

**TRANSCANADA HYDRO NORTHEAST INC.
DEERFIELD RIVER PROJECT (LP 2323)**

LOW IMPACT HYDROPOWER CERTIFICATION APPLICATION

**ATTACHMENT D
DETAILED RESPONSES TO APPLICABLE LIHI QUESTIONS**

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<u>Question B.1.a</u>	Water Quality – Water Quality Certifications
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A.1 – Flow Conditions

The Project is in compliance with flow conditions and reservoir elevations for fish and wildlife protection, mitigation and enhancement for reaches below all tailraces and all bypassed reaches. These requirements are included in License Articles 401 through 406. Flows and reservoir elevations are monitored continuously. Hourly flow and elevation data for each month at each Project development are reported annually to FERC and the Resource Agencies. Temporary flow deficiencies have occurred infrequently at some facilities. Most have been caused by emergency situations, mechanical equipment or instrumentation failure, or low inflows. In all cases, these deficiencies were of short duration; corrective and preventative actions were taken immediately to avoid recurrence; and all such incidents are reported to FERC and the Resource Agencies. There have been no compliance or license violations as a result of these minor deficiencies.

Summary of Flow Requirements

River Reach Below	Minimum Flow	Other Flow Conditions
Somerset Dam	30 CFS from Oct. 1 to Dec. 15 48 CFS from Dec. 16 to Feb. 28 30 CFS from March 1 to April 30 12 CFS from May 1 to Sep. 30	<ul style="list-style-type: none"> Minimum flow guaranteed from storage. From May 1 to July 31, flow may be reduced to 9 CFS if necessary to maintain reservoir elevations. Up-ramping: 100 CFS or less over 24 hours from Aug 1 to Apr 30. Rate can be suspended as necessary to lower the reservoir to meet the common loon nesting target elevation by May 1. Down-ramping: 50 CFS or less over 24 hours.
Searsburg Dam	The lesser of 35 CFS or inflow from June 1 to Sep. 30. 55 CFS or inflow from Oct. 1 to May 31.	
Harriman Dam	70 CFS from Oct. 1 to June 30 57 CFS from July 1 to Sep. 30	<ul style="list-style-type: none"> Minimum flow guaranteed from storage. Rising or stable water levels in Harriman reservoir from April 1 to June 15 to protect fishery resources. Maximum 1 foot per day drawdown from June 16 to July 15.
Sherman	n/a	n/a
Deerfield No. 5 Dam	The lesser of 73 CFS or inflow	Inflow cannot be less than the 57 CFS guaranteed from Harriman.
Deerfield No. 4 Dam	The lesser of 100 CFS or inflow from Oct. 1 to May 31. The lesser of 125 CFS or inflow from June 1 to Sep. 30.	Downstream fish passage flows (Table A.1-2)
Deerfield No. 3 Dam	The lesser of 100 CFS or inflow.	Downstream fish passage flows (Table A.1-2)
Deerfield No. 2 Dam	200 CFS	<ul style="list-style-type: none"> Minimum flow guaranteed from storage. Changes from the minimum flow to generation flows cannot occur on average more than two times per day and more than ten times per week in order to reduce the effects of rapidly changing flows on fish resources. Downstream fish passage flows (Table A.1-2)

In a recent FERC Order (02/24/09) approving the Company's Final Downstream Fish Passage Plan pursuant to License Article 408 (see also Section C.1 and C.6 below), the following additional flow requirements were set, based on Resource Agency recommendations:

Deerfield No. 4:

