

FEDERAL ENERGY REGULATORY COMMISSION
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OFFICE OF ENERGY PROJECTS

Project No. 2485-063 – Massachusetts
Project No. 1889-081 – Massachusetts
FirstLight Hydro Generating Company

Mr. John S. Howard
Director- FERC Hydro Compliance
FirstLight Hydro Generating Company
Northfield Mountain Station
99 Millers Falls Road
Northfield, MA 01360

**Reference: Study Plan Determination for the Turners Falls Hydroelectric Project
and the Northfield Mountain Pumped Storage Project**

Dear Mr. Howard:

Pursuant to 18 C.F.R. § 5.13(c) of the Commission's regulations, this letter contains the study plan determination for the Turners Falls Hydroelectric Project No. 1889 (Turners Falls Project) and the Northfield Mountain Pumped Storage Project No. 2485 (Northfield Mountain Project) located on the Connecticut River in the states of Massachusetts, New Hampshire and Vermont. The determination is based on the study criteria set forth in section 5.9(b) of the Commission's regulations, applicable law, Commission policy and practice, and the record of information.

Background

On April 15, 2013, FirstLight Hydro Generating Company (FirstLight) filed its proposed plan for 36 studies covering geologic and soil resources, water quality, geomorphology, hydrology, instream flow, fish and aquatic resources, wildlife resources, botanical resources, recreation and aesthetic resources, and cultural and paleontological resources in support of its intent to relicense the projects.

FirstLight held its Study Plan Meeting on May 14, 2013, and subsequently held nine resource-specific study plan meetings on May 14, 15, 21, and 22, and on June 4, 5, 11, 12, and 14. In addition, FirstLight met with the Narragansett Tribe on June 6 to discuss proposed studies. On June 28, 2013, FirstLight filed an updated Proposed Study Plan for additional stakeholder review and comment. Following the conclusion of study

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plan meetings and receipt of comments on its Proposed Study Plan and Updated Proposed Study Plan, FirstLight filed its Revised Study Plan on August 14, 2013. The Revised Study Plan includes 38 proposed studies.

Comments on FirstLight's study plans were filed by: the U.S. Fish and Wildlife Service (FWS); the U.S. Environmental Protection Agency (USEPA); the National Park Service (NPS); the National Marine Fisheries Service (NMFS); the Massachusetts Division of Fish and Wildlife (MADFW); the Massachusetts Department of Environmental Protection (MADEP); the Massachusetts Department of Conservation and Recreation (MADCR); the Massachusetts Historical Commission; the New Hampshire Department of Environmental Services (NHDES); the Vermont Agency of Natural Resources (VANR); the Vermont Division for Historic Preservation; the Nolumbeka Project; American Whitewater; The Nature Conservancy; the Appalachian Mountain Club; the Vermont River Conservancy; the Friends of the Connecticut River Paddlers' Trails; New England FLOW; Trout Unlimited; Landowners and Concerned Citizens for License Compliance (Concerned Citizens); the Connecticut River Watershed Council (Watershed Council); the Franklin Conservation District; the Franklin Regional Council of Governments (Franklin Regional Council); the Town of Gill, Massachusetts; the Town of Northfield, Massachusetts; Turners Falls Fire Department; and the following individuals: Karl Meyer, Donald Pugh, Warren Ondras and Lisa McLoughlin, Steven Alves, Philip F. Tomlinson Jr., Peter Richardson, Katherine Putnam, Jane Whittlesey Winn, Glen Ayers, and Elizabeth Austin.

Aquatic Resource Studies

On August 27, 2013, Entergy announced that it plans to decommission its Vermont Yankee Nuclear Power Plant (Vermont Yankee) during the fourth quarter of 2014. Vermont Yankee withdraws its cooling water from and discharges it back to TransCanada Hydro Northeast's reservoir for the Vernon Hydroelectric Project No. 1904. The Vernon reservoir is located immediately upstream of the Turners Falls reservoir. Operation of Vermont Yankee has increased Connecticut River water temperatures within the Vernon reservoir and downstream through the Turners Falls Project since the plant went into operation in 1972. Because this will no longer be the case after 2014, FirstLight's proposed aquatic studies may produce unusable data if conducted during 2014 while Vermont Yankee is still operating. Because of this unusual circumstance, we are not issuing a determination on 18 of FirstLight's proposed aquatic resource studies at this time¹ but are addressing the 20 studies that are not likely to be influenced by the presence or absence of Vermont Yankee's operation.

¹ Appendix C includes a list of all proposed and requested studies that staff have identified as potentially affected by the decommissioning of Vermont Yankee.

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We intend to hold a technical meeting to obtain more information on the proposed Vermont Yankee decommissioning and hear from the licensee and stakeholders on any necessary adjustments to the proposed and requested study designs and/or schedules. Additional detail on the technical meeting will be provided soon. Thereafter, we will issue a study plan determination on the aquatic resource studies.

General Comments

A number of the comments received do not address study plan issues. This determination does not address these comments, but rather addresses comments specific to the merits of the proposed studies submitted pursuant to section 5.13 of the Commission's regulations and comments received thereon.

Study Plan Determination

Of the 20 studies proposed by FirstLight and addressed in this study plan determination, 16 are approved with staff-recommended modifications and four are approved as filed by FirstLight (see Appendix A). No additional studies are being required. The specific modifications to the study plan and the basis for modifying FirstLight's study plan, and the reasons for not adopting the additional studies are discussed in Appendix B. Although Commission staff considered all study plan criteria in section 5.9 of the Commission's regulations, only the specific study criteria that are particularly relevant to the determination are referenced in Appendix B.

As discussed in Appendix B, of the 16 modified study plans, FirstLight is required to file three for Commission approval.² FirstLight must file these modified studies within 90 days from the date of this letter, and allow at least 30 days for the identified stakeholders to comment on the proposed modifications. FirstLight must include in its filing copies of any comments, a discussion of how comments are addressed, and its reasons for not adopting any recommendations.

Nothing in this study plan determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional

²The modified studies needing Commission approval are: Study 3.5.1 *Baseline Inventory of Wetland, Riparian and Littoral Habitat in Turners Falls Impoundment, and Assessment of Operational Impacts on Special-Status Species*; Study 3.6.3 *Whitewater Boating Evaluation*; and Study 3.6.7 *Recreation Study of Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use*.

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studies. In addition, FirstLight may choose to conduct any study not specifically required herein that it feels would add pertinent information to the record.

If you have any questions, please contact Ken Hogan at (202) 502-8434.

Sincerely,

Jeff C. Wright
Director
Office of Energy Projects

Enclosures: Appendix A--Approved and modified studies subject to this determination
Appendix B--Staff's recommendations on proposed and requested studies
Appendix C – List of Proposed and requested studies that we have
identified as potentially affected by the decommissioning of Vermont
Yankee

cc: Mailing List
Public Files

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APPENDIX A**SUMMARY OF DETERMINATIONS ON PROPOSED AND REQUESTED
STUDY MODIFICATIONS AND STUDIES REQUESTED BUT NOT ADOPTED
BY FIRSTLIGHT**

Study	Recommending Entity*	Approved	Approved with Modifications	Not Required
3.1.1 -- 2013 Full River Reconnaissance Study	FirstLight		X	
3.1.2 -- Northfield Mountain/Turner Falls Operations Impact on Existing Erosion and Potential Bank Instability	FirstLight		X	
3.1.3 -- Northfield Mountain Project Sediment Management Plan	FirstLight		X	
3.2.2 -- Hydraulic Study of Turners Falls Impoundment, Bypassed Reach, and the Connecticut River below Cabot Station	FirstLight		X	
3.3.8 -- Computational Fluid Dynamics Modeling of the Fishway Entrances and Powerhouse Forebays	FirstLight		X	
3.3.9 -- Two-Dimensional Modeling of the Northfield Mountain Pumped Storage Project Intake/Tailrace Channel and Connecticut River Upstream and Downstream of the Intake/Tailrace	FirstLight		X	

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Study	Recommending Entity*	Approved	Approved with Modifications	Not Required
3.4.1 -- Baseline Study of Terrestrial Wildlife and Botanical Resources at the Turners Falls Impoundment, in the Bypassed Reach, and below Cabot Station within the Project Boundary	FirstLight	X		
3.4.2 -- Effects of Northfield Mountain Project-related Land Management Practices and Recreation Use on Terrestrial Habitats	FirstLight	X		
3.5.1 -- Baseline Inventory of Wetland, Riparian and Littoral Habitat in Turners Falls Impoundment, and Assessment of Operational Impacts on Special-Status Species	FirstLight		X	
3.6.1 -- Recreational Use/User Contact Survey	FirstLight		X	
3.6.2 -- Recreation Facilities Inventory and Assessment	FirstLight		X	
3.6.3 -- Whitewater Boating Evaluation	FirstLight		X	
3.6.4 -- Assessment of Day Use and Overnight Facilities Associated with Non-motorized Boats	FirstLight		X	

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Study	Recommending Entity*	Approved	Approved with Modifications	Not Required
3.6.5 -- Land Use Inventory	FirstLight	X		
3.6.6 -- Assessment of Effects of Project Operation on Recreation and Land Use	FirstLight	X		
3.6.7 -- Recreation Study of Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use	FirstLight		X	
3.7.1 -- Phase 1A Archaeological Survey	FirstLight		X	
3.7.2 -- Reconnaissance-Level Historic Structures Survey	FirstLight		X	
3.7.3 -- Traditional Cultural Properties Study	FirstLight		X	
3.8.1 -- Evaluate the Impact of Current and Potential Future Modes of Operation on Flow, Water Elevation and Hydropower Generation	FirstLight		X	
Climate Change and Continued Project Operations	FWS, MADFW, NHDES, Town of Gill, Watershed Council, Concerned Citizens			X

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Study	Recommending Entity*	Approved	Approved with Modifications	Not Required
Closed Loop System Evaluation	Franklin Regional Council, Franklin Conservation District, Town of Gill, Watershed Council, Concerned Citizens			X
Contingent Valuation Study	American Whitewater, Appalachian Mountain Club, New England FLOW			X
Present and Increased Noise Level Determination and (possible) Mitigation of Northfield Mountain Pumped Storage Project	Lisa McLoughlin, Warren Ondras			X

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APPENDIX B

STAFF'S RECOMMENDATIONS ON PROPOSED AND REQUESTED STUDY MODIFICATIONS AND STUDIES REQUESTED

The following discusses staff's recommendations on studies proposed by FirstLight and participants' requests for study modifications and additional studies. We base our recommendations on the study criteria outlined in the Commission's regulations [18 C.F.R. section 5.9(b)(1)-(7)]. Except as explained below, the revised study plan, filed on August 14, 2013, as modified below, adequately addresses all study needs at this time.

I. Requests for Study Modifications

Study 3.1.1 - 2013 Full River Reconnaissance Study

Northfield Mountain Project operations fluctuate water levels in the Turners Falls reservoir; thereby, increasing erosion potential of the reservoir rim. To address erosion in the Turners Falls reservoir, in 1999 the project licensee was required to develop and implement an Erosion Control Plan (ECP). As a requirement of the ECP, FirstLight must conduct a Full River Reconnaissance (FRR) Study every 3-5 years. The FRR is designed to document reservoir erosion conditions and to evaluate trends in erosion. At our request, FirstLight includes the FRR study in its study plan as the information generated by the FRR is will support other licensing studies designed to identify trends and causation of erosion within the Turners Falls reservoir.

Existing Erosion Characterization

Applicant's Proposed Study

FirstLight proposes to conduct a reconnaissance level survey along the entire Turners Falls Project shoreline to characterize erosion by type, stage, extent, and potential for future erosion. The study would characterize upper and lower streambanks by height, slope, sediment type and vegetative cover. FirstLight would include an evaluation of indicators of future erosion, such as overhanging banks, leaning trees, exposed roots and tension cracks at each site. The study includes a Quality Assurance Project Plan with photographic examples, definitions, drawings and descriptions, field data sheets, field data collection methodologies designed to produce to assist field surveyors in producing representative and comparable characterizations of shoreline erosion conditions. The study will produce various maps and geospatial data sets and be performed without reference to the causes of erosion.

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Comments on the Study

The Franklin Regional Council disagrees with FirstLight's proposed methodology that combines erosion features and characteristics and performs statistical distributions to aid in further understanding erosion and stability issues. The Regional Council recommends that FirstLight follow definitions and methodologies recommended by the Field study. The Regional Council objects to the use of subjective qualitative terminology and measurements to describe the use of extent and stage of erosion and to the use of such data that are proxies for erosion, in a study to determine the causes of erosion.

Discussion and Staff Recommendation

FirstLight's proposed study plan is a reconnaissance level study and will be performed and as such, includes many parameters that will be estimated visually such as steepness of slope and degree of vegetative cover. Other parameters, such as the length and location of an erosion site will be precisely measured with modern GPS equipment. While the recording of some classification parameters might be qualitative, these observations and measurements would be performed by trained technical personnel under the supervision of an engineer and documented not only with field sheets but also with photographs and geo-referenced videographs. This technique is common scientific practice for a reconnaissance level study (section 5.9 (b)(6)).³ Therefore we are not recommending any changes to the proposed methodology.

Operational Trends

Applicant's Proposed Study

The purpose of the Full River Reconnaissance Study is to characterize erosion by type, stage, extent, and potential for future erosion. In response to a recommendation to consider project operation changes in this study, FirstLight proposes to record and report project operations changes that occur during the study period (2013-2014). The study will produce various maps and geospatial data sets and be performed without reference to the causes of erosion.

Comments on the Study

NHDES comments that any changes in operation of the FirstLight's projects during the study period since the implementation of the 1999 ECP, should be evaluated to

³ Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

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see if such changes in operation during the study period are related to any apparent erosion trends.

Discussion and Staff Recommendation

Changes in operating procedures, such as available storage volume, unit upgrades, and hydraulic capacities could influence the magnitude, timing, and duration of flow releases and may have affected erosion patterns. However operational changes during the brief (2013-2014) study period are unlikely to show any discernible trends. A longer term trend analysis would inform our understanding of the erosional responses to changes in operation (section 5.9(b)(5)) and provide data for the development of license conditions. Therefore, we recommend that FirstLight include an analysis of operational changes through the period 1999 to 2013 to identify any correlation between operational changes and observed changes in erosion rates. However this analysis should be conducted as a part of study 3.1.2 - *Northfield Mountain/Turner Falls Operations Impact on Existing Erosion and Potential Bank Instability*. We estimated that the recommended modification would increase the cost of the study by \$10,000.

Study 3.1.2 - Northfield Mountain/Turner Falls Operations Impact on Existing Erosion and Potential Bank Instability

Project operations may affect the reservoir bank stability through fluctuations of water levels and flows. Therefore, FirstLight proposes to gather data on site conditions, morphology, and engineering properties of soils along the reservoir, and to conduct analyses and studies to evaluate the causes of erosion within the reservoir.

Mapping of Beaches

Applicant's Proposed Study

FirstLight proposes to review existing information, identify data gaps, and conduct field investigations to identify and evaluate the causes of erosion in the Turners Falls Impoundment. The study would use the results of study 3.2.2 – *Hydraulic Study of Turners Falls Impoundment* to quantify velocities and water level fluctuations. These results in turn would be used in the evaluation of the causes of erosion at selected representative transects. FirstLight does not propose to map beaches in this study. Mapping of erosion will be accomplished by study 3.1.1 - *Full River Reconnaissance Study*. Mapping of beaches is not an objective of this study 3.1.1.

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Comments on the Study

The Watershed Council cites a recommendation from the 2007 Field report⁴ that recommends that possible future work include a remote sensing study, using LiDAR⁵, to map the presence and absence of beaches to identify areas of deposition and erosion.

Discussion and Staff Recommendation

The Watershed Council does not explain the necessity of mapping beaches with LiDAR or why FirstLight's proposed methodology is not adequate to identify the causes of erosion. Mapping beaches is not an objective of FirstLight's study. FirstLight does not specifically need LiDAR mapping to fulfill its study objectives of determining the causes of erosion in the Turners Falls reservoir. The study will determine areas susceptible to erosion and its cause because FirstLight has detailed bathymetry data for input to its hydraulic models. FirstLight's proposed 1-D and 2-D hydraulic models, properly calibrated and verified, will be able to predict flow velocities sufficient to identify likely reaches susceptible to erosion and deposition. In addition, the analyses within study 3.1.2 will quantify the erosive forces and inform the causative analysis of the forces or combination of forces contributing to erosion at each study site.

