FirstLight™ Power Resources

GDF SUEZ

Turners Falls Hydroelectric Project (FERC No. 1889)

Northfield Mountain Pumped Storage Project (FERC No. 2485)

2015 Updated Study Report

September 29-30, 2015

Purpose of Updated Study Report Meeting [18 CFR 5.15(c)(2)]

Per Regulation…..

Within 15 days following the filing of the Updated Study Report (September 14, 2015), the Applicant shall hold a meeting with licensing participants and Commission staff to discuss the study results and the potential applicant's and/or other participant's proposals, if any, to modify the study plan in light of the progress of the study plan and the data collected.

Meeting Objectives

- ❑ Discuss the progress of the relicensing studies to date
- ❑ Discuss any upcoming study activities
- ❑ Discuss any proposed study modifications (variances)

Relicensing Process- Next Steps

Updated Study Report Meeting (All Stakeholders and FirstLight)
- September 29-30, 2015

Updated Study Report Meeting Summary Filed (FirstLight)
- October 14, 2015

Disagreements/Modifications to Study/Propose New Study (All Stakeholders)
- November 13, 2015

Filing of Draft License Application
- December 4, 2015

File Responses to Disagreements (All Stakeholders)
- December 14, 2015

Last date for the Director to resolve disagreements and amend the approved study plans (FERC, if necessary)
- January 12, 2016

Comments due on Draft License Application
- March 3, 2016

Study Recap

Total of 39 studies

- 2 studies previously filed with FERC and complete (3.1.1 Full River Reconnaissance and 3.6.2 Recreation Facilities Inventory)
- 2 studies previously filed with FERC, but further work needed (3.7.1 Archaeological Survey, 3.7.2 Historic Structures Survey)
- 9 study reports filed with FERC on 9/14/2015
- 26 study summaries filed with FERC on 9/14/2015

- 2 studies slated for 2016 (3.3.5 Eel Downstream Passage- Yr 2, 3.3.19 Ultrasonic Array)

Agenda- Day 1

September 29, 2015 (17 Studies)

Times	Study
9:00-9:30 am	Introductions, Review of Meeting Purpose, Meeting Objectives, Schedule
	Fish and Aquatic
9:30 am-Noon	3.3.1- Instream Flow Study
	3.3.13- Impacts of the Turners Falls Project and Northfield Mountain Project on Littoral Zone Fish Habitat and Spawning Habitat
	3.3.14- Aquatic Habitat Mapping of Turners Falls Impoundment
	3.3.11- Fish Assemblage
	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
	3.3.2- Evaluate Upstream and Downstream Passage of Adult American Shad
	3.3.15- Assessment of Adult Sea Lamprey Spawning within the Turners Falls Project and Northfield Mountain Project Area
	3.3.4- Evaluate Upstream Passage of American Eel
Noon-1:00 pm	**Lunch on your own**
1:00-5:00 pm	3.3.3- Evaluate Downstream Passage of Juvenile American Shad
	3.3.5- Evaluate Downstream Passage of American Eel
	3.3.6- Impact of Project Operations on Shad Spawning, Spawning Habitat and Egg Deposition in the Area of the Northfield Mountain and Turners Falls Projects
	3.3.18- Impacts of the Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms
	3.3.19- Evaluate the Use of an Ultrasound Array to Facilitate Upstream Movement to Turners Falls Dam by Avoiding Cabot Station Tailrace
	3.3.7- Fish Entrainment and Turbine Passage Mortality Study
	3.3.20- Study to Evaluation Entrainment of Ichthyoplankton at the Northfield Mountain Pumped Storage Project
	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
	Water Quality
	3.2.1-Water Quality Monitoring Study

NOTE: this agenda is subject to change pending the pace of reviewing the USRs at the meetings.

Agenda- Day 2

September 30, 2015 (22 Studies)

Times	Study
	Fish and Aquatics
9:00 am-Noon	3.3.10-Assess Operational Impacts on Emergence of State-Listed Odonates in the Connecticut River
	3.3.16-Habitat Assessment, Surveys, and Modeling of Suitable Habitat for State-listed Mussel Species in CT River below Cabot Station
	Botanical
	3.4.1-Baseline Study of Terrestrial Wildlife and Botanical Resources
	3.4.2-Effects of Northfield Mountain Project-related Land Management Practices and Recreation Use on Terrestrial Habitats
	3.5.1-Baseline Inventory of Wetland, Riparian and Littoral Habitat in the Turners Falls Impoundment, and Assessment of Operational Impacts on Special-Status Species
	Hydraulic Modeling
	3.2.2-Hydraulic Study of Turners Falls Impoundment, Bypass Reach and below Cabot Station
	3.3.8-Computational Fluid Dynamics Modeling in the Vicinity of the Fishway Entrances and Powerhouse Forebays
	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.
	Operations Model
	3.8.1-Evaluate the Impact of Current and Potential Future Modes of Operation on Flow, Water Elevation and Hydropower Generation
Noon-1:00 pm	**Lunch on your own**
	Geology and Soils
1:00-5:00 pm	3.1.1-2013 Full River Reconnaissance
	3.1.2-Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability
	3.1.3-Northfield Mountain Project Sediment Management Plan
	Recreation
	3.6.1-Recreation Use/User Contact Survey
	3.6.2-Recreation Facilities Inventory and Assessment
	3.6.3-Whitewater Boating Evaluation
	3.6.4-Assessment of Day Use and Overnight Facilities Associated with Non-motorized Boats
	3.6.5-Land Use Inventory
	3.6.6-Assessment of Effects of Project Operation on Recreation and Land Use
	3.6.7-Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use
	Cultural Resources
	3.7.1-Phase 1A, 1B, and II Archaeological Surveys
	3.7.2-Survey and Evaluation of Historic Architectural Resources
	3.7.3-Traditional Cultural Properties Study

NOTE: this agenda is subject to change pending the pace of reviewing the USRs at the meetings.

Fish and Aquatic Resources
Water Quality Resources

3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

Study Progress

Task 1: Consult with Agencies and Interested Stakeholders to Determine Study Area, Study Reaches and HSI Curves

- Site visit to reaches 1, 2 and 3 conducted September 2013
- Consultation regarding HSI Curves completed during 2013 and 2014
- Site visit to Reach 4 conducted August 2015

Task 2: Method for Assessing State and Federally Listed Mussels

Task 2a: Screening Level Mussel Assessment

- Delphi panel established
- This task will occur once the HSI criteria are complete

Task 2b: Detailed 1D HEC-RAS Modeling

- Contingent on results of screening assessment

Task 3: Field Data Collection

- Hydraulic, substrate, bed profile data collected in reaches 1-3 during summer 2014

Task 4: Hydraulic Modeling (Reaches 1-4)

- Reaches 1-2 1-D data entered, reviewed and calibrated during December 2014 – March 2015
- Reaches 2-3 2-D data entered, reviewed and calibrated during January-July 2015

3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

Study Progress

Task 5: Hydraulic Modeling (Reach 5)
- Contingent on results of screening assessment

Task 6a: Habitat Modeling (Reaches 1-4)
- Raw Weighted Usable Area (WUA) calculations for reaches 1-3 modeled; output is undergoing QA/QC
- Reach 2's 1-D and 2-D model output to be integrated
- Reach 3 raw output calculated and under review

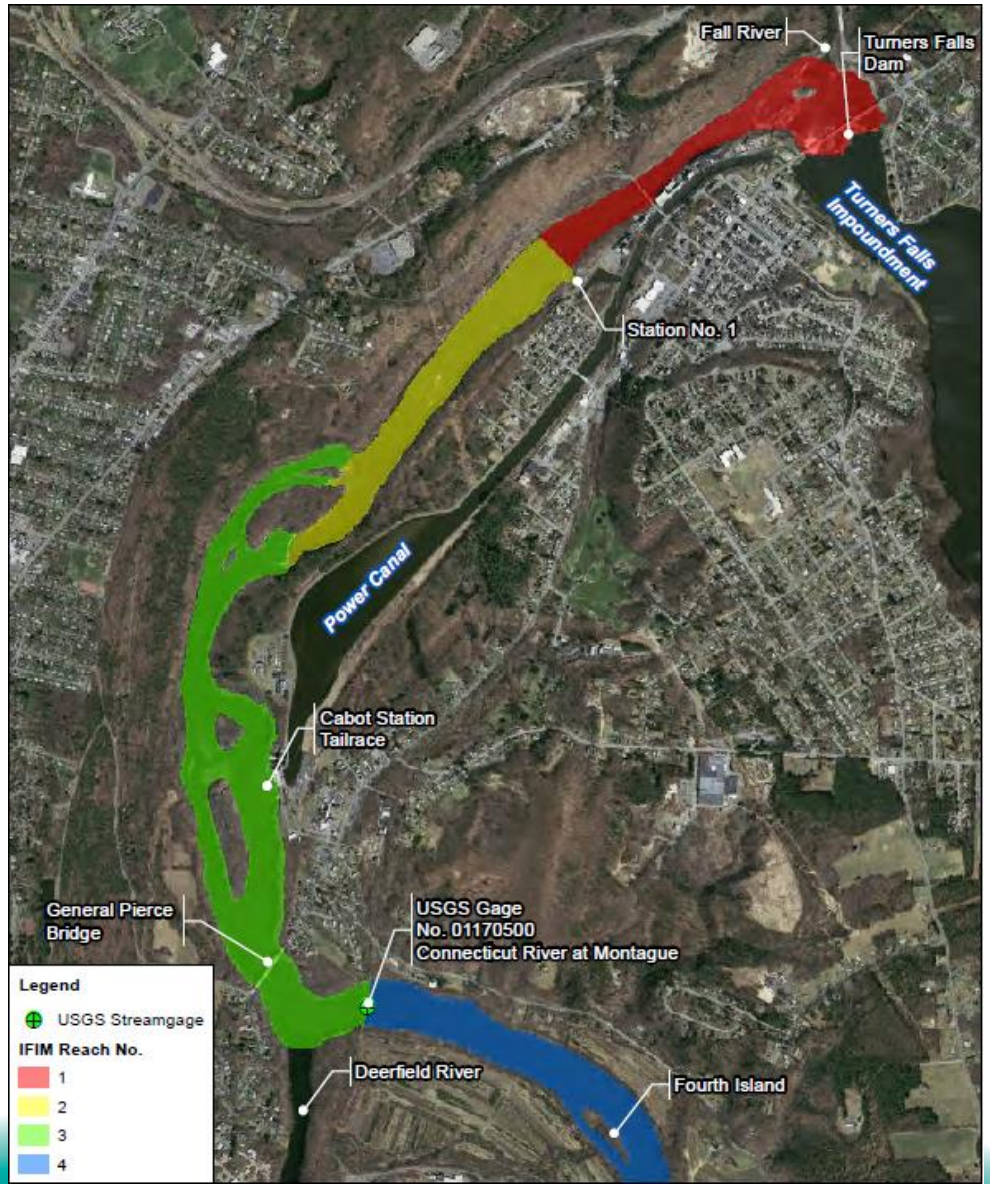
Task 6b: Persistent Potential Habitat Modeling [Reach 4, if necessary, and Reach 5, mussels only]
- Not yet conducted

Task 7: Habitat Time Series (Reaches 3 and 4)
- Not yet conducted

Task 8: Persistent Habitat Analysis and Mapping (Reach 3) and Dual Flow Analysis (Reach 4)
- Not yet conducted

Task 9: Study Report
- Not complete

3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station



3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

Notes:

Transect positions based on GPS data obtained at each tailpin on river left during field study (July 22-26, 2014)

H-2 and T-7 are the same transects and H-4 and T-10 are the same transects.

Benchmark Elevations surveyed in with RTK-GPS on August 1, 2014. Vertical Datum = NAVD 88.

BM1 = 123.077 feet
BM2 = 122.035 feet
BM3 = 129.350 feet

3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

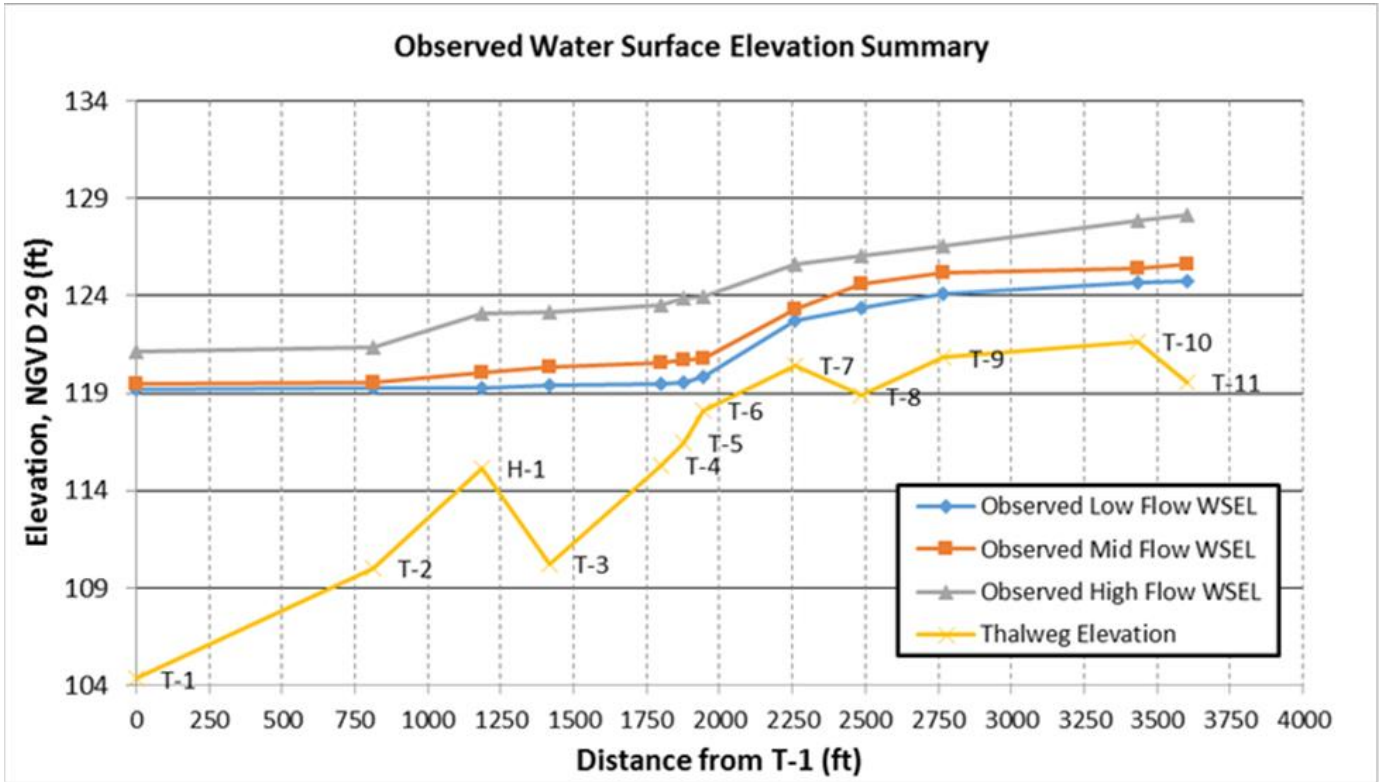
Findings Reach 1-2: Model successful at simulating flow and habitat throughout targeted flow range

Above Station No. 1

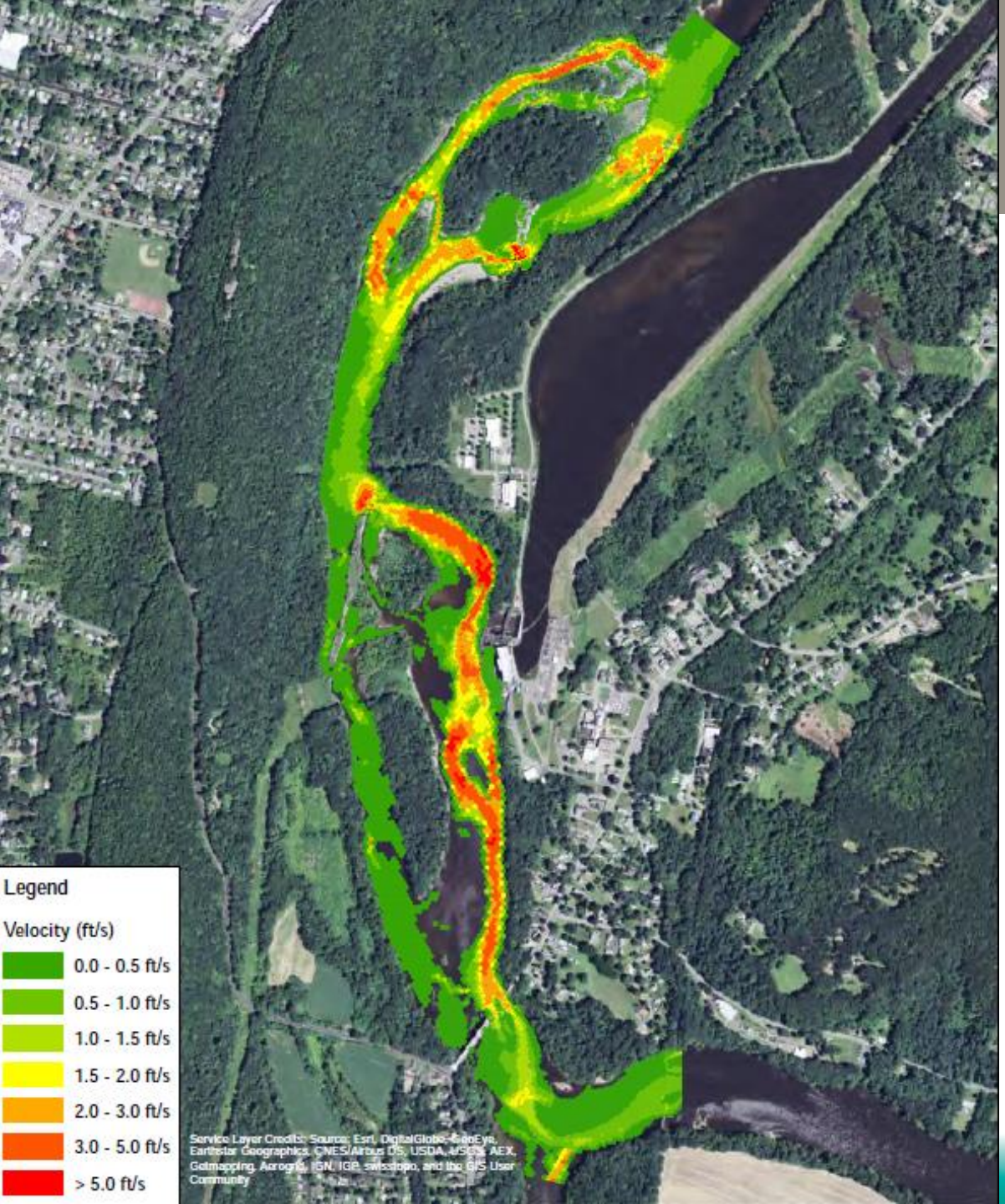
Calibration flow set	Discharge	Simulation range
Low flow	210 cfs	120-400 cfs
Medium flow	626 cfs	400-1,400 cfs
High flow	3,904 cfs	1,600-10,000 cfs

Below Station No. 1

Calibration flow set	Discharge	Simulation range
Low flow	293 cfs	120-400 cfs
Medium flow	720 cfs	400-1,400 cfs
High flow	4,000 cfs	1,600-10,000 cfs



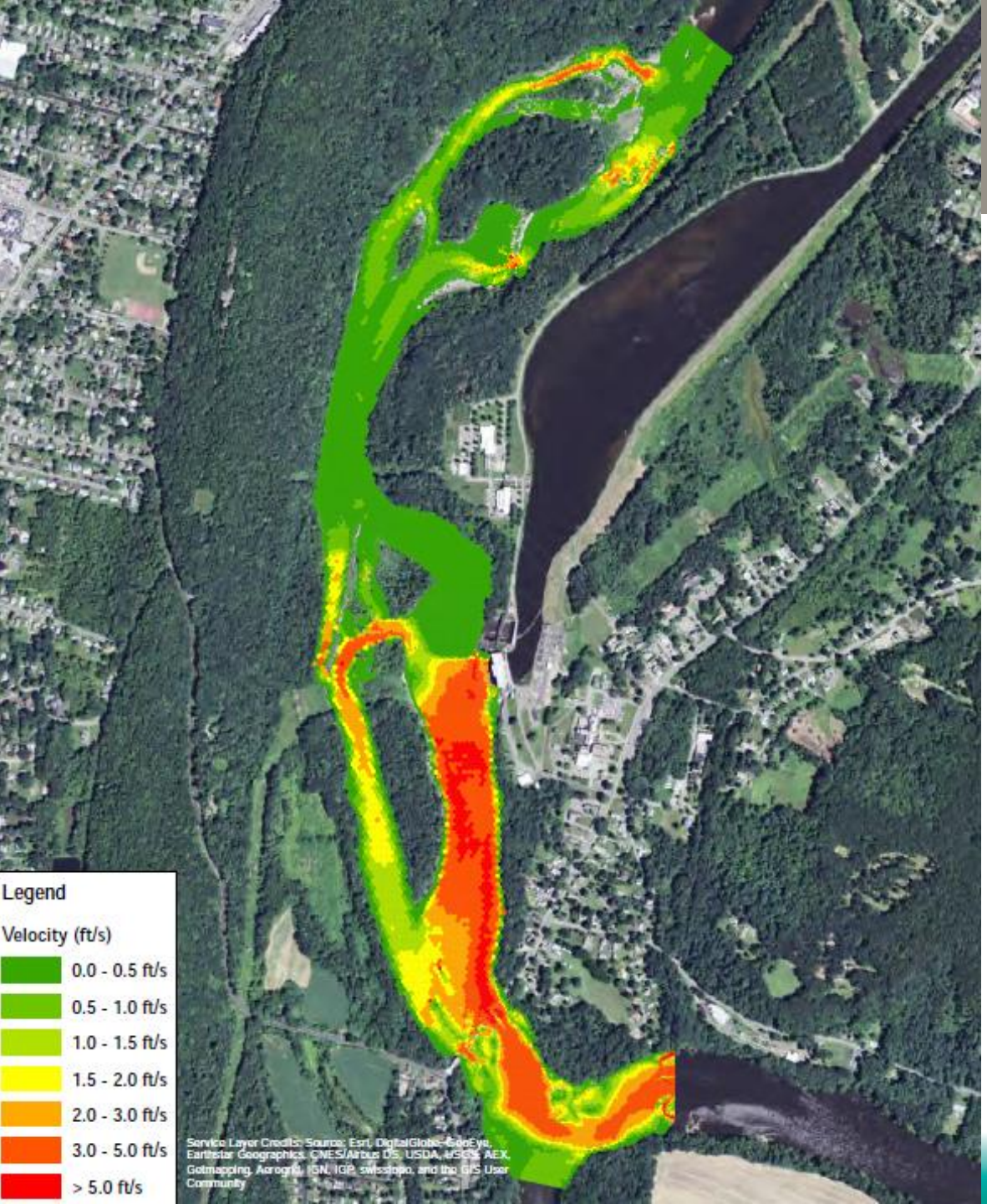
3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station



<u>Velocity Map</u>
Reach 3

Bypass:	1,600 cfs
Cabot:	0 cfs
Deerfield:	200 cfs

3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station



<u>Velocity Map</u>
Reach 3

Bypass:	2,000 cfs
Cabot:	13,728 cfs
Deerfield:	1,445 cfs

3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

Variance (if any)

- Schedule- originally were planning on conducting work in Reaches 1-3 in 2013 and Reaches 4-5 in 2014.

Work Remaining

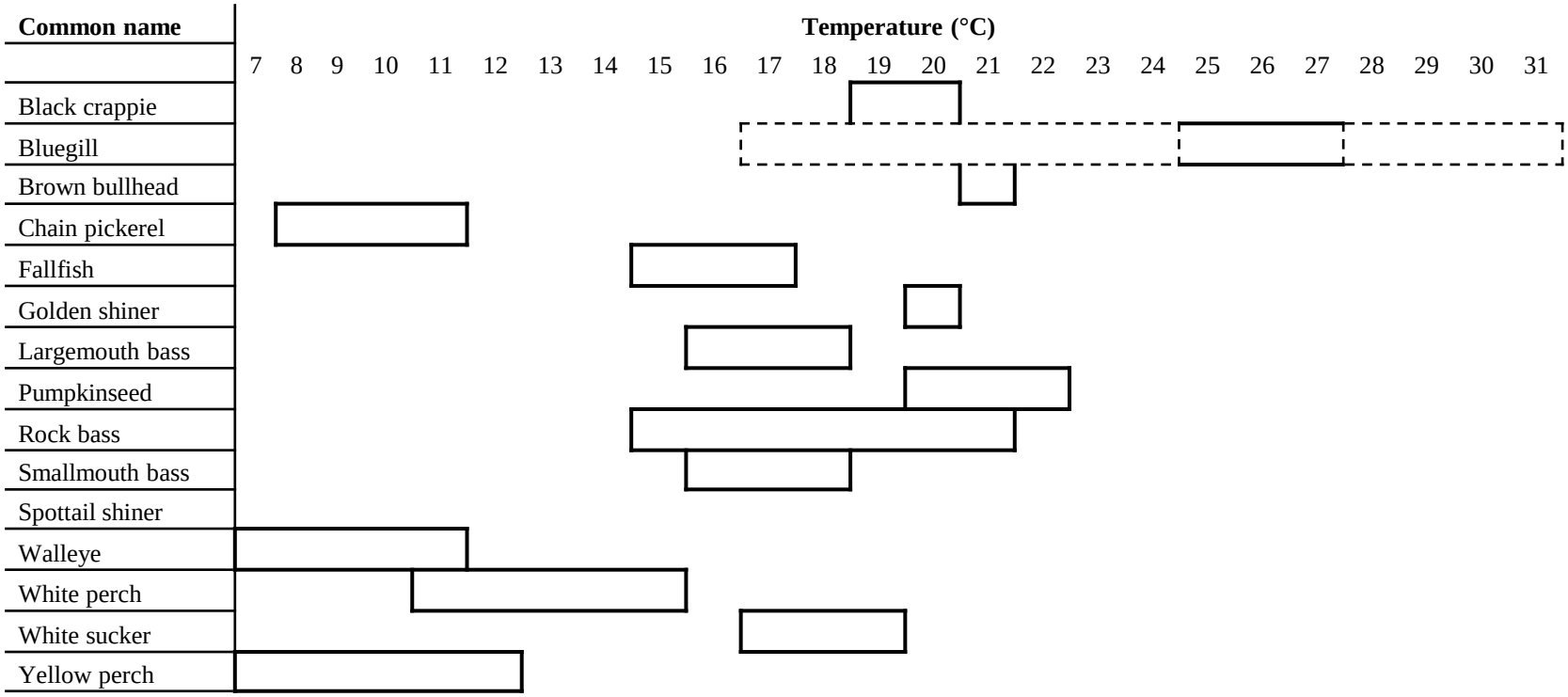
- Review Reaches 1-4 WUA output with stakeholders
- Determine need for persistent habitat and time series analysis of WUA output with stakeholders
- Conduct Flow Demonstration (“BOPSAR”) in Reach 1 riffle with stakeholders
- Report to be completed by 9/1/2016.

3.3.13- Impacts of the Turners Falls Project and Northfield Mountain Project on Littoral Zone Fish Habitat and Spawning Habitat

Study Progress

Task 1: Literature Review

- Literature review conducted in first quarter 2015 to target spawning periods for fish species known to occur in the impoundment, based on water temperature. Historic temperature data reviewed to target approximately date ranges



3.3.13- Impacts of the Turners Falls Project and Northfield Mountain Project on Littoral Zone Fish Habitat and Spawning Habitat

Task 2: Field Survey

- Two fish surveys (early spring and early summer) were conducted on May 4-6 and June 11-13 to identify spawning area.

Task 3: Reporting

- Data analysis is underway. Report will be completed on June 1, 2016.

Findings (if any)

- Two distinct littoral zone types due to varying river geomorphology

Variances (if any)

- None.

Work Remaining

- Littoral Zone Study (No. 3.3.13) will include evaluation of water level fluctuations on habitat and littoral zone, the Aquatic Habitat Mapping Report (No. 3.3.14) provides a baseline inventory of habitat conditions in the Turners Falls Impoundment. Water level fluctuation assessment will be conducted as part of Study No. 3.3.13.

3.3.14-Aquatic Habitat Mapping of Turners Falls Impoundment

Study Progress

Task 1a: Delineation and Task 1b: Microhabitat
- Field work for the delineation and microhabitat mapping completed in 2014.

Task 2: Analysis and Report
- Posted to relicensing website on 6/30/2015 and filed with FERC on 9/14/2015.

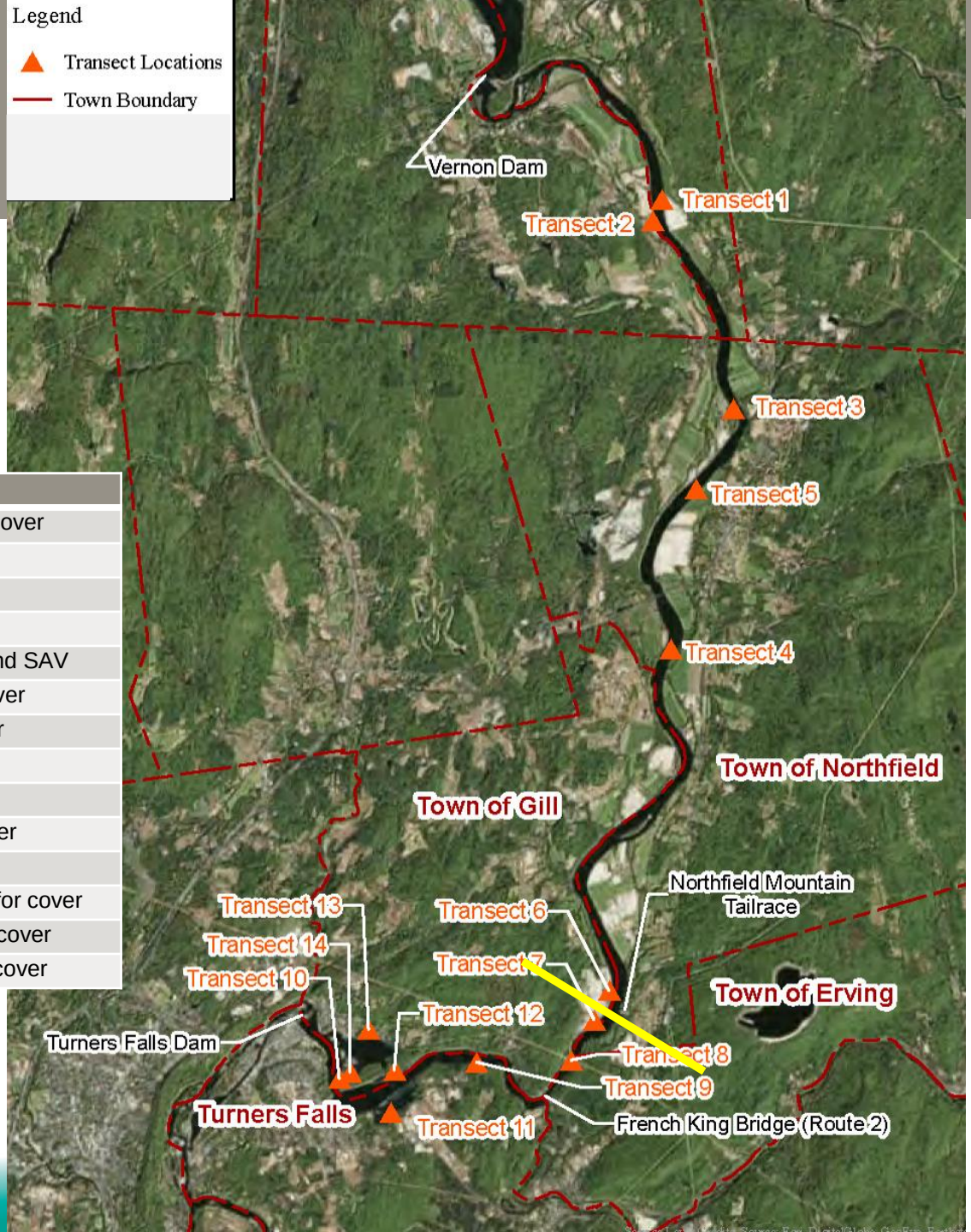
Findings (if any)
- Two distinct littoral zone types due to varying river geomorphology.
- Upstream segment is relatively uniform, alluvial substrates and channel forms, limited object cover.
- Downstream bedrock controlled with alternating vertical ledge (minimal littoral zone) and embayment, good object cover.

Variances (if any)
- 2014: Water level loggers, rather than a benchmark survey, were used to monitor changes in the water elevation and to acquire the water surface elevation at the beginning of the survey.

Work Remaining
- Littoral Zone Study (No. 3.3.13) will include evaluation of water level fluctuations on habitat and littoral zone, the Aquatic Habitat Mapping Report (No. 3.3.14) provides a baseline inventory of habitat conditions in the Turners Falls Impoundment. Water level fluctuation assessment will be conducted as part of Study No. 3.3.13.

- Phase 1: major habitat and shoreline types classified.
- Phase 2: detailed microhabitat data collected at representative transects.
- Two distinct littoral reaches (Upper and Lower Reach).

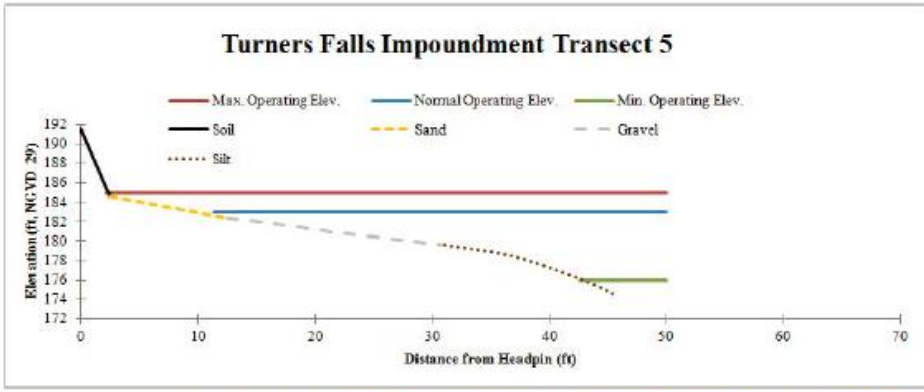
Transect	Habitat Description
1	Steep-sloped, dominated by cobble and gravel, no cover
2	Shallow-sloped dominated by fines, no cover
3	Steep-sloped, cobble and boulder cover
4	Moderate-sloped, dominated by fines, no cover
5	Moderate-sloped, cobble, scattered woody debris and SAV
6	Moderate-sloped, cobble and sand substrate, no cover
7	Moderate-sloped, cobble and silt substrate, no cover
8	Steep-sloped, bedrock, boulder and crevasse cover
9	Sand and silt shoal, some SAV beds provide cover
10	Sand and silt shoal, some SAV patches provide cover
11	Moderate-sloped, sand substrate, poor cover
12	Shallow-sloped dominated by fines, with EAV beds for cover
13	Embayment with sand and silt shoal area with SAV cover
14	Embayment with silt shoal area with SAV and EAV cover



3.3.14-Aquatic Habitat Mapping of Turners Falls Impoundment

Upstream reach(~13 mi):

- From 1 mi below Vernon Dam to ~ Northfield Mountain tailwater.
- Relatively uniform and located within a broad floodplain.
- Substrates comprised of alluvial materials such as gravel, cobble and fines.
- Object cover limited to scattered patches of SAV and woody debris.