- a) During spring passage season from April 1 through June 15 when the station is generating:
 1. Between the period from 1800 to 0600, the existing fish passage gate will be set to pass the maximum flow possible while maintaining a 2-foot differential between the pond elevation and the water level below the gate inside the vertical intake structure to prevent escapement. The flow is approximately 175 cubic feet per second (cfs).
 2. Between the period of 0600 and 1800, the fish passage gate will pass the required habitat protection minimum flow, unless spill over the crest or flashboards is occurring or likely to occur. The required habitat protection minimum flow is the lesser of 100 cfs or inflow from October 1 to May 31 and the lesser of 125 cfs or inflow from June 1 to September 30. If spill should occur, the fish passage gate will be opened to pass as much as possible (estimated 175 cfs) while maintaining a 2-foot differential between the pond elevation and the water level below the gate inside the vertical intake structure to prevent escapement.
- b) During spring passage season from April 1 through June 15 period when the station is not generating; the fish passage gate will pass the required habitat protection minimum flow.
- c) Before initiating any generation, the fish passage gate must first pass the maximum flow possible while maintaining a 2-foot differential between the pond elevation and the water level below the gate inside the vertical intake structure.
- d) The previously required fall passage season of September 15 to November 15 will no longer be required. However, the fish passage gate will discharge the required habitat protection minimum flow, unless sufficient flow below the dam is provided by other means such as over the spillway or through other gates if necessary.

Deerfield No. 3:

- a) During the spring passage season of April 1 through June 15 when the station is generating:
 1. Between the period from 1800 to 0600, the fish passage facility will be operated such that the gated flow is approximately 30-50 percent of intake flow. This equates to the following flows:
 - A minimum of 100 cfs during non-generation periods;
 - 250 cfs when one unit is running
 - 350 cfs when two units are running
 - 500 cfs when three units are running when new angled bar rack is not in place or under construction;

- 350 cfs when all three units are operating with new angled bar rack installed and functional.
2. Between the period from 0600 to 1800, the fish passage gate will be operated to pass the required habitat protection minimum flow. The required habitat protection minimum flow is the lesser of 100 cfs or inflow.
- b) During periods when the station is not generating: The previously required fall passage season of September 15 to November 15 will no longer be required. However, the fish passage gate will discharge the required habitat protection minimum flow, unless sufficient flow below the dam is provided by other means such as over the spillway or through other gates if necessary.
 - c) Agreement has been reached with the fishery agencies to install an angled bar rack system at the dam to prevent out-migrating smolts from passing the intakes to the forebay. The design and schedule for installation has been negotiated with the agencies and the project will be constructed and completed to meet the 2011 spring passage requirements.

Deerfield No.2:

- a) During spring passage season from April 1 through June 15 during all hours whether the station is or is not generating:
 1. Between the period from 1800 to 0600, the #2 sluice gate will be utilized as the spring downstream fish passage gate, passing either the required habitat protection minimum flow or greater flow, equivalent to approximately 30-50 percent of intake flow. This equates to the following flows:
 - 200 cfs if no generating units are operating
 - 250 cfs when one unit is running
 - 350 cfs when two units are running
 - 500 cfs when all three units are operating.
 2. Between the period from 0600 to 1800: When spill is unnecessary to pass inflows, the #2 Sluice gate will be closed and generating units will provide means for both fish passage and the required habitat protection minimum flow of 200 cfs. If spill is necessary, a combination of generation, sluice gates and overflow crest control will be used to pass flows.
- b) The previously required fall passage season of September 15 to November 15 will no longer be required.

B.1.a – Water Quality Certifications

The Project is in compliance with all conditions of the Clean Water Act Section 401 water quality certifications. The Vermont water quality certification was issued January 30, 1995; and the Massachusetts water quality certification was issued on December 14, 1994. Both are included as appendices to the 1997 FERC License (see Attachment A).

Harriman:

Article 414 of the License, and Condition G of the Vermont water quality certificate required the Company to conduct a study to monitor dissolved oxygen (DO) and temperature of the Deerfield River at three locations below Harriman Dam, after initiation of the new minimum flows stipulated in License Article 405. The purpose of the monitoring was to determine if stream flows below Harriman dam support Vermont's water quality standards levels for temperature and DO necessary for the normal development of trout.

Condition H of the Vermont water quality certificate stipulates that the Resource Agency could request the Company to implement measures as necessary to meet dissolved oxygen standards and/or raise the water temperature in the Harriman bypass sufficiently to support high quality habitat for aquatic biota and fish, including the provision of a temperature regime that does not impair the growth rates of fish. To date, the agency has not made such a request.

