Relicensing Study 3.3.18

IMPACTS OF THE TURNERS FALLS CANAL DRAWDOWN ON FISH MIGRATION AND AQUATIC ORGANISMS

Initial Study Report Summary

Northfield Mountain Pumped Storage Project (No. 2485) and Turners Falls Hydroelectric Project (No. 1889)

Prepared for:

FirstLight™
GDF SUEZ

Prepared by:

Kleinschmidt
GOMEZ AND SULLIVAN ENGINEERS

SEPTEMBER 2014

1.1 Study Summary and Consultation Record to Date

Study 3.3.18 is designed to quantify the impacts of the annual Turners Falls Project canal drawdown on emigrating and resident fishes, freshwater mussels, sea lamprey juveniles and mudpuppies in the canal. The study is intended to facilitate the collection of information necessary to conduct effect analyses. The study will commence as soon as practicable after canal dewatering and will be conducted on the day following the drawdown (Monday 9/29/14) and again on the day before the canal is rewatered (Friday 10/3/14). The consultation record on Study 3.3.18 includes the following:

In the Federal Energy Regulatory Commission's (FERC) February 21, 2014 Study Plan Determination Letter (SPDL) relative to Study 3.3.18, it states "*During the power canal's drawdown, dissolved oxygen concentrations within zone 7 may be affected by a number of variables including temperature and biological oxygen demand (section 5.9(b)(5)). FirstLight did not provide any information that would indicate if the rate and turnover of flow through the pool in zone 7 is sufficient to maintain adequate dissolved oxygen levels during the canal drawdown. Therefore, to understand the potential effects project operations may have on dissolved oxygen, it is appropriate to monitor dissolved oxygen in within the zone 7 pool (section 5.9(b)(6)) during the canal drawdown. As such, we recommend that FirstLight consult with FWS, NMFS, and MADFW on two appropriate locations for measuring dissolved oxygen within the zone 7 pool*".

On June 3, 2014, FirstLight met at the Northfield Mountain Visitors Center with FERC (via phone), National Marine Fisheries Service (NMFS) (via phone), United States Fish and Wildlife Service (USFWS), Massachusetts Division of Fish and Wildlife (MADFW), The Nature Conservancy (TNC), and Connecticut River Watershed Council (CRWC) to discuss the study. At the meeting the group discussed proposed dissolved oxygen (DO) sampling sites with the agencies and all parties agreed to proposed sites.

On July 17, 2014, FirstLight sent a letter (see Appendix A) via email to the agencies and other stakeholders with proposed locations of quadrats for sea lamprey and mussel survey.

On July 29, 2014, FirstLight received email responses from its July 17, 2014 letter from the USFWS on July 29, 2014 (Appendix A), and from Massachusetts Natural Heritage and Endangered Species Program (NHESP) on July 31, 2014 (Appendix A) commenting on proposed quadrat locations and size of the quadrats.

On August 15, 2014 (Appendix A), FirstLight sent a letter via email to agencies and other stakeholders responding to the USFWS and NHESP comment letters.

1.2 Study Progress Summary

An amended study plan was developed based on the consultation described above. Field efforts will occur in September/October 2014, as indicated above. Based on the consultation with the agencies, it was agreed that the dissolved oxygen in Section 7 will be sampled from the two bridges that cross the canal in that section and additional quadrats were added especially on the Western bank. Changes are documented in the modified study plan (see Appendix B).

The study schedule is outlined in the modified study plan.

1.3 Variances from Study Plan and Schedule

To date, there have been no variances.

1.4 Remaining Activities

- Conduct the field study in 2014.
- Complete report.

Appendix A
Consultation Record

July 17, 2014

VIA EMAIL

John Warner, US Fish & Wildlife Service
Melissa Grader, US Fish & Wildlife Service
Ken Sprankle, US Fish & Wildlife Service
Caleb Slater, MA Division of Fish & Wildlife
Jessica Pruden, National Marine Fisheries Service
Bill McDavitt, National Marine Fisheries Service
Alex Haro, USGS Conte Lab

Re: FirstLight, Relicensing of the Turners Falls Hydroelectric Project (FERC No. 1889) and Northfield Mountain Pumped Storage Project (FERC No. 2485), Study No. 3.3.18- *Impact of Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms*

Dear All,

FirstLight Hydro Generating Company (FirstLight) is currently in the process of relicensing its Turners Falls Hydroelectric Project (FERC No. 1889) and Northfield Mountain Pumped Storage Project (FERC No. 2485) with the Federal Energy Regulatory Commission (FERC). On August 14, 2013 FirstLight filed its Revised Study Plan (RSP). The purpose of this letter is to consult with the resource agencies and Conte Lab researchers about the final number and placement of quadrats that will be used to determine the distribution and relative abundance of juvenile sea lamprey (ammocoetes) and mussels as required in Study No. 3.3.18- *Impact of Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms.*