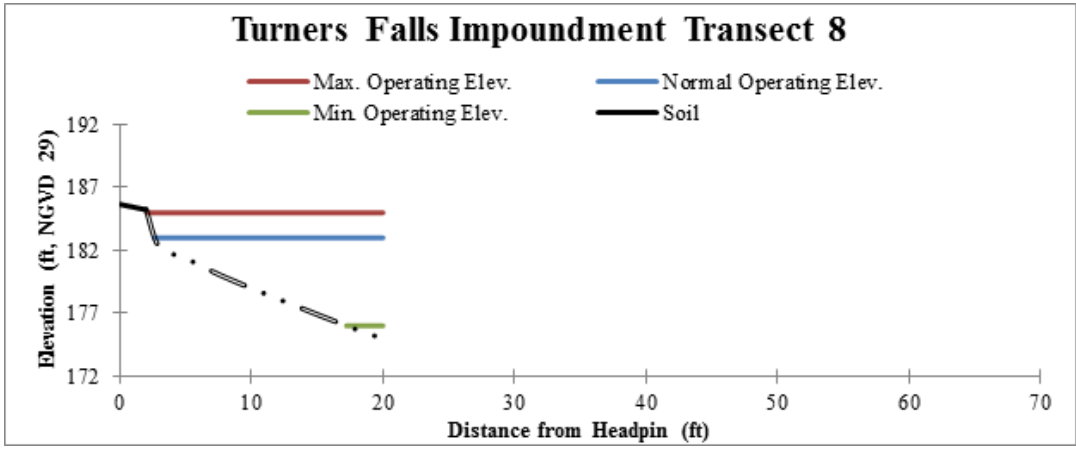


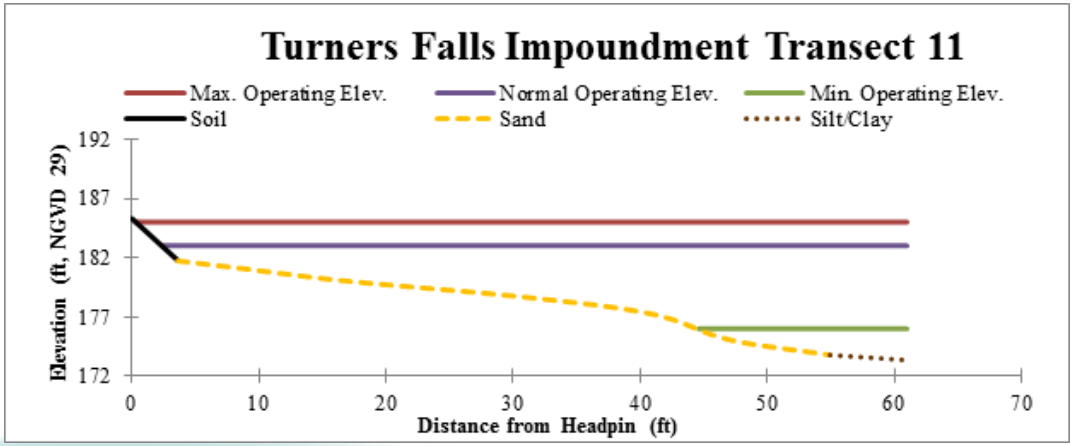
3.3.14-Aquatic Habitat Mapping of Turners Falls Impoundment

Downstream reach(~ 5 mi):

- From Northfield Mountain tailrace to the Turners Falls dam.
- Bedrock controls much of the stream geometry and substrate features; no floodplain.
- Littoral zone absent in some locations due to vertical bedrock cliffs.
- French King gorge (1.5 mi), a high banked, narrow, steeply sloped, littoral zone confined to a narrow, almost vertical zone.
- Immediately downstream from the gorge, impoundment follows a meandering course.
- Lower impoundment geometry is complex, and defined by both bedrock and depositional features:
  - embayment, points, coves, islands and wide range of substrates
  - shallow lacustrine littoral habitat adjacent to a deeply incised thalweg
  - broad horizontal shoals composed of gravel, sand or other fines in embayed sections
  - localized dense patches of SAV and wetlands, emergent aquatic vegetation (EAV)

3.3.14-Aquatic Habitat Mapping of Turners Falls Impoundment





3.3.11- Fish Assemblage

Study Progress

Task 1: Sampling Location Selection

- Consulted with USFWS, MADFW and NMFS on fish assemblage sampling locations. No sampling in bypass reach for first survey due to shortnose sturgeon concerns.

Task 2: Fish Capture

- First survey completed July 6-9 (Midwest Biodiversity Institute) involved, was initially slated for week of June 22, but abandoned due to high flows. Second survey conducted week of September 21, both impoundment and bypass reach.

Task 3: Data Analysis and Reporting

- Not complete.

Findings (if any)

- Based on first survey, a total of 23 fish species captured (provisional data attached).

Variances (if any)

- There were no suitable shorelines available for beach seining. Areas that were adequately free of woody debris, boulder or vegetation were insufficient for net deployment. As an alternative, two shoreline areas were selected (one in Barton Cove and another near the TF yacht club) and boat electrofished, each for 500 seconds.

Work Remaining

- Report to be completed by 3/1/2016.

3.3.11- Fish Assemblage

Fish species collected in the Turners Falls impoundment during the June and July 2015 fish assemblage survey (*provisional information*). Species listed in declining order of numeric abundance

Spottail Shiner
White Sucker
Yellow Perch
Smallmouth Bass
Bluegill Sunfish
Fallfish
Rock Bass
Pumpkinseed
Sunfish
Tessellated Darter
Walleye
Common Shiner
American Eel
Largemouth Bass
Golden Shiner
Black Crappie
Channel Catfish
Brown Bullhead
Common Carp
Chain Pickerel
Sea Lamprey
Mimic Shiner
Northern Pike
American Shad

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

Study Progress

Task 1: Field Data Collection

- Spring, Summer and Fall Surveys completed in 2014.

Task 2: Evaluation of Fluctuation Range

- If fluctuations create barriers to fish movement, hydraulic model would be used to determine if changes in the fluctuation range would mitigate impact.

Task 3: Data Analysis and Reporting

- Report posted to relicensing website on 6/30/2015 and filed at FERC on 9/14/2015.

Findings (if any)

- Outflow from the three large tributaries is controlled by dams upstream of the confluence with the Connecticut River.
- The 16 small, low order tributaries exhibit natural seasonal flow variability, which affects the character (depth, flow, water velocities, substrate, sediment deposition, erosion, scour, etc.) of the streams and their confluences.
- Most confluences were determined to provide suitable access for riverine fishes.
- For the three with observed restrictions, it was found that barriers were localized and temporary resulting from factors such as sediment deposition and woody debris accumulation.
- Overall, the study results indicate that the effects of Project-related water fluctuations on tributary access and aquatic habitat conditions are minimal.

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

Variances (if any)

- As reported in 2014, although the RSP envisioned that surveys would be performed with a sub-meter accuracy GPS and aerial imagery, delineation of the perimeter was hindered by extensive mud deposits, and dense canopy over the tributaries reduced the accuracy and connectivity of the GPS and obscured the tributary in aerial photos.
- The study team therefore delineated the upstream extent of the confluence with sub-meter GPS and LiDAR data in conjunction with field data to map the confluence perimeters.

Work Remaining

- None.

3.3.2-Evaluate Upstream and Downstream Passage of Adult American Shad

Study Progress

Task 1: Review Existing Information

- Review of the data has led to a collaborative effort between Conte Lab and FL to develop more rapid telemetry data reduction techniques.

Task 2: Study Design and Methods

- Adult shad used in the evaluation were collected at the Holyoke fish lift and within the Cabot Ladder at Turners Falls using the existing fish trapping facilities.
- Tagging occurred on 12 days in the months of May and June, 2015 with approximately half of the shad tagged with radio and PIT tags (double tagged) (n=397) and half tagged with PIT only (n=396).

Date of Collection/Release	Collection Location	Release Location	Number of Double Tagged Shad	Number of PIT only Shad	Total Tagged and Released
5/6/15	Holyoke	Holyoke	72	1	73
5/7/15	Holyoke	Holyoke	0	72	72
5/12/15	Holyoke	Holyoke	48	1	49
5/13/15	Holyoke	Holyoke	0	47	47
	Cabot	Canal	25	25	50
5/15/15	Holyoke	TFI	33	29	62
5/16/15	Cabot	TFI	33	33	66
5/18/15	Cabot	Canal	0	25	25
5/19/15	Holyoke	Holyoke	48	48	96
	Cabot	Canal	25	0	25
5/22/15	Holyoke	Impoundment	33	33	66
5/23/15	Cabot	TFI	33	33	66
5/26/15	Holyoke	Holyoke	24	24	48
6/8/15	Holyoke	Holyoke	23	25	48
Totals			**397**	**396**	**793**

3.3.2-Evaluate Upstream and Downstream Passage of Adult American Shad

Task 2: Study Design and Methods (cont)

- Tracking occurred at 30 telemetry and PIT tag stationary locations.
- Mobile tracking of radio tagged shad was conducted weekly between Holyoke and the Mount Herman School. A second day of weekly tracking concentrated on the area between the Hatfield S curve and Cabot Station.
- A total of 21 days of mobile tracking were conducted between May 15 and July 7, 2015.

Task 3: Evaluation of Mortality

- Mortality was assessed using mortality tags from Sigma Eight. All shad were tagged with Pisces Transmitter (tags) operating on five frequencies

Task 4: Reporting

- A workshop will be scheduled this winter with stakeholders to review results and accept input before final report is written.
- A final report will be completed by September 1, 2016.

Findings (if any)

- Data Analysis in Progress

Variances (if any)

- 100 shad were to be collected at the Cabot fish ladder and released into the TFI. However, due to a miscommunication 132 shad were collected at the Cabot ladder and released into the TFI. Thus a greater number of shad were collected at Cabot and released in the TFI and fewer fish were collected and released at Holyoke than planned. This reduction represented 6% of all the fish released at Holyoke.

Work Remaining

- Report to be completed by 9/1/2016.

3.3.15- Assessment of Adult Sea Lamprey Spawning within the Turners Falls Project & Northfield Mountain Project Area

Study Progress

Task 1: Field Data Collection

- 40 adult sea lamprey were collected from the Holyoke fish lift and transported to two locations (Rt.116 Bridge in Sunderland and the Turners Falls Impoundment) where they were radio-tagged and released. Half the lampreys (20) were tagged and released during the early portion of their run (5/21/15); ten of the 20 were released at the Rt. 116 Bridge and ten were released upstream of Turners Falls Gatehouse. The other half was released during the mid-portion of their run (5/28/15) at the same two release locations.
- Sea lamprey were mobile-tracked twice weekly; tracking was conducted by boat using a Lotek receiver and a 3-element yagi antenna. Weekly tracking was first conducted from Holyoke Dam to the Mount Herman School and second from the Hatfield S curve to Cabot Station. A total of 17 days of mobile tracking occurred between 6/3/15 & 7/7/15.
- A total of 30 redds were GPS located in five (5) distinct regions of the Project

Project area	Number of GPS located redds	Number of Capped redds
Above Turners Falls Dam, Connecticut River mainstem within close proximity of Vernon Dam (both sides of Stebbins Island)	7	1
Above Turners Falls Dam, Ashuelot River confluence with the Connecticut River	11	1
Above Turners Falls Dam, Millers River confluence with the Connecticut River	5	1
Below Turners Falls Dam in bypass, Fall River confluence with the Connecticut River	2	1
Below Turners Falls Dam and Cabot Station, Hatfield S curve below Rt. 116 Bridge	5	1
Totals	**30**	**5**

3.3.15- Assessment of Adult Sea Lamprey Spawning within the Turners Falls Project & Northfield Mountain Project Area

Task 1: Field Data Collection (cont.)
Each of the GPS located redds was monitored every third day for several parameters including substrate, depth, water velocity and water quality (temperature, dissolved oxygen (DO), turbidity, pH, conductivity). Five of the 30 redds were capped using a 4x4ft, weighted PVC framed collection net (1mm mesh) funneling into a collection jar on the downstream end in order to capture emerging larvae.

Task 2: Data Analysis
All radio telemetry and redd data were compiled, entered into a database, assured for quality, and archived. Data analysis and reporting are in process.

Task 3: Report
- A final report will be completed by June 1, 2016.

Findings (if any)
- None yet

Variances (if any)
- No variances

Work Remaining
- Data Analysis
- Report

3.3.4- Evaluate Upstream Passage of American Eel (Year 2 of 2 Year Study)

Study Progress

Task 1: Systematic Surveys (2014)
- Completed in 2014.
- Year 1 Study Report uploaded to relicensing website on 3/31/2015 and filed with FERC on 9/14/2015.

Task 2: Trap Collection (2015)
- Stakeholder site visit held on 5/7 to locate eel ramp locations.
- Temporary eel ramps installed in early July at Cabot Emergency Spill Gate, Cabot Ladder and Spillway Ladder after consultation with Alex Haro and other stakeholders. Medusa traps placed below Station No. 1.
- Being monitored ~ 3x/week - captured fish moved above TF Dam. Traps in place until October 2015.

Task 3: Data Analysis
- Not complete.

Task 4: Report
- Not complete.

Findings (if any)
- Year 2: All eel ramps operating properly. Similar to the systematic surveys, most eels are detected in the Spillway ladder.

Variances (if any)
- 2014: On 6/26/2014, certain areas not surveyed for safety reasons. After 7/17/2014, due to the lack of eels detected some sites were eliminated from further survey.
- 2015: RSP indicated eel ramp inclines should be 35°. As installed, the incline of the ramps was 38°, 40°, and 43° at the Spillway fishway, Cabot fishway and Cabot spill gate eel ramps, respectively.

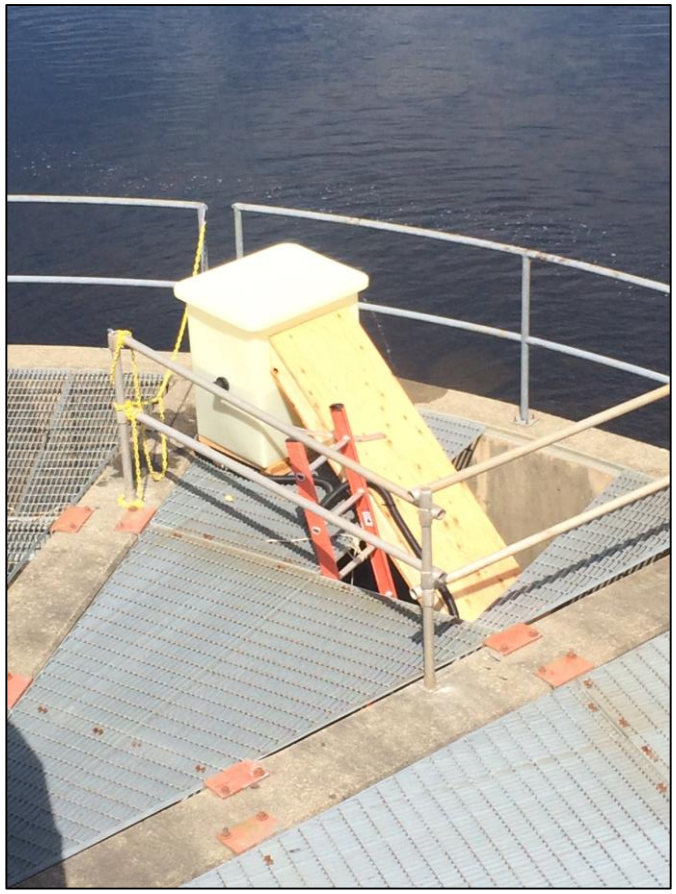
Work Remaining
- Data analysis and report complete by 3/1/2016.

3.3.4- Evaluate Upstream Passage of American Eel (Year 2 of 2 Year Study)

Cabot Emergency Spillway Eel Ramp

3.3.4- Evaluate Upstream Passage of American Eel (Year 2 of 2 Year Study)

Spillway Ladder Trap



Cabot Ladder Trap

3.3.3-Evaluate Downstream Passage of Juvenile American Shad

Study Progress

Task 1: Evaluation of Timing, Duration and Magnitude of Migration

- The juvenile shad emigration timing, duration and magnitude are being evaluated using split beam sonar which was installed on July 9, 2015.
- Data collection began on August 15, 2015 and will continue to end of October, 2015.
- 4 split beam systems were installed at: Cabot Station (2); Turners Falls Power Canal; and Northfield tailrace.
- The downstream fish bypass at Cabot Station will be sampled during 12 to 18 evenings to ground truth the hydroacoustic data and compare the percent of juvenile shad passing via the Cabot sampler and Cabot Station. Sampling began in September 2015 and continue through October.

Task 2: Evaluate Route of Passage

- Installation of the radio telemetry equipment occurred in late August, 2015 with the study initiated in mid-to-late September.
- A total of 224 larger juvenile shad will be tagged externally using the Lotek NanoTag Series model NTQ – 1. This is the smallest radio tag currently available.
- Tagged shad will be released about 2 mi upstream of the Northfield Mountain Project intake/tailrace and at least 1 mi upstream of the Turners Falls Dam.
- The releases will occur on six days and tagged fish will be monitored at 13 antenna locations within the study area.

Task 3: Turbine and Dam Passage Survival

- The turbine and dam passage survival study will determine rates of survival for juvenile shad entrained at No. 1 and Cabot Stations, and spilled over the dam using HI-Z Turb'N tags.
- 150 tagged juvenile shad will be released into the turbines for testing and an additional 150 will be released into the tailrace as controls. An additional 125 tagged juvenile shad will be released above the dam.

Task 4: Reporting

- Not complete.

3.3.3-Evaluate Downstream Passage of Juvenile American Shad

Findings (if any)

- Study ongoing.

Variances (if any)

- The specification for the radio tags have been changed.
- A Gatehouse monitoring station was added.
- A Cabot Station tailrace monitoring station was added.
- FL proposes to conduct the first turbine survival tests running both Station No. 1 Units 2 and 3 together, rather than running Unit 2 alone.
- FL proposes to inject a total of 120 juvenile shad above bascule gate 1 (60 juvenile shad), bascule gate 4 (60 juvenile shad).

Work Remaining

- Field Studies.
- Data Analysis.
- Report to be completed by 9/1/2016.

3.3.5- Evaluate Downstream Passage of American Eel (2015 & 2016 Study)

Study Progress

Task 1: Evaluation of Timing, Duration and Magnitude of Migratory Movement

- In order to optimize the split beam transducers spatial coverage of the targeted areas, field testing was performed in August 2014.

Task 2: Assessment of Downstream Passage of American Eel

- Data collection began on August 1, 2015 and will continue through the end of October, 2015. Silver eels will be tagged and released at strategic points of interest to assess general passage routes.

Task 2a: Northfield Mountain Route Selection Study

- One split beam sonar unit (with four transducers) was installed at the Northfield Mountain Project intake. Telemetry receivers were installed at the intake and in the upper reservoir.

Task 2b: Turners Falls Dam Route Selection Study

- Two split beam sonar units (each with four transducers) were installed at the Cabot Station intake and one unit was installed within the Turners Falls power canal in the vicinity of the 6th Street Bridge. A dual frequency identification sonar (DIDSON) unit was installed in the power canal adjacent to the split beam system. A total of 19 radio telemetry monitoring stations were installed throughout the Turners Falls Project area, covering approximately eight river miles.

Task 2c: Mobile Tracking

- Mobile tracking (i.e., via boat, vehicle, or by foot) in river reaches between release sites and 5 km downstream of Cabot Station will be performed on a weekly basis during and after releases to confirm routes and fates of passed fish. Tracking will occur until the tagged eels leave the study area or water temperatures at 5°C.

Task 3: Data Management, Analysis and Reporting

- Not complete.

3.3.5- Evaluate Downstream Passage of American Eel (2015 & 2016 Study)

Findings (if any)

- Study ongoing.

Variances (if any)

- The RSP envisioned conducting the testing at two turbines at Station No. 1 (one to represent the four larger turbines and one at the smaller turbine, Unit 2). It was determined that the velocity at the smaller unit is not high enough to ensure entrainment. Typical operations include tandem operation of Unit 2 and Unit 3.

- FL proposes to conduct the first turbine survival test running both Units 2 and 3 together (50 adult eels) and then perform a second test at one of the larger units with an additional 50 adult eels. By setting up the tests in this manner, survival at both the smaller and larger units can be estimated.

Work Remaining

- Field Studies
- Data analysis
- Report to be completed by 3/1/2017.

3.3.6-Impact of Project Operations on Shad Spawning, Spawning Habitat and Egg Deposition in the Area of the Northfield Mountain and Turners Falls Projects

Study Progress

Task 1: Development of Detailed Study Design

- After consultation in early 2015, a final study design plan was sent out on 4/27/2015.

Task 2: Examination of Known Spawning Areas between Cabot and Rte 116 Bridge

Task 3: Identification of Spawning Areas in TF Impoundment

Task 4: Identification of Spawning Areas in TF Canal, Rock Dam and Station No. 1

Task 5: Examination of Identified Spawning Areas in TF Canal

- Field work completed between 5/19 to 6/24/2015.

Task 6: Data Analysis and Reporting

- Not Complete.

Findings (if any)

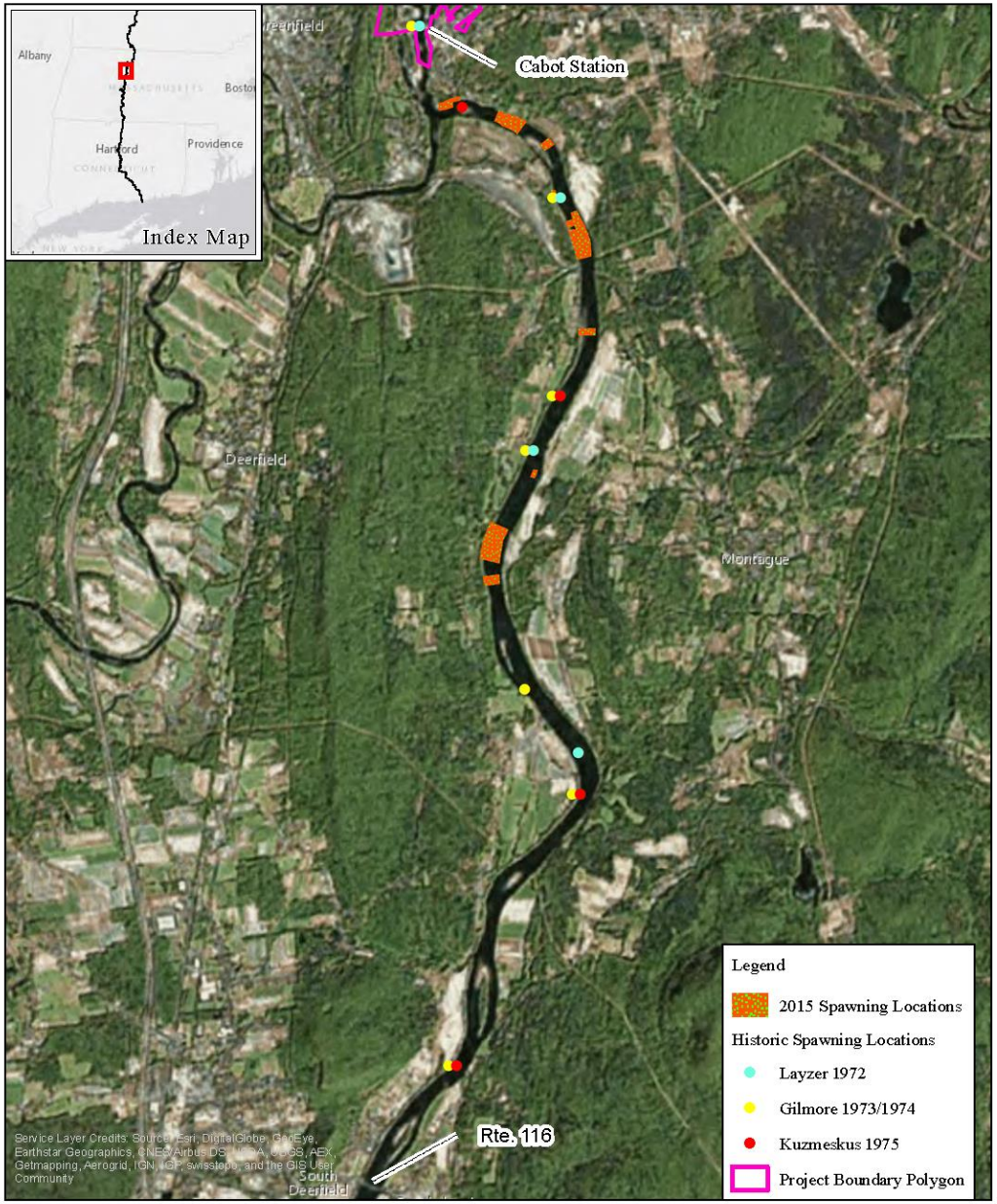
- Because minimal shad spawning activity was observed in the Turners Falls Canal, no spawning areas in the canal were identified for further examination.
- The largest concentration of spawning areas occurred between Cabot Station and the Rte 116 bridge.
- Spawning in the impoundment took place in the vicinity of Stebbins Island.

Variances (if any)

- Survey terminated on 6/24 (6/30 was the proposed end date) because spawning activity was not observed during the 6/24 survey.

Work Remaining

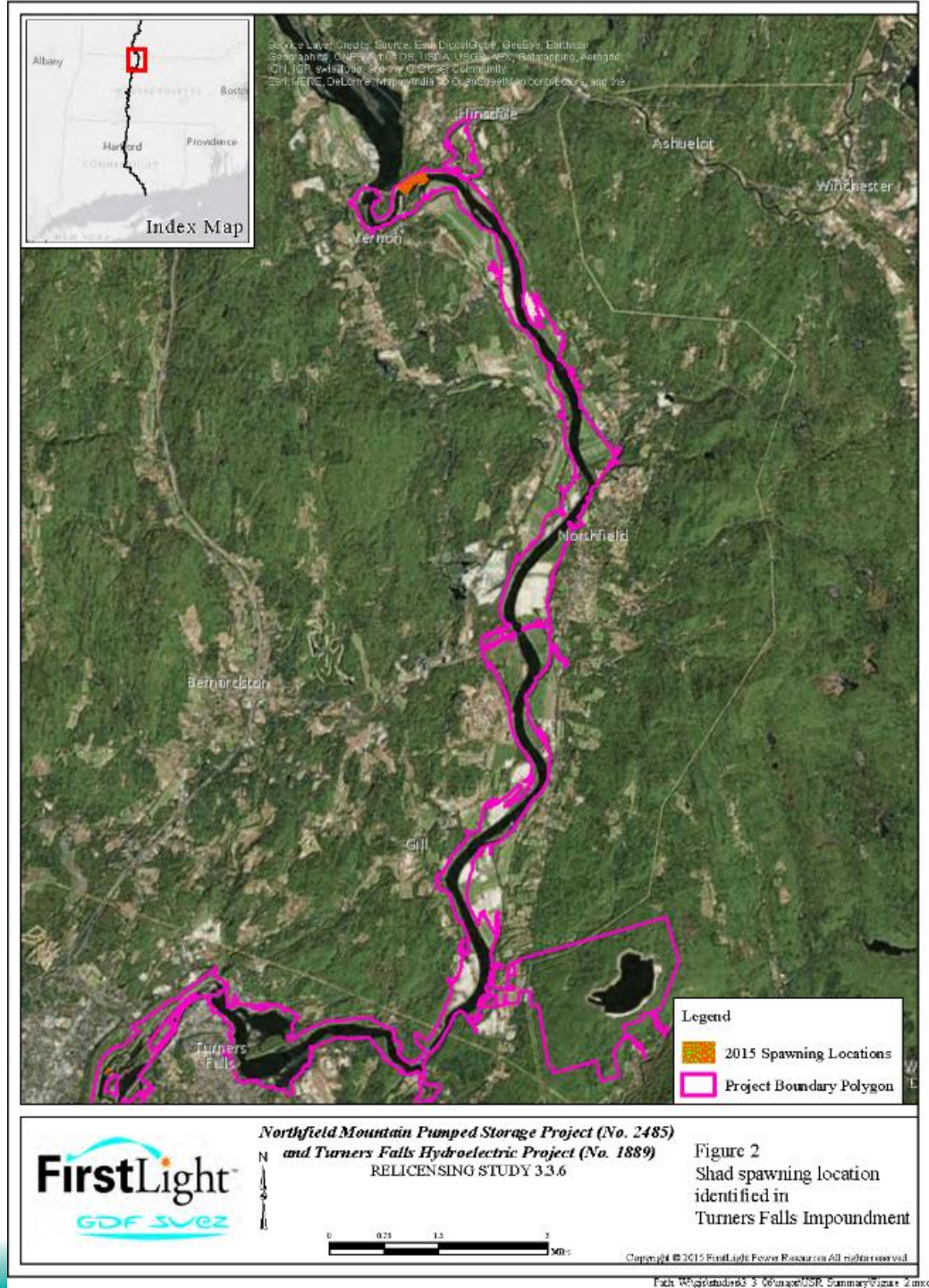
- Report to be completed by 3/1/2016.



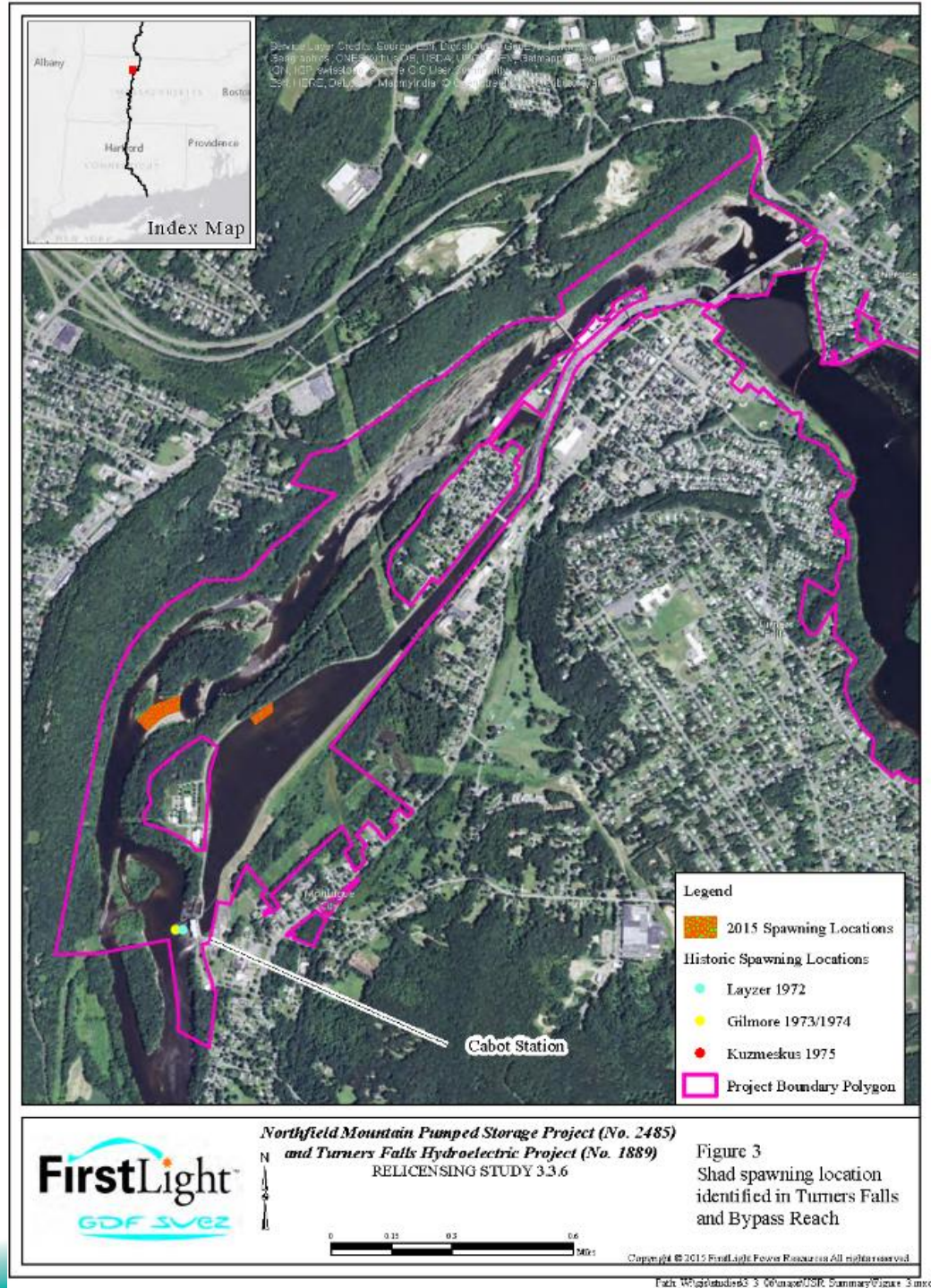
Northfield Mountain Pumped Storage Project (No. 2485) and Turners Falls Hydroelectric Project (No. 1889)
RELICENSING STUDY 3.3.6

Figure 1
Historic and 2015 shad spawning locations between Cabot Station and the Route 116 Bridge.

Shad spawning between Cabot & Rte 116 Bridge



Shad spawning in the Turners Falls Impound.



Shad Spawning in the Turners Falls Bypass Reach and Canal

3.3.17- Impacts of Turners Falls and Northfield Mountain Projects on Tributary and Backwater Area Access and Habitat

Study Progress

Task 1: Field Data Collection

- A review of aerial maps and photographs was conducted as an initial screening of potential survey locations.
- An assessment was then conducted by boat during high flow and low water level conditions in the spring to locate individual tributaries and backwater areas.
- Surveys were conducted on eight days between May 21 through June 11, 2014 (spring), on five days between August 5 through September 2, 2014 (summer), and on three days from October 13 through October 15, 2014 (fall).
- A total of 19 tributary confluences were surveyed.

Task 2: Evaluation of Fluctuation Range

- Surveyors visited tributaries in the summer and fall during seasonally lower flow and water level conditions to determine if stream flow intermittency occurred or access to the mouth of the tributaries was affected as a result of Project operations, resulting in restricting fish movement in the tributaries.

Task 3: Data Analysis and Reporting

- Report for Study 3.3.17 posted to the FL relicensing website on 6/30/2015.

Findings (if any)

- Backwatering within the highly dynamic tributary confluences was observed in most cases, particularly in the Turners Falls Impoundment during high WSELs and during the spring high flow season.
- Most tributaries were small with the exception of the Ashuelot, Millers, and Deerfield Rivers.
- The tributaries exhibited natural seasonal variability in discharge that affected the condition of the confluences with respect to connectivity and habitat. This variability and the resulting effects were most apparent in the small, low order tributaries.

3.3.17- Impacts of Turners Falls and Northfield Mountain Projects on Tributary and Backwater Area Access and Habitat

Variances (if any)

- Original intent was to delineate the perimeter of the inundated tributary confluence area with a sub-meter accuracy GPS. Field conditions precluded this approach due to mud deposits along the perimeter of the tributary confluence areas. Areal imagery also proved difficult due to dense canopy over the tributaries. In consultation with the study team, it was determined that LiDAR data, available from Vernon Dam down to Holyoke Dam, will be used in conjunction with field data to map the confluence perimeters.

Work Remaining

- None.

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

Study Progress

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

- An amended study plan was developed based on the consultation.
- Field work completed September 29 – October 2, 2014.

Task 2: Identify and Assess Potential Measures

- See Findings, below.

Task 3: Design Selected Measure

- See Findings, below.

