The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner

September 30, 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 August 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 August 1, 2016, TransCanada Hydro Northeast, Inc. (TransCanada) filed with FERC updated study reports (USRs) and a status summary of all USRs indicating that comments on USR #s 2&3 (combined), 4, 5, 6, 10, 12, 13, 14&15 (combined), 16, 20, 21, 25, 26, 27, 28, 29 and 32, were due by September 30, 2016 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).

The Department has reviewed the USRs mentioned above and offers the following comments. Please know that the Department also supports comments submitted by the New Hampshire Fish and Game Department (dated September 30, 2016).

Study 2&3: Erosion

As stated on p. 2: "The goal of the Riverbank Transect Study (Study 2) and Riverbank Erosion Study (Study 3) was to provide data relative to erosion in project-affected areas in order to consider in a reasoned way the potential effect and contribution of project operations on erosion. Documentation of the location, types, rates, and severity of erosion throughout the study area as well as characterizing the natural conditions (e.g., soil composition, valley confinement) and human influences (e.g., agricultural practices, bridges, project operations, etc.) potentially impacting that erosion provides an opportunity to quantify the spatial distribution of erosion relative to other factors and analyze the potential cause of erosion in the project-affected areas."

Executive Summary, p. ES-1 to ES-3:

3-1. The Department requests that this section be revised as necessary to reflect the Department's comments and concerns expressed below in comments 3-3, 3-6, 3-9, and 3-13 through 3-23.

Section 4.0 Methods, p. 5:

3-2. The methods section states the following: "Conduct repeated surveys, take ground photographs, and collect water-level monitoring data at the erosion monitoring sites at least four times per year for 2 years".

As indicated in the Department's comments submitted to FERC on 7/15/13 regarding TransCanada's updated study plans, the Department recommended that surveys should have been done more frequently (i.e., bieweekly for one year). This request was denied by FERC on 9/13/13 who stated that the suggested bi-weekly monitoring would not definitively identify the circumstances that finally caused a mass wasting event and that the level of effort and costs would not necessarily result in additional useful information over the proposed study. The Department believes that the increased survey frequency may have helped to isolate the effect (if measurable) of daily operation on riverbank erosion and instability by determining if erosion occurred prior to higher flows.

3-3. The methods section also states the following: "Analyze hydraulic modeling data to provide information on flow velocity, stage (water surface elevation or WSE), and shear stress impacting riverbanks in the study area."

The Department understands that TransCanada will review modeling data to assess whether the impacts of velocity and shear stress can be determined on riverbanks in the study area and that information will be included in the revised study report.

Section 5.1.1 Connecticut River Valley Studies, p. 7:

3-4. Examples are given where erosion has occurred in the Connecticut River upstream of the study area in free-flowing portions of the river and that this demonstrates two important points: "First, bank erosion can occur very rapidly on free-flowing sections of the Connecticut River and second, erosion rates can be significantly altered by localized changes in channel gradient associated with the shortening of the river at a meander cutoff."

For the examples given, please clarify if flows in the free-flowing sections were fluctuated by upstream dam operation.

5.1.2 Erosion Studies, p. 11 – 15:

3-5. The following is stated on p. 11: "The shear stress acting on a bank can be increased in several ways such as through removal of the underlying support (e.g., overhanging banks), an increase in the surcharge (i.e., weight) on the bank slope accompanying precipitation or the addition of failed material from upslope, or an increase of lateral stresses that can accompany the formation of ice in cracks or water added to pore spaces." The Department interprets this to mean that water added to pore spaces in the banks associated with water level fluctuations due to project operations can contribute to erosion. Please confirm and clarify this in the report.

5.2.3 Other Watershed Factors, p. 20 -21:

3-6. The following is stated on p. 20: "On the upper Connecticut River upstream of the study area, evidence drawn from maps and field studies suggests more than 30% of the river channel was artificially straightened and is considered a primary cause for erosion today (Field, 2005) even though much of that straightening was due in large part to large log drives that occurred throughout the late 19th and early 20th centuries (Gove, 2003); and railroad construction in the latter half of the 19th century."