Study No. 3.3.18 is a study to quantify the impacts of the annual Turners Falls Project canal drawdown on emigrating and resident fishes, freshwater mussels and mudpuppies in the canal. The study will commence as soon as practicable after dewatering and will be completed on the day following the drawdown, 9/30/14. A crew of experienced biologists will conduct a meander survey in unwetted areas, and a backpack electrofishing and/or seine survey in wetted areas. Areas of the canal with appropriate soft sediment habitat will be sampled using 1-m by 1-m quadrats to determine counts of ammocoetes and mussels. Figure 1 displays the locations of the proposed quadrats. These were positioned in areas either along the banks or the hard bottom of the canal where sampling is possible without sinking in the soft sediments. Sample locations may be modified in the field if bottom sediments have shifted. When the canal is drawn down we may find out that some areas have been covered with the muck that makes some

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Director FERC Compliance
Chief Dam Safety Engineer

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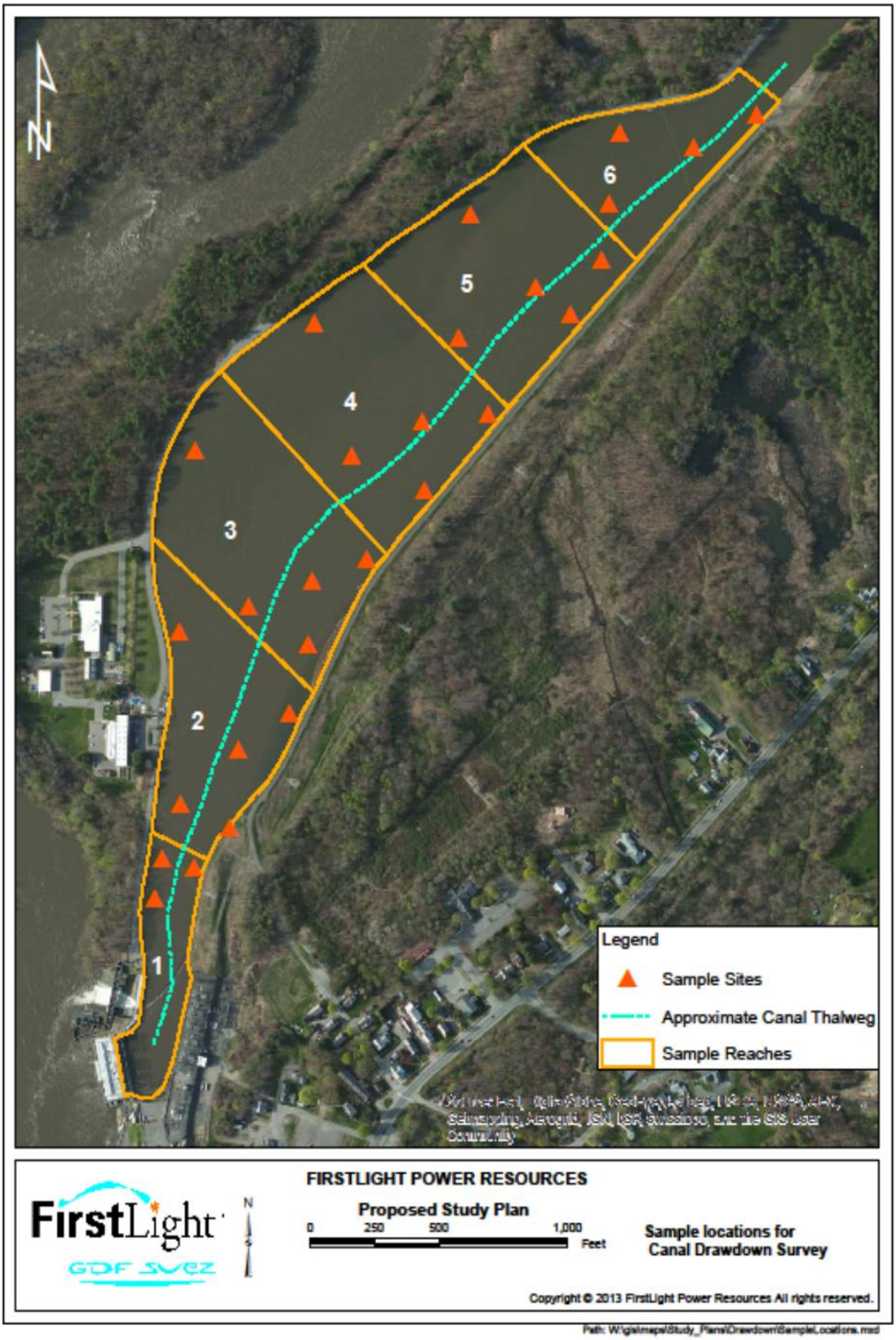
places inaccessible. Please respond by August 1, 2014 to confirm that the number of quadrats and proposed locations will address your concerns about the study's potential impacts to ammocoetes and mussels. If no response is received, we will assume that the proposed locations are approved.