Task 4: Report

- Report for Task 1 posted to relicensing website on 3/31/2015 and filed with FERC on 9/14/2015.

Findings (if any)

- Results of this study demonstrated little impact to organisms in the canal during the drawdown. To further enhance aquatic organism survival, FL has identified the following potential measures: draw the canal down at a rate similar to what occurred in 2014 to allow time for fish to exit the canal, and for mussels and sea lamprey ammocoetes to burrow into sediment; and establish travel zones for heavy machinery within the canal to minimize the area disturbed.

Variances (if any)

- None.

Work Remaining

- None.

3.3.19- Evaluate the Use of an Ultrasound Array to Facilitate Upstream Movement to Turners Falls Dam by Avoiding Cabot Station Tailrace (2016 Study)

Study Progress (2016 Study)

Task 1: Ultrasound Deployment

- Plans are in progress to establish a high frequency sound (ultrasound) array across the entire Cabot Station tailrace and determine the effect of the ensonified field on upstream migrating shad moving by Cabot Station by monitoring shad behavior.
- Two test treatments will be evaluated: array on and array off. A minimum of six replicates per treatment per flow condition will be targeted. The first “on” treatment will begin between 10am and noon and will last at least two hours and each “off” treatment will last at least three hours. Testing three days per week for at least two weeks is planned.

Task 2: Reporting

- Study not started until 2016.

Findings (if any)

- None.

Variances (if any)

- None

Work Remaining

- Conduct Study spring 2016
- Data Analysis
- Report to be completed by 3/1/2017.

3.3.7-Fish Entrainment and Turbine Passage Mortality Study

Study Progress

Task 1: Qualitative Assessment of Entrainment and Impingement

- A preliminary assessment of entrainment risk was performed for resident species documented in previous studies. Results from the Fish Assemblage Assessment (Study No. 3.3.11, conducted September 2015) is needed to complete the desktop analyses for resident species.

Task 2: Quantification of Shad and Eel Entrainment

- Not complete – need to complete juvenile shad (3.3.3) and adult eel (3.3.5) turbine mortality studies.

Task 3: Estimation of Turbine Mortality Rates

- Plan to test turbine mortality for juvenile shad and adult eels week of October 12 to 16, 2015.

Task 4: Report

- Not Complete.

Findings (if any)

- Data analysis has not yet begun and will commence upon completion of field data collection in the fall of 2015.

Variances (if any)

- None to date.

Work Remaining

- Results from the Fish Assemblage Assessment (Study No. 3.3.11, to be conducted in 2015) will be necessary to complete the desktop analyses for resident species.
- Entrainment and turbine mortality of juvenile and adult American shad and adult American eel will be estimated using hydroacoustic and radio telemetry data (Study Nos. 3.3.2, 3.3.3, and 3.3.5).
- Report to be completed by 10/1/2016.

3.3.20- Ichthyoplankton Entrainment Assessment at the NFM

Study Progress

Task 1: Entrainment Sampling

- Entrainment sampling to collect American shad eggs and larvae (ichthyoplankton) was accomplished by tapping off of existing piping that supplies cooling water from the Connecticut River to the station.
- PVC and rubber piping, a digital flow meter, a 1,000-liter plastic tank, and a 0.333 mm mesh plankton net were utilized to construct the sampling system.
- 100-200 cubic meters of intake water at a rate of 3 and 3 ½ gallons per second was filtered for each sample.
- At least once per week samples were collected every 2 hours during a pumping cycle.
- Sample collection was initiated at least 30 minutes after the pumping cycle began to ensure the water was well mixed.
- Weekly samples were designated as ***random*** because the number of pumps operated was not controlled.
- Pumpback operations were manipulated to specifically sample operations with 1 2, 3, and 4 pumps running (***Scenario*** samples). Scenario samples were intended to coincide with peak shad spawning:

Scenario 1: 1 pump operational (Unit 2)
Scenario 2: 2 pumps operational (Unit 2 and one

Scenario 3: 3 pumps operational (Unit 2 and two

Scenario 4: All 4 pumps operational

3.3.20- Ichthyoplankton Entrainment Assessment at the NFM

Sample Number	Rep	Date	Regime	Number of Pumps
1	1	5/28/2015	Random	3
2	2	5/28/2015	Random	3
3	1	6/5/2015	Random	3
4	2	6/5/2015	Random	3
5	1	6/9/2015	Scenario	4
6	2	6/9/2015	Scenario	4
7	1	6/10/2015	Scenario	3
8	2	6/10/2015	Scenario	3
9	1	6/11/2015	Random	1-3
10	2	6/11/2015	Random	3
11	1	6/15/2015	Random	1-3
12	2	6/15/2015	Random	1-4
13	1	6/18/2015	Scenario	2
14	2	6/18/2015	Scenario	2
15	1	6/19/2015	Scenario	1
16	2	6/19/2015	Scenario	1
17	1	6/26/2015	Random	1-3
18	2	6/26/2015	Random	3
19	1	7/1/2015	Random	1-2
20	2	7/1/2015	Random	3
21	1	7/8/2015	Random	4
22	2	7/8/2015	Random	4
23	1	7/17/2015	Random	1

3.3.20- Ichthyoplankton Entrainment Assessment at the NFM

Task 2: Sample Processing

- Samples are currently being sorted by staff biologists with the aid of a dissecting microscope.
- American shad larvae and eggs will be removed from the samples, identified to the lowest practical taxonomic category, and enumerated.
- A quality control program designed to ensure that the Average Outgoing Quality Limit for sorting and identification is greater than 90% will be followed.

Task 3: Ichthyoplankton Data Analysis Methods

Entrainment Estimates

Entrainment estimates for American shad eggs and larvae will be derived based on the extrapolation of raw counts using a volumetric ratio and summing of weekly estimates derived from samples. The daily water volume pumped will be calculated based on daily average flow rates obtained from Northfield Mountain Project personnel. An estimate for each day not sampled will be calculated by multiplying the average entrainment density for a weekly time period by the total number of days sampled in that week by the volume of water used on each day not sampled.

Equivalent Adult Estimates

The numbers of entrained fish larvae and eggs will be converted into adult equivalents to determine population impact.

Adult equivalent losses (AELs) are estimates of the number of entrained organisms removed from the population that

otherwise would have survived to some future age, or age of equivalence.

3.3.20- Ichthyoplankton Entrainment Assessment at the NFM

Task 4: Report
- Not complete.

Findings (if any)
- Not complete.

Variances (if any)
- None to date.

Work Remaining
- Finish sample sorting.
- Data entry and analysis.
- Final Report.
- Report to be completed by 3/1/2016.

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

Study Progress

Task 1 – Analysis of Existing Data

- Analysis provided in ISR. Questions raised at ISR meeting were addressed in the ISR meeting summary-- data presented as cfs (vs no. of gates opened) and whether the gates were opened for emergency or non-emergency reasons.
- On 3/18/2015, FL provided stakeholders with a memo containing additional analysis. On 3/24/2015, FL held a meeting to discuss the additional data analysis.

Task 2: Scenario Development

- Contingent on whether additional field study is required.

Task 3: Field Verification of Conditions

- FL proposes to use the two-dimensional hydraulic model that is being developed as part of Study No. 3.3.1 (Instream Flow Study) for Reach 3 to assess the potential for sediment impacts (scour and deposition) to sturgeon spawning areas in the river reach just downstream of Cabot Station.

Task 4: Data Analysis and Reporting

- FL will conduct the remaining data analysis once the River 2D model is completed for the instream flow study as described in Study No. 3.3.1.

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

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

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

Findings

- Spill gate operation was documented in the Initial Study Report.

Variances

- FL is proposing to utilize 2D modeling to assess potential impacts, in lieu of field data collection.

Work Remaining

- Apply River2D model.
- Assess results.
- Complete report by 3/1/2016.

3.2.1-Water Quality Monitoring Study

Study Progress

Task 1: Develop Sampling Plan

- Field Sampling Plan filed with ISR.

Task 2: Dissolved Oxygen (DO) and Temperature Monitoring

- 18 Monitoring Sites
- Temperature: April through mid-November
- Dissolved Oxygen: June through September
- Biweekly site visits to download data and calibrate meters.

Task 3: DO and Temperature Profiles

- Three profile sites in the Turners Falls Impoundment
- Biweekly vertical profiles
- April through mid-November

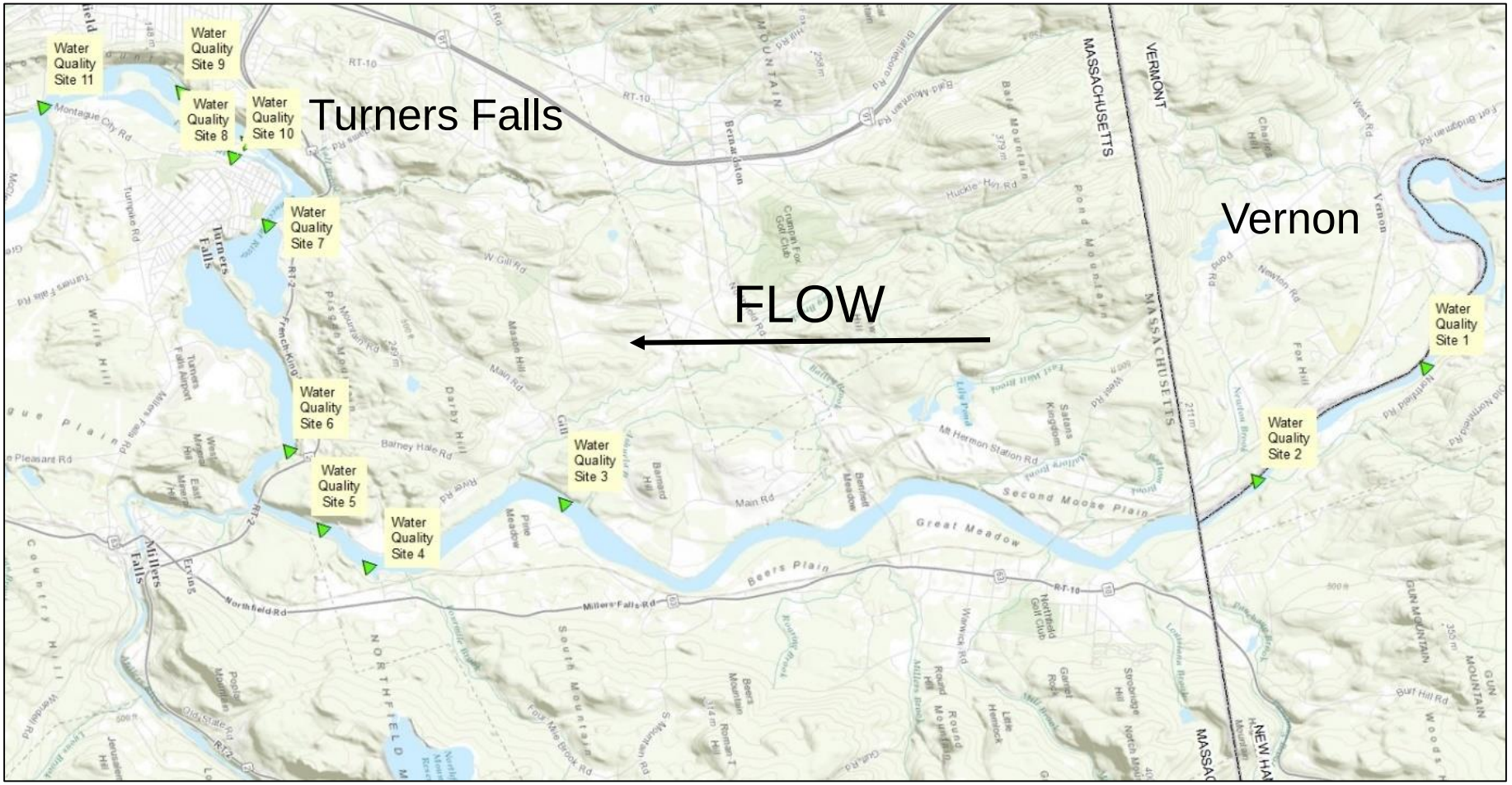
Task 4: Report

- Not complete.

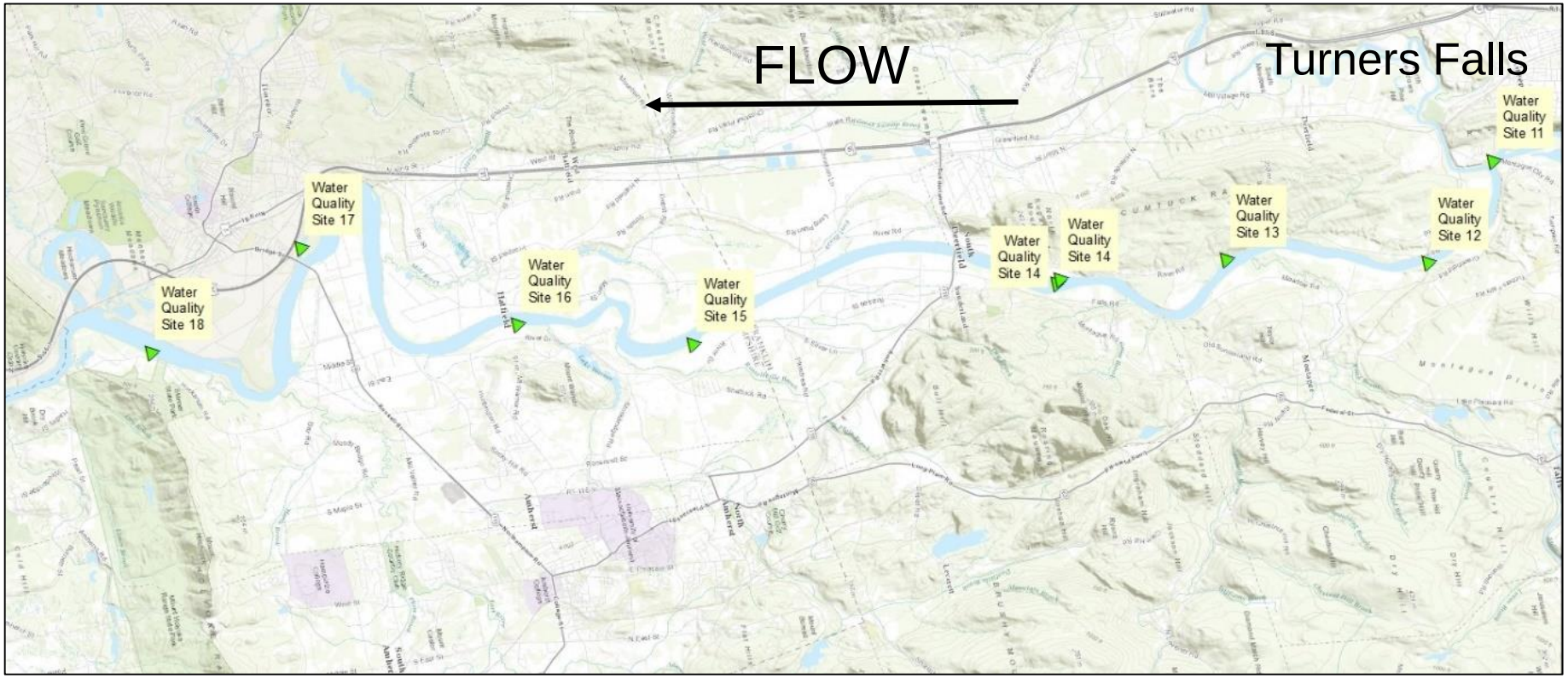
Variances

- Temperature loggers installed April 3-10, due to ice cover.
- Station 7 at boat barrier installed in May 14 due to ice cover and high flows.
- Station 10 and Station 12 location.

3.2.1-Water Quality Monitoring Study



3.2.1-Water Quality Monitoring Study



3.2.1-Water Quality Monitoring Study

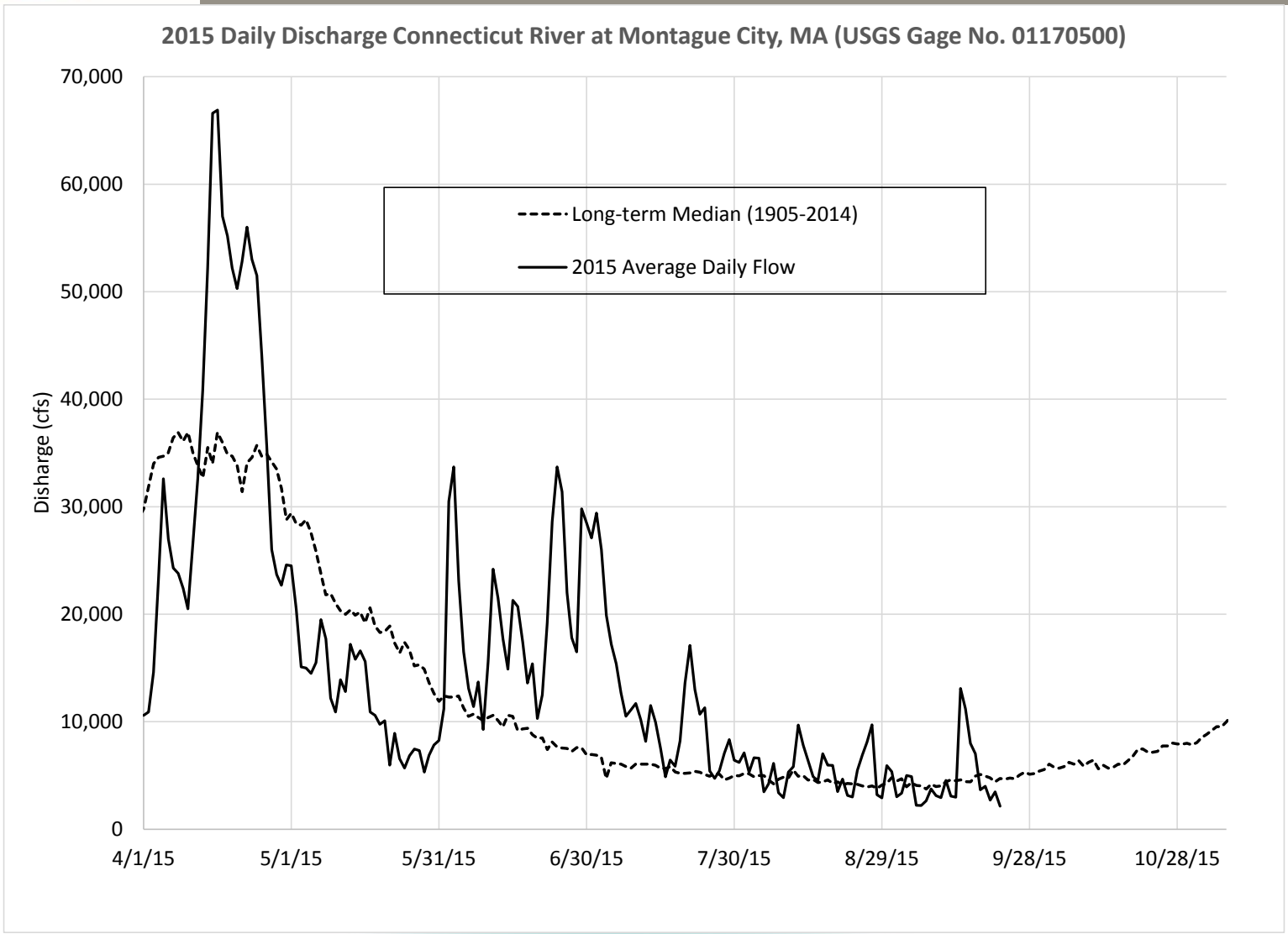
Findings

- Turners Falls Impoundment does not stratify.
- DO levels high.
- Water temperature results similar from site to site.
- Operational effects not evaluated at this time.

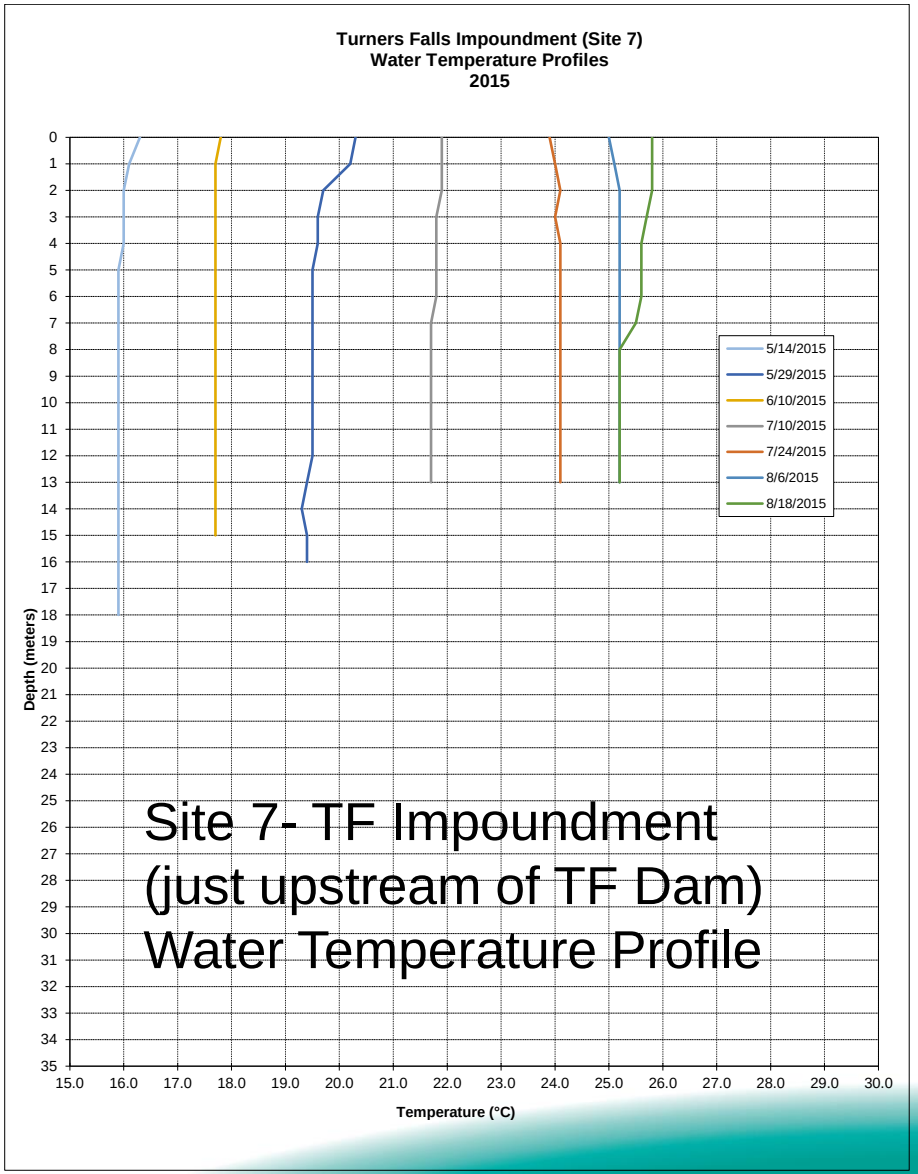
Work Remaining

- DO data collected through 9/30/2015.
- Water temperature data collected through mid-November.
- Data analysis and report to be completed by 3/1/2016.

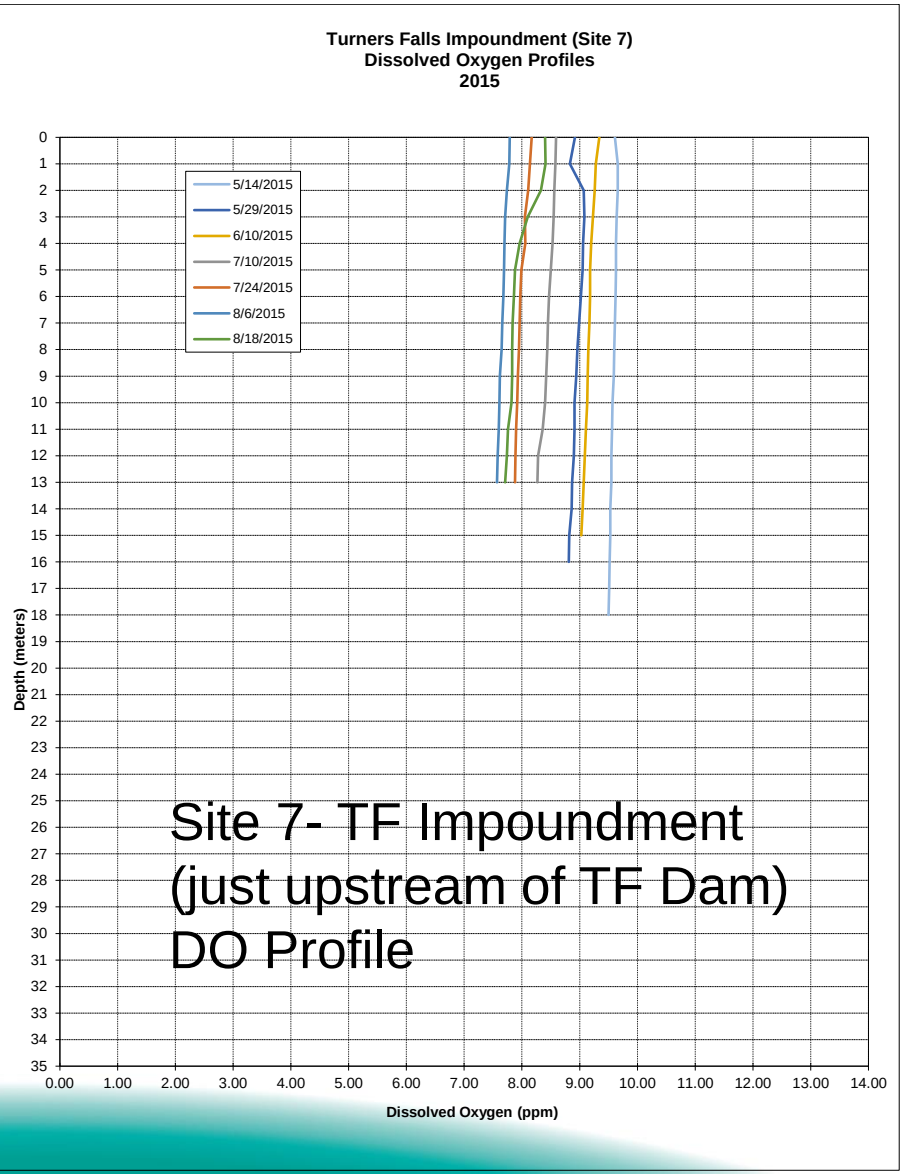
3.2.1-Water Quality Monitoring Study



3.2.1-Water Quality Monitoring Study



Site 7- TF Impoundment (just upstream of TF Dam) Water Temperature Profile



Site 7- TF Impoundment (just upstream of TF Dam) DO Profile

3.3.10-Assess Operational Impacts on Emergence of State-Listed Odonates in the Connecticut River

Study Progress

Task 1: Review of Existing Information

- Some existing information reviewed to provide context for Phase 1 results and to help plan for Phase 2 fieldwork
- A more comprehensive review and synthesis will be provided in the final report.

Task 2: Finalize Study Plan and Attain Collection Permit

- Meeting held with NHESP and USFWS on April 28, 2015 after Task 3 was completed.
- Concurrence on methods and site selection was reached at the meeting.
- Field sampling plan provided with USR.

Task 3: Qualitative Surveys for Larvae and Exuviae to Determine Species Preference

- Field work was completed at 8 sites in May and June 2014.
- Phase 1 report summarizing Task 3 was included on FL's website in April 2015 and filed with USR.

Task 4: Quantitative Surveys of Emergency/Eclosure Behavior

- FL conducted quantitative surveys at five sites in the Connecticut River.
  1. Barton Cove (Gill)
  2. Rock Dam in the bypass reach (Montague)
  3. Area from bike path bridge to Montague City Road, opposite the Deerfield River confluence (Montague)
  4. DFW conservation lands on the eastern shore upstream from the Sawmill River confluence (Montague)
  5. Eastern shore near the Route 116 Bridge (Sunderland)
- Six transects at each site.
- Late May – Early September, biweekly

3.3.10-Assess Operational Impacts on Emergence of State-Listed Odonates in the Connecticut River

Study Progress

Task 5: Water Fluctuations and Assessment

- Temporary loggers installed at most locations. Permanent gages (TF Dam and USGS gage) will also be used.
- Assessment not complete

Task 6: Report

- Not complete

Findings

- Qualitative surveys documented species assemblage, habitat and emergence and eclosure patterns.
- Quantitative surveys: For each exuvia and teneral, the vertical height above the water's surface, the horizontal distance from the water's edge, and its eclosure structure/substrate was recorded. Each exuvia and some tenerals were collected, labeled with site information and date, and preserved for later species identification.

Variances

- Included one additional qualitative survey site near the Route 116 Bridge to compare species composition here to areas farther upstream.
- Addition of approximately 7 days of fieldwork to collect additional information on emergence behavior in an attempt to increase sample sizes (especially for rare species).

Work Remaining

- Synthesis of existing information, identification of samples, data entry and analysis, the water fluctuation impact assessment, and preparation of the quantitative survey report (to be completed by 3/1/2016)

3.3.16-Habitat Assessment, Surveys, and Modeling of Suitable Habitat for State-listed Mussel Species in CT River below Cabot Station

Study Progress

Task 1: Finalize Study Plan

Task 2: Mussel Survey and Habitat Assessment

- Task 1 and 2 are complete. In June 2014, a habitat assessment was completed throughout the 13-mile reach of the Connecticut River between Cabot Station and the Sunderland Bridge. A summary report of these findings was posted to the relicensing website in January 2015.

Task 3: Develop Binary HSI Curves for State-Listed Mussel Species documented in the Project Area

- Delphi panel established
- The three target species include Yellow Lampmussel (*Lampsilis cariosa*), Tidewater Mucket (*Leptodea ochracea*), and Eastern Pondmussel (*Ligumia nasuta*). All found in "Reach 5."

Task 4: Effects of Flow Regime on State-Listed Mussels

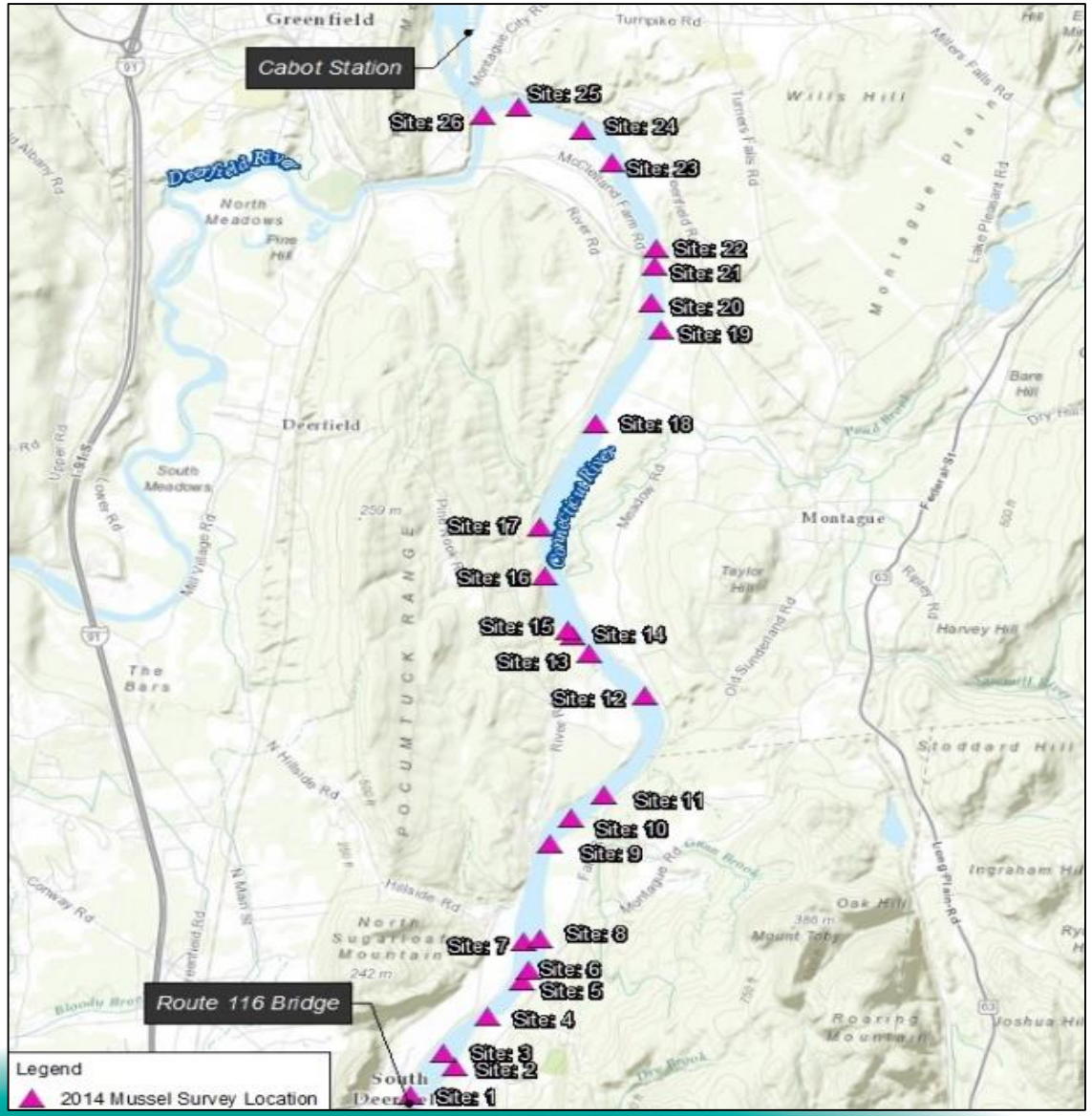
- This task will occur once the HSI criteria are complete.

Task 5: Report

- To be completed by 3/1/2016.

3.3.16-Habitat Assessment, Surveys, and Modeling of Suitable Habitat for State-listed Mussel Species in CT River below Cabot Station

2014 Mussel Survey Sites



3.3.16-Habitat Assessment, Surveys, and Modeling of Suitable Habitat for State-listed Mussel Species in CT River below Cabot Station

Findings

- Summary of mussel community and habitat provided.
- The mussel community in the reach from Cabot Station to the Route 116 Bridge is dominated by Eastern Elliptio.
- No live state-listed mussels were found in the survey areas. One relic *Lampsilis cariosa* shell was found.

Variances (if any)

- Schedule.

Work Remaining

- Development of HSI criteria.
- HSI criteria will be used in the habitat modeling in the IFIM study (Study No. 3.3.1) to model the potential effects of flow regime on state-listed mussels.
- Completion of final report by 3/1/2016.

Terrestrial and Wildlife Resources

3.4.1-Baseline Study of Terrestrial Wildlife and Botanical Resources

Study Progress

Task 1. Literature Review
- Prior to field work in 2014, the literature review was completed.

Task 2: Field Surveys
- Surveys were completed from May-Sep 2014
  - Wildlife & Habitat Type Mapping
  - Botanical Surveys
  - Invasive Plant Surveys
  - NHESP vegetation plots/transects will be completed in early fall 2015

Task 3: Data Analysis and Reporting
- Plant and wildlife lists have been completed
- Mapping of invasive species has been completed

Findings (if any)
- Invasive species not widespread, but do occur along the Turners Falls Impoundment. Common species that occur are Purple loosestrife, Oriental bittersweet, Japanese knotweed, and yellow iris.

Variances (if any)
- NHESP forms will be completed in early fall 2015.

