Before the Federal Energy Regulatory Commission

Amended Final Application for New License for Major Water Power Project – Existing Dam

Northfield Mountain Pumped Storage Project (FERC Project Number 2485)

FirstLight

VOLUME I OF V (PUBLIC)

- **INITIAL STATEMENT AND ADDITIONAL INFORMATION**
- **VERFICATION STATEMENT**
- **EXHIBIT A- PROJECT DESCRIPTION**
- **EXHIBIT B- PROJECT OPERATIONS AND RESOURCE UTILIZATION**
- **EXHIBIT C- CONSTRUCTION HISTORY**
- **EXHIBIT D- STATEMENT OF COST AND FINANCING**
- **EXHIBIT G- PROJECT BOUNDARY MAPS**
- **EXHIBIT H- PLANS AND ABILITY OF APPLICANT TO OPERATE THE PROJECT**

DECEMBER 2020

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INITIAL STATEMENT PER 18 CFR § 4.51

Before the Federal Energy Regulatory Commission
Application for New License Major Water Power Project - Existing Dam

1. Northfield Mountain LLC (hereinafter referred to as FirstLight or Applicant) applies to the Federal Energy Regulatory Commission (Commission or FERC) for a new license for the existing Northfield Mountain Pumped Storage Project (Northfield Mountain Project), FERC Project Number 2485, as described in the attached Exhibits. The current license for the Northfield Mountain Project was issued on May 14, 1968 and expired on April 30, 2018. FirstLight is currently operating the Northfield Mountain Project under annual licenses.

2. The location of the Northfield Mountain Project is:

The structures associated with the Northfield Mountain Project are located in the towns of Northfield and Erving, MA. In addition, the Turners Falls Dam, which creates the Turners Falls Impoundment (the Connecticut River), serves as the lower reservoir for the Northfield Mountain Project. The Turners Falls Impoundment borders several towns including Gill, Montague, Northfield, and Erving, MA, with upper portions extending into Vernon, VT and Hinsdale, NH.

3. The exact name, address, and telephone number of the Applicant are:

FirstLight Power Services LLC
111 South Bedford Street, Suite 103
Burlington, MA 01803
Tel: 781-653-4247

The exact name, address, and telephone number of each person authorized to act as agent for the Applicant in this application are:

Mr. Justin Trudell
Vice President, Operations
Northfield Mountain LLC
111 South Bedford Street, Suite 103
Burlington, MA 01803
Tel: 781-653-4247
Email: justin.trudell@firstlightpower.com

Mr. Michael A. Swiger, Esq.
Ms. Julia S. Wood, Esq
Van Ness Feldman LLP
1050 Thomas Jefferson Street, NW
Seventh Floor
Washington, DC 20007
Tel: 202-298-1800
Email: mas@vnf.com
jsw@vnf.com

4. The Applicant is a domestic corporation and is not claiming preference under section 7(a) of the Federal Power Act, 16 U.S.C. 796.

5. There are no statutory or regulatory requirements of NH or VT that affect the project as proposed to continue to be operated with respect to bed and banks and to the appropriation, diversion, and use of water for power purposes, or with respect to the right to engage in the business of developing, transmitting, and distributing power or in any other business necessary to accomplish the purposes of the license under the Federal Power Act. The statutory or regulatory requirements of the Commonwealth of Massachusetts are:

- The Applicant must apply for a Water Quality Certification from the Massachusetts Department of Environmental Protection under Section 401 (a)(1) of the Clean Water Act.

(ii) The steps which the Applicant has taken or plans to take to comply with the regulations cited above are:

- The Applicant will submit a request for Water Quality Certification from the Massachusetts Department of Environmental Protection.

- FirstLight possesses the necessary riparian property rights to use the waters of the Connecticut River for power purposes.

6. FirstLight owns all of the existing Northfield Mountain Project facilities; there are no Federally owned or operated facilities associated with this application.

ADDITIONAL INFORMATION REQUIRED BY 18 C.F.R. § 5.18(A)

1. Identify every person, citizen, association of citizens, domestic corporation, municipality, or state that has or intends to obtain and will maintain any proprietary right necessary to construct, operate or maintain the project:

FirstLight has or intends to obtain and will maintain the proprietary rights necessary to operate and maintain the Northfield Mountain Project under the new license.

2. Identify (providing names and mailing addresses):

(i) Every county in which any part of the project and any Federal facilities that would be used by the project would be located;

Franklin County government in Massachusetts was abolished in 1997, although the county continues to exist as a geographical and political entity. County-wide comprehensive planning responsibilities are undertaken by the Franklin Regional Council of Governments (FRCOG). The FRCOG's offices are located at:

The Franklin Regional Council of Governments
12 Olive Street, Suite 2
Greenfield, MA 01301-3318

Upper portions of the Turners Falls Impoundment extend into the following Vermont and New Hampshire counties:

Windham County
P.O. Box 784
Brattleboro, VT 05302

Cheshire County
Administration
33 West Street
Keene, NH 03431

(ii) Every city, town, or similar local political subdivision:

i. In which any part of the Project, and any Federal facility that would be used by the project, would be located; or

Town of Erving
12 East Main Street
Erving, MA 01344

Town of Gill
325 Main Street
Gill, MA 01354

Town of Greenfield
14 Court Street
Greenfield, MA 01301

Town of Montague
1 Avenue A
Montague, MA 01376

Town of Northfield
69 Main Street
Northfield, MA 01360

Town of Vernon
567 Governor Hunt Road
Vernon, VT 05354

Town of Hinsdale
Town Hall
11 Main Street
Hinsdale, NH 03451

ii. **That has a population of 5,000 or more people and is located within 15 miles of the project dam.**

The following cities and towns each have a population of 5,000 or more people (2010 census data) and are located within 15 miles of the Turners Falls Dam:

Town of Amherst (population: 37,819)
Town Clerk
Town Hall
4 Boltwood Avenue
Amherst, MA 01002

Town of Greenfield (population: 17,456)
Town Clerk
14 Court Street
Greenfield, MA 01301

Town of Athol
(population: 8,265)
Town Clerk
584 Main Street, Suite 10
Athol, MA 01331

Town of Hadley (population: 5,250)
Town Clerk
100 Middle Street
Hadley, MA 01035

Town of Brattleboro (population: 7,414)
Town Clerk
230 Main Street, Suite 108
Brattleboro, VT 05301

Town of Montague (population: 8,437)
Town Clerk
One Avenue A
Turners Falls, MA 01376

Town of Deerfield (population: 5,125)
Town Clerk
8 Conway Street
South Deerfield, MA 01373

Town of Orange (population: 7,839)
Town Clerk
6 Prospect Street
Orange, MA 01364

(iii) Every irrigation district, drainage district or similar special purpose political subdivision (A) in which any part of the project is located, and any Federal facility that is or is proposed to be used by the project is located, or (B) that owns, operates, maintains, or uses any project facility or any Federal facility that is or is proposed to be used by the project:

There is no irrigation district, drainage district, or similar special purpose political subdivision in which any part of the Northfield Mountain Project is located or that owns, operates, maintains, or uses any project facility.

(iv) Every other political subdivision in the general area of the Project that there is reason to believe would likely be interested in, or affected by, the application.

There is no other political subdivision in the general area of the Northfield Mountain Project that there is reason to believe would be likely to be interested in, or affected by, this notification.

(v) All Indian tribes that may be affected by the Project.

Federally recognized tribes in Massachusetts include:

Wampanoag Tribe of Gay Head (Aquinnah)
Lee Ander Wander
Chief of Staff
20 Black Brook Road
Aquinnah, MA 02535-1546
cos@wampanoagtribe-nsn.gov

Mashpee Wampanoag Tribe
483 Great Neck Road
South Mashpee, MA 02649
trish.keliinui@mwtribe-nsn.gov

There are no federally recognized tribes in New Hampshire or Vermont.

There are no state recognized tribes New Hampshire. There is one state recognized tribe in Massachusetts and four in Vermont as shown below. Other tribes that may potentially be interested in the relicensing are listed below:

Massachusetts Recognized Tribes

Nipmuc Nation
25 Main Street
South Grafton, MA 01560
info@nipmucnation.org

Vermont Recognized Tribes

Elnu Abenaki Tribe
Chief Roger Longtoe Sheehan
Tribal Headquarters
5243 VT Route 30
Jamaica, VT 05343
gitceedadann@yahoo.com

Nulhegan Abenaki Tribe
Chief Don Stevens
156 Bacon Drive
Shelburne, VT 05482
chiefdonstevens@comcast.net

Koasek of the Koas of the Abenaki Nation
Chief Shirly Hook
188 Allen Bent Road
W. Braintree
Roxbury, VT 05669
shirly480@gmail.com

Missisquoi Abenaki Tribe
Chief Richard Menard
P.O. Box 133
Swanton, VT 05488
richard.menard@abenakination.com

Other Potentially Interested Tribes

Abenaki Nation New Hampshire
262 Lancaster Road
Whitefield, NH 03598
Kcicasco@aol.com

Ms. Bonney Hartley
Stockbridge-Munsee Community
400 Broadway #718
Troy, NY 12181
bonney.hartley@mohican-nsn.gov

Narragansett Indian Tribe
Chief Sachem: Anthony Dean Stanton
Narragansett Indian Longhouse
4425-A South County Trail
Charlestown, RI 02813
adstanton@nitribe.org

Nolumbeka Project
91 Main Street
P.O. Box 285
Greenfield, MA 01302
nolumbekaproject@gmail.com

Koasek Traditional Band
P.O. Box 147
Post Mills, VT 05058
n.pero@aol.com

3.

(i) The Applicant has made a good faith effort to give notification by certified mail of the filing of the application to:

(A) Every property owner of record of any interest in the property within the bounds of the Project, or in the case of the Project without a specific boundary, each such owner of property which would underlie or be adjacent to any Project works, including any impoundments; and

(B) The entities identified in paragraph (2) above, as well as any other federal, state, municipal or other local government agencies that there is reason to believe would likely be interested in or affected by the application.

Because this is an application for a new license under section 15 of the Federal Power Act, the Applicant is not required to provide notice by certified mail of the Application to landowners.

VERIFICATION STATEMENT REQUIRED BY 18 C.F.R. § 5.18(A)

This application is executed in the

STATE OF: New Hampshire

COUNTY OF: Strafford

By: Justin Trudell, being duly sworn, deposes and says that the contents of this application are true to the best of his knowledge or belief. The undersigned applicant has signed this application this 28th day of November 2020.

Justin Trudell
Vice President, Operations
Northfield Mountain LLC
111 South Bedford Street, Suite 103
Burlington, MA 01803
Tel: 781-653-4247
Email: justin.trudell@firstlightpower.com

Subscribed and sworn before me, a Notary Public of the State of New Hampshire, this 28th day of November 2020.

Notary Republic

ELI I. TILLINGHAST, Notary Public
My Commission Expires March 25, 2025

ACRONYMS AND ABBREVIATIONS

2D	two dimensional
3D	three dimensional
A	Ampere
AC	alternating current
ACHP	Advisory Council of Historic Preservation
ADA	Americans with Disabilities Act
AFLA	amended Final License Application
AMC	Appalachian Mountain Club
APE	Area of Potential Effects
ARLAC	Ashuelot River Local Advisory Committee
ATUs	Accumulated Thermal Units
AWIA	America's Water Infrastructure Act
AWWA	American Whitewater Association
BA	Biological Assessment
BSTEM	Bank Stability and Toe Erosion Model
CAFRC	Conte Anadromous Fish Research Center
CEII	Critical Energy Infrastructure Information
CEQ	Council of Environmental Quality
CFD	Computational Fluid Dynamics
CFR	Code of Federal Regulations
cfs	cubic feet per second
CFU	colony forming units
CJS	Cormack Jolly Seber live recapture model
CL&P	Connecticut Light & Power
cm	Centimeter
cmbgs	centimeters below ground surface
CPRs	Critical Protective Rates
CPUE	Catch-Per-Unit–Effort
CRASC	Connecticut River Atlantic Salmon Commission
CRJC	Connecticut River Joint Commissions
CRSEC	Connecticut River Streambank Erosion Committee
CRUISE	Connecticut River Unimpacted Streamflow Estimation
CRWC	Connecticut River Watershed Council
CT	Connecticut
CTDEEP	Connecticut Department of Energy and Environmental Protection
CTDEP	Connecticut Department of Environmental Protection
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
°C	degrees Celsius
DLA	Draft License Application
DO	dissolved oxygen
DRTU	Deerfield River Chapter of Trout Unlimited
DSSMR	Dam Safety Surveillance and Monitoring Report
EA	Environmental Assessment
EAP	Emergency Action Plan
EAV	emergent aquatic vegetation
ECP	Erosion Control Plan
EFH	essential fish habitat

EIS	Environmental Impact Statement
ESA	Endangered Species Act
FCD	Franklin Conservation District
FCRP	Friends of the Connecticut River Paddlers
FEMA	Federal Emergency Management Agency
FERC or Commission	Federal Energy Regulatory Commission
FGS	Field Geology Services
FirstLight	Northfield Mountain LLC
FIS	Flood Insurance Study
FLA	Final License Application
FPA	Federal Power Act
fps	feet per second
FRCOG	Franklin Regional Council of Governments
FRR	Full River Reconnaissance
FSF	Four Star Farms
ft	foot or feet
ft^2	square feet
°F	degrees Fahrenheit
GPD	gallons per day
GRH	Great River Hydro
HAER	Historic American Buildings Survey
HEC	USACE Hydrologic Engineering Center
HEC-RAS	Hydrologic Engineering Center River Analysis System
HEC-ResSim	Hydrologic Engineering Center Reservoir System Simulation
HELCO	Hartford Electric Light Co.
HG&E	Holyoke Gas and Electric
HPMP	Historic Properties Management Plan
hr	hour
HSI	habitat suitability index
IFIM	Instream Flow Incremental Methodology
ILP	Integrated Licensing Process
ISO-NE	ISO New England
ISR	Initial Study Report
kcfs	kilo cubic feet per second
kV	kilovolt
kW	kilowatt
kWH	kilowatt-hour
l	liter
LCCLC	Landowners and Concerned Citizens for License Compliance
m	meter
MA	Massachusetts
MACRIS	Massachusetts Cultural Resources Information System
MADFW	Massachusetts Division of Fish and Wildlife
MAEOEEA	Massachusetts Executive Office of Energy and Environmental Affairs
MAFBF	Massachusetts Farm Bureau Federation, Inc.
MassGIS	Massachusetts Geographic Information System
MAWMA	Massachusetts Water Management Act
MBI	Midwest Biodiversity Institute
MDEP	Massachusetts Department of Environmental Protection
MDFG	Massachusetts Division of Fisheries and Game
mg	milligram

MGD	million gallons per day
MHC	Massachusetts Historical Commission
mi	mile
mi^2	square miles
ml	milliliter
MOA	Memorandum of Agreement
msl	mean sea level
MVA	Mega volt ampere
MW	megawatt
MWH	megawatt-hour
NCC	Town of Northfield Conservation Commission
NEE	New England Environmental
NE FLOW	New England Flow
NEFU	New England Farmers Union
NEMBA	New England Mountain Biking Association
NEPA	National Environmental Policy Act
NEPOOL	New England Power Pool
NET	New England National Scenic Trail
NGVD29	National Geodetic Vertical Datum of 1929
NH	New Hampshire
NHDES	New Hampshire Department of Environmental Services
NHDHR	New Hampshire Division of Historical Resources
NHDOT	New Hampshire Department of Transportation
NHESP	Natural Heritage and Endangered Species Program
NHFGD	New Hampshire Fish and Game Department
NHPA	National Historic Preservation Act
NID	National Inventory of Dams
NIT	Narragansett Indian Tribe
NLCD	National Land Cover Database
NMFS	National Marine Fisheries Service
NMTTC	Northfield Mountain Tour and Trail Center
NOI	Notice of Intent
Northfield Mountain Project	Northfield Mountain Pumped Storage Project
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NRF	Naturally Routed Flow
NTU	Nephelometric Turbidity Unit
NUSCO	Northeast Utilities Service Company
NWI	National Wetland Inventory
NWRC	National Wetlands Research Center
NY-ISO	New York ISO
NYRO	FERC New York Regional Office
NYSDEC	New York Department of Environmental Conservation
O&M	operation and maintenance
PAD	Pre-Application Document
PCBs	polychlorinated biphenyls
PHABSIM	Physical Habitat Simulation
PIT	passive integrated transponder
PLC	programmable logic controller
PM&E	Protection, Mitigation & Enhancement

PSP	Proposed Study Plan
PTB	Puritan Tiger Beetle
PVPC	Pioneer Valley Planning Commission
QA/QC	quality control/quality assurance
RANS	Reynolds Averaged Navier-Stokes equations
REA	Ready for Environmental Analysis
RM	River mile
RMP	Recreation Management Plan
RRA	River Residents Association
RSP	Revised Study Plan
RTE	Rare, Threatened, and Endangered
S&A	Simons and Associates
SAV	submerged aquatic vegetation
SCORP	State Comprehensive Outdoor Recreation Plan
SD1	Scoping Document 1
SD2	Scoping Document 2
SDR	Supporting Design Report
SHPO	State Historic Preservation Officer
SMP	Surveillance and Monitoring Plans
SNS	Shortnose Sturgeon
SPDL	Study Plan Determination Letter
SSC	suspended sediment concentration
SSSRT	Shortnose Sturgeon Status Review Team
STPs	shovel test pits
TBD	to-be-determined
TCP	Native American Traditional Cultural Properties
TDS	total dissolved solids
TFI	Turners Falls Impoundment
THPO	Tribal Historic Preservation Officer
TMDL	Total Maximum Daily Load
TN	total nitrogen
TNC	The Nature Conservancy
TP	total phosphorus
TSS	total suspended solids
TU	test unit
Turners Falls Project	Turners Falls Hydroelectric Project
UMass	University of Massachusetts at Amherst
USACE	United States Army Corps of Engineers
USDOI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USR	Updated Study Report
µS	microsiemens
VRC	Vermont River Conservancy
VT	Vermont
VTANR	Vermont Agency of Natural Resources
VTDEC	Vermont Department of Environmental Conservation
VTDHP	Vermont Division of Historic Preservation
VTFWD	Vermont Fish and Wildlife Department
VY	Vermont Yankee Nuclear Facility

WMA	Wildlife Management Area
WMCC	Western Massachusetts Climbing Coalition
WMECO	Western Massachusetts Electric Company
WQC	Water Quality Certificate
WSEL	water surface elevation
WSP	Water Surface Profile
WUA	weighted useable area
YOY	young-of-year

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Amended Final Application for New License for Major Water Power Project – Existing Dam

Northfield Mountain Pumped Storage Project (FERC Project Number 2485)

EXHIBIT A-PROJECT DESCRIPTION

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXHIBIT A – PROJECT DESCRIPTION

The following excerpt from the Code of Federal Regulations (CFR) at 18 CFR § 4.51(b) describes the required content of this Exhibit.

Exhibit A is a description of the project. This exhibit need not include information on project works maintained and operated by the U.S. Army Corps of Engineers, the Bureau of Reclamation, or any other department or agency of the United States, except for any project works that are proposed to be altered or modified. If the project includes more than one dam with associated facilities, each dam and the associated component parts must be described together as a discrete development. The description for each development must contain:

1. *The physical composition, dimensions, and general configuration of any dams, spillways, penstocks, powerhouses, tailraces, or other structures, whether existing or proposed, to be included as part of the project;*

2. *The normal maximum surface area and normal maximum surface elevation (mean sea level), gross storage capacity, and usable storage capacity of any impoundments to be included as part of the project;*

3. *The number, type, and rated capacity of any turbines or generators, whether existing or proposed, to be included as part of the project;*

4. *The number, length, voltage, and interconnections of any primary transmission lines, whether existing or proposed, to be included as part of the project (see 16 U.S.C. 796(11));*

5. *The specifications of any additional mechanical, electrical, and transmission equipment appurtenant to the project; and*

6. *All lands of the United States that are enclosed within the project boundary described under paragraph (h) of this section (Exhibit G), identified and tabulated by legal subdivisions of a public land survey of the affected area or, in the absence of a public land survey, by the best available legal description. The tabulation must show the total acreage of the lands of the United States within the project boundary.*

1 NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT

The Northfield Mountain Pumped Storage Project (Northfield Mountain Project) is owned and operated by Northfield Mountain LLC (hereinafter referred to as FirstLight). The Northfield Mountain Project is a pumped-storage facility located on the Connecticut River in Massachusetts (MA) that uses the Turners Falls Impoundment (TFI) as its lower reservoir. The Northfield Mountain Project boundary is shown on Figure 1.0-1. The Northfield Mountain Project Boundary overlaps with Turners Falls Project Boundary along nearly the entire perimeter of the TFI, but it does not include the Turners Falls Dam. The TFI is a shared project feature with the Turners Falls Hydroelectric Project (FERC No. 1889). Key features of the Northfield Mountain Project are shown on Figure 1.0-2. The tailrace of the Northfield Mountain Project is located approximately 5.2 miles upstream of Turners Falls Dam, on the east side of the TFI. The Northfield Mountain Project's Upper Reservoir is a man-made structure situated atop Northfield Mountain, to the east of the Connecticut River. During pumping operations, water is pumped from the TFI to the Upper Reservoir. When the Northfield Mountain Project is generating, water is passed from the Upper Reservoir through an underground pressure shaft to a powerhouse cavern and then a tailrace tunnel delivers the water back to the TFI.