We do not recommend adopting the requested modification because FirstLight's proposed study is sufficient to meet the objectives of the study and its stated information needs Section 5.9(b)(7).

Historic Comparisons

Applicant's Proposed Study

FirstLight proposes to perform a "historic geomorphic assessment of the Connecticut River based on the review of aerial imagery, topographic maps, archival documents, and other pertinent datasets" as a means of "providing context of long term trends in the Connecticut River."

Comments on the Study

The Watershed Council and Franklin Conservation District request that FirstLight review available mapping to assess bank position and bank erosion over time, including

⁴ Field Geology Services. (2007). Fluvial Geomorphology Study of the Turners Falls Pool on the Connecticut River between Turners Falls, MA and Vernon, VT. Farmington, ME.

⁵ LiDAR is a remote sensing technology that measures distances by illuminating a target with a laser and analyzing the reflected light. LiDAR can be used for contour mapping.

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the use of 1961 aerial photographs and original surveys associated with the increase in Connecticut River water levels associated with the construction of the Northfield Pumped Storage plant.

Discussion and Staff Recommendation

A historical geomorphic trend analysis, like the one proposed by FirstLight, would provide useful information related to bank conditions over time (section 5.9(b)(5)). However, neither the Watershed Council nor the Franklin Conservation District provide any information on the potential accuracy, precision, or the cost of the method of 1961 analysis they suggest that FirstLight adopt (sections 5.9(b)(6) and 5.9(b)(7)). Given the lack of available historical orthophotos, the inherent distortions contained within historical aerial imagery (differences in lens technologies and uncorrected plane warp and tilt errors and the lack of photo ground control, the method proposed by the Watershed Council and the Franklin Conservation District are likely to only produce qualitative comparisons and any attempts to produce quantitative comparisons in bank position are likely to be inconclusive considering the magnitude of potential measurement errors of the 1961 aerial imagery.

FirstLight provides little detail regarding its proposed historical trend analysis of bank conditions. Discussions at the study plan meetings revealed that FirstLight has a 1970 vintage topographic ground survey used as base mapping in the planning and design of the Turners Falls pool raise associated with the Northfield Pumped Storage Project construction contain detailed information along the reservoir rim existing at that time. FirstLight could transfer or scan these maps into modern CAD drawings and compare map details with other available aerial orthophotos or maps representing existing conditions.

To provide more detailed methodology (section 5.9(b)(6)), we recommend that FirstLight's perform its historic geomorphic assessment using available mapping such as the 1970 vintage ground survey of the impoundment as a base map, comparing it against more recent aerial imagery and available survey data to analyze trends in bank position within the Turners Falls impoundment. We estimate the costs of the recommended study modification to be \$20,000.

Hourly Analysis

Applicant's Proposed Study

The applicant proposes to correlate seasonal project-caused water level fluctuations with flow by using mean daily inflows as the inflow to the project operations model.

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Comments on the Study

The Watershed Council comments on FirstLight's planned use of daily average flows to describe the hydrology at Turners Falls dam, the planned use of daily average flows for the correlation between the reservoir elevation variations with daily average river flow, and requested that the analysis be performed using hourly data and for the full range of flows, not just high flows.

FirstLight responds that the use of daily average flows provides "context on the range and seasonal variability of flows" and was not intended for use in the analysis of sub-daily flow fluctuations. FirstLight also responds that they intend to perform the analysis for the full range of flows experienced at the project, not concentrating only on high flows.

Discussion and Staff Recommendation

The purpose of FirstLight's proposed analysis is to study the range of daily water level fluctuations on a seasonal basis and using hourly flows is not likely to result in useful information. A high hourly flow for a short period of time will not necessarily result in an increase in the pool elevation, nor would a low hourly inflow necessarily result in a decrease in pool elevation. Other factors, most importantly, average daily inflow to the project and releases at Turners Falls dam vary according to seasonal patterns and ultimately play a larger role with respect to water level fluctuations. Therefore, mean daily flows are the appropriate time step for correlating daily fluctuations with the seasonal flows, Section 5.9(b)(6).

As such, we do not recommend FirstLight revise the study plan to employ hourly flows in this analysis.

Report Content

Applicant's Proposed Study

The applicant proposes that the final report will contain a discussion and summary of all data, a geomorphic assessment of the Connecticut River, and a discussion of the results of each task listed in the study methodology.

Comments on the Study

The Watershed Council comments that more detail is needed to describe the outcome of the study, noting that the study plan had little detail in the report description.

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Discussion and Staff Recommendation

While FirstLight provides little information about the report content, we note that there is sufficient detail in the description of the analysis to inform our expectations of the report. It is incumbent on FirstLight to provide an Initial Study Report that satisfies section 5.15(c)(1) of the Commission's regulations. Section 5.15 of the Commission's regulations provides an opportunity for all stakeholders to review and comment on the Initial Study Report and to seek improvements where appropriate.

As such, we do not recommend FirstLight revise the study plan to provide greater detail on the report contents.

Site Selection

Applicant's Proposed Study

FirstLight proposes to identify and select a number of fixed riverbank transects where detailed study and analyses would occur. The primary candidates for site selection are 22 locations where FirstLight's ongoing long-term erosion monitoring has occurred.

Comments on the Study

The Franklin Conservation District expresses dissatisfaction with the site selection process for the fixed transects because it is based on what it sees as a flawed methodology and does not incorporate stakeholder involvement.

Discussion and Staff Recommendation

FirstLight describes its site selection process for the fixed transect locations in its study plan, explaining that they will be selected based on the results of study 3.1.1, the existing 22 permanent transects, an assessment of erosion potential (high, low, active, or stable), and the opinions of the geomorphologist/hydraulic engineer and the geotechnical engineer.

Including stakeholders knowledgeable about local field conditions along the Connecticut River, would ensure that transects are located in the appropriate areas as necessary to determine projects effects of erosion (section 5.(b)(6)). Therefore, we recommend that FirstLight consult with the Watershed Council, the Franklin Regional Council, MADEP, and NHDES prior to final transect selection. We do not anticipate that seeking stakeholder input for site selection will significantly increase the cost the proposed study.

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Survey Methods

Applicant's Proposed Study Plan

FirstLight proposes that field transect surveys be performed four times per year and after significant flood events. FirstLight would collect data based on the geometry at each change/break in grade.

Comments on the Study

NHDES comments that its study request required that FirstLight specify the density of survey points and stated that the density needed to be high enough to detect changes in geometry that may be primarily attributable to project operation. It notes that if the density was not deemed adequate, then it requests that bank pins be used. Installation of bank pins and measuring the length of the pin that is exposed is an alternate method of establishing erosion rates. Further, NHDES notes that its request for bi-weekly surveys (July through September) would help isolate the potential effects of daily project operation. Finally, NHDES recommends FirstLight perform surveys at a higher resolution (approximately every foot and at every break in grade) for two years.

Discussion and Staff Recommendation

Erosion can either occur at a slow rate over a long period of time, or suddenly, as a result of a significant flow or geologic event. FirstLight's proposed survey schedule is sufficient to estimate the slower rate of erosion caused by daily operations. Higher rates of erosion caused by significant events would be documented by FirstLight's proposal to survey within 15 days of each high-flow event. In any case, the aftermath of mass-wasting events should be evident even under the proposed quarterly monitoring due to the large amount of soil loss generally associated with such events. The commenters' suggested bi-weekly monitoring would not definitively identify the circumstances that finally caused a mass-wasting event.

The proposed study frequency for resurveying each transect, a minimum of four times per year, is consistent with generally accepted scientific principles (section 5.9(b)(6)). The level of effort and costs required by the recommended bi-weekly monitoring would not necessarily result in additional useful information over the proposed study (section 5.9 (b)(7)).

As a result, we do not recommend incorporating the requested modification for bi-weekly monitoring in the study plan.

Finally, our review of FirstLight's study plan indicates that FirstLight did not specifically define the flow value that would trigger a high-flow event survey (section 5.9

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(b)(6)). Therefore, for the purposes of this study, we recommend that FirstLight define a “high-flow event” as a flow greater than 56,000 cfs at Turners Falls dam. This flow approximates the annual flood flow, as calculated by a 1.5-year probability recurrence interval.

BSTEM Modeling

Applicant’s Proposed Study

FirstLight proposes to use the BSTEM program to determine the causes of erosion at selected intensely monitored transects.

Comments on the Study

NMFS would like to see root resistance employed in the BSTEM analysis using the RIPROOT feature of the model, recommending that requisite root data be collected for the most dominant four or five species in the area

Discussion and Staff Recommendation

The RIPROOT feature of the BSTEM model is a component that addresses the increase in strength and stability of streambanks due to the mechanical action of bank-top vegetation. Input to the RIPROOT feature of the model consists of the vegetation type, age, and approximate root depth of an assemblage of vegetation collected at the specific survey sites. The RIPROOT feature then calculates the additional bank strength, and therefore resistance to erosion, provided by the presence of roots.

While we recognize that there would be costs associated with the field data collection necessary to inform the RIPROOT module, incorporating bank vegetation and protection data into the BSTEM model would allow the model to more accurately describe the erodability of the soils and banks in the project area, which is the purpose of the study (section 5.9(b)(7)).

We recommend that FirstLight employ the RIPROOT module within the BSTEM model to more accurately describe the erodability of the soils and banks in the project area. We estimate the costs associated with gathering field data on vegetation types age, and approximate root depths and executing the module would increase the cost of the study by approximately \$10,000 (section 5.9(b)(7)).

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Mitigation

Applicant's Proposed Study

FirstLight does not propose to evaluate operational changes to reduce riverbank erosion.

Comments on the Study

NHDES requests that study 3.1.2 identify project operational techniques that may be used to reduce riverbank erosion within the Turners Falls reservoir and downstream.

Discussion and Staff Recommendation

FirstLight's proposed studies 3.1.1 and 3.1.2 are designed to identify and map areas of erosion within the Turners Falls reservoir and to evaluate erosional causes at the mapped site. Evaluating various operating regimes to limit erosion prior to identifying locations of erosion and the cause of the erosion, as requested by NHDES, would be premature (section 5.9(b)(5)). As a result, we do not recommend that FirstLight evaluate adjustments to project operations to limit erosion as part of study 3.1.2.

Study 3.1.3 - Northfield Mountain Project Sediment Management Plan

The Northfield Mountain Project pumps water from the Connecticut River to the Northfield Mountain Upper Reservoir (Upper Reservoir). Sediments may become entrained during pumping operations and subsequently deposited in the Upper Reservoir. Accumulated sediment in the Upper Reservoir may become dislodged when the reservoir's elevation is lowered for routine maintenance and may affect water quality.

FirstLight proposes to evaluate sediment transport and dynamics between the Connecticut River and Upper Reservoir. Therefore, FirstLight proposes to collect suspended sediment concentration (SSC) data in 2013, 2014, and 2015 in the Connecticut River upstream of the Route 10 Bridge and in the Northfield Mountain Tailrace using remote analytical sampling equipment.⁶

⁶ Suspended Sediment Concentration (SSC) is also a method to determine the amount of suspended sediment in waters.

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Suspended Sediment Concentration Monitoring versus Total Suspended Sediment Monitoring

Applicant's Proposed Study

FirstLight proposes to monitor SSC suspended sediment concentrations on an hourly basis in the Connecticut River and on a half-hourly basis at the Northfield Project intake/tailrace channel.

Comments on the Study

The U.S. Environmental Protection Agency (USEPA) identifies the importance of real-time monitoring of Total Suspended Sediment (TSS) in the Connecticut River.⁷

Discussion and Staff Recommendation

TSS analysis methods were originally developed for analyses of wastewater samples, and the use of TSS for natural river water is not recommended by the U.S. Geological Survey (USGS) as it is "shown to be fundamentally unreliable for the analysis of natural-water samples," and is not directly comparable to SSC methods⁸. The USGS recommends that all natural water analyses be performed using the SSC methods.

We do not recommend that FirstLight modify the study plan because its proposed methodology uses generally accepted scientific practices (section 5.9(b)(6)).

Suspended Sediment Monitoring at the Northfield Mountain Upper Reservoir Intake

Applicant's Proposed Study

The applicant does not propose to monitor suspended sediment in the intake channel in the upper reservoir of the Northfield Mountain Project.

Comments on the Proposed Study

USEPA requests that FirstLight include TSS monitoring both in the river and within the intake channel of the Upper Reservoir.

⁷ Total Suspended Solids (TSS) is a laboratory method of determining the amount of total suspended solids in water.

⁸ Gray, Glysson, Turcios, and Schwarz. Comparability of Suspended-Sediment Concentration and Total Suspended Solids Data. USGS Water-Resources Investigations Report 00-4191, 2000.

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Staff Discussion and Recommendation

As proposed by FirstLight, there would be two suspended sediment monitors near the entrance to the intake/tailrace channel within Turners Falls pool which will both be capable of monitoring the sediment concentration during the pump cycle where flow is pumped from the Connecticut River into the Upper Reservoir, and capable of monitoring the sediment concentrations returned to the river during the generation cycle. A comparison of the pumping cycle sediment concentrations and the generation cycle sediment concentrations would provide data for analysis of the project operational effects on sediment concentrations (section 5.9(b)(5)). It is not clear what benefit would result from USEPA's recommended monitoring in the Upper Reservoir and how these data would inform a licensing decision.

The methodology proposed by FirstLight is adequate to gather sediment concentration data to analyze the effects of project operation on sedimentation to discharges to the Connecticut River (section 5.9(b)(6)). No further data appears necessary, and we do not recommend the installation of additional sediment concentration monitors in the Upper Reservoir.

Schedule of Sampler Deployment

Applicants Proposed Study

FirstLight plans to deploy suspended sediment concentration samplers in the 2014 and 2015 seasons according to the same schedule that was used in 2013. As a result this means FirstLight proposes to deploy the suspended sediment concentration samplers located at the Route 10 Bridge in the spring and the suspended sediment samplers located at the entrance to the Northfield Mountain intake/spillway channel in the summer.

Comments on the Study

The Watershed Council requested that FirstLight deploy all suspended sediment sampling units at the same time in the spring.

Discussion and Staff Recommendation

Simultaneous installation of all SCC equipment at locations as early as possible in the spring, post-icing conditions, would provide data to inform a more complete understanding of the seasonal variation of the sediment concentrations within the river.

We recommend that FirstLight modify the study plan schedule to achieve the installation of all SSC monitoring equipment by April 1st and leave the units deployed until November 1st in order to capture the seasonal variation in the SSC data for high and

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low flows (section 5.9(b)(6)). We estimate that the recommended modification will increase the cost of the proposed study by \$4000.

Study 3.2.2 - Hydraulic Study of Turners Falls Impoundment, Bypassed Reach, and the Connecticut River below Cabot Station

Project operations may affect river flows, velocities, and water levels within the Turners Falls impoundment, bypassed reach, and in the Connecticut River below Cabot Station. Therefore, FirstLight proposes to develop two one-dimensional hydraulic models, one for the Turners Falls impoundment and one for the Connecticut River from the Turners Falls dam to the Holyoke dam. These models would water level fluctuations at the three locations identified above associated with operations of the Turners Falls and Northfield Mountain projects. To better inform development of the impoundment model, FirstLight proposes to deploy water level loggers throughout the project impoundment. Additionally, FirstLight proposes to use the data from five existing downstream water level loggers as well as information gathered during study 3.3.1 - *Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station Study* to validate the downstream model. The results of this hydraulic modeling study would support the assessment of project effects in several other study areas including: environmental, geologic, and recreational resources.

Water Level Loggers

Applicant's Proposed Study

FirstLight proposes to deploy the water level loggers at nine locations. The locations are shown in Figure 3.2.2-3 of the Revised Study Plan.⁹ The hydraulic grade line showing the slope of the channel and water surface elevations at various flows is shown in Figure 3.2.2-2 of the Revised Study Plan. FirstLight proposes to deploy the loggers from August through November of 2013. FirstLight would re-install the loggers in 2014 if the 2013 data collected does not cover a wide enough range of flows.

Comments on the Study

The Watershed Council recommends that FirstLight deploy additional water level loggers within the Turners Falls impoundment to better define the hydraulic dynamics of

⁹ Pre-Application Document. Northfield Mountain Pumped Storage Project, FERC Project No. 2485, Turners Falls Hydroelectric Project, FERC Project No. 1889. Filed on October 30, 2012.

Revised Study Plan. Northfield Mountain Pumped Storage Project, FERC Project No. 2485, Turners Falls Hydroelectric Project, FERC Project No. 1889. Filed on August 14, 2013.