Sincerely,

John Howard

Cc: Ken Hogan, FERC (via email)

Attachment: Figure 1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Sample Sites
Approximate Canal Thalweg
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GDF SUEZ
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FIRSTLIGHT POWER RESOURCES
Proposed Study Plan
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Feet
Sample locations for
Canal Drawdown Survey
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Mark Wamser

From: Warner, John <john_warner@fws.gov>
Sent: Tuesday, July 29, 2014 11:33 AM
To: firstlight@gomezandsullivan.com
Cc: Ken Sprankle; Melissa Grader; Caleb Slater; William McDavitt - NOAA Affiliate; Jessica Pruden; Alexander Haro; Ken Hogan; Howard, John; Mark Wamser; Chris Tomichek; Stira, Robert; lkhitrik@gomezandsullivan.com
Subject: Re: FirstLight, Relicensing. Study No. 3.3.18- Impact of Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms

The U. S. Fish and Wildlife Service received your email dated July 17, 2014, regarding requested input for Study No. 3.3.18 - Impacts of Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms design plans. The Service has reviewed the draft plan and has the following comments:

1) The FERC Study Plan Determination (February 2014) requires a survey immediately following the drawdown as your email notes and a second later survey to compare data, which is not mentioned. The plan should be amended to add a second drawdown assessment.

2) The six study zones defined in the figure provided in your July 17 email are reasonable to the extent that they would reflect a transition in potential habitats and biota from upstream to downstream. However, the zones will not clearly distinguish differences in the impacts on habitat between the western bank/zone, the channel area, and the eastern bank/zone.

The figure of possible quadrat sites indicates that the "western zone" of the canal area would have relatively fewer quadrat samples than the thalweg area, and the relatively narrow eastern bank area. The west bank has a large shallow shelf which represents a higher elevation (and first dewatering) and softer sediments that merit additional sampling effort.

We recommend that either: (a) 10 sites be selected within each of three zones (western bank/mud flat area, thalweg, eastern bank) distributed across the 6 upstream/downstream zones noted here; or (b) more specifically have zones be re-drawn to make different zones for the eastern thalweg and bank area and the western mudflat area and divide those zones into upstream and downstream segments (not all upstream downstream segments include the western mudflat area).

3) The proposed plan indicates that softer sediment areas would be avoided. These softer sediments represent suitable habitat for juvenile lamprey in particular, and therefore, avoiding sampling them potentially could under-represent impacts to them from canal drawdowns. Rather than avoid these areas, sampling of the large area of potentially softer sediments can be done either by using plastic snowshoes, or by laying down planks over soft areas to distribute weight and allow access. These approaches should be considered so that all habitats can be adequately sampled.

4) The quadrat sample size of one square meter is relatively small and the expected patchiness of organism occurrence and associated variability in counts may be quite high, potentially reducing usefulness of the data and any inferences. An increase in quadrat size to two square meters (from one) would be a relatively minor increase in effort but would in effect double the sample size area with anticipated benefits in helping to reduce the degree of variability among nearby site values.

5) The description of seine and backpack surveys would appear to be sufficient to obtain data including relative abundance and allow comparisons among areas and over time (early and late survey).

Please contact me or Ken Sprankle if you have any questions on these comments. Thank You.

- John Warner

Mark Wamser

From: Leddick, Jesse (FWE) <jesse.leddick@state.ma.us>
Sent: Thursday, July 31, 2014 4:06 PM
To: John_Warner@fws.gov; Ken_Sprankle@fws.gov; Melissa_Grader@fws.gov; Slater, Caleb (MISC); William.McDavitt@noaa.gov; jessica.pruden@noaa.gov; aharo@usgs.gov; Hazelton, Peter (FWE); Marold, Misty-Anne (FWE); Andrea Donlon; 'Don Pugh'
Cc: kenneth.hogan@ferc.gov; john.howard@gdfsuezna.com; mwamser@gomezandsullivan.com; Chris.tomichek@kleinschmidtusa.com; Robert.Stira@gdfsuezna.com; lkhitrik@gomezandsullivan.com
Subject: RE: FirstLight, Relicensing. Study No. 3.3.18 - MA NHESP/DFW Comments

John,

In response to the letter submitted by FirstLight dated July 17, 2014 re: Study No. 3.3.18 - *Impact of Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms*, the Natural Heritage and Endangered Species Program of the MA Division of Fisheries and Wildlife would like to offer the following comments:

1. The random allocation of sample sites shown on the map entitled "Sample locations for Canal Drawdown Survey" shows a majority of samples occurring along the eastern bank of the canal in Zones 1-6. Though these sites were chosen using random selection, they may not adequately represent the proportions of available habitat within the canal. The western bank of the canal (especially through Zones 3-5) contains a relatively shallow shelf which is likely to dominate dewatered habitat during a canal drawdown compared with the relatively steep and rocky eastern bank. However, there are few sample locations in this area and such a bias may cause surveyors to miss or misinterpret abundances and densities of aquatic organisms in this habitat. We recommend that the number and location of sample sites be selected using a stratified random approach in order to incorporate and better represent the proportion of various habitat types within the canal (e.g. east bank to depth x, west bank to depth x, and canal thalweg below depth x, where depth x is a depth at which the canal thalweg is defined).

2. Revised Study Plan 3.3.18 states that up to 10 randomly selected 1m^2 quadrats will be sampled in each Zone. However, the current proposal provides only 5 (or fewer) sample sites allocated to each Zone. We believe that a greater effort of sampling is needed to adequately assess drawdown effects on stranded benthic species (i.e. larval sea lamprey and freshwater mussels) and request that an average of 10 sites be used per Zone. Larger zones may therefore have more than 10 sample sites depending on total Zone size, and smaller Zones may have fewer. Such an allocation of sample sites would give better resolution to the data to assess drawdown effects.