The Northfield Mountain Project consists of a) the Upper Reservoir dam/dikes; b) an intake channel; c) pressure shaft; d) an underground powerhouse; e) a tailrace tunnel and f) the TFI.

1.1 Northfield Mountain Upper Reservoir Dams and Dikes

Main Dam

The crest of this structure, known as the Main dam, is at elevation 1010 feet (NGVD29[1]), and is 30 feet wide, with a 2 foot high rock/earth fill wave berm along the upstream edge. The height of the Main dam varies between 30 to 140 feet and it is approximately 1 mile long. The upstream slope is 1:1.8 (V:H) (the top 15 feet of the upstream slope is at a steeper 1:1.5 slope); downstream slope = 1:1.6. The top of the impervious core is 12 feet wide with 3:1 (V:H) upstream and downstream slopes. The core is founded on sound groutable rock at approximately elevation 860 feet. There are sand and gravel filter zones upstream and downstream of the impervious core. Oversize rock zones form the upstream and downstream faces. This dam contains an intake structure at station 27 + 28 and sub-foundation pipe constructed for possible water-supply diversion to the Quabbin Reservoir, a principal water supply for the City of Boston and parts of the Greater Boston metropolitan area. The base of the intake structure is at elevation 921 ft and the top is at elevation 1010 ft. The structure is designed with two 7 ft x 9 ft sluice gates and an 8 ft ID outlet pipe with invert elevation of 923 ft. The Main dam has a 24-inch diameter x 589 foot long low level outlet pipe at station 8 + 00 with an inlet at elevation of 893 ft, with a Gage House at the end.

Three Vertical Impervious-Core Rock-Fill Dikes

The three dikes, known as the North, Northwest and West dikes, are constructed in a similar manner and to the same crest elevation as the main rock fill dam, with a central impervious core-filter and compacted rock-filled embankments. They help form the Upper Reservoir. The North dike is approximately 25 feet high and 425 feet long. The Northwest dike is approximately 45 feet high and 2,800 feet long. The West dike is approximately 40 feet high and 1,700 feet long.

[1] Unless otherwise noted in this AFLA, reported elevations are based on the National Geodetic Vertical Datum (NGVD) of 1929.

Concrete Gravity Dam

Located at the west end of the intake channel, the concrete gravity dam is 327 feet long and ranges in height from 10 to 20 feet, with a crest at elevation 1010 feet. The downstream face has been backfilled to elevation 1002 feet. The concrete walls at both ends of the gravity section are constructed to a higher level, allowing a parapet wall to be constructed against the retaining wall on the right side of the intake. The remaining section, approximately perpendicular to the main section, varies from 5 to 10 feet in height.

Intake Channel

The intake channel directs water from the Upper Reservoir into the pressure conduit intake. The channel is 1,890 feet long and is excavated in rock with side slopes of 4:1 (V:H). The invert is 130 feet wide at elevation 880 feet. There is a small check dam (submerged) at the upstream end of the intake channel with a stoplog and gate structure. The purpose of this control structure, a low dam between the Upper Reservoir and intake channel, is to prevent stormwater from entering the pressure conduit when the intake channel is dewatered. The submerged check dam is 63 feet long and approximately 9 feet high with a crest at elevation 900 feet. It has two manually operated sluice gates (2.75 feet high by 6 feet wide), two 18-foot-wide stoplog slots which usually hold eight concrete stoplogs (weighing approximately 3,000 lbs. each). Slots on the crest are also available to hold an additional set of 3 12x12 inch wooden stop logs, if necessary.

Concrete Gravity Spillway Structure

The ungated concrete gravity overflow structure is 550 feet long with a crest elevation of 1006.5 feet. There is a 20-foot-long notch at elevation 1005.0 feet near the center of the structure which is designed to concentrate small discharges due to precipitation and runoff when the reservoir is full. The overflow spillway is approximately 6 feet high on the upstream side. The remaining spillway length has been sized to prevent overtopping of the embankments due to over-pumping.

1.2 Pressure Shaft

The pressure conduit system consists of a reinforced concrete intake portal, a 200 foot long concrete lined transition section, a portal 55 feet wide by 80 feet high, an inclined concrete-lined pressure shaft connecting the intake and manifold shaft (31 feet diameter, 853 feet long, inclined 50º from the horizontal), concrete-lined manifold formed by branching of the pressure shaft into two 22 feet diameter conduits (approximately 100 to 150 feet long) and then into four 14 feet diameter tunnels leading to four steel-lined penstocks (340 feet long, diameter decreases from 14 to 9.5 feet). During pumping operation, water is pumped from the TFI through a tailrace tunnel to the powerhouse cavern and then through the pressure shaft to the Upper Reservoir. During generation, water flows from the Upper Reservoir back through the pressure shaft to the powerhouse and then the tailrace tunnel delivers the water back to the TFI.

1.3 Tailrace Tunnel

Water flows between the powerhouse cavern and the TFI via the tailrace tunnel. There are four 11-foot diameter concrete draft tubes, approximately 25 feet long[2] connected by a manifold to a common tailrace tunnel. The tailrace tunnel is concrete-lined, horseshoe shaped and 5,136 feet long, with a maximum width of 33 feet and a height of 31 feet. The tunnel discharges during generation through a concrete exit structure into the TFI. The exit structure includes a transition from the horseshoe shape into a trapezoidal shape. Steel stop logs (approximately 35 feet long and 8 tons each) are used in the exit structure when needed to dewater

[2] The length does not include a transition to a 17-foot diameter draft tube, which is approximately 20 feet long.

the tailrace tunnel; the stoplogs are stacked to a total height of approximately 40 feet when in use. A floating boom, approximately 400 feet long, is deployed across the exit channel to provide a barrier to large debris and boaters.

The trapezoidal trashrack opening has the following dimensions: top width: 99'-6", bottom width: 74'4", depth: 48'-0", resulting in a gross area opening of 4,400 ft^2. The bar thickness is 0.75 inches, with a clear-spacing of 6 inches.

1.4 Upper Reservoir

The Upper Reservoir, formed by the Main dam, the Rockfill dikes, and the Concrete Gravity dam, has a gross storage capacity of 17,050 acre-feet. Per the current FERC license for the Northfield Mountain Project, the Upper Reservoir may operate between 1000.5 feet and 938 feet (constituting a 62.5-foot drawdown), which equates to a useable storage capacity of approximately 12,318 acre-feet. This is equivalent to approximately 8,729 MWhs[3] (formerly 8,475 MWhs) of stored energy. The surface areas at elevations 938 and 1000.5 feet are 134 and 286 acres, respectively. The Upper Reservoir was constructed to accommodate an elevation of 1004.5 feet as approved by FERC in 1976. In addition, the reservoir retains useable storage capacity down to elevation 920 feet. The useable storage volume between elevation 1004.5 feet and 920 feet is approximately 15,327 acre-feet, which is equivalent to approximately 10,779 MWhs of stored energy. FirstLight has received temporary license amendments from FERC in the past to use more of the Upper Reservoir storage for seasonal grid reliability.

1.5 Lower Reservoir or Turners Falls Impoundment

The TFI, formed by the Turners Falls Dam, extends upstream approximately 20 miles to the base of Great River Hydro's Vernon Dam in Vernon, VT. The first dam was built in 1798 as an extension to a lock and dam system that started in Holyoke, MA. Other dams have been constructed or rebuilt between 1798 and the present-day dam. In 1970, to provide storage capacity for the Northfield Mountain Project, the Gill Dam was rebuilt with three taintor gates and the existing wooden flashboards on top of the Montague Dam were replaced with four bascule-type spillway gates raising the TFI 5.4 feet to elevation 185.0 feet as measured at the Turners Falls Dam providing an additional 12,600 acre-feet of storage. The lower and upper limits of the TFI, per the FERC license, range from a minimum elevation of 176.0 feet to a maximum elevation of 185.0 feet as measured at the Turners Falls Dam. This range decreases from downstream to upstream. The TFI has a surface area of approximately 2,110 acres and a gross storage volume of approximately 20,300 acre-feet at elevation 185.0 feet (as measured at the Turners Falls Dam).

The TFI, between Turners Falls Dam and Vernon Dam, has a water surface profile that varies depending on the magnitude of flow in the Connecticut River, the water level at the Turners Falls Dam and the storage used for the Northfield Mountain Project. The profile slope steepens as the magnitude of flow increases. At pinch-points or hydraulic controls such as at the French King Gorge, located downstream of the Northfield Mountain Project tailrace, the water level upstream of the hydraulic control is higher than below and will exceed 185.5 ft in accordance with the river backwater curve and inflow amount.

[3] Efficiency improvements were made to the four turbines as described later.

1.6 Powerhouse

The underground powerhouse is 328 feet long and 70 feet wide. The floor of the spherical valve gallery is at elevation 56 feet and the roof is at 190 feet. The powerhouse contains four reversible pump/turbines operating at gross heads ranging from 753 to 824.5 feet. Each of the four units has an electrical capacity of 291.7 MW, for a total station nameplate capacity of 1,166.80 MW. Historically, the total station capacity was 1,080 MW (270 MW/unit); however, Units 2, 3 and 4 underwent efficiency improvements with the replacement of the turbine runners and rewind of the motor-generators between 2011 and 2014.[4] A new runner was installed in Unit 1 in 2004; and a rewind of the motor-generator commenced in August 2015 and was completed in February 2016.

When operating in a pumping mode, the maximum hydraulic capacity (4 pumps) is approximately 15,200 cfs (3,800 cfs/pump). Alternatively, when operating in a generation mode, the maximum hydraulic capacity (4 turbines) is approximately 20,000 cfs (5,000 cfs/turbine). The minimum flow to safely spin one unit and produce power is approximately 2,300 cfs.

At the north end of the underground powerhouse is a ventilation and emergency access shaft from elevation 123 feet to elevation 751 feet. The 629-foot-long vent shaft is bedrock lined with gunite, rock bolts, and plate assemblies throughout. It is 18 feet in diameter at the lower end and 15 feet in diameter at the upper end. At the ground level opening of the shaft is the ventilation shaft house. The shaft provides ventilation for exhaust air from the powerhouse, ventilation for intake and exhaust air from the surge shafts, access to the powerhouse by means of stairs, and access to the surge gallery and draft tube gantry crane from the powerhouse. The draft tubes are 17 feet in diameter. They are steel lined from the unit runner chamber and extend downward toward the draft tube gate and surge gallery chamber. Once past the draft tube gate the draft tube tunnels transition to a concrete lined bedrock tunnel and end at the tailrace manifolds. Two units are combined first into two concrete lined arch roofed tunnels 22.5-feet-wide and 22.5-feet- high. The two tunnels are 120 feet and 150-feet-long, which combine to form the tailrace tunnel. The tailrace tunnel is 5,136-feet-long, is concrete lined, and is horseshoe shaped. It has a maximum width of 33 feet and is 31 feet high.

Transmission Facilities

Each of the four generators is connected to its respective unit breaker by means of an Iso phase bus. Each pair of units is provided with a dual secondary step-up transformer (rated 345/13.8 kV, 666 MVA, 3 phase, 60 cycle) to step from 13.8 kV generating voltage up to 345 kV. Each transformer is located in a vault, excavated in the rock adjacent to the powerhouse. From these two transformers, power is transmitted through two 345 kV pipe type cables, installed in the access tunnel (comprised of bedrock with 10-foot minimum length rock bolt/plate re-enforcements) which is approximately 24 feet high by 26 feet wide by 2,365 feet long, to the Northfield Switching Station which is located near the access tunnel. FirstLight owns the pipe cables 1X and 3X into the Northfield switchyard, through the 1X and 3X pot heads (cable ends), up to the 345 kV yard disconnect switches. Table 1.6-1 includes information on the generator leads.

[4] On August 17, 2011, and supplemented on January 17, 2012, February 14, 2012, and February 24, 2012, FirstLight filed an amendment application to revise the authorized installed capacity of Northfield Mountain. FERC issued an order amending the license and revising annual charges on March 23, 2012. On June 10, 2016, and in an errata issued on June 15, 2016, FERC issued an order amending the license upon completion of the final unit efficiency upgrade.

Table 1.6-1: Generator Leads at Northfield Mountain Pumped Storage Facility

Leads	Length	Voltage	Conductors per phase
Unit 1 to1X Transformer	26’	13.8 KV	1
Unit 2 to 1X Transformer	26’	13.8 KV	1
1X Transformer to Switching Station	3000’	345 KV	1
Unit 3 to 3X Transformer	26’	13.8 KV	1
Unit 4 to 3X Transformer	26’	13.8 KV	1
3X Transformer to Switching Station	3000’	345 KV	1

The pipe cables to the switchyard are of transmission voltage. The switchyard is not a Project facility but is owned by Eversource and is part of the interconnected grid.

1.7 Fish Passage Facilities

A fixed-position guide net approximately 650 feet long by 15 feet deep was deployed from 1998 to 2014 to reduce entrainment of Atlantic salmon smolts in flows pumped from the TFI to the Upper Reservoir during downstream migration. After the initial evaluation in 1995, further net modifications were field tested in 1996 and 1997 and the guide net was then deployed annually during the downstream smolt migration season. Since 2016, the Connecticut River Atlantic Salmon Commission (CRASC) has not required installation of the barrier net as the salmon restoration program on the Connecticut River was terminated.

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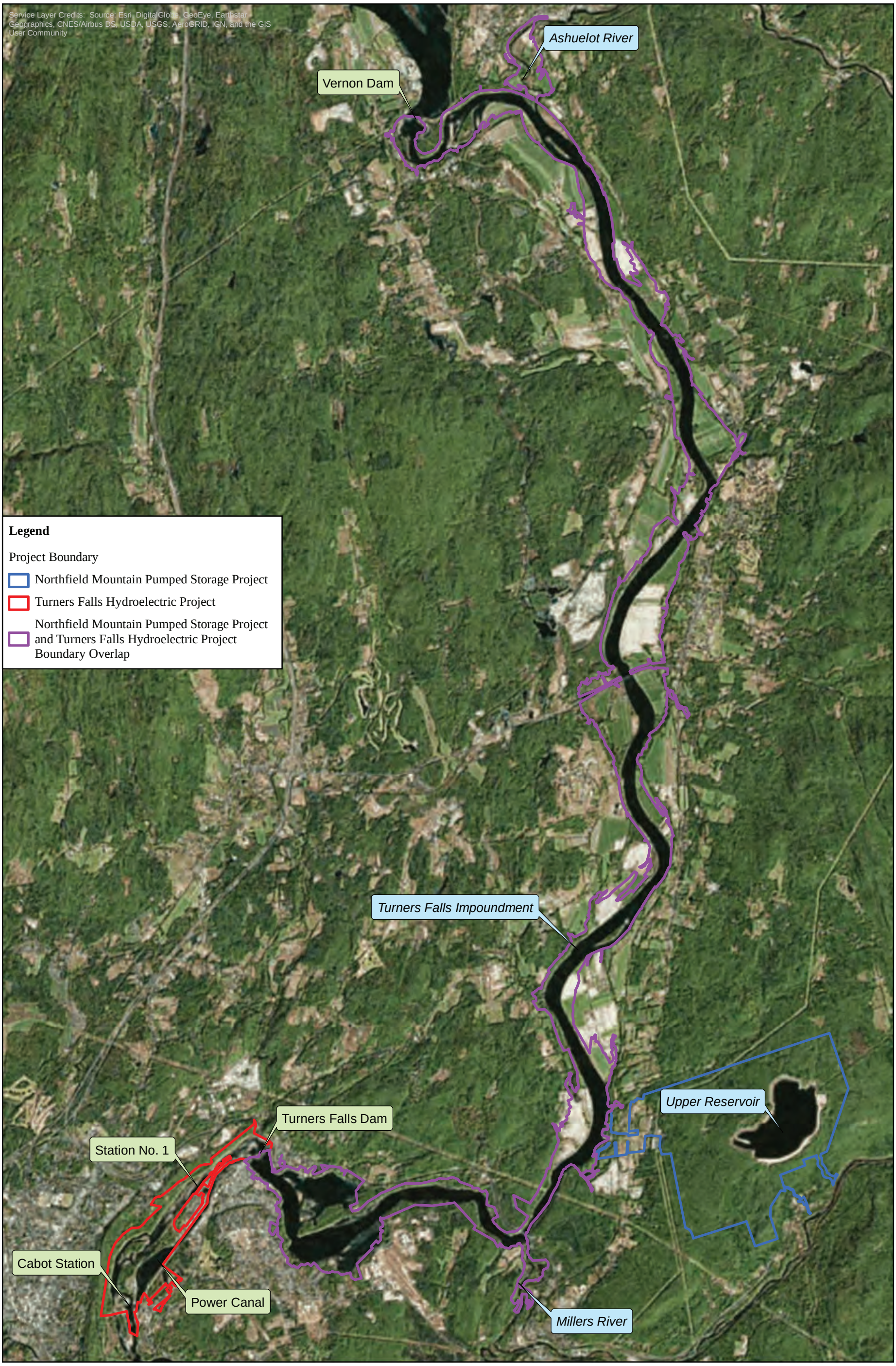

NORTHFIELD MOUNTAIN LLC
Northfield Mountain Pumped Storage Project (No. 2485)
Amended Final License Application Exhibit A

Figure 1.0-1
Northfield Mountain Pumped Storage Project Boundary Map

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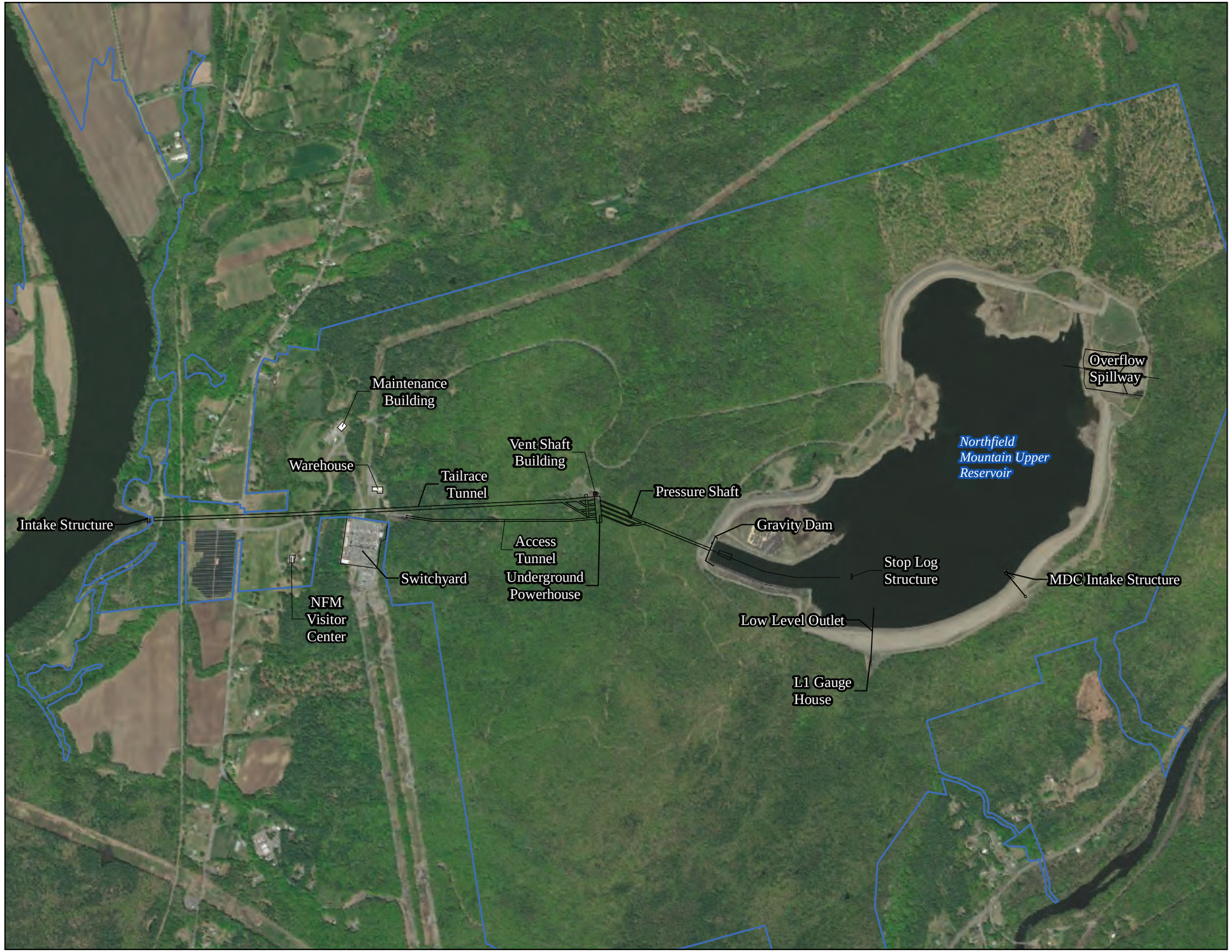

NORTHFIELD MOUNTAIN LLC
Northfield Mountain Pumped Storage Project No. 2485

Amended Final License Application
Exhibit A

Figure 1.0-2
Northfield Mountain Pumped Storage
Project Features

Legend

Project Boundary

N

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

0 600 1,200 2,400 Feet

1 inch = 1,200 feet

FirstLight

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2 ADDITIONAL EQUIPMENT

The Northfield Mountain Project also includes various turbine governors, generator exciters, batteries, control panels and circuit breakers.

