow to the project is insufficient to permit both passage of these minimum flows and refilling of the impoundment, the impoundment shall be refilled while releasing 90% of instantaneous inflow downstream at all times.
- E. The applicant shall file for review and approval, within 90 days of the issuance of this certification, a plan for monitoring instantaneous flow releases at the project, both in the bypass and below the tailrace. Following approval of the monitoring plan, the applicant shall then measure instantaneous flows and provide records of discharges at the project on a regular basis as per specifications of the Department. Upon receiving a written request from the applicant, the Department may waive the requirement for flow monitoring at this project provided the applicant satisfactorily demonstrates that the required flow will be discharged at all times.
- F. Within six months of the issuance date of the license, the applicant shall submit a plan for downstream fish passage to the Department of Fish and Wildlife for review and written approval. Downstream passage shall be provided April 1 - June 15 and September 15 - November 15 and shall be functional with and without flashboards in place, with the period subject to adjustment by the Department based on knowledge gained about migration periods for migratory salmonids. The approved plan shall be fully implemented within two years of license issuance and shall include provisions to:
 - 1. minimize passage of fish into the generating unit(s);
 - 2. minimize impingement of fish on trashracks or on devices or structures used to prevent entrainment; and

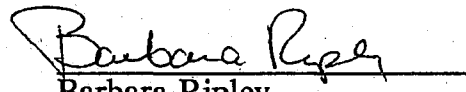
3. convey fish safely and effectively downstream of the project, including flows as necessary to operate conveyance facilities.

The plan shall include an implementation/construction schedule and a proposal for an interim fish bypass method for use until permanent facilities are completed; the interim method shall be utilized beginning with the spring 1995 passage period. The U.S. Fish and Wildlife Service and the Department of Fish and Wildlife shall be consulted during plan development. The plan shall include an erosion control and water management plan designed to assure compliance with water quality standards during construction.

- G. Within two years of a written request by the Agency, the applicant shall provide for upstream fish passage, subject to plan approval by the Department of Fish and Wildlife. The U.S. Fish and Wildlife Service and the Department of Fish and Wildlife shall be consulted during plan development. The plan shall include an erosion control and water management plan designed to assure compliance with water quality standards during construction.
- H. The applicant shall provide the Department with a copy of the turbine rating curves, accurately depicting the flow/production relationship, for the record within one year of the issuance of this certification.
- I. Within 90 days of the issuance of this certification, the applicant shall submit a plan for proper disposal of debris associated with project operation, including trashrack debris, for written approval by the Department. The plan shall include the method used for flashboard construction, including materials used and means of sealing to prevent leakage. The plan shall be designed to prevent or minimize the discharge of debris or trash downstream.
- J. Any proposals for project maintenance or repair work involving the river, including desilting of the dam impoundment, impoundment drawdowns to facilitate repair/maintenance work, and tailrace dredging, shall be filed with the Department for prior review and approval.
- K. The applicant shall provide a canoe portage around Arnold Falls dam by October 1, 1995. The applicant shall consult with the Recreation Section of the Department of Forests, Parks and

Recreation and the Department of Environmental Conservation in the planning, siting, and design of the portage. Design and maintenance plans for the portage shall be filed with the Department of Environmental Conservation and the Department of Forests, Parks and Recreation for review and approval before construction of the portage.

- L. The applicant shall allow continued public access to the river for utilization of the public resources, subject to reasonable safety and liability limitations. Any proposed limitations of access to State waters to be imposed by the applicant shall first be subject to written approval by the Department.
- M. The applicant shall allow the Department to inspect the project area at any time to monitor compliance with certification conditions.
- N. A copy of this certification shall be prominently posted within the facility.
- O. Any change to the project that would have a significant or material effect on the findings, conclusions, or conditions of this certification, including project operation, must be submitted to the Department for prior review and written approval.
- P. The Department may request, at any time, that FERC reopen the license to consider modifications to the license necessary to assure compliance with Vermont Water Quality Standards.


Barbara Ripley
Secretary
Agency of Natural Resources

Dated at Waterbury, Vermont this 16
day of June, 1994.

cc: distribution list

From: [Davis, Eric](#)
To: [Katie Sellers](#); [Crocker, Jeff](#)
Subject: RE: Arnold Falls Hydroelectric Project - Review for LIHI Certification Application
Date: Thursday, November 17, 2016 9:47:07 AM
Attachments: [image002.png](#)

Hi Katie,

As you described, the Passumpsic River in the vicinity of the Arnold Falls project is impaired due to E. coli from the St. Johnsbury wastewater treatment plant and combined sewer system.

I can confirm that the current operations of the Arnold Falls project continue to not be a contributing cause of the river's impairment.

Eric

Eric Davis, River Ecologist

1 National Life Drive, Main 2
Montpelier, VT 05620-3522
802-490-6180 / eric.davis@vermont.gov
<http://www.watershedmanagement.vt.gov/rivers>
(Please note my new e-mail address, effective July 27, 2015)



See what we're up to on our [Blog, Flow](#).