3. While 1 m^2 quadrats have been specified in the Revised Study Plan, this size of sample unit may be too small to effectively represent the available habitat in the canal even with an increase to 10 sample sites per Zone. Given the same search area, larger sample units (i.e. quadrats) are more cost effective to set up than using smaller units for the same total search area. This is discussed in depth in *A Guide to Sampling Freshwater Mussel Populations* by Dave Strayer & Dave Smith, 2003. Using the current proposed methods (27 x 1m^2 quadrats) only 0.001% of the canal area (0.243km^2) would be surveyed. Alternatively, with n = 27 4m^2 quadrats (i.e. 2m x 2m), 0.04% of the canal would be surveyed with little additional cost, and likely a greater probability of detection through random placement. We believe that increased quadrat size should be considered in addition to an increase in samples for each Zone to better assess drawdown effects on mussels and ammocoete sea lamprey.

4. In *Appendix G- 2011 Cabot Station Drawdown Juvenile American Shad Stranding Survey* included with the Revised Study Plan, the abundance of all freshwater mussels are pooled and apparently were not identified to species. We request that mussels found as part of quadrat surveys be identified to species and that average and variances of species counts be reported for each Zone, with habitat type and species included. Similar mean measurements and variances should be reported for ammocoete sea lamprey.

Thank you for the opportunity to comment. Please contact me or Dr. Peter Hazelton, the Division's Aquatic Biologist, if you have any questions or if we can provide additional information.

Best regards,

Jesse Leddick
Endangered Species Review Biologist
Natural Heritage & Endangered Species Program
Massachusetts Division of Fisheries & Wildlife
100 Hartwell Street, Suite 230, West Boylston, MA, 01583
Phone: 508-389-6386 | Fax: 508-389-7890

---------- Forwarded message ----------
From: <firstlight@gomezandsullivan.com>
Date: Thu, Jul 17, 2014 at 9:12 AM
Subject: FirstLight, Relicensing. Study No. 3.3.18- Impact of Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms
To: John_Warner@fws.gov, Ken_Sprankle@fws.gov, Melissa_Grader@fws.gov, Caleb.Slater@state.ma.us, William.McDavitt@noaa.gov, jessica.pruden@noaa.gov, aharo@usgs.gov
Cc: kenneth.hogan@ferc.gov, john.howard@gdfsuezna.com, mwamser@gomezandsullivan.com, Chris.tomichek@kleinschmidtusa.com, Robert.Stira@gdfsuezna.com, lkhitrik@gomezandsullivan.com

Dear All,
Attached please find consultation letter for Study No. 3.3.18- Impact of Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms.

Thank you.

If you have any questions, comments or request please email to FirstLight@gomezandsullivan.com

August 15, 2014

VIA EMAIL

John Warner, US Fish & Wildlife Service
Melissa Grader, US Fish & Wildlife Service
Ken Sprankle, US Fish & Wildlife Service
Caleb Slater, MA Division of Fish & Wildlife
Jesse Leddick, MA Natural Heritage
Jessica Pruden, National Marine Fisheries Service
Bill McDavitt, National Marine Fisheries Service
Alex Haro, USGS Conte Lab

Re: FirstLight, Relicensing of the Turners Falls Hydroelectric Project (FERC No. 1889) and Northfield Mountain Pumped Storage Project (FERC No. 2485), Study No. 3.3.18- *Impact of Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms*

Dear All,

FirstLight Hydro Generating Company (FirstLight) is currently in the process of relicensing its Turners Falls Hydroelectric Project (FERC No. 1889) and Northfield Mountain Pumped Storage Project (FERC No. 2485) with the Federal Energy Regulatory Commission (FERC). On July 17, 2014 FirstLight emailed a letter to resource agencies and Conte Lab researchers about the final number and placement of 1-m by 1-m quadrats that will be used to determine the distribution and relative abundance of juvenile sea lamprey (ammocoetes) and mussels as required in Study No. 3.3.18- *Impact of Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms.* John Warner and Jesse Leddick replied to the letter and requested more quadrats in the western bank of the canal, especially in Zones 3-5. Other requests include: identifying mussels found as part of quadrat surveys to species; reporting average and variances of species counts for each Zone, with habitat type and species included; reporting similar mean measurements and variances for ammocoete sea lamprey; describing the second survey to occur the day prior to rewatering the canal; and increasing the size of the 1-m by 1-m quadrats to 2-m by 2-m.

FirstLight considered your comments about the locations of the quadrats and as recommended have added additional quadrats on the western bank particularly in Zones 3-5 (Figure 1). These new sampling locations follow the recommendations that along the western bank, thalweg and eastern bank each have at least 10 quadrat locations. We plan to identify the mussels found in the quadrat sampling to species and