2.1 Proposed Fish Passage Structure

Install Barrier Net. FirstLight proposes to install a barrier net in front of the Northfield Mountain Project intake/tailrace to prevent the entrainment of migratory fish when the Northfield Mountain Project is pumping. The net will be approximately 30-foot-high by 1050-feet-long wide with 3/4-inch mesh from top to bottom. The net will be positioned approximately in line with the river shoreline upstream and downstream of the Northfield Mountain Project tailrace. The net will be anchored at each end of the net at the shoreline with additional anchoring along the base of the net to prevent migrants from passing under the net.

FirstLight proposes to have the barrier net in place from August 1 to November 15 each year.

FirstLight will consult with the United States Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS) and Massachusetts Division of Fisheries and Wildlife (MADFW) on the barrier net.

2.2 Proposed Recreation Features

FirstLight proposes to construct or modify the following recreation facilities as described below.

Relocation of the Boat Tour Dock at Riverview. The proposed barrier net would be in place from August 1 to November 15 during a portion of the summer recreation season. The current layout of the barrier net encloses the existing Boat Tour Dock. Given this, FirstLight proposes to relocate the dock further upstream of its current location. It would entail extending the existing road further north.

Create a New Access Trail with Stairs for a Put-In at Riverview. A new put-in would be located off of Pine Meadow Road, where Fourmile Brook discharges into the TFI. The site would entail establishing a 6-foot wide stone path to timber and concrete stairs leading to a put-in on the northern bank along the brook. Pine Meadow Road would be widened to add approximately seven (7) parking spots and a sign (Project Name and FERC No.) would be installed near the stone path.

Formal Access Trail and Put-In at Cabot Camp. FirstLight proposes to create a 200-foot long, 10-foot wide formal path leading from the Cabot Camp parking area to an access point on the Millers River just upstream of the confluence with the Connecticut River. There is currently an informal path in this area. A sign (Project Name and FERC No.) and directional portage sign would be installed along the formal path leading the public from the parking lot directly to the 10-foot-wide gravel path leading to the water's edge.

A separate Recreation Management Plan is included as part of the Northfield Mountain Project Amended Final License Application.

3 LANDS OF THE UNITED STATES

There are no federal lands in the Northfield Mountain Project Boundary.

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Amended Final Application for New License for Major Water Power Project – Existing Dam

Northfield Mountain Pumped Storage Project (FERC Project Number 2485)

EXHIBIT B-PROJECT OPERATION AND RESOURCE UTILIZATION

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXHIBIT B – PROJECT OPERATION AND RESOURCE UTILIZATION

The following excerpt from the Code of Federal Regulations (CFR) at 18 CFR § 4.51 (c) describes the required content of this Exhibit.

Exhibit B is a statement of project operation and resource utilization. If the project includes more than one dam with associated facilities, the information must be provided separately for each such discrete development. The exhibit must contain:

(1) A statement whether operation of the powerplant will be manual or automatic, an estimate of the annual plant factor, and a statement of how the project will be operated during adverse, mean, and high water years;

(2) An estimate of the dependable capacity and average annual energy production in kilowatt hours (or a mechanical equivalent), supported by the following data:

(i) The minimum, mean, and maximum recorded flows in cubic feet per second of the stream or other body of water at the powerplant intake or point of diversion, with a specification of any adjustments made for evaporation, leakage, minimum flow releases (including duration of releases), or other reductions in available flow; monthly flow duration curves indicating the period of record and the gauging stations used in deriving the curves; and a specification of the period of critical streamflow used to determine the dependable capacity;

(ii) An area-capacity curve showing the gross storage capacity and usable storage capacity of the impoundment, with a rule curve showing the proposed operation of the impoundment and how the usable storage capacity is to be utilized;

(iii) The estimated hydraulic capacity of the powerplant (minimum and maximum flow through the powerplant) in cubic feet per second;

(iv) A tailwater rating curve; and

(v) A curve showing powerplant capability versus head and specifying maximum, normal, and minimum heads;

(3) A statement, with load curves and tabular data, if necessary, of the manner in which the power generated at the project is to be utilized, including the amount of power to be used on-site, if any, the amount of power to be sold, and the identity of any proposed purchasers; and

(4) A statement of the applicant's plans, if any, for future development of the project or of any other existing or proposed water power project on the stream or other body of water, indicating the approximate location and estimated installed capacity of the proposed developments.

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1 PROJECT OPERATION AND RESOURCE UTILIZATION

1.1 Project Operation

The Northfield Mountain Pumped Storage Project (Northfield Mountain Project) is a pumped storage hydroelectric facility. Water is pumped from the Turners Falls Impoundment (TFI, lower reservoir, Connecticut River) to the Upper Reservoir which has 12,318[1] acre-feet of useable storage available for pumped storage operations. Typically, pumping occurs during low-load periods when energy costs are low, while generation occurs during high-load periods when energy costs are high. The current FERC operating conditions for the Northfield Mountain Project are summarized below.

Upper Reservoir Operations

The Upper Reservoir is licensed to fluctuate between elevation 938 and 1000.5 feet. However, the Upper Reservoir was designed to allow for a fluctuation between elevation 920 and 1004.5 feet. In fact, FERC has granted FirstLight Hydro Generating Company (predecessor of the current Licensee) temporary license amendments in the past that permitted greater use of the Upper Reservoir storage capacity to support grid reliability. As described later, Northfield Mountain LLC (hereinafter referred to as FirstLight) is proposing to operate the Upper Reservoir within the band of 920 to 1004.5 feet.

1.2 Annual Plant Factor

The average annual plant factor is determined using the following equation:

Average Annual Generation/ (Nameplate Capacity x 8,760 hrs per year) = Avg. Annual Plant Factor

The Northfield Mountain Project has an average annual generation of approximately 889,845 MWh per year and an average annual energy consumption of approximately 1,189,640 MWh/year for the period 2011-2019. The Northfield Mountain Project's annual plant factor is approximately 9% (889,845/10,221,168) based on a nameplate capacity of 1,166.80 MW. This nameplate capacity reflects the various efficiency improvements and upgrades previously completed on Units 1-4.

1.3 Operation During Adverse, Mean, and High Water Years

Because the Turners Falls Project and Northfield Mountain Pumped Storage Project (Northfield Mountain Project) share the TFI, the operations described pertain to both facilities. As noted above, the water level of the TFI can vary from a minimum elevation of 176.0 feet to a maximum operating elevation of 185.0 feet as measured at the Turners Falls Dam. Below is a summary of how the Turners Falls Project and Northfield Mountain Project operate over a range of flow conditions.

Turners Falls Project and Northfield Mountain Project Operations when Naturally Routed Flows (NRF) are < 1,433 cfs (Minimum Flow)

When NRFs[2] are very low, i.e., less than 1,433 cfs (current minimum flow, river flows exceed 1,433 cfs approximately 96% of the time), FirstLight MA Hydro LLC and Northfield Mountain LLC (collectively referred to herein as FirstLight) generally maintains the TFI elevation between 180.5 and 182.0 feet to create sufficient hydraulic head to pass flow through the gatehouse.

[1] In the original 1968 license order the planned usable storage was 12,750 acre-feet; however, the as-built usable storage is closer to 12,318 acre-feet.

[2] Naturally Routed Flows = Vernon discharge+ Ashuelot River flow + Millers River flow (both rivers have USGS gages).

At flows less than 1,433 cfs, bypass flows are provided first, and the balance of flow is passed through Station No. 1.

Bypass flows are provided at Turners Falls Dam as required for fishery needs during certain periods of the year. If bypass flows are required, they are provided by bascule gate no. 1 closest to the gatehouse.

At these low flows (less than 1,433 cfs), the Northfield Mountain Project may operate during peak demand hours and pump back during low demand periods. The number of turbines operating, and the magnitude of generation flow will vary depending on demand.

Turners Falls Project and Northfield Mountain Project Operations when NRFs are between 1,433 cfs and 13,728 cfs (Cabot Capacity)

Under moderate flow conditions, i.e., NRFs are between 1,433 cfs and 13,728 cfs (river flow exceeds 13,728 cfs approximately 31% of the time), the TFI elevation is typically managed around elevation 180.5 feet, but fluctuates under these inflow conditions due to the upstream Vernon Hydroelectric Project[3] peak demand operations, Cabot peak demand operations, and the pumping/generating cycle at the Northfield Mountain Project. The TFI level also varies based on the volume of water in the Northfield Mountain Upper Reservoir in order to maintain a balance. Sufficient water volume must be available in the TFI to fill the Northfield Upper Reservoir, and sufficient storage volume must be available in the TFI to accept Northfield Mountain generation. Under most circumstances, the TFI elevation fluctuates between 180.5 and 184.0 feet under these inflow conditions. The target elevation in the power canal at the Cabot Station forebay remains at 173.5 feet.

When NRFs are between 1,433 cfs and 13,728 cfs (the approximate hydraulic capacity of Cabot Station), FirstLight will operate various units at Cabot Station and Station No. 1 based on several factors such as water and unit availability and unit efficiency. Depending on the inflow and electrical demand, Cabot Station may be operated as a peak demand facility, with the number of peaks per day varying with electrical demand. If demand is high, such as in the summer and winter, Cabot Station may peak twice a day to meet demand, in the morning and late afternoon. Outside of these hours, Cabot Station's generation is typically curtailed to base load needs, by reducing the flow through the gatehouse. Excess inflow to Turners Falls Dam is stored within the TFI. If inflow is consistently in the 13,728 cfs range, Cabot Station will operate continuously at full capacity.

Turners Falls Project and Northfield Mountain Project Operations when NRFs are between 13,728 cfs and 15,938 cfs (full capacity of Station No. 1 and Cabot)

Under these flow conditions, operations are similar to above; however, Cabot Station is typically operated at full hydraulic capacity, while the remaining flow is passed through Station No. 1. On an annual basis, river flow exceeds 15,938 cfs approximately 21% of the time.

Turners Falls Project and Northfield Mountain Project Operations when NRFs are between 15,938 cfs and 30,000 cfs

Under normal to somewhat high flows, as the NRF to the TFI exceeds the hydraulic capacity of Cabot Station and Station No. 1, both facilities operate at full capacity. Per the agreement with the United States Army Corps of Engineers (USACE) as required by Article 32 of the Turners Falls Project license, and Article 43 of the Northfield Mountain Project license, the maximum TFI elevation during inflows of this magnitude is 186.5 feet, which would occur under the flood of record, although under lesser flood flows, FirstLight typically opens the bascule gates at the Turners Falls Dam, as needed, to maintain the TFI

[3] The Vernon Hydroelectric Project is owned and operated by Great River Hydro.

elevation closer to 180-182 feet. On an annual basis, river flow exceeds 30,000 cfs approximately 9% of the time.

FirstLight continually evaluates the volume of water in the TFI storage versus the volume of water in the Upper Reservoir to ensure there is sufficient volume in the TFI to fill the Upper Reservoir, if needed.

Turners Falls Project and Northfield Mountain Project Operations when NRFs are between 30,000 cfs and 65,000 cfs

When flows are in this high range, Turners Falls Project and Northfield Mountain Project operations are generally the same as above, with one exception: the USACE requires that FirstLight draw the TFI elevation down as far as possible, but not below elevation 176.0 feet. In drawing the TFI down, discharges cannot be increased by more than 10,000 cfs per hour above the NRF. The TFI elevation is maintained down until the NRF drops below 30,000 cfs or the actual discharge exceeds 65,000 cfs. When the actual discharge past Turners Falls Dam rises to 65,000 cfs (river flow exceeds 65,000 cfs approximately 1% of the time), the discharge is maintained at 65,000 cfs until the TFI elevation has fallen to 176.0 feet or the TFI begins to rise, at which point a constant TFI elevation is maintained.

Turners Falls Project and Northfield Mountain Project Operations when NRFs are between 65,000 cfs and 126,000 cfs

Per the USACE agreement, when the NRF exceeds 65,000 cfs, but is expected to be less than 126,000 cfs (this flow is very rarely exceeded), the outflow at the Turners Falls Project should be regulated according to the operating schedule of the Northfield Mountain Project. If the Northfield Mountain Project is operating, it is required to keep the combined useable volume of the Upper Reservoir and TFI constant. If the Northfield Mountain Project is not operating, it is required to keep the TFI elevation constant until the spillway gates are wide open.

Turners Falls Project and Northfield Mountain Project Operations when NRFs exceed 126,000 cfs

When the NRF is expected to be greater than 126,000 cfs, the operating rules continue to require the following: if the Northfield Mountain Project has not been operating in the previous hour, it is required to maintain a constant TFI elevation. If the Northfield Mountain Project has been operating in the previous hour, it is required to maintain a constant combined useable storage volume.

1.4 HEC-ResSim Operations Model

FirstLight developed an operations model to better understand how operational changes at the three[4] upstream Great River Hydro (GRH) hydroelectric projects and FirstLight's Turners Falls Project and Northfield Mountain Project affect the timing of river flows and energy generation. The model considers each Project's engineering data and operational constraints, such as current FERC licensed water level fluctuations and minimum flow requirements. The model outputs include hourly flow, reservoir elevation and generation from the GRH and FirstLight hydroelectric facilities.

[4] Great River Hydro is in the process of relicensing three projects in series on the Connecticut River located immediately upstream of the Turners Falls Project and having the same license expiration date of April 30, 2018. They include, in upstream to downstream order: Wilder Hydroelectric Project (FERC No. 1892), Bellows Falls Hydroelectric Project (FERC No. 1855) and the Vernon Hydroelectric Project (FERC No. 1904). GRH (then TransCanada), requested FERC to extend the license term by one year. On July 22, 2015 FERC granted the one-year extension such that the new expiration date was April 30, 2019. On May 9, 2019, the FERC authorized continued operation of the three GRH projects and thus they are now operating under annual licenses.

The model calibration procedure involved adjusting several model parameters and constraints to reasonably match historic (2002-2003) Project data (flow, reservoir elevation, generation). The calibrated model was subsequently updated to reflect today's equipment; this model is termed the baseline model representing existing conditions. The hourly baseline model was subsequently run for a longer-term period of record from 1962-2003[5]. The hourly baseline model output (flow, reservoir elevation, generation) was ultimately used as a tool to compare baseline conditions with FirstLight's proposed operations.

Some sections of this license application, including Exhibit D and Exhibit E, use model output from simulating baseline and FirstLight's proposed operations.

2 DEPENDABLE CAPACITY AND AVERAGE ANNUAL GENERATION

2.1 Estimate of Dependable Capacity and Average Annual Generation

The net dependable capacity of the Northfield Mountain Project is 1,166.80 MW.

Average annual net generation at the Northfield Mountain Project for the period 2011-2019 was 890,049 MWh. Average annual pumping generation use by the Northfield Mountain Project for the same time period was 1,189,432 MWh. The monthly and annual net generation and pumping energy use for the period 2011-2019 are provided in Table 2.1-1 and Table 2.1-2, respectively.

2.2 Streamflow

There is no "inflow" to the Upper Reservoir; only direct precipitation.

FirstLight estimates the total instantaneous inflow to the TFI – referred to as the NRF-- as the sum of the Vernon Hydroelectric Project discharge and inflow from two larger tributaries equipped with United States Geological Survey (USGS) gages – the Ashuelot and Millers Rivers. The drainage areas at the Vernon Dam and Turners Falls Dam are 6,266 square miles (mi^2) and 7,163 mi^2, respectively, a difference of 897 mi^2. Thus, 87% of the inflow to the TFI is controlled by the Vernon Hydroelectric Project. Information on the Ashuelot and Millers Rivers is shown in Table 2.2-1.

Table 2.2-1: USGS Gages on Tributaries to the Turners Falls Impoundment

Gage No.	Gage Name	Period of Record	Drainage Area	Regulation
01161000	Ashuelot River at Hinsdale, NH	1907-current	420 mi^2	Regulated by Corps Storage Reservoir- Surry Dam since 1941.
01166500	Millers River at Erving, MA	1915-current	372 mi^2	Regulated by Corps Storage Reservoirs- Tully Dam and Birch Hill Dams since 1949 and 1941, respectively.

[5] Model inflows were obtained from the Connecticut River Unimpacted Streamflow Estimation (CRUISE) model that was developed by the USGS. The period of record of the CRUISE model ended in 2003. FirstLight had hoped to extend the period of record to 2012 or later but based on extensive correspondence with the USACE and the Nature Conservancy, it was not possible to extend the period of record past 2003.

The total drainage area of these two gages is 792 mi^2, which represents 88% (792/897) of the incremental additional drainage area below Vernon Dam contributing to the TFI. The remaining 105 mi^2 represents other drainage to the TFI (1.5% of the total drainage area).

GRH reports the Vernon Hydroelectric Project discharge to FirstLight, including flow through the Vernon turbines (total station hydraulic capacity of 17,130 cfs) plus any spill via the gates. There is a gage in the Vernon Powerhouse that is used to measure the discharge; however, the gage can be influenced by backwater conditions[6]. Spill at Vernon Dam is estimated via rating curves for the various gates.

Article 304[7] of the Vernon Hydroelectric Project FERC license requires GRH to coordinate project operations with FirstLight. On May 28, 2003, GRH (then US Gen New England, Inc.) and FirstLight (then Northeast Generating Company) reached a hydro operating agreement relative to the coordinated operations between the Vernon Project and Turners Falls and Northfield Mountain Project. That agreement includes the following steps GRH must take relative to reporting the Vernon Project's generation schedule.

1. By 8:00 am each day, GRH is to fax FirstLight its estimate of the total discharge (cfs-hours) expected the next day at its Vernon Project.
2. When GRH receives the hourly dispatch schedule for the next day from the Independent System Operator-New England (ISO-NE), GRH will fax its Vernon Project schedule to FirstLight. GRH generally receives the ISO-NE report between 12:00 pm and 2:00 pm.
3. If any subsequent dispatch schedules are received during the day showing changes in the project hourly flow schedules, the updated schedule for the Vernon Project will be sent by fax to Northfield.

The agreement also calls for GRH to transmit to FirstLight the instantaneous total discharge and tailwater elevation at the Vernon Project. The current agreement is problematic for FirstLight as it receives inaccurate next day total Vernon Project discharge volumes, and multiple, or sometimes no, real-time updates of the Vernon Project discharges. In Exhibit E of the license application, FirstLight describes what additional information it needs to better manage the Turners Falls and Northfield Mountain Projects under its proposed operating conditions.

FirstLight sums the reported Vernon Project discharge and the Ashuelot and Miller Rivers flows and then adjusts it based on the travel time required to reach the Turners Falls Dam. FirstLight refers to the adjusted flow on its log sheets as the NRF. Note that the electronically available data is only available for the period 2000-2014. Thus, to estimate the inflow to Turners Falls Dam over a longer period of record a different method was used to estimate inflow as described below.

[6] Prior to the raising of the Turners Falls Dam the USGS had a gage located immediately below Vernon Station (Gage No. 011565000, Connecticut River at Vernon, VT). The gage was active from 1936 to 1973. However, with the raising of the Turners Falls Dam and TFI water levels, the gage was retired because it is influenced, at times, by backwater conditions. FirstLight still obtains flow estimates recognizing that there are times when the gage is backwatered.

[7] Article 304 of the Vernon Project license was added to the license in 1992 (59 FERC ¶62,267) and generally requires the Licensee to develop and file with the Commission a coordination agreement with the licensee of certain downstream facilities in the event that the regional central dispatch system was ever discontinued. The dispatching of these hydropower projects under that system was discontinued several years ago in connection with the restructuring of the New England power markets.

The Connecticut River flow at the Turners Falls Dam was estimated using two USGS gages as listed in Table 2.2-2.

Table 2.2-2: USGS Gages to Estimate Inflow to Turners Falls Dam

Gage No.	Gage Name	Period of Record	Drainage Area	Regulation
01170500	Connecticut River at Montague City, MA	1904-current	7,860 mi^2	Regulated seasonally by dams on the CT River (and other major tributaries): First and Second CT Lakes, Moore Reservoir and Comerford Reservoir.
0117000	Deerfield River at West Deerfield, MA	1940-current	557 mi^2	Regulated seasonally by dams on the Deerfield River: Somerset and Harriman Reservoirs.