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the impoundment, but only specifies a location for one; between the Turners Falls boat barrier and the Northfield Mountain tailrace.

The Watershed Council asserts that the installation of the water level loggers for the proposed four-month period of August 2013 through November 2013 is not adequate. The Watershed Council states that the deployment period should cover the range of potential project operations and river flows. The Watershed Council states that, if year-round recording is not achievable, then at a minimum a full season of data is necessary to adequately characterize the full range of river fluctuations.

Discussion and Staff Recommendation

Hydraulic dynamics and water level fluctuations are heavily dependent on hydraulic grade and sharp changes in hydraulic grade. Based on our review of the hydraulic grade line shown in Figure 3.3.2-3 steep changes in hydraulic grade occur near transects 14,000 and 70,000. These transects are either far away or significantly steeper in slope from the closest proposed water level logger. We believe that the calibration and verification of the model would benefit from two additional water level loggers. Providing water level loggers at these two locations would better define the hydraulic dynamics of the impoundment, improve the integrity and reliability of the model results (section 5.9(b)(7)). As such, we recommend additional loggers near Transection station 14,000 (as requested by the Water Council) and another near Transect station 70,000 (section 5.9(b)(6)).

Additionally, we question whether FirstLight will be able to capture and characterize the range of potential project operations and river flows during the proposed four month period in 2013. While FirstLight indicates that if adequate data is not collected it will redeploy the water level loggers in 2014, FirstLight does not indicate the timing or duration of that redeployment (section 5.9(b)(4)). Water level logger data would be used to validate and calibrate the hydraulic model. Because river flows vary seasonally with high spring flows and low summer flows, capturing these seasonal flow attributes and how they interrelate with project operations to effect water level fluctuations is critical for the hydraulic model's calibration and validation (section 5.9(b)(6) and (7)). As such, we recommend that FirstLight collect water level logger data, at a minimum, during the months of April through November.

We estimate the cost of the additional level loggers and extended deployment period to be \$10,000 (section 5.9(b)(7)).

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Operational Alternatives

Applicant's Proposed Study

FirstLight's proposed hydraulic study of the Turners Falls Impoundment will model water level flows, elevations and velocities in Turners Falls Impoundment, in the bypass reach and in the free flowing stretch of Connecticut River Cabot Station and Holyoke Project impoundment. FirstLight will run the model for 16 different scenarios for the section of the Connecticut located below Cabot Station. The scenarios vary depending on operations at Turners Falls Project and conditions at two downstream projects. The proposed operating scenarios do not include as a variable operations at the upstream Northfield Mountain Pumped Storage project.

Comments on the Study

The Watershed Council requests that FirstLight update Table 3.2.2-4 of the Revised Study Plan to include a model run evaluating the effects of Northfield Mountain's operations on flow fluctuations in the Connecticut River below Cabot.

Discussion and Staff Recommendation

The primary cause of flow fluctuations below Cabot Station is the operational mode of the Turners Falls Project and Deerfield River No. 2 station. Northfield Mountain uses up to 9 feet of the operational storage within the Turners Falls impoundment. This available operating pool buffers the effects of discharges from Northfield Mountain n discharges below Turners Falls dam. Under normal operations Northfield Mountain does not affect flows below the Turners Falls dam (section 5.9(b)(5)). Because the operations of Turners Falls and Northfield Mountain are coordinated by FirstLight such that when Northfield Mountain is generating, the Turners Falls impoundment normally has sufficient empty storage to capture the released water without causing spilling at Turners Falls dam. Only under the conditions of a full pool at Turners Falls coinciding with inflows greater than greater than 17,000 cfs could Northfield Mountain discharges alter flows below Cabot station.

We do not recommend modifications to the study plan to evaluate the effects of Northfield Mountain's operations on the flow fluctuations in the Connecticut River below Cabot Station because of a lack of nexus between project operations and the resource (section 5.9(b)(5)).

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Study 3.3.8 - Computational Fluid Dynamics Modeling in the Vicinity of the Fishway Entrances and Powerhouse Forebays

The projects' operation can affect flow conditions in the vicinity of the fishway entrances and the powerhouse forebays which could affect fish passage and entrainment of fish into the powerhouses. Therefore, FirstLight proposes to develop Computational Fluid Dynamics (CFD) models of: (1) the power canal in front of the Station No. 1 powerhouse; 2) the Station No. 1 intake racks; 3) the power canal in front of the Cabot Station powerhouse; 4) the Cabot Station intake racks; 5) the Cabot fishway entrance; and 6) the Spillway fishway entrance. In addition, FirstLight will incorporate the previously developed CFD model of the entrance to the gatehouse fish ladder at the Turners Falls dam into the study. FirstLight proposes to assess potential impacts to upstream migrating fish in the tailrace of Station No. 1 using the hydraulic modeling proposed as part of study 3.3.1. FirstLight will "couple" the CFD modeling of the fishway entrances with the telemetry results (studies 3.3.2, 3.3.3, 3.3.5, and 3.3.19). The telemetry study will assess passage counts and environmental variables (water temperature, river flow) to understand which conditions are preferable for guiding migrating fish to the entrances. FirstLight proposes to "couple" assessments after the conclusion of both the telemetry and CFD modeling studies.

Modeling the Station No. 1 Tailrace and Bypass Channel

Applicant's Proposed Study

Instead of using a CFD model, FirstLight proposes to assess the hydraulics at the Station No. 1 tailrace and within the bypass channel with a 1-D model approach using the PHABSIM model proposed as part of study 3.3.1.¹⁰

Comments on the Study

To evaluate potential impacts to upstream fish migration through the bypass reach, the Watershed Council, MADFW, and Karl Meyer request that FirstLight develop CFD models of the Station No. 1 tailrace and the bypass channel instead of FirstLight's proposed approach.

Discussion and Staff Recommendation

The purpose of study 3.3.1 includes the assessment of the potential effects of the range of discharges from Station No. 1 on wetted area and aquatic habitat suitability in

¹⁰ FirstLight notes that a 2-D model may be required for a portion of the uppermost section of the bypass reach.

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the Connecticut River between Turners Falls dam and Cabot Station (the bypassed reach) and below Cabot Station downstream to the Route 116 Bridge in Sunderland, MA.

At this time, it is unclear if a hydraulic barrier to fish passage exists within the bypassed reach whether in the vicinity of Station No. 1 or not. The information obtained from study 3.3.1, and more appropriately the results of the telemetry studies 3.3.2, 3.3.3, 3.3.5, and 3.3.19 could be used to evaluate whether flow fields within the tailrace of Station No. 1 and in the bypassed reach are creating a hydraulic barrier (sections 5.9(b)(5) and (6)). The development and implementation of a CFD model prior to a determination that a barrier exists would be premature (section 5.9(b)(4), (5), and (7)). If, based on the results study 3.3.1 and results from the telemetry studies 3.3.2, 3.3.3, 3.3.5, and 3.3.19, demonstrate that a hydraulic barrier may be present, a site-specific CFD model could be developed to inform potential mitigation and enhancement measures to address the barrier if appropriate.

We, therefore, do not recommend that FirstLight develop CFD models of the Station No. 1 tailrace and the bypass channel.

Study Reports

Applicant's Proposed Study

FirstLight proposes to develop a report summarizing the study findings. The report will include maps, cross-sections, and other visualizations of the model results that are relevant to the study objectives. The study will analyze fishway attraction flows at the entrances to fish ladders, near rack sweeping velocities at the powerhouse intakes and assessing whether fish are directed to the surface bypass weir at Cabot Station.

Comments on the Study

FWS requests that FirstLight provide it with all resulting study data and the relevant project design drawings such as intake drawings and tailrace bathymetry. FWS requests that the report include detailed bathymetry data and relevant project drawings necessary to independently review the study.

Discussion and Staff Recommendation

The study report contents as described, by FirstLight would provide sufficient information, data and drawings to analyze hydraulic forces around fishway entrances and powerhouse intakes. Such information will allow staff to analyze project effects on fish passage and entrainment.

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We recommend FirstLight provide all requested study data and any relevant project drawings to any stakeholder who requests it. We recognize that some project drawings may be categorized as Critical Energy Infrastructure Information (CEII) and, therefore, not readily available. We estimate that the costs of providing information on request is negligible compared to the overall cost of the study.

Study 3.3.9 - Two-Dimensional Modeling of the Northfield Mountain Pumped Storage Project Intake/Tailrace Channel and Connecticut River Upstream and Downstream of the Intake/Tailrace.

Northfield Mountain Project operations may interfere with fish migration due to Project affects on velocities and flow fields at, and in proximity to, the Northfield Mountain Project intake/discharge structure when pumping or generating. Therefore, FirstLight proposes to conduct hydraulic modeling of a 10-kilometer portion (5 km upstream, 5 km downstream) of the Turners Falls impoundment surrounding the Northfield Mountain project tailrace.¹¹ In the immediate vicinity of the tailrace, FirstLight proposes to collect field data under both pumping and generating conditions and to use this data to assess flow field conditions in this area. FirstLight proposes to conduct a series of model runs “production runs” using a two-dimensional hydraulic model to evaluate velocities and water level fluctuations in reaches affected by the Northfield Mountain Project. To establish the configuration of the various production runs FirstLight will employ three model variables: a) Turners Falls impoundment elevation; b) main stem river flow (base flow); c) Northfield Mountain Project flow (4 pumps, 2 pumps, 4 generators, 2 generators).

Production Runs

Applicant's Proposed Study

FirstLight proposes to conduct two series of production runs using a transient two-dimensional model with Connecticut River base flows equal to the 25% (17,500 cfs) and 75% (6,000 cfs) exceedance flows as measured at Turners Falls dam.¹²

¹¹ As noted by the FWS, task 5 of the methodology states “steady-state” model runs; however, we interpret this to be in error and reflective of previous versions of the study plan.

¹² Flow exceedance is the percent of time a flow has been historically met or exceeded at a given location. For example, 17,500 cfs is exceeded approximately 25% of the time as measured Turners Falls dam for the period January 1941 through September 2010, and is therefore, defined as the 25% exceedance flow at Turners Falls dam.

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Comments on the Study

To better evaluate the full range of potential operational impacts, NMFS recommends FirstLight revise the study plan to include production runs over a greater range of Connecticut River flows. NMFS proposes production runs with base flows using the 5%, 25%, 50%, 75%, and 95% exceedance flows at Turners Falls dam.

Discussion and Staff Recommendation

The hydraulic capacity of the Northfield Mountain project is approximately 15,200 cfs while in pumping mode and 20,000 cfs when generating. Therefore, Northfield Mountain Project operations have the potential to influence flow direction, velocity, and magnitude within the Connecticut River. The significance of these affects varies depending on the base flow in the Connecticut River and the magnitude of the project's operation (section 5.9(b)(5)).

These operational effects are likely more pronounced when pumping or generating increases in magnitude and/or during periods of low river flow. In contrast, these effects of the project are likely attenuated when river flows are significantly greater than the project's hydraulic capacity. For example, flows equal to the 5% exceedance flow are approximately 45,000 cfs, and nearly triple the hydraulic pumping capacity of the Northfield Mountain Project. As a result, the effects of Northfield Mountain Project's pumping operation would be significantly diminished when compared with that same pumping operation at the 95% exceedances flow (2,500 cfs) in the Connecticut River flow(section 5.9(b)(5)).

Conducting the productions runs at 25% and 75% exceedance flows likely will not provide sufficient data to fully evaluate Northfield Mountain's operational effects on the Connecticut River at a full range of base river flows, or support an analysis of how these project effects may also effect other resources (e.g., anadromous fish migration) (section 5.9(b)(7)).

Therefore, we recommend FirstLight add the 5 % (45,000 cfs), 50% (9,500 cfs), and 95% (2,500 cfs) exceedance flows to its production runs. The additional production runs will provide model results to better support an evaluation of the full range of operational impacts (section 5.9(b)(7)). We estimate that this recommended study modification would cost approximately \$20,000 (section 5.9(b)(7)).

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Intake/tailrace Channel Transects

Applicant's Proposed Study

FirstLight proposes to use actual field measure velocities at three transects across the intake/tailrace channel to document velocity and flow field in the channel during pumping and generating operations, instead of modeled velocities, because the two-dimensional model is depth averaged and unable to predict water column velocity profiles. FirstLight proposes to use a floating apparatus that will measure velocity as it pulled across the channel on a metal cable and along each of three transects.

Comments on the Study

The Watershed Council states that the three transects in the intake tailrace channel may not allow for the assessment of entrainment resulting from Northfield Mountain Project operations due to the distance between the most inland transect and from the Northfield Mountain Project intake.

The Watershed Council questions why FirstLight cannot collect velocity data at a fourth transect at a point closer to the intake.

Discussion and Staff Recommendation

The intake/tailrace channel for the Northfield Mountain Pumped Storage Project is an approximately 450-foot-long, v-shaped side channel located off the main channel of the Connecticut River. Figure 3.3.9-2 indicates the three proposed transects, with the nearest approximately 150 feet from the intake of the Northfield Mountain Project. The channel geometry incrementally widens at each of the proposed transects as they get further from the project intake/discharge, as such flow velocities will likely incrementally slow at each of these locations. However, given the distance of transect 1 from the intake/discharge and the configuration of the channel, Figure 3.3.9-2 of the revised study plan demonstrates that velocities collected solely at the proposed transect locations would not accurately represent the velocities within the channel (section 5.9(b)(6) and (7)).

Therefore, we recommend that FirstLight add another transect, equidistant between the project's intake/discharge and the proposed transect 1. We estimate the cost of establishing the additional transect and collecting the additional data to be \$4,000(section 5.9(b) (7)).

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Study 3.4.1 - Baseline Study of Terrestrial Wildlife and Botanical Resources at the Turners Falls Impoundment, in the Bypassed Reach, and below Cabot Station within the Project Boundary

Project operation, maintenance activities, and recreational use could affect terrestrial wildlife and botanical resources. FirstLight proposes to characterize and describe the terrestrial wildlife and botanical resources that use representative upland habitats within and adjacent to the project boundary. To document the type and distribution of terrestrial wildlife habitats and vegetation communities in the study area, FirstLight proposes to conduct a survey adjacent to the shoreline of the Turners Falls impoundment, the bypassed reach, and below Cabot Station to the Route 116 Bridge in Sunderland, MA.

Comments on the Study

The Nolumbeka Project recommends that FirstLight modify study 3.4.1 to include terrestrial wildlife and botanical resources studies on the Wissatinnewag property located along the Connecticut River adjacent to FirstLight lands in the Turners Falls bypassed reach. The Nolumbeka Project believes that such studies would add to the body of knowledge that the recreational historic tourism public would desire.

FirstLight notes that the Wissatinnewag property is not located within the project boundary, as shown in Figure B1 of the Proposed Study Plan, and thus believes there is no nexus between the project and the Wissatinnewag property.

Discussion and Staff Recommendation

The Nolumbeka Project does not provide any information showing how the project would affect the property or how the information would inform potential license requirements (section 5.9(b)(5)). However, if FirstLight needs to evaluate these lands as alternatives for portage around the dam, then wildlife and botanical surveys may be necessary (see recreation study 3.6.4). We, therefore, do not recommend modifying study 3.4.1 to include a wildlife and botanical evaluation of the Wissatinnewag property at this time.

Study 3.5.1 - Baseline Inventory of Wetland, Riparian and Littoral Habitat in Turners Falls Impoundment, and Assessment of Operational Impacts on Special-Status Species

Water level fluctuations associated with project operation could affect wetland, riparian, and littoral habitat and/or habitat for special-status plant and invertebrate species. FirstLight proposes to characterize and describe wildlife and botanical resources within the project area and assess the potential impacts of project-related water level

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fluctuations on habitat of state-listed plant species and state-listed invertebrate species, including the cobblestone tiger beetle (*Cicindela marginipennis*) and the Puritan tiger beetle (*Cicindela puritana*).¹³ FirstLight would collect data on depth and substrate along transects to assess habitat.

Project Water Level Fluctuation Assessment (Task 6)

Applicant's Proposed Study

To evaluate the effects of water level fluctuations associated with project operations on state-listed plant and invertebrate species (Task 6), FirstLight proposes to develop a HEC-RAS model (study 3.3.2). FirstLight proposes to use information from this hydraulic model to address how hydraulically connected habitats and vegetation are affected by project operations. FirstLight proposes to establish transects in known areas of cobblestone tiger beetle and Puritan tiger beetle habitat for use in conjunction with the hydraulic model results. FirstLight also proposes to consult with FWS and MADFW on the need for additional fine-scale surveying and mapping at occupied locations based on the information obtained from relicensing studies. Finally, FirstLight indicates it is not proposing to establish specific transects at unoccupied patches of suitable habitat for state-listed invertebrates.