B.2 and B.3 – Water Quality Standards – CWA Section 303(d)

Some areas within the Project are identified by Vermont and Massachusetts in their respective 2008 Clean Water Act Section 303(d) List of Impaired Waters. However, no Project facilities are identified as causing these water quality impairments.

The State of Vermont 2008 Water Quality Assessment Report¹ (305B Report) states:

“Deposition of pollutants (mercury and low pH) to the Vermont landscape from the atmosphere is principally responsible for the impairment of fish consumption.” (p. 20).
The Report concludes: *“In the case of [all] reservoirs within the Deerfield River drainage, mercury levels are attributed to natural watershed susceptibility.”* (p. 46).

The Report also states: *“Regional and long-range emissions of acid-forming precursors cause acidification of Vermont waterbodies. The atmospheric deposition of nitrous oxide (NO_x) and sulfate (SO₄) from Midwestern sources (and NO_x from regional and mid-Atlantic mobile sources) has resulted in acidification of 34 lakes and eight streams within Vermont.”* (p. 21). This includes reaches below Somerset Dam and Searsburg Dam that have been identified as impaired for aquatic life uses due to low pH from atmospheric deposition.²

¹ http://www.vtwaterquality.org/planning/docs/305b/pl_2008.305b-report.all_sections.pdf

² http://www.vtwaterquality.org/planning/docs/pl_2008.303d_Final.pdf

The Massachusetts 2008 Integrated List of Waters Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 303(d) and 305(b) of the Clean Water Act³ separates waters into different categories of impairment. The Massachusetts portion of Sherman Reservoir is identified as a Category 5 Water, requiring a TMDL, due to impairment from metals (p. 115). All other reaches in the vicinity of, and below Project facilities are listed as Category 2 Waters, currently supporting the uses for which they have been assessed (although not all uses may have been assessed). Uses of aquatic life, primary contact, secondary contact and aesthetics are currently supported in these reaches (p 45).

In the 2004 Deerfield River Watershed Assessment Report⁴, sediment grab samples from Sherman Reservoir showed elevated levels of arsenic and copper. Impoundments at Deerfield No. 4, No. 3 and No. 2 also showed slightly elevated levels of arsenic (pp. 30-31). No potential sources of metals impairment were identified in that report or in the State's 2006 Section 303(d) report to US EPA. The Massachusetts Department of Public Health also issued a fish consumption advisory for Sherman Reservoir due to elevated mercury levels from atmospheric deposition. As a result, the fish consumption use for this portion of the river was categorized as impaired (p. 30).

However, it is extremely unlikely that the Project is the cause of impairment. Arsenic occurs naturally throughout New England, and both arsenic and copper are components of atmospheric deposition due to coal and oil power generation in the Midwest. Historical records also identify former leather tanneries, mines and other potential sources of arsenic and copper from facilities that once operated throughout the region.

C.1 – Anadromous Fish Passage

The Project is in compliance with *Mandatory Fish Passage Prescriptions* as specified in the License for upstream and downstream passage of anadromous fish, specifically Atlantic salmon. Upstream fish passage requirements apply to Deerfield No. 2; downstream fish passage requirements apply to Deerfield No. 4, Deerfield No. 3 and Deerfield No. 2 developments.

Deerfield No. 4, No. 3 and No. 2 (see also Section A.1 above):

Downstream Passage

In accordance with License Articles 408 and 411, downstream fish passage facilities were installed and have been operated and monitored at Deerfield No. 4, No. 3 and No. 2 since 1999. Since that time numerous alterations have been made to the fish passage structures and in operational strategies during spring passage season. FERC recently approved (02/24/09) the Company's Final Downstream Fish Passage Plan (the Plan). The Plan constitutes the Company's downstream passage compliance document, developed as a result of many years of agency consultation; monitoring and effectiveness studies; modification of existing passage structures; operating alternative passage devices; modifying flows (see Section A.1 above); and ultimately proposing significant structural changes.