From: Katie Sellers [mailto:Katie.Sellers@KleinschmidtGroup.com]
Sent: Tuesday, October 18, 2016 10:49 AM
To: Crocker, Jeff <Jeff.Crocker@vermont.gov>; Davis, Eric <Eric.Davis@vermont.gov>
Subject: Arnold Falls Hydroelectric Project - Review for LIHI Certification Application

Good Morning Eric and Jeff,

We are working on the Low Impact Hydropower Institute (LIHI) re-certification application for Green Mountain Power's Arnold Falls Hydroelectric Project (FERC No. 2399) located on the Passumpsic River.

The LIHI application asks that we gain your feedback on the following water quality information:

The Arnold Falls Project is located within the Passumpsic River Class B waterway. According to the 2014 State of Vermont 303d List of Impaired Waters, the Passumpsic River from Tremont Street in St. Johnsbury downstream five miles is listed for E-Coli. The St. Johnsbury wastewater treatment facility passes combined sewer overflows. This area includes all waters within the Arnold Falls Project. During the Project's 1994 relicensing process, it was concluded that the continued operation of the

Project would not violate the minimum water quality standards.

Could you please confirm, to your best abilities, that the Project's current operations continue to not be a contributing cause to the river's water quality limitations?

When you have a moment to review, could you please provide us with your feedback on this topic?

Thank you!

Katie

Katie Sellers

Regulatory Coordinator

Kleinschmidt

Office: 207-416-1218

www.KleinschmidtGroup.com



From: Katie Sellers
To: ["Davis, Eric"](#)
Cc: [Andy Qua](#); ["Greenan, John"](#)
Subject: Pierce Mills, Arnold Falls, Gage Projects - Operations Data Submissions for LIHI
Date: Thursday, March 29, 2018 11:36:00 AM
Attachments: [Estimated Plant Curves - Gage, Arnold Falls, Pierce Mills.pdf](#)

This message contains attachments delivered via [ShareFile](#).

- 2015-2016 Arnold Falls Operations Data_FINAL.xlsx (26.5 MB)
- 2015-2016 Gage Operations Data_FINAL.xlsx (24.5 MB)
- 2015-2016 Pierce Mills Operations Data_FINAL.xlsx (28.3 MB)

Download the attachments by [clicking here](#).

Hi Eric,

In response to your request for additional information regarding Low Impact Hydropower Institute (LIHI) Certification review for the Pierce Mills Hydroelectric Project (FERC No. 2396), Arnold Falls Hydroelectric Project (FERC No. 2399), and Gage Hydroelectric Project (FERC No. 2397), Kleinschmidt, on behalf of Green Mountain Power Corporation, herein provides one year (2015-2016) of operations data for each project.

The attached 2015-2016 data depicts project generation, headpond level, river flow, and flashboard data to display operations occurring at the Pierce Mills Project, Arnold Falls Project, and Gage Project. As depicted in attachment cover pages, flow data was either obtained or prorated from USGS gage 01135500 – Passumpsic River at Passumpsic, VT. Strict run-of-river operations are represented well across data sets. Fluctuations in headpond levels shown correlate to changes in river flow and are generally not products of operations. For example, an incident of low pond level that occurred at the Gage Project in February 2016 was a product of an extreme high flow event and the net result of losing all flashboards at once.

In addition, please find theoretical turbine rating curves attached for each project. These theoretical curves were developed using a combination of the attached operations data and standard factory information on individual turbines. These theoretical curves have an accuracy range of approximately +5% to -10%.

Please note that the attached operational data is considered provisional by GMP, but has been vetted with operations staff to identify any likely causes of anomalies. Should you have any questions upon review, please do not hesitate to make contact with John Greenan or myself, as GMP staff are available to provide background information or further explanation as needed.

Thank you,
Katie

*To access ShareFile documents, select the "clicking here" link, fill in your name, email, and organization name when prompted (no passwords required). You will then be allowed to download the documents.

Katie E. Sellers, M.S.

Regulatory Coordinator

Kleinschmidt

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APPENDIX D

FISH PASSAGE

From: Katie Sellers
To: ["Towler, Brett"; "Grader, Melissa"](#)
Cc: ["Greenan, John \(John.Greenan@greenmountainpower.com\)"; "Chaloux, Frank"; "Kirn, Rich"; "Davis, Eric"; "Kratzer, Jud"](#)
Subject: RE: Fish Passage Reviews for Gage, Arnold Falls, Pierce Mills - LIHI
Date: Thursday, May 25, 2017 11:32:00 AM
Attachments: [image005.png](#)

Hi Brett – Want to follow-up on this LIHI review for Gage, Arnold Falls, and Pierce Mills facilities. I have also looped Melissa in on this chain as I understand now that she is the preferred contact for LIHI reviews (if she hasn't already been looped into this).

Please let us know if you have any questions regarding USFWS feedback.

Best
Katie

Katie E. Sellers, M.S.
Regulatory Coordinator

Kleinschmidt

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From: Katie Sellers
Sent: Friday, April 14, 2017 4:45 PM
To: 'Kratzer, Jud' <Jud.Kratzer@vermont.gov>; Towler, Brett <brett_towler@fws.gov>
Cc: Greenan, John (John.Greenan@greenmountainpower.com) <John.Greenan@greenmountainpower.com>; Chaloux, Frank <Frank.Chaloux@greenmountainpower.com>; Kirn, Rich <Rich.Kirn@vermont.gov>; Davis, Eric <Eric.Davis@vermont.gov>
Subject: RE: Fish Passage Reviews for Gage, Arnold Falls, Pierce Mills - LIHI

Hi Jud – Thank you for all of the research that went into providing this feedback – much appreciated.