Comments on the Study

FWS requests that FirstLight modify Task 6 to include additional transects and/or fine-scale surveying and mapping so that FirstLight can fully assess the areal extent of habitat (both occupied and potential unoccupied habitat) potentially impacted by various river flows and impoundment elevations.

MADFW states that field assessments of both existing and potential habitats should involve data collection at a scale sufficient to assess the quality and extent of habitat changes over a range of flows. Specifically, MADFW recommends that FirstLight locate transects in a subset of unoccupied but potentially suitable habitats at narrow between-transect distances such that data collection can occur at a sufficiently fine scale. MADFW states that this would enable data collection to support analysis of variability in elevation, slope, substrate, and flow characteristics and how these micro-habitat features vary within and between both occupied and unoccupied patches of potentially suitable habitat. MADFW states that FirstLight should incorporate a full velocity profile, with increased measurement spacing in at- and near- substrate ranges into data collection.

¹³ The Puritan tiger beetle is also a federally threatened species.

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Discussion and Staff Recommendation

Assessing impacts on potential unoccupied habitat that might otherwise support viable populations of state-listed invertebrate species under modified flow regimes is just as important as an assessment of occupied habitat because this would allow us to develop appropriate, data-driven flow recommendations that may be needed to protect or enable use of potential unoccupied habitats. This information is necessary to inform the development of license requirements that pertain to any protection, mitigation, and enhancement measures that would be necessary to protect environmentally sensitive habitats, both occupied and unoccupied (section 5.9(b)(5)).

We recommend that FirstLight modify study 3.5.1 to incorporate additional transects located in unoccupied areas with suitable habitat for special-status invertebrate species, and to ensure survey methodologies are sufficient to permit assessment of how the quality and extent of both existing and potentially suitable habitat changes over a range of flows within the project area (section 5.9(b)(5)). We recommend that FirstLight modify study 3.5.1 to include additional measurements of elevation, slope, flood depth, flood duration, and velocity along transects. We recommend that FirstLight consult with FWS and MADFW on the appropriate number and location of these additional transects and/or mapping techniques and additional analyses to fully assess the areal extent of habitat potentially impacted by various river flows and impoundment elevations. We recommend that FirstLight file a revised study plan within 90 days for Commission approval that addresses the recommended modifications, including documentation of consultation with FWS and MADFW and how the agencies comments were addressed. We estimate that the cost to incorporate additional transects in unoccupied areas of suitable habitat for state-listed invertebrate species and to collect the additional information would be \$10,000 to \$20,000 for the study season (section 5.9(b)(7)).

Sensitive Plant Survey (Task 3)

Applicant's Proposed Study

To survey for sensitive plant species, FirstLight proposes to identify high-probability areas that have suitable habitat and a high likelihood for sensitive plant species and then survey these areas using a timed-per-unit area approach.¹⁴

¹⁴ Each survey would be conducted for a set time period based on the extent of the survey area, location, complexity of the plant diversity, and population densities.

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Comments on the Study

MADFW states that the study plan suggests that data would only be collected at sites where state-listed plants are located. MADFW requests that FirstLight collect data sufficient to enable hydrological modeling of water elevations and timing, duration, and frequency of flooding from both occupied and unoccupied patches of suitable habitat. MADFW states that the proposed study plan lacks sufficient detail on the criteria that FirstLight would use to identify areas with a high likelihood for sensitive plant associations.

MADFW states that fine-scale surveying and mapping is necessary to enable accurate hydrologic modeling and facilitate analysis of how germination, growth, or dispersal is affected by the timing, duration, extent, and frequency of flooding. MADFW further notes that because fine-scale variability in habitat characteristics (e.g., elevation, slope, substrate, etc.) has the potential to significantly impact habitat suitability, multiple transects are likely needed to fully understand the extent and quality of habitats at these sites. MADFW states that data collection would not be necessary in all suitable habitats. Instead, MADFW recommends that FirstLight establish transects in a subset of habitats.

FirstLight states that it would consult with MADFW to identify known habitats for state-listed plant species and for concurrence on appropriate survey windows, survey intensity (time-per-unit area), and identification characteristics. FirstLight states that the hydraulic model developed for study 3.2.2 (as discussed above) would provide data to determine the extent of water level fluctuations associated with project operations. FirstLight states that this modeling would enable analysis of how germination, growth, or dispersal of listed plants may be affected by project-related water level fluctuations. FirstLight indicates it is not proposing to establish specific transects at unoccupied areas of suitable habitat for state-listed plant species.

Discussion and Staff Recommendation

In order to fully evaluate the effects of the project on state-listed plant species, additional information is needed on flood depth, timing, duration, extent, and the frequency of project-related water level fluctuations and how these change over a range of test flows in both occupied and unoccupied habitat for state-listed plant species, as recommended by MADFW. This additional information is needed to characterize aspects of flow fluctuations, determine potential project-related effects, and inform the development of license requirements that might be necessary to protect environmentally sensitive habitats (section 5.9(b)(5)).

We, therefore, recommend that FirstLight modify the study plan to incorporate additional transects located in unoccupied areas of suitable habitat for state-listed plant species to permit assessment of how the quality and extent of both existing and

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potentially suitable habitat changes over a range of flows within the project area (section 5.9(b)(5)). We also recommend that FirstLight modify the study to include additional measurements of flood depth, timing, duration, and extent as well as frequency and changes to substrate characteristics along transects. We recommend that FirstLight establish transects in a subset of suitable habitats as described by MADFW, including: (1) occupied, high-quality habitats, (2) occupied, low-quality habitats, and (3) unoccupied (but otherwise suitable) habitats.

FirstLight should file a revised study plan within 90 days for Commission approval that addresses the recommended modifications, including documentation of consultation with FWS and the MADFW and how the agencies comments were addressed. We estimate that the additional cost to incorporate transects in unoccupied areas of suitable habitat for state-listed plant species and to collect the additional information would be \$10,000 to \$20,000 for the study season (section 5.9(b)(7)).

Study 3.6.1 - Recreational Use/User Contact Survey

FirstLight proposes to conduct user counts, visitor surveys, and a mailed survey to determine the amount of recreation use at the Turners Falls and Northfield Mountain Projects and compile user opinions of recreation facilities. FirstLight would use this information to assess: (1) the sufficiency of existing recreation facilities to meet recreation demand; (2) the need to enhance recreation opportunities; and (3) the need to improve access at the projects.

Survey Target Audience

Applicant's Proposed Study

FirstLight's proposal includes traffic counts and calibration observations, spot counts of recreation use, on-site surveys at project recreation facilities, and a mailed survey to land owners adjacent to the project. FirstLight proposes to distribute two separate on-site questionnaires: one for general on-site users and one for Northfield Mountain Visitor Center and associated facilities.

Comments on the Study

NPS, MADCR, Appalachian Mountain Club, Vermont River Conservancy, the Friends of the Connecticut River Paddlers' Trail, Watershed Council, New England FLOW, and American Whitewater state that the on-site survey and adjacent landowner survey proposed are not adequate to assess the needs of non-project users¹⁵. Commenters

¹⁵ Non-project users are defined as recreationists who do not currently recreate at the project for unknown reasons.

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recommend using online user surveys or focus groups targeting specific groups such as whitewater boating groups, mountain bike groups, and other specialized recreation and environmental groups to assess recreation needs and interests. NPS, MADCR, and the Watershed Council also specifically identify river users and residential riverfront abutters outside of project boundaries and downstream of the Poplar Street access to Sunderland Bridge as groups that should also be surveyed.

FirstLight disagrees with the need to implement surveys or focus groups targeting the general population or special user groups, stating that its study is designed to determine what recreational activities are taking place at the projects and to determine users' opinions of their recreational experiences. FirstLight states that the effort required to obtain information relevant to the projects from a general population survey would be burdensome and unwarranted. Furthermore, FirstLight believes that surveying members of specific user groups would create a survey bias.

Discussion and Staff Recommendation

A number of commenters made statements about assessing the demand and needs of non-project users, specialized user groups, and downstream residents in relation to various proposed recreation studies, including studies 3.6.3, 3.6.4, 3.6.6, and 3.6.7. We address all these comments here.

FirstLight's proposed study plan includes a reasonable methodology for sampling both on-site visitors and individuals whose use behavior and preferences are not likely to be captured by the on-site sampling (section 5.9(b)(6)). FirstLight's proposed methods would consider a wider audience than on-site sampling alone, survey relevant members of the public around the project area, and survey a wider group of users including possible non-users of FirstLight facilities. It is reasonable to assume the population of the residential abutters to the project would represent various recreation interests at a rate similar to the population in general.

While we may consider recreation and development plans from non-governmental organizations as existing information (section 5.9(b)(4)), we do not believe it is necessary to require additional direct surveying of non-governmental groups (section 5.9(b)(7)). However, stakeholder groups may distribute surveys to their own members and submit their findings and reports. Therefore, we do not recommend additional sampling of on-site or non-project users not already included in the study plan.

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Recreation Demand Estimates

Applicant's Proposed Study

FirstLight proposes to review statewide recreation planning documents (Massachusetts, New Hampshire, and Vermont) as well as regional and local recreation plans to identify recreational needs and compare this information with recreational opportunities provided by the project. FirstLight's proposal indicates that it does not propose to estimate future recreation demand at the projects.

Comments on the Study

NPS, MADCR, Appalachian Mountain Club, Vermont River Conservancy, the Friends of the Connecticut River Paddlers' Trail, the Watershed Council, New England FLOW, and American Whitewater state that the on-site survey and abutting residents survey proposed are not adequate to assess unmet recreation demand because they believe demand may exist from people not currently visiting the project.

Discussion and Staff Recommendation

We recommend that FirstLight incorporate population trends in the project area to better understand how growth over a potential new license term could affect recreation needs to the year 2050. These population trends should be combined with recreation trend data, identified gaps between local and regional recreation needs and opportunities, and recreation opportunities provided by the project. These methods are a generally accepted practice for estimating recreational demand (section 5.9(b)(6)). This information, in conjunction with other future study results in the revised study plan, would give a broad understanding of current recreation trends, current recreation needs, and possible changes or needs over a possible license term.

On-Site Survey Locations

Applicant's Proposed Study

FirstLight will conduct on-site surveys at all project recreation facilities that allow for public access from the most upstream portion of the Turner Falls impoundment to just below Cabot Station at the Poplar Street access area. FirstLight also states that the Western Massachusetts Climbers Coalition will be consulted for determining appropriate locations for collection of data from rock climbers.

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Comments on the Study

NPS, MADCR, and the Watershed Council state that the locations where FirstLight proposes to administer the questionnaires should be clarified and that FirstLight should include informal recreation sites.

NPS, MADCR, Appalachian Mountain Club, Vermont River Conservancy, the Friends of the Connecticut River Paddlers' Trail, and the Watershed Council state that because no user surveys are proposed downstream of the Poplar Street access, the user survey results are not going to adequately capture project effects downstream of Cabot Station. Therefore, they request that FirstLight survey users at non-project access areas and abutters along the full length of the Connecticut River below Cabot Station to the Sunderland Bridge.

FirstLight states that its on-site survey is designed to determine what recreational activities are taking place at the projects and to determine users' opinions of their recreational experiences. Therefore, the project recreation facilities, including the Poplar Street access downstream of Turner Falls dam, are the appropriate locations for on-site surveys. FirstLight states that users of informal recreation sites would be represented in surveys conducted at formal recreation sites because users often access informal sites through formal site. FirstLight also states that the residential abutter survey would capture recreation users who access the projects through private lands.

FirstLight disputes the need to implement surveys targeting the downstream abutters and user groups, stating that the effort required to obtain such information only result in a marginal increase in survey data that is relevant to the projects.

Discussion and Staff Recommendation

FirstLight's proposal to administer the on-site survey at project recreation facilities is appropriate. No informal sites have been identified that if surveyed, would result in a reasonable amount of additional information to justify the additional level of effort and cost it would take to survey users at all possible informal site locations (section 5.9(b)(7)). The residential abutter survey would also assess use of informal sites. However, our review indicates that the study plan currently lacks clarity on where specifically the on-site survey will be conducted. Therefore, to add specificity, FirstLight should, at a minimum, distribute on-site surveys to all of sites listed in the existing recreation facilities inventory and assessment study plan (study 3.6.2; Section 5.9(b)(6)).

A number of stakeholders commented on the need to survey users and abutters of the full length of the Connecticut River below Cabot Station to the Sunderland Bridge in surveys of recreationists in study 3.6.6. We address these comments here.

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While currently outside of the project boundary, the Poplar Street access site (owned and operated by FirstLight) provides the most upstream access to the Connecticut River downstream of the project boundary and is currently used as the put-in for portaging the Turner Falls dam and as an initial put-in for recreationists accessing the Connecticut River below the project. Poplar Street access is immediately downstream of the Cabot Station powerhouse and is affected by operation flows and, thus, integrally connected to project operations. However, recreation access points below Poplar Street are not integrally connected to the project because they are effected by other hydropower projects on the Deerfield River that are not associated with FirstLight or this relicensing process, and users of the Poplar Street access point would likely identify similar recreation issues for any portion of the river down to Sunderland Bridge (section 5.9(b)(5)). Therefore, we do not recommend that FirstLight include surveys of users downstream of Poplar Street access in its study.

Survey Instrument

Applicant's Proposed Study

FirstLight attached the questionnaires for each survey type as part of their revised study plan. FirstLight's proposal includes three questionnaires. First is the general user survey that will be distributed at all recreation sites. Second is the Northfield Mountain Trail User Survey that will only be distributed at Northfield Mountain trail system and Visitor Center. The third survey is the Residential Abutters' Survey. This survey will be distributed to property owners with lands adjacent to the project boundaries.

Comments on the Study

Several commenters suggested revisions or additions to FirstLight's proposed survey instruments. The Watershed Council states that the on-site surveys should include questions about fishing and hunting. Appalachian Mountain Club, Vermont River Conservancy, and the Friends of the Connecticut River Paddlers' Trail state that the on-site survey should be modified to include a question about the respondent's impression of recreation opportunities at the Turner Falls impoundment. These commenters also request that FirstLight revise and expand economic impact questions. Some of these commenters recommend adding a rating of the conditions of toilets and river access to Question 15 and adding a time period to qualify how visitors have recreated at the project in Question 11.

NPS, MADCR, and the Watershed Council state that the on-site survey and residential abutters' survey should include more questions about the impacts of water levels on access, land use, and other non-recreation resources, and any loss (e.g., soil erosion) caused by fluctuations. Additionally, the Watershed Council recommends

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adding the question “If you could ask project managers to do something different with reservoir levels, what would you ask them to do?”

NPS, MADCR, Appalachian Mountain Club, Vermont River Conservancy, and the Friends of the Connecticut River Paddlers’ Trail recommend a revision to Northfield Mountain Trail User Survey Question 13 to ask respondents if the hours and seasons of operation are adequate on a disagree/agree scale, with opportunity to suggest what would be adequate.

FirstLight states surveys have been modified based on input, and open-ended questions have been added to allow for respondents to elaborate on their answers, which should account for commenters concerns.

Discussion and Staff Recommendation

Additional questions on the on-site survey about demographics, water level, and economic expenditures are not needed to achieve study goals or inform license requirements (section 5.9(b)(5)) because the current survey questions are adequate to address these concerns. Information regarding the types of species targeted by fishermen and hunters is a state management issue. The information with respect to aquatic species needed for this licensing process will be addressed by aquatics resource studies (section 5.9(b)(4)). However, requesting on-site respondents to rate facility amenities (Question 15) and an additional Likert-type question¹⁶ about user satisfaction with the number of recreation facilities at the impoundment would provide information relevant to user satisfaction and recreation need. Therefore, FirstLight should modify the on-site survey Question 15 list to include “toilets or restrooms” and “river access.” Additionally, a Likert-type question about satisfaction with the number of recreation facilities at the projects should be added. FirstLight should also add the qualifier “in the past five years” to Question 11 on the on-site survey to provide a temporal context to recreation use at the project.