The Department requests that, if possible, the location and length of artificially straightened channels, and the estimated percent of river channel that was artificially straightened in the study area, be provided in the report along with supporting documentation.

5.4.2 Repeat Monitoring, p. 42-55:

3-7. The description on p. 42 of what is presented in Table 5.4.2-1 is somewhat unclear. The Department recommends that the following revisions to the first sentence of the last paragraph to help clarify (changes are in bold): "Four general conditions were observed along the transects during the two-year monitoring period: 1) bank recession at the top of the bank **(in feet)**, 2) changes on the bank slope **(y = some change, n = no change, add = material added to that portion of the bank)**, 3) loss or accumulation of bank material at the bank toe **(in feet)**, and 4) no change (Figure 5.4.2-1 and Figures 5.4.2-2a and 5.4.2-2b)."

Similarly, the Department recommends that the notes for Table 5.4.2-1 on p. 47 be revised as follows: "b. Values for "Top of bank" represent the amount of recession at the top of bank in feet. Notes regarding changes in bank slope for the Upper, Mid and Lower bank include n = no change; y = some change; and add = material added to that portion of bank. Values for the "Toe of bank" represent the amount removed or added in feet with negative values representing material added to the base of the bank causing it to build out."

3-8. On p. 50, explanations for the erosion at transects 02-W03, 02-B01 and 02-B07 are provided. The explanation for Site 02-W03 is that it is immediately upstream of a meander cutoff that occurred in the 1950s and refers the reader to Figure 5.2.2-1 on p. 19. Figure 5.2.2-1, however, does not show Site 02-W03. The Department recommends that Site 02-W03 be shown on Figure 5.2.2-1 on p. 19.

In addition, the explanation for Site 02-B07 refers the reader to Figure 5.4.2-4 on p. 51 however the site shown on Figure 5.4.2-4 is labeled as 02-B01. The Department recommends that this apparent error be corrected.

3-9. The last paragraph on p. 53, discusses how, at some impoundment sites close to project dams, higher project discharges occur at a lower elevation on the monitored transects because during high flow events, the WSE at the dams are lowered to reduce upstream flood elevations. The Department requests that the erosion effects of this occasional lowering just prior to high flow events(which can promote seepage causing erosion or make a bank more susceptible to erosion) be addressed and acknowledged in the report.

3-10. On p. 54, the following is stated with regards to 4 of the 21 sites where no change of any kind was recorded: "WSE fluctuations at these sites were similar to those at sites where notching and other changes at the bank toe were aligned with the elevation range of normal project operations."

It is unclear how many of the 21 sites exhibited similar conditions. The Department requests that the report include a list of the transects where notching and other changes at the bank toe were aligned with WSE fluctuations. On p. 111, it appears that a total of 8 of the 21 transects had notching and other changes aligned with WSE fluctuations.

3-11. On p. 55, it is stated that a site by site analysis of WSE fluctuations was not provided and that the WSE variation associated with the 50% probability reported by the operations model during no spill conditions was considered to most closely match the typical fluctuation observed in the water level logger data. Figure 5.4.2-7 shows a sample graph created from water level logger data. The Department requests that graphs similar to Figure 5.4.2-7 (but for the entire period) be provided for all 21 transects and included in Appendix A so that one can compare the median WSE from the operations model to the water level logger data. The elevations associated with the median WSE fluctuations for each site should also be provided in Appendix A. Times when water levels were purposely drawn down prior to high flow events, should also be indicated on the graphs.

5.6.1.a Falls, p. 60 -62:

3-12. On p. 60, it is stated that notching and overhangs were seen along 37% of the river's banks. It is unclear if all of the notches are at the base and within the range of elevations associated with WSE fluctuations associated with operation of the dams? The Department requests that this be clarified in the report.