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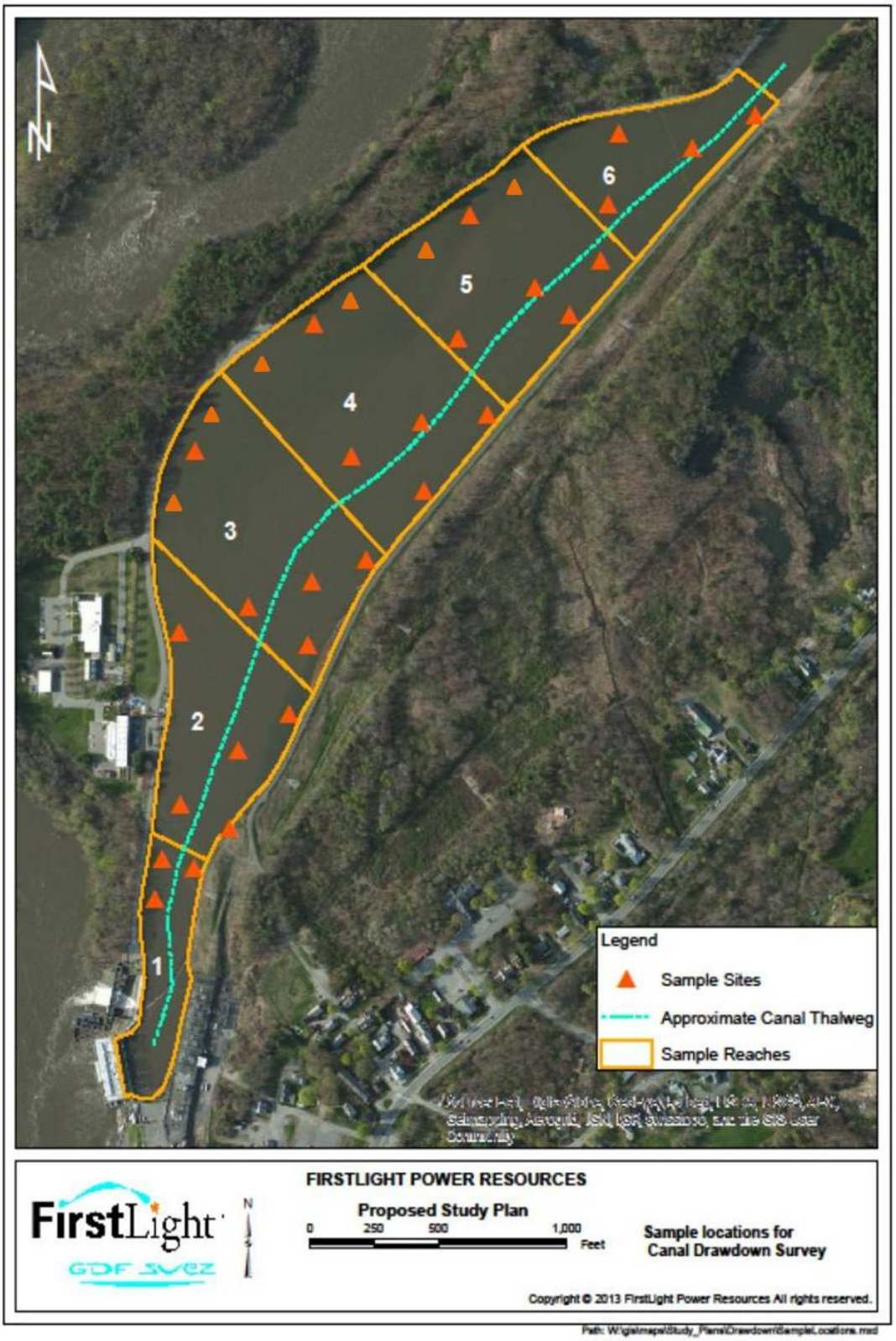
will report the average and variances of species counts by Zone including habitat type for mussels and ammocoete sea lamprey. As indicated in the SPDL, FirstLight plans to conduct a second survey, the same as the first survey, the day before the canal is rewatered on Friday October 3, 2014. However Firstlight does not plan to increase the quadrat size from 1-m by 1-m to 2-m by 2-m as FERCs Study Plan Determination Letter approved the use of 1-m by 1-m quadrats as set forth in the Revised Study Plan.

Sincerely,

John Howard

Cc: Ken Hogan, FERC (via email)
Don Pugh, TU (via email)
Andrea Donlon, CRWC (via email)

Attachment: Figure 1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FIRSTLIGHT POWER RESOURCES
Proposed Study Plan
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Feet
Sample locations for
Canal Drawdown Survey
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Appendix B
Modified Study Plan

3.3.18 Impacts of the Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms

General Description of Proposed Study

In the study request letter from the USFWS, a study to quantify the impacts of the annual Turners Falls Project canal drawdown on emigrating and resident fishes, freshwater mussels and mudpuppies in the canal was requested. Similar requests were also received from the MADFW, NHFGD, NOAA, CRWC, and TU. The stakeholder's indicate that the study request is intended to facilitate the collection of information necessary to conduct effect analyses and to develop reasonable and prudent conservation measures, along with PME measures.

Historically, FirstLight has conducted informal annual surveys of the canal during drawdown events. In 2011, a more extensive survey was conducted and documented in a memo report as explained below under the Existing Information discussion. FirstLight will conduct a similar survey during the 2014 drawdown event, with additional data collection aimed to fulfill the stakeholder's objectives as described below.