Work Remaining
- Update vegetation type mapping with results from NHESP sample transects.
- Report to be completed following completion of NHESP sample transects (by 12/31/2015).

3.4.2-Effects of Northfield Mountain Project-related Land Management Practices and Recreation Use on Terrestrial Habitats

Study Progress

Task 1. Literature Review

Task 2: Wildlife and Habitat Type Mapping

Task 3: Vegetation Cover Type Mapping

Task 4: Invasive Plant Survey

Task 5: Land Management Practices and Recreation Use

- Completed in 2014

Task 6: Data Analysis and Reporting

- Completed and filed 9/14/2015.

Findings (if any)

- 35 mammal species, 23 amphibian or reptile species, and 59 species of birds.
- 13 woodland vernal pools identified.
- 179 plant species occurring in 6 NHESP Communities (as well as a ROW community and areas of development).

Variances (if any)

- None.

Work Remaining

- None.

Pool ID	Egg Masses		Pool Dimensions (Feet)	Water Depth (Feet)	Comments
	Spotted Salamander	Wood Frog			
VP-2	0	0	200x50	3.0	Spotted salamander (Ambystoma maculatum) spermatophores man-made rock-quarry
VP-3	>66	40	45x72	1.5	
VP-4	25	0	120x30	2.0	
VP-5	50	25	100x40	1.0	
VP-6	32	0	100x45	1.0	
VP-7	25	0	125x75	2.0	
VP-8	18	6	75x40	2.0	
VP-9	12	2	20x20	2.0	
VP-10	12	0	-	3.0	
VP-11	52	18	45x25	2.0	
VP-12	15	>30	-	-	red spotted newts (Notophthalmus viridescens) feeding on egg masses
VP-13	25	>500	250x50	4.0	red spotted newts (Notophthalmus viridescens) feeding on egg masses
VP-14	5	6	120x45	2	

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

Study Progress

Task 1. Literature Review

- Completed in 2014.

Task 2: Riparian and Littoral Zone Botanical Survey

- Littoral zone and SAV mapping completed in 2014.

Task 3: Sensitive Plant Survey

- 10 Target Species as identified by NHESP, Surveys completed in the Impoundment and from the Turners Falls Dam downstream to the Route 116 Bridge in Sunderland, MA.
- Field survey efforts assisted by Steven Johnson PhD. – NHESP approved botanist.
- Initial Recon completed in June 2014.
- A survey to gather presence/ absence data on state-listed plants at identified potential habitat and historic EO was conducted over the weeks of August 18 – October 10 2014.
- During the presence / absence survey, botanists will selected preliminary transects which will later be used to collect additional fine scale data and complete biological evaluations on representative populations.
- Fine scale data collections was completed in August of 2015.

Task 4: Invasive Plant Survey

- Completed in 2014, with supplemental data collection occurring in 2015.

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

Study Progress

Task 5: Mapping Wetlands and Waters of the United States
- Completed in 2014.

Task 6: Project Water Level Fluctuation Assessment
- Data collected during this study, along with the results of hydraulic modeling (Study 3.2.2), are being used to evaluate the effect of Project-related water level fluctuations on known populations of Puritan and cobblestone tiger beetles habitat. Fine scale data collected at each of 15 sensitive plant transects as well as transects surveyed in 2014 within tiger beetle habitat (Rainbow beach and North Bank) are being used along with the results of Study 3.2.2 to analyze the potential impacts.

Task 7: Data Analysis
- Currently underway.

Task 8: Reporting
- Currently underway.

Findings (if any)
- Data analysis and reporting is in development.

Variances (if any)
- Fine scale data collection at each of 15 survey transects was completed in August of 2015. Surveys could not be completed in 2014, as the growing season ended prior to the planned survey.

Work Remaining
- Report to be completed by 12/31/2015.

Hydraulic Modeling

3.2.2-Hydraulic Study of Turners Falls Impoundment, Bypass Reach and below Cabot Station

Study Progress

Task 1: Update Turners Falls Impoundment HEC-RAS Model

Task 2: Installation of Water Level Recorders in Turners Falls Impoundment for Model Verification

Task 3: Model Verification and Calibration

Task 4: Unsteady Flow Model

Task 5: Contact FEMA and Obtain FIS Hydraulic Model

Task 6: Development of HEC-RAS Model and Model Calibration

Task 7: Unsteady Flow Model

Task 8: Report

- All of the above tasks are complete. Report posted to relicensing website on 6/30/2015 and filed with FERC on 9/14/2015.

Findings (if any)

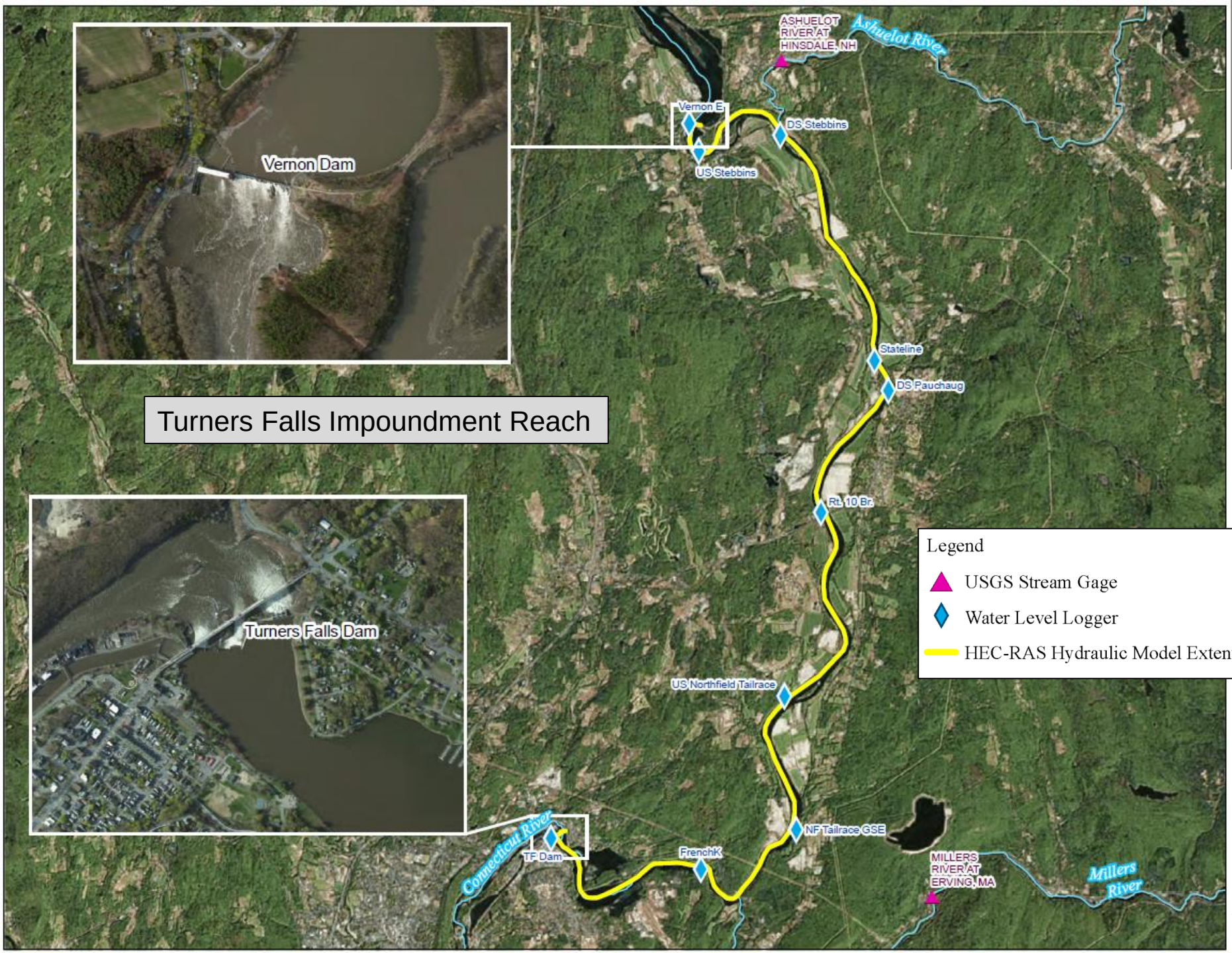
- See next pages.

Variances (if any)

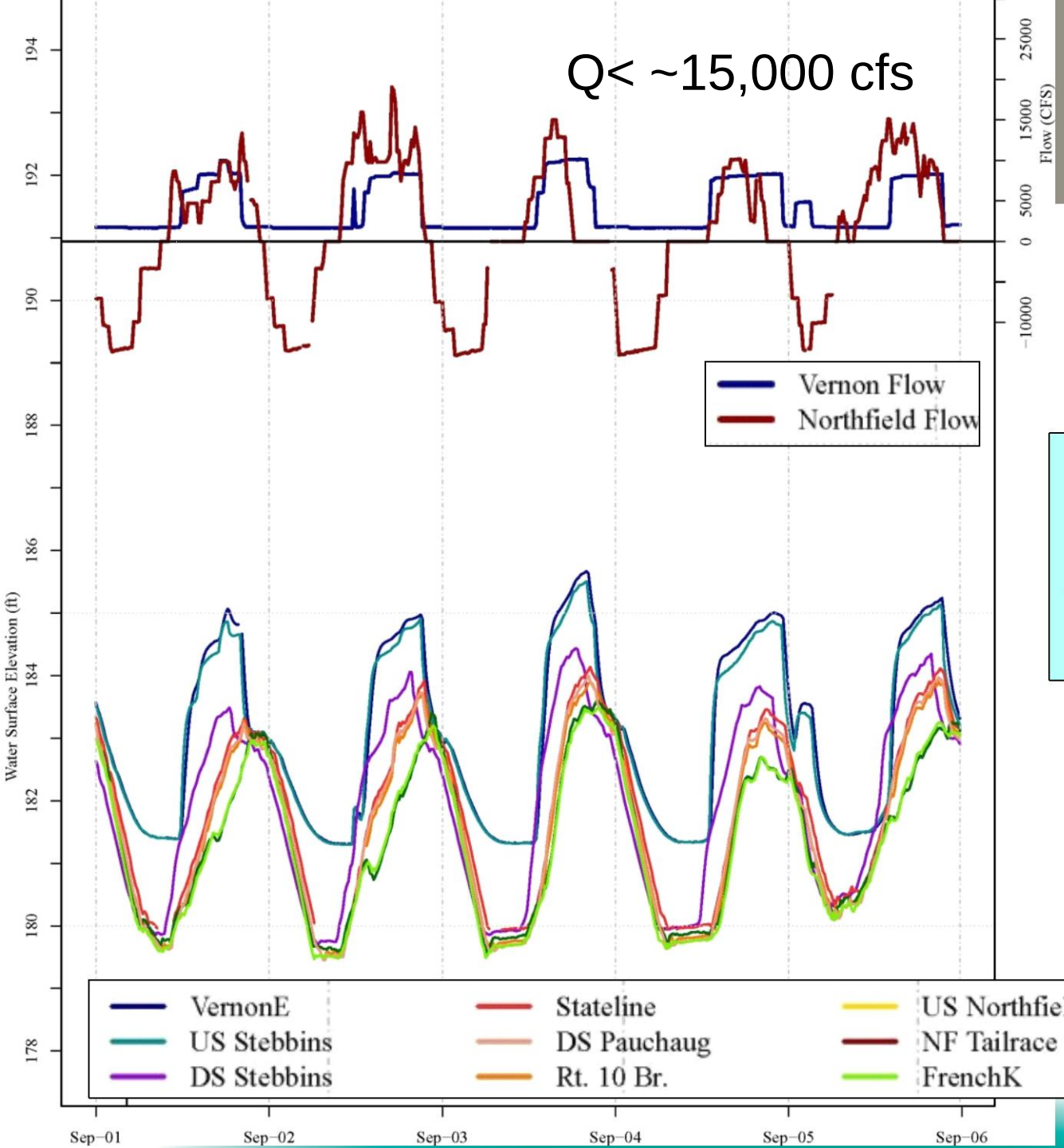
- Water level loggers were to be installed in April 2014, the logger at the French King gorge was not installed until the end of April due safety concerns. FERC's SPDL requested FL install an additional water level logger at Transect 70000. Due to vandalism concerns in this area the logger was relocated downstream to transect 69500.
- Hydraulic model – TF Dam to Holyoke Dam; modified to be Montague USGS Gage to Holyoke Dam.

Work Remaining

- None.

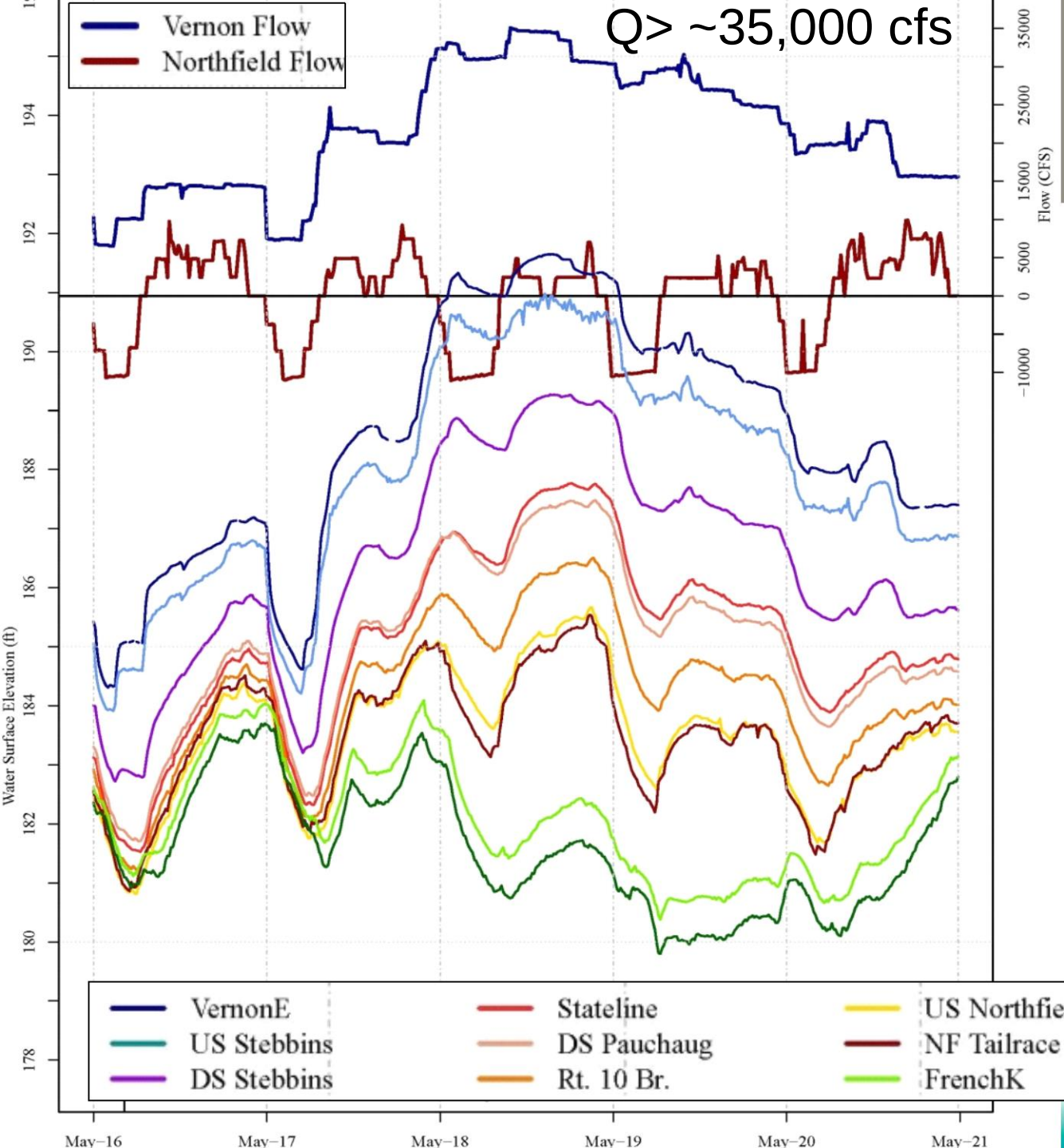

Vernon Dam
Turners Falls Impoundment Reach
Turners Falls Dam
ASHUELOT RIVER AT HINSDALE, NH
Ashuelot River
Vernon E
DS Stebbins
US Stebbins
Stateline
DS Pauchaug
Rt. 10 Br.
US Northfield Tailrace
NF Tailrace GSE
FrenchK
TF Dam
Connecticut River
MILLERS RIVER AT ERVING, MA
Millers River
Legend
USGS Stream Gage
Water Level Logger
HEC-RAS Hydraulic Model Extent

Project Operations Data, Flow Data, and WSEL plots

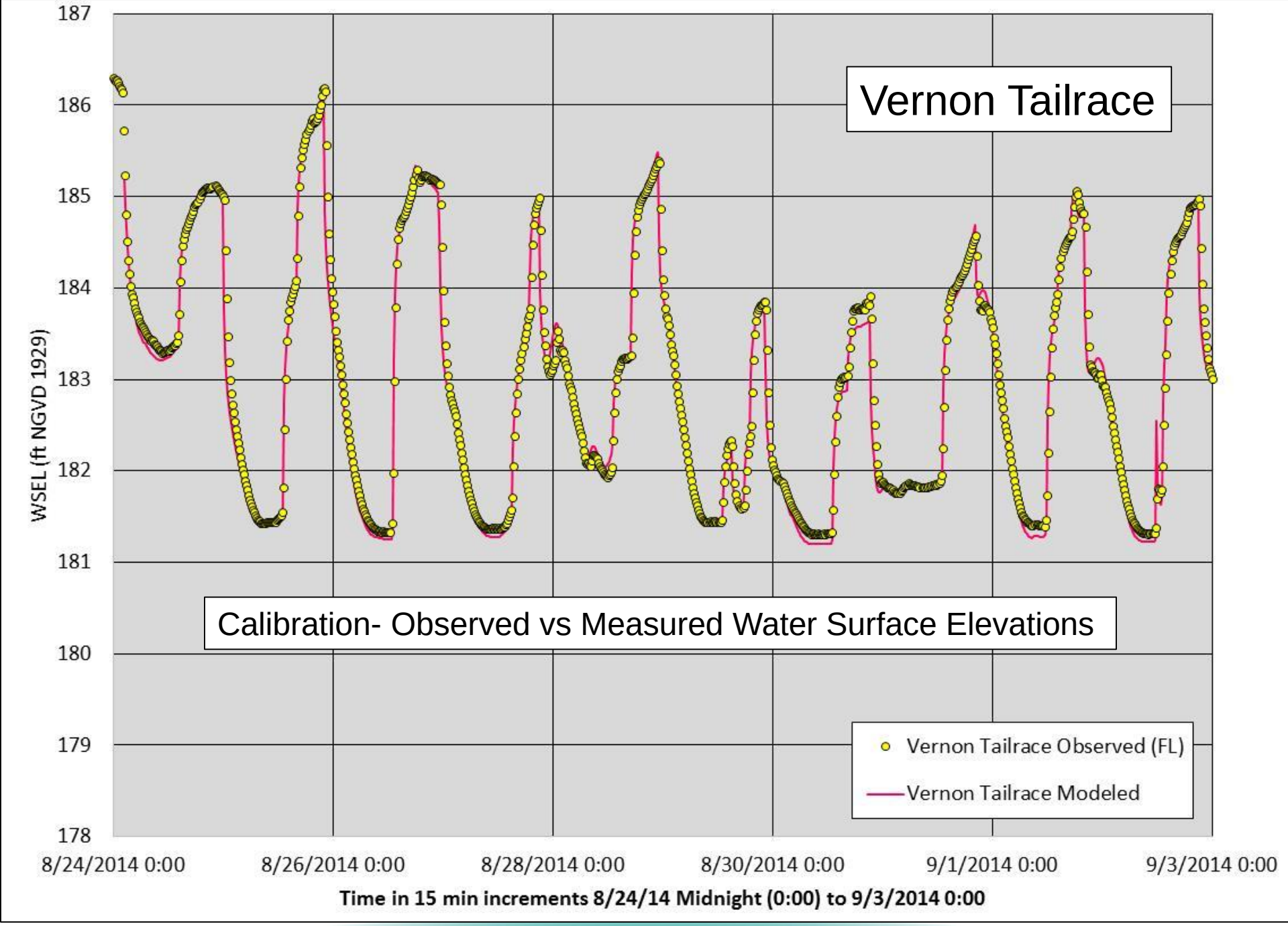


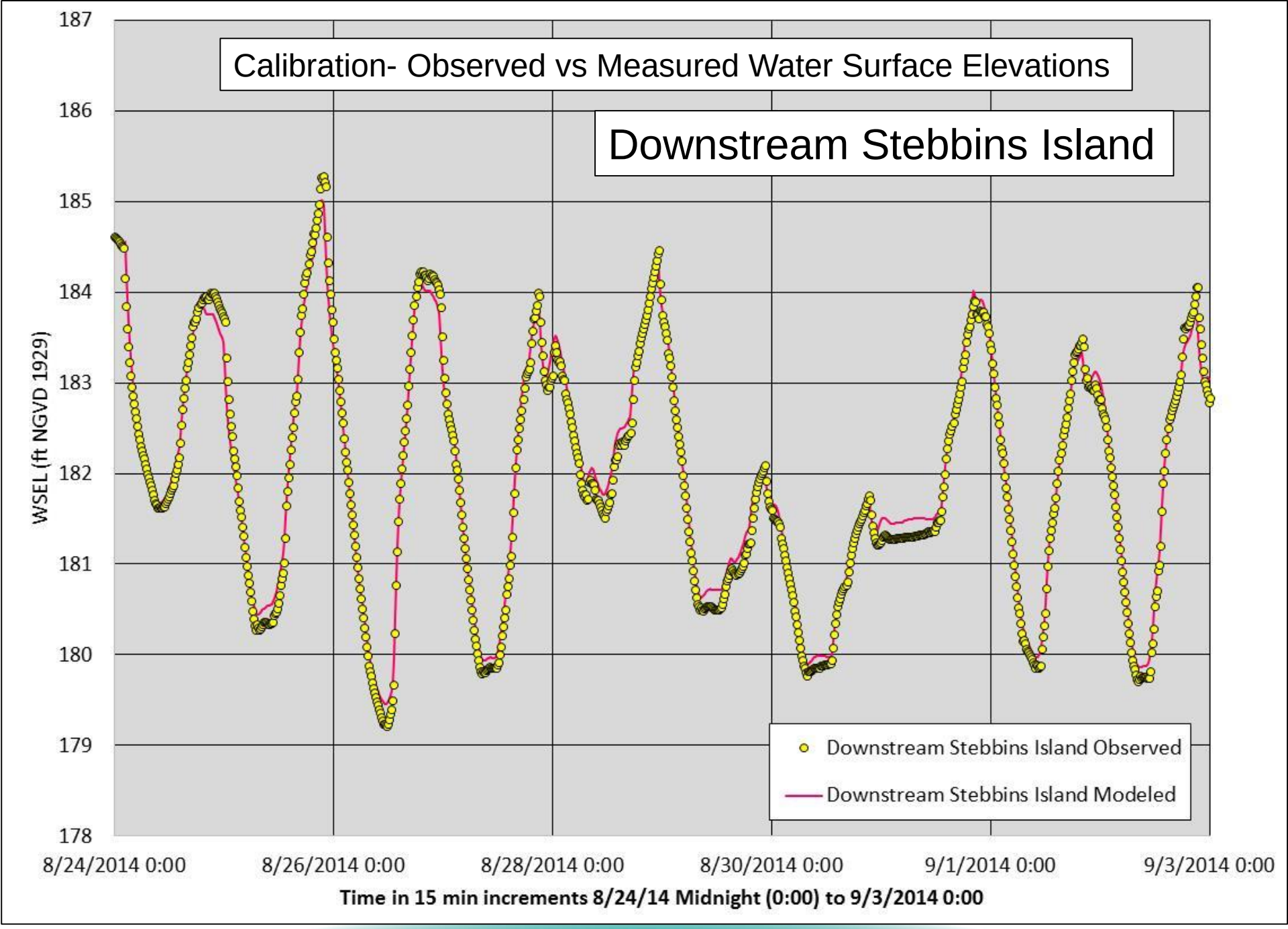
Example Low Flow Event- Plots developed For Entire Period Water Level Loggers Operated

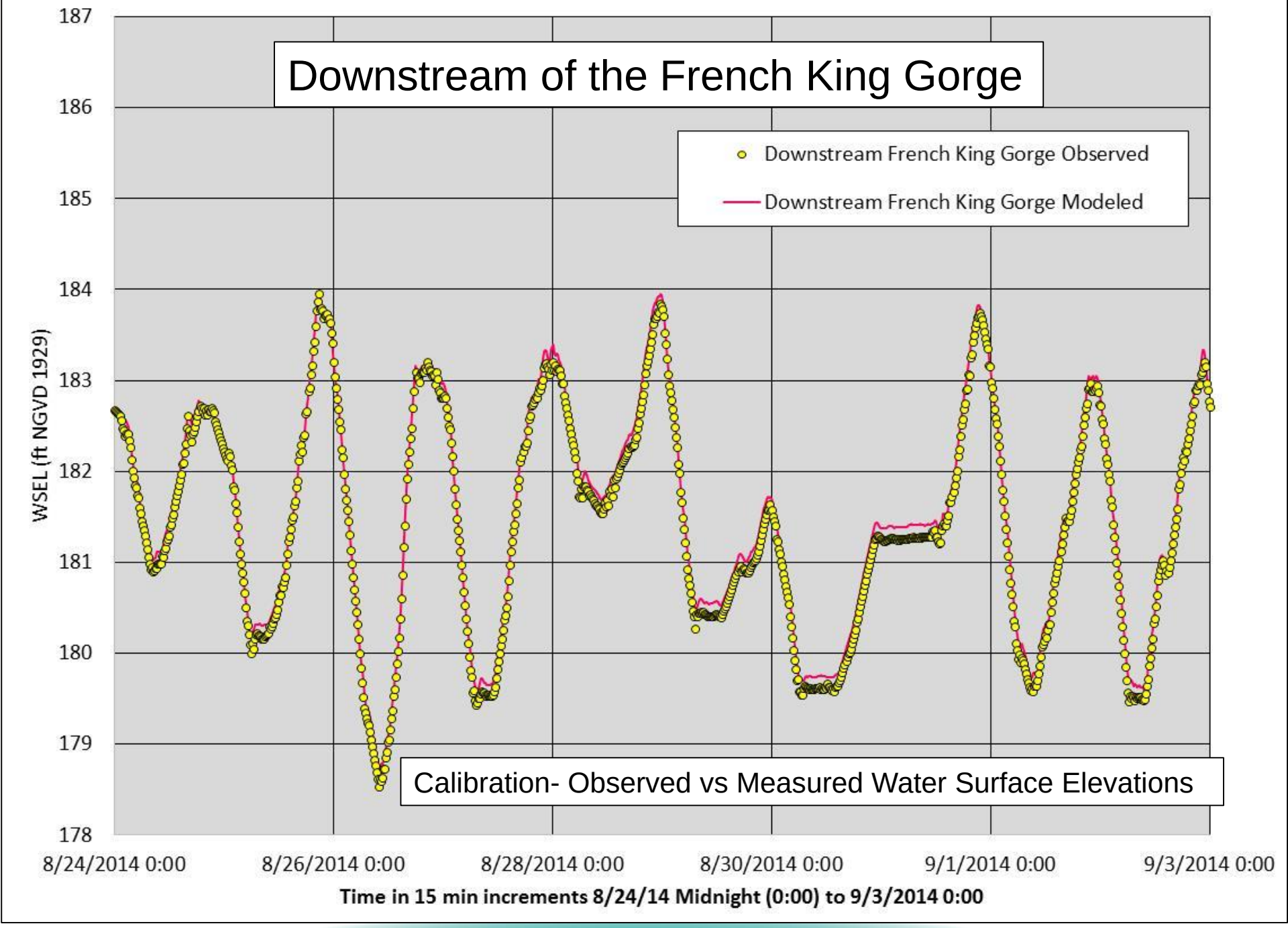
Project Operations Data, Flow Data, and WSEL plots

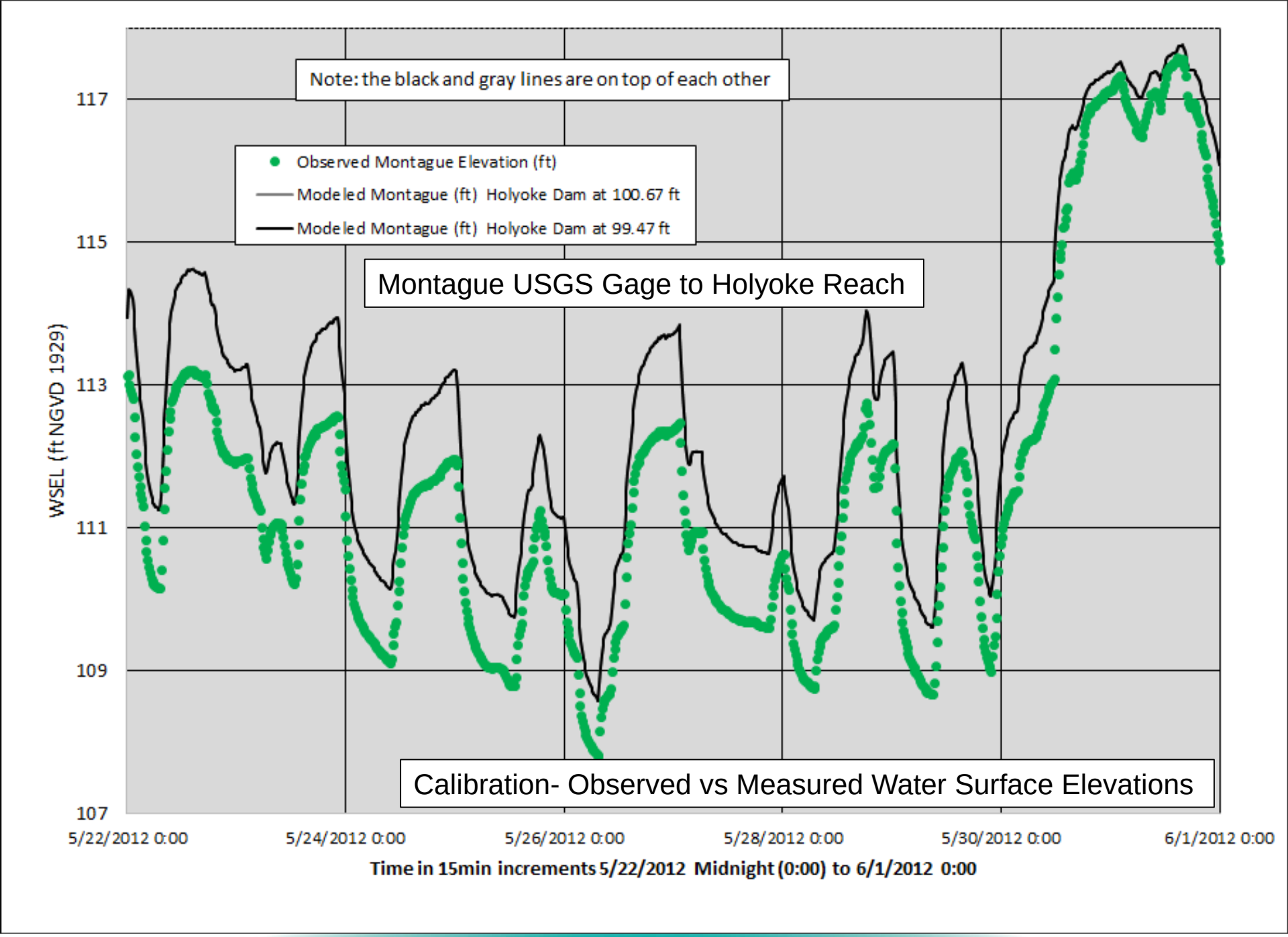


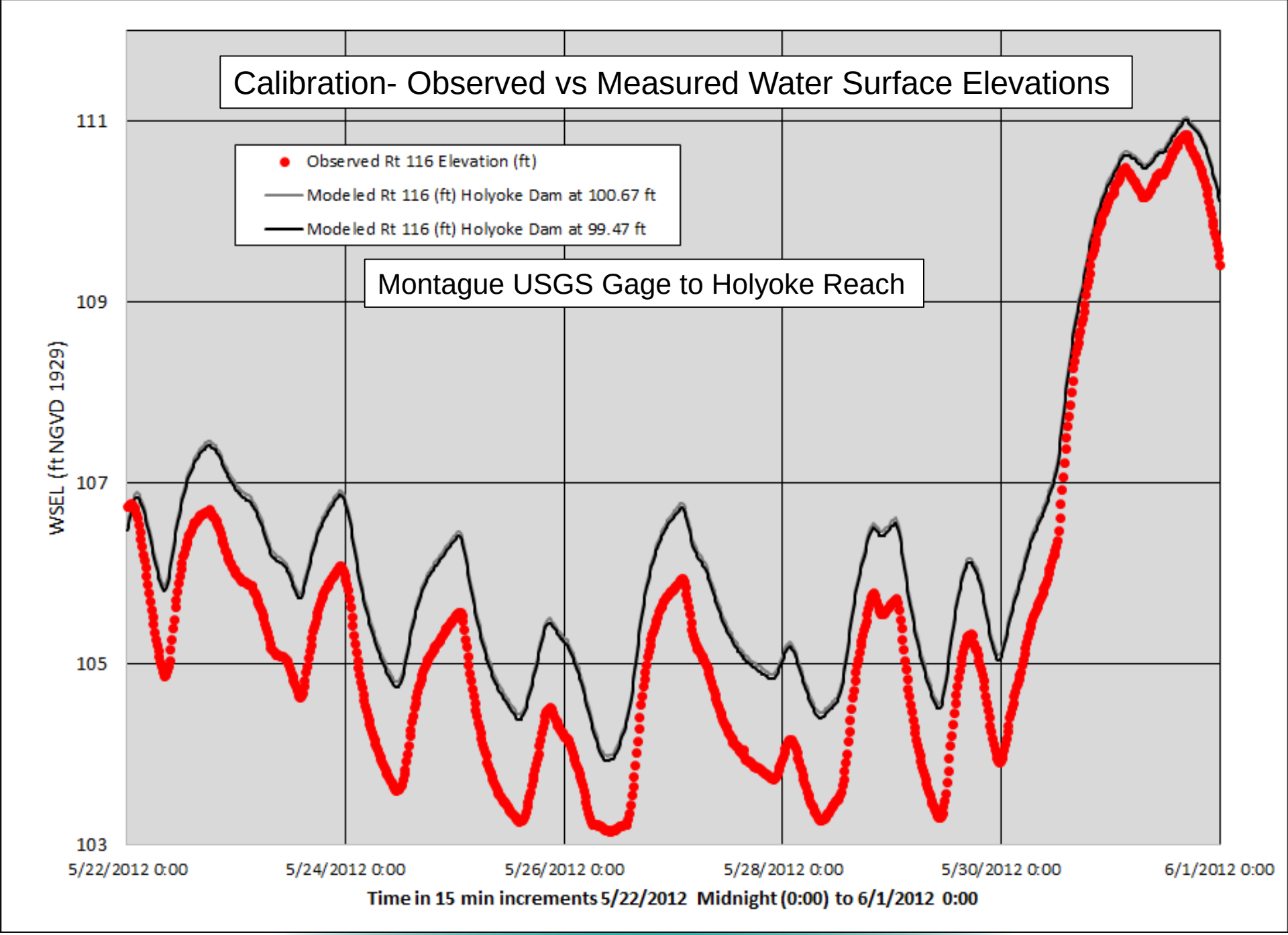
Example High Flow Event- see influence of French King Gorge