Best,
Katie

Katie E. Sellers, M.S.
Regulatory Coordinator

Kleinschmidt

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www.KleinschmidtGroup.com

*Providing **practical** solutions for **complex** problems affecting energy, water, and the environment*

From: Kratzer, Jud [<mailto:Jud.Kratzer@vermont.gov>]
Sent: Thursday, March 16, 2017 10:41 AM
To: Katie Sellers <Katie.Sellers@KleinschmidtGroup.com>; Towler, Brett <brett_towler@fws.gov>
Cc: Greenan, John (John.Greenan@greenmountainpower.com)
<John.Greenan@greenmountainpower.com>; Chaloux, Frank
<Frank.Chaloux@greenmountainpower.com>; Kirn, Rich <Rich.Kirn@vermont.gov>; Davis, Eric
<Eric.Davis@vermont.gov>
Subject: RE: Fish Passage Reviews for Gage, Arnold Falls, Pierce Mills - LIHI

Hello Katie,

I felt a bit inadequate to address your latest inquiry, so I spoke to retired fisheries biologist, Len Gerardi. Regarding the effectiveness of downstream fish passage at these three projects, Len said that it was never evaluated for Atlantic salmon smolts or resident species. He did mention that there had been some problems with downstream passage at the Gage Dam. He worked with GMP (CVPS at the time, I believe) to address this issue, and the situation apparently improved.

Len had little information for me regarding compliance and suggested that I contact Eric Davis and Jeff Crocker (VTDEC). They didn't have any information either, so they reached out to USFWS. I have not met Brett, but perhaps he will be your best source of information on compliance.

American eel passage would not be required at these three dams within the next five years.

Thanks,
Jud



Jud Kratzer
Fisheries Biologist
Vermont Fish and Wildlife Department
374 Emerson Falls Rd., Suite 4
St. Johnsbury, VT 05819
[phone] 802-751-0486
[website] www.vermontfishandwildlife.com

From: Katie Sellers [<mailto:Katie.Sellers@KleinschmidtGroup.com>]
Sent: Wednesday, March 08, 2017 7:58 AM
To: Towler, Brett <brett_towler@fws.gov>; Kratzer, Jud <Jud.Kratzer@vermont.gov>
Cc: Greenan, John (John.Greenan@greenmountainpower.com)
<John.Greenan@greenmountainpower.com>; Chaloux, Frank
<Frank.Chaloux@greenmountainpower.com>
Subject: Fish Passage Reviews for Gage, Arnold Falls, Pierce Mills - LIHI

Good Morning Jud and Brett,

As I know you are well aware of Jud, GMP is currently consulting with the Low Impact Hydropower Institute (LIHI) for re-certification of the Pierce Mills Project (FERC No. 2396), Arnold Falls Project (FERC No. 2399), and Gage Project (FERC No. 2397). LIHI has taken an initial review of the certification applications submitted for these projects and has asked that we further consult with both of you on the topic of fish passage.

Per LIHI recommendations, we are hoping that you might be able to provide input on the following two items: a) confirm effectiveness and compliance of downstream fish passage facilities located at Pierce Mills, Arnold Falls, and Gage; and b) confirm that American eel passage will not be required at Pierce Mills, Arnold Falls, or Gage during the next LIHI Certification term (approximate next 5-years).

Do let us know if you have any follow-up questions regarding these reviews.