Study Goals and Objectives (18 CFR § 5.11(d)(1))

The goal of this study is to identify and evaluate potential measures to reduce adverse effects due to dewatering for the annual canal drawdown events. The objectives are to:

- Assess whether juvenile shad and American eel abundance in the canal increases leading up to the time of its closure, due to delays in downstream passage (e.g., is fish accumulation occurring).
- Evaluate level of mortality for juvenile sea lamprey from exposure of burrow habitats in the canal.
- Conduct a survey of fish and aquatic organisms (e.g., freshwater mussels and mudpuppies) during the 2014 canal drawdown to document species presence, estimate relative densities, determine status (stranded, alive, dead), and map wetted areas.
- Evaluate measures to minimize aquatic organism population impacts of the canal drawdown.

Resource Management Goals of Agencies/Tribes with Jurisdiction over Resource (18 CFR § 5.11(d)(2))

The CRASC developed *A Management Plan for American Shad in the Connecticut River Basin* in 1992. Management Objectives in the plan include the following:

1. Achieve and sustain an adult population of 1.5 to 2 million individuals entering the mouth of the Connecticut River annually.
2. Maximize outmigrant survival for juvenile and spent adult shad.

The ASMFC Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (American Shad Management), approved in 2010, has the stated goal of "*Protect, enhance, and restore Atlantic coast migratory stocks and critical habitat of American shad in order to achieve levels of*

spawning stock biomass that are sustainable, can produce a harvestable surplus, and are robust enough to withstand unforeseen threats," and includes the following objectives:

1. Maximize the number of juvenile recruits emigrating from freshwater stock complexes.

2. To enhance survival at dams during emigration, evaluate survival of post spawning and juvenile fish passed via each route (e.g. turbines, spillage, bypass facilities, or a combination of the three) at any given facility, and implement measures to pass fish via the route with the best survival rate.

The USFWS seeks the accomplishment of a number of resource goals and objectives through the relicensing process for the Turners Falls Project. General goals include the following:

1. Ensure that PME measures are commensurate with Project effects and help meet regional fish and wildlife objectives for the basin.

2. Conserve, protect, and enhance the habitats for fish, wildlife, and plants that continue to be affected by the Turners Falls Project.

Specific to diadromous fishes, the USFWS goal is to minimize current and potential negative project operation effects on diadromous fishes, including juvenile shad, adult silver eels, and sea lamprey ammocetes.

Existing Information and Need for Additional Information (18 CFR § 5.11(d)(3))

Historically, FirstLight has observed stranding of juvenile American shad during annual canal drawdown events. In 2011, FirstLight's consultant and staff from Conte Lab conducted a more formal survey to include delineation of the canal into seven distinct zones. Each zone was visually surveyed for juvenile shad and other species, which were counted or estimated depending on numbers present. Any pool areas were documented with photos and represented on aerial photos. A summary report was developed and is provided in Appendix G of this RSP. While no shad were observed, probably because of a flood event prior to the drawdown, a variety of species were documented, including centrarchid and cyprinid species, sea lamprey, carp, perch, mussels, chain pickerel, and American eel. Numbers observed varied by zone and by species.

FirstLight believes that Study Nos. 3.3.4 and 3.3.5 will further address the concerns regarding whether outmigrating shad and American eels are impacted by the annual drawdown events.

Project Nexus (18 CFR § 5.11(d)(4))

Previous studies at Cabot Station have documented that juvenile American shad and American eel migrate through the project area during the canal drawdown period. During normal operations (where canal water level elevations are stable), downstream migrants are able to utilize the Cabot bypass facility; however, as the canal water level is drawn down, the bypass is no longer available, and the only routes of egress are through the turbines at Cabot Station and Station No. 1.

Once the canal has been drawn down, much of the canal bed still has a well defined channel with water flowing, although some isolated shallow pools remain until the canal is refilled. During this period, fish (including lamprey ammocoetes), amphibians, and benthic invertebrates may be prone to desiccation, predation or other sources of mortality.

The annual canal drawdown was formerly conducted in July. In response to ISO-NE's request that FirstLight conduct the drawdown outside of the June through August period, FirstLight moved the drawdown to September, which coincides with the part of the migration period for some diadromous species.

Methodology (18 CFR § 5.11(b)(1), (d)(5)-(6))

FirstLight believes that, with modifications, the 2011 survey methods are adequate to meet study objectives for documenting the species (fish, freshwater mussels, and mudpuppies) present in the canal during a drawdown event, estimating their relative densities, determining physical status (stranded, alive, dead), and developing a map of wetted areas. Additional efforts, described below, will be included to determine the level of mortality of juvenile sea lamprey and mussels due to exposure of burrowing habitat at the downstream end of the canal. Data collected during the 2014 canal drawdown event will be used to inform the selection of potential mitigation measures to be evaluated for minimizing the adverse effects of the drawdown events on aquatic organisms in 2015. FirstLight believes that Study Nos. 3.3.3 and 3.3.5 will address the concerns regarding whether outmigrating shad and American eels are impacted by the annual drawdown events.

Due to the iterative process of conducting survey methods that will be used by FirstLight and stakeholders to identify and evaluate potential mitigation measures, the Study Schedule section below identifies an estimated time line of activities to incorporate a consultation process into this study.