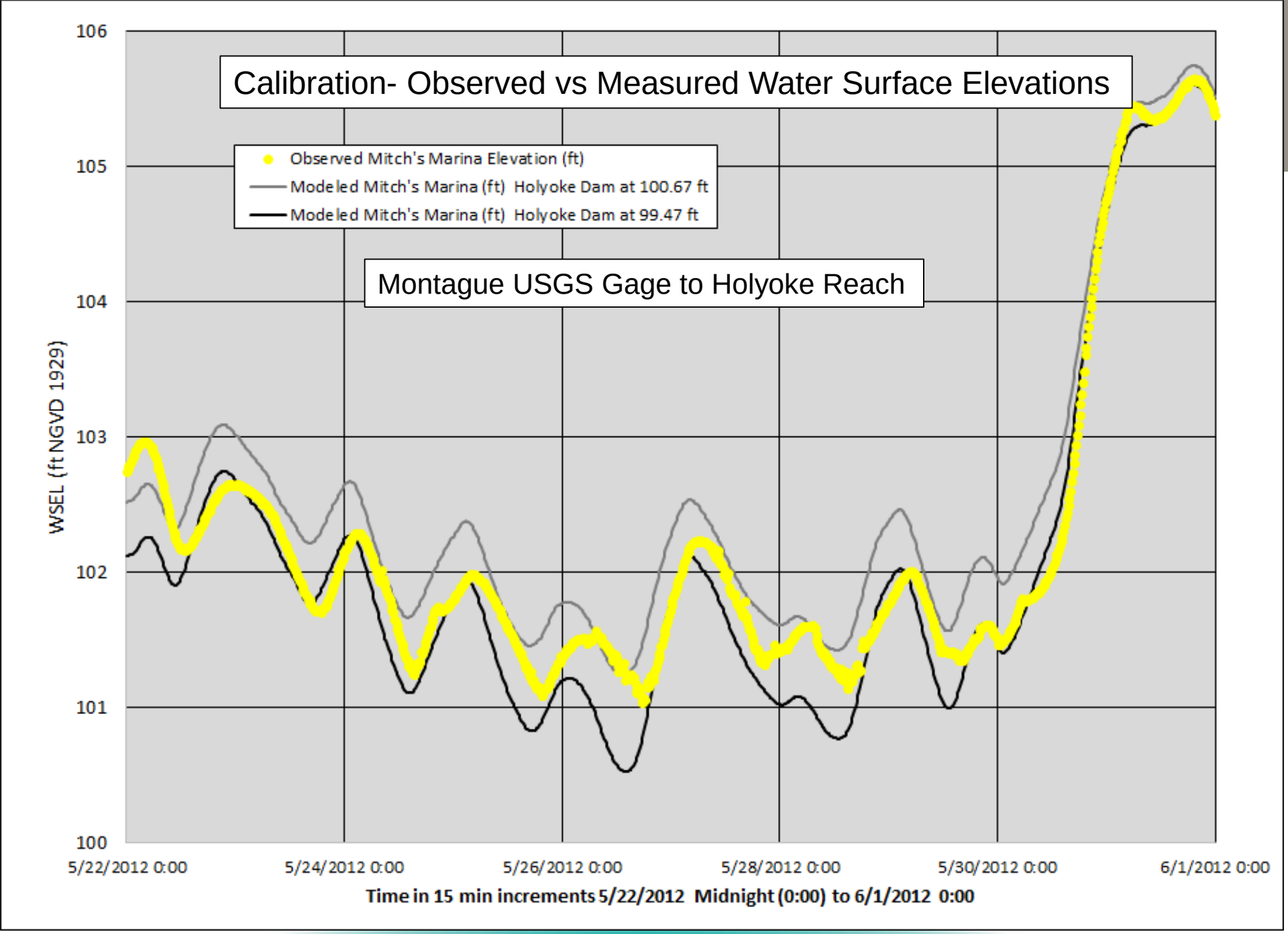

Vernon Tailrace
Calibration- Observed vs Measured Water Surface Elevations
WSEL (ft NGVD 1929)
187
186
185
184
183
182
181
180
179
178
8/24/2014 0:00
8/26/2014 0:00
8/28/2014 0:00
8/30/2014 0:00
9/1/2014 0:00
9/3/2014 0:00
Time in 15 min increments 8/24/14 Midnight (0:00) to 9/3/2014 0:00
Vernon Tailrace Observed (FL)
Vernon Tailrace Modeled


Calibration- Observed vs Measured Water Surface Elevations
Downstream Stebbins Island
WSEL (ft NGVD 1929)
187
186
185
184
183
182
181
180
179
178
8/24/2014 0:00
8/26/2014 0:00
8/28/2014 0:00
8/30/2014 0:00
9/1/2014 0:00
9/3/2014 0:00
Time in 15 min increments 8/24/14 Midnight (0:00) to 9/3/2014 0:00
Downstream Stebbins Island Observed
Downstream Stebbins Island Modeled


Downstream of the French King Gorge
Downstream French King Gorge Observed
Downstream French King Gorge Modeled
WSEL (ft NGVD 1929)
187
186
185
184
183
182
181
180
179
178
8/24/2014 0:00
8/26/2014 0:00
8/28/2014 0:00
8/30/2014 0:00
9/1/2014 0:00
9/3/2014 0:00
Time in 15 min increments 8/24/14 Midnight (0:00) to 9/3/2014 0:00
Calibration- Observed vs Measured Water Surface Elevations


Note: the black and gray lines are on top of each other
Observed Montague Elevation (ft)
Modeled Montague (ft) Holyoke Dam at 100.67 ft
Modeled Montague (ft) Holyoke Dam at 99.47 ft
Montague USGS Gage to Holyoke Reach
Calibration- Observed vs Measured Water Surface Elevations
WSEL (ft NGVD 1929)
117
115
113
111
109
107
5/22/2012 0:00
5/24/2012 0:00
5/26/2012 0:00
5/28/2012 0:00
5/30/2012 0:00
6/1/2012 0:00
Time in 15min increments 5/22/2012 Midnight (0:00) to 6/1/2012 0:00


Calibration- Observed vs Measured Water Surface Elevations
Observed Rt 116 Elevation (ft)
Modeled Rt 116 (ft) Holyoke Dam at 100.67 ft
Modeled Rt 116 (ft) Holyoke Dam at 99.47 ft
Montague USGS Gage to Holyoke Reach
WSEL (ft NGVD 1929)
111
109
107
105
103
5/22/2012 0:00
5/24/2012 0:00
5/26/2012 0:00
5/28/2012 0:00
5/30/2012 0:00
6/1/2012 0:00
Time in 15 min increments 5/22/2012 Midnight (0:00) to 6/1/2012 0:00


Calibration- Observed vs Measured Water Surface Elevations
Observed Mitch's Marina Elevation (ft)
Modeled Mitch's Marina (ft) Holyoke Dam at 100.67 ft
Modeled Mitch's Marina (ft) Holyoke Dam at 99.47 ft
Montague USGS Gage to Holyoke Reach
WSEL (ft NGVD 1929)
106
105
104
103
102
101
100
5/22/2012 0:00
5/24/2012 0:00
5/26/2012 0:00
5/28/2012 0:00
5/30/2012 0:00
6/1/2012 0:00
Time in 15 min increments 5/22/2012 Midnight (0:00) to 6/1/2012 0:00

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

Study Progress

Task 1: Bathymetric Survey of Study Areas
- Survey work completed in 2014.

Task 2: Compile Model Input Datasets in CAD
- Total of 4 models: Station No. 1 intake, Cabot intake, Cabot Ladder, Spillway Ladder. All CAD work is complete.

Task 3: Construct 3D Model
- CFD models of the four locations are complete.

Task 4: Conduct Model Production Runs
- Production runs for the Station No. 1 forebay and Cabot forebay are complete.
- Cabot fishway and spillway fishway are still underway.

Task 5: Report
- Underway, but not complete. Waiting for completion of the Cabot and spillway fishway production runs.

Findings (if any)
- Not complete. Some preliminary results are shown in the following slides.

Variances (if any)
- The RSP called for developing high-resolution sub-models at the face of the Cabot and Station No. 1 intake racks.
- Due to computational limitations, not practical to create/build these models.
- In lieu of separate model, added 1-foot mesh in front of intake racks to calculate approach and sweeping velocities.

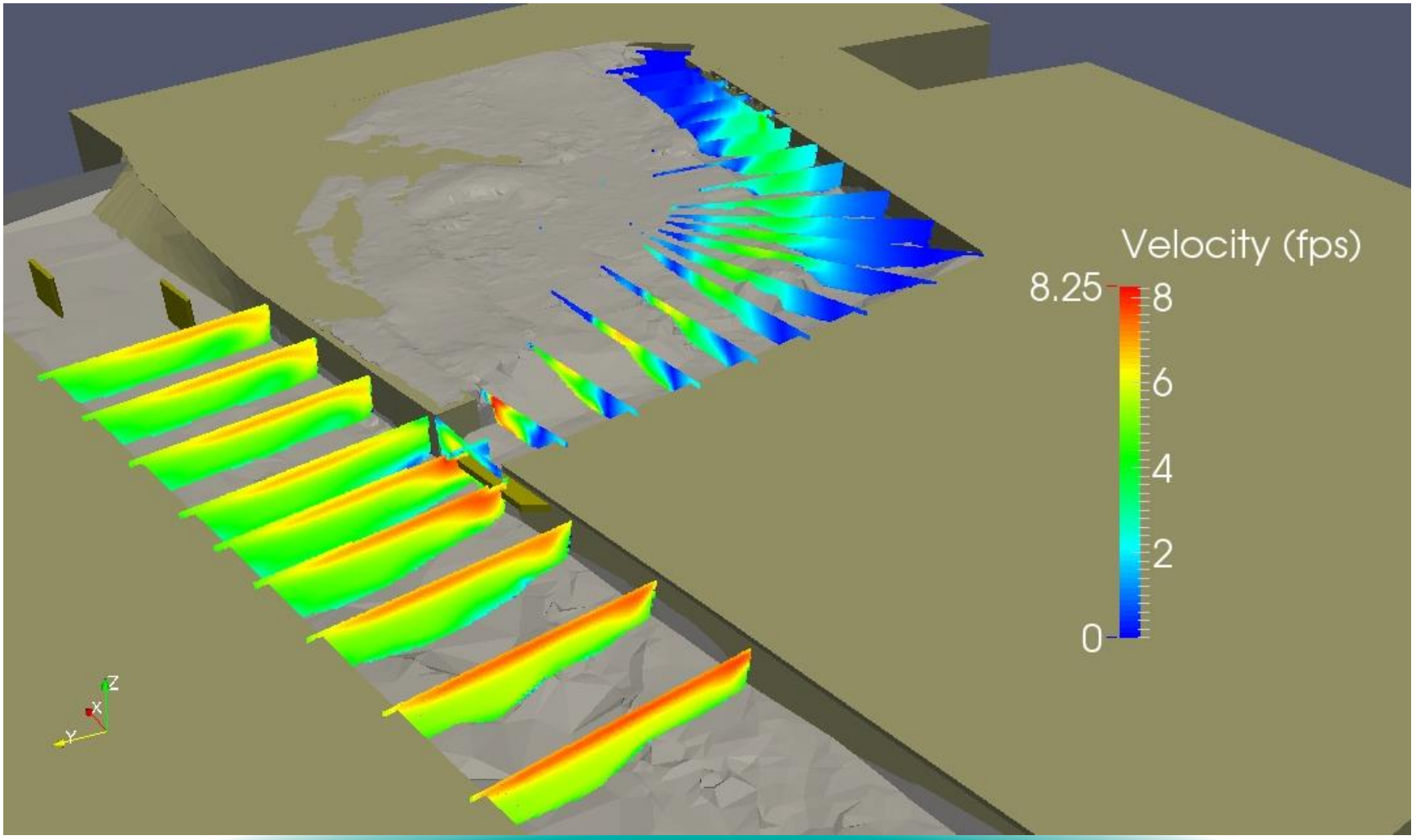
Work Remaining
- Report to be completed by 12/1/2015.

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

Geometry input for the Cabot forebay CFD model

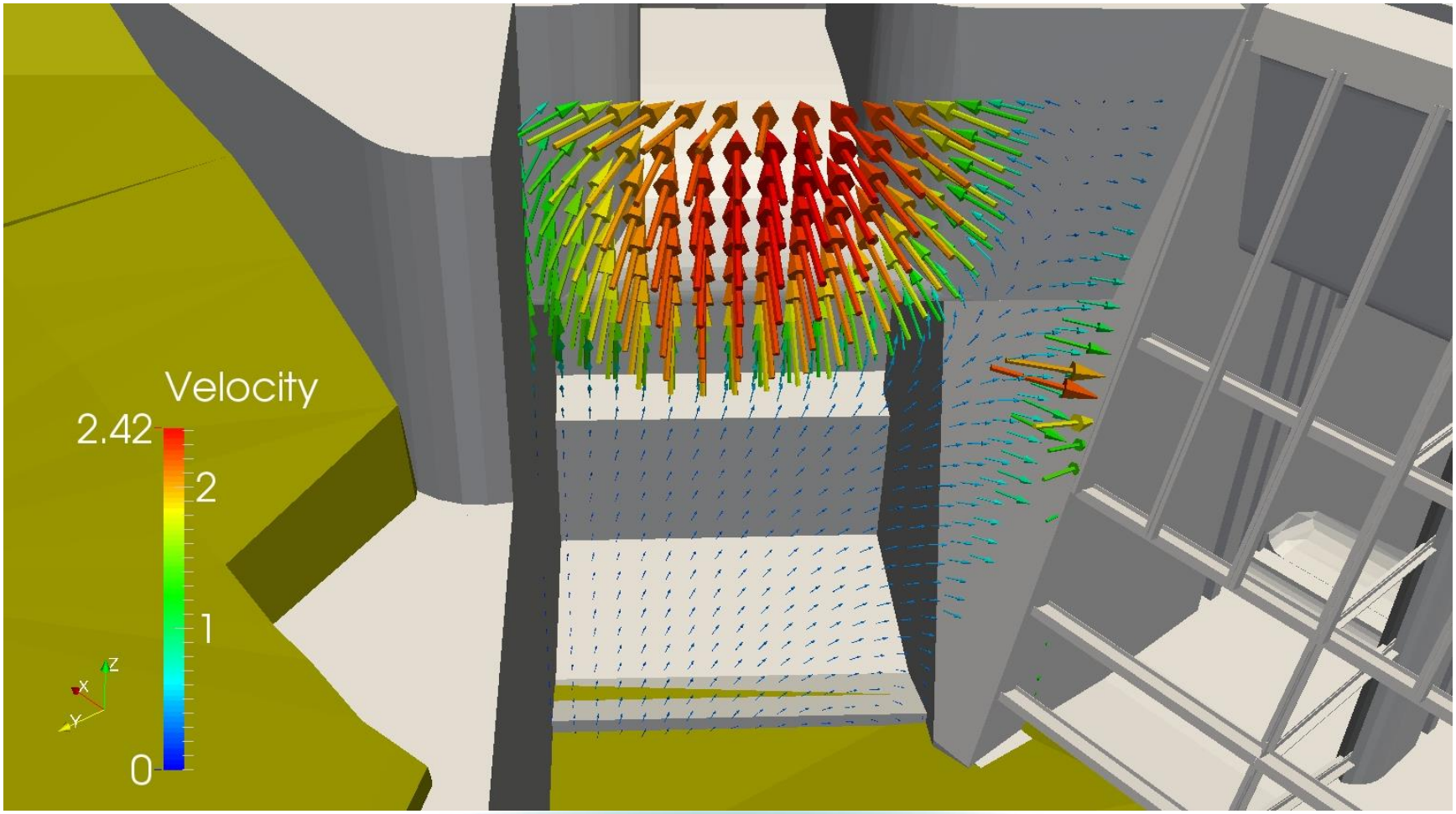
3.3.8-Computational Fluid Dynamics Modeling in the Vicinity of the Fishway Entrances and Powerhouse Forebays

Preliminary results for Station No. 1 forebay CFD model, production run number 1-3.



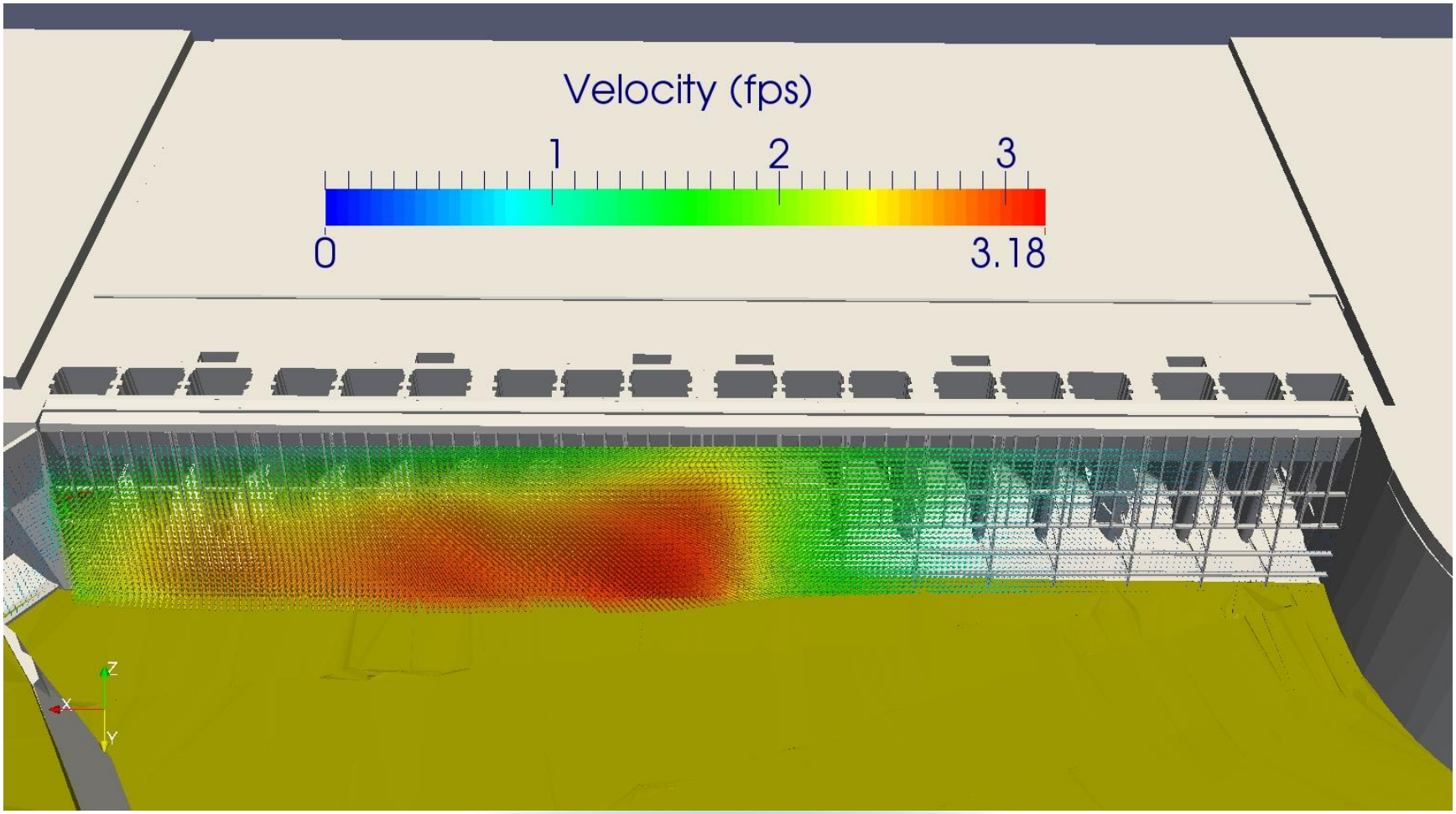
3.3.8-Computational Fluid Dynamics Modeling in the Vicinity of the Fishway Entrances and Powerhouse Forebays

Preliminary results for Cabot forebay, production run number 3-1 at the log sluice entrance.



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

Preliminary results for Cabot forebay, production run number 3-2 near the Cabot Station intake racks.



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

Study Progress

Task 1: Review Existing Data and Identify Data Gaps
Task 2: Bathymetric Survey Update and Post Processing
Task 3: Develop and Graph Water Column Velocity Profiles
Task 4: Build and Calibrate 2D Model
Task 5: Conduct and Analyze Transient Production Runs

- Complete

Task 6: Reporting

- Approximately 80% complete.

Findings (if any)

- See next page.

Variances (if any)

- Water column velocity data only collected at three transects as the fourth transect was located on top of the intake structure.

Work Remaining

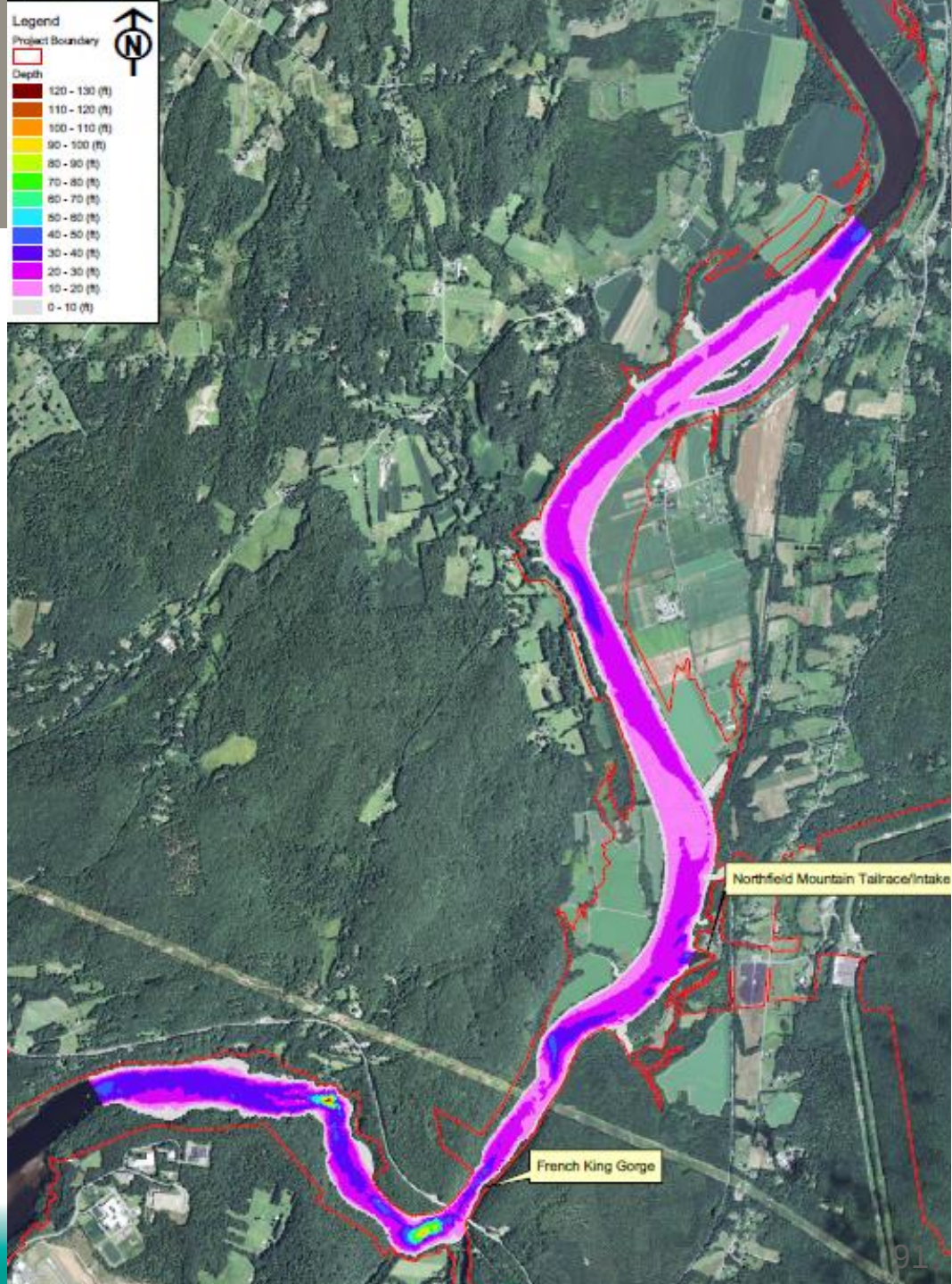
- Report to be completed by the 12/1/2015.

Table 1: List of River2D Hydraulic Modeling Scenarios

Scenario No.	Northfield Mountain Generation Flow (cfs)	Northfield Mountain Pumping Flow (cfs)	Turners Falls Impoundment Elevation at Turners Falls Dam (ft)	Turners Falls Dam Flow (cfs)
1	10,000	0	176.0	1,760 (95% exceedance flow)
2	10,000	0	185.0	1,760
3	20,000	0	176.0	1,760
4	20,000	0	185.0	1,760
5	0	7,600	176.0	1,760
6	0	7,600	185.0	1,760
7	0	15,200	176.0	1,760
8	0	15,200	185.0	1,760
9	10,000	0	176.0	4,900 (75% exceedance flow)
10	10,000	0	185.0	4,900
11	20,000	0	176.0	4,900
12	20,000	0	185.0	4,900
13	0	7,600	176.0	4,900
14	0	7,600	185.0	4,900
15	0	15,200	176.0	4,900
16	0	15,200	185.0	4,900
17	10,000	0	176.0	8,440 (50% exceedance flow)
18	10,000	0	185.0	8,440
19	20,000	0	176.0	8,440
20	20,000	0	185.0	8,440
21	0	7,600	176.0	8,440
22	0	7,600	185.0	8,440
23	0	15,200	176.0	8,440
24	0	15,200	185.0	8,440
25	10,000	0	176.0	15,700 cfs (25% exceedance flow)
26	10,000	0	185.0	15,700
27	20,000	0	176.0	15,700
28	20,000	0	185.0	15,700
29	0	7,600	176.0	15,700
30	0	7,600	185.0	15,700
31	0	15,200	176.0	15,700
32	0	15,200	185.0	15,700
33	10,000	0	176.0	40,100 (5% exceedance flow)
34	10,000	0	185.0	40,100
35	20,000	0	176.0	40,100
36	20,000	0	185.0	40,100
37	0	7,600	176.0	40,100
38	0	7,600	185.0	40,100
39	0	15,200	176.0	40,100
40	0	15,200	185.0	40,100

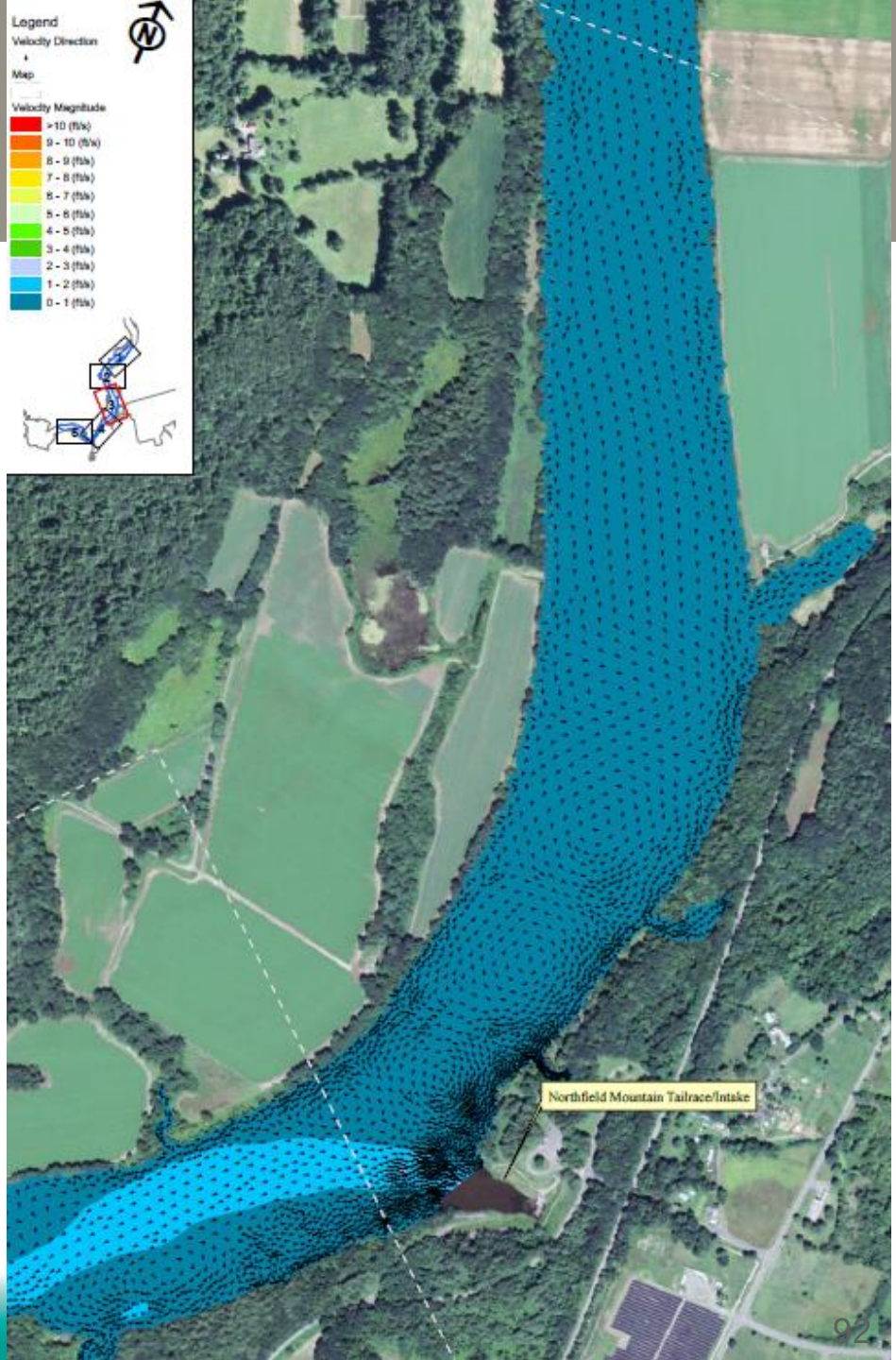
Depth Map for Scenario 18

- 50% Exceedence Flow (8,440 cfs)
- 2 Units Generating (10,000 cfs)
- WSEL at Dam= 185 ft



Velocity Vector Map for Scenario 18

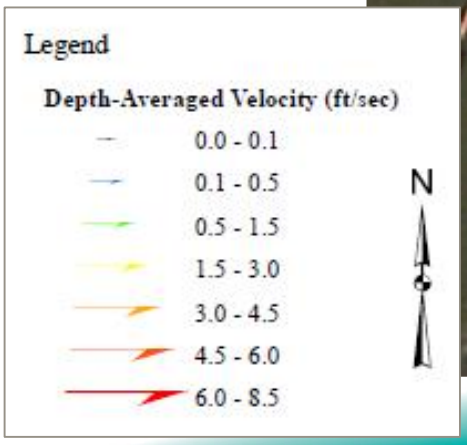
- 50% Exceedence Flow (8,440 cfs)
- 2 Units Generating (10,000 cfs)
- WSEL at Dam= 185 ft



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

Velocity Vector Map

- 4 Units Generating (20,000 cfs)



Developmental Resources

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

Study Progress

Task 1: Modify Model
- Using HEC-ResSim simulation model provided by the USACOE via The Nature Conservancy.
- Model was updated to reflect hourly time step, pumping/generating cycles at Northfield and fishway/attraction flows.

Task 2: Calibration
- Model calibrated to generation (for the year 2000) and flow at the Montague USGS Gage.
- Added updated hydrology (2004-2012), but have not validated model with these data.

Task 3: Establish Baseline Model
- Established a baseline model reflecting current operations and operating equipment .

Task 4: Production Runs
- Some internal productions runs are being evaluated.

Task 5: Use of Model Output for other Uses
- To date, the model output has not been used for other studies such as habitat time series analysis.

Task 6: Report
- Not complete.

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

Findings (if any)

- None to date.

Variances (if any)

- None

Work Remaining

- Validate model calibration for period of record 2004-2012.
- Once studies are complete, evaluate alternative modes of operation.
- Report to be completed by 3/1/2017.

Geology & Soils

3.1.1-2013 Full River Reconnaissance Study

Study Progress

- All tasks have been completed

Variances (if any)

- None to report.

Work Remaining

- None - final report filed on 9/15/2014, addendum to final report filed in 4/22/2015.

Summary of 2015 Activities

- FL distributed a draft addendum to the final report to the Stakeholders on February 24, 2015. The draft addendum included:
  - Attachment A: Riverbank Segment QA Comparison, and
  - Attachment B: 2007 to 2014 Photo Comparison.

- FL held a meeting for interested Stakeholders on March 4, 2015 to discuss the draft addendum.
  - FL received comments on the draft addendum from FRCOG on April 2, 2015, no other comments were received.
  - On April 22, 2015 FL filed the final FRR Addendum as well as a responsiveness summary addressing FRCOG's comments.

Summary of 2015 Activities

- In March 2015, FRCOG requested FERC make a determination regarding FL's compliance with the 1999 Erosion Control Plan, specifically if the proposed stabilization sites found in the 2013 FRR (i.e. Phase IV sites) were appropriate.
  - FL met with the CRSEC on April 15, 2015 to discuss the proposed Phase IV stabilization sites.
  - In July 2015, FERC requested that FL provide the Commission with information regarding how the Phase IV sites were selected and why they are appropriate.
  - FL provided the requested information to FERC on August 4, 2015.
    - In addition to providing rationale for why the sites proposed for Phase IV stabilization were appropriate, FL agreed to add Segments 140-142 to the Phase IV scope of work based on feedback received from the CRSEC.
    - FL requested that FERC approve the updated Phase IV stabilization sites.

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

Study Progress

Task 1: Data gathering and literature review

- Supplemental resources and data were provided to Stakeholders in December 2014, May 2015, and August 2015.
- Task Complete.

Task 2: Geomorphic understanding of the Connecticut River

- Substantially complete. Outstanding sub-task: historic imagery analysis (ongoing).

Task 3: Identification of potential causes of erosion.

- In progress. Identification of potential and potential primary causes of erosion has been completed, the process of assessing the relative importance of each of those causes will not be conducted until completion of Tasks 4, 5, and 6.
- Potential primary causes: hydraulic shear due to flowing water, boat waves, water level fluctuations due to hydropower operations, and land management & anthropogenic influences in riparian zone.

Task 4: Field studies and data collection

- Ongoing- Field work continues until March 2016 (ice).

Task 5: Data Analyses

- Ongoing.

Findings (if any)

- None at this time. Data review is still underway as is model development and calibration (BSTEM).

Variances (if any)

- Supplemental boat wave data collection and analysis (ongoing).