Thank you,
Katie

Katie Sellers

Regulatory Coordinator

Kleinschmidt

Office: 207-416-1218

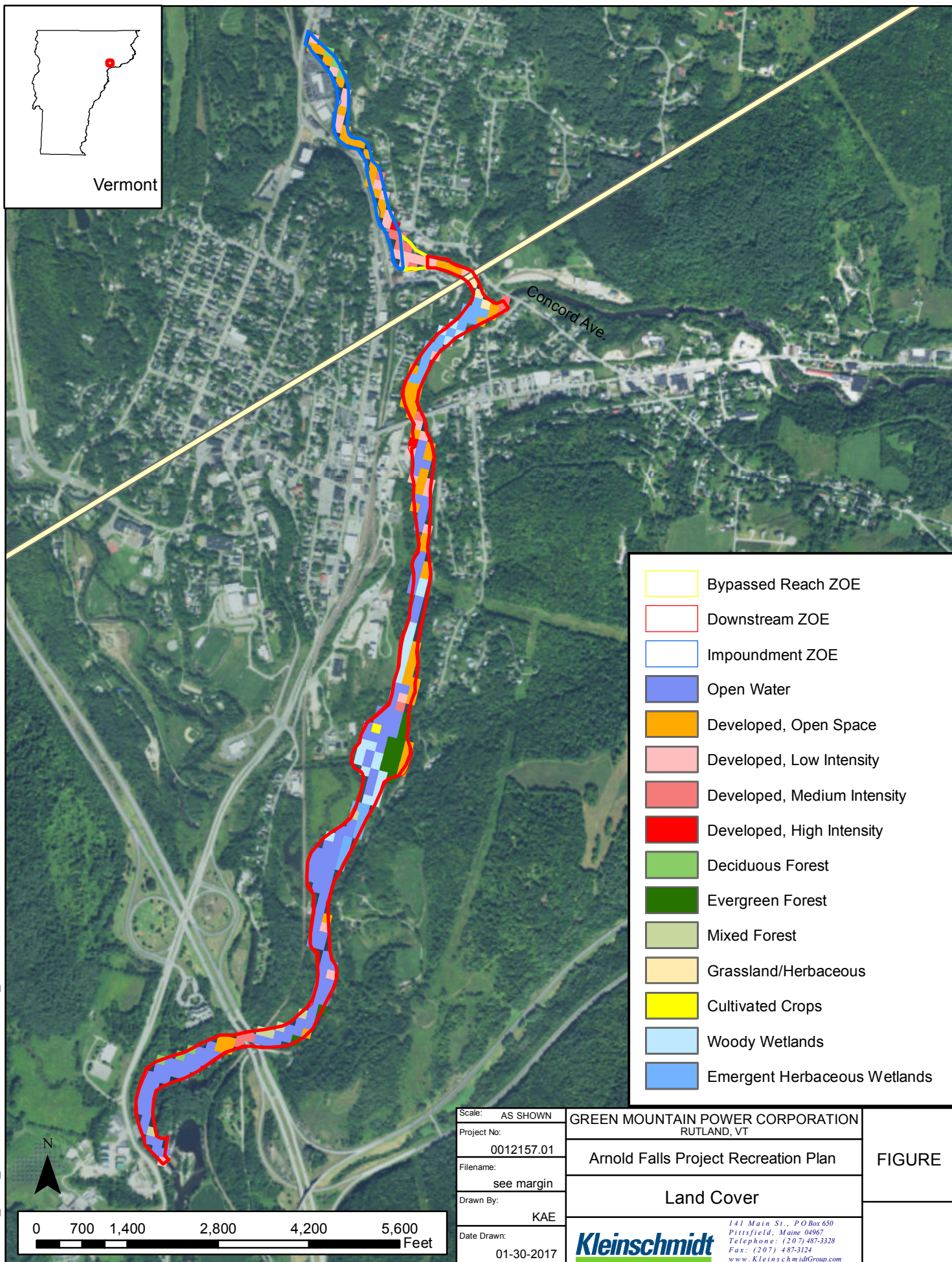
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APPENDIX E