Task 1: Conduct Aquatic Organism Survey of Canal During 2014 Drawdown

Similar to the 2011 survey, the survey will be conducted by segmenting the canal into approximately seven distinct zones (see map in Appendix G) and surveying each of the dewatered zones for observations of fish, mussels, and mudpuppies. The surveys will commence as soon as practicable after dewatering has been completed to avoid potential interference from avian predation of stranded fish. FirstLight proposes to conduct the study on the day following the drawdown, since post-drawdown predation and scavenging by birds and mammals could bias survey results. A second survey will be conducted the day before the canal is refilled to provide information on the extent of the effects associated with the duration of the drawdown. A field crew of experienced biologists will systematically traverse each of the zones in a meander survey fashion recording observations of estimated number of each species encountered. For each species observed, an assessment of the number of stranded, dead and alive individuals will be estimated. Additional information on the general location of species observations and predominant substrate type will be recorded on standardized field data sheets, as well as relevant weather conditions (air temperature, cloud cover estimate, precipitation, etc.).

For areas that remain sufficiently wetted (greater than 6 inches depth) in Zones 1-6 after the drawdown is completed, backpack electrofishing and/or beach seine techniques will be employed to determine relative abundance of fish in these areas. Standardized backpack electrofishing techniques will be utilized as habitat conditions permit and beach seines may be used in those areas not suited for backpack electrofishing (greater than 3 feet depth). For backpack electrofishing, a single backpack operator with a dip net will be accompanied by one or two additional netters and each sampling event will be standardized by time, such that results can be reported as the number of fish collected per 500 seconds of sampling. Beach seines will be used in appropriate areas where water depth is such that the net wall can extend from the surface to the bottom of the water column, and where the bottom contour is smooth to avoid net hang-ups. Beach seines will be performed with two people, each holding a pole at the end of the wing and towing the net through the wetted area until a specified, pre-determined area has been covered. At the conclusion of the seine sampling event, the wings of the net will be brought together and the bag

will be hauled to an appropriate area where the nets content can be sorted for identification and enumeration.

Based on observations during previous drawdown events, leakage through the gatehouse and canal bathymetry allows the majority of Zone 7 to remain sufficiently wetted (see photos below). This leakage combined with the egress through the Keith Drainage Tunnel, appears to provide adequate flow and depth to support aquatic species over the short term. As such, the survey for aquatic organisms in Zone 7 will be focused on the exposed, higher elevation areas only.

Photos (taken during 2011 drawdown survey) depicting typical conditions in Zone 7 during canal drawdown event.

Areas in Zones 2-6 (includes the areas of previous observations of juvenile sea lamprey) with appropriate soft sediment habitat will be further scrutinized to determine the distribution and relative abundance of juvenile sea lamprey (ammocoetes) and mussels. Up to 10 randomly selected 1-m by 1-m quadrats will be sampled in each zone and counts of ammocetes and mussel by species will be recorded. The quadrats will be stratified by bank and channel with 10 each on the east bank, west bank and thalweg (Figure 3.3.18-1).. The physical status (stranded, alive, dead) of the individuals will also be recorded. These data will be used to extrapolate counts for the entire area of suitable habitat within each zone.

The location of sufficiently wetted areas or pools will be GPS-located for subsequent map generation (including Zone 7). Based on observations during previous drawdown events, a large pool typically remains in the Cabot forebay area for the duration of the drawdown period. A GPS unit will be utilized to record the location and extent of the pool for inclusion on the map of wetted areas. Water quality parameters (temperature, dissolved oxygen, turbidity) will be also measured and recorded in the pools. Water temperature will be continuously monitored in Zone 7 with a long-term temperature logger at a location selected in consultation with resource agencies for the duration of the drawdown event. Dissolved oxygen will be measured in Zone 7 during the two drawdown surveys. These measurements will be taken from the 2 bridges that cross the canal in that Zone.

Results for aquatic organism sampling will be reported in units of standardized time of effort for electrofishing and also by unit area for the seining and quadrat sampling. A comparison of data collected during the two surveys will be compared. Water quality information, fish survey and quadrat data will be summarized in tabular format and included with the graphical canal representation in a report for stakeholder review.

Task 2: Identify and Assess Potential Measures

This task will consist of consulting with agencies and other stakeholders to identify and evaluate potential measures that may reduce adverse effects on fish and mussels in the canal during drawdown conditions. Potential measures may include, but not be limited to, assessment of the need for annual drawdowns; assessment of drawdown timing and frequency; and placement of temporary weirs or baffles in select areas of the canal to enlarge pools that remain during drawdown events or create additional pools to keep specific habitat areas wetted for the duration of the drawdown event. The evaluation will compare the merits and drawbacks of each measure, as well as develop an order-of-magnitude cost estimate. Should FirstLight and stakeholders reach an agreement on appropriate measure(s) to evaluate in the field then engineering design will proceed in Task 3. Stakeholders will also be consulted for development of a study design to assess the effectiveness of the selected measure that will be tested in the field.