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

Work Remaining

- Task 2: Historic imagery analysis.
- Task 3: Evaluation of causes upon completion of Tasks 4,5, & 6
- Task 4: Complete field work for BSTEM and boat wave analyses. Also, ice monitoring through March 2016.
- Task 5: Review, post process, and QA/QC all field collected data.
- Task 6: Evaluation of the Causes of Erosion.
- Task 7: Report and Deliverables.
  - *Final report to be completed by second quarter 2016*

Task 4: Field Studies and Data Collection – Summary of 2014/2015 Activities

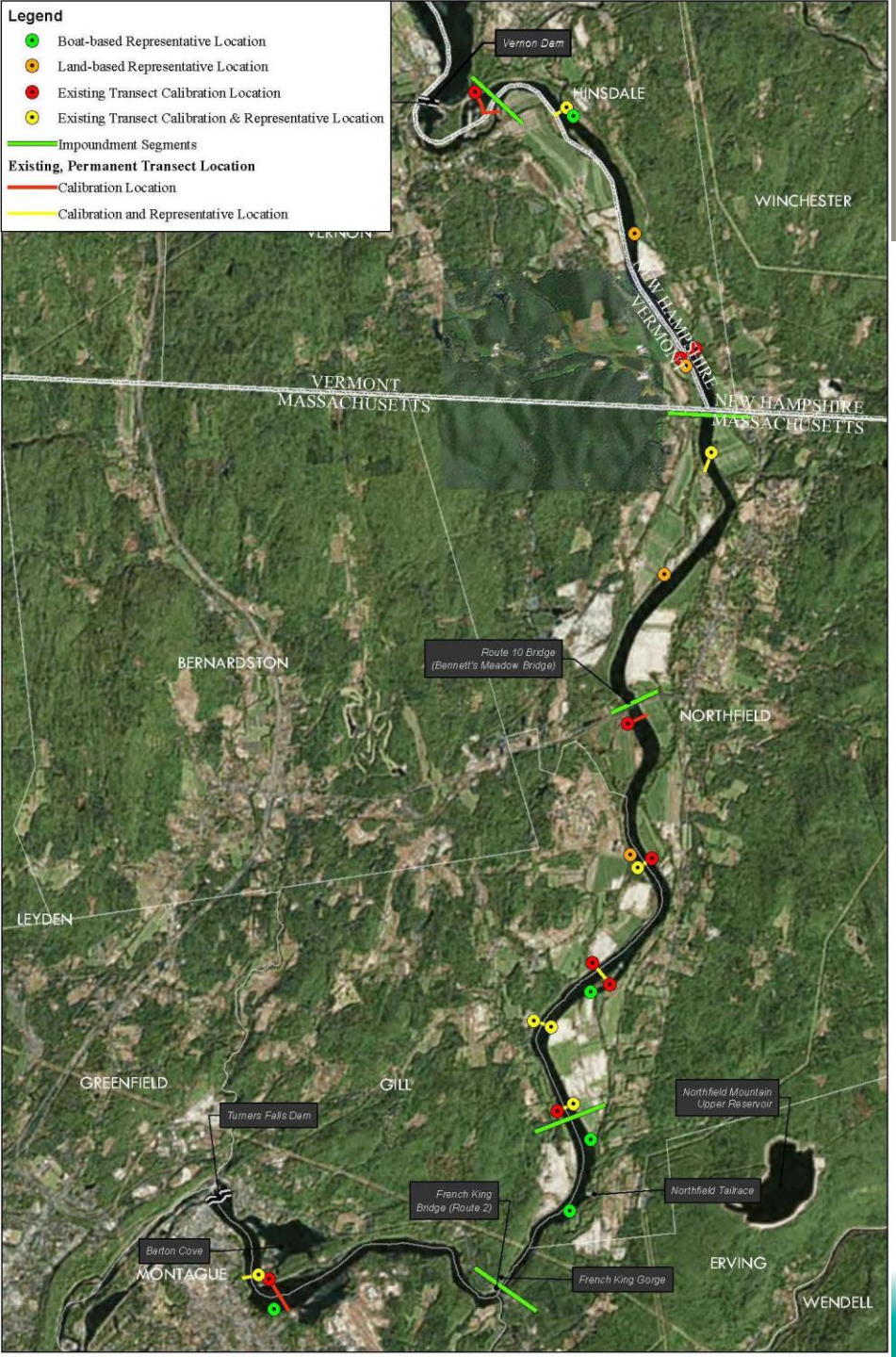
- 2014 – BSTEM data collection
  - Soils analyses
  - Collection of sediment samples
  - Direct, in-situ bore hole shear tests *(see photos)*
  - Submerged jet tests *(see photos)*
  - Information on vegetation, root structure, and density *(see photos)*
  - Annual cross-section surveys
- 2015
  - Supplemental BSTEM data collection
  - Annual cross-section surveys
  - Boat wave data collection
  - HEC-RAS model output
  - RIVER2D model output
  - Project Operations data (flow, water level, operating conditions)
  - Ice monitoring *(to occur winter 2015/2016)*

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

Task 5: Data Analyses

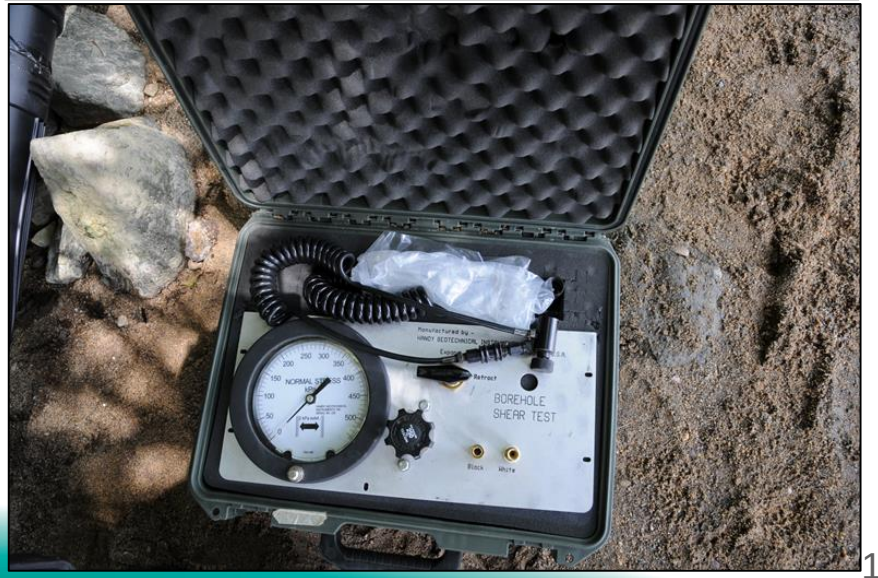
- Data collected during the 2014 field season have been reviewed, post processed (if required), and undergone QA/QC. Following completion of the QA/QC process, the data were analyzed for incorporation into BSTEM.
- Preliminary review of data collected in 2015 has begun
- Data analysis and BSTEM setup and calibration are ongoing

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



Location of Detailed Study Sites

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



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

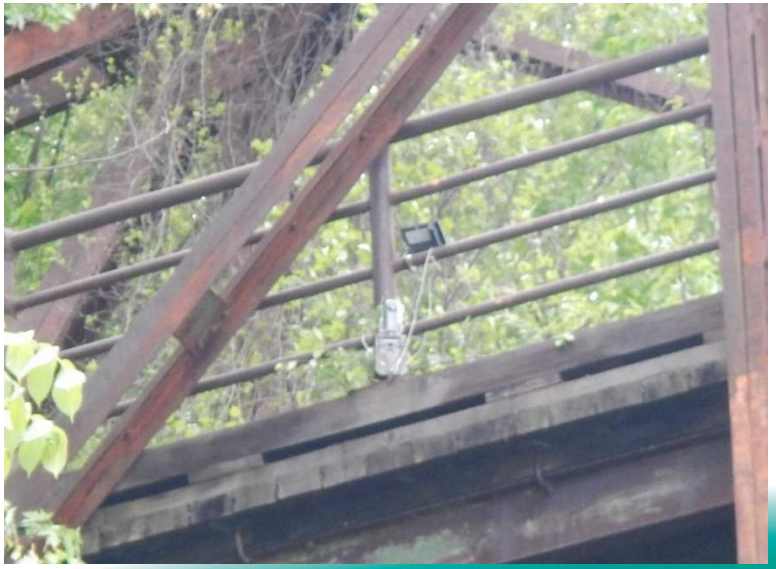
3.1.2-Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability

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

Supplemental Boat Wave Data Collection

- In early 2015 historic boat wave data was found to be insufficient for inclusion in BSTEM.
- Supplemental boat wave data were collected from May – September to address this.
- Data collected included:
  - Boat statistics: *boat length, boat speed, and distance of its sailing line from the shoreline.*
  - Wave properties: *wave period, wave height, and direction of wave propagation.*
- Digital cameras were installed at three locations (French King Bridge, Rt. 10 Bridge, and Schell Bridge) to capture boat statistics *(see photos).*
- Wave loggers were installed at three locations in the vicinity of the cameras to capture the wave properties *(see photos).*
  - Upstream of the French King Bridge.
  - Downstream of the Rt. 10 Bridge.
  - Upstream of Schell Bridge/Pauchaug boat launch.
- Data were downloaded on a bi-weekly schedule at which time a preliminary QA check occurred.
- The data are then analyzed using a custom developed image processing tool to measure the speed, location, and passage time of the boat as well as to estimate the type, shape, and size of boats as they pass.
- The corresponding wave data for each wave passage is then extracted from the wave staff measurements.
- The results of the imaging analysis together with the wave measurements will provide data for the calibration and use of the empirical wave height model in BSTEM.

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



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

Schedule

- Final study will be completed in second quarter of 2016, as specified in the USR. Cover letter incorrectly indicated 3/1/2016 completion date.

3.1.3-Northfield Mountain Project Sediment Management Plan

Study Progress

- Continuous suspended sediment monitoring – adjacent to Rt. 10 Bridge and at Northfield Mountain tailrace.
- Collection of grab samples at continuous monitoring locations and across Rt. 10 Bridge *(ongoing).*
- Annual bathymetry surveys - 2011-2014 *(2015 survey to be completed in October).*
- Computational Hydrodynamic Sedimentation model of the Upper Reservoir *(ongoing).*
- Computational Fluid Dynamics Model of the Northfield Mountain tailrace *(ongoing).*
- Physical model of the Northfield Mountain tailrace *(ongoing).*
- Pilot dredge of the Upper Reservoir *(ongoing).*

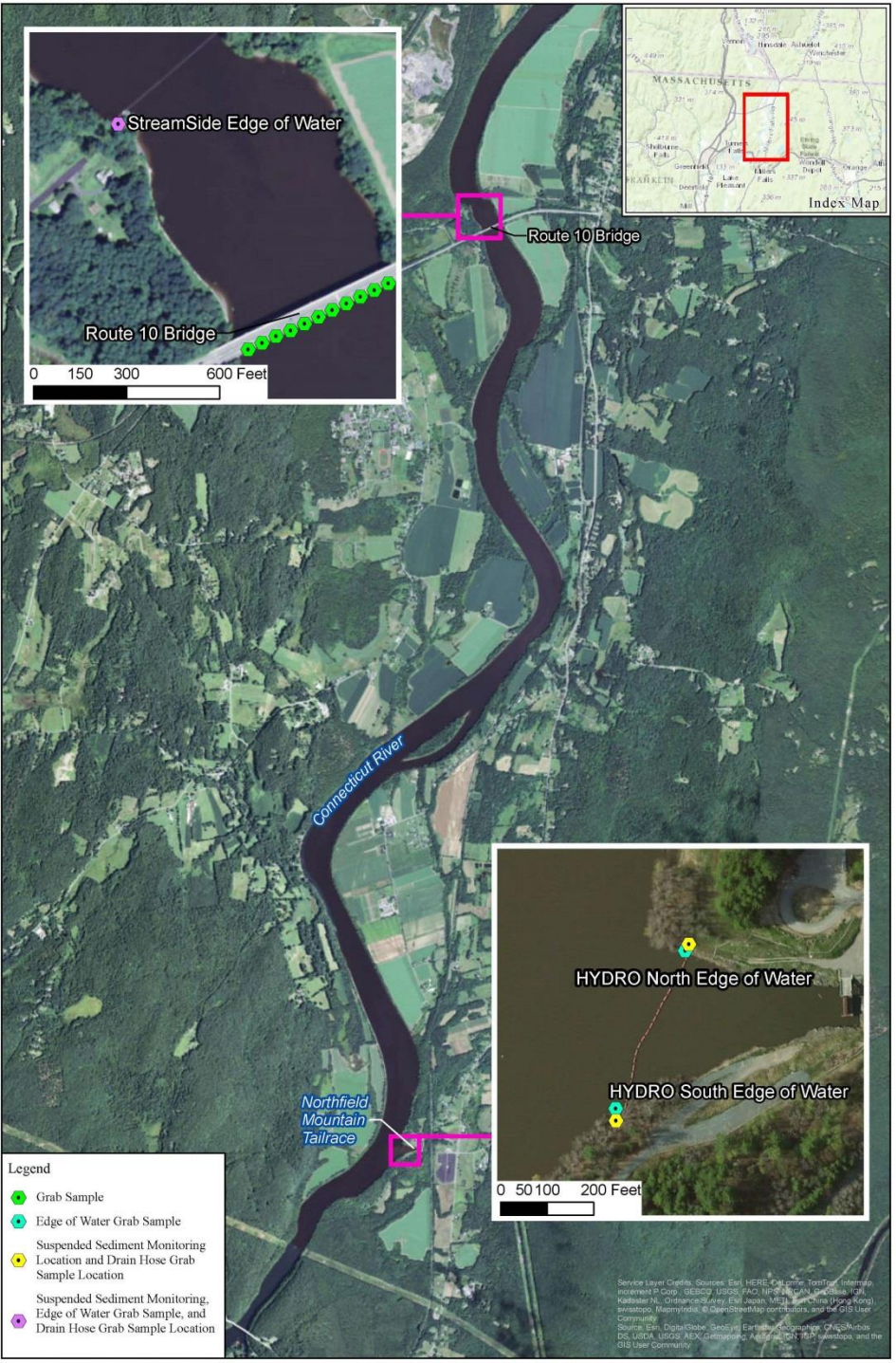
Variances (if any)

- Discontinuation of continuous monitoring in June 2015, expanded grab sample program in 2015.
- Expansion of study to include pilot dredge and mathematical and physical modeling efforts.
- Final report proposed to be completed by September 1, 2016 to allow evaluation of expanded study elements that are continuing into 2016.

Work Remaining

- Grab sample collection through mid-November, 2015 Upper Reservoir bathymetry survey.
- Physical model and review of all modeling results.
- Completion of pilot dredge and assessment of results.
- Review the results of all components of this study to inform sediment management measures that will avoid or minimize the entrainment of sediment in the Project works and Connecticut River.
- Final report– September 1, 2016.

3.1.3-Northfield Mountain Project Sediment Management Plan

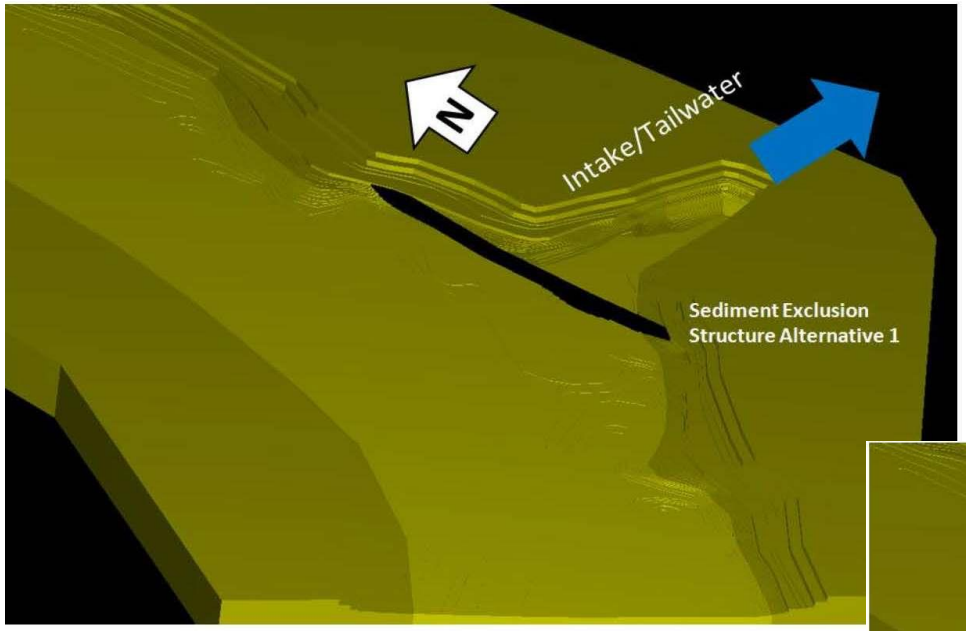


3.1.3-Northfield Mountain Project Sediment Management Plan

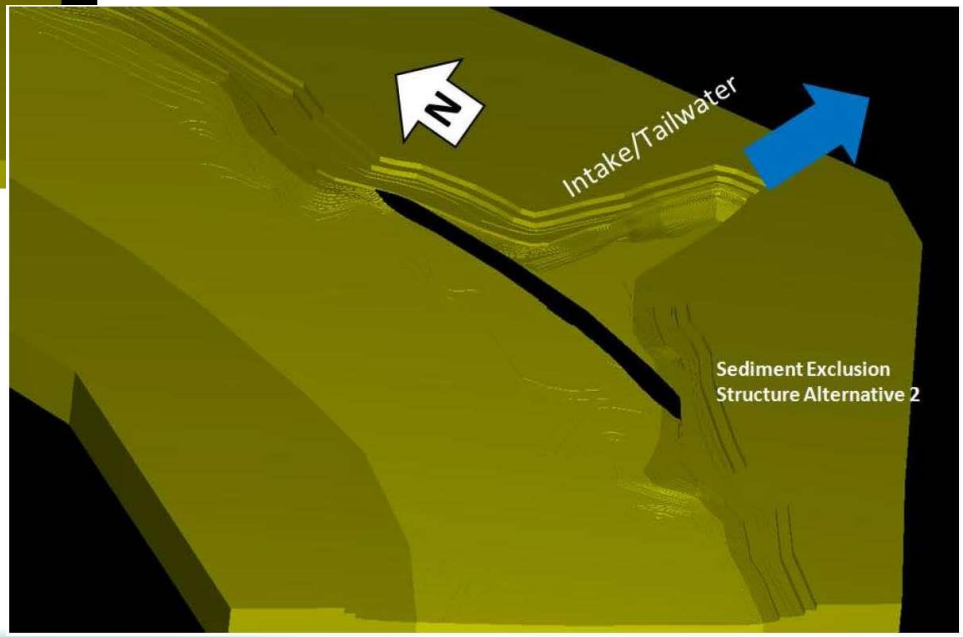
Computational Modeling

- Computational Hydrodynamic Sedimentation Modeling of the Upper Reservoir
  - *Alden developed a 2-D model to understand the process of sedimentation in the Upper Reservoir and to evaluate long-term sediment management alternatives.*
  - *Objective: determine if a modification in the Upper Reservoir intake channel geometry or lowering the Upper Reservoir below its current lower limit could reduce sediment accumulation.*
  - *Four model runs were executed: 1) the current operational drawdown limit (938 ft. msl); 2) lowering the drawdown limit to 928 ft.; 3) lowering the drawdown limit to 920 ft.; and 4) physically reducing the intake channel width, with the goal of increasing intake channel velocities during generation.*
  - *Results are still under review in conjunction with the other modeling components.*
  - *Alden report was filed as an appendix to the 2014 Annual Summary of Sediment Monitoring Activities report*
- Computational Fluid Dynamics Sediment Modeling of the Northfield Mountain tailrace
  - *Alden developed a 3-D model to understand the sediment dynamics of the entrained sand and fine material from the Connecticut River which is transported to the Upper Reservoir during operational pumping phases as well as potential solutions in the tailrace to reduce sediment transport to the Upper Reservoir*.
  - *Objective: determine if physical modifications to the tailrace intake area could reduce sediment entrained to the Upper Reservoir during pumping operations.*
  - *Model extended 500 ft. upstream and downstream of the tailrace, including the tailrace intake area.*
  - *Three CFD simulations were run: 1) existing conditions; 2) installing a convex sediment exclusion structure; and 3) installing a concave sediment exclusion structure.*
  - *Results are still under review in conjunction with the other modeling components.*

3.1.3-Northfield Mountain Project Sediment Management Plan



Convex Sediment Structure (Alternative 1)



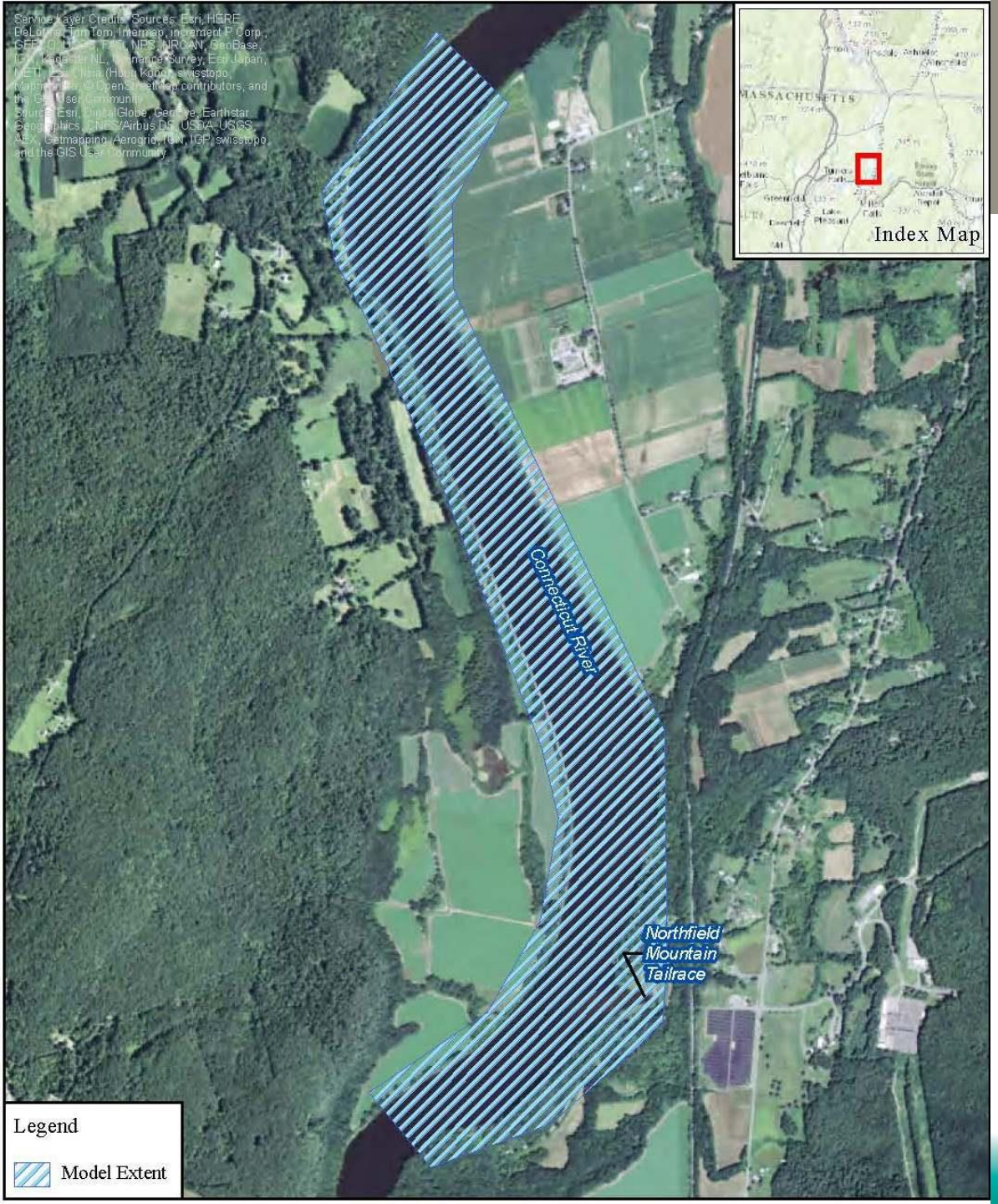
Concave Sediment Structure (Alternative 2)

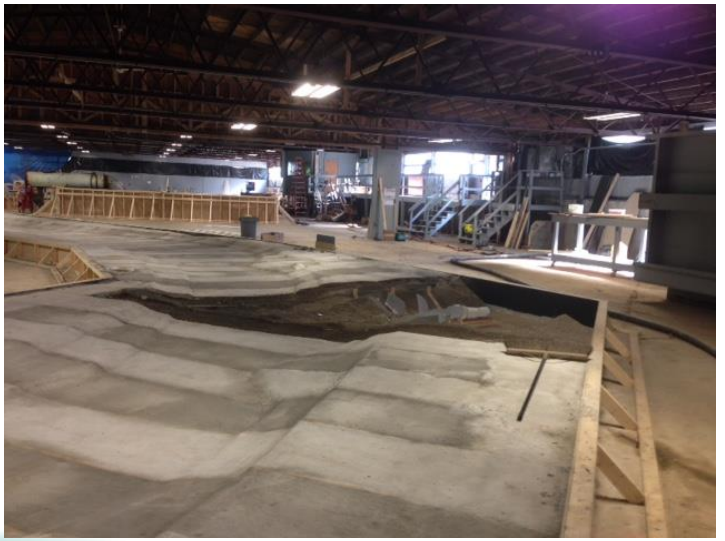
3.1.3-Northfield Mountain Project Sediment Management Plan

Physical Model

- Northfield Mountain Tailrace and Surrounding Area – Physical Model
  - *Alden developed a physical model of the Northfield Mountain tailrace and surrounding area (3.2 km upstream and 0.8 km downstream) to reproduce river conditions and to investigate new civil works that could be constructed at the tailrace to reduce the entrainment of sediment.*
  - *Supplemental field data (suspended sediment, bed sediment, bathymetry, and water level) were collected in 2015.*
  - *The model will be used to compare sediment intake associated with any modeled structural modifications to the existing intake structure.*
  - *The modeled change to the intake structure will consist of a deviation/deflection structure upstream of the existing intake structure to mobilize the river secondary currents and divert the sediment away from the intake structure.*
  - *Model is currently being constructed. Model results will be reviewed in conjunction with other modeling efforts to help inform sediment management measures.*

3.1.3-Northfield Mountain Project Sediment Management Plan





3.1.3-Northfield Mountain Project Sediment Management Plan

Upper Reservoir Pilot Dredge

- Started in April 2015, targeted completion fall 2015.
- Conducted to assess whether deep water hydraulic dredging is a viable option for removing excess sediment in the Upper Reservoir.
- Dredging activities are occurring within and immediately upstream of the intake channel.
- Affects about 4.5 acres (1.6%) of the 274 acre Upper Reservoir.
- As of September 21, ~36,000 cubic yards have been dredged.
- Dredged slurry mixture is incorporated with a polymer additive while being pumped into the Geotube dewatering system, which is located adjacent to the Upper Reservoir.
- Sediments from the sediment-water mixture will be substantially captured in the Geotubes, with the filtered effluent flowing back into the Upper Reservoir at a controlled flow rate.

3.1.3-Northfield Mountain Project Sediment Management Plan

3.1.3-Northfield Mountain Project Sediment Management Plan

Upper Reservoir Bathymetry Surveys

- Surveys conducted annually starting in 2011.
- Using the results from the 2012 and 2014 multi-beam survey and gravity core analysis, net deposition in the Upper Reservoir was found to be between ~4,000 - 8,000 cubic yards per year.

Suspended Sediment Monitoring - Analyses

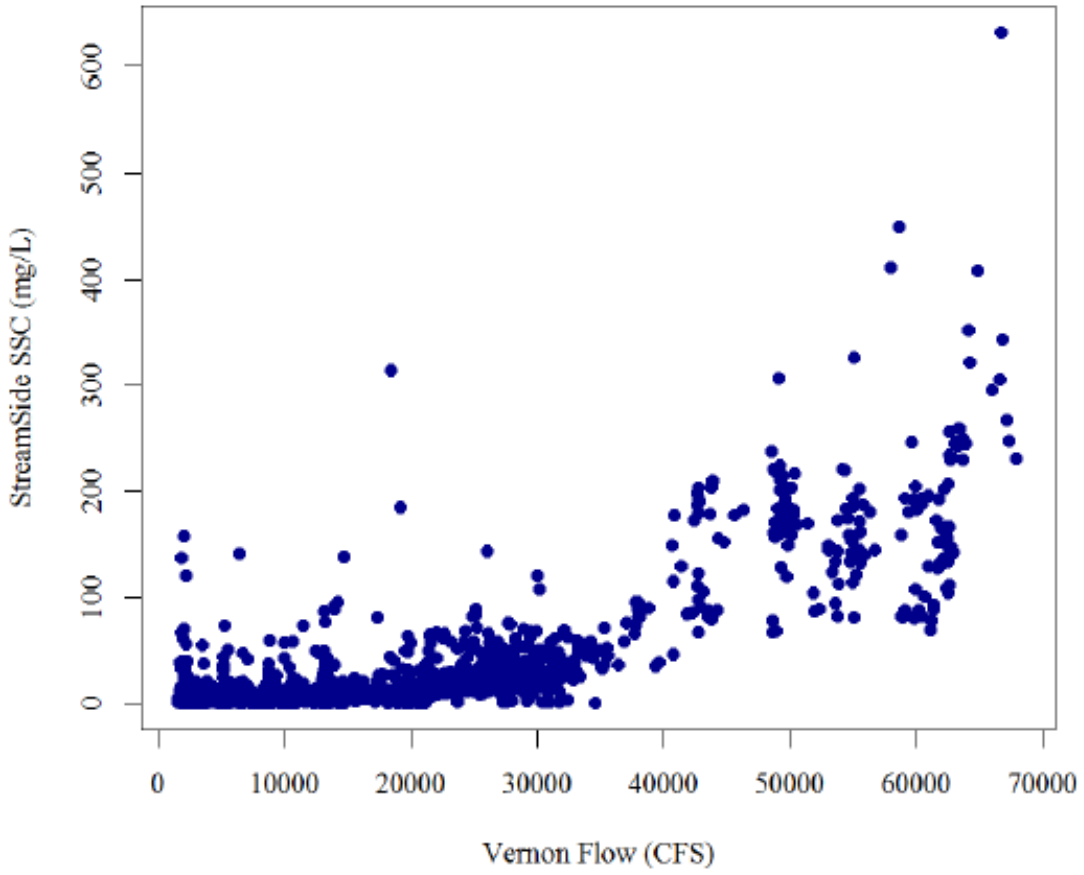
- Continuous LISST data (StreamSide, HYDRO North, and HYDRO South) were converted from µl/L to mg/L using available grab sample data.
- Data collected via the LISST-100X were used to determine if general patterns observed in the data were consistent with the patterns observed at the continuous LISST instruments and if the location of the continuous instrument pumps were representative of the cross-section.
- The converted continuous LISST data (StreamSide) were compared against the cross-sectional Rt. 10 Bridge grab sample data to determine if the StreamSide location was representative of the cross-section.
- Suspended sediment data were analyzed to identify:
  - *Seasonal SSC patterns and trends observed in relation to flow;*
  - *SSC patterns and trends observed in relation to flow and Project operating conditions at Vernon; and*
  - *SSC patterns and trends observed in relation to flow and Project operating conditions at Northfield Mountain*
    - Three representative time periods were examined in detail: 1) a spring freshet when flows increased to a level greater than 35,000 cfs; 2) a moderate flow period when flows were between 12,000-35,000 cfs; and 3) a low flow period when flows were less than 12,000 cfs.
- Timeseries plots of all converted data were developed for 2013, 2014, and 2015.

3.1.3-Northfield Mountain Project Sediment Management Plan

Suspended Sediment Monitoring - Results

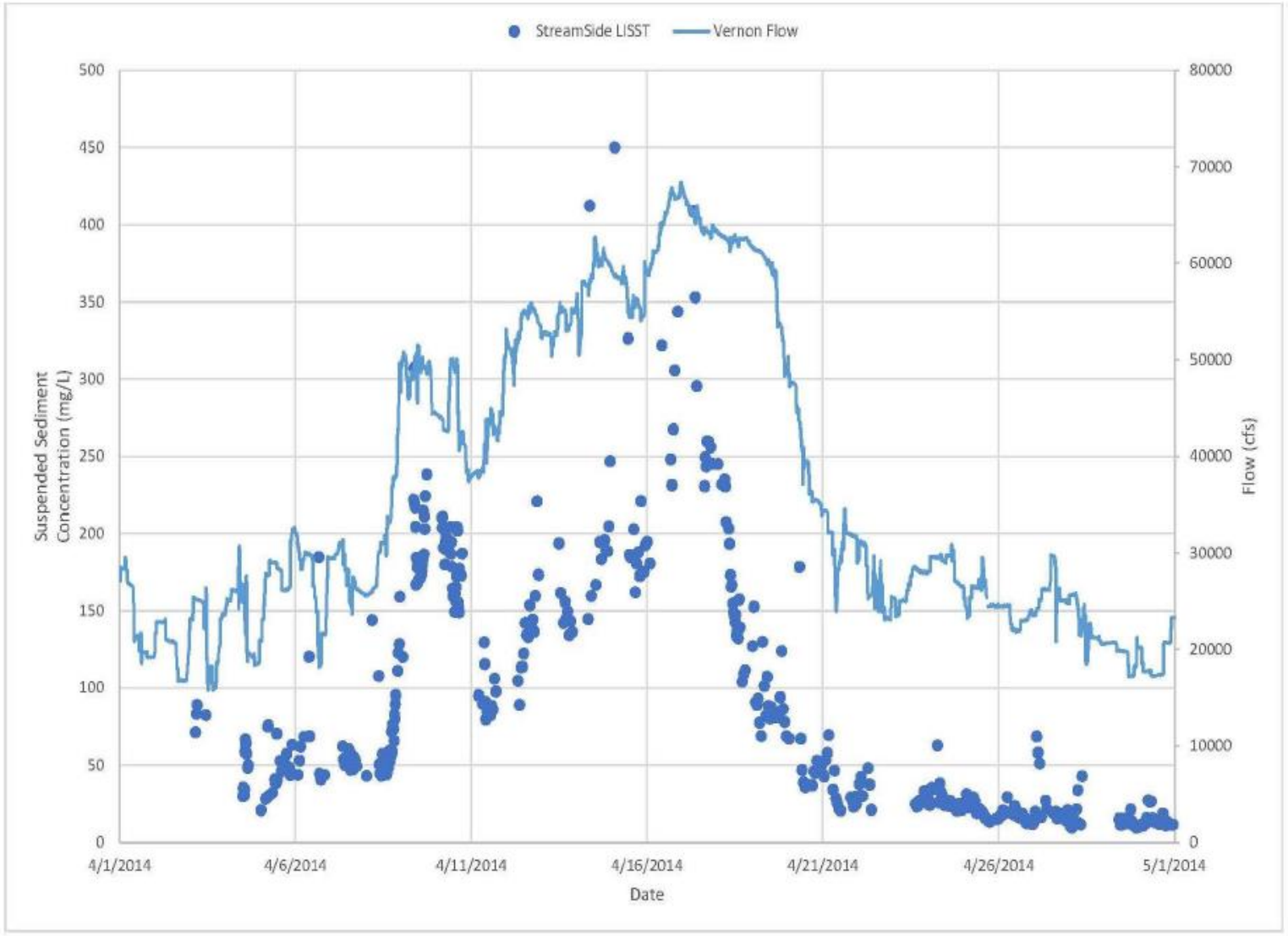
- Mainstem SSC values are directly proportional to flow (i.e., the higher the flow, the higher the SSC values).
- Three flow thresholds were observed in regard to SSC values - <12,000 cfs, 12,000-35,000 cfs, and >35,000 cfs. Median values for each threshold were 2.9 mg/L (<12,000 cfs), 12.45 mg/L (12,000-35,000 cfs), and 144.61 mg/L (>35,000 cfs).
  - *Flows <12,000 cfs were equaled or exceeded 53% of the time over the course of the study, 12,000-35,000 cfs 42% of the time, and >35,000 cfs 5%.*
- Mainstem hydrology is typically defined by the season
- Apparent increases in SSC were typically not observed during Vernon peaking events.
- During high and moderate flow periods SSC measurements as recorded at the HYDROs were comparable to those measured in the mainstem (StreamSide) when Northfield Mountain was pumping. Alternatively, SSC values lower than those observed in the mainstem were observed when the Project was generating. This suggests that the Project was pumping more suspended sediment into the Upper Reservoir than it was transporting back to the river and that the Project had no discernable impact on mainstem SSC values.
- During low flow periods SSC values observed in the river were very low and differences in SSC between generation and pumping cycles were negligible.
- Data collected from the North and South banks of the Northfield Mountain tailrace, the Northfield Mountain tailrace cross-section, and the Rt. 10 Bridge cross-section all indicated that the continuous LISST pumps were installed at locations representative of the cross-section.

