The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner

May 2, 2016

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E. Room 1A
Washington, DC 20426

RE: Comments on Updated Study Reports filed on March 1, 2016 for FERC No. P-1892 (Wilder), P-1855 (Bellows Falls) and P-1904 (Vernon).

Dear Secretary Bose:

The New Hampshire Department of Environmental Services (NHDES or Department) is responsible for issuing federal Clean Water Act § 401 water quality certifications (401 certifications) in New Hampshire. State statutory authority for issuing 401 certifications is provided in RSA 485-A:12, III. NHDES is also responsible for establishing and administering surface water quality standards for New Hampshire.

On March 1, 2016, TransCanada Hydro Northeast, Inc. (TransCanada) filed ten "final" study reports (report numbers 1, 4, 6, 10, 11,12, 18, 30, 31, and 32) and three "interim" study reports (report numbers 9, 14 & 15 (combined) and 16) for review for the following three hydroelectric projects on the Connecticut River:

Wilder Project (FERC No. 1892),
Bellows Falls Project (FERC No. 1855),
Vernon Project (FERC No. 1904).

"Final" reports for 18 studies have not yet been filed for review. The Department has reviewed the Updated Study Reports filed with FERC on March 1, 2016 and offers the following comments. Please know that the Department also supports comments filed by the New Hampshire Fish and Game Department (dated April 29, 2016), and comments expected to be filed on or before May 2, 2016 by the Vermont Agency of Natural Resources, the U.S. Department of Interior Fish and Wildlife Service and The Nature Conservancy.

Study 4: Hydraulic Modeling

The goal of this study was to develop a hydraulic model that would simulate routing of river flow on the mainstem of the Connecticut River for the three project impoundments and associated riverine sections downstream of each project dam.

Section 4.1.7 Bridges, p. 15: It is stated that bridges were not explicitly modeled. This suggests that there is a flow limit, above which the model will not provide accurate results. The Department requests that this upper flow limit be specified in the report.

Section 4.2 Hydraulic Model Calibration and Validation, p. 15: The Department requests that the range of flows used to calibrate and validate the model be specified.

Section 5.1 Model Calibration and Validation, p.28: Table 5-1 shows the Calibration Results. Modeled results were subtracted from observed results, totaled and then averaged. The Department requests that the range of the difference between observed and modeled results at each station be included in the table to provide a better understanding of how well the model is calibrated.

Section 5.2 Velocity Comparison, p. 32: The HEC-RAS velocities represent the average velocity along the cross-section. It is not clear if the observed velocities also represent the average velocity (i.e., calculated by dividing the measured flow by the measured cross sectional area where flow and area are calculated from measurements of velocity and depth across the cross section). The Department requests that the report clarify what the observed velocities in Table 5-2 represent to facilitate interpretation of observed and simulated results.

Appendix B-1 and B-2: Graphs of calibration results for each station are provided in these appendices. In some cases, the difference between observed and simulated elevations approximately 0.5 feet (e.g., W07, W09, WR01, WR05, WR08, B01, BR01, BR05, V02, Upstream Stebbins). Could a better match be obtained with further adjustments of Manning's 'n'?

Study 6: Water Quality

The overall goal of this study was to determine the potential effects of Wilder, Bellows Falls, and Vernon operations on water quality parameters of water temperature, dissolved oxygen (DO), conductivity, turbidity, pH, nutrients and chlorophyll-a (chl-a).

Executive Summary: The Department requests that the Executive Summary be revised to be consistent with the comments below.

Section 3 Study Area, p.3-5, Tables 3.0-1, 3.0-2, and 3.0-3: The tables include mean depths for each station. It is not clear how the mean depths were determined and, therefore, what they represent. The Department requests that an explanation be added. Also, it is unclear if the tributary stations are influenced by water quality in the Connecticut River (i.e., due to backwater effects). The Department requests that an explanation be added as this is needed to interpret the water quality data.

Section 4.1.2 Continuous Monitoring with Multiparameter Datasondes, p. 10: It is stated that the multiparameter sondes during the 10-day high temperature, low flow monitoring were deployed from one of three moorings (river left, mid-channel, river right) at whichever location was most representative of the river cross section. The Department requests that selected location be specified for each station.

Section 4.1.4 Impoundment Water Column Sample and Laboratory Analyses, p. 11: This section discusses the sampling protocols for nutrient and chl-a but does not include the frequency of sampling. The Department requests that the frequency of sampling be added.

Section 4.2.5 Data Synthesis, p. 13: This section states that flow in the Bellows Falls bypassed reach during spill was provided by TransCanada and during periods without spill, leakage flows in the bypass Reach were determined by TransCanada to be approximately 125 cfs. How these flows were determined is not provided. The Department requests that further details be provided regarding how these flows were calculated.

Section 4.2.6 Data Censorship and Correction, p. 14: It is stated that some datasonde deployment intervals required correction to adjust for calibration drift and biofouling effects on sensor readings and that the decision to apply a correction was based on criteria described in a USGS document, as summarized in Table 4.2-2. It appears the wrong table was inadvertently referenced as correction criteria is included in Table 4.2-1 (not 4.2-2); this should be revised. Further, to facilitate interpretation of the data, a summary of the corrected parameters, corrected time periods and the values used to determine that correction was necessary should be provided. In addition, for each corrected parameter, graphs showing the uncorrected and corrected continuous

data for each corrected time interval, should be provided for comparison. The Department requests that this information be provided.