³ <http://www.mass.gov/dep/water/resources/08list2.pdf>

⁴ http://www.mass.gov/Eoeaa/docs/eea/water/assess_deerfield.pdf

Structural changes have been, or are being, completed in accordance with the Plan's implementation schedule and in consultation with the Resource Agencies. At Deerfield No. 4, barrier netting was installed in 2009 at the forebay and monitored to lessen stranding of out-migrating smolts during the spring passage season. At Deerfield No. 3, agreement has been reached with the fishery agencies to install an angled bar rack system at the dam to prevent out-migrating smolts from passing the intakes to the forebay. The design and schedule for installation has been negotiated with the agencies and the project will be constructed and completed to meet 2011 spring passage requirements. At Deerfield No. 2, a larger sluice gate located next to the intakes is now the designated fish passage gate. In 2009, a guidance wall was installed downstream of the gate on the spillway ogee to provide greater depth and protection for smolts. Additional modifications were made to the bottom sill of the ogee, and an old sub-gate was covered to provide a smoother surface.

Upstream Passage

In accordance with License Articles 409, 410, 411 and 413, implementation of upstream fish passage requirements at Deerfield No. 2 was based on a trigger number of Atlantic salmon present in the reach downstream of Deerfield No. 2:

- Twelve adult Atlantic salmon present below the No. 2 dam for each of two consecutive years, as verified by an interim fish trapping system; or
- Four adult Atlantic salmon below the dam for each of two consecutive years as determined by the radio-tagging monitoring program required in Article 413.

Since 1998, Atlantic salmon have been annually captured, radio-tagged and released in the Connecticut River downstream of its confluence with the Deerfield River. The Company, in conjunction with the Resource Agencies, annually conducts monitoring of fish movement in the Deerfield River and in the Connecticut River. Five adults reached Deerfield No. 2 in 2005, seven in 2006, and four in 2007. Although the trigger number had been met for two consecutive years by 2006, the Resource Agencies have not yet requested the Company to construct upstream passage facilities in accordance with License Article 409. Instead, agencies have chosen to have the Company continue the adult salmon radio-tagging monitoring program. This program provides crucial information about the distribution and movement of returning adults released at Holyoke Dam into the upper Connecticut River basin.

Searsburg:

Conditions K and M of the Vermont water quality certification stipulate implementation of downstream, and upstream fish passage, respectively, at Searsburg Dam. These conditions are contingent upon a request from the Vermont Department of Fish and Wildlife. To date, no such requests have been made.

C.6 – Entrainment Protection

Deerfield No. 4, Deerfield No. 3, and Deerfield No. 2 - see Section C.1 above.

Searsburg:

The Project is in compliance with License Article 418 and Condition L of the Vermont water quality certificate to monitor the effectiveness of trashracks at Searsburg Dam to reduce fish impingement and entrainment. These requirements are contingent upon a request from the Vermont Department of Fish and Wildlife. To date, no such request has been made.

D.2 – Enhancement Fund

In accordance with License Article 429, the Company created the Deerfield River Basin Environmental Enhancement Fund, in the amount of \$100,000. The fund's purpose is to finance watershed conservation; development of low impact recreational and educational projects and facilities; and the planning, design, maintenance and monitoring of such facilities and projects. The Vermont Community Foundation⁵ is the Fund Trustee, and they, along with the Community Foundation of Western Massachusetts⁶, jointly administer grants distributed under the fund.

As of the end of calendar year 2008 the fund balance was \$129,213.70. Two rounds of grant-making in 2003 (5 grantee recipients and grants totaling \$15,700), and in 2007 (3 grantee recipients and grants totaling \$10,150.00) have been concluded with the expectation that funding will continue on a four year funding cycle.

D.3 – Conservation Easements

The Settlement Agreement and License Article 427 include protection from development of 18,350 acres of land through permanent conservation easements. An easement was executed in 2000 for 15,736 acres in Vermont; and a separate easement was executed in 2001 for 1,362 acres in Massachusetts. The Vermont Land Trust holds the easement on lands in Vermont and the Massachusetts Department of Environmental Management holds the easement for the lands in Massachusetts.