Connecticut River SSC vs. Vernon Discharge (2013-2015)



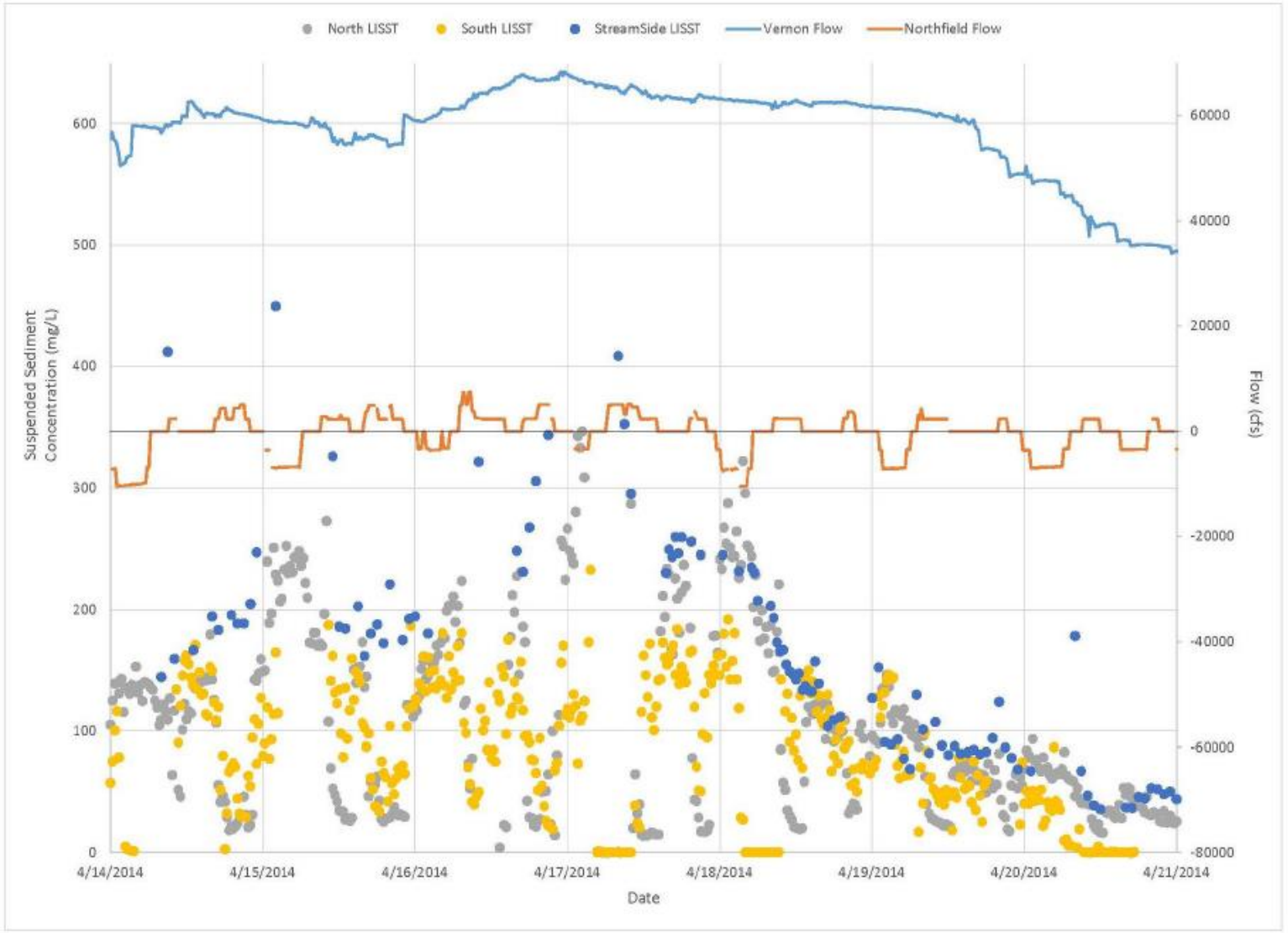
3.1.3-Northfield Mountain Project Sediment Management Plan

2014 Spring Freshet – SSC vs. Flow (StreamSide)



3.1.3-Northfield Mountain Project Sediment Management Plan

Northfield Mountain Tailrace High Flow Scenario



Recreation and Land Use Resources

3.6.1-Recreation Use/User Contact Survey

Study Progress

Task 1: Study Preparation

- Study preparation was primarily conducted in 2014 and reported in the ISR.
- Conducted consultation with the MA Environmental Police and local police departments.
- Confirmed with recreation departments in local towns and recreation/open space committees that FL has obtained the most current recreation and open space plans.

Task 2: Field Work

- Traffic counters removed when each site closed in the fall of 2014 or prior to the first snowfall.
- Field work completed in December of 2014.
- Information regarding recreation use at the Franklin County Boat Club, Turners Falls Rod and Gun Club, the Northfield Mount Hermon School and the Massachusetts Division of Fish and Wildlife was requested.

Task 3: Data Entry and Statistical Analysis

- Data entry into electronic spreadsheets was completed and QA/QC'ed.
- Data analysis for the Northfield Mountain trail user survey was conducted and results presented in the report for Study No. 3.6.7 – Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use.

Findings (if any)

- Findings will be presented in the study report.
- Findings regarding Northfield Mountain Trail survey were reported in the report for Study No. 3.6.7, which was posted on the relicensing website in June 2015 and filed with FERC on September 14, 2015.

Variances (if any)

- There were no variances from the study plan or schedule during the second year of the study.

Work Remaining

- Statistical/data analysis is ongoing.
- Report is under development and anticipated to be filed by 12/31/2015.

3.6.2-Recreation Facilities Inventory and Assessment Addendum

Addendum

- Original Recreation Facilities Inventory and Assessment was filed with ISR on September 15, 2014.
- FERC issued the Determination on Requests for Study Modifications and New Studies on January 22, 2015.
  - Requirements included:
    - A full inventory and assessment of all climbing areas within the Project boundaries, including Rose Ledge;
    - A full inventory and assessment of the put-in site downstream of Turners Falls Dam;
    - Separate descriptions of the Poplar Street Access Site and the Portage Route including take-out and put-in locations, the process to call for portage assistance, and the route(s) used for the portage (including distance);
    - A description of how visitors access the bypassed reach from Cabot Woods and the condition of the route;
    - Address discrepancies between the text of the assessment report and the inventory sheet for Cabot Woods and provide a legible site drawing or map that show and label all pertinent features, such as parking lots, gates, and river access routes;
    - A condition assessment of Poplar Street Access Site and the Gatehouse Fishway Viewing Area with legible site drawings or maps that show and label all pertinent features such as parking lots, gates, and river access routes;
    - Inclusion of all information from FL's response to comments;
    - Legible site maps that show and label all pertinent features (e.g. river access routes, parking lots, and structures); and
    - Recreation Facilities and Recreation Amenities tables that list all sites and include basic facility information.

3.6.2-Recreation Facilities Inventory and Assessment Addendum

Addendum

- Full inventory and assessment of the put-in site downstream of Turners Falls Dam.
- Separate descriptions of Poplar Street Access Site and the Canoe Portage Route.
- Description of how visitors access the bypassed reach from Cabot Woods including condition of route.
- Addressed discrepancies between the text of the assessment report and the inventory sheet for Cabot Woods.
- Provided legible site drawing or map that shows and labels all pertinent features of all sites including Cabot Woods.
- Condition assessment of Poplar Street Access Site and the Gatehouse Fishway Viewing Area with legible site drawings or maps that show and label all pertinent features such as parking lots, gates, and river access routes.
- Included information from FL response to comments filed December 15, 2014.
- Provided Recreation Facilities and Recreation Amenities tables for the 10 Commission approved recreation facilities.
- FERC-required addendum posted on the relicensing website and filed with FERC on 6/15/2015.

Findings

- See next pages.

Variances (if any)

- None.

Work Remaining

- None.

3.6.2-Recreation Facilities Inventory and Assessment Addendum

Results and Analysis

- Report contains the following information

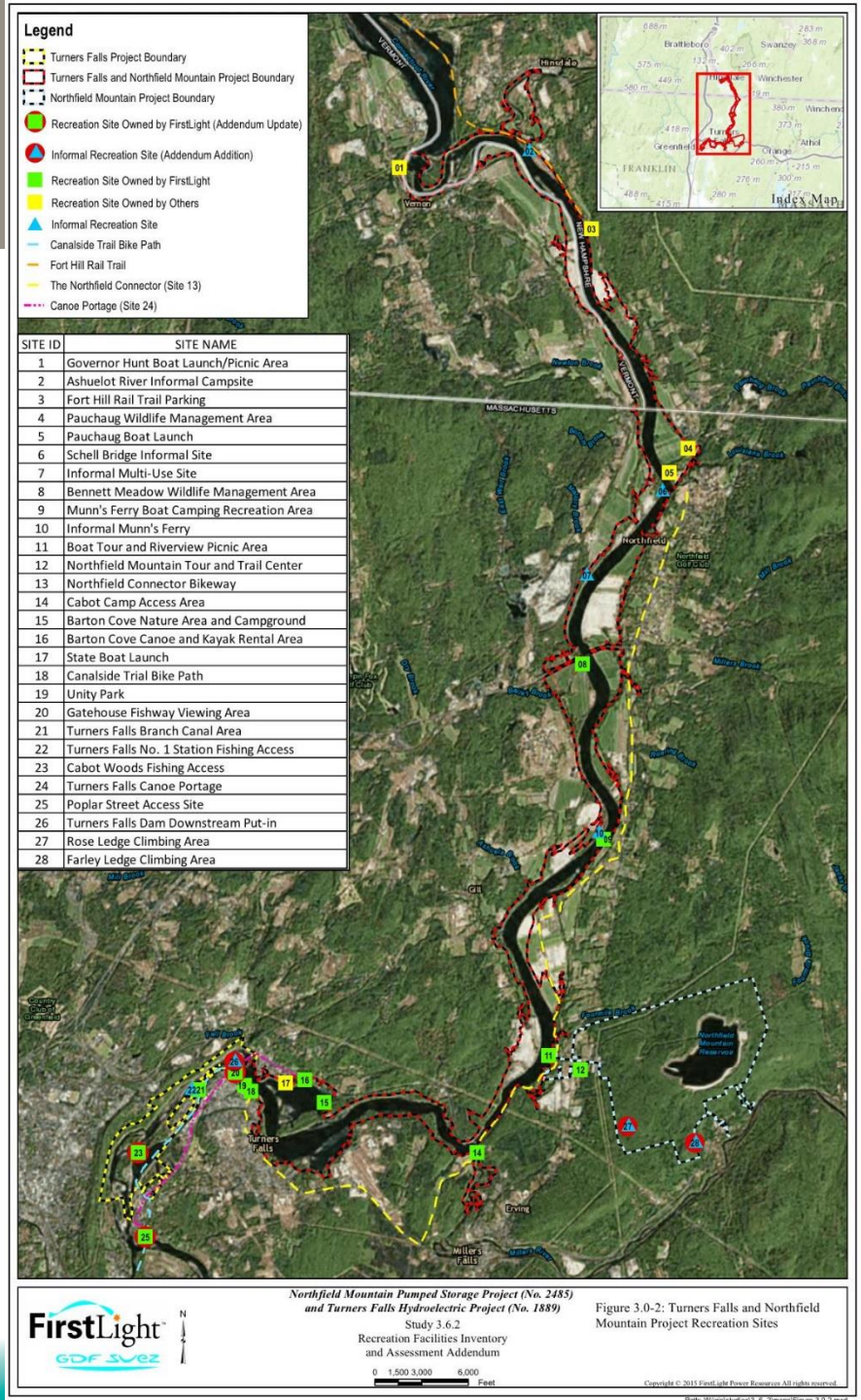
Recreation Site Data Collected as part of the Inventory Addendum

Site ID	Recreation Site Name	Data Collected as Part of the Recreation Inventory Assessment Addendum
1	Governor Hunt Boat Launch/Picnic Area	New field site map of the portion of the site located within the Project boundaries.
3	Fort Hill Rail Trail	New field site map.
4	Pauchaug Wildlife Management Area	New field site map.
5	Pauchaug Boat Launch	New field site map.
6	Schell Bridge Informal Site	New field site map
8	Bennett Meadow Wildlife Management Area	New field site map.
9	Munn's Ferry Boat Camping Recreation Area	New field site map.
10	Informal Munn's Ferry Access Site	New field site map
11	Boat Tour and Riverview Picnic Area	New field site map.
12	Northfield Mountain Tour and Trail Center (Northfield Mountain Visitors Center)	New field site map.
14	Cabot Camp Access Area	New field site map.
15	Barton Cove Nature Area and Campground	New field site map.
16	Barton Cove Canoe and Kayak Rental Area	New field site map.
17	State Boat Launch	New field site map.
19	Unity Park	New field site map
20	**Gatehouse Fishway Viewing Area**	**New field site map, updated inventory, and condition assessment.**
21	Turners Falls Branch Canal Area	New field site map.
22	Turners Falls No. 1 Station Fishing Access	New field site map
23	**Cabot Woods Fishing Access**	**New field site map, updated inventory and, description of how the bypass can be accessed from this site.**
24	**Turners Falls Canoe Portage**	**Review of portage operations and updated portage description.**
25	**Poplar Street Access Site**	**New field site map, updated inventory, and condition assessment.**
26	**Turners Falls Dam Downstream Put-in**	**Completed inventory data form, and assessed to prepare field site map.**
27	**Rose Ledge Climbing Area**	**Completed inventory data form, and assessed to prepare field site map.**
28	**Farley Ledge Climbing Area**	**Completed inventory data form, and assessed to prepare field site map.**

Sites in bold are those sites for which FERC's ISR Determination Letter specifically requested new or updated information.

3.6.2-Recreation Facilities Inventory and Assessment Addendum

- 28 Recreation Sites Inventoried.
- 10 Project Recreation Sites (Commission Approved).
- Remaining 18 Sites include both formal (improved) and informal (unimproved) recreation sites and access areas.
- Of the 10 Project Recreation Sites (Commission approved):
  - 5 were approved as part of the Northfield Mountain Exhibit R in 1977.
  - 1 was approved as part of the Northfield Mountain Revised Exhibit R in 2003.
  - 4 were approved as part of the Turners Falls Exhibit R in 1982.



SITE ID	SITE NAME
1	Governor Hunt Boat Launch/Picnic Area
2	Ashuelot River Informal Campsite
3	Fort Hill Rail Trail Parking
4	Pauchaug Wildlife Management Area
5	Pauchaug Boat Launch
6	Schell Bridge Informal Site
7	Informal Multi-Use Site
8	Bennett Meadow Wildlife Management Area
9	Munn's Ferry Boat Camping Recreation Area
10	Informal Munn's Ferry
11	Boat Tour and Riverview Picnic Area
12	Northfield Mountain Tour and Trail Center
13	Northfield Connector Bikeway
14	Cabot Camp Access Area
15	Barton Cove Nature Area and Campground
16	Barton Cove Canoe and Kayak Rental Area
17	State Boat Launch
18	Canalside Trial Bike Path
19	Unity Park
20	Gatehouse Fishway Viewing Area
21	Turners Falls Branch Canal Area
22	Turners Falls No. 1 Station Fishing Access
23	Cabot Woods Fishing Access
24	Turners Falls Canoe Portage
25	Poplar Street Access Site
26	Turners Falls Dam Downstream Put-in
27	Rose Ledge Climbing Area
28	Farley Ledge Climbing Area

3.6.3-Whitewater Boating Evaluation

Work Completed

Task 1: Develop Boating Evaluation Protocol, Logistics and Schedule
Task 2: On-Water Boating Evaluation
Task 3: Identify and Evaluate Access to the Turner Falls Bypass Reach
Task 4: Data Review and Analysis
Task 5: Report Development

- All of the above tasks are complete. Report posted to website on 3/31/15 and filed with FERC on 9/14/15.

Findings

- See next pages.

Variances

- "Photograph/Videotape Coverage Locations" component of Task 1 of the Modified RSP:
  - FirstLight originally proposed a site near the Turners Falls Road Bridge. Based on discussions with the boater stakeholders at the July 1, 2014 consultation meeting, this site was eliminated and replaced with a site at the Gill-Montague Bridge near Turners Falls Dam.

Work Remaining

- None.

3.6.3-Whitewater Boating Evaluation

Methodology

- Five specific tasks:
  - Boating evaluation protocol, logistics and schedule development
  - On-Water Boating Evaluation
  - Identification and Evaluation of Access to the Turners Falls
  - Data Analysis
  - Report Preparation
- Whitewater experience evaluated for 6 flows: 2,500, 3,500, 5,000, 8,000, 10,000, and 13,000 cfs.
- Variety of watercraft included: hard shell kayaks, solo open canoes (OC1), solo closed canoes (C1), tandem closed canoes (C2), rafts, cataraft/shredders, and a stand up paddle board (SUP).
- 42 participants, of various levels of boating experience, rated the flows and boating experience.
- After each test flow, participants completed a “Single Flow Evaluation Form”.
- After the final run, participants completed the “Comparative Flow Evaluation Form”.
- Post-Evaluation Discussion was collected to identify additional input from the boaters regarding the bypass reach whitewater opportunities.

3.6.3-Whitewater Boating Evaluation

Findings: Assessment of Whitewater Boating Opportunities in the Bypass Reach

- The reach was found to provide an acceptable boating experience for most watercraft types at all six of the study flows; participant evaluations showed varied acceptable and optimal flows:
  - Minimum flow varied by watercraft, from 2,500 to 5,000 cfs.
  - Optimal flow also varied by watercraft, from 3,500 to 10,000 cfs.
  - Overall, flows in the range of 5,000 to 8,000 cfs provided optimal boating conditions for most watercraft types.
- Both lower and higher flows rated well with the participants, although the ratings were dependent on type of watercraft and skill level.

Bypass Reach Flow Suitability by Watercraft

Watercraft	Flow 1 2,500 cfs	Flow 2 3,500 cfs	Flow 3 5,000 cfs	Flow 4 8,000 cfs	Flow 5 10,000 cfs	Flow 6 13,000 cfs
Kayaks	Acceptable (0.60)	Acceptable (0.63)	Acceptable (1.27)	Totally Acceptable (1.67)	Acceptable (1.09)	Acceptable (1.18)
OC1	Acceptable (0.75)	Acceptable (1.00)	Acceptable (1.20)	Acceptable (1.25)	Acceptable (0.66)	Neutral (0.50)
Rafts	Unacceptable (-0.75)	Neutral (0.00)	No response	Acceptable (1.00)	Acceptable (1.10)	Acceptable (1.00)
C1/C2	Acceptable (1.50)	Acceptable (1.50)	Acceptable (1.00)	Totally Acceptable (2.00)	Acceptable (1.00)	Acceptable (1.00)
Cataraft/Shredder	No response	Acceptable (1.20)	Totally Acceptable (2.00)	Totally Acceptable (2.00)	Did not run	Did not run
SUP	Totally Acceptable (2.00)	Totally Acceptable (2.00)	Totally Acceptable (2.00)	Totally Acceptable (2.00)	Did not run	Did not run

Minimum Acceptable and Optimal Flow Compilation/Comparison

Watercraft	2,500 cfs		3,500 cfs		5,000 cfs		8,000 cfs		10,000 cfs		13,000 cfs	
	Min	Opt	Min	Opt	Min	Opt	Min	Opt	Min	Opt	Min	Opt
Kayak					✓					✓		✓
OC1	✓					✓						
Raft					✓		✓	✓				
C1/C2	✓			✓		✓						
Cataraft/Shredder			✓		✓	✓		✓				
SUP	✓							✓				

3.6.3-Whitewater Boating Evaluation

Findings: Assessment of Whitewater Boating Opportunities in the Bypass Reach

- The Turner Falls Dam bypass reach was rated as a Class I-IV whitewater run, although at most flows, the overall rating is Class II-IV.
- For most evaluation flows, the Class IV rating was attributed to a single natural feature, the Rock Dam.
- Overall, the results of the whitewater boating evaluation of the reach demonstrate that the bypass reach provides whitewater opportunities for a variety of watercraft and skill levels, over a range of flow conditions.
- Post-study discussion input suggests that other factors impact satisfaction with the bypass reach, including aesthetics. Several boaters indicated that the urban/industrial setting would deter recreational boaters.

Bypass Reach Flow Difficulty based on the International Scale of River Difficulty by Watercraft and Flow

Watercraft	Flow 1 2,500 cfs	Flow 2 3,500 cfs	Flow 3 5,000 cfs	Flow 4 8,000 cfs	Flow 5 10,000 cfs	Flow 6 13,000 cfs
Hard shell kayak	I to III	II to III	II to IV	II+ to IV	II to IV	I[5] to IV
Solo Open Canoe (OC1)	I to II	II to III+	II to IV	II to IV	III	III to IV
Raft	II to III	I to III	I to IV	II to III	I to III+	II to III
Closed canoe (C1 and C2)	II	II to II+	II to II+	II to III	II+ to III	III
Cataraft/Shredder	II	II to III+	II to III	II to III	Did not run	Did not run
Stand Up Paddle Board (SUP)	II to III	II to III	III	III	Did not run	Did not run
OVERALL RATING	I to III	II to III	II-IV	II to IV	II-IV	II-IV

Skill Level needed to Safely Paddle Bypass Reach

Level	2,500 cfs	3,500 cfs	5,000 cfs	8,000 cfs	10,000 cfs	13,000 cfs
Beginner	6 (22%)	3 (11%)	1 (4%)	1 (4%)	2 (6%)	2 (7%)
Novice	15 (56%)	14 (54%)	14 (56%)	7 (29%)	5 (16%)	6 (20%)
Intermediate	6 (22%)	9 (35%)	10 (40%)	14 (58%)	21 (68%)	18 (60%)
Advanced	0	0	0	2 (8%)	3 (10%)	4 (13%)
Expert	0	0	0	0	0	0

3.6.3-Whitewater Boating Evaluation

Findings: Demand for Whitewater Boating in the Bypass Reach

- At optimal flows of 5,000 – 8,000 cfs, boaters were fairly evenly divided among those who would "possibly", "probably", and "definitely" return.
- At minimum acceptable flows of 2,500 cfs, boaters were equally split between those that would "definitely not return" and those that would "possibly" or "probably" return.
- Some boaters indicated a lack of interest to return to the bypass due to factors including short run, lack of features, and availability of better regional opportunities.

Likelihood of Boaters to Return to Boat the Test Flows

All Boaters				
Likely to Return	**Definitely No**	**Possibly**	**Probably**	**Definitely Yes**
2,500, cfs	11 (42%)	7 (27%)	3 (12%)	5 (19%)
3.500 cfs	6 (23%)	10 (38%)	5 (19%)	5 (19%)
5,000 cfs	0	7 (33%)	7 (33%)	7 (33%)
8,000 cfs	1 (5%)	5 (24%)	8 (38%)	7 (33%)
10,000 cfs	1 (3%)	9 (31%)	7 (24%)	12 (41%)
13,000 cfs	2 (9%)	7 (30%)	4 (17%)	10 (43%)

3.6.3-Whitewater Boating Evaluation

Findings: Demand for Whitewater Boating in the Bypass Reach

- More than 60 regional whitewater boating opportunities that provide the same range of whitewater classifications (Class I to IV) were identified within a 50 mile radius of the Turners Falls Project.
- Many regional rivers provide longer whitewater stretches (4 to 30 miles) than the bypass reach (2.7 miles).
- Regional rivers provide a variety of natural flow and regulated spill release rivers.

Unregulated/Natural Flows

- Some regional boating rivers are dependent on natural flows, including the Turners Falls bypass reach.
- Natural flows provide seasonal whitewater boating opportunities, typically in the spring or fall, or after a heavy rain.

Scheduled Flow Release

- Several regional boating reaches provide scheduled flow releases.
- These scheduled releases provide regulated flow throughout the recreation season, including on weekends and during summer.
- Locations that provide scheduled whitewater boating releases include the Deerfield, West, and Millers Rivers.
- The Deerfield River provides approximately 106 scheduled boating flows, annually.

3.6.3-Whitewater Boating Evaluation

Findings: Demand for Whitewater Boating in the Bypass Reach

- 11 regional rivers within a 40 mile radius of the Turners Falls bypass reach were identified for comparison.
- The bypass reach provides an average to slightly better than average whitewater opportunity in comparison to other local and regional opportunities of similar difficulties.
- Survey results suggest that the overall appeal of the bypass reach is impacted based on the short length of the boating run (2.7 miles), the urban setting, and the lack of information of spills.
- When evaluating the overall boating experience including suitability and characteristics of boating features, ratings indicate that almost all of the regional rivers are slightly more desirable than the bypass reach. Numerous regional whitewater boating opportunities, that are available as a result of scheduled releases, or seasonally, provide as good or better whitewater opportunities for boaters of all skill levels.

Overall, regional opportunities appear to be sufficient to meet current demand, based on the boaters' ratings of the comparability of these other rivers to the Turners Falls bypass reach.

Bypass Comparison to Rivers/Boating Opportunities of Similar Difficulty

	Other rivers w/in a 1 hour drive	Other rivers in Massachusetts	Other rivers in the northeast	Other rivers in the country
Kayak	Better than average (0.64)	Average (0.46)	Average (0.00)	Average (-0.21)
Open canoe	Average (0.00)	Average (0.00)	Average (-0.13)	Average (-0.25)
Raft	Better than average (0.67)	Average (0.47)	Average (0.00)	Worse than average (-0.54)
Closed canoe	Average (0.00)	Average (0.00)	Average (0.00)	Average (0.00)
Cataraft/Shredder	Average (0.40)	Better than average (1.00)	Average (0.00)	Average (-0.25)
SUP	Average (0.00)	Average (0.00)	Average (0.00)	Average (0.00)

3.6.3-Whitewater Boating Evaluation

Findings:
Whitewater Boating Flow Analysis

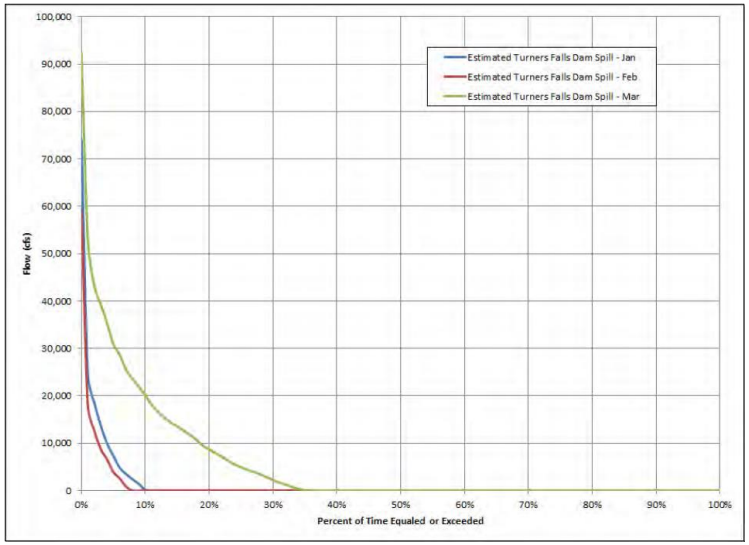
- Based on the river hydrology assessment, acceptable boating flows typically occur an estimated 40-45 days between April and November.
  - Approx. 45 days exceeding acceptable boating flows (2,500-3,500 cfs)
  - Approx. 40 days exceeding optimal boating flows (5,000-8,000 cfs)
- Analysis was conducted to estimate flows at the Turner Falls Dam using long term records (1940-2013) from USGS gauges along the Connecticut River.
  - USGS gauges include Gauge No. 01170500 at Montague City, MA, and 01170000 near West Deerfield, MA.
- Spill duration curves demonstrate that boatable flows >2,500 cfs can and do occur in the bypass reach year round, with the highest incidence of boating opportunities occurring in the spring (March through May).
- Boatable flows occur in the spring
  - Approx. 74% of the time in April
  - Approx. 38% of the time in May

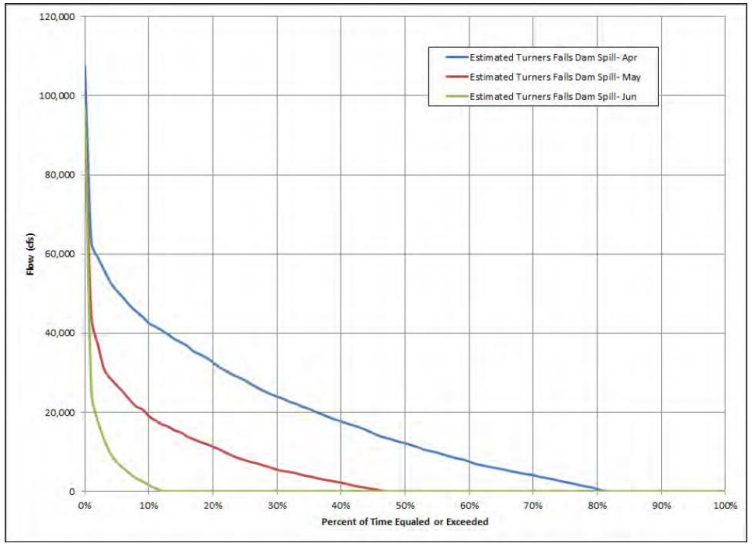
Percentage by Month and Estimated Number of Days Spill Flows Equal or Exceed Boating Evaluation Flows

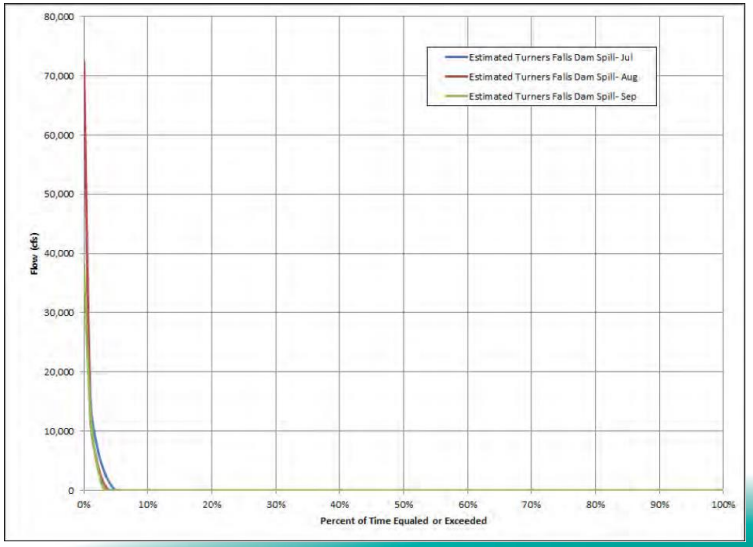
Month	Flows Evaluated during the July 2014 Bypass Reach Whitewater Boating Study					
	2,500 cfs		5,000 cfs		10,000 cfs	
	Percent of Time	Estimated Days	Percent Exceeded	Estimated Days	Percent Exceeded	Estimated Days
January	7%	2	5%	2	4%	1
February	6%	2	4%	1	2%	<1
March	29%	9	24%	7	18%	6
April	74%	22	66%	20	54%	16
May	38%	12	31%	10	21%	7
June	8%	2	6%	2	3%	1
July	3%	1	2%	1	1%	<1
August	2%	1	2%	1	1%	<1
September	2%	1	2%	1	1%	<1
October	8%	2	6%	2	4%	1
November	12%	4	9%	3	4%	1
December	17%	5	14%	4	10%	3

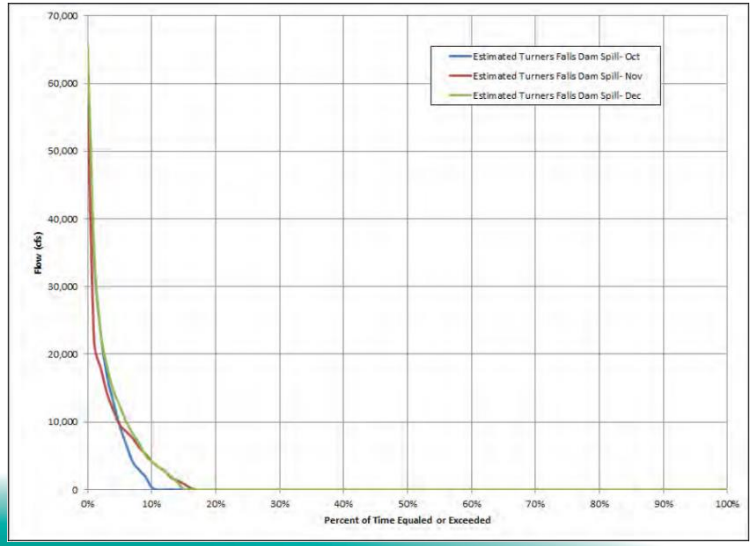
3.6.3-Whitewater Boating Evaluation

Turners Falls Dam Spill into Bypass Reach – Seasonal Spill Duration Curves (1940-2013)



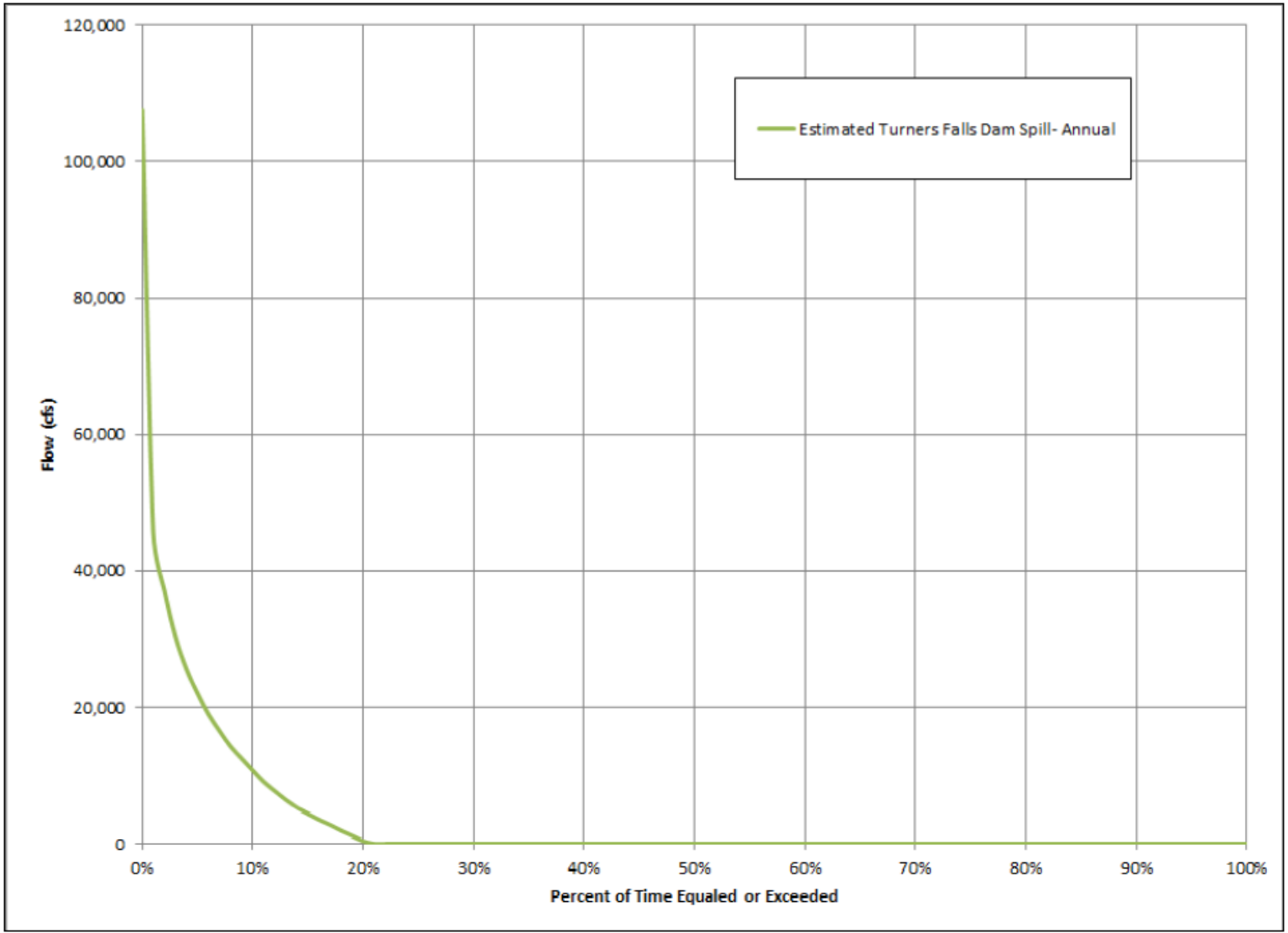






3.6.3-Whitewater Boating Evaluation

Turners Falls Dam Spill into Bypass Reach – Annual Spill Duration Curve (1940-2013)



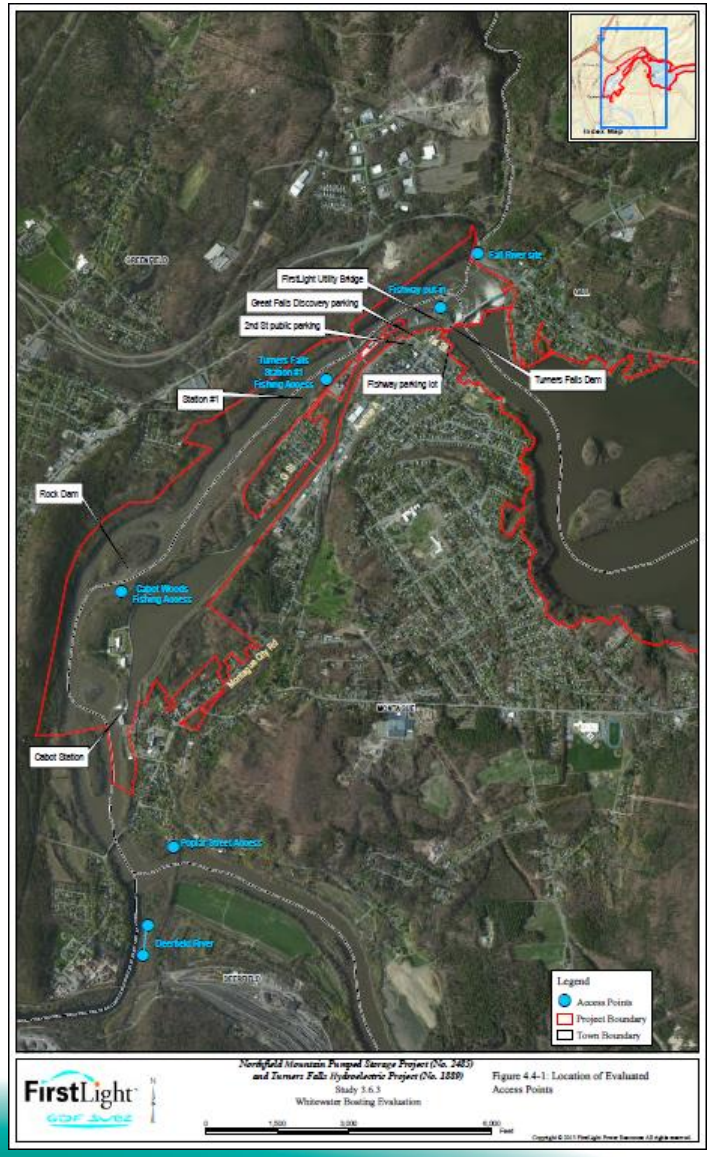
3.6.3-Whitewater Boating Evaluation

Findings: Bypass Reach Access

- Three existing access points into the bypass reach include the fishway put-in (RM 20.2), Turners Falls Station No. 1 Fishing Access (RM 20.9), and Cabot Woods Fishing Access (RM 22.0).
- Both the fishway put-in and Turners Falls Station No. 1 Fishing Access are suitable for whitewater boating use and reach access.
- Cabot Woods Fishing Access is not suitable as a boating access due to steep slopes and in-water safety concerns.
- The Poplar Street Access, downstream of the bypass was the take-out location during the July 2014 evaluation. 91% of participants rated access as moderate/difficult.