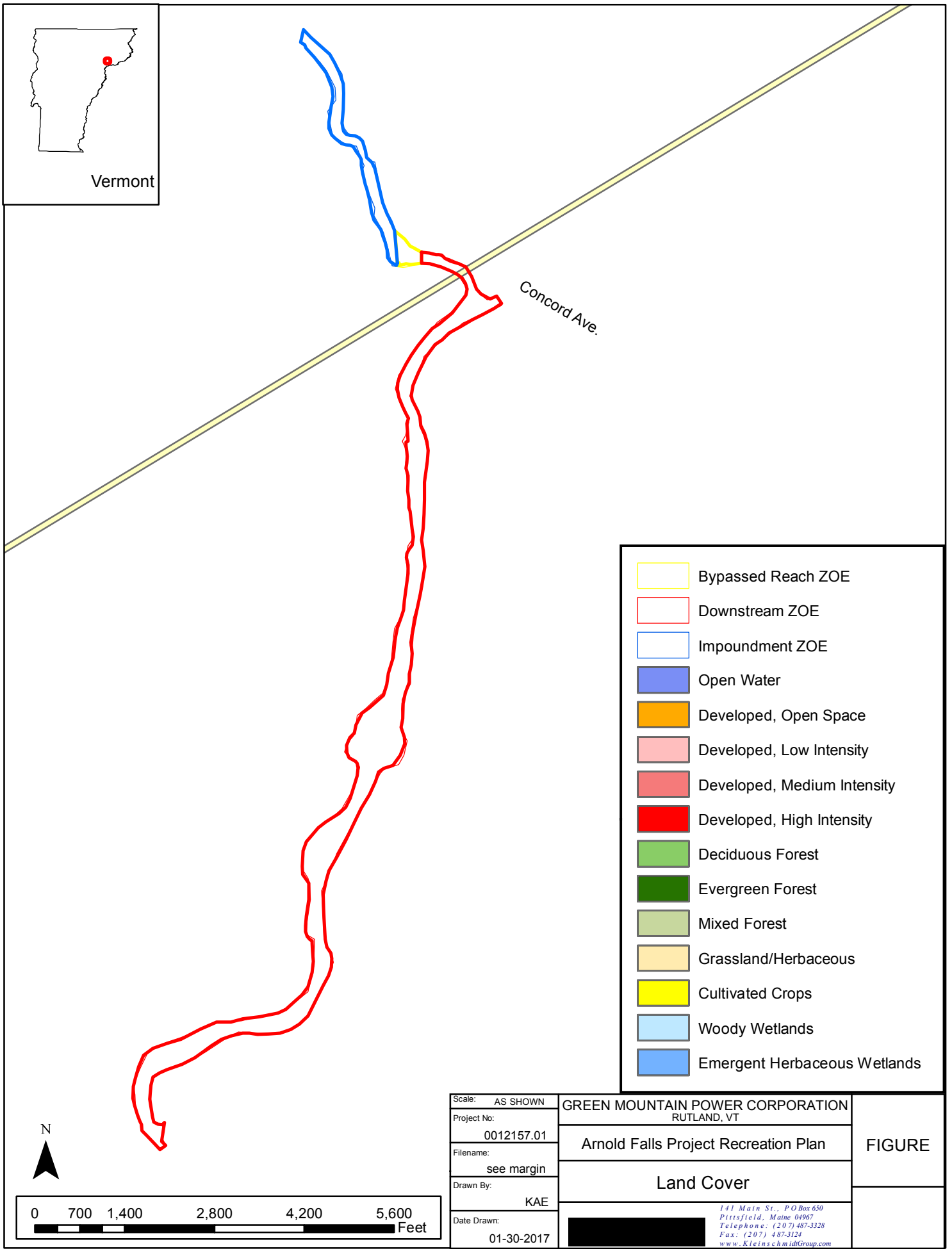
LANDCOVER

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Source:

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Source:

APPENDIX F

THREATENED AND ENDANGERED SPECIES



United States Department of the Interior



FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 COMMERCIAL STREET, SUITE 300
CONCORD, NH 03301
PHONE: (603)223-2541 FAX: (603)223-0104
URL: www.fws.gov/newengland

Consultation Code: 05E1NE00-2017-SLI-0408

December 06, 2016

Event Code: 05E1NE00-2017-E-00515

Project Name: Arnold Falls LIHI

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment



United States Department of Interior
Fish and Wildlife Service

Project name: Arnold Falls LIHI

Official Species List

Provided by:

New England Ecological Services Field Office

70 COMMERCIAL STREET, SUITE 300

CONCORD, NH 03301

(603) 223-2541

<http://www.fws.gov/newengland>

Consultation Code: 05E1NE00-2017-SLI-0408

Event Code: 05E1NE00-2017-E-00515

Project Type: DAM

Project Name: Arnold Falls LIHI

Project Description: Review of current operations for LIHI certification application.

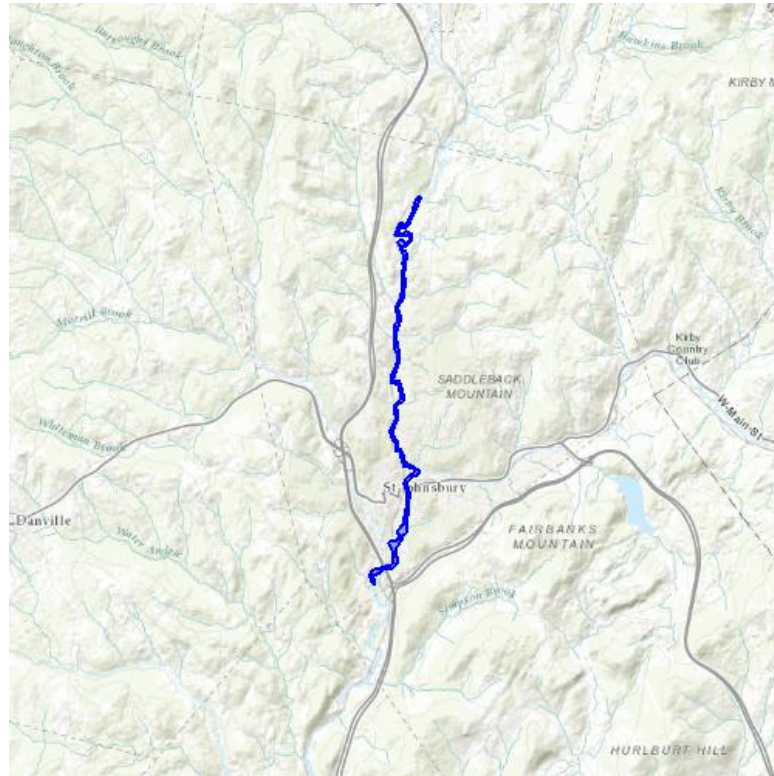
Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.



United States Department of Interior
Fish and Wildlife Service

Project name: Arnold Falls LIHI

Project Location Map:



Project Coordinates: The coordinates are too numerous to display here.

Project Counties: Caledonia, VT



United States Department of Interior
Fish and Wildlife Service

Project name: Arnold Falls LIHI

Endangered Species Act Species List

There are a total of 1 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

| Mammals | Status | Has Critical Habitat | Condition(s) |
|---|------------|----------------------|--------------|
| Northern long-eared Bat (<i>Myotis septentrionalis</i>) Population: Wherever found | Threatened | | |



United States Department of Interior
Fish and Wildlife Service

Project name: Arnold Falls LIHI

Critical habitats that lie within your project area

There are no critical habitats within your project area.

From: [Darling, Scott](#)
To: [Kratzer, Jud](#); [Katie Sellers](#)
Cc: [Buck, John](#)
Subject: RE: Gage Hydroelectric Project - Review for LIHI Certification Application
Date: Wednesday, October 19, 2016 10:47:47 AM
Attachments: [image002.png](#)

Katie:

Given no trees are being felled for these projects, there will be no impacts to northern long-eared bats.