The questions proposed by FirstLight about water level fluctuations are sufficient to understand potential impacts on recreation. Survey questions about non-recreation resources such as land use or soil erosion are not material to a recreation survey (section 5.9(b)(5)). FirstLight proposes other studies to assess erosion, shoreline impacts, and project operations.

The requested additional question about hours of operations would provide additional relevant information to the Northfield Mountain trail user survey. Therefore, we recommend that Question 13 be modified to include the variable of “Hours of

¹⁶ A Likert-type question presents a continuous scale (e.g., 1-9) with anchors representing scale values (e.g., 1 = strongly disagree, 9 = strongly agree).

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Operation” and Question 13 should conclude with an open-ended inquiry into how any rated variables could be improved (section 5.9(b)(4)).

Survey Administration

Applicant’s Proposed Study

FirstLight does not state whether it would administer the survey verbally or hand it to respondents.

Comments on the Study

NPS, MADCR, and the Watershed Council recommend handing out the recreation user survey (on-site) rather than administering the survey verbally because this method would allow respondents to more thoughtfully and completely fill out the survey. It also eliminates the potential for surveyor editing or altering the respondent’s comments.

Discussion and Staff Recommendation

Both verbally-administered and self-administered surveys have advantages and disadvantages such as ensuring respondents understand each question and reducing the potential error of respondents giving socially desirable answers, respectively. Both methods are generally accepted survey methods (section 5.9(b)(6)). Therefore, survey participants should be provided with an option of self-administered or orally-administered surveys.

Extend Sampling to a Two-Year Study

Applicant’s Proposed Study

FirstLight proposes to conduct all recreation survey sampling in 2014.

Comments on the Study

NPS and MADCR comment on the need of extending the data collection phase to two years to account for unique events (weather or economic conditions) that change from year to year.

FirstLight states that if weather or economic extremes during the study year occur, the study would be suspended and begun again the following year.

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Discussion and Staff Recommendation

If any anomalous conditions occur during the first year of study, an additional year of study could be required (section 5.15(d)(2)). Therefore, at this time, we do not recommend that FirstLight modify its study plan.

Study 3.6.2 - Recreation Facilities Inventory and Assessment

FirstLight proposes to prepare a summary report of existing information based on an inventory of recreation facilities conducted in 2011, 2012, and March 2013. The report would identify the number of existing recreation facilities and access sites at the Turners Falls and Northfield Mountain projects, document ownership and management for each facility, and discuss the overall condition of each recreation facility and access site.

Facilities Not Owned or Managed by FirstLight

Applicant's Proposed Study

FirstLight's survey would cover all developed recreation facilities that provide access to project lands and waters, including facilities not owned or managed by FirstLight.

Comments on the Study

The Appalachian Mountain Club, Vermont River Conservancy, Friends of the Connecticut River Paddlers' Trail, and New England FLOW state that the inclusion of facilities not owned or managed by FirstLight in the recreation facilities inventory and assessment makes it appear that project recreation facilities are more extensive than what actually exists. Some of these commenters further object to the inclusion of a Turners Falls Canoe Portage in the list of facilities that FirstLight would inventory, because the commenters claim that the canoe portage does not exist.

FirstLight states that the inventory would contribute to an accurate assessment of all recreation use at or near the Project, regardless of whether or not FirstLight owns the facility. In the report, FirstLight would identify ownership for each facility.

Discussion and Staff Recommendation

All developed recreation facilities that provide access to project lands and waters, including the Turners Falls canoe portage, are appropriate to include in the report because all recreation use contributes to resource and experience impacts for all users and is needed for a comprehensive look at recreation use in the project vicinity.

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Therefore, we do not recommend that FirstLight include modifications to the list of recreation facilities in this study.

Revisions to Facility Inventory Form

Applicant's Proposed Study

FirstLight attached the inventory form for inventorying and assessing facilities as part of their revised study plan. This form was used to inventory and assess facilities during the summer of 2012 and the winter of 2013. The inventory form catalogs the type and amount of amenities at each site, such as parking spaces, boat ramps, and campgrounds.

Comments on the Study

NPS states that the inventory should include information about when each facility is open to the public.

The Appalachian Mountain Club, Vermont River Conservancy, and the Friends of the Connecticut River Paddlers' Trail recommend that the inventory include information about boat launch surface materials (e.g., concrete, gravel, sand, dirt, or wood) so that boat launches suitable for fiberglass, wood, or other cartop and non-motorized boats are identified.

American Whitewater states that FirstLight should include an assessment of the adequacy of facilities from the perspective of whitewater boaters and through paddlers in the inventory. American Whitewater suggests that FirstLight could accomplish this through coordination with stakeholder groups that have an interest in utilizing the recreation facilities.

The Watershed Council recommends that the inventory include more detail on the site's condition and user impacts in a numeric ranking format.

In response to comments, FirstLight states that it has completed field work and the report would include information on existing recreation facilities and their general condition.

Discussion and Staff Recommendation

Information about when recreation facilities are open (seasonally and daily), the surface material of boat launches, and accessibility of amenities is appropriate to include in a recreation facilities inventory. This is basic information pertinent to describe

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existing conditions. Using a numeric or graded scale to describe facility condition(s) would allow for a qualitative method for identifying facility conditions. This information would be used to inform a future recreation management plan including a schedule for immediate or future maintenance, repair, or replacement needs for each facility inventoried (section 5.9(b)(5)). Therefore, we recommend that FirstLight modify the study to include, for each recreation facility inventoried, information on seasons and hours of operation, boat launch surface materials, and a description of accessible features. The report should also include a numeric or graded scale used to rate the physical condition of all amenities at each recreation facility inventoried. The assessment should include, at minimum, current functional condition, user impacts (e.g., presence of litter, evidence of vandalism, vegetation damage, soil compaction or erosion), and estimated time before any repair or replacement work would be needed. If any of this information is not currently available based on data collected in 2011, 2012, and March 2013, FirstLight should conduct additional field assessments.

Study Area

Applicant's Proposed Study

FirstLight's proposal only includes assessing the sites within the project boundary, with the exception of the Poplar Street access. The Poplar Street access is downstream of the project and currently serves as the put-in for recreationists portaging the Turner Falls dam. Poplar Street access is the only site FirstLight proposes to study and is downstream of the project.

Comments on the Study

American Whitewater recommends that the inventory include all recreation facilities on the Connecticut River downstream of the project to the confluence with the Deerfield River.

FirstLight states that field work has been completed to collect baseline information regarding existing recreational facilities associated with the project. It indicates that the report would only include information on existing recreation facilities already inventoried.

Discussion and Staff Recommendation

A detailed inventory and assessment of recreation facilities that are not currently within the project boundary is not necessary, with the exception of Poplar Street access for reasons discussed above because of its direct nexus to the project. The purpose of this study is not to inventory all recreational facilities along the Connecticut River (section 5.9(b)(7)), but to inventory existing recreation facilities at the Turner Falls and Northfield

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Mountain projects (section 5.9(b)(5)). Therefore, we do not recommend that FirstLight modify the study to include an assessment of recreation facilities not already listed in the proposal.

Potential Future Facilities

Comments on the Study

The Appalachian Mountain Club, Vermont River Conservancy, and the Friends of the Connecticut River Paddlers' Trail recommend that the study assess opportunities and locations for additional facilities, such as new boat launches, primitive camping areas, or portage trails. They further state that the study plan could include outreach to area recreation groups to develop a more comprehensive list of suggestions for additional facilities. We address these comments below in the assessment of day use and overnight facilities associated with non-motorized boats (study 3.6.4).

Study 3.6.3 - Whitewater Boating Evaluation

FirstLight proposes to conduct a controlled flow study of the Turners Falls bypassed reach to identify minimum and optimal flows for whitewater boating. FirstLight states that the specific study methods would be developed with stakeholders including the exact dates of flows and volumes to be evaluated, a schedule for the evaluation, recruitment of experienced boaters to participate in the evaluation, and refining a methodology and comparative evaluation process to meet study objectives before conducting the evaluations. FirstLight proposes to complete this study utilizing five tasks. Task 1 includes developing protocols for methodology and evaluation processes, logistics, and schedules. Task 2 includes an on-water boating evaluation. Task 3 involves identifying and evaluating access to the bypassed reach. Task 4 involves data review and analysis. Task 5 is the development of a report.

Details of Proposed Study Plan

FirstLight should develop detailed study protocol, logistics, and schedules in consultation with interested stakeholders before it conducts the study. Therefore, within 90 days of the date of the issuance of this determination, we recommend FirstLight submit a detailed study plan for the controlled whitewater boating assessment of the Turners Falls bypassed reach (Task 2 of the revised study plan), including methods to identify and evaluate access to the Turners Falls bypassed reach (Task 3 of the revised study plan). FirstLight should develop the study plan in consultation with the NPS, American Whitewater, Appalachian Mountain Club, Vermont River Conservancy, the Watershed Council, the Friends of the Connecticut River Paddlers' Trail, MADFW, FWS, and NMFS. The plan filed for Commission staff approval should include documentation of consultation, copies of comments and recommendations on the

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completed study plan after it has been prepared and provided for consultation, and a description of how comments are accommodated by the study plan. FirstLight should allow a minimum of 30 days for agencies and other entities to comment before filing the plan with the Commission. If FirstLight does not adopt a recommendation, the filing should include the reasons, based on site-specific information.

Number of Controlled Whitewater Releases

Applicant's Proposed Study

FirstLight proposes two spring flows utilizing natural bypass flows and four summer controlled releases for a total of six flows examining the suitability of the bypassed reach as a recreational resource.

Comments on the Study

New England FLOW, Appalachian Mountain Club, Vermont River Conservancy, and the Friends of the Connecticut River Paddlers' Trail request that FirstLight evaluate a full range of flows, from identifying a minimum to full generation, and note that this approach may take more than the six proposed test flows (two natural and four controlled), with the exact number of flows determined through interviews with local paddlers and study participants.

Discussion and Staff Recommendation

At this time, it is unclear whether four specific controlled release flows would be adequate to fully evaluate minimum and optimal flows for whitewater boating. Therefore, the number of controlled releases should be based on paddler interviews and not fixed at only four as proposed. Because, it is premature to assess the exact number of controlled releases needed, we recommend the study assess at least four controlled releases and consider the need for more if the interviews suggest more are warranted (Section 5.9(b)(6) and (7)).

Seasonal Study Flows

Applicant's Proposed Study Plan

FirstLight proposes to evaluate two spring flows utilizing natural bypass flows and four summer controlled releases. It is our understanding that the natural flows portion of the study would only evaluate spillage flows and not result in a decrease in power generation.

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Comments on the Study

MADFW states it will not support “seasonally inappropriate” flow regimes, (specifically high flows in mid-summer) that will adversely affect the biota of the bypassed reach. MADFW does not indicate how it defines “inappropriate seasonal flow” regimes.

New England FLOW, Appalachian Mountain Club, Vermont River Conservancy, and the Friends of the Connecticut River Paddlers’ Trail state that controlled flow releases in the summer are preferred over non-controlled releases during high flows in the spring. The commenters suggest that these non-controlled releases pose difficulties in scheduling boaters with appropriate skill due to the short notice that would result from attempting to study non-controlled flows.

Discussion and Staff Recommendation

MADFW does not indicate a specific volume of water that it would consider seasonally inappropriate. As a result, we recommend FirstLight consult with MADFW, FWS, NMFS, and whitewater-related stakeholder groups (including American Whitewater, New England FLOW, and Appalachian Mountain Club) to determine the goals and concerns of each stakeholder group. These consultations should inform and guide the flow study as it proceeds and this information should be included in the detailed study plan due 90 days after the date of the issuance of this determination as mentioned above. We recognize that some details, such as the exact number of controlled releases and the volume of those releases, will be determined later in the process (i.e., after the 90 days); however, these consultations should provide a foundation of information for directing a final study plan. If FirstLight does not adopt a recommendation by either resource agencies or whitewater-related stakeholder groups, that filing should include FirstLight’s reasons based on project-specific information.

There are unique difficulties associated with attempting to use natural flows (as opposed to controlled flows) in a whitewater boating flow study. As mentioned by the commenters, providing short notice to study boaters can result in limited study participation. Additionally, natural flows are often not at a consistent level throughout the day, leading to difficulties for boaters to specifically identify the flow(s) that they paddled. However, utilizing natural flows would reduce the cost of lost generation as well as possibly provide valuable information. Therefore, we are not requiring FirstLight to conduct the two natural flow tests as proposed, but recognize that FirstLight may decide to continue to conduct these tests in effort to gain additional information at a lower cost (section 5.9(b)(7)). As mentioned above we are only recommending the study assess at least four controlled releases and consider the need for more if the interviews suggest more are warranted.

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Survey Instruments

Applicant's Proposed Study

FirstLight's proposal includes three survey forms: the Pre-Run Boater Information Form, the Single Flow Evaluation Form, and the Comparative Flow Evaluation Form.

Comments on the Study

New England FLOW, Appalachian Mountain Club, Vermont River Conservancy, the Friends of the Connecticut River Paddlers' Trail, and the Watershed Council recommend various revisions to all three survey forms.

Pre-Run Boater Information Form

Question 1 of the Pre-Run Boater Information Form reads: "How would you describe yourself as a boater (what type of boater are you)?" New England FLOW, Appalachian Mountain Club, Vermont River Conservancy, and the Friends of the Connecticut River Paddlers' Trail recommend changing the wording in order to better characterize boaters experience, skill set, and preferences.

The Watershed Council states that two items from the Question 9¹⁷ table on the Pre-Run Boater Information Form should be deleted.

Single Flow Evaluation Form

New England FLOW, Appalachian Mountain Club, Vermont River Conservancy, and the Friends of the Connecticut River Paddlers' Trail made comments on Question 4 of the Single Flow Evaluation Form. Question 4 asks participants on a Likert-type scale (scaled -2 to 2 with anchors of totally unacceptable to totally acceptable) to evaluate different items based on their "craft and skill level." Commenters explain that they do not like ratings based on "craft and skill level" because more advanced paddlers may have preferences for difficulty levels (e.g., Class V) above what flows can possibly provide (e.g., Class II). For example, an expert kayaker may rate Class II flows as totally unacceptable for their skill level, meaning flows are not at an expert level.

Appalachian Mountain Club, Vermont River Conservancy, and the Friends of the Connecticut River Paddlers' Trail comment on Question 8 and 9 of the Single Flow Evaluation Form. Question 8 reads "Relative to **this** flow, would you consider the

¹⁷ Items for Question 9 of the Pre-Run Boater Information Form includes: "Running challenging whitewater is the most important part of my boating trips" and "I am willing to tolerate difficult put-ins and portages in order to run interesting reaches of whitewater"

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minimum flow (defined as the lowest flow you would return to boat) to be higher, lower, or about the same as this flow?” Question 9 reads “Relative to **this** flow, would you consider the **optimal** flow (defined as the ideal flow you would return to boat) to be higher, lower, or about the same as this flow?” Commenters state that the question should be more impersonal and not depend upon whether or not this particular boater would return.

Comparative Flow Evaluation Form

Similar to Question 4 on the Single Flow Evaluation Form, New England FLOW, Appalachian Mountain Club, Vermont River Conservancy, and the Friends of the Connecticut River Paddlers’ Trail made comments to Question 5 of the Comparative Flow Evaluation Form. Commenters explain that they do not like ratings based on “craft and skill level” because more advanced paddlers may have preferences for difficulty levels (e.g., Class V) above what flows can possibly provide (e.g., Class II). For example, an expert kayaker may rate Class II flows as totally unacceptable for their skill level, meaning flows are not at an expert level.

Discussion and Staff Recommendation

The Pre-Run Boater Information Form is used to better understand the type of boaters participating in the study and to ensure a variety of types of boaters are recruited to participate. The results of the Pre-Run Boater Information Form have little influence on the evaluation of the appropriateness and characteristics of flows, which is measured by the single and comparative flow evaluation forms. The current wording on the form is adequate to characterize boaters for both question 1 and 9. Therefore, we do not recommend changes to the Pre-Run Boater Information Form.

There is a distinct value in how questions 4 of the Single Flow Evaluation Form and 5 of the Comparative Flow Evaluation Form are worded. Asking boaters to evaluate flows based on their “craft and skill level” allows for the identification of recreation opportunities across a variety of craft and skill levels that may or may not be provided based on flows. Further, if FirstLight determines during the consultation and preliminary investigation portion of the study that the Turner Falls bypassed reach is likely to provide opportunities for novice or intermediate boaters, then the boater participants in the study should be composed of novice and intermediate boaters (section 5.9(b)(6)).