Section 4.3 Data Analysis, Table 4.3.1, p. 20. Applicable Vermont and New Hampshire surface water quality standards for the mainstem Connecticut River, p. 20: Designated Uses for New Hampshire surface waters are provided in the New Hampshire Consolidated Assessment and Listing Methodology[1] (CALM). These include Aquatic Life, Fish and Shellfish Consumption, Drinking Water Supply after Adequate Treatment, Primary and Secondary Contact Recreation, and Wildlife. The Department requests that the Designated Uses for New Hampshire in Table 4.3-1 be revised to reflect the CALM. In addition, the Department requests that the following be added to the turbidity standard in the table " Env-Wq 1703.11 (d) "For purposes of state enforcement actions, if a discharge causes or contributes to an increase in turbidity of 10 NTUs or more above the turbidity of the receiving water upstream of the discharge or otherwise outside of the visible discharge, a violation of the turbidity standard shall be deemed to have occurred."

Section 5.2.1 Tributaries, p.30: As previously stated above, it is unclear if the tributary stations are influenced by water quality in the Connecticut River. The Department requests that an explanation be added as this information is needed to interpret the water quality data.

Sections 5.2.2 , 5.2.3, 5.2.4 (Stratification): In the discussions for temperature and dissolved oxygen for the Wilder, Bellows Falls and Vernon projects, terms such as "mild surface warming" and "thermal discontinuity" are used which are not defined. It is not clear if, and when, stratification, as defined in section 4.1.3 (... "the temperature difference in the stratum of greatest thermal discontinuity exceeded 1^{o}C per meter), occurred. The Department requests clarification and consistency in the document as to where and when (dates) stratification (as defined in section 4.1.3) occurred.

Sections 5.2.2 , 5.2.3, 5.2.4 (Turbidity): Turbidity was measured in the forebays and tailraces of each Project from June through September. In the discussions for turbidity it is stated that "Turbidity did not exceed the NH surface water quality standard of 10 NTU beyond natural conditions at the forebay, bypassed reach, or tailrace stations." It is not clear how this conclusion was reached. According to Env-Wq 1702.29 "Naturally occurring conditions" means conditions which exist in the absence of human influences." Clearly, none of the stations sampled for this study are without human influence; consequently, "natural conditions", as defined in the State surface water quality regulations, have not been determined. To avoid confusion the Department requests that the term "natural" not be used. To determine compliance with turbidity criteria, Env-Wq 1703.11 (d) states "For purposes of state enforcement actions, if a discharge causes or contributes to an increase in turbidity of 10 NTUs or more above the turbidity of the receiving water upstream of the discharge or otherwise outside of the visible discharge, a violation of the turbidity standard shall be deemed to have occurred". For the purposes of this report, the Department recommends using the stations above each impoundment (06-W-04, 06-BF-04 and 06-V-04) as estimates of background beyond the influence of each project recognizing that this is an approximation as background for the downstream projects may still have some influence from the upstream projects. Further, some stations within the influence of each project may also be influenced by other sources such as tributaries. The background stations should then be compared to the turbidity in the impoundments and tailraces to determine if the stations in the impoundments and tailraces exceed the background by 10 NTU or more. Comparison of the graphs in Appendix E suggests that during the low flow sampling period (8/30/15 to 9/9/15), turbidity criteria in Env-Wq 1703.11(d) were met. Though based on grab samples, the graphs showing mean turbidity in the water column ($\pm$ one standard deviation) in Appendix B, can also be used to estimate compliance with turbidity criteria. Comparison of the these plots suggests that on the sampled dates, there may have been an exceedance on 6/4/15 in the Wilder impoundment. Figure B-1 (p. B-1) shows a background of <1 NTU at 06-W-04. Turbidity remains low through the upper and mid impoundment exceedances but then spikes in the forebay to a mean of 25 NTU (Figure B-4, p. B-4). It's not clear if this is primarily due to operation or other sources of turbidity. The report states that June 4, 2015 was a high flow event and that the addition of runoff resulted in turbidity levels through the profile that

[1] http://des.nh.gov/organization/divisions/water/wmb/swqa/2014/documents/2014-calm.pdf

ranged from approximately 10 to 60 NTU (p. 37). It's curious, however, why the mid and upper impoundment stations did not reflect a similar increase during the storm. An explanation should be provided?

The graphs in Appendix B and sections 5.2.2 through 5.2.3, show other times when turbidity increases which are attributed in the report to high flow events. This may be the case, however, since flow was not included on the graphs, one cannot confirm or readily see the relationship between turbidity and flow. The Department requests that flow be included on the turbidity graphs in Appendix B, E and Figures 5.2.2-3, 5.2.2-4, 5.2.3-3, 5.2.3-4, 5.2.3-5, 5.2.4-3 and 5.2.4-4.