5.6.3 .a Stable, p. 74-75:

3-13. The following is stated on p. 75: "While stable banks exhibit none of the erosion types on the upper bank, banks with notching or low overhangs at the base of the bank were mapped as stable as long as no other erosion types or failure surfaces were present higher on the bank face." Subsequent analyses and discussions in the report are based on this definition of stable. However, as discussed on page 69, notching and overhangs are often the first step in the erosion cycle which suggests that all banks with notches or overhangs should perhaps be categorized as unstable. The Department requests that additional analyses and discussion be provided in the report that consider all banks with notching or overhangs to be unstable. This includes the analyses in sections 5.6.4, 5.6.5, 6.0 and the executive summary. As stated on p. 80, a total of 37 % of the banks were observed with notching at the base with 21% observed along stable and armored banks and 16% on unstable banks. Consequently, if banks with notching are included in the unstable category for the reasons mentioned above, it could have significant effect on the results and conclusions.

5.6.4 Mapping Results, p. 79-80:

3-14. The following is stated on p. 79: "Considering bank stability for the study area as a whole, 11% of the banks were mapped as eroding, 22% as vegetated eroding, and 6% as failing armor, resulting in a total 39% of bank length that can be considered unstable (Figure 5.6.4-2). In contrast, 61% of the banks are either stable (42%), armored (15%), or no longer eroding (i.e., healed erosion) (4%). For comparison, mapping along 85 miles of the upper Connecticut River outside of the study area found that 49% of the banks were unstable (Field, 2005)."

For reasons stated in comment 3-13 above, the Department requests that additional analyses and discussion be provided in the report that considers all banks with notching or overhangs to be unstable.

With regards to the comparison with mapping of the 85 miles along the upper Connecticut River outside of the study area where 49% of the banks were unstable (Field, 2005) (as compared to 39% within the study area), the Department requests that the report include an explanation of how the methods between the two studies compared. If significantly different, this sentence should be deleted as its misleading by itself, or more information provided describing the differences in methodology between the two studies. Further, if 21% of the banks with notches that are currently considered stable, are instead considered unstable, then 60% (39+21) of the banks in the study area would be considered unstable (instead of 39%).

5.6.5a Spatial Variations in Erosion, p. 82-98:

3-15. The second paragraph on p. 82 describes the method used to analyze unstable banks relative to other features using GIS and an erosion ratio. The Department requests that the report include more information about the methodology such as who developed it, if it has been peer reviewed, if it is a commonly accepted method used by others in the erosion field, references to the other studies that have used this method, etc.

It is stated that the erosion ratio (or instability ratio) "...represents the percentage of unstable banks in the study area (or portion thereof) that were present within the specified feature (e.g., outside bend of a meander) divided by the percent of percentage of bank length occupied by that feature. For example, if 20% of all the unstable banks in the study area occurred where the bank heights were between 5 and 10 ft high, and banks 5 to 10 ft high represent 10% of the total bank length then the erosion ratio would be 2.0 (i.e, 20/10 = 2.0)." It is further stated that "Any erosion ratio above 1.0 indicates that unstable banks preferentially occur within the given feature while erosion ratios less than 1.0 indicate unstable banks are less likely to occur within the feature." Could an erosion ratio of greater than 1.0 also be interpreted to mean that there is a greater tendency for unstable banks to occur within the given feature as compared to the prevalence of that feature throughout the study area (and a lesser tendency if the erosion ratio is less than or equal to 1.0)?

The Department appreciates that Table 5.6.5-1 and Figures 5.6.5-1 through 5.6.5-4a –f, show the erosion ratio as well as the percent of total erosion within a feature and percent of feature length in the study area for comparison. In addition, the Department recommends that these graphs also show the % Erosion from Table 5.6.5-1 which is equal to the erosion length divided by the feature length. This is also useful information for evaluating the potential effects of various features on erosion because it provides a sense of the percent of banks for a given feature that are categorized as unstable. If the percentage is high, it may indicate that the feature is a significant contributor to bank instability. For example, from Table 5.6.5-1, it can be seen that the percent of banks that are considered unstable for various median water surface elevation (WSE) fluctuation ranges is quite high (i.e., 42.7% for WSE = 0.50-0.99 ft, 37.4 % for WSE = 1.00-1.49 ft , 52.8% for WSE 1.50-1.99 ft, etc.). This may suggest that WSE fluctuations are more important with regards to bank stability than suggested by the erosion ratios. The Department therefore requests that the report also include a discussion of the % Erosion and if it changes any conclusions based on the erosion ratio.