Additionally, a question that evaluates the quality of the whitewater experience at the level of difficulty produced by the flow in question would be valuable. Therefore, we recommend that FirstLight add the following question to the Single Flow Evaluation Form:

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Evaluate the recently completed flows for your craft based on your perceived difficulty of the run for a ‘typical user.’ For example, if you perceived that a flow of 200 cfs was Class II, please rank this flow for a typical Class II boater.

<i>Release Date/Time</i>	<i>Flow (cfs)</i>	<i>Your Perceived Difficulty of the run (I-V+)</i>	<i>Totally Unacceptable</i>	<i>Unacceptable</i>	<i>Neutral</i>	<i>Acceptable</i>	<i>Totally Acceptable</i>
			-2	-1	0	1	2

With respect to questions 8 and 9 of the Single Flow Evaluation Form, minimum and optimal flows should not be based on whether boaters “would return to boat,” because some boaters may find that the stretch of river cannot accommodate their preferences and would never return regardless of flows. Therefore, we recommend FirstLight modify Question 8 to read: “*Relative to this flow, would you consider the minimum acceptable flow (enough flow for an enjoyable recreation experience) (defined as the lowest flow you would return to boat) to be higher, lower, or about the same?*” Question 9 should be similarly modified to read: “*Relative to this flow, would you consider the optimal flow for this type of trip (defined as the ideal flow you would return to boat) to be higher, lower, or about the same as this flow?*”

Access During the Study

Applicant’s Proposed Study

FirstLight did not propose specific boater access points for the study. It states that it will work out study protocol and logistics in consultation with the stakeholders before conducting the study.

Comments on the Study

Appalachian Mountain Club, Vermont River Conservancy, and the Friends of the Connecticut River Paddlers’ Trail state that FirstLight should examine and improve the boater access points for the proposed study prior to conducting the flow evaluations to reduce the difficulty and increase the safety of access for study participants.

Discussion and Staff Recommendation

As mentioned above, access to the bypassed reach will be evaluated during stakeholder consultations. If the access sites are unreasonably difficult, access improvements should be considered.

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Study 3.6.4 - Assessment of Day Use and Overnight Facilities Associated with Non-motorized Boats

FirstLight proposes to assess day use and overnight facilities associated with non-motorized boats at the Northfield Mountain Pumped Storage and Turners Falls Projects. It would accomplish the study under three tasks. Task One would include a literature review (including non-governmental maps, plans, and guide books) in conjunction with other study results (both the recreation use/user contact survey [study 3.6.1] and the recreation facilities inventory and assessment [study 3.6.2]). Task Two would include field work to verify the locations for potential future sites, potential canoe portage trails, and access sites. Task Three would include a summary report of the results of Tasks One and Two.

Study Consultation

Applicant's Proposed Study

FirstLight's proposal includes reviewing literature provided by stakeholders (including non-governmental maps, plans, and guide books), but does not include direct consultation with stakeholders throughout the study process.

Comments on the Study

The Watershed Council recommends FirstLight schedule a stakeholder working group meeting during Task Two (field work) to discuss Task One results and to visit the study sites.

FirstLight states in its response to comments that it is not adopting this recommendation for consultation into the study plan but does not provide a reason.

Discussion and Staff Recommendation

It would be beneficial to include pertinent stakeholders (including NPS, Appalachian Mountain Club, the Watershed Council, Vermont River Conservancy, and Friends of the Connecticut River Paddlers' Trail) in consultation for Task One and Task Two to incorporate their local knowledge and experiences with project recreation needs. FirstLight should consult with stakeholders during Task One to identify literature for review and possible locations for future carry-in boat facilities. FirstLight should also invite stakeholders to participate in field surveys to assist in determining feasibility of developing sites as well as help develop criteria for determining site feasibility (e.g., location, current ownership, cost). Therefore, we recommend that FirstLight consult with stakeholders throughout Task One and Two phases of this study and include documentation of this consultation in its study report (section 5.9(b)(6)).

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Study 3.6.5 - Land Use Inventory

The goal of this study is to compile existing land use information for lands within and adjacent to the project boundary, up to 200 feet beyond the project boundary, and develop the appropriate land use designations for mapping these lands. This information will aid in future land management decisions for lands within the Turners Falls Project and Northfield Mountain Projects.

Evaluating Lands Outside of the Project Boundary

Applicant's Proposed Study

The applicant proposes to evaluate lands up to 200 feet outside the project boundary.

Comments on the Study

NPS states that FirstLight's proposal to evaluate only lands within the project boundary and a 200-foot strip of abutting lands would not be adequate to identify development and upland land-use practices that could adversely impact river resources including aesthetic values, water quality, and sedimentation.

FirstLight notes that lands outside of the project boundary are subject to local and state zoning laws and that the purpose of this study is not to assess whether development and land use activities outside the project boundary may affect resources within the project boundary.

Discussion and Staff Recommendation

While information on land use over 200 feet outside the project boundary could inform our analysis of any identified cumulative impacts, it would not inform decisions on potential license conditions because the Commission would not have jurisdiction over non-project lands. Therefore, we do not recommend the requested modifications to the study.

Combining Land Use Studies

Applicant's Proposed Study

FirstLight proposes using seven different land use classifications (crop, livestock, residential, recreation, industrial, wetlands, and forested) to examine existing land-use

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information for lands within and adjacent to the project boundary. FirstLight states that these land use designations may be refined as appropriate.

Comments on the Study

The Watershed Council recommends that FirstLight use MassGIS land use classification, which uses 37 different land use classifications, because FirstLight is using MassGIS land use classifications in the Full River Reconnaissance (study 3.1.1).

FirstLight states that it does not plan to modify the seven land use classifications proposed to match the Full River Reconnaissance study (study 3.1.1) because these classifications are better suited to address the purpose of this study – to inform future land management decisions for lands within the projects. FirstLight states that they will review information from the Full River Reconnaissance study (study 3.1.1) when developing land use classifications.

Discussion and Staff Recommendation

The Full River Reconnaissance study (study No. 3.1.1) and this study have two distinctly different purposes and provide unique information. The Full River Reconnaissance study (study No.3.1.1) proposes to focus mostly on the riverbank for characteristics and erosion indicators while this study proposes to investigate land use data within and adjacent to the project. Therefore, it is inappropriate in this case to use the exact same land use types for two studies of differing purposes (section 5.9(b)(6)). We also note that both these studies will produce maps which can be used to inform decisions regardless of any specific study which the maps were developed. Therefore, we do not recommend the requested modification to the proposed study.

Study 3.6.7 - Recreation Study of Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use

FirstLight proposes to conduct an assessment of recreational use and existing facilities at Northfield Mountain. It identifies two primary objectives for the study. First, to determine whether the project's Northfield Mountain Tour and Trail Center facility is meeting recreation needs and if improvements or additions are necessary for future use. Second, to identify the amounts and types of use on the current trail system, determine if the current trail system is suitable and adequate for sustaining those uses, and evaluate the trail system's condition. FirstLight indicates that the majority of the data for this study would come from the visitor surveys that are part of the recreation use/user contact study (study 3.6.1), including data from the visitor questionnaire, traffic counts, and calibration counts.

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Cost of maintenance

Applicant's Proposed Study

FirstLight's proposal does not include reporting expenditure trend information for recreation programming and maintenance at Northfield Mountain.

Comments on the Study

NPS, MADCR, Appalachian Mountain Club, Vermont River Conservancy, and Friends of the Connecticut River Paddlers' Trail request that FirstLight evaluate its Northfield Mountain recreation expenditures over the term of the current license to identify budget trends.

FirstLight responds that past expenditure information is available on the FERC Form 80s filed every six years. FirstLight also states that that it would include estimates for any proposed recreational improvements in its license application.

Discussion and Staff Recommendation

Information on expenditures or trends for recent expenditures on maintenance of Northfield Mountain is not needed to determine whether or not the facility is meeting the needs of recreationists at the site (section 5.9(b)(5)). Studies 3.6.2 and 3.6.1 will collect information on the current condition of this facility and recreation user satisfaction, respectively. Therefore, we do not recommend this requested modification to the study.

Trail Design and Condition Assessment Methodology

Applicant's Proposed Study

FirstLight proposes to collect information on trail characteristics at Northfield Mountain such as grade, cross slope, width, surface material/firmness, width, and drainage, and also proposes to record typical characteristics.

Discussion and Staff Recommendation

Our review of the study plan indicates that it does not contain a specific methodology to conduct this analysis. Therefore, within 90 days of the date of the issuance of this determination, FirstLight should submit for Commission approval, a proposed methodology for collecting the trail design and condition characteristics listed in the study plan.

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Study 3.7.1 – Phase IA Archeological Survey

Area of Potential Effect, Study Methodology, and Schedule

Applicant's Proposed Study

FirstLight proposes to conduct a Phase IA archeological survey. The purpose of the Phase IA archeological survey is to identify archeological resources (dating from the pre-European contact period into the modern historic era of the 20th century), as well as to determine locations where there is a high potential for archeological resources to exist within the Turner Falls and Northfield Mountain projects' area of potential effects (APE). FirstLight would conduct the Phase IA investigations on a reconnaissance level (i.e., a broad-bush, sampling strategy) in order to get some understanding about whether some of the archeological resources are potentially eligible for listing in the National Register of Historic Places (National Register). FirstLight explains that the Phase IA archeological survey would also provide recommendations for future Phase IB field surveys involving subsurface testing for buried archeological deposits and assess potential project-related effects on archeological resource that might be eligible for the National Register.

Comments on the Study

The acting Vermont State Historic Preservation Officer (SHPO) commented on FirstLight's proposed Phase IA study, and requested that FirstLight: (1) conduct a Phase IB site identification survey (involving sub-surface testing) within the project's APE involving all archaeologically sensitive areas that are experiencing active erosion; (2) conduct a Phase II site evaluations (archeological excavations) on any actively eroding archeological site identified within the projects' APE to determine the site's National Register eligibility; (3) survey the projects' APE for traditional cultural properties (TCPs); and (4) assess and evaluate historic structures within the project's APE for National Register eligibility. The acting Vermont SHPO concluded that by doing these additional Phase IB, Phase II, and TCP surveys and evaluations, there would be sufficient information for developing a historic properties management plan (HPMP) that, in turn, would ensure that FirstLight would be able to effectively resolve any potential project-related adverse effects to historic properties for the term of any new license for the projects.

The Massachusetts SHPO stated that the APE defined for the Phase IA study is adequate for preliminary identification efforts; however, the Massachusetts SHPO looks forward to consulting more with the Commission, and seeing what the Commission determines as a final APE for the Turner Falls and Northfield projects involving this relicensing.

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Discussion and Staff Recommendation

FirstLight does not propose to conduct a Phase IB or Phase II survey until after it has reviewed the results of the Phase IA survey with the SHPOs and Narragansett Tribal Historic Preservation Officer (THPO). Furthermore, FirstLight expects that it would only need to do a Phase IB archeological survey in archeologically sensitive areas within the APE where project-induced erosion has been occurring. Accordingly, FirstLight proposes to conduct the Phase IA survey in 2014, and perhaps, do Phase IB and Phase II investigations in 2015. For the APE, for the Phase IA archaeological investigations, FirstLight accepts our general definition for an APE that indicates that it would include all lands within its project boundary and lands outside its project boundary where historic properties could be affected by the projects. While we agree with FirstLight's APE definition, our review indicates that its APE maps for the Phase IA survey (Figures 3.7.1-1 through 3.7.1-5 in their revised study plan 3.7.1) show a much narrower area where only lands 10 meters beyond the normal high water mark would be surveyed for archaeological resources. However, the correct maps that fit FirstLight's definition of the APE above, are in fact, Figures 3.7.2-1 through 3.7.2-5 in their revised study plan 3.7.2.

Section 106 of the National Historic Preservation Act requires the Commission to define an APE and then inventory the APE for cultural resources and evaluate them for their National Register-eligibility. Furthermore, section 106 requires that the Commission take into consideration the potential project-related effects of all National Register-eligible properties. While we recognize that the reconnaissance level survey proposed by FirstLight (Phase IA) is a good start to get a basic understanding of what archeological resources may lie within the APE, and which ones could perhaps be eligible for the National Register, and what the potential effects might be, we are concerned about FirstLight's lack of detailed methodology regarding possible Phase IB and Phase II investigations (section 5.9(b)(6)). Although FirstLight intends to phase-in the Phase IB and Phase II investigations after the 2014 field season, and after formal consultation with the involved SHPOs and other involved parties could be conducted, such work involving Phase IA, Phase IB, and Phase II investigations within a single field season, notwithstanding any additional follow-up work which needs to be finalized within a second field season, or programmed into an HPMP, could be accomplished.

Therefore, we conclude that FirstLight should conduct a full archeological inventory of the APE during the 2014 field season that includes Phase IB and II investigations (see specific methods below) using established scientific protocols for evaluating archeological resources (section 5.9(b)(6)). We give our estimated costs for these inventories further below (section 5.9(b)(7)).

Pursuant to section 106, the Commission is also required to define the APE for the projects and seek concurrences from the Massachusetts, Vermont, and New Hampshire SHPOs. Therefore, we recommend FirstLight carry out Phase IA, Phase IB, and Phase II

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investigations within the projects' APE which we define as all lands within the FERC project boundary (as demarcated by Figures 3.7.2.1 through 3.7.2.5 in FirstLight's revised study plan 3.7), and all lands outside the FERC project boundary where historic properties could be affected by project-related adverse effects. Commission staff intends to formally seek the concurrences on the APE from the three SHPOs.

Study 3.7.2 – Reconnaissance-Level Historic Structures Survey

Study Methodology and Schedule

Applicant's Proposed Study

FirstLight proposes to carry-out a Historic Structures Survey within the projects' APE. The purpose of this study is to conduct a reconnaissance-level inventory of the built environment associated with the hydroelectric facilities, along with other structures presently located within the projects' APE, determine which structures need further evaluation for National Register eligibility, and assess possible effects as a result of the projects' ongoing operation and maintenance activities.

Comments on the Study

The acting Vermont SHPO recommends that FirstLight conduct a more comprehensive assessment of the built environment within the projects' APE than FirstLight proposed. The acting Vermont SHPO indicates that a reconnaissance level Historic Structures Survey will identify and compile information on known historic structures but that a reconnaissance-level survey will not formally evaluate these structures (as well as other unevaluated structures within the projects) for National Register eligibility, and assess potential project-related effects to any of these structures rendered eligible for the National Register.

Similar to the comment involving the proposed archeological work, the Massachusetts SHPO commented that the APE for the Historic Structures Survey study has been preliminarily defined by FirstLight, but it looks forward to seeing what the Commission determines as a final APE for cultural resources investigations.

Discussion and Staff Recommendation

Section 106 (36 CFR Part 800.4 through 800.5) requires a systematic and complete inventory of the built environment, including evaluating all inventoried structures for National Register eligibility and assessing project-related effects to those structures that are rendered to be eligible for the National Register. Such an inventory needs to be done prior to Commission staff reviewing the preliminary license proposals, and final license applications for NEPA analysis, and before the Commission's decision

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on issuing new licenses for these projects. FirstLight's proposed reconnaissance level historic structures survey accomplished only for the 2014 season would not provide the detailed information the Commission needs for its section 106 requirements nor its evaluation of project effects on cultural resources (section 5.9(b)(5)).

We, therefore, recommend that FirstLight conduct an inventory and National Register evaluation of all structures (historic architectural investigation) within the project's APE in the 2014 field season (see specific methods below).

Due to the contiguousness of most of the project facilities, many of the structures, if they are eligible for the National Register, could be grouped into one or more historic districts. The study should also include identifying existing and potential project-related effects on each of the inventoried structures. For consultation purposes, FirstLight would not need to include the Narragansett THPO when discussing or reviewing various aspects involved with the built environment, because such structures do not constitute historic properties of religious and cultural significance to the Narragansett.

Study 3.7.3—Traditional Cultural Properties Study

Applicant's Proposed Study

FirstLight proposes to carry-out a Traditional Cultural Properties (TCP) study that would assess properties or places associated with cultural practices or beliefs of a living community, such as Indian tribes, who have lived continuously in the same area for many hundreds or thousands of years, and where such properties or places are integral to the culture and identity of the tribes. If such places are known to exist within the projects' APE, FirstLight would evaluate them for National Register significance.

FirstLight proposes to retain an ethnographer to conduct the TCP survey and study, and would consult with the Narragansett THPO and Nolumbeka Project after it selects the ethnographer.