Collectively, these easements cover primarily undeveloped land, some of which is in agricultural and forestry use. These lands provide wildlife habitat, natural resource protection, and recreational and scenic opportunities. The easements preserve in their natural state the protected properties associated with the Project, while allowing for the continued operation of Project facilities. The protected lands cannot be used for purposes other than agricultural, forestry, educational, non-commercial recreation, open space, and the present and future operation of electric transmission and hydroelectric generation facilities.

⁵ <http://www.vermontcf.org/deerfield-river>

⁶ <http://www.communityfoundation.org/>

E.1 – Listed Species

- In Vermont, the state-threatened tubercled orchid (*Platanthera flava var. herbiola*) is found in river reaches below Searsburg and Harriman dams.
- In Massachusetts, the entire Deerfield River corridor has been identified as “priority habitat” for rare species under the Massachusetts Endangered Species Act (MESA).
- Until 2007, bald eagles were protected under the federal Endangered Species Act. Bald eagles are present along the Deerfield River corridor and at some Project reservoirs.
- The Common Loon (*Gavia immer*) became a Vermont-listed endangered species in 1983, but was removed from the list in 2005. Loons are found, and successfully nest on Somerset Reservoir, as a result of reservoir management operations for nesting protection as stipulated in License Articles 401, 402 and 406.

E.2 – Recovery Plans

While there is no Vermont State Recovery Plan for the tubercled orchid, License Article 419 and Condition I of the Vermont water quality certification included detailed provisions for the Company to implement a tubercled orchid mitigation and monitoring program, in effect a local recovery plan. The purpose of this program was to protect plants and their habitats in the Harriman and Searsburg bypassed reaches from increased flows released pursuant to Article 405 of the License. The program inventoried, relocated and monitored populations of tubercled orchids affected by the increased minimum flows. The program then monitored the success of tubercled orchid relocations over a five-year period and collected seeds from flowering orchids for preservation and future potential use. Some of those seeds were dispersed throughout the bypass reaches in 2003.

The State of Vermont has a Loon Recovery Plan and Project that has been ongoing since 1978. The Common Loon is no longer a state-listed species, but at the time of Project relicensing it was listed as state endangered. License Articles 401, 402, 403 and 406, along with Conditions B and D of the Vermont water quality certification, stipulate limited reservoir elevation fluctuations and gate operations to facilitate loon nesting between May 1 and July 31 each year. The reservoir has a target elevation for loon nesting as well as a limit of +/- 3 inches in reservoir fluctuation during the nesting season. Flows and reservoir operations are continuously monitored and hourly data is reported annually to the Resource Agencies. In addition, License Article 420 required artificial loon nesting platforms to be installed and maintained at Somerset Reservoir. Since 1999, one or more pairs of loons have been active, nested, and/or successfully hatched one or two chicks in most years.

E.3 - Takings

The Company's tubercled orchid recovery program necessitated obtaining a takings permit in order to meet the State mandated relocation plan, including collection of seeds for preservation and potential future use. The Project was in compliance with the terms of the takings permit throughout the five-year program.

In Massachusetts, the entire Deerfield River corridor has been identified as “priority habitat” for rare species under the Massachusetts Endangered Species Act (MESA). MESA requires consultation and regulatory review for impacts upon threatened or endangered species if they are likely, or are found, within an area of proposed activity (i.e., wetlands or riverine alteration). The Company has developed an Operations and Maintenance Compliance Plan, and a Vegetation Management Plan, both of which include protections for rare species and habitats. Both plans have been approved by the State under MESA.

F.1 - Cultural Resource Protection

The Project is in compliance with Article 428 of the License, which provides for cultural resources protection, via implementation of a Programmatic Agreement (PA) executed in 1996 between FERC, the Advisory Council on Historic Preservation, the Vermont State Historic Preservation Officer (Vt SHPO) and the Massachusetts State Historic Preservation Officer (Ma SHPO). The PA specified that a Cultural Resources Management Plan (CRMP) be developed by the Company. The CRMP was completed and approved in 1999.