The Montague USGS gage is located approximately 4,500 feet downstream of Cabot Station. It represents the total flow on the Connecticut River including flow from the Deerfield River. The Deerfield River USGS gage is located further upstream from its confluence with the Connecticut River. As noted above, the drainage area of the Connecticut River at the Turners Falls Dam is 7,163 mi^2. The additional drainage area at the Montague USGS gage compared to the Turners Falls Dam is 697 mi^2, of which the bulk of the increase is attributable to the Deerfield River (557 mi^2 as measured at the USGS gage and 665 mi^2 as measured at its confluence with the Connecticut River). The Deerfield River gage flow was prorated by a factor of 1.25 (697/557) to represent the additional flow from the 697 mi^2 drainage area. This prorated flow was then subtracted from the corresponding flow measured at the Montague USGS Gage to estimate the flow at Turners Falls Dam. The following equation was applied to estimate the flow at Turners Falls Dam:

$Q_{\text{Turners Falls Dam}} = Q_{\text{Montague USGS Gage}} - 1.25(Q_{\text{Deerfield USGS Gage}})$, where

$Q_{\text{Turners Falls Dam}}$=	calculated approximate inflow to Turners Falls Dam (cfs)
$Q_{\text{Montague USGS Gage}}$=	flow recorded at the Montague USGS Gage (cfs)
1.25 =	ratio of the drainage areas (697/557)
$Q_{\text{DeerfieldUSGS Gage}}$=	flow recorded at the Deerfield USGS gage (cfs)

The annual and monthly mean and median flows, and flow per square mile of drainage area at the Turners Falls Dam were calculated for the period 1940-2016 as shown in Table 2.2-3.

Table 2.2-3: Estimated Connecticut River at Turners Falls Dam Drainage Area= 7,163 mi^2, Period of Record Oct 1940-Dec 2016 (cfs)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Mean	10,231	9,491	18,068	34,656	20,413	10,993	6,650	5,770	5,543	8,645	11,503	12,018	12,821
Mean/ mi^2	1.30	1.21	2.30	4.41	2.60	1.40	0.85	0.73	0.71	1.10	1.46	1.53	1.63
Median	8,013	7,641	13,163	30.336	17,304	9,001	4,976	4,156	4,084	5,974	9,654	9,575	8,478
Median/ mi^2	1.02	0.97	1.67	3.86	2.20	1.15	0.63	0.53	0.52	0.76	1.23	1.22	1.08

Figures 2.2-1 through 2.2-5 show the monthly and annual flow duration curves representing calculated Turners Falls Dam average daily flows, respectively.

2.3 Area Capacity Curve

The Upper Reservoir stage versus storage curve is shown in Table 2.3-1 and plotted in Figure 2.3-1. The Upper Reservoir licensed operating range is between 1000.5 and 938 ft, a 62.5-foot fluctuation providing a total usable storage of 12,318 acre-feet[8]. As noted earlier, the Upper Reservoir can be operated between 1004.5 ft and 920 ft, an 84.5-foot fluctuation providing a total usable storage of 15,327 acre-ft. The Upper Reservoir has a surface area of approximately 278 acres at elevation 1000.5 ft.

Combined Useable Storage Volume in the Northfield Mountain Project System

The combined useable volume in the Northfield Mountain Project is the sum of useable water volumes in the Upper Reservoir and the TFI. At any given time, a comparison of the actual combined useable storage volume and the useable storage in the full Upper Reservoir (12,318 acre-feet) provides an indication of whether the TFI useable storage volume is adequate for filling the deficit in the Upper Reservoir. The useable volume in the Upper Reservoir plus the useable volume in the TFI equals 12,318 acre-feet when the system is balanced. At any given time three situations are possible as follows:

- *Combined Useable Storage = 12,318 acre-feet*. This indicates a balanced condition, where the total storage in the TFI and Upper Reservoir is 12,318 acre-feet.

- *Combined Useable Storage < 12,318 acre-feet*. This indicates there is insufficient water available in the TFI to refill the Upper Reservoir. During periods of low flow, this deficiency can be rectified by curtailing generation at Cabot Station or Station No. 1 to allow the TFI to fill.

- *Combined Useable Storage > 12,318 acre-feet*. This indicates there is more than enough water available in the TFI to refill the Upper Reservoir.

In general, FirstLight strives to maintain a near balanced condition or a positive imbalance where the combined useable storage is close to 12,318 acre-feet.

2.4 Hydraulic Capacity

The Northfield Mountain Project includes four reversible pump turbines. The maximum hydraulic capacity of the Northfield Mountain Project when in a pumping and generating mode is approximately 15,200 cfs (3,800 cfs/pump) and 20,000 cfs (5,000 cfs/turbine), respectively. The minimum hydraulic capacity of the Northfield Mountain Project when in a pumping and generating mode is approximately 12,800 cfs (3,200 cfs/pump) and 9,000 cfs (2,250 cfs/turbine), respectively

2.5 Tailwater Rating Curve

The Northfield Mountain Project uses the TFI as its lower reservoir. TFI elevations reflect multiple influences, including operations of the water elevation management at the Turners Falls Dam, Vernon Hydroelectric Project discharges, Northfield Mountain Project pumping or generating discharges, and Turners Falls Project operations. Therefore, Northfield Mountain Project hourly operations do not necessarily correlate with TFI elevations, such that a traditional tailwater elevation versus plant discharge relationship can be produced. However, FirstLight maintains a long-term water logger in the Northfield Mountain tailrace and hourly TFI elevations at the tailrace are electronically available for the period 2000-2014. An elevation duration curve was developed at the Northfield Mountain tailrace as shown in Figure

[8] As noted later in this license application, Northfield Mountain LLC is proposing to expand the use of the Upper Reservoir to be between elevations 920 and 1004.5 feet.

2.5-1. The tailrace elevation generally ranges from 181.1 ft (90% exceedance elevation) to 184.9 ft (10% exceedance elevation).

2.6 Powerplant Capability versus Head Curve

Powerplant capacity versus head for the Northfield Mountain Project is shown in Table 2.6-1.

Table 2.6-1: Northfield Mountain Project- Powerplant Capacity versus Head

Head (feet)	Capacity (MW)
820 (max	1,168
768	840
758 (min)	280

3 UTILIZATION OF PROJECT POWER

The primary purpose of the Northfield Mountain Project is to supply energy, capacity, regulation and other ancillary services to the ISO-NE Interconnection, a regional transmission organization that coordinates the movement of wholesale electricity.

The Northfield Mountain Project typically pumps water to the Upper Reservoir when power demand is low and generates when power demand is high. The Northfield Mountain Project provides critical energy, operating reserves and operational flexibility to ISO-NE system operation. The fact that ISO-NE, as part of its daily operational planning processes, can rely on the Northfield Mountain Project to supply these operational flexibilities from a certain fuel supply is of high value to ISO-NE and the New England region. In many periods, this significant supply of operational flexibility has avoided the commitment of many other less flexible resources to provide for a more efficient system dispatch. This peak load ability provides rapid response power resources to the grid to help prevent regional blackouts.

Storage provides other important reliability benefits to the system. These include helping to manage light load, or excess generation conditions during off peak periods and the ability to respond very quickly to energy and operating reserve needs on the power system during any time of the day or year. Additionally, as New England's electric system transitions to include significantly more intermittent, zero carbon, renewable generation including solar and wind, the flexibility of Northfield Mountain Project will become even more important to ISO-NE.

4 PLANS FOR FUTURE DEVELOPMENT

There are no plans for future development of the Northfield Mountain Project other than FirstLight's proposal to expand the Upper Reservoir operating limits to be 1004.5 to 920 feet.

Table 2.1-1 Northfield Mountain Pumped Storage Project- Summary of Monthly and Annual Generation (MWH) for 2011 to 2019

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2011	65,671	64,477	46,452	42,301	50,058	56,290	103,392	79,772	67,771	76,893	52,454	51,629	757,160
2012	45,074	26,698	52,722	68,596	74,068	55,938	98,932	110,138	61,517	59,794	72,925	55,424	781,826
2013	66,781	65,362	57,176	51,085	61,099	60,465	109,059	76,220	57,764	60,570	64,130	79,232	808,943
2014	68,726	64,673	67,949	58,571	81,431	74,821	98,883	101,214	99,761	82,828	89,316	87,993	976,166
2015	84,761	76,276	75,692	74,164	82,656	79,365	93,588	104,442	82,916	75,174	67,656	89,615	986,305
2016	70,427	78,136	97,314	89,548	76,333	78,607	98,249	103,611	87,408	79,945	77,393	94,190	1,031,161
2017	77,035	58,887	72,710	65,578	73,887	76,891	116,460	98,546	102,825	79,832	87,314	73,384	983,349
2018	68,885	63,707	58,918	71,745	64,094	57,575	92,285	109,742	78,862	75,110	73,248	59,238	873,409
2019	54,645	71,214	62,486	66,354	62,123	55,635	104,420	88,007	54,054	67,587	66,226	57,538	810,289
Average	66,889	63,270	65,713	65,327	69,528	66,176	101,696	96,855	76,986	73,081	72,296	72,027	889,845

Table 2.1-2 Northfield Mountain Pumped Storage Project- Summary of Monthly and Annual Generation (MWH) Consumption in Pumping Mode for 2011 to 2019

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2011	96,439	82,752	72,367	55,866	69,610	81,690	142,141	106,248	93,523	110,491	71,918	69,741	1,052,786
2012	57,045	38,936	65,705	93,555	99,673	77,037	132,357	140,865	86,191	74,027	99,027	77,183	1,041,601
2013	88,692	85,026	71,356	68,421	83,307	81,206	144,181	94,930	80,654	76,997	84,133	110,535	1,069,438
2014	85,727	87,745	87,358	84,204	105,758	100,985	129,180	129,100	128,599	113,603	119,270	114,094	1,285,623
2015	113,994	96,390	106,254	99,943	105,947	106,392	126,168	135,916	104,935	104,434	82,567	118,609	1,301,549
2016	101,032	102,953	133,445	124,239	98,663	101,350	129,575	138,128	112,640	107,149	105,880	127,310	1,382,364
2017	106,517	80,838	99,223	82,815	105,015	100,793	153,982	133,414	134,807	103,775	117,657	104,686	1,323,522
2018	85,301	91,145	78,193	92,669	85,943	79,509	124,524	140,047	102,387	106,684	93,434	82,177	1,162,013
2019	77,096	88,667	89,904	90,058	80,912	74,554	137,952	113,890	80,404	88,334	92,008	74,084	1,087,863
Average	90,205	83,828	89,312	87,974	92,759	89,280	135,562	125,838	102,682	98,388	96,210	97,602	1,189,640

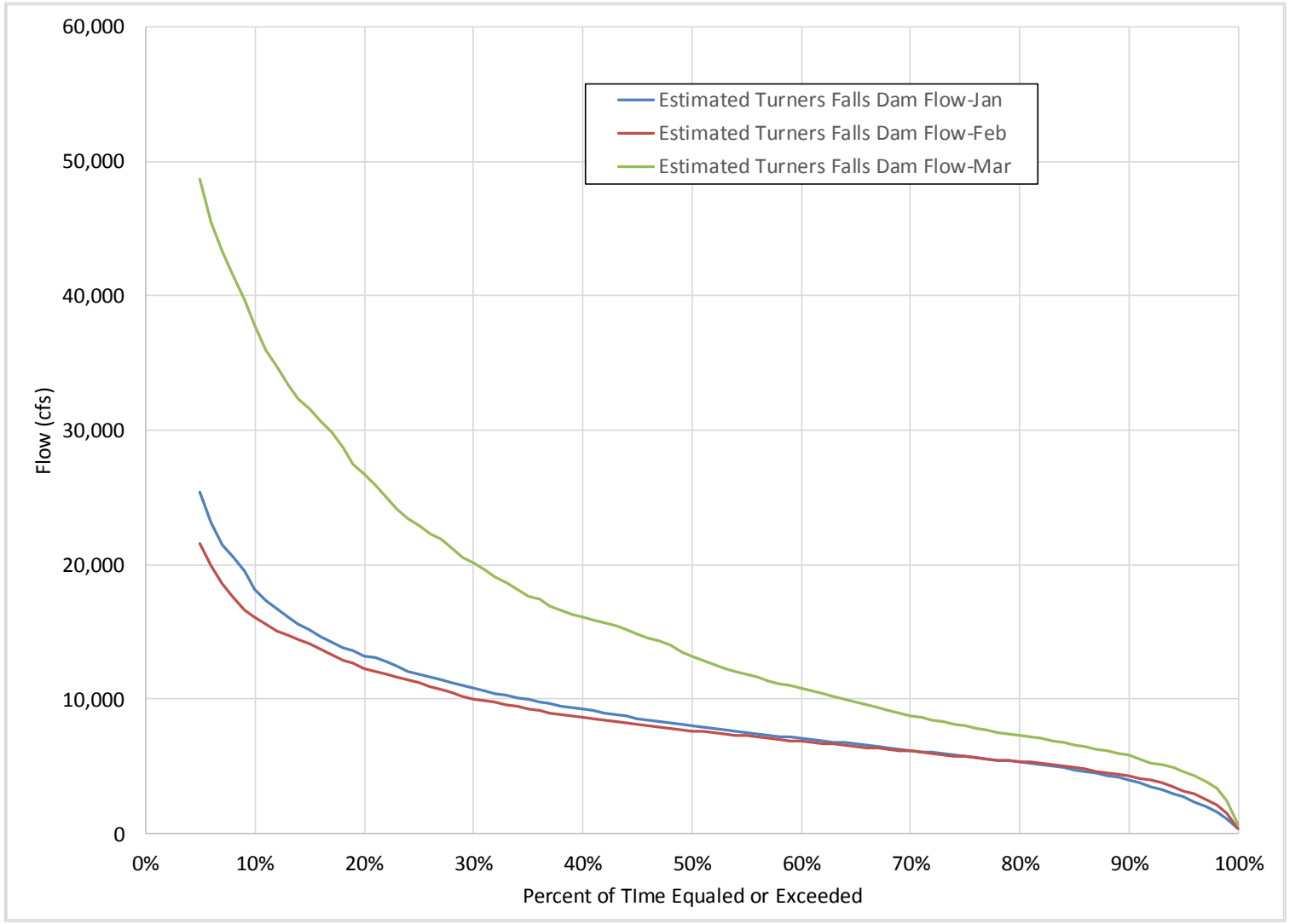

Figure 2.2-1. Connecticut River at Turners Falls Dam, Jan-Mar Flow Duration Curve, Oct 1940-Dec 2016, Drainage Area= 7,163 mi^2

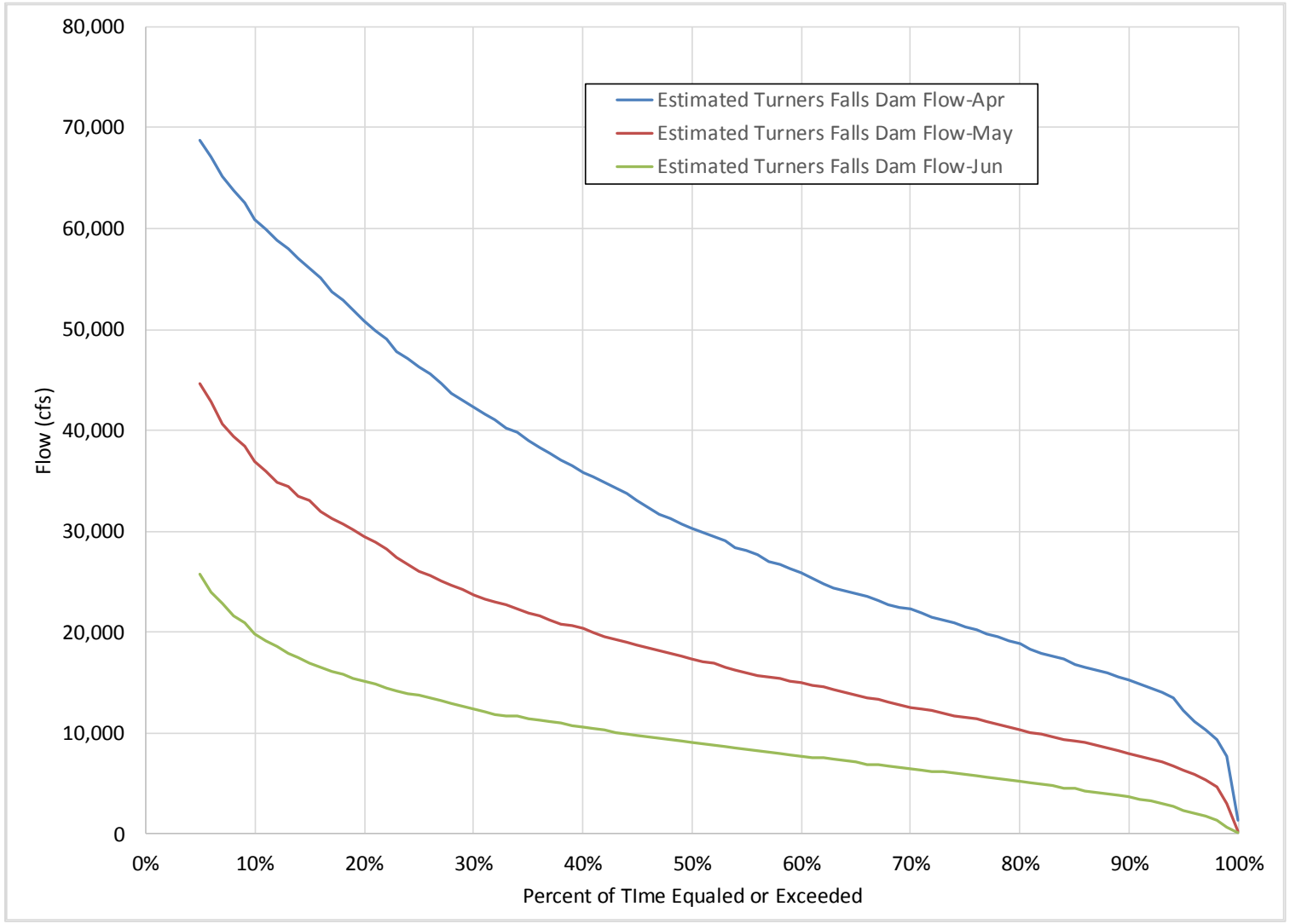

Figure 2.2-2. Connecticut River at Turners Falls Dam, Apr-Jun Flow Duration Curve, Oct 1940-Dec 2016, Drainage Area= 7,163 mi^2

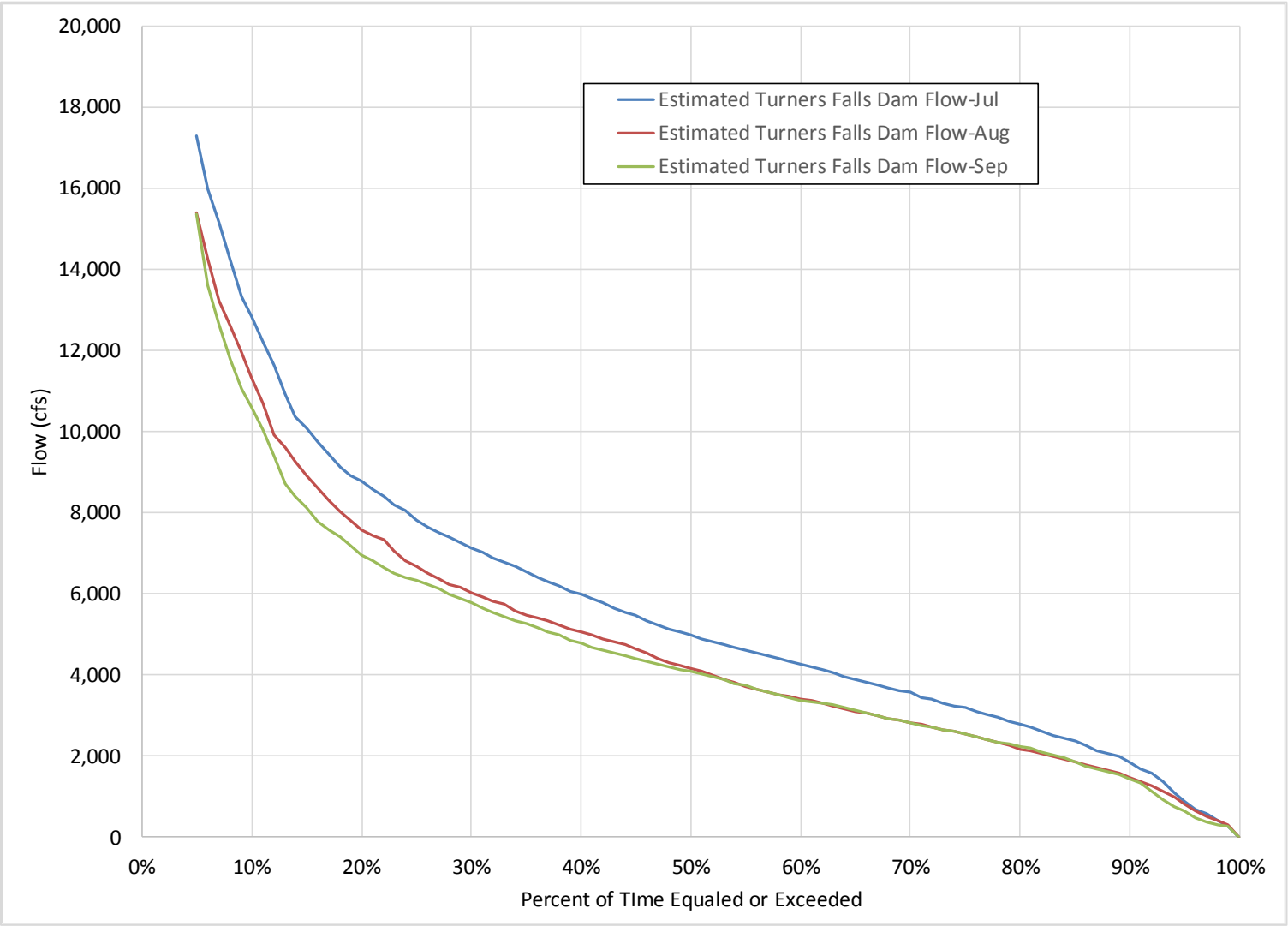

Figure 2.2-3. Connecticut River at Turners Falls Dam, Jul-Sep Flow Duration Curve, Oct 1940-Dec 2016, Drainage Area= 7,163 mi^2