Area of Potential Effects and Study Methodology

Discussion and Staff Recommendation

For the TCP study, FirstLight again accepts the general FERC definition for an APE that would include all lands within the FERC project boundary and lands outside the FERC project boundary where historic properties could be affected by the projects, but uses the much narrower APE maps (Figures 3.7.1-1 through 3.7.1-5) for conducting the TCP survey.

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For the TCP study, we recommend that FirstLight carry-out all cultural resource investigations within the Turner Falls and Northfield APE, as defined as all lands within the FERC project boundary (as demarcated by Figures 3.7.2.1 through 3.7.2.5 in FirstLight's revised study plan 3.7.2) and all lands outside the FERC project boundary where historic properties could be affected by project-related adverse effects (section 5.9(b)(5)).

Prior to selecting an ethnographer, we recommend that FirstLight first consult with Native American tribal representatives, including the Narragansett THPO and Nolumbeka Project. As with all consultations under section 106, a decision on choosing an ethnographer needs to be done in consultation with both the Narragansett THPO and Nolumbeka Project prior to FirstLight making a final a selection (section 5.9(b)(6)).

Combined Cultural Resources Study

FirstLight did not provide any details regarding methodologies for Phase 1B and Phase II archeological investigations (study 3.7.1), or the survey of historic architectural resources beyond a phase 1A reconnaissance level (study 3.7.2). Therefore, we recommend FirstLight incorporate the following methodologies, consistent with established scientific practice (section 5.9 (b)(6)), into its study plans.

METHODOLOGIES

Phase 1B and Phase II Archeological Investigations

As determined in consultation with FERC, the SHPOs, and Native American tribes, Phase IB surveys will be conducted in the Turner Falls and Northfield APEs to locate and identify known and undocumented archaeological resources in areas of active erosion or other identified project-related impacts. Phase II field evaluations will be conducted, as needed, to determine the National Register eligibility of identified archaeological sites. Phase IB survey will be completed during the 2014 field season. Phase II site evaluations, if necessary, will also be conducted in the 2014 field season. Phase IB survey and Phase II methodologies will be reviewed and approved by the Massachusetts, Vermont, and New Hampshire SHPO prior to the start of field work. The survey methodologies will be designed and implemented in accordance with the standards and guidelines set forth by the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation and Section 106 of the National Historic Preservation Act of 1966, as amended, and related regulations (36 C.F.R. § 800); the Vermont SHPO's Guidelines for Conducting Archeology in Vermont (final adoption June 2007); the New Hampshire SHPO's Archaeological Standards and Guidelines; and Massachusetts SHPO's Guidelines for Survey and Planning Applicants.

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Native American Tribal representatives will be notified of the Phase IB and II schedules and will, if so desired, accompany the archaeologists during the field work in order to collect data on identified Native American sites and TCPs including sacred landscapes.

Phase IB Identification Surveys

Phase IB identification surveys will be conducted in archaeologically sensitive area where active erosion is occurring. These archaeologically sensitive areas will include the borders of active shoreline erosion up to 10 meters (33 feet) back from the top of the embankments. Bordering areas on private property that were not included in the Phase IA surveys will initially be subjected to a complete walkover with close ground surface inspection to assess existing conditions and the presence of visible cultural materials. The results of the walkover survey will inform the locations of Phase IB subsurface testing designed to locate and identify archaeological deposits including small sites that may be present. The Phase IB identification surveys including additional walkover and subsurface testing will be conducted in consultation with the Massachusetts, Vermont, and/or New Hampshire SHPO. For this proposal, Phase IB survey will be conducted in archaeological site and sensitive areas where direct project impacts are occurring, and as identified during the Phase IA surveys.

If access to private property is needed for the additional walkovers and subsurface testing, landowner permissions will be obtained by FirstLight prior to the start of field work. No field work will be conducted on private lands where landowner permission has not been obtained by FirstLight. The correspondence relating to landowner permissions will be included in the project survey files.

In areas where landowner permission is obtained, Phase IB subsurface testing will initially be conducted in the form of shovel test pits placed at 10-meter intervals along linear transects within 10 m of the river bank. The hand testing will be designed to investigate sensitive soil strata to depths up to 100 cm below ground surface (3 feet). Based on the Phase IA survey, cultural deposits and sensitive soil strata are present at these shallow depths where hand testing is the preferred method of excavation. Approximately 1000 or more test pits will be excavated in the archaeologically sensitive areas and potential site locations within the APE based upon linear estimates of active bank erosion in Turner Falls and Northfield projects.

All Phase IB survey test pits will measure 50-x-50- cm in size and will be placed at 10- m intervals along transects, and at 2.5- and 5-meter intervals in test pit arrays where potentially significant cultural materials are identified during the initial testing. All test pits will be excavated by shovel in arbitrary 10-cm levels to at least 100 cm below the ground surface and/or sterile glacial subsoils. All excavated soil will be screened through 0.25-inch hardware cloth, and remaining cultural material will be

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collected. Soil horizons/profiles will be recorded using Munsell soil descriptions for each unit. Cultural material and samples will be bagged and labeled with provenience information. Digital photographs will be taken of the project APE areas subjected to subsurface testing. Test pit soil profiles will be photographed if they contain potentially significant cultural features, soil anomalies, and/or structural remains. All test units and cultural deposits will be located using GPS technology and plotted on USGS 7.5 minute topographic maps and project plans.

All cultural materials, including those that may be identified by Native American tribal representatives, collected during the Phase IB surveys will be returned to the appropriate facilities, for laboratory processing and analyses. These activities will include: cleaning, identification, and cataloging of any recovered cultural materials; analysis of spatial distributions of cultural materials; and map and graphics production.

Results of the hand testing, along with an analysis of geotechnical data generated through previous and ongoing geofluvial studies of the river shorelines will be used to inform on the potential presence of deeply buried cultural deposits in identified site and sensitive areas. If deep sensitive strata are identified, further Phase IB subsurface investigations will be conducted to investigate the presence of cultural deposits. These investigations may be in the form of geoarchaeological coring and/or larger hand or machine-assisted excavations within 10-meter of the top of the riverbank or into the riverbank escarpments where safety measures meeting the Occupational Safety and Health Administration's regulations can be effectively implemented. Detailed scope of work/methodologies for all Phase IB investigations will be developed and submitted for review to the FERC, Massachusetts, Vermont New Hampshire SHPOs, and Native American tribes prior to the initiation of field work.

Phase II Site Evaluations

If potentially significant archaeological deposits are identified during the Phase IB investigations in areas of active erosion or other project impacts, then additional testing in the form of Phase II evaluations will be conducted during the 2014 field season. Archaeological sites identified during the Phase IA surveys in other portions of the APE not subjected to Phase IB survey will be treated as significant resources for the purposes of Section 106 until additional archaeological investigations to determine their boundaries and NR eligibility are conducted. The treatment and protection of these sites along with a phased plan to complete Phase II site evaluations will be addressed in each project's HPMP.

Phase II evaluations will consist of the excavation of shovel test pits (50-x-50-cm) and larger units (combinations of 1-x-1 meter squares) for shallow (up to 100 cm below the ground surface) cultural deposits in each identified site area. Note: if deeper cultural deposits are present, the site-specific testing methodologies to investigate these deep

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resources will be developed in accordance with the information obtained during the Phase IB surveys. The shovel test pits will be used to determine the archaeological site boundaries along with natural landforms, historic and/or modern structures/features, and artificial (disturbed) elements. The larger units will be hand excavated to examine cultural material concentrations and/or features (e.g., fire pits, hearths, privies) and inform on the age and internal configuration/complexity of the site. This information will be used to assist in a determination of the site(s)' significance and their eligibility to meet the criteria for listing in the National Register.

The exact placement and amount of Phase II testing at each identified site area will be based on the results of the Phase IB surveys. The Phase II excavation and recordation procedures will follow those established above for the Phase IB survey subsurface testing. Detailed scope of work/methodologies for all Phase II site evaluations will be developed and submitted for review to the FERC, Massachusetts, Vermont, and New Hampshire SHPOs, and Native American tribes prior to the initiation of field work. Archival research including land evidence records and local town histories will be conducted as needed for any potentially significant post-contact period sites. The research will be used to refine archaeological site boundaries in relation to historic property divisions and assist in applying the National Register criteria of eligibility to these resource types.

If National Register eligibility determinations for identified archaeological sites cannot be made during the first and second field seasons, the need for follow-up site evaluations to determine National Register eligibility will be included in each project's HPMP.

Survey and Evaluation of Historic Architectural Resources

The survey of historic architectural resources will assess existing condition of all resources, identify any other potentially significant resources within the APEs, and evaluate the significance of resources that have not yet been formally determined eligible for listing in the National Register. The work will be conducted in the following manner.

The historic architectural survey and evaluation will be carried out by a team consisting of an architectural historian and industrial historian who meet the Secretary of the Interior's Professional Qualification Standards (36 C.F.R. § 61). The initial phase of the survey will consist of a review of available sources and documentation regarding the history of the hydroelectric projects. The review will include visits to the Massachusetts, Vermont, and New Hampshire SHPOs offices (the SHPOs) to review inventory records and other relevant files they may contain.

The field survey will consist of walkover of the lands within the project APEs. The team will visit each of the previously identified resources and document any other

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resource that appears to be 50 years of age or older. Information about the current appearance, including the setting, physical condition, and character-defining architectural features of the resources, will be recorded. High-resolution digital photographs will be taken of each resource. Additional photography will include general context views that show the resources in relation to one another and their surroundings. A photo log will be kept, and the locations of the views will be recorded on a base map.

Upon the completion of the field investigations, FirstLight's contractor will analyze all collected data and prepare historical contexts that identify the significant themes, events, and/or people that had an impact on the historical development of the potential districts. The historic contexts and field notes regarding integrity will serve as the basis for the National Register evaluation of the district and individual resources that contribute or do not contribute to its significance. Contractors for FirstLight will determine the areas, period(s), and level(s) of significance for the district and apply the National Register criteria for evaluation. The integrity of the resources will be evaluated to determine if the properties retain a sufficient amount of their historic appearance to be considered for listing in the National Register.

The product of the survey will be a report that provides information about previous National Register evaluations and recommendations regarding the potential National Register eligibility of resources that have not been formally evaluated. The reports will contain a narrative description of the resources identified during the survey, including information about the general setting and current physical condition. The narrative will provide a statement of integrity that addresses changes that have occurred over time.

The description will be followed by historic context statement that will provide information about the general historical development of hydroelectric facilities on the Connecticut River during the early twentieth century and other themes, if any, that may apply to resources identified in the field.

The recommendations section of the report will include the results of the National Register evaluation for the potential Turner Falls and Northfield project Historic Districts which has previously been determined eligible for listing in the National Register. Recommendations will include a narrative statement of significance that will define the applicable National Register criteria, criteria considerations (if any apply), areas of significance, and periods of significance for the districts. The narrative will include a summary statement of significance that will establish the level(s), period(s), and areas of significance. Each area of significance will be supported by a statement that identifies the historical development of the district and defines the themes, trends, events, and people that are important in American history and lend the district its significance.

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Other components of the report will consist of a bibliography of sources consulted and graphical information, including a map of the district and photographs of the contributing and non-contributing resources. The map will be prepared in ArcGIS format and will include the scale, north arrow, and legend. All contributing and non-contributing resources and prominent landscape features will be clearly labeled to correspond with information provided in the district data sheet. The map will also show the district boundaries and location of views corresponding to the photographs included with the documentation.

Development of Historic Property Management Plans

HPMPs will be developed for the Turner Falls and Northfield projects prior to the issuance of a new FERC license. The HPMPs will govern future actions as they relate to historic properties, including standing structures and archaeological sites, within the project boundaries. The HPMPs will identify the nature and significance of historic properties within the project boundaries that may be affected by project-related maintenance and operation, proposed improvements to project facilities, and public access. The HPMPs will identify goals for the preservation of historic properties; establish guidelines for routine maintenance and operation; and establish consultation procedures. They will identify the responsible FirstLight officer in charge of executing the plan and establishing procedures for training plant operators, maintenance staff, and other employees in its implementation. The HPMPs will be integrated with existing management plans, as appropriate.

The HPMP for each project will be developed according to the following principles and procedures:

- **Consultation.** The HPMPs will be prepared through a process that will involve consultation with, and input from FERC, Massachusetts SHPO, Vermont SHPO, New Hampshire SHPO, Native American tribes, historic preservation experts, and other interested parties that may be identified.
- **Identification and Evaluation of Historic Properties.** The HPMPs will identify known historic properties within the projects and specify future phased efforts that will be carried out to determine the significance of any identified, but unevaluated resources within the project APEs.
- **Routine Project Operations.** The HPMPs will include a description of how historic properties, including known and predicted archaeological resources, are or could be affected by routine project operations. This discussion will include the suspected or known cause of an effect on each site or feature. The HPMPs will identify and prioritize preservation issues associated with routine project operations.

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- **Protection of Historic Properties.** The HPMPs will address the continuation of routine project operations in relation to the protection of the integrity of historic properties. These operations include, but are not limited to: continued use and maintenance that affects historic properties, shoreline erosion caused by routine operations, recreational developments, other project-related ground-disturbing activities, and vandalism.
- **Mitigation of Adverse Effects.** The HPMPs will include a process for determining and mitigating unavoidable adverse effects on historic properties.
- **Discovery of Human Remains.** The HPMPs will include mechanisms for the treatment and disposition of any human remains that may be discovered, taking into account applicable Massachusetts, Vermont, and New Hampshire state laws and the Advisory Council on Historic Preservation's Policy Statement Regarding Treatment of Human Remains and Grave Goods.
- **Discovery of Previously Unidentified Properties During Project Operations.** The HPMPs will include a plan to evaluate previously unidentified resources that may be discovered in the future during project operations.
- **Public Interpretation.** The HPMPs will specify the implementation of a program to provide interpretation of the historic and archaeological values of the projects to the general public.

ANALYSIS

The results of proposed Phase IA, IB, and Phase II archaeological surveys, TCP identification survey, and National Register evaluation report for historic architectural resources will be used to determine the potential for adverse effects to historic properties created by the continued operation of the Turner Falls and Northfield projects. The information on potential effects will be used as the basis for preparing the HPMPs for each of the projects, which will guide FirstLight's actions relating to Section 106 during the term of the new licenses.

CONSISTENCY WITH GENERALLY ACCEPTED SCIENTIFIC PRACTICE

The archaeological monitoring/Phase IA survey as well as any subsequent Phase IB survey and Phase II investigations that may be necessary will be conducted according to the applicable federal and state regulations and guidelines. The archaeological surveys in will be conducted in accordance with VDHP/SHPO Guidelines for Conducting Archeology in Vermont, dated June 2007 (final adoption). In New Hampshire, the archaeological surveys will be conducted in accordance with the NHDHR Archaeological Standards and Guidelines. In Massachusetts, surveys and planning processes will be

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conducted in accordance with MHC Guidelines for Survey and Planning Applicants and Massachusetts State Historic Preservation Plan. In addition, all surveys will meet the standards and guidelines set forth by the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation and Section 106 of the NHPA.

DELIVERABLES

The 2014 cultural resource reporting deliverables for the Turner Falls and Northfield projects will follow the completion of Phase IA for the first season and of first and second season Phase IB surveys and Phase II evaluation field work, research, and laboratory analyses.

- Phase IA archaeological reconnaissance survey reports for the Turner Falls and Northfield projects.
- Phase IB Archaeological Identification Survey and Phase II Evaluation reports for the Turner Falls and Northfield projects. Draft report(s) will be prepared for comment by the SHPOs and Native American tribes. Each technical report will contain a description of the project APE, cultural contexts, results of the field work, and conclusions and recommendations for the treatment of identified National Register-eligible sites. The reports will each contain maps showing the project APE, testing locations, and all identified archaeological sites. The final reports will follow the draft review.
- TCP identification survey, final reports for the Turner Falls and Northfield projects, based on the results of research and field work.
- Historic architectural resources National Register evaluation report.

SCHEDULE

The Historic Architectural Resources National Register Evaluation Report will be prepared and filed with FERC, and the Massachusetts, Vermont, and New Hampshire SHPOs by September 13, 2014.

The Phase IA and Phase IB survey field work will begin during the 2014 field season. The Phase II site evaluation field work will begin continues and/or be completed in the 2014 field season. The draft reports for the first and second field season investigations will follow the completion of field work and laboratory analysis, with an anticipated submittal date of August 2014. Due to the sensitive nature of the information that will be provided in the archaeological reports, they will be issued as stand-alone documents and will only be distributed to the SHPOs, involved tribes, and FERC.