Scott Darling

Scott R. Darling, CWB
Wildlife Management Program Manager
Vermont Fish and Wildlife Department
271 North Main Street
Rutland, VT 05701
Office: 802-786-3862
scott.darling@vermont.gov

From: Kratzer, Jud
Sent: Wednesday, October 19, 2016 9:57 AM
To: Darling, Scott <Scott.Darling@vermont.gov>
Cc: Buck, John <John.Buck@vermont.gov>
Subject: RE: Gage Hydroelectric Project - Review for LIHI Certification Application

Scott,

I passed your question on to Katie. You can see her response below.

Yesterday, she sent another email asking the exact same questions for the Arnold Falls Dam which is about 1 mile upstream of the Gage Dam, right in the middle of St. Johnsbury. In case it helps, the coordinates of the two dams are:

Gage: 44.39816, -72.02323
Arnold Falls: 44.42480, -72.01362

Thanks,
Jud

Katie's response:

Hi Jud, No tree clearing. Nothing is changing at all with the projects and they will continue to operate and exist as they currently are right now.

Thank you!
Katie

Katie Sellers
Regulatory Coordinator
Kleinschmidt
Office: 207-416-1218
www.KleinschmidtGroup.com



From: Kratzer, Jud [<mailto:Jud.Kratzer@vermont.gov>]
Sent: Wednesday, October 19, 2016 8:57 AM
To: Katie Sellers <Katie.Sellers@KleinschmidtGroup.com>
Subject: RE: Arnold Falls Hydroelectric Project- Review for LIHI Certification Application

Hello Katie,

Our bat biologist asked if any tree clearing would be necessary. This question would apply to both dams.

Thanks,
Jud

From: Darling, Scott
Sent: Tuesday, October 18, 2016 8:53 AM
To: Kratzer, Jud <Jud.Kratzer@vermont.gov>
Subject: RE: Gage Hydroelectric Project - Review for LIHI Certification Application

Jud:
Can we assume no tree cutting is needed?

Scott

From: Kratzer, Jud

Sent: Thursday, October 13, 2016 4:08 PM

To: Darling, Scott <Scott.Darling@vermont.gov>; Buck, John <John.Buck@vermont.gov>

Subject: FW: Gage Hydroelectric Project - Review for LIHI Certification Application

Gentlemen,

Please see the question below from Kleinschmidt. The Gage Dam is on the Passumpsic River just downstream of St. Johnsbury Village. I can't imagine how the continued operation of a small hydro dam could affect bats or eagles, but you guys are the experts. Let me know if you need any more details on the location, the dam, operations, etc.

Thanks,
Jud

From: Emerson, Peter

Sent: Thursday, October 13, 2016 2:02 PM

To: Kratzer, Jud <Jud.Kratzer@vermont.gov>

Subject: FW: Gage Hydroelectric Project - Review for LIHI Certification Application

Jud,

I think this is yours.

Pete

Note: My email changed to Peter.emerson@vermont.gov on August 1, 2015.

Pete Emerson
Fisheries Biologist
1229 Portland Street, Suite 201
St. Johnsbury, VT 05819
(802) 751-0485
Peter.emerson@vermont.gov

From: Katie Sellers [<mailto:Katie.Sellers@KleinschmidtGroup.com>]

Sent: Thursday, October 13, 2016 1:52 PM

To: Emerson, Peter <Peter.Emerson@vermont.gov>

Cc: Andy Qua <Andy.Qua@KleinschmidtGroup.com>; Kayla Easler
<Kayla.Easler@KleinschmidtGroup.com>

Subject: Gage Hydroelectric Project - Review for LIHI Certification Application

Good Afternoon Peter,

Kleinschmidt Associates is working with Green Mountain Power on a number of Low Impact Hydropower Institute (LIHI) re-certifications for a group of hydroelectric projects previously certified

by LIHI in 2012. The first of which is for the Gage Hydroelectric Project (FERC No. 2397) located on the Passumpsic River.

Within the LIHI re-certification application we are required to gain the following feedback from the Vermont Division of Fish and Wildlife:

The 1994 Environmental Assessment notes that the continued operation of the Gage Project would not adversely affect populations of species inhabiting unique habitat within the Passumpsic River. Currently now it is identified that the federally threatened and state endangered northern long-eared bat and state endangered bald eagle may have presence within the project area. Can you please confirm that the Project's continued run of river operations do not negatively affect these species that may have transient occurrence within the project area?

If you (or another appropriate contact) could please provide us with feedback on this topic at your earliest convenience it would be much appreciated.

Thank you!
Katie Sellers

Katie Sellers
Regulatory Coordinator

Kleinschmidt

Office: 207-416-1218

www.KleinschmidtGroup.com



From: [Kratzer, Jud](#)
To: [Katie Sellers](#)
Subject: FW: Gage Hydroelectric Project - Review for LIHI Certification Application
Date: Friday, October 21, 2016 12:35:18 PM
Attachments: [image002.png](#)

Katie,

See below for bald eagles...

From: Buck, John
Sent: Thursday, October 20, 2016 4:15 PM
To: Kratzer, Jud <Jud.Kratzer@vermont.gov>; Darling, Scott <Scott.Darling@vermont.gov>
Subject: RE: Gage Hydroelectric Project - Review for LIHI Certification Application

Jud,

The continued operation of these two dams is unlikely to cause negative impacts to Bald Eagle recovery in the Passumpsic River drainage.