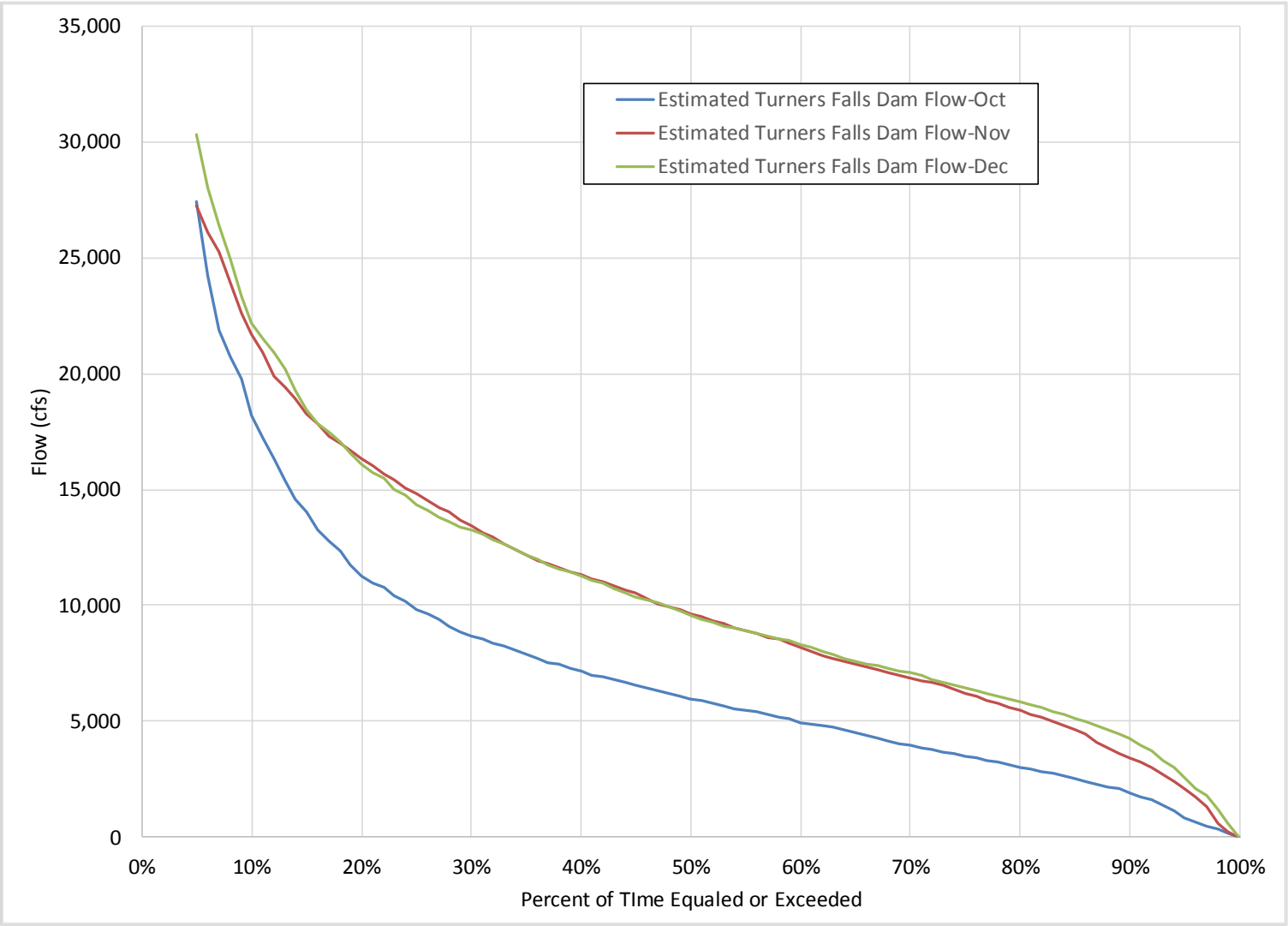

Figure 2.2-4. Connecticut River at Turners Falls Dam, Oct-Dec Flow Duration Curve, Oct 1940-Dec 2016, Drainage Area= 7,163 mi^2

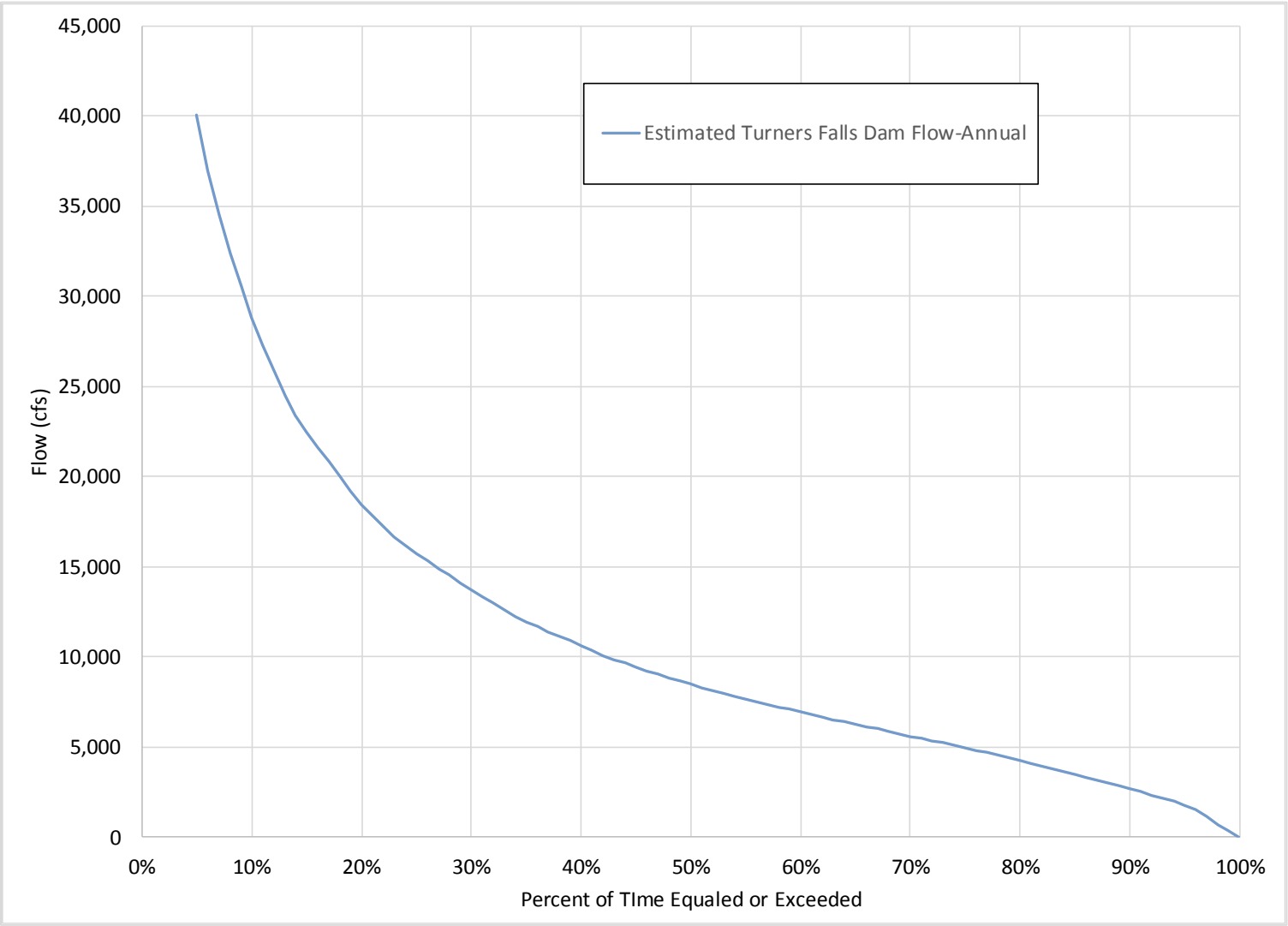

Figure 2.2-5. Connecticut River at Turners Falls Dam, Annual Flow Duration Curve, Oct 1940-Dec 2016, Drainage Area= 7,163 mi^2

Table 2.3-1: Upper Reservoir Stage versus Storage Curve

Upper Reservoir Elev (ft)	**Storage** (acre-ft)	**Upper Reservoir Elev** (ft)	**Storage** (acre-ft)
920	0	966	6,141
921	88	967	6,328
922	177	968	6,519
923	269	969	6,713
924	363	970	6,910
925	459	971	7,110
926	558	972	7,314
927	658	973	7,520
928	760	974	7,729
929	865	975	7,940
930	972	976	8,155
931	1,081	977	8,374
932	1,192	978	8,596
933	1,306	979	8,820
934	1,422	980	9,046
935	1,540	981	9,276
936	1,660	982	9,508
937	1,781	983	9,743
938	1,905	984	9,980
939	2,030	985	10,221
940	2,157	986	10,464
941	2,286	987	10,710
942	2,417	988	10,958
943	2,550	989	11,208
944	2,685	990	11,461
945	2,823	991	11,751
946	2,962	992	11,971
947	3,101	993	12,229
948	3,244	994	12,489
949	3,387	995	12,750
950	3,532	996	13,014
951	3,678	997	13,280
952	3,827	998	13,547
953	3,976	999	13,816
954	4,128	1000	14,087
955	4,281	1000.5	14,223
956	4,436	1001	14,360
957	4,593	1002	14,633
958	4,752	1003	14,969
959	4,912	1004	15,187
960	5,077	1004.5	15,327
961	5,248		
962	5,425		
963	5,597		
964	5,775		
965	5,956		

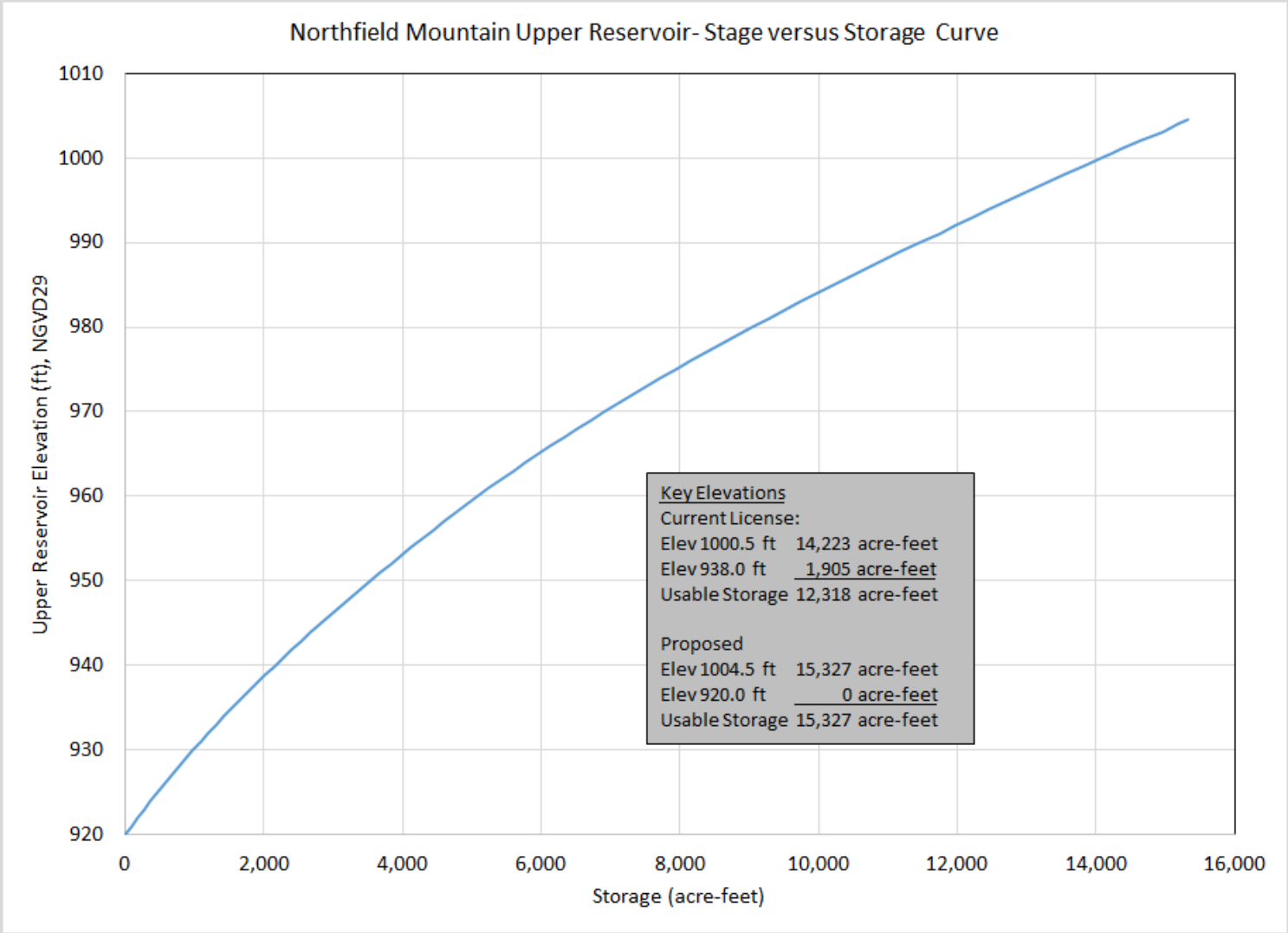

Figure 2.3-1: Northfield Mountain Upper Reservoir Stage versus Storage Curve

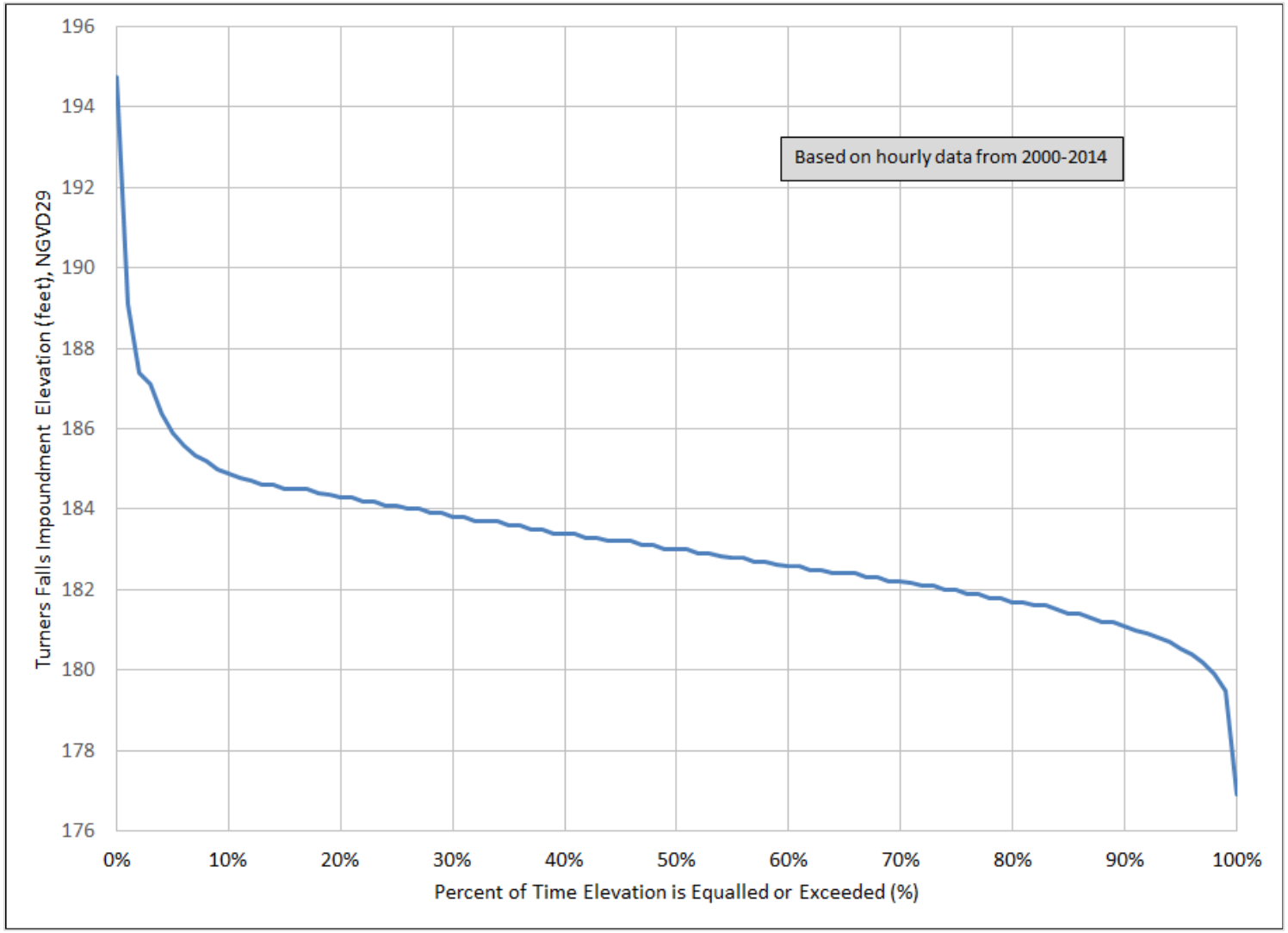

Figure 2.5-1: Turners Falls Impoundment- Elevation Duration Curve at Northfield Mountain Pumped Storage Project Tailrace
(based on hourly data from 2000-2014)

Amended Final Application for New License for Major Water Power Project – Existing Dam

Northfield Mountain Pumped Storage Project (FERC Project Number 2485)

EXHIBIT C-CONSTRUCTION HISTORY AND PROPOSED CONSTRUCTION

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TABLE OF CONTENTS

LIST OF TABLES

EXHIBIT C – CONSTRUCTION HISTORY AND PROPOSED CONSTRUCTION

The following excerpt from the Code of Federal Regulations (CFR) at 18 CFR § 4.51 (d) describes the required content of this Exhibit.

(d) Exhibit C is a construction history and proposed construction schedule for the project. The construction history and schedules must contain:

(1) If the application is for an initial license, a tabulated chronology of construction for the existing projects structures and facilities described under paragraph (b) of this section (Exhibit A), specifying for each structure or facility, to the extent possible, the actual or approximate dates (approximate dates must be identified as such) of:

(i) Commencement and completion of construction or installation;

(ii) Commencement of commercial operation; and

(iii) Any additions or modifications other than routine maintenance; and

(2) If any new development is proposed, a proposed schedule describing the necessary work and specifying the intervals following issuance of a license when the work would be commenced and completed.

1 PROJECT HISTORY

Northfield Mountain LLC (hereinafter referred to as FirstLight) is licensed by the Federal Energy Regulatory Commission (FERC) to operate the Northfield Mountain Pumped Storage Project (Northfield Mountain Project).

Northfield Mountain Project

The Northfield Mountain Project is a pumped-storage facility located on the eastern bank of the Connecticut River in the Commonwealth of Massachusetts (MA) and is located approximately 5.2 miles upstream of Turners Falls Dam. The Turners Falls Impoundment (TFI) serves as its lower reservoir. This Project's Upper Reservoir is a man-made structure situated atop Northfield Mountain, to the east of the Connecticut River. During pumping operations, water is pumped from the TFI to the Upper Reservoir. When generating, water is passed from the Upper Reservoir through an underground pressure shaft to a powerhouse cavern and then a tailrace tunnel delivers the water back to the TFI.

The Northfield Mountain Project consists of a) an Upper Reservoir and dam/dikes; b) an intake channel; c) pressure shaft; d) an underground powerhouse; and e) a tailrace tunnel.

On May 14, 1968, the Federal Power Commission issued an original license to Connecticut Light and Power Company, Hartford Electric Company, and Western Massachusetts Electric Company for the construction of the proposed 1,000 MW Northfield Mountain Project. The Northfield Mountain Project included four (4) 250 MW reversible pump-turbines. Construction of the Northfield Project began in 1968 and was completed when the first unit went into commercial operation in 1972.