Task 3: Design Selected Measure(s)

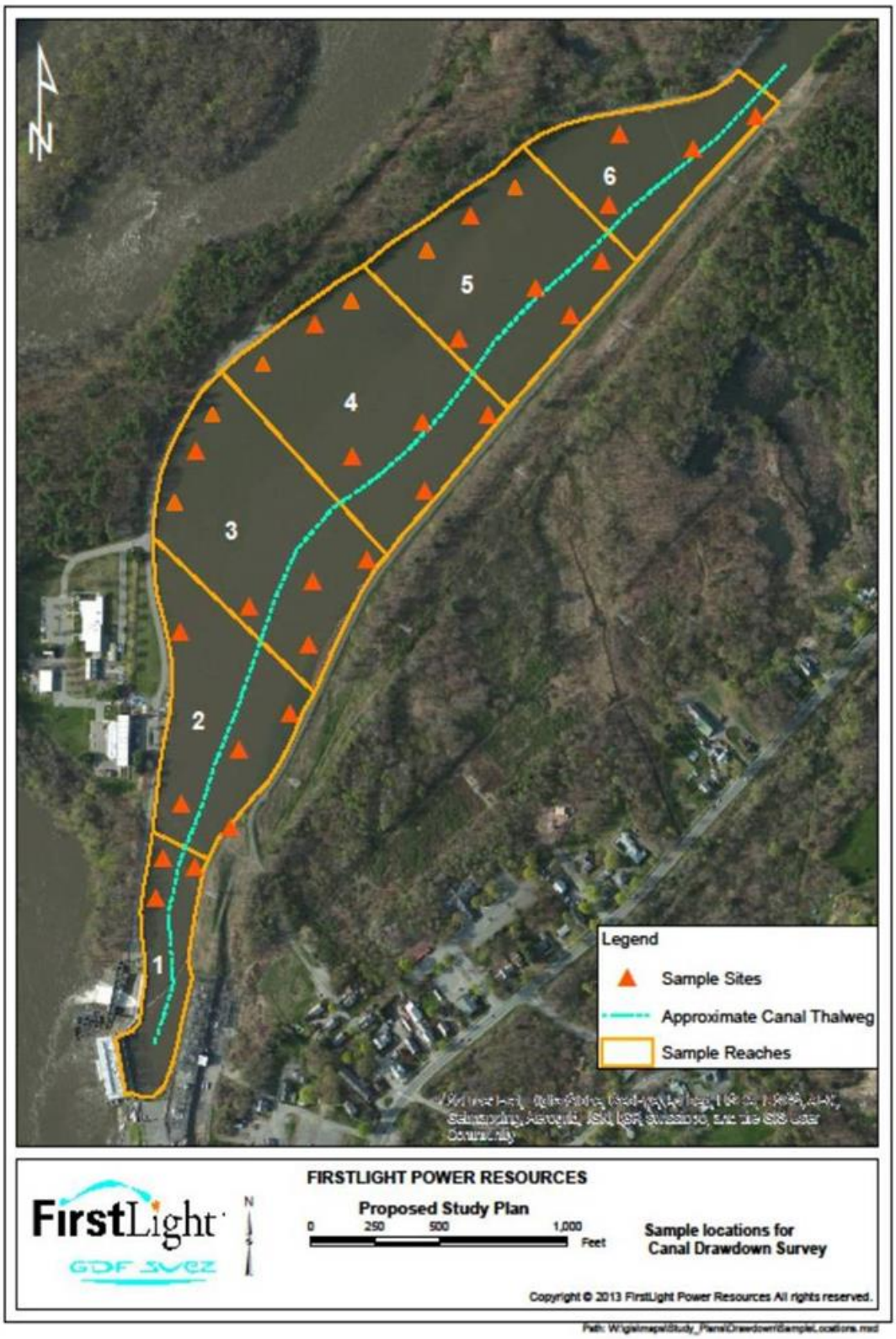
Upon agreement between FirstLight and stakeholders on appropriate measure(s), if any, to reduce adverse effects on aquatic organisms during drawdown events, engineering design (if applicable) of the selected measure(s) will be developed in consultation with Stakeholders in 2015. Following design, the selected measure will be tested in the field during the 2015 drawdown event.

Level of Effort and Cost (18 CFR § 5.11(d)(6))

FirstLight believes the proposed level of effort is adequate to conduct a drawdown survey and design potential measures, if feasible, to reduce the impacts of the annual drawdown events on aquatic organisms present in the canal. The total estimated cost for the proposed study is approximately $80,000 - $100,000.

Study Schedule (18 CFR § 5.11(b)(2) and (c))

- FirstLight to conduct Task 1 field surveys – September 2014
- Distribute summary report of results Task 1 and initial list of potential measures to be evaluated under Task 2 – First Quarter of 2015
- Hold meeting with Stakeholders to review Task 1 summary, seek to reach consensus on measure(s) to be field evaluated, and metrics for determining relative success of measure(s) to reduce effects of drawdowns – First Quarter of 2015
- Prepare conceptual design, if applicable, of measure(s) to be evaluated and submit to Stakeholders for review – April – May 2015
- Finalize conceptual design in consultation with Stakeholders, including meetings as determined appropriate – June 2015
- Construct test materials for placement and testing – July – August 2015
- Install and test – September 2015
- Distribute summary report of 2015 results for Stakeholder review – January 2016
- Hold meeting with Stakeholders to review results of testing and conclusions – February – March 2016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Legend
Sample Sites
Approximate Canal Thalweg
Sample Reaches
FirstLight
GDF SUEZ
FIRSTLIGHT POWER RESOURCES
Proposed Study Plan
0 250 500 1,000
Feet
Sample locations for Canal Drawdown Survey
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