Turners Falls Bypass Reach Put-in and Take-out Ratings

Fishway Put-in Rating							
	Kayakers	OC1	Raft	C1/C2	Cataraft/Shredder	SUP	Totals
Easy	56	26	27	6	7	4	126 (85%)
Moderate	1	5	7	5			18 (12%)
Difficult	2				2		4 (3%)
Poplar Street Access (Take-out) Rating							
	Kayakers	OC1	Raft	C1/C2	Cataraft/Shredder	SUP	Totals
Easy	4	3	5		2		14 (9%)
Moderate	37	11	15	1	1	3	68 (44%)
Difficult	17	20	15	11	7	1	71 (46%)



3.6.3-Whitewater Boating Evaluation

Conclusions:

The final results of the whitewater boating evaluation demonstrate that the current bypass reach provides adequate whitewater boating opportunities for a variety of watercraft and skill levels, and in conjunction with the abundance of regional whitewater boating opportunities, there is no significant demand for increased whitewater boating opportunities in the bypass reach.

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

Work Completed

Task 1: Literature Review
Task 2: Field Work
Task 3: Report Preparation

- All of the above tasks are complete. Report posted to website on 3/31/15 and filed with FERC on 9/14/15.

Findings (if any)

- See next pages.

Variances (if any)

- None.

Work Remaining

- None.

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

Methodology

- Literature review:
  - Internet and literature search providing information regarding the Connecticut River Trail, facilities, access and use of the Connecticut River through the Projects' areas.
- Field work:
  - Collection of existing data, such as municipal property records reviewed to determine general land ownership adjacent to study area.
  - Field work occurred and was completed on August 28-29, 2014.
  - Representatives from AMC, CWRC, and Northfield Open Space Committee participated in field work on one or both days.
  - Field work included:
    - Boating shorelines of study area.
    - Ground-verifying location of existing and potential use and access sites, including those identified in the "MA-CT Expansion Feasibility Study".
    - Investigating areas where potential canoe portage trails may be beneficial to paddlers.

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

Existing Campsites and Access Sites within the Study Area

Site Name/ Designation	Facilities/ Amenities	Location[9]	Access and/or Camping	Ownership[10]	Located w/in Project[11]
Governor Hunt Boat Launch/ Picnic Area[13]	Hard surface boat launch	RM 0.1 River right	access	TransCanada	Partially
Stebbins Island	Water access camping	RM 1.1 island	camping	TransCanada	Yes
Pauchaug Boat Launch	Hard surface boat launch	RM 6.5 River left	access	Commonwealth of MA.	Yes
Munn's Ferry Boat Camping Recreation Area	5 water access campsites, dock	RM 11.5 River left	camping	FirstLight	Yes
Boat Tour and Riverview Picnic Area	Picnic area, pavilion, tour boat dock,	RM 14.7 River left	access	FirstLight	Yes
Cabot Camp Access Area	Parking	RM 16.2 River left	access	FirstLight	Yes
Barton Cove Nature Area & Campground	Carry-in access, campsites	RM 18.3 River right	access & camping	FirstLight	Yes
Barton Cove Canoe & Kayak Rental	Carry-in access	RM 19.6 River right	access	FirstLight	Yes
State Boat Launch	Hard surface boat ramp	RM 19.6 River right	access	Commonwealth of MA.	Partially
Poplar Street Access	Parking, steep unimproved path to shoreline	RM 23.5 River left	access	FirstLight	No
Sunderland Bridge Boat Launch	Unimproved boat launch	RM 32.5 River left	access	Maintained by Town of Sunderland	No
Sunderland Bridge access	Parking and foot path to river	RM 32.5 River right	access	Within State right-of-way	No

Findings: Existing Campsites and Access Sites

- Sites within the study area:
  - 2 formal campsites and 6 access sites owned and operated by FirstLight within the Project boundary.
  - 1 formal campsite and 1 access site either partially or wholly within the Project boundary owned and operated by TransCanada.
  - 3 access sites and no campsites in the 9.5 mile reach below the Project.

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

Findings: Determining Necessity of Future Campsites and Access Facilities

- FirstLight's campground records show the maximum occupancy that has occurred in the past five years:
  - 56.4% at Munn's Ferry
  - 67.4% at Barton Cove
- Significant surplus capacity throughout the camping season at both campgrounds.

Occupancy Rates for FirstLight Managed Project Campgrounds

Year	Munn's Ferry (Memorial Day weekend – Columbus Day weekend)		Barton Cove (Group sites – Memorial Day weekend – 3rd weekend in November; Individual sites – Memorial Day weekend – Labor Day weekend)	
	Weekday	Weekend	Weekday	Weekend
2014	5.1%	30.2%	8.4%	37.6%
2013	4.2%	28.4%	9.1%	39.2%
2012	9.6%	31.1%	13.6%	50.7%
2011	12.7%	56.4%	13.6%	55.8%
2010	14.3%	38.6%	15.0%	67.4%

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

Findings: Determining Necessity of Future Campsites and Access Facilities

Water Trail Guidelines for Campsite and Access Site Spacing	Current Spacing

• Water trail spacing guidelines vary considerably, and range from 3-15 miles for campsites, and 4-10 miles for access sites.
• FCRPT Connecticut River Paddlers' Trail Management Protocol and Stewardship Guidelines recommendations:
  • Access spacing: 5-10 miles for ideal spacing of access points.
  • Campsite spacing: No recommendation noted in guidelines. Short-term goal is 15 mile spacing.
	• Spacing between access points:
	  • Between 1.3 and 9 miles apart.
	  • Consistent with other water trails spacing.
	  • Consistent with FCRPT's "ideal" spacing of access every 5-10 miles.
	• Spacing between campsite facilities:
	  • Between 6.8 and 10.4 miles apart.
	  • Consistent with campsite spacing on other water trails.
	  • Consistent with FCRPT's short term goal of 15 mile spacing between campsites.

- The field assessment identified 8 additional possible locations for campsites and 7 additional possible locations for access sites within the study area, should it be determined that additional camping or access sites are needed in the future due to an increase in demand or a change in spacing requirements for the river trail system.

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

Findings:
Canoe Portage Trail Assessment

- Existing vehicle portage shuttle provided by FirstLight provides adequate portage around Turners Falls Dam.
  - Telephone number provided for pick up.
  - Portage provided within 15-90 minutes.
  - Take-out is at Barton Cove Rental Area.
  - Put-in is approx. 3.5 miles downstream of Turners Falls Dam at Poplar Street Access site.
  - Free, as-needed service.
- Feasibility of hand-carry canoe portage analyzed.
  - Identified Canalside Trail Bike Path (Route A) as the best alternative route, to minimize use of dangerous public streets.
    - Length of route: 3.08 miles total, with 0.37 miles on public side streets.
  - Alternative route on southerly end (Route A-1) would utilize side streets from Depot Street to the Poplar Street Access.
    - Length of route: 3.17 miles total, with 0.80 miles on public side streets.
  - Improvements would be needed to allow use of either hand-carry portage trail option.

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

Conclusions:

- *Existing campsites and access sites provide adequate overnight and day use facilities based on both spacing considerations and existing use and demand.*
- *If demand for campsites or access increases in the future or there are changes regarding river trail system spacing goals, the study has identified a number of possible locations for development of additional access or campsites.*
- *Currently, the collected data confirms that there is no necessity for additional facilities to be developed.*
- *The study identified a feasible hand-carry portage route utilizing the Canalside Trail Bike Path that could serve as walkable canoe portage trail, although the existing vehicle portage shuttle provides adequate portage around the Turners Falls Dam.*

3.6.5-Land Use Inventory

Study Progress

Task 1: Literature and Aerial Photography Review

- Reviewed and consolidated data from the National Land Cover Database and MassGIS into eight potential land use classifications.
- Aerial photography review is complete.
- Areas unclear in aerial photography were ground-truthed to verify appropriate land use classification.
- Reviewed available open space plans, master plans and applicable development plans.
- Contacted the towns of Erving, Gill, Greenfield, Montague, Northfield, Hinsdale and Vernon to confirm proper plans were obtained and reviewed.
- Existing conservation easements within 200 feet of the Project boundaries have been identified.

Task 2: Development and Application of Land Use Designations

- Land use classifications have been developed.

Task 3: Map and Summary Development

- Preliminary land use maps have been developed.

3.6.5-Land Use Inventory

Findings (if any)

- None to report at this time.

Variances (if any)

- None.

Work Remaining

- Continue to refine the land use maps based on information from other relicensing resource studies such as delineated wetlands and plans that were reviewed as part of task 1.
- Report is under development and anticipated to be completed by 12/31/2015.

3.6.6-Assessment of Effects of Project Operation on Recreation and Land Use

Study Progress

Task 1: Data Compilation

- Completed applicable studies include: Recreation Facilities Inventory and Assessment (Study No. 3.6.2), Recreation Facilities Inventory and Assessment Addendum (Study No. 3.6.2), Whitewater Boating Evaluation (Study No. 3.6.3), Assessment of Day Use and Overnight Facilities Associated with Non-Motorized Boats (Study No. 3.6.4), Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use (Study No. 3.6.7),and Hydraulic Study of Turners Falls Impoundment, Bypass Reach and below Cabot Station (Study No. 3.2.2).

- Analysis will also be based on data from other pertinent relicensing studies, including Recreation Use/User Contact Survey (Study No. 3.6.1), Two-Dimensional Modeling of the Northfield Mountain Pumped Storage Project Intake/Tailrace Channel and Connecticut River Upstream and Downstream of the Intake/Tailrace (Study 3.3.9), and Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability (Study No. 3.1.2).

Task 2: Data Analysis

- Data and information applicable to the assessment of Project operational effects on recreation facilities and land use are being reviewed as various studies progress and are completed.

Task 3: Report Development

- Report is anticipated to be completed by 6/30/2016.

3.6.6-Assessment of Effects of Project Operation on Recreation and Land Use

Findings (if any)

- None to report at this time.

Variances (if any)

- None to date.

Work Remaining

- Completion of data compilation, data analysis and report development will occur as results from supporting studies become available.

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

Study Progress

Task 1: Review of Existing Information
Task 2: Field Work
Task 3: Desktop Analysis
Task 4: Report Development

- All of the above tasks are complete. Report posted to website on 6/30/2015 and filed with FERC on 9/14/2015

Findings (if any)

- See next pages.

Variances (if any)

- None to report.

Work Remaining

- None.

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

Findings: Northfield Mountain Tour and Trail Center (NMTTC)

The NMTTC is a four-season facility that provides a wide variety of opportunities, programs and amenities.

- Physical features and amenities include:
  - Visitor Center: interpretive displays, meeting rooms, cross-country ski rentals, a lounge, public restrooms.
  - Trail System: approximately 25 miles of trail used for hiking, mountain biking, equestrian use, snowshoeing and cross-country skiing.
  - Parking: paved area for approximately 53 vehicles. Overflow is provided on nearby mowed area. Horse trailers and buses utilize the cul-de-sac on the west side of the Visitor Center for parking.
  - Mountain Top Observation Area: wooden platform which provides views of the Upper Reservoir from the southern shore.
  - Additional amenities: picnic tables, grills, informational kiosks , and a yurt.
- Visitor Center offers a variety of public and school programs

- Recreation facilities and programs managed from the NMTTC include:
  - Munn's Ferry Boat Camping Recreation Area and camping at Barton Cove Nature Area and Campground;
  - the Quinnetuckut II ticket sales; and
  - the Gatehouse Fishway Viewing Area.

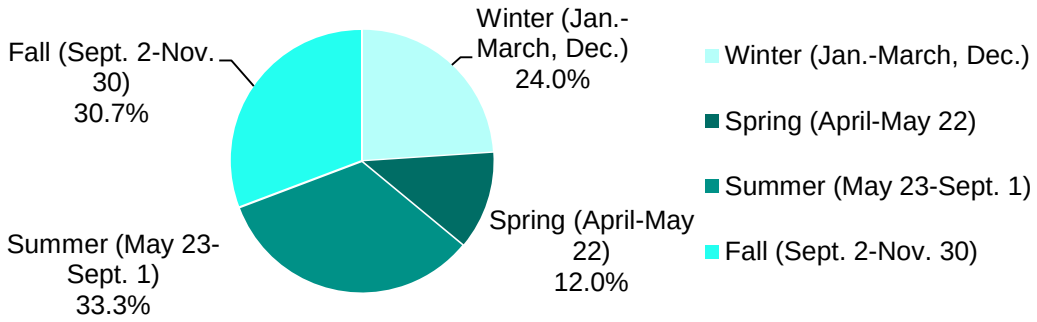
3.6.7-Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use

Findings: Northfield Mountain Tour and Trail Center (NMTTC)

Recreation Use of the NMTTC

- The NMTTC supported an estimated 20,024 recreation days in 2014.

Recreation Usage by Season



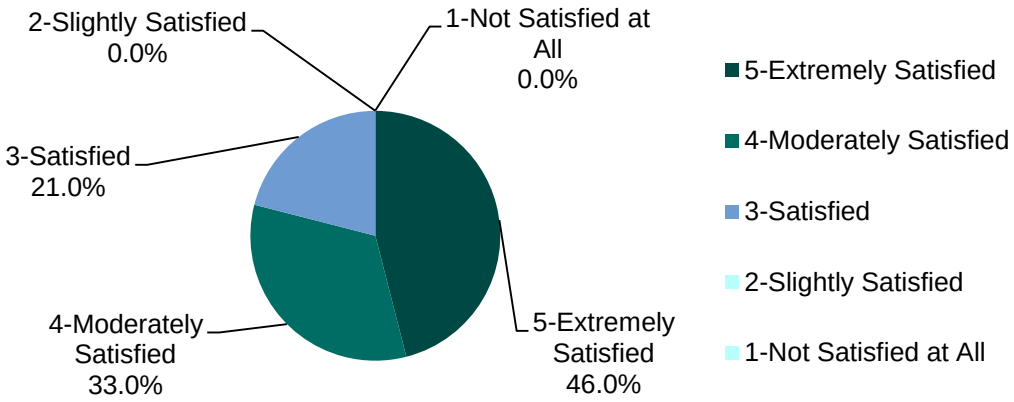
- Use of the NMTTC fell into three broad categories:
  - registered program use (includes registrants for environmental programs, recreation programs and ticketed cross-country skiers and snowshoers): data derived from records maintained by staff.
  - trail use during the Visitor Center's open times (non-ticketed trail users): data derived from records maintained by staff.
  - trail use during the Visitor Center's closed times: data derived from parking lot spot counts and calibrations.

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

Findings: Northfield Mountain Tour and Trail Center (NMTTC)

- Visitors were asked beginning in late August to rate their overall satisfaction on a scale of 1 (“not satisfied at all”) to 5 (“extremely satisfied”) with the available recreation facilities at the NMTTC.

Visitor Overall Satisfaction with Available NMTTC Recreation Facilities



- Visitors were requested to rate certain amenities and aspects of the NMTTC on a scale of 1 (“poor”) to 5 (“excellent”). 94% of respondents rated “parking” as a 4 or 5. 93% of respondents rated the “facility condition” and “toilets/restrooms” as a 4 or 5.
- Visitors were asked if the NMTTC amenities serve their interest. Of the visitors who responded 96% responded “yes” while only 4% responded “no”.

Overall, visitors were satisfied with available programs and amenities.

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

Findings: NMTTC Recent Historic Use

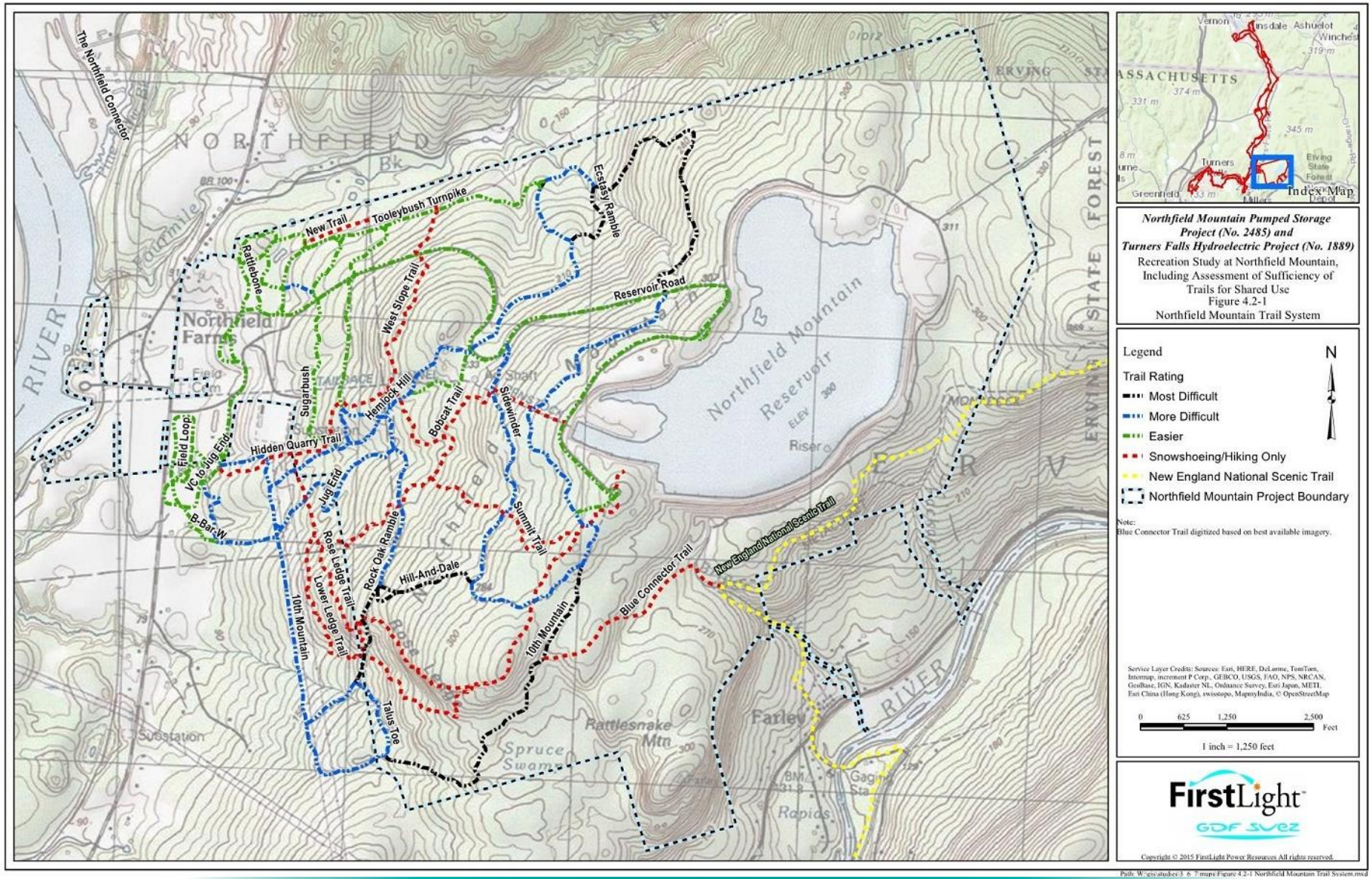
- Registration data for NMTTC program use and trail use was compiled for the period 2010-2014 and 2005.
- Average number of registrants over the five-year period from 2010 to 2014 was 20,430, which is 6% lower than 2014 use.
- Total registrations for NMTTC programs and trail use was highest in 2012; much of the increase was associated with a large cross-country meet.
- 2010 experienced the lowest use in terms of registrations. This is attributable to the fact that recreation areas adjacent to the Upper Reservoir were temporarily closed while the Project was out of service from early May to mid-November.

NMTTC Program/Activity Registration Data

Event	2005	2010	2011	2012	2013	2014	2010-2014 Average
Participants in Environmental Programs	3,064	2,828	2,534	2,998	2,167	3,623	2,830
Riverboat Passengers	5,718	3,530	1,239	2,722	2,748	2,733	2,594
Skiers/Snowshoers	3,578	1,910	4,775	484	2,434	2,922	2,505
Trail Use	9,433	548	6,322	16,060	7,484	7,398	7,563
Fishway Tours	4,845	5,183	4,464	5,221	4,760	5,061	4,938
Total	26,638	13,999	19,334	27,485	19,593	21,737	20,430
Note: The figures here do not include use occurring when the NMTTC was closed.							

Use of the NMTTC has remained relatively consistent in the near term.
Use of environmental programs, the Quinnetuckut II and tours of the Turners Falls Fishway has seen a downward trend when viewing long-term use data.

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



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

Findings: NMTTC Trail System

- The trail system supports a variety of uses such as for hiking, mountain biking, equestrian use, snowshoeing and cross-country skiing.
- Trails are a mix of organic materials and gravel.
- Maintenance is on-going and are conducted on an as-needed basis.
- General assessments of the trail system are completed in spring, July and in fall. Winter maintenance includes grooming of cross-country ski trails for both classical and free-style skiing when snow conditions permit.
- An active tree program targets potential hazard trees and removes them as necessary.

Results of Trail Survey

- Rapid assessment of entire trail system (including Blue Connector and portion of the New England National Scenic Trail.)
- Trails and trail segments were selected for more detailed observation based on steep slopes, observed drainage concerns/erosion, alignment issues, and trails requiring more frequent maintenance.
- Ski trails can support mountain biking and horseback riding.
- Long-term sustainability could be improved by implementing measures to address a few areas of drainage and erosion issues.

Overall, the trail system is well designed, well maintained and in good condition.

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

Findings: NMTTC Trail System

Trail Use

- The trail system saw an estimated 16,123 recreation days in 2014.
- Visitors were asked their opinions of the NMTTC Trail system

User Opinions on the NMTTC Trail System

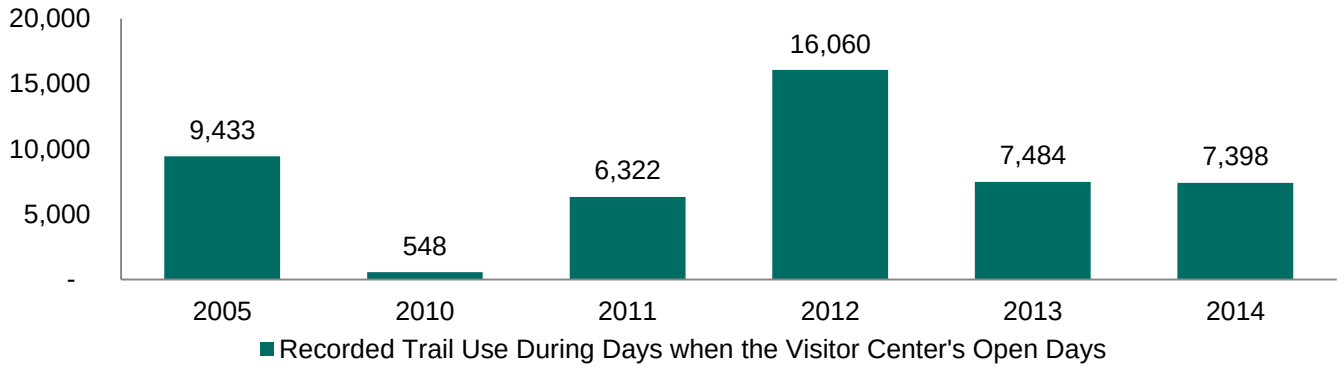
Variable (Total Responses)	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Trails are in good condition (90)	50%	44%	3%	2%	0%
Trails are well maintained (89)	52%	43%	4%	1%	0%
Trails are too steep (88)	1%	3%	14%	49%	33%
Trails are too flat (88)	0%	1%	10%	51%	38%
More trails are needed (88)	1%	11%	26%	44%	17%
There is an appropriate mix of easy, moderate, difficult trails (87)	42%	51%	6%	1%	0%
Winter trail grooming is sufficient (68)	54%	31%	10%	4%	0%
Trail signage/markings are adequate (86)	35%	47%	6%	9%	3%
Trailhead parking is sufficient (87)	39%	53%	2%	5%	1%
Trail surface material is adequate (86)	36%	48%	16%	0%	0%
Hours of operation are adequate (26)	42%	54%	4%	0%	0%
Note: Figures may not total to 100% because of rounding.					

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

Findings: NMTTC Trail System

Historic Trail Use

- Trail use has remained relatively consistent over the 2010 to 2014 period when considering for special events and closures.



Existing Hiking and Mountain Bike Trails in the Northfield Mountain Area

- 133 properties with hiking and/or mountain biking opportunities within 25 miles of the NMTTC.
- 64 provide both hiking and mountain bike trails.
- 62 provide only hiking trails.
- 7 provide only mountain bike trails.
- Owned and managed by various federal and state agencies, municipalities, land trusts and other non-profit organizations, colleges, universities, land management companies, and private landowners.

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

Conclusion

NMTTC

- The NMTTC is a well-utilized regional recreation resource with a wide variety of opportunities, programs and amenities.
- Surveyed visitors were overwhelmingly satisfied with the amenities provided at the NMTTC.
- With exception of special circumstances, total recreation use associated with the NMTTC has remained relatively consistent over the past five years (2010-2014).
- Over the longer term, environmental program use, QII use, and fishway viewing tour use have declined since the 1980s.
    - Declines are not a result of reduced program offerings, which have remained constant or increased slightly since 2001.
- The results of the recreation user survey and analysis demonstrate that the NMTTC and related program offerings are meeting or exceeding area recreation needs.

Northfield Mountain Trail System

- Trail System supports cross-country skiing, snowshoeing, hiking, biking, and horseback riding.
- Vast majority of visitors to the Trail System are very satisfied with the number of trails and difficulty of the trails.
- Overall the Trail System is well designed, well maintained and in good condition.
- A few areas were identified where measures could be implemented to improve long-term sustainability of trails.
- Though designed for hiking and cross-country skiing, the cross-country ski trail system is well adapted to handle mountain biking and can accommodate horseback riding use while remaining in good condition.
- There are ample hiking and mountain biking opportunities in the area, which are supplemented by the NMTTC Trail System.

Cultural Resources

3.7.1-Phase 1A, 1B, and II Archaeological Surveys

Study Progress

- Completion of Phase IA (Reconnaissance) Archaeological Survey Reports.
  - Two study reports were generated from the study: one combined both the Vermont and New Hampshire portions of the Project; a separate report focused on the Massachusetts portion of the Project.
  - The reports included a summary of background research, precontact and historic contexts for the Project environs, a description of the sensitivity model, methods and results of Phase IA reconnaissance survey, maps of the APE, and recommendations for future Phase IB (Intensive) archaeological surveys, in the event that it is determined that any observed erosion is Project-induced, or that there are other Project-related effects.
  - Background research (completed in 2014) identified 73 previously recorded archaeological sites in the APE: 71 in Massachusetts, 2 in Vermont, none in New Hampshire.
  - Field reconnaissance (conducted in July 2014) recorded three previously recorded precontact period sites and six previously unrecorded archaeological sites in the Project APE.
  - The Phase IA (Reconnaissance) reports were issued to MA, VT, and NH SHPOs and filed with FERC in December 2014.
  - In February 2015, FL received report review letters from NH and MA SHPOs concurring with recommendations for Phase IB (Intensive) archaeological surveys in segments identified as sensitive for archaeological resources. No review report letter was received from the VT SHPO. In April 2015, the Stockbridge-Munsee Tribal Historic Preservation Office commented it wished to continue consultation and receive future survey reports.

3.7.1-Phase 1A, 1B, and II Archaeological Surveys

Variances (if any)

- No variances from the study plan or schedule have been identified since the publication of the ISR in September 2014.

Work Remaining

- Conduct possible Phase IB (Intensive) archaeological surveys, followed by possible Phase II (Site Examination) NRHP evaluation studies, as determined appropriate based on FERC and SHPO consultation and their comments on the Phase IA Reconnaissance reports.

3.7.2-Survey and Evaluation of Historic Architectural Resources

Study Progress

- FERC has defined the Area of Potential Effects (APE) for the Project in consultation with SHPOS from MA, VT and NH, Narragansett Indian Tribe, and The Nolumbeka project. (November 27, 2013)
- TRC, on behalf of FL, conducted field surveys to document all resources 50 years or older within the APE. (March 2014 and July 2015).
- Reports were completed and filed with the SHPOs from MA, VT, and NH and FERC on December 31, 2014.

Findings (if any)

- The historic architectural survey report with NRHP recommendations, historic context, maps, and state survey forms was submitted to Massachusetts SHPO (MHC) and Vermont SHPO (VDHP) on December 31, 2014.
- VDHP has concurred with findings that no historic properties are located in Vermont portion of APE (March 2015).
- MHC responded (January 2015) with request for additional information. FL conducted additional research and fieldwork in May-July 2015 and will submit revised report/survey forms to MCH and FERC in 4th Quarter of 2015.
- The NH required-Project Area Form was submitted to New Hampshire SHPO (NHDHR) on December 31, 2014. NHDHR has concurred with findings of Project Area Form and that no further evaluation or study is necessary (July 2015).

Variances (if any)

There were no variations from the FERC-approved study plan.

Work Remaining

Submit revised architectural survey report and survey forms to MHC and FERC by 12/31/2015.

3.7.3-Traditional Cultural Properties Study

Study Progress

- FL completed a Traditional Cultural Properties Study Report in March 2015.
- The report included background research that was undertaken to identify Traditional Cultural Properties.
- Background research identified one NRHP listed TCP with the Project vicinity – the Turners Falls Sacred Ceremonial Hill Site, located at the Turners Falls Municipal Airport.
- No NRHP listed TCPs were identified in the Project APE.
- The report noted that field work and interviews to document and evaluate potential TCPs had not taken place, because FL has been unable to schedule meetings with the NIT and the Nolumbeka Project despite a number of requests to them.
- A letter to FERC from Mr. Joe Graveline of the Nolumbeka Project dated April 29, 2015 offered comments on the report, and offered to conduct a field visit of TCPs located on the Wissatinnewag property that was claimed to be located within the Project APE.
- FL responded to FERC and the Nolumbeka Project in a letter dated June 9, 2015 accepting the offer to walk the Wissatinnewag property but noted that the property is located outside of the Project APE. There has been no further communication from the Nolumbeka Project.

Variances (if any)

- The schedule for the FERC-approved Study Plan has not been met because it has not been possible to document TCPs with the NIT.

Work Remaining

- Tasks 2 (Tribal Consultation and Documentation of TCPs) and 4 (Field Visit) will be conducted if the NIT participates in the FERC-approved TCP study.