The Project is maintained through regularly scheduled maintenance inspections and replacement of equipment as components reach the end of their service life. In addition to the routine maintenance, various components of the Project have been refurbished. An overview of the history of Project improvements is summarized in Table 1.0-1.

Table 1.0-1. Northfield Mountain Project Milestones.

Date	Station	Description
1972	Northfield	First unit, Unit 4 began commercial operation 11/30/72
1973	Northfield	Units 1, 2, 3 began commercial operation; U1 02/28/73, U3 07/25/73, U2 10/08/73
2004	Northfield, Unit 1	Turbine runner and generator circuit breaker replacement
2006	Northfield, Unit 3	Electrical equipment replacement
2007	Northfield	1X Main power step-up Transformer replacement
2008	Northfield, Units 2 and 4	Electrical equipment replacement
2011	Northfield, Unit 3	Turbine runner and 3X Main power step-up Transformer replacement and generator rewind
2012	Northfield, Unit 2	Turbine runner replacement and generator rewind
2014	Northfield Unit 4	Turbine runner replacement and generator rewind
2015-16	Northfield Unit 1	Generator rewind

2 SCHEDULE FOR PROPOSED PROJECT DEVELOPMENT

FirstLight is currently not proposing any new hydropower development at the Northfield Mountain Project; however, it is proposing to expand the use of the Upper Reservoir. Specifically, FirstLight is proposing to expand the current range of Upper Reservoir operation from the FERC license limits of 1000.5 to 938 feet to 1004.5 to 920 feet.

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Amended Final License Application for New License for Major Water Power Project – Existing Dam

Northfield Mountain Pumped Storage Project (FERC Project Number 2485)

EXHIBIT D – STATEMENT OF COST AND FINANCING

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TABLE OF CONTENTS

LIST OF TABLES

EXHIBIT D – STATEMENT OF COSTS AND FINANCING

The following excerpt from the Code of Federal Regulations (CFR) at 18 CFR § 4.51 (e) describes the required content of this Exhibit.

(e) Exhibit D is a statement of costs and financing. The statement must contain:

(1) If the application is for an initial license, a tabulated statement providing the actual or approximate original cost (approximate costs must be identified as such) of:

(i) Any land or water right necessary to the existing project; and

(ii) Each existing structure and facility described under paragraph (b) of this section (Exhibit A).

(2) If the applicant is a licensee applying for a new license, and is not a municipality or a state, an estimate of the amount which would be payable if the project were to be taken over pursuant to section 14 of the Federal Power Act upon expiration of the license in effect [see 16 U.S.C. 807], including:

(i) Fair value;

(ii) Net investment; and

(iii) Severance damages.

(3) If the application includes proposals for any new development, a statement of estimated costs, including:

(i) The cost of any land or water rights necessary to the new development; and

(ii) The cost of the new development work, with a specification of:

(A) Total cost of each major item;

(B) Indirect construction costs such as costs of construction equipment, camps, and commissaries;

(C) Interest during construction; and

(D) Overhead, construction, legal expenses, taxes, administrative and general expenses, and contingencies.

(4) A statement of the estimated average annual cost of the total project as proposed specifying any projected changes in the costs (life-cycle costs) over the estimated financing or licensing period if the applicant takes such changes into account, including:

(i) Cost of capital (equity and debt);

(ii) Local, state, and Federal taxes;

(iii) Depreciation and amortization;

(iv) Operation and maintenance expenses, including interim replacements, insurance, administrative and general expenses, and contingencies; and

(v) The estimated capital cost and estimated annual operation and maintenance expense of each proposed environmental measure.

(5) A statement of the estimated annual value of project power, based on a showing of the contract price for sale of power or the estimated average annual cost of obtaining an equivalent amount of power (capacity and energy) from the lowest cost alternative source, specifying any projected changes in the cost of power from that source over the estimated financing or licensing period if the applicant takes such changes into account.

(6) A statement specifying the sources and extent of financing and annual revenues available to the applicant to meet the costs identified in paragraphs (e) (3) and (4) of this section.

(7) An estimate of the cost to develop the license application;

(8) The on-peak and off-peak values of project power, and the basis for estimating the values, for projects which are proposed to operate in a mode other than run-of-river; and

(9) The estimated average annual increase or decrease in project generation, and the estimated average annual increase or decrease of the value of project power, due to a change in project operations (i.e., minimum bypass flows; limits on reservoir fluctuations).

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1 COST OF ORIGINAL DEVELOPMENT

This application is for a new license, not an initial license; the Northfield Mountain Pumped Storage Project (Northfield Mountain Project) was originally licensed in 1968. Accordingly, the Commission's regulations do not require Northfield Mountain LLC (hereinafter referred to as FirstLight) to include a statement of costs of lands, water rights, structures or facilities. 18 C.F.R. § 4.51(e)(1).

2 ESTIMATED AMOUNT PAYABLE IN THE EVENT OF PROJECT

To date, no agency or interested party has recommended a Federal takeover of the Northfield Mountain Project pursuant to Section 14 of the Federal Power Act (FPA). If such a takeover were to occur, FirstLight would have to be reimbursed for the net investment, not to exceed the fair value of the property taken, plus severance damages, if any, to property of the licensee valuable, serviceable, and dependent for its usefulness on the continuance of the license, but not taken. (Section 14, FPA).

2.1 Fair Value

The term "fair value" is not defined in the FPA Section 14. FirstLight believes the best approximation of fair value is the cost to construct and operate a comparable pump-generating facility. Because of the high capital costs involved with constructing new facilities and the increase in fuel costs, the fair value would be considerably higher than the net investment (see Section 2.2). If a takeover were proposed, FirstLight would calculate fair value based on then-current conditions.

2.2 Net Investment

The FPA defines "net investment" as the original cost, plus additions, minus the sum of the following items (to the extent that such items have been accumulated during the period of the license from earnings in excess of a fair return on such investment): (a) unappropriated surplus; (b) aggregate credit balances of current depreciated accounts; and (c) aggregate appropriations of surplus or income held in amortization, sinking fund, or similar reserves.

The Northfield Mountain Project net investment is approximately $768,022,000.

2.3 Severance Damages

Severance damages are determined either by the cost of replacing (retiring) equipment that is "dependent for its usefulness upon the continuance of the License" but not taken (Section 14, FPA). At this time, the only equipment, facilities or structures and related contractual obligations and requirement that are not required for the successful operation of the Northfield Mountain Project are associated with the approximately 3 MW solar array on the east bank of the Connecticut River within the Northfield Mountain Project Boundary. This solar project has no connection to the Northfield Mountain Project and if the facility were taken, the Solar Farm would need to be compensated.

It will not be possible to separate the Solar Farm from the Northfield Mountain Project because a portion of its tailrace runs under the land occupied by the Solar Farm. Rather, the Solar Farm would remain and incremental Operations and Maintenance (O&M) costs resulting from the assumption of the O&M Agreement would be due to the Owner as Severance Damages.

Under the terms of its current Lease and O&M Agreements with FirstLight, FirstLight Storage Company (the parent company) pays an annual land lease fee as well as those costs associated with O&M related expenses. It is assumed that the land lease fee would remain unchanged. However, the O&M costs,

specifically labor costs, are based upon the O&M personnel from Northfield Mountain Station performing these duties. If the federal government were to assume the Northfield Mountain Project, there would be an incremental increase in labor cost because either additional staff or external resources would be required to perform the tasks currently undertaken by Northfield personnel. This is estimated to be one full time equivalent person at a fully loaded annual cost of approximately $100,000 (2019 USD). Allowing for the current labor cost included in the O&M Budget the incremental labor cost would be $75,000/year (2019 USD).

3 ESTIMATED CAPITAL COST OF PROPOSED PROJECT

FirstLight does not propose to add any additional power generation facilities to the Northfield Mountain Project.

4 ESTIMATED AVERAGE ANNUAL COST OF PROJECT

The average annual cost of the Northfield Mountain Project includes capital costs, taxes, depreciation, pumping costs, as well as O&M costs. The average annual costs also includes any costs associated with the proposed Protection, Mitigation and Enhancement (PM&E) measures.

4.1 Capital Costs

The current estimated average annual capital cost for the Northfield Mountain Project is approximately $8,220,000/year. These costs include life cycle costs such as runner replacements, generator rewinds, and oil circuit breaker replacements and routine replacement of vehicles and tools. Additional capital costs related to the implementation of PM&E measures will add to the annual capital expense. Those costs are detailed in Section 4.5.

Other Capital Costs

On October 23, 2018, the America's Water Infrastructure Act (AWIA) of 2018 was enacted. The Act added Section 36 to the FPA, requiring FERC to consider, and give equal weight to, project-related investments by the Licensee under the new license and project-relative investments by the Licensee over the term of the existing license when setting the term under the new license.

Section 36(b)(2) requires FERC to consider investments by the Licensee over the term of the existing license (including any terms under annual licenses) that "(A) resulted in redevelopment, new construction, new capacity, efficiency, modernization, rehabilitation or replacement of major equipment, safety improvements, or environmental, recreation, or other protection, mitigation, or enhancement measures conducted over the term of the existing license; and (B) were not expressly considered by the Commission as contributing to the length of the existing license term in any order establishing or extending the existing license term."

There have been considerable investments into efficiency and modernization of the four pump-turbines at the Northfield Mountain Project as documented in Exhibit C. The major modernization work was completed between 2011 and 2016 related to turbine runner replacement and generator rewinds at all four pump-turbines. The total cost of these improvements was approximately $80,407,000.

4.2 Taxes

The actual annual property tax for the fiscal year ending December 31, 2019 associated with the Northfield Mountain Project was $10,522,000. FirstLight estimates paying approximately $100,000 in state franchise tax annually. A summary of the local and state franchise tax for the fiscal year ending December 31, 2019

is shown in Table 4.2-1. Federal income taxes for the Northfield Mountain Project are incorporated into costs of the Licensee's consolidated business and are not separated out for the Northfield Mountain Project.

Table 4.2-1: State and Local Taxes Associated with the Northfield Mountain Project (FY 2019 dollars)

Tax	Northfield Mountain Project
Local (property)	$10,522,000
State	$100,000
Total	**$10,622,000**

4.3 Depreciation and Amortization

The estimated annual depreciation and amortization costs associated with the Northfield Mountain Project are approximately $55,300,000.

4.4 Operation and Maintenance Expenses

Annual O&M expenses include interim replacements, insurance, and administrative and general costs associated with the operation of the Northfield Mountain Project, as well as compliance with environmental measures. The O&M costs for the Northfield Mountain Project are approximately $24,900,000/year.

Additional O&M expenses related to the implementation of PM&E measures will add to the annual O&M experience. Those costs are detailed in Section 4.5.

4.5 Costs of Proposed Protection, Mitigation and Enhancement Measures

FirstLight proposes several PM&E measures for inclusion in the new license for the Turners Falls Project. The PM&E measures have extensive associated capital cost, periodic capital cost, and annual O&M cost over the proposed 50-year license term. Table 4.5-1 summarizes the PM&E measures and includes the following:

- The total capital costs, including engineering, permitting and construction, for each PM&E measure.
- The periodic costs, including the cost of replacing and/or repairing equipment associated with each PM&E measure.
- The annual O&M costs associated with each PM&E measure.

Table 4.5-1: Cost Estimate of Proposed PM&E Measures at the Northfield Mountain Project

PM&E Measure	Total Capital Cost over 50 years (2019 dollars)	Total Periodic Capital Cost over 50 years (2019 dollars)	Total O&M Cost over 50 years (2019 dollars)	Average[1] Annual Cost over 50 years (2019 dollars)
Periodic Dredging of the Upper Reservoir Intake Channel				
[2]Cost of Dredging Upper Reservoir Intake Channel- 10 hydraulic dredges at $4,000,000/dredge and 4 mechanical dredges at $5,000,000/dredge.	$60,000,000		$70,000 $5,000 x 14 events	$1,201,000
Fish Passage Measures				
Install a Barrier Net at Tailrace/Intake to prevent entrainment	$4,095,000	[3]$931,000	$20,148,000 $438,000/yr for 46 years	$503,000
Recreation				
[4]At Riverview- Relocate the existing Boat Tour Dock given that it would be enclosed by the Barrier Net	$316,000	-	$470,000 $10,000/yr for 47 years	$16,000
Create a new access trail with stairs for a put-in at Riverview	$134,000	-	$329,000 $7,000/yr for 47 years	$9,000
Create a formal access trail for a put-in at Cabot Camp	$30,000		$329,000 $7,000/yr for 47 years	$7,000
Total	**$64,575,000**	**$931,000**	**$21,346,000**	**$1,736,000**

[1]Rounded to the nearest $1,000. Average Annual Cost= (Total Capital Costs + Total Periodic Costs + Total O&M Costs)/50 years.

[2]FirstLight dredged the Upper Reservoir in 2015 for $4.0M. Assuming a 50-year license term, it was assumed a similar Upper Reservoir dredge would occur 10 times over the 50-year period totaling $40,000,000. Additionally, the Upper Reservoir will be dewatered and mechanical silt removal will take place every 15 years for a total cost of $20,000,000 over the 50-year period.

[3]Periodic costs include replacing two net panels every 2 years, replacing portions of the debris boom every 10 years and replacing/repairing the riverbed anchors every 10 years. O&M costs are based on removing/installing net annually and is also based on past experience with a smolt barrier net in the same general location.

[4]The proposed barrier net would enclose the existing floating dock at Riverview. Thus, it would be relocated outside of the barrier net.

The average annual cost of the PM&E measures over 50 years is $1,736,000/year.

5 ESTIMATED ANNUAL VALUE OF PROJECT POWER

If all of the Northfield Mountain Project generation were sold into the market, it would be priced at the Day Ahead and Real Time Locational Marginal Prices that clear for each generator. For 2019, the Northfield Mountain Project had a realized energy value of $46.03/MWh (this is a realized value calculated as revenue divided by generation). The economic analysis of Northfield Mountain Project also recognizes that the NEPOOL market values the capacity, reserve and ancillary/regulation services provided by generation facilities.

Capacity is required by NEPOOL to ensure the reliability of the electric system and the price is established by NEPOOL through the forward capacity auction process. For 2019, the calendar average forward capacity auction clearing price was $8.07/KW-month, second all-time high, while the capacity revenue received by the Northfield Mountain Project was approximately $111,400,000. With known Forward Capacity Auction clearing prices, capacity revenue will drop precipitously to approximately $28,000,000 in 2024 as shown in Table 5.0-1.

Table 5.0-1: Annual Capacity Revenue of the Northfield Mountain Project

Year	Average Price ($kW-month)	Expected Revenue
2020	$6.02	$84,388,000
2021	$4.91	$68,806,880
2022	$4.15	$58,108,000
2023	$2.75	$38,544,000
2024[1]	$2.00	$28,032,000

[1]Capacity prices are cleared through May 2024; remainder of 2024 period assumes a $2.00/Kw-month clearing price with unchanged qualified capacity of 1,168 MW.

Forward Reserve Market is an ISO-New England (ISO-NE) market to acquire, in advance, capability to supply pool-required Operating Reserve. It is a voluntary market and the price is set through two Forward Reserve Auctions per year, a four month summer season and an eight month winter season. In 2019, the Northfield Mountain Project participated in the forward reserve auction and real-time reserves with the revenue received from this market of $6,300,000.

In addition to energy, capacity and forward reserve market, the Northfield Mountain Project produces ancillary and regulation services that provide spinning and offline reserve and "fine tuning" necessary for effective system control by responding to minute-to-minute changes in load. For 2019, the ancillary services ($600,000) and regulation revenue ($2,800,000) has been calculated as $3,400,000.

Table 5.0-2 below shows the total valuation of the power based on the product components identified above. This is based on 810,289 MWh of generation in 2019. The annual market value of the energy, capacity and forward reserve and ancillary/regulation services is approximately $158,398,000, which equates to $195.48/MWh.

Table 5.0-2: Annual Revenue of the Northfield Mountain Project (2019)

Revenue Source	Value
Energy ($46.03/MWh for Year 2019 for 810,289 MWh)	$37,298,000
Capacity	$111,400,000
Locational Forward Reserve Market and Real-Time Reserves	$6,300,000
*Ancillary (NCPC, Posturing, ISO-Fees)	$600,000
Regulation	$2,800,000
Total Value	$158,398,000

NOTE: Numbers may not be exact due to rounding.
* Ancillary includes ISO-NE expenses

6 SOURCES AND EXTENT OF FINANCING

The Northfield Mountain Project finances capital projects using cash flow from operations and as necessary additional debt obligations. It is part of a portfolio of 13 hydro assets which together service existing debt obligations. Interest expenses to service these obligations are approximately $29,250,000 annually. Based on the value of Northfield Mountain Project power, it should have adequate financial resources to meet the costs of operating the facility for the term of the new license.

7 ESTIMATED COST TO DEVELOP LICENSE APPLICATION

The cost to develop the information necessary to complete the license application through March 2020 is estimated to be $32,150,000 (which includes both the Turners Falls Project and the Northfield Mountain Project). This estimate includes all study costs, Integrated Licensing Process (ILP) costs, and personnel and administrative costs associated with processing.

8 ON-PEAK AND OFF-PEAK VALUES OF POWER

The Northfield Mountain Project operates within NEPOOL, whose geographic area includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont[1].

The Market has provided the historical 2019 On-Peak and Off-Peak prices for the Northfield Mountain Project generation node:

On-Peak Price	$33.33/MWh
Off-Peak Price	$27.61/MWh

9 ESTIMATED AVERAGE ANNUAL INCREASE OR DECREASE IN PROJECT GENERATION

FirstLight is proposing the following operational measures outlined in more detail in Exhibit E (which is a combined Exhibit E for the Turners Falls Project and Northfield Mountain Project).

Operational Regime

(a) Flood Flow Operations. The Licensee shall operate the Northfield Mountain Pumped Storage Project in accordance with its existing agreement with the United States Army Corp of Engineers (USACOE).

This agreement, memorialized in the *Reservoir and River Flow Management Procedures* (1976), as it may be amended from time to time, governs how the Northfield Mountain Pumped Storage Project shall operate during flood conditions and coordinate its operations with the Licensee of the Turners Falls Hydroelectric Project (FERC No. 1889).

(b) Upper Reservoir Water Level Management: The Licensee shall operate the Northfield Mountain Pumped Storage Project Upper Reservoir between elevation 1004.5 and 920 feet NGVD29.

As discussed in Exhibit B, FirstLight developed an hourly time step operations model of the Connecticut River Basin for the period 1962-2003 to determine the impact on generation, flows and reservoir level due to alternative modes of operations. The operations model simulated two scenarios- baseline conditions (representing current operations) and a sensitivity case that included FirstLight's proposal and a revised 2009 Northfield Mountain Project pump-generation schedule allowing it to operate more often[2]. Analysis of this sensitivity case was conducted to evaluate the potential impacts to other resources.

It is not possible to predict, with any certainty, whether increasing the Upper Reservoir storage capacity will result in more or less operation of Northfield Mountain. Northfield Mountain's operation is a function of the cost of the energy to pump and the value of the energy when generating. These values vary hour to hour, day to day, and week to week. Therefore, FirstLight developed a sensitivity case in which Northfield generated approximately 50,000 MWhs more than it did using the observed 2009 Northfield Mountain Project pump-generation schedule.

Shown in Table 9.0-1 is the following:

- The average annual generation produced by the Northfield Mountain Project under baseline conditions (2009 observed pump/generation schedule) from the operations model (Column 1 in Table 9.0-1).

- The average annual generation consumed by the Northfield Mountain Project under baseline conditions. The average ratio of pumping (1,189,640 MWh average from 2011-2019) to generating (889,845 MWh average from 2011-2019) is approximately 1.34 meaning it takes 34% more energy to pump than to generate. Thus, the average annual generation was multiplied by 1.34 to estimate the average annual energy consumed for pumping (Column 2 in Table 9.0-1).

- The difference between the average annual generation and average annual pumping is the net generation, which will always be a negative value since more energy is consumed for pumping than generating (Column 3 in Table 9.0-1).

- The same analysis described above for baseline conditions was repeated for the Sensitivity Case, which includes the increased 2009 pump/generation schedule (Columns 4, 5, and 6).

- The difference in average annual generation, generation used for pumping and net generation between baseline conditions and the Sensitivity Case (Columns 7, 8 and 9).

[2] The operations model used the 2009 pump-generation schedule for the period of record.