Also, for reasons stated in comment 3-13 above, the Department requests that similar analyses and discussion be provided in the report that considers all banks with notching or overhangs to be unstable. This would result in even higher % Erosion than those currently reported in Table 5.6.5-1.

3-16. Figures 5.6.5-3a -c on p. 85-87, show the variation in the amounts of erosion with distance from the Wilder, Bellows Falls and Vernon dams respectively. In each graph the percent of unstable banks is shown for each mile upstream and downstream of each dam. This is useful information. It is our understanding, however, that unstable banks in these figures do not include all banks with notching. For reasons stated in comment 3-13 above, the Department requests that three more graphs at the same horizontal scale (to facilitate comparison) be developed with the y-axis equal to the percent of unstable banks per mile, where unstable banks include all banks with notching.

To help determine the effects of project operation, the Department also requests three more graphs at the same horizontal time scale be developed with the y-axis equal to the WSE fluctuation range at each mile (or this information could be included on the existing graphs). This would show how WSE fluctuations change spatially, and if WSE tends to trend spatially with the percent of unstable banks. The Department also requests that the discussion regarding WSE fluctuations include an explanation (and supporting information) of the primary cause(s) of WSE fluctuations with distance in the riverine section downstream of each dam. That is, to what extent are the fluctuations in riverine sections downstream of each dam primarily due to WSE fluctuations associated with operation of the upstream dam?

Finally, to see where notching spatially occurs, the Department requests three more graphs at the same horizontal scale be provided but with the y-axis equal to the percent of river banks with notching per mile.

3-17. On p. 97 and 98, many statements and conclusions in this section are based on the erosion ratio. For reasons previously stated in comment comments 3-13 and 3-15 above, the Department requests that this section of the report also include a discussion of the results assuming all banks with notches are unstable, and the % Erosion for each feature.

3-18. The following is stated: "A number of other similar analyses comparing erosion with potential causal factors are possible with the GIS data provided in Appendix C such as determining if erosion preferentially occurs upstream of valley constrictions, adjacent to tributary confluences, near sites of bank armoring, where changes in water-surface slope are greatest, or where shear stress is highest. However, a complete and exhaustive analysis of all possible relationships was beyond the scope of this study." The Department understands that TransCanada will review modeling data to assess whether the impacts of velocity and shear stress can be determined on riverbanks in the study area and that information will be included in the revised study report.

5.6.5b Temporal Variations in Erosion, p. 98-103:

3-19. For reasons stated in comment 3-13 above, the Department requests that similar analyses (as shown in Tables 5.6.5-2 and 5.6.5-3 and Figure 5.6.5-5) and discussion be provided in this section of the report that considers all banks with notching or overhangs to be unstable. Although on p. 99 it is stated that "...notching alone would unlikely have been considered as eroding in 1955 or 1978...", there is no hard evidence indicating that notching was not considered unstable in earlier studies. If the 21% of banks with notching that are currently defined as stable (see p.80 of the report) , are instead considered unstable, the percent eroding for the entire study (for example) shown in Table 5.6.5-2 and Figure 5.6.5-5, would increase from 11.3% to 33.3% in 2014, which is substantially higher than the percent eroding in 1958 and 1978 of 12.9% and 14.7% respectively. This suggests that level of erosion may have increased.

5.6.5c Rates of Erosion, p. 104 – 106:

3-20. For reasons stated in comment 3-13 above, the Department requests that similar analyses and discussion be provided in the report that considers all banks with notching or overhangs to be unstable.