John

John M. Buck, Wildlife Biologist

Nongame Bird Project Leader
Vermont Fish and Wildlife Department
5 Perry St., Suite 40
Barre, Vermont 05641

john.buck@Vermont.gov

Desk-802-476-0196

Office-802-476-0199

From: Kratzer, Jud
Sent: Thursday, October 13, 2016 4:08 PM
To: Darling, Scott <Scott.Darling@vermont.gov>; Buck, John <John.Buck@vermont.gov>
Subject: FW: Gage Hydroelectric Project - Review for LIHI Certification Application

Gentlemen,

Please see the question below from Kleinschmidt. The Gage Dam is on the Passumpsic River just downstream of St. Johnsbury Village. I can't imagine how the continued operation of a small hydro dam could affect bats or eagles, but you guys are the experts. Let me know if you need any more details on the location, the dam, operations, etc.

Thanks,

Jud

From: Emerson, Peter

Sent: Thursday, October 13, 2016 2:02 PM

To: Kratzer, Jud <Jud.Kratzer@vermont.gov>

Subject: FW: Gage Hydroelectric Project - Review for LIHI Certification Application

Jud,

I think this is yours.

Pete

Note: My email changed to Peter.emerson@vermont.gov on August 1, 2015.

Pete Emerson

Fisheries Biologist

1229 Portland Street, Suite 201

St. Johnsbury, VT 05819

(802) 751-0485

Peter.emerson@vermont.gov

From: Katie Sellers [<mailto:Katie.Sellers@KleinschmidtGroup.com>]

Sent: Thursday, October 13, 2016 1:52 PM

To: Emerson, Peter <Peter.Emerson@vermont.gov>

Cc: Andy Qua <Andy.Qua@KleinschmidtGroup.com>; Kayla Easler
<Kayla.Easler@KleinschmidtGroup.com>

Subject: Gage Hydroelectric Project - Review for LIHI Certification Application

Good Afternoon Peter,

Kleinschmidt Associates is working with Green Mountain Power on a number of Low Impact Hydropower Institute (LIHI) re-certifications for a group of hydroelectric projects previously certified by LIHI in 2012. The first of which is for the Gage Hydroelectric Project (FERC No. 2397) located on the Passumpsic River.

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If you (or another appropriate contact) could please provide us with feedback on this topic at your earliest convenience it would be much appreciated.

Thank you!
Katie Sellers

Katie Sellers
Regulatory Coordinator

Kleinschmidt

Office: 207-416-1218

www.KleinschmidtGroup.com



APPENDIX G
CULTURAL RESOURCES

From: [Greenan, John](#)
To: [Katie Sellers](#); [Dillon, Scott](#)
Cc: [Chaloux, Frank](#)
Subject: RE: Passumpsic Projects - Annual CRMP Report Question
Date: Friday, April 07, 2017 11:57:31 AM
Attachments: [image002.png](#)

Hi Scott-

I hope all is well. Any chance you can take a look our Passumpsic CRMP request soon? Thanks.

John G

From: Katie Sellers [mailto:Katie.Sellers@KleinschmidtGroup.com]
Sent: Tuesday, March 07, 2017 7:15 PM
To: Dillon, Scott
Cc: Greenan, John; Chaloux, Frank
Subject: Passumpsic Projects - Annual CRMP Report Question

Hi Scott – Hope all is well.

Want to touch base with you in regards to the Annual CRMP Report for the Passumpsic Hydroelectric Projects (Pierce Mills Project (FERC No. 2396); Arnold Falls Project (FERC No. 2399); Gage Project (FERC No. 2397); Passumpsic Project (FERC No. 2400)).

We are currently consulting with the Low Impact Hydropower Institute (LIHI) for re-Certifications of the above noted Passumpsic Projects. Per review of our initial application submissions LIHI has inquired, after reading through Annual CRMP Reports, to see if the altered 3-year CRMP Reporting timeline, as recommended by Charity Baker in the last several years of Reports, will be implemented within the next 5-years (LIHI certification term). The 2016 CRMP Report is attached for your reference.

I understand that this recommendation has not been specifically discussed beyond Annual Report submissions, therefore, I believe it would make sense to review not only for the fulfillment of LIHI application requirements but to also understand future expectations for these Reports.

Any thoughts you have on this topic would be much appreciated. Also, if you would like to set-up a call to discuss in further detail do let us know.

Thank you,
Katie

Katie Sellers
Regulatory Coordinator

Office: 207-416-1218
www.KleinschmidtGroup.com

APPENDIX H

RECREATION

From: [Greenan, John](#)
To: [Katie Sellers](#)
Subject: FW: Passumpic River Recreational Assessment - Community Meeting
Date: Tuesday, November 21, 2017 9:40:08 AM

From: noah.pollock@gmail.com [mailto:noah.pollock@gmail.com] **On Behalf Of** Noah Pollock
Sent: Friday, April 29, 2016 10:39 AM
Subject: Passumpic River Recreational Assessment - Community Meeting

Dear friends,

Please join us to learn about an emerging initiative to improve recreational opportunities along the Passumpic River. The meeting is scheduled for Wednesday, May 25th, from 7:00 to 8:30 P.M, at the Fairbanks Museum and Planetarium in St. Johnsbury.