Table 9.0-1: Average (1962-2003) Annual Generation Impact of Sensitivity Case

(1) Northfield Mountain Project- Average Annual *Baseline Generation* from Operations Model (MWh/year)	**(2) Northfield Mountain Project- Average Annual *Baseline Pumping* – Gen x 1.34 (MWh/year)**	**(3) Net Northfield Mountain Project- Average Annual *Baseline Net Generation* (MWh/year)**	**(4) Northfield Mountain Project- Average Annual *Sensitivity Case Generation* from Operations Model (MWh/year)**	**(5) Northfield Mountain Project- Average Annual *Sensitivity Case Pumping* – Gen x 1.34 (MWh/year)**	**(6) Net Northfield Mountain Project- Average Annual *Sensitivity Case Net Generation* (MWh/year)**	**(7) Northfield Mountain Project- Average Annual Change in *Generation* due to Sensitivity Case (MWh/year)**	**(8) Northfield Mountain Project- Average Annual Change in *Pumping* due to Sensitivity Case (MWh/year)**	**(9) Net Northfield Mountain Project- Annual Net Change in *Generation* (MWh/year)**
938,197	1,257,184	-318,987	989,012	1,325,276	-336,264	50,815 (column 4-1)	68,092 (column 5-2)	17,277 (column 6-3)
The average ratio of pumping to generating is 1.34 meaning it takes 34% more energy to pump than generate. For example, if the average annual generation is 938,197 MWh, it was assumed that the number of MWh used for pumping was 938,197 x 1.34 or 1,257,184 MWh.								

Amended Final Application for New License for Major Water Power Project – Existing Dam

Northfield Mountain Pumped Storage Project (FERC Project Number 2485)

EXHIBIT G- PROJECT BOUNDARY MAPS

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXHIBIT G – PROJECT BOUNDARY MAPS

The following excerpt from the Code of Federal Regulations (CFR) at 18 CFR § 4.41(h) describes the required content of this Exhibit.

Exhibit G is a map of the project that must conform to the specifications of § 4.39. In addition to the other components of Exhibit G, the applicant must provide the project boundary data in a georeferenced electronic format - such as ArcView shape files, GeoMedia files, MapInfo files, or any similar format. The electronic boundary data must be potentially accurate to ± 40 ft, in order to comply with the National Map Accuracy Standards for maps at a 1:24,000 scale (the scale of the USGS quadrangle maps). The electronic exhibit G data must include a text file describing the map projection used (i.e., UTM, State Plane, Decimal Degrees, etc.), the map datum (i.e., North American 27, North American 83, etc.) and the units of measurement (i.e., feet, meters, miles, etc.). Three sets of the maps must be submitted on CD or other appropriate electronic media. If more than one sheet is used, for the paper maps, the sheets must be numbered consecutively, and each sheet must bear a small insert sketch showing the entire project and indicating that portion of the project depicted on that sheet. Each sheet must contain a minimum of three known reference points. The latitude and longitude coordinates, or state plane coordinates, of each reference point must be shown. If at any time after the application is filed there is any change in the project boundary, the applicant must submit, within 90 days following the completion of project construction, a final Exhibit G showing the extent of such changes. The map must show:

(1) Location of the project and principal features. The map must show the location of the project as a whole with reference to the affected stream or other body of water and, if possible, to a nearby town or any other permanent monuments or objects, such as roads, transmissions lines or other structures, that can be noted on the map and recognized in the field. The map must also show the relative locations and physical interrelationships of the principal project works and other features described under paragraph (b) of this section (Exhibit A).

(2) Project Boundary. The map must show a project boundary enclosing all project works and other features described under paragraph (b) of this section (Exhibit A) that are to be licensed. If accurate survey information is not available at the time the application is filed, the applicant must so state, and a tentative boundary may be submitted. The boundary must enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of environmental resources (see paragraph (f) of this section (Exhibit E)). Existing residential, commercial, or other structures may be included within the boundary only to the extent that underlying lands are needed for project purposes (e.g., for flowage, public recreation, shoreline control, or protection of environmental resources). If the boundary is on land covered by a public survey, ties must be shown on the map at sufficient points to permit accurate platting of the position of the boundary relative to the lines of the public land survey, the best available legal description of the position of the boundary must be provided, including distances and directions from fixed monuments or physical features.

The boundary must be described as follows:

(i) Impoundments.
(A) The boundary around a project impoundment must be described by one of the following:
(1) Contour lines, including the contour elevation (preferred method);
(2) Specified courses and distances (meets and bounds);
(3) If the project lands are covered by a public land survey, lines upon or parallel to the lines of the survey; or
(4) Any combination of the above methods.

(B) The boundary must be located no more than 200 feet (horizontal measurement) from the exterior margin of the reservoir, defined by the normal maximum surface elevation, except where deviations may be necessary in describing the boundary according to the above methods or where additional lands are necessary for project purposes, such as public recreation, shoreline control, or protection of environmental resources.

(ii) Continuous features. The boundary around linear (continuous) project features such as access roads, transmission lines, and conduits may be described by specified distances from center lines or offset lines of survey. The width of such corridors must not exceed 200 feet unless good cause is shown for a greater width. Several sections of a continuous feature may be shown on a single sheet with information showing the sequence of contiguous sections.

(iii) Noncontinuous features.
(A) The boundary around noncontinuous project works such as dams, spillways, and powerhouses must be described by one of the following:

(1) Contour lines;
(2) Specified courses and distances;
(3) If the project lands are covered by a public land survey, lines upon or parallel to the lines of the survey; or
(4) Any combination of the above methods.

(B) The boundary must enclose only those lands that are necessary for safe and efficient operation and maintenance of the project or for other specified project purposes, such as public recreation or protection of environmental resources.

(3) Federal lands. Any public lands and reservations of the United States (Federal lands) [see 16 U.S.C. 796 (1) and (2)] that are within the project boundary, such as lands administered by the U.S. Forest Service, Bureau of Land Management, or National Park Service, or Indian tribal lands, and the boundaries of those Federal lands, must be identified as such on the map by:

(i) Legal subdivisions of a public land survey of the affected area (a protration of identified township and section lines is sufficient for this purpose); and
(ii) The Federal agency, identified by symbol or legend, that maintains or manages each identified subdivision of the public land survey within the project boundary; or
(iii) In the absence of a public land survey, the location of the Federal lands according to the distances and directions from fixed monuments or physical features. When a Federal survey monument or a Federal benchmark will be destroyed or rendered unusable by the construction of project works, at least two permanent, marked witness monuments or benchmarks must be established at accessible points. The maps show the location (and elevation, for benchmarks) of the survey monument or benchmark which will be destroyed or rendered unusable, as well as of the witness monuments or benchmarks. Connecting courses and distances from the witness monuments or benchmarks to the original must also be shown.
(iv) The project location must include the most current information pertaining to affected federal lands as described under § 4.81(b)(5).

(4) Non-Federal lands. For those lands within the project boundary not identified under paragraph (h)(3) of this section, the map must identify by legal subdivision:

(i) Lands owned in fee by the applicant and lands that the applicant plans to acquire in fee; and
(ii) Lands over which the applicant has acquired or plans to acquire rights to occupancy and use other than fee title, including rights acquired or to be acquired by easement or lease

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1 DETAILED MAPS

Exhibit G provides maps showing the Project boundary enclosing the Northfield Mountain Pumped Storage Project (Northfield Mountain Project or Project) as described in Exhibit A. The Northfield Mountain Project Boundary includes lands around the upper reservoir and the tailrace, as well as the Turners Falls Impoundment (TFI) down to the Turners Falls Dam; however, it does not include the Turners Falls Dam or the lands below it. The Turners Falls Hydroelectric Project (Turners Falls Project) boundary overlaps with the Northfield Mountain Project boundary around the TFI. The maps conform to the requirements of Section 4.41(h) of the Commission's regulations. Maps of the Northfield Mountain Project Area showing principal features and the boundary are included.

2 PROJECT BOUNDARY

The Northfield Mountain Project boundary is shown on the attached Exhibit G maps. Northfield Mountain LLC (hereinafter referred to as FirstLight) is proposing three changes to the existing Project boundary:

- The removal of an 0.2-acre parcel of land at 39 Riverview Drive in Gill, MA[1] (Sheet 1 of 13, Exhibit G-1). FirstLight has no ownership rights on this residential parcel and land rights are not needed for Project operations or any other Project purpose. None of the lands FirstLight proposes to exclude from the Project boundary contains historic properties eligible or potentially eligible for the National Register of Historic Places.

- The removal of an 8.1 acre parcel of land referred to as Fuller Farm located near 169 Millers Falls Road in Northfield, MA (Sheet 3 of 13, Exhibit G-3). Both the existing and proposed Project boundaries are depicted on the Exhibit G maps. These lands are not needed for Project operations or any other purpose.

  The Commission's regulations provide that the boundary of a project "*must enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of environmental resources" and that "[e]xisting residential, commercial, or other structures may be included within the boundary only to the extent that underlying lands are needed for project purposes.*" 18 C.F.R. § 4.41(h)(2). The lands occupied by Fuller Farm do not meet these criteria. Fuller Farm also is not needed for Project operations or any other Project purpose.

  FirstLight's predecessor purchased the farm as part of a much larger tract when acquiring land to construct the Northfield Mountain Project. When the Project design was finalized, the farm and land were not necessary for Project purposes, even though they continued to remain in the Project boundary along with the larger tract, some of which contains recreational trails or is used for recreational programming. The 8.1-acre farm property, however, includes residential and agricultural structures, and the underlying lands are not necessary for power generation, recreation, or any other Project purpose. FirstLight's historical structures survey found that the buildings (house, barn, and outbuildings) located on the 8.1 acre parcel are not eligible for listing on the National Register of Historic Places due to lack of historic/architectural significance and lack of integrity.[2] While FirstLight's Phase IA reconnaissance level archaeological survey included the Fuller Farm parcel in its recommendations for Phase IB survey, the parcel is not in a location that is susceptible to erosion or in an area that suggests there are Project-related effects on the property.

[1] Note that this parcel has an overlapping Project Boundary with the Turner Falls Hydroelectric Project.
[2] Historic Architectural Resources Survey & National Register Evaluation at V-35, Project Nos. 2485 and 1889 (filed Jan. 21, 2015).

- The addition of 135.5 acres[3] of land south of the Northfield Switching Station located in the Towns of Northfield and Erving in Massachusetts (Sheet 3 and Sheet 4 of 13, Exhibit G-3, Exhibit G-4). Some of these lands are currently owned by Eversource and are necessary to include recreation trails associated with the Northfield Mountain Trail and Tour Center that are not currently enclosed in the Project Boundary.

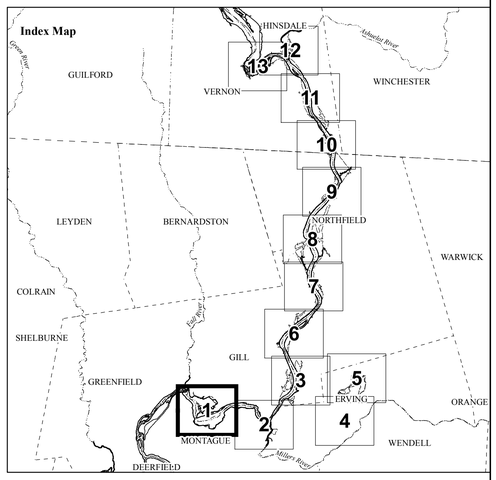
3 FEDERAL LANDS

There are no federal lands located in the Project Boundary.

4 NON-FEDERAL LANDS

The attached Exhibit G maps identify lands that FirstLight owns in fee, and lands over which FirstLight has acquired or intends to acquire rights to occupancy and use other than fee title, including by easement or lease.

[3] Of the 135.5 acres, 12.5 acres is owned by FirstLight, while the remaining 122 acres is owned by Eversource.



Legend

- Project Boundary
- Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

Licensee Land Rights

- Own in Fee
- Flowage Easement
- License to Occupy
- Right to be Acquired

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929

MN 14°12' W

Declination changing by 0° 3' E/Year

I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT (FERC #2485) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

STATE OF NEW HAMPSHIRE No. 626 ARTHUR F. SCIACTANO, JR. LICENSED LAND SURVEYOR

Northfield Mountain LLC
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
FERC PROJECT NO. 2485

SHEET 1 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-1 1 inch = 400 feet 1:4,800

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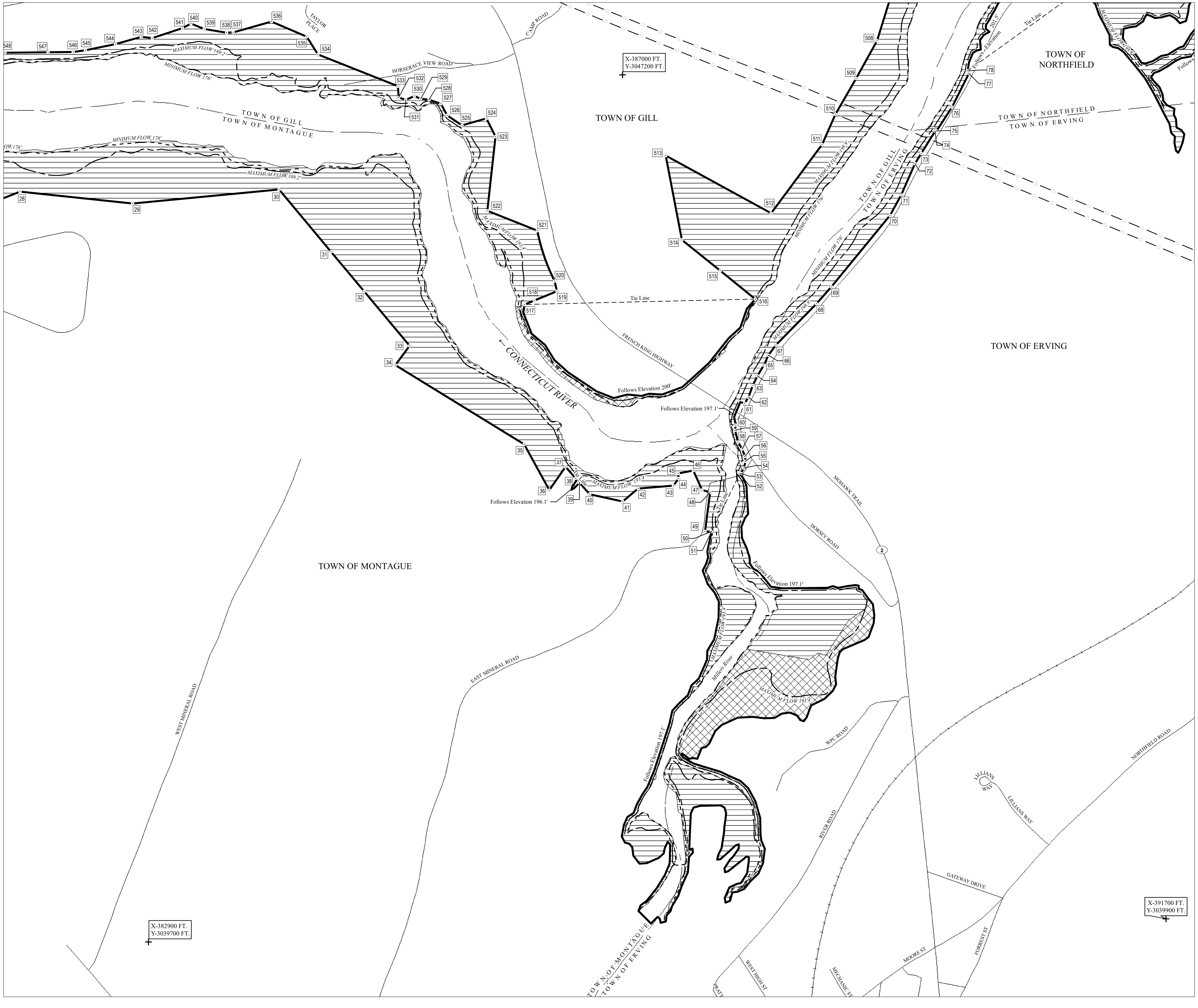
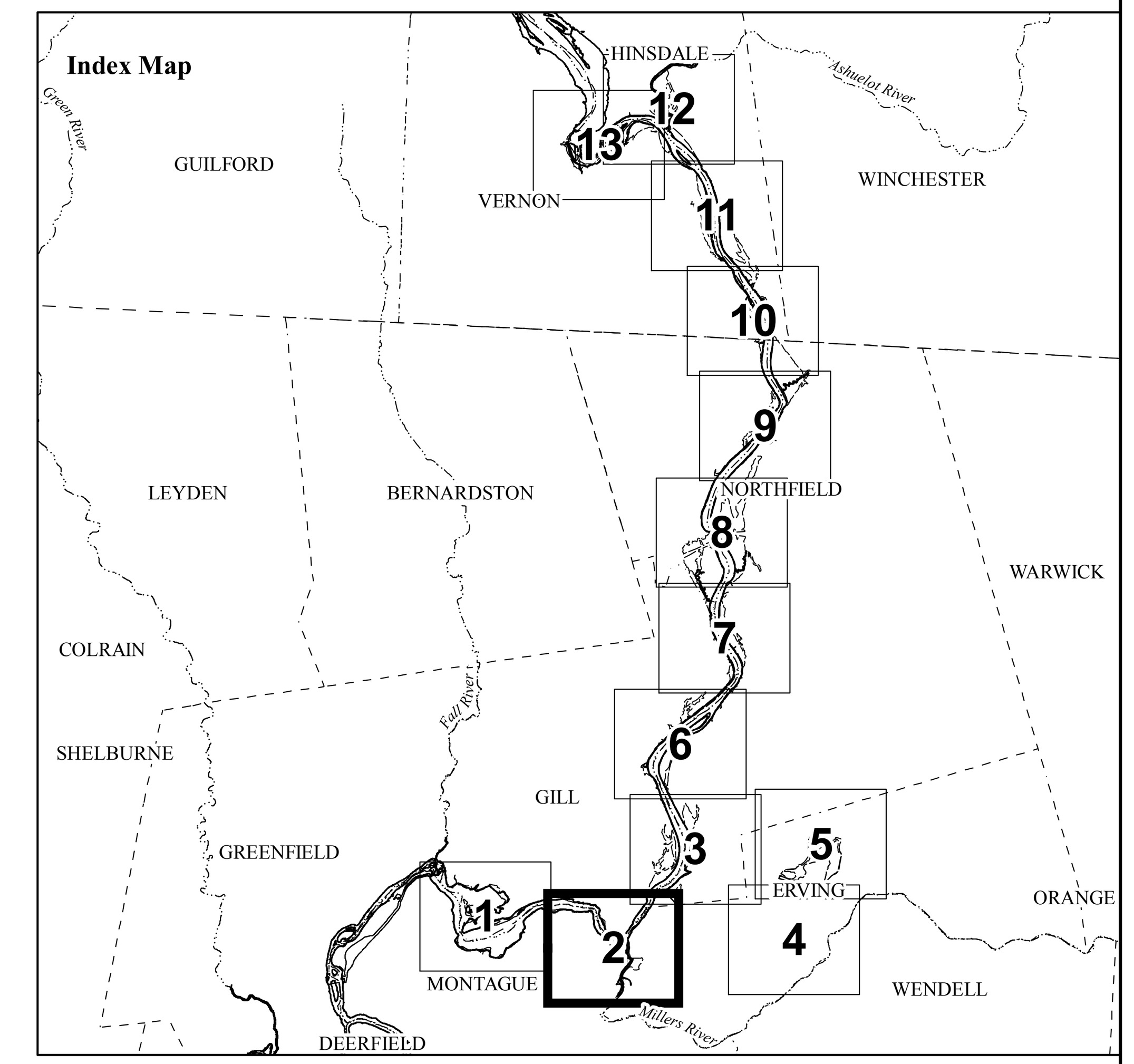




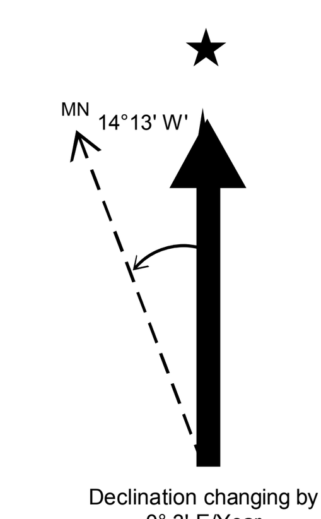
Legend

- Project Boundary
- 164 Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

Licensee Land Rights

- Own in Fee
- Flowage Easement
- License to Occupy
- Right to be Acquired

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929



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STATE OF NEW HAMPSHIRE
LICENSED LAND SURVEYOR
NO. 626
ARTHUR F. SICILIANO, JR.

Northfield Mountain LLC
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
FERC PROJECT NO. 2485

SHEET 2 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-2 | 1 inch = 400 feet | 1:4,800

Path: W:\gis\maps\exhibit_g\nfm_amended\nfm_exhibit_g.mxd

X-388700 FT.
Y-3054900 FT.

X-397700 FT.
Y-3054900 FT.