5.8 Hydraulic and Operations Modeling, p. 106 – 107:

3-21. The discussion on p. 107, states the following: "Additional analysis of the modeling data was not conducted with respect to bank erosion since it was beyond the scope of this study, namely the effects of changing slope resulting from the lowering of dam levels under high water operations. High water operations can occur as part of river flow management when TransCanada may periodically initiate "River Profile Reservoir Operations" by lowering WSE at the dams below the normal operating range in anticipation of inflows greater than maximum generating capacity at each project. This is done under Article 32 of the existing project licenses and in coordination with the US Army Corps of Engineers which operates flood control dams on several tributaries to the Connecticut River that discharge to project impoundments. These high water operations are initiated in order to maintain upstream water elevations within a range that protects specific railroad grade embankments along the river and to reduce the potential for river flows to spill outside of the normal operating ranges. These conditions and operating protocols are not considered normal project operations.
As a result of lowering WSE at the dams, a convexity in the longitudinal profile develops at the lower end of the impoundments (Figure 5.6.7-1) that could potentially engender a channel response as a stable river profile typically has a concave-up profile in contrast to the observed convexity. Similar convexity and rapid gradient changes result where flow releases from an upstream project entering a downstream impoundment encounter lowering water in the receiving impoundment."

The second paragraph above, which states that convexity in the longitudinal profile could potentially engender a channel response, suggests that high water drawdowns can have a significant impact on erosion and should be further explained. The Department requests that this section of the report include the frequency of the high water drawdowns at each project, and a discussion of how such drawdowns can influence and potentially cause or, make a bank more prone to, erosion.

6.0 Assessment of Project Effects, p. 108-115:

3-22. Please see previous comments above and revise this section accordingly as they may impact the results summarized in this section. For example, the discussion in this section is based on the definition of stable that include some banks with notching. For reasons stated in comment 3-13 above, the discussion should also include a summary of results assuming all banks with notching are unstable as this could significantly change some of the conclusions.

3-23. Throughout this section (including the "Conclusions") the potential for project operation to cause or contribute to erosion by making riverbanks more susceptible to erosion, appears to be downplayed. For example, on p. 114, the following is stated: "Furthermore, the approximately 40% of bank instability mapped through the study area is similar to more free-flowing portions of the Connecticut River (Field, 2005), so normal project operations cannot be considered to be a cause of excessive erosion." The Department requests that this be revised to include language such as the following: "Furthermore, the approximately 40% of bank instability mapped through the study area is similar to more free-flowing portions of the Connecticut River (Field, 2005), which suggests that normal project operations may not be a direct cause of excessive erosion, although such operations likely contribute to erosion by making banks more prone to erosion due to seepage forces associated with daily fluctuations." A similar acknowledgement of the potential for project operations to cause or contribute to erosion by making riverbanks more susceptible to erosion should be added to the second paragraph (beginning with "Fluctuations in WSE...") on p. 111 and at the end of the first paragraph (beginning with "... on the cyle of erosion...") on page 115.

3-24. On p. 112, the following is stated: "Study 6 – Water Quality Monitoring Study (Louis Berger Group and Normandeau, 2016a) found that the Wilder, Bellows Falls, and Vernon projects had negligible to no effect on turbidity, with recorded values remaining generally very low and within state water quality standards. The few recorded spikes in turbidity were found to occur in response to high flows resulting from heavy rain events." It should be acknowledged that turbidity meters were not located near shore, as requested by the Department on 7/15/13, so local effects (i.e., near-shore turbidity plumes due to project operation) were not measured.

Study 6: Water Quality

As stated on p.1: "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:

6-1. The Department disagrees with the following sentence on the second page: "However, exceedances were not associated with project operations; they were instead attributable to natural conditions (low flow, high air temperature) or potential nutrient loading from sources outside the projects." This suggests that the presence and operation of the dams have no impact at all on the exceedances, which is not supported by the data. The Department requests that this sentence be revised with language such as the following: "However, project operations were not believed to be the major cause of the exceedances; they were instead believed to be primarily due to natural conditions (low flow, high air temperature) or potential nutrient loading from sources outside the projects."