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The schedule for the completion of the TCP inventory and reporting will follow the schedule established above for the archaeological survey and reports. The information on TCPs generated by the Native American tribes may be incorporated into the archaeological report narratives for both the 2013 and 2014 field season deliverables.

LEVEL OF EFFORT AND COST ESTIMATE

The estimated costs for completing the Phase IB Archaeological Survey, the Phase II Archaeological Site Evaluations, and the Survey and Evaluation of Historic Archeological Resources are as follows:

- Phase IB Archaeological Survey of the Northfield Mountain and Turners Falls projects' APEs: \$175,000 to \$200,000.
- Phase II Archaeological Site Evaluations: Unknown pending the results of the Phase IB investigations and consultation; and depending on the extent of archeological excavations and where such excavations would take place.
- Survey and Evaluation of Historic Archaeological Resources: \$45,000 to \$60,000.

By carrying-out the above investigations by the methodologies and schedule above, and in the APE as determined by Commission staff, FirstLight would, on behalf of the Commission, adequately address all cultural resource needs in: (1) inventorying; (2) assessing effects; and (3) determining and resolving potential adverse effects to historic properties involving this relicensing, pursuant to section 106 of the National Historic Preservation Act.

Study 3.8.1 - Evaluate the Impact of Current and Potential Future Modes of Operation on Flow, Water Elevation and Hydropower Generation

Project operations may affect river flows and water levels within the Turners Falls impoundment, which can, in-turn, affect river-bank erosion, water quality, and aquatic resources. Therefore, FirstLight proposes to evaluate hydrologic and hydraulic conditions under varying inflows and hydroelectric operations and use the results in studies 3.2.2 and 3.3.1 to assess project effects. FirstLight proposes to use a long-term series of hydrologic flows with the Corps of Engineer's HEC-ResSim operations model to simulate proposed and alternative Turners Falls and Northfield Mountain Project operations. The HEC-ResSim model will simulate project operation using a hourly time step for the period 1960 to 2003.

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Operational Alternatives

Applicant's Proposed Study

In its revised study plan, FirstLight proposes including a series of stakeholder-determined production runs to evaluate how alternative modes of operation affect flow, water elevation, and hydropower generation. FirstLight states that run-of-river operations could be one of the production runs. However, FirstLight does not propose to evaluate ramping rates through its operations model because the model time step is too long to evaluate ramping rates.

Comments on the Study

Several stakeholders request that FirstLight provide an avenue for stakeholders to request alternative operation model runs. Specifically, NHDES requests that FirstLight update the study plan to include a model run assuming instantaneous run-of-river operations.

Additionally, because ramping at Northfield Mountain and Turners Falls has the potential to affect habitat, water quality, and recreation, the Watershed Council notes that FirstLight should explicitly provide a method to evaluate operational ramping-rate alternatives.

Discussion and Staff Recommendation

FirstLight's revised plan allows stakeholders to model alternative operations.

The study of ramping rates should not be done with the production model because the 1-hour time step to be used is too long to simulate the changes in project loading (section 5.9(b)(7)). Rather, ramping rates should be studied with the HEC-RAS modeling proposed in study 3.2.2, or with a modified version of the ResSim model (section 5.9(b)(6)). We recommend that if FirstLight evaluates ramping rates through application of the ResSim model that FirstLight first verify that the ResSim model, when simulated at a sub-hourly timestep, responds like the physical system it represents.

Because these recommendations are consistent with FirstLight's proposal, we do not anticipate any additional cost to the study (section 5.9(b)(7)).

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II. Studies Requested but not Adopted by FirstLight

In this section, we discuss our findings on studies requested by stakeholders that were not adopted by FirstLight. We base our findings on the study criteria outlined in the Commission's regulations [18 C.F.R. section 5.9(b)(1)-(7)].

Climate Change and Continued Project Operations

Study Request

The Town of Gill, Concerned Citizens, MADFW, the Watershed Council, NHDES, and the FWS (requesting parties) request a study of climate change as it relates to continued operation of the projects. The parties state that the requested study would provide information on how any change in climate over the next 30-50 years would affect river temperature under both existing and modified operation. The parties also suggest that the study include any effects on future high-flow events and the management of those events.

FirstLight says that the requested study is unlikely to produce any additional information beyond the licensee's proposed studies. Additionally, FirstLight states climate change models are not yet sufficiently sensitive to accurately predict changes in the temperatures of individual rivers or the frequency or seasonal distribution of high-flow events in the short-term, let alone for the 30-50 year period of a new license.

Discussion and Staff Recommendation

The requesting parties seek a climate change study but do not propose a specific study methodology (section 5.9(b)(6)). We consider global climate models as too uncertain to rely upon for the development of license requirements, in accordance with section 5.9(b)(5), which requires a nexus between project operations and effects on the resource to be studied, and how the study results would inform the development of license requirements.

With regard to any future changes to the Connecticut River watershed, conventional hydrologic studies, monitoring techniques, and predictive models can effectively study and evaluate effects on environmental resources, and the Commission may address any unanticipated environmental effects through the Commission's standard reopener articles.

For the reasons discussed above, we do not recommend that FirstLight adopt the requested Climate Change and Continued Project Operations Study.

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Closed Loop System Evaluation

Study Request

The Town of Gill, Concerned Citizens, Franklin Regional Council, Franklin Conservation District, and the Watershed Council (requesting parties) request that FirstLight study the feasibility of converting the Northfield Mountain Pumped Storage Project into a closed-loop or partially closed-loop system. The study objectives would include identification of:

- candidate locations for placement of an alternate lower reservoir so that the Connecticut River is no longer used as the lower pool;
- costs and logistics of construction and modification of the current facility to convert to a closed-loop or partially closed-loop system; and
- projected savings associated with eliminating the need for ongoing mitigation measures, including other ancillary costs or savings such as eliminating requested studies, operational changes, or mitigation measures.

FirstLight did not adopt this request for a closed-loop study citing that requestors' study is not commensurate with a feasibility-level study and would require it to complete costly comprehensive evaluations. FirstLight also states that it is not proposing a closed-loop system.

Discussion and Staff Recommendation

The requesting parties want FirstLight to study the feasibility of making major changes to an existing hydro project, which is essentially mitigation for the effects of the project under its current configuration. Modifying the existing project to a closed-loop configuration would include: siting and building a new lower reservoir of an appropriate size, modifying the existing tailrace, possible changes to the powerhouse equipment, building a new pump house for reservoir filling and makeup water, and shutting down operations for 1 or 2 years during construction. Building a new lower reservoir would result in major infrastructure changes that could include moving the existing switchyard, re-routing a road, and displacing several private residences.

The requesting parties estimate the study cost would be low. However, given the scope of what they are asking the licensee to study, we would consider the cost of an appropriate study likely to be high (section 5.9(b)(7)). In addition, it is unclear that the projects ongoing effects cannot be reasonable mitigated under its current physical configuration.

Therefore, we do not see the need for FirstLight to conduct the requested study until we better understand the environmental effects of the existing project configuration

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and any alternative mitigation measures that may be developed based on FirstLight's approved study plan.

Contingent Valuation Study

Study Request

American Whitewater, Appalachian Mountain Club, and New England FLOW request a contingent valuation (i.e., willingness to pay) study. The requesters, generally, argue that this study is needed to adequately assess the regional economic benefits of various flow release alternatives in the Turner Falls bypassed reach. The proposal recommends data should be collected through surveys of known paddling clubs, commercial whitewater outfitters, and customers of commercial whitewater outfitters.

FirstLight states the request lacks a nexus to project operation and effects, and contingent valuation studies do not produce a reliable assessment of the potential economic impact of adding a recreational opportunity to an area. FirstLight also states the controlled whitewater flow evaluation in the Turner Falls bypassed reach, assessment of access needs for paddling, and assessments of use and demand will provide the needed information for license conditions.

Discussion and Staff Recommendation

In general, non-power resources such as recreation, aquatic habitat, fish and wildlife, and aesthetics cannot be adequately evaluated by dollars and cents. Instead, we expect to take a more qualitatively approach using the information from FirstLight's proposed recreation studies.¹⁸ Thus the additional level of effort and cost needed to conduct a contingent evaluation study is not needed as it would likely not inform a licensing decision.

We do not recommend that FirstLight develop and implement the requested Contingent Valuation Study.

¹⁸ See *Great Northern Paper, Inc.*, 85 FERC ¶ 61,316 (1998), *reconsideration_denied*, 86 FERC ¶ 61,184 (1999), *aff'd*, *CLF v. FERC*, 216 F.3d 41 (D.C. Cir. 2000); *Joseph M. Keating*, 42 FERC ¶ 61,030 (1988), *citing Namekegon Hydro Co.*, 12 FPC 203, 206 (1954), *aff'd*, *Namekegon Hydro Co. v. FPC*, 216 F.2d 509 (7th Cir. 1954) (when unique recreational or other environmental values are present such as here, the public interest cannot be evaluated adequately only by dollars and cents).

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Present and Increased Noise Level Determination and (possible) Mitigation of Northfield Mountain Pumped Storage Project

Study Request

Lisa McLoughlin and Warren Ondras (participants), who own and occupy a residence approximately one mile north of the Northfield Mountain Project, report hearing noises possibly related to project operations. As such, the participants request that FirstLight conduct a study to determine if the Northfield Mountain Pumped Storage Project is the source of this noise.

They request a two-phased study approach. First, they request that FirstLight survey other nearby residents about the occurrence of unexplained noises. If this survey reveals noises correlated with project operation, they request a second, more-detailed study phase using Massachusetts Department of Environmental Protection testing standards. The participants also include the option of FirstLight beginning with phase two.

Lisa McLoughlin and Warren Ondras note that they began observing the noise: (1) after a May 5, 2010 “landslide”;¹⁹ (2) following installation of equipment upgrades in 2011 and 2012;²⁰ and (3) during existing equipment maintenance.

Background

On April 23, 2013, Lisa McLoughlin submitted a log of noise observations. FirstLight compared the observations with project operations. Commission staff filed the log and FirstLight’s review into the Commission’s record on May 3, 2013. Subsequently, on June 28, 2013, Warren Ondras filed additional information regarding noises recorded at his home and noises recorded at the tailrace of the project. Mr. Ondras suggests that the information displays a persistent tone at 42 Hz at both locations and is louder at the tailrace-recording site than at the residence. Additionally, on July 12, 2013, Lisa

¹⁹ The “landslide” event refers to when FirstLight drained the upper reservoir of the Northfield Mountain Pumped Storage Project in May 2010, as part of a plan to perform regular maintenance. However, during the process of draining the upper reservoir, a significant quantity of sediment was entrained into the project’s works rendering the project inoperable for several months.

²⁰ Efficiency upgrades to Northfield Mountain pump/turbine units 3 and 2 were done in 2011 and 2012, respectively.

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McLoughlin and Warren Ondras filed a list of noises, associated frequencies, and characteristics at both the tailrace and their house.

In response, FirstLight states that project-related noise levels outside of the plant are not at a level that could negatively impact the quality of life of the project neighbors because the plant infrastructure is deep inside a mountain. Further, FirstLight notes that personnel working outside of the mountain have not heard excessive noise levels during project operations and that no other allegations of noise disturbance have previously been reported to FirstLight since the plant went into service in 1972.

On June 28, 2013, FirstLight submitted additional information on communications between FirstLight and the United States Air Force (USAF) concerning a USAF study to measure surface vibration from the project's underground pump generators.²¹ FirstLight states that these communications indicate that measurements of vibrations were recorded in the frequencies of 60 Hz and 90 Hz. Additionally, the USAF personnel stated that they could not hear any sound or feel the vibrations that were detected by their study equipment immediately above the turbine area on the surface.

FirstLight also submitted communications between it and Douglas Leubner, a Level II Vibration Analyst who conducted vibration analyses in connection with a project maintenance issue at a location where vibration from rotational and hydraulic forces can be measured. FirstLight suggests that Mr. Leubner's measurements reveal that, during generation mode, both a 30 Hz vibration frequency and 90 Hz vibration frequency were detected. FirstLight explains that when the Northfield Mountain project units are pumping, the steady state pump operation shows similar 30 Hz and 90 Hz harmonics. Mr. Leubner also notes that he reviewed Warren Ondras' additional information, filed by FirstLight on June 28, 2013, and states that he did not notice any significant vibration at Mr. Ondras' reported 42 Hz and that this frequency does not line up with any rotating component frequencies at the project.

Discussion and Recommendations

Given the additional information provided by Mr. Leubner, project operations appear to produce sounds at frequencies of 30, 60, and 90 Hz. Lisa McLoughlin and Warren Ondras indicate that their observed noise concerns occur at a frequency of 42 Hz. In addition, we note that of the seven unknown noises documented by Lisa McLoughlin, at least four have no correlation to the Northfield Mountain Project as the project was not operating at the time of observation.

²¹ The USAF was conducting its study to measure surface vibration at Northfield Mountain for its own purposes.

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Further, given that the powerhouse is located underground, we would not expect any sound from the powerhouse equipment to be heard at surface level, much less a mile away in a heavily wooded area. The lack of noise from the powerhouse above ambient noise levels has been confirmed by operating personnel and the USAF study. In addition, the tailrace is over 2 miles away from the participants' residence, so we would also not expect the participants to hear any sounds above ambient coming from the tailrace area.

As a result, we find it unlikely that the Northfield Mountain Project produces the noises of concern and conclude that the available information does not demonstrate a reasonable nexus between the documented noises and the Northfield Mountain Project (section 5.9(b)(5)).²²

Therefore, we do not recommend FirstLight conduct the requested *Present and Increased Noise Level Determination and (possible) Mitigation of Northfield Mountain Project* study.

²² Generally, a "reasonable nexus" exists where a clear and distinct path can be traced between a specific and definable project operation, construction, or maintenance effect and the resource to be studied.

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APPENDIX C**LIST OF PROPOSED AND REQUESTED STUDIES THAT WE HAVE IDENTIFIED AS POTENTIALLY AFFECTED BY THE DECOMMISSIONING OF VERMONT YANKEE**

Study	Recommending Entities
3.2.1 -- Water Quality Monitoring Study	FirstLight
3.3.1 -- Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station	FirstLight
3.3.2 -- Evaluate Upstream and Downstream Passage of Adult American Shad	FirstLight
3.3.3 -- Evaluate Downstream Passage of Juvenile American Shad	FirstLight
3.3.4 -- Evaluate Upstream Passage of American Eel at the Turners Falls Project	FirstLight
3.3.5 -- Evaluate Downstream Passage of American Eel	FirstLight
3.3.6 -- Impact of Project Operation on Shad Spawning, Spawning Habitat and Egg Deposition in the Area of the Northfield Mountain and Turners Falls Projects	FirstLight
3.3.7 -- Fish Entrainment and Turbine Passage Mortality Study	FirstLight
3.3.10 -- Assess Operational Impacts on Emergence of State-Listed Odonates in the Connecticut River	FirstLight
3.3.11 -- Fish Assemblage Assessment	FirstLight
3.3.12 -- Evaluate Frequency and Impact of Emergency Water Control Gate Discharge Events and Bypass Flume Events on Shortnose Sturgeon Spawning and Rearing Habitat in the Tailrace and Downstream from Cabot Station	FirstLight
3.3.13 -- Impacts of the Turners Falls Project and Northfield Mountain Project on Littoral Zone Fish Habitat and Spawning Habitat	FirstLight

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Study	Recommending Entities
3.3.14 -- Aquatic Habitat Mapping of Turners Falls Impoundment	FirstLight
3.3.15 -- Assessment of Adult Sea Lamprey Spawning within the Turners Falls Project and Northfield Mountain Project Areas	FirstLight
3.3.16 -- Habitat Assessment, Surveys and Modeling of Suitable Habitat for State-listed Mussel Species in the CT River below Cabot Station	FirstLight
3.3.17 -- Assess the Impacts of Project Operations of the Turners Falls Project and Northfield Mountain Project on Tributary and Backwater Area Access and Habitat	FirstLight
3.3.18 -- Impacts of the Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms	FirstLight
3.3.19 -- Evaluate the Use of an Ultrasound Array to Facilitate Upstream Movement to Turners Falls Dam by Avoiding Cabot Station Tailrace	FirstLight
4.2.3 -- Hydraulic Study of Turners Falls Power Canal	Karl Meyer

Document Content(s)

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