In collaboration with the NorthWoods Stewardship Center, our goals are to foster improved stewardship of access areas, create an updated map and guide for visitors, and, with partners, promote flood resiliency and riparian lands conservation.

At the meeting, you will have a chance to:

- See the results of an inventory and assessment of current and potential river access points and portage trails, and provide input into site conditions and stewardship opportunities
- Brainstorm priority projects that will improve water-based recreational opportunities while promoting flood resiliency and ecological restoration.
- Help craft a shared vision to guide this work going forward.

Light refreshments will be provided. RSVPs appreciated. Please share this invite to others. Hope you can join us on the 25th!

Sincerely,

--

-Noah Pollock
Project Manager, Vermont River Conservancy
[\(802\) 540-0319](tel:8025400319) (direct)
[\(802\) 229-0820](tel:8022290820) (VRC office)
29 Main St, Montpelier VT 05602
noah@vermontriverconservancy.org
www.vermontriverconservancy.org

From: [Davis, Eric](#)
To: [Katie Sellers](#); [Greenan, John](#)
Cc: [Andy Qua](#); [Chaloux, Frank](#); [Crocker, Jeff](#)
Subject: Passumpsic Projects: LIHI Recreation Criterion
Date: Friday, January 19, 2018 11:03:32 AM

Good afternoon John and Katie,

From prior conversations, I understand that Kleinschmidt is assisting Green Mountain Power is preparing an application to LIHI for re-certification of three hydroelectric projects, specifically the Pierce Mills (P-2396), Arnold Falls (P-2399), and Gage (P-2397) stations. The Agency has not yet conducted a full review of the compliance of the projects with certification conditions and LIHI criteria, but as a result of past consultation, the Agency can assess the recreation criterion, as it may be helpful in preparation of the application.

The applicable LIHI recreation criterion for these projects are H-2, which states, “if there are comprehensive resource agency recommendations for recreational access or accommodation (including recreational flow releases) on record, or there is an enforceable recreation plan in place, the Facility demonstrates that it is in compliance...”. Further, facilities may meet the H-PLUS criterion if, “the Facility has created significant new public recreational opportunities in the area of the Facility beyond any otherwise required by agencies...”

H-2 Criterion

Article 413 of the License for Pierce Mills project required the Licensee to conduct a study of recreational use of all the Licensee’s hydropower projects on the Passumpsic River on the tenth and twentieth anniversary of the license. This article specifically required: 1) recreation use data, by activity; 2) a discussion of the adequacy of recreation facilities at each project site to satisfy recreation demand; 3) a description of the methodology used to collect all study data; 4) if there is a need for additional facilities, Licensee’s proposals to provide for them. As part of the twenty year study, the Licensee facilitated a site visit to each facility for interested stakeholders to assess the recreation facilities. The Agency participated in these visits, assessed the facilities in the context of the required recreation plans, and made recommendations for improvements. The Licensee agreed to make recreational improvements at each project, including improvements to access areas and portage trails. The recreational study and improvements were approved by FERC on November 30, 2015. Given the Agency consultation during this process, the Agency can confirm compliance with the approved recreation plans for the projects.

H-PLUS Criterion

Article 412 of the Pierce Mills License required GMP to produce and make available to the public, the Passumpsic River Canoeing and Recreation Guide. While the creation of the guide was originally required by the License, the Licensee has gone above and beyond the license requirement by continuing to update the guide throughout the license term to ensure the public can both enjoy recreational opportunities at the facilities and throughout the Passumpsic River watershed. In 1999, in collaboration with recreation section of the Vermont Department of Forests, Parks, and

Recreation, the Town of St. Johnsbury, the Passumpsic River Watch, and other interested groups and individuals, the Licensee revised the guide to focus on the seven hydroelectric generating stations along the river's 23-mile mainstem, which was subsequently distributed free of charge through the region. As part of the aforementioned twenty year study, the Licensee voluntarily agreed to again update the guide. As part of this update, GMP initiated consultation with interested stakeholders and enlisted the Vermont River Conservancy, the Northwood Stewardship Center, and a local historian to prepare new, detailed riverway maps, identify recreational and historic features, and update text and photographs. In addition to project affected area, the updated guide includes information about the East Branch of the Passumpsic River, the west branch of the Passumpsic River as well as a reach of the Moose River tributary. This was a significant update that highlighted new recreational opportunities. Both in the voluntary and comprehensive nature of the revision and , as well as the geographic expansion that includes recreational opportunities throughout the watershed, GMP went beyond the scope of Pierce Mills' License Article 412 to ensure the public can not only enjoy recreational opportunities in the area of the facilities or the affected river reach, but also additional opportunities throughout the watershed. In light of the Licensee's efforts to support recreational access and enjoyment in the watershed, the Agency would support qualification for the H-PLUS criterion.

Please note that the applicability of this review is limited to criterion H. Once the Agency has the opportunity to conduct a full review, the Agency intends to draft a letter summarizing its findings, including a recommendation on re-certification.

Thank you,
Eric

Eric Davis, River Ecologist

1 National Life Drive, Main 2
Montpelier, VT 05620-3522
802-490-6180 / eric.davis@vermont.gov
<http://www.watershedmanagement.vt.gov/rivers>
(Please note my new e-mail address, effective July 27, 2015)



See what we're up to on our [Blog, Flow](#).