The hydroelectric facilities are considered eligible for listing in the National Register of Historic Places (Register). Forty standing structures were identified as eligible for the Register. During the archeological surveys, twenty-five documented and two undocumented historic sites were identified at six Project developments, consisting of nineteenth and twentieth century residences, mill/factory complexes, mining complexes, schoolhouses, bridge abutments, and one family cemetery. An interesting historical summary of the Project is available on the website of the Public Archeology Laboratory Inc.⁷

The CRMP included mitigation measures for the historic properties, including an evaluation of any site that will be impacted by an activity. All of the archeological sites were monitored to establish a baseline. A Historic American Building Survey/Historic American Engineering Record (HABS/HAER) of the historic buildings and structures was also conducted. This baseline information will be updated at 10-year intervals through visual inspections by a qualified professional architectural historian. Annual reports are also filed with the two SHPOs.

The CRMP also integrates cultural resource management into the Company’s master planning process for the Project. Cultural resources are evaluated during planning for any alterations to Project facilities, and consultation with the appropriate SHPO is initiated if activities could impact those resources.

G.1 - Recreation

The Project is in compliance with all FERC License and water quality certificate requirements for recreational access, accommodation (including recreational flow releases) and facilities. Applicable License provisions include:

1. Article 423 stipulated upgrades and/or new recreational areas for picnicking, boating, and hiking; and Article 424 mandated construction of a canoe portage at Searsburg dam. Forty-

⁷ <http://www.palinc.com/PDF%20Folder/PopReport/Deerfield-CT%20River%20Hydro%20History.pdf>

four separate recreation area enhancements were implemented in a ten-year comprehensive recreation plan. The plan was developed and implemented in ongoing, detailed facility-by-facility consultation with the Resource Agencies, citizen's groups and recreationalists. All recreation area enhancements have been completed.

2. Article 425 stipulated an instream recreational safety study and safety enhancements to ensure that recreational users, particularly fishermen, would be properly warned of sudden changes in discharge flows. The study and installation of enhancements (warning lights, recorded messages, etc.) were completed with consultation with the Resource Agencies and recreational users.

Article 426 included provisions to provide scheduled whitewater releases from Deerfield No. 5 dam. Releases from the Deerfield No. 5 Dam are provided for whitewater boating. Releases occur for at least four continuous hours on Fridays starting at 11:00 a.m., at least five continuous hours on Saturdays starting at 10:00 a.m., and at least four continuous hours on Sundays starting at 10:00 a.m. The flow levels for the whitewater release periods are distributed equally over the schedule in order to average 1,000 CFS. The schedule provides for 26 weekend days or holidays and six Fridays from May 1 to October 31 annually:

<u>Month</u>	<u>Allocation</u>
May	2 weekend days
June	5 weekend days and 2 Fridays
July	6 weekend days and 2 Fridays
August	7 weekend days and 2 Fridays
September	4 weekend days
October	2 weekend days releases
Holidays	May be substituted for weekend days upon agreement between the Company and the citizens groups before April 1 of each year.

The Company meets annually with representative citizens groups, including New England FLOW, before January 1 of each year, in order to collaboratively develop the whitewater release schedules for the coming summer. An annual schedule is published by April 1 of each year following further consultation with these citizens groups. In cases where emergencies, power generation needs, equipment failure or other factors preclude scheduled releases, the Company consults with stakeholders to provide alternative scheduling of equivalent releases. As stipulated in License Article 426, the Company also provides a 24-hour telephone and website that lists current and forecasted flows at all Project facilities⁸ to give recreational users an opportunity to time their visits with river flows conducive to their particular recreation purposes (e.g., fishing, whitewater boating).

3. Article 406 paragraphs a) and c) stipulated maintenance of minimum reservoir levels for open water recreation (e.g., boating) at Somerset and Harriman reservoirs, respectively. These reservoir restrictions have been incorporated into the Project's water management and operations protocols, and the Project is in compliance with these requirements.

⁸ <http://www.h2oline.com/Ma.asp> and <http://www.h2oline.com/Vt.asp>