6-2. The Department also requests revisions to the last sentence of the Executive Summary, which currently reads: "Overall, the data from both the 2012 and 2015 studies show that, irrespective of the effects of project operations, water quality in project-affected waters supported the designated uses and met applicable Class B VT and NH surface water quality standards for the overwhelming majority of the study period throughout the entire study area." The Department requests that this sentence be revised to delete the word "overwhelmingly" as it is a subjective term, and to reflect that although water quality standards were met most of the time for the parameters which were tested, it does not necessarily mean that designated uses were met since designated uses can be impacted by many other parameters which were not sampled as part of this study. Language such as the following would be acceptable to the Department with regards to NH water quality standards (VTDEC may have other comments): "Overall, the data from both the 2012 and 2015 studies suggest that, irrespective of the effects of project operations, water quality for the parameters which were sampled in project-affected waters met applicable Class B VT and NH surface water quality standards for the majority of the study period throughout the entire study area."

Section 5.5.1 New Hampshire Water Quality Standards, p. 112-113:

6-3. The fourth sentence in the first paragraph on p. 112, reads as follows: " The continuous and vertical profile turbidity data collected at all mainstem monitoring stations indicate that turbidity would not exceed the NH surface water quality standard of 10 NTU beyond upstream waters under normal project operations." The Department requests that this be revised as follows since the data was not representative of all conditions: "The continuous and vertical profile turbidity data collected at all mainstem monitoring stations suggest that turbidity would most likely comply with the NH surface water quality standard of 10 NTU beyond upstream waters under normal project operations."

6-4. The sixth sentence in the first paragraph reads as follows: " TransCanada does not 'discharge' a 'pollutant' as defined in Env-Wq 1702.18 and in 40 CFR §122.2, respectively." The Department disagrees with this sentence and requests that it be deleted since water discharged from dams can introduce pollutants per Env-Wq 1703.29[1] to the downstream receiving waters and is therefore considered a discharge per Env-Wq 1702.18[1]. An example is heat associated with slower residence times in the impoundments which can result in higher temperatures being discharged downstream of the dam.

Section 6.0 Assessment of Project Effects, p. 125-127:

6-5. The next to the last sentence in the second paragraph on p. 126 references Figure L-6 in Appendix L for an example of when DO levels on July 18, 2012 fell below standards in the forebay but project discharges at Wilders and Bellows Falls remained well-oxygenated even with increasing and decreasing project discharges. Figure L-6 shows temperature instead of DO. This should be corrected.

6-6. The last sentence on p. 127 states the following: "Therefore, available data strongly suggests that currently, the three projects individually and collectively meet VT and NH state surface water quality standards and designated uses for Class B waters." The Department disagrees with this sentence because it contradicts previously statements in the same paragraph (and elsewhere in the study) which acknowledge that there were occasional exceedances of water quality standards in 2012 and 2015. The Department requests that this sentence be deleted and replaced with the Department's recommended last sentence in the Executive Summary (see comment 6-2 above).

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[1] Env-Wq 1702.18 "Discharge" means:
(a) The addition, introduction, leaking, spilling, or emitting of a pollutant to surface waters, either directly or indirectly through the groundwater, whether done intentionally, unintentionally, negligently or otherwise; or
(b) The placing of a pollutant in a location where the pollutant is likely to enter surface waters.

Env-Wq 1702.39 "Pollutant" means "pollutant" as defined in 40 CFR 122.2. According to 40 CFR 122.2 "Pollutant means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 *et seq.*)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean:....".

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

Sincerely,

Gregg Comstock, P.E.
Supervisor, Water Quality Planning Section
Watershed Management Bureau
New Hampshire Department of Environmental Services

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Document Content(s)