Section 5.5.1 New Hampshire Water Quality Standards, p102: This section summarizes compliance with New Hampshire water quality standards based on data collected in 2015. The Department requests that this section mention that there were occasions of noncompliance with dissolved oxygen and pH in 2012 as discussed in section 5.6.

It is stated that "This suggests that elevated levels of pH are due to natural causes related to photosynthesis of algae and aquatic vegetation." The sentence should revised as not all sources of nutrients stimulating growth of algae and other aquatic vegetation (such as nutrients from wastewater treatment facilities) are natural. Further, impoundments formed by dams are not natural and can facilitate algal growth by increasing residence times and water temperature. Although diel patterns were more prevalent in the upstream stations, pH did occasionally increase in the forebays by approximately 0.5 pH units (see Appendix E) which could be due to increased algal growth. The Department recommends the sentence above be revised to the following: "This suggests that elevated levels of pH are due to photosynthesis of algae and aquatic vegetation." We also request that the report acknowledge that the Project's impoundments may contribute to the pH exceedances by increasing residence times and water temperatures which can facilitate growth of algae and other aquatic vegetation. Similar revisions should be made throughout the document wherever pH is discussed.

Section 5.6 Comparison of Results to 2012 Water Quality Study, p. 105: This section includes a general description of exceedances of water quality standards in 2012. However, it is unclear how many exceedances of each state's water quality standards occurred in 2012, and where they occurred. The Department requests the number and range of 2012 dissolved oxygen and pH values at each station, that were in noncompliance with each state's water quality standards, be added to this section.

The Department also requests that the average and range of flows during the low flow sampling periods in 2012 and 2015 be added to facilitate comparison of conditions during these two years.

Section 6.0 Assessment of Project Effects, p. 112:

It is stated that "Overall, mean water temperatures were generally very similar among forebay and tailrace stations...". This sentence references tables which show mean monthly temperatures. The Department requests that the sentence be revised to indicate these are mean monthly temperatures. Similarly throughout the report, wherever the term "mean" is used the Department requests that it be qualified with the appropriate time reference (i.e., daily mean, monthly mean, annual mean, etc.) so that the reader can properly interpret the statements being made.

The discussion in this section appears to focus mainly on mean monthly results. It is not readily apparent how water quality is impacted by project operation on a shorter time scale. Using the near-continuous data from the datasondes, it is recommended that information be provided that clearly shows the effects of operation throughout the study period (June through September). This would capture the effects of operation during a wider range of temperatures, flows and generation. The graphs shown in Figures 6.0-1 through 6.0-5 for the low flow sampling period in the tailrace stations are good templates with the exception that continuous data from the forebay should be added to each graph to clearly show the effects of operation. Similar graphs should be provided for the rest of the sampling period (June through September) and at a scale no smaller than those shown on Figures 6.0-1 through 6.0-5. Similar graphs should also be provided using the data from the 2012

data report. The Department requests this information to facilitate assessment of project operation on water quality.

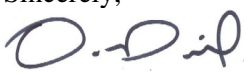
The last paragraph in this section states the following: "Although the presence and operation of the projects appeared to have some minor effects on temperature and DO, and negligible to no effect on pH, specific conductivity, or turbidity, all water quality parameters were generally within VT and NH state water quality standards. Therefore, there is no indication that operation of the Wilder, Bellows Falls, and Vernon projects would affect adherence to VT or NH state surface water quality standards." The Department disagrees with this conclusion. Based on the information presented in the report, it is the Department's understanding that under the conditions sampled in 2012 and 2015, the presence and operation of the projects can increase water temperature, significantly decrease DO (by approximately 1 mg/L), and that the longer residence times and higher temperatures in the impoundments may contribute to increased growth of algae and other aquatic vegetation which can impact pH Further, since there were occasional exceedances of New Hampshire water quality standards for pH (in 2012 and 2015) and dissolved oxygen (one in 2012) the presence and/or operation of the projects can cause or contribute to occasional exceedances of state surface water quality standards. The impact of the projects on turbidity is not readily apparent from the way the data is presented but a visual comparison of the forebay and tailrace graphs in Appendix E and Figure 6.0-5 respectively, suggests that operation can cause increased levels of turbidity during operation (see the previous comment for information needed to help determine compliance with turbidity water quality standards and the impact of operation on turbidity). With regards to compliance with turbidity standards, it can be said that during the low flow sampling period and on the dates profiles were taken in 2015, it appears compliance with turbidity criteria in Env-Wq 1703.11(d) were met (with the possible exception the Wilder forebay on June 4, 2015, for which the Department requires further information as previously requested in above). The Department requests that that this paragraph be revised to be more in-line with the Department's interpretation and that conclusions regarding turbidity be revised based on the results of the analyses requested above.

Appendix B and E: The Department requests that flow be added to the turbidity graphs in each of these appendices so that one can readily see the relationship between flow and water quality.

Appendix C – Profiles: The Department requests that the depth of the turbine intakes be shown on the forebay profiles to assist with interpreting the results.

We thank you for the opportunity to comment. Should you have any questions, please do not hesitate to contact either myself (603-271-0699) or Gregg Comstock (602-271-2983)

Sincerely,



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