TOWN OF GILL

TOWN OF NORTHFIELD

TOWN OF ERVING

TOWN OF NORTHFIELD

TOWN OF NORTHFIELD

TOWN OF ERVING

TOWN OF NORTHFIELD

TOWN OF NORTHFIELD

TOWN OF ERVING

TOWN OF NORTHFIELD

TOWN OF NORTHFIELD

TOWN OF GILL

TOWN OF NORTHFIELD

TOWN OF NORTHFIELD

CONNECTICUT RIVER

RIVER ROAD

PISGAH MOUNTAIN ROAD

CROSS ROAD

MILLERS FALLS ROAD

FOUR MILE BROOK ROAD

LOWER FARMS ROAD

WARWICK ROAD

MILLERS FALLS ROAD

MINIMUM FLOW 176'

MAXIMUM FLOW 178'

MAXIMUM FLOW 196'

MINIMUM FLOW 176'

MAXIMUM FLOW 196'

MINIMUM FLOW 176'

MAXIMUM FLOW 196'

Follows Elevation 201.5'

Follows Elevation 202.2'

Follows Elevation 202.2'

Follows Elevation 202.2'

Follows Elevation 202'

Follows Elevation 202'

Follows Elevation 201.5'

Follows Elevation 201.5'

Follows Elevation 201.5'

Tie Line

Tie Line

Tie Line

Tie Line

Tie Line

Boat Tour and Riverview Picnic Area

L2 Gauge House
Northfield Mountain
Tailrace Structure

Northfield Mountain Tour and Trail Center

Maintenance Building

Warehouse

Tailrace Tunnel

Vent Shaft Building

Access Tunnel

Parcel Excluded from Project Boundary

Northfield Switching Station (Eversource)

345 kV Pipe Type Cables Through and Including Disconnect Switches Up to Eversource Ring Buss Connection

Visitor Center Parking Lot

Visitor Center

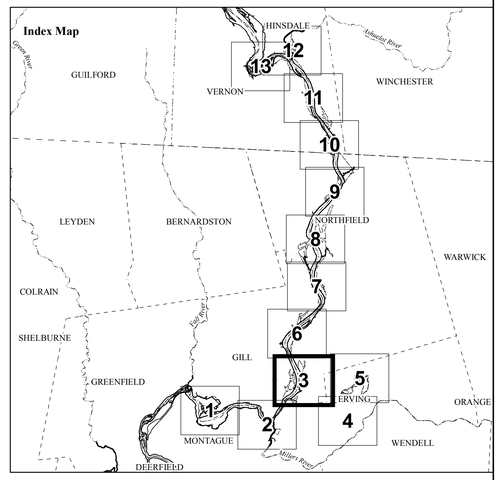
X-393600 FT.
Y-3047500 FT.

63

503 504 505 506 507 508 509 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219

E1 E2 E3 E4 E5

Index Map



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- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

Licensee Land Rights

- Own in Fee
- Flowage Easement
- License to Occupy
- Right to be Acquired

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929

MN 14°14 ' W'

Declination changing by 0° 3' E/Year

I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT (FERC #2485) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

STATE OF NEW HAMPSHIRE
No. 626
ARTHUR F. SCIACCHITANO, JR.
LICENSED LAND SURVEYOR

Northfield Mountain LLC
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
FERC PROJECT NO. 2485

SHEET 3 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-3

1 inch = 400 feet

1:4,800

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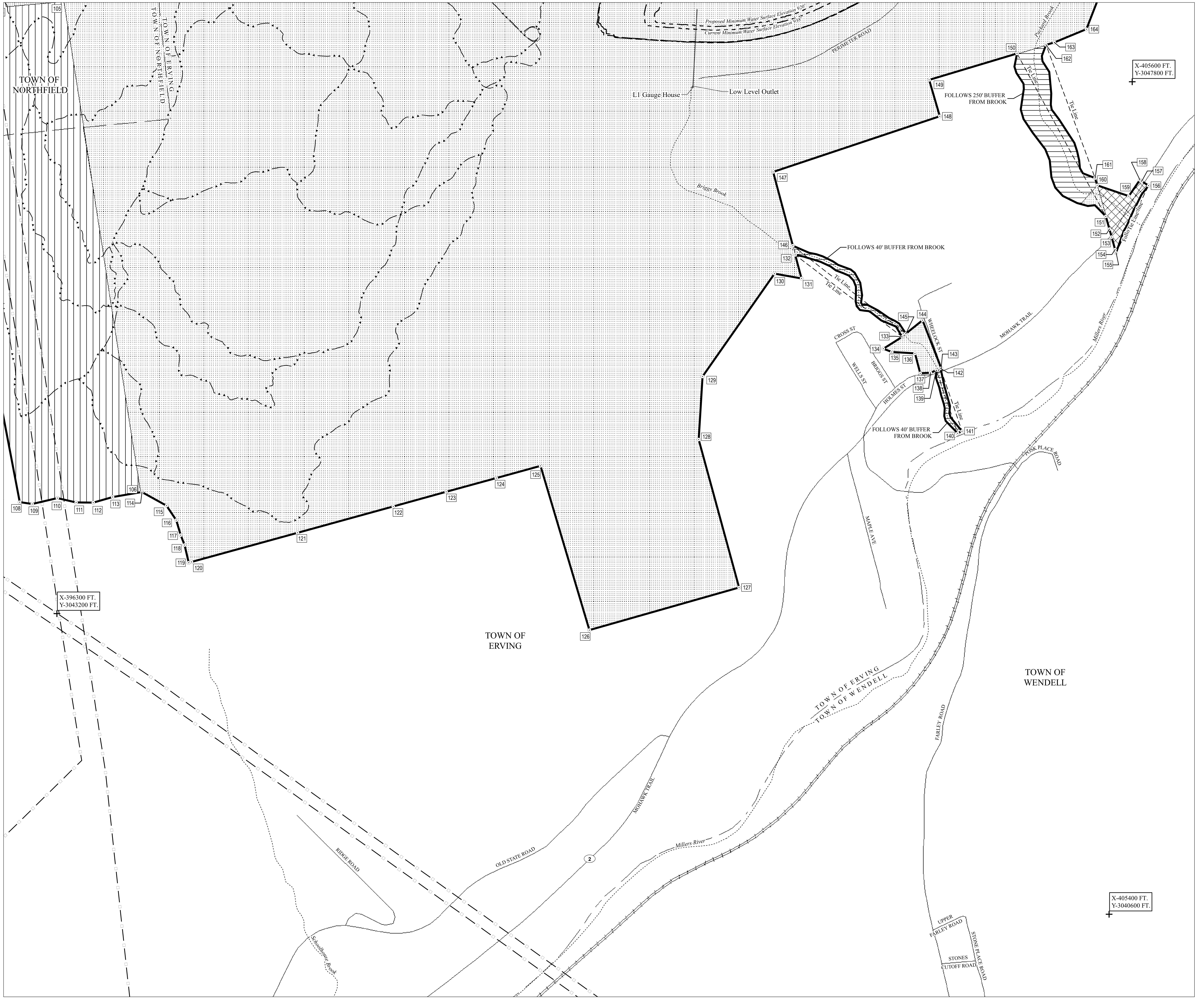

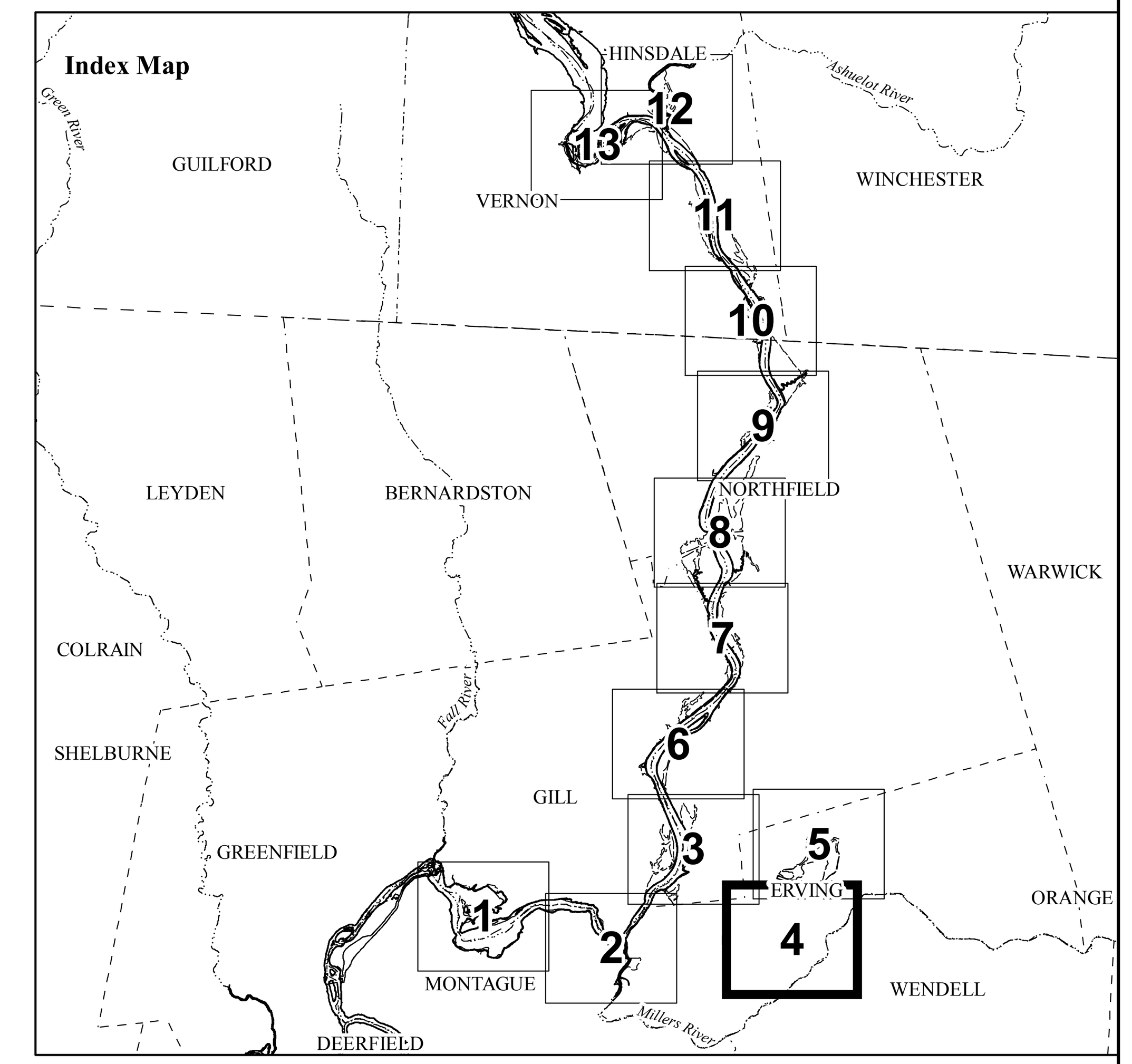

Legend

- Project Boundary
- 164 Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
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Licensee Land Rights

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MN 14° 15' W

Declination changing by 0° 3' E/Year

Coordinate System:
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STATE OF NEW HAMPSHIRE LICENSED LAND SURVEYOR No. 626 ARTHUR F. SICILIANO, JR. SIGNATURE

Northfield Mountain LLC
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
FERC PROJECT NO. 2485

SHEET 4 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-4 1 inch = 400 feet 1:4,800

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X-398500 FT.
Y-3055400 FT.

TOWN OF NORTHFIELD

X-407200 FT.
Y-3055000 FT.

TOWN OF NORTHFIELD
TOWN OF ERVING

TOWN OF ERVING

Fourmile Brook

FOUR MILE BROOK ROAD

Fourmile Brook

166
167
168
169
170
171
172
165
164
163
162
150
149
148

PERIMETER ROAD

Proposed Maximum Water Surface Elevation 1084'

Current Maximum Water Surface Elevation 1082'

EAST ACCESS ROAD

Currents Minimum Water Surface Elevation 938'

Proposed Minimum Water Surface Elevation 936'

WEST ACCESS ROAD

PERIMETER ROAD

Vent Shaft Building

Penstock

Pressure Shaft

Northfield Mountain Powerhouse

L4 Gauge House

Gravity Dam

Northfield Mountain Intake

Northfield Mountain Tour and Trail Center

Mountaintop Oberservation Area

UPPER RESERVOIR

MDC Intake Structure

Stop Log Structure

Proposed Minimum Water Surface Elevation 936'

Current Minimum Water Surface Elevation 938'

PERIMETER ROAD

L1 Gauge House

Low Level Outlet

Packard Brook

Tie Line

FOLLOWS 250' BUFFER FROM BROOK

X-405600 FT.
Y-3047800 FT.

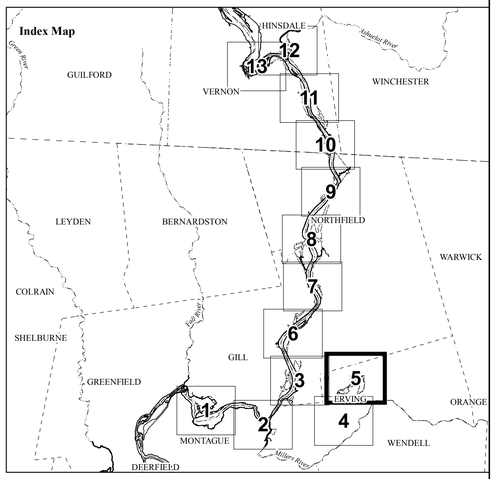
Millers River

TOWN OF ERVING

TOWN OF WENDELL

TOWN OF WENDELL

Index Map



Legend

- Project Boundary
- 164 Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary

Licensee Land Rights

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STATE OF NEW HAMPSHIRE — LICENSED LAND SURVEYOR — No. 626 — ARTHUR F. SCIOTANO, JR.

Northfield Mountain LLC
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
FERC PROJECT NO. 2485

SHEET 5 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-5 — 1 inch = 400 feet — 1:4,800

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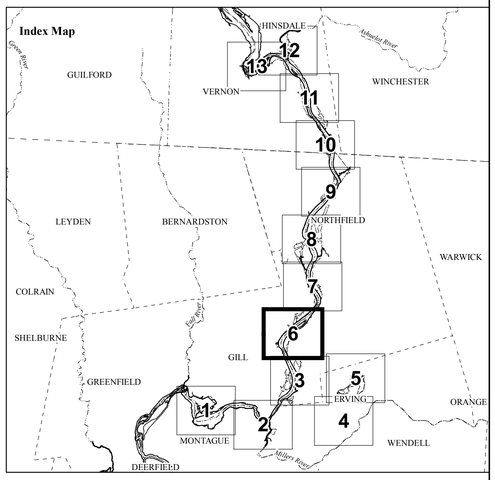

Legend

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- 164 — Point No. (see Project Boundary Data table for metes and bounds)
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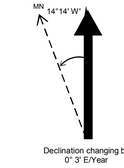

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Northfield Mountain LLC
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
FERC PROJECT NO. 2485

SHEET 6 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-6 1 inch = 400 feet 1:4,800

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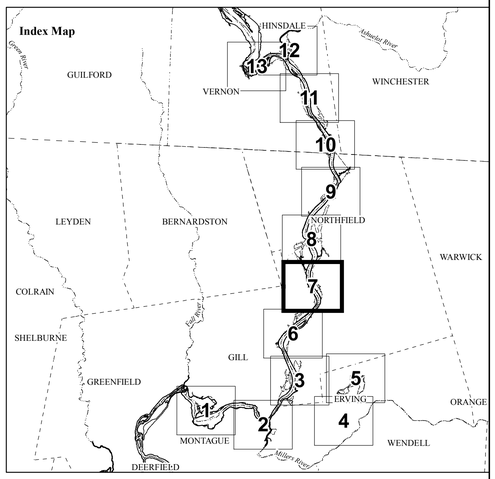

Legend

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- Point No. (see Project Boundary Data table for metes and bounds) (164)
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MN 14°15' W

Declination changing by 0° 3' E/Year

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STATE OF NEW HAMPSHIRE — No. 638 — ARTHUR F. SCIOTTI, JR. — LICENSED LAND SURVEYOR

Northfield Mountain LLC
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
FERC PROJECT NO. 2485

SHEET 7 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-7 — 1 inch = 400 feet — 1:4,800

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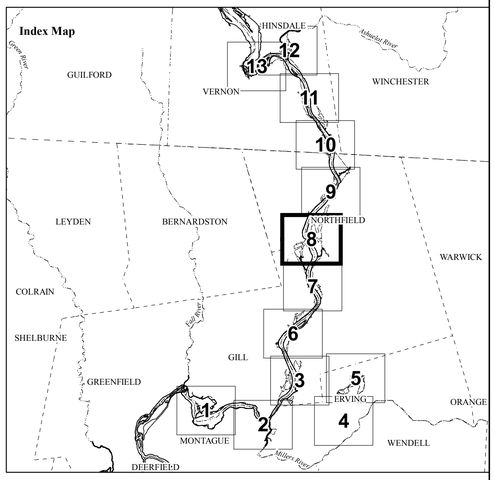

Legend

- Project Boundary
- Point No. (see Project Boundary Data table for metes and bounds) (164)
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Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
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NGVD 1929

MN 14°16' W
Declination changing by 0° 3' E/Year

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STATE OF NEW HAMPSHIRE — No. 628 — ARTHUR F. SCIOTANO, JR. — LICENSED LAND SURVEYOR

Northfield Mountain LLC
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
FERC PROJECT NO. 2485

SHEET 8 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-8 — 1 inch = 400 feet — 1:4,800

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X-394100 FT.
Y-3088200 FT.

X-403100 FT.
Y-3088400 FT.

X-399200 FT.
Y-3080800 FT.

TOWN OF NORTHFIELD

Follows Elevation 207.2'

Follows Elevation 207.2'

Follows Elevation 207.2'

Follows Elevation 206.7'

Follows Elevation 206.6'

Follows Elevation 206.1'

Follows Elevation 206'

Follows Elevation 206.9'

Follows Elevation 205.8'

Follows Elevation 205'

Tie Line

MAXIMUM FLOW 207.2'

MAXIMUM FLOW 206.9'

MAXIMUM FLOW 206.7'

MAXIMUM FLOW 206.1'

MAXIMUM FLOW 206'

MINIMUM FLOW 176'

MAXIMUM FLOW 205'

MAXIMUM FLOW 205'

MOUNT HERMON STATION ROAD

WEST ROAD

Mattoon Brook

CALDWELL CROSS ROAD

WEST NORTHFIELD ROAD

RANDALL ROAD

CALDWELL ROAD

CONNECTICUT RIVER

Pauchaug Brook

Louisiana Brook

PAUCHAUG-RAMP ROAD

MUSIC HALL DRIVE

EAST HALL DRIVE

WINCHESTER ROAD

BOLTON ROAD

THE WILLOWS

EAST NORTHFIELD ROAD

MOODY ST

NORTH LN

PINE ST

HOWARD ST

ALDRICH ST

ELM AVE

GLENWOOD AVE

HIGHLAND AVE

BIRNAM ROAD

HOLTON ST

NORTHFIELD INN DRIVE

63

MILL ST

BRIDGE ST

MAIN ST

PETTYCOAT ROAD

Mill Brook

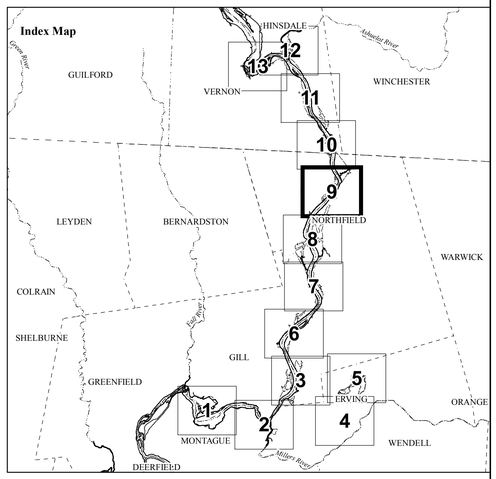
DICKINSON ST

MEADOW ST

SCHOOL ST

GREAT MEADOW ROAD

Index Map



Legend

- Project Boundary
- 164 Point No. (see Project Boundary Data table for metes and bounds)
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Licensee Land Rights

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Coordinate System:
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MN 14° 16' W

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STATE OF NEW HAMPSHIRE — LICENSED LAND SURVEYOR — No. 626 — ARTHUR E. SCIACANO, JR.

Northfield Mountain LLC
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
FERC PROJECT NO. 2485

SHEET 9 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-9 — 1 inch = 400 feet — 1:4,800

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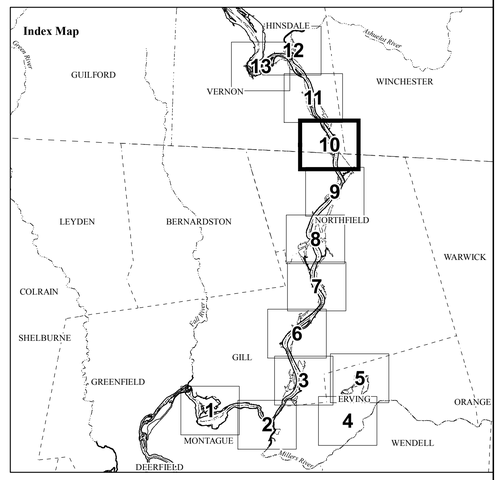

Legend

- Project Boundary
- Point No. (see Project Boundary Data table for metes and bounds)
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STATE OF NEW HAMPSHIRE — No. 626 — ARTHUR F. SCIOTANO, JR. — LICENSED LAND SURVEYOR

Northfield Mountain LLC
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
FERC PROJECT NO. 2485

SHEET 10 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-10 — 1 inch = 400 feet — 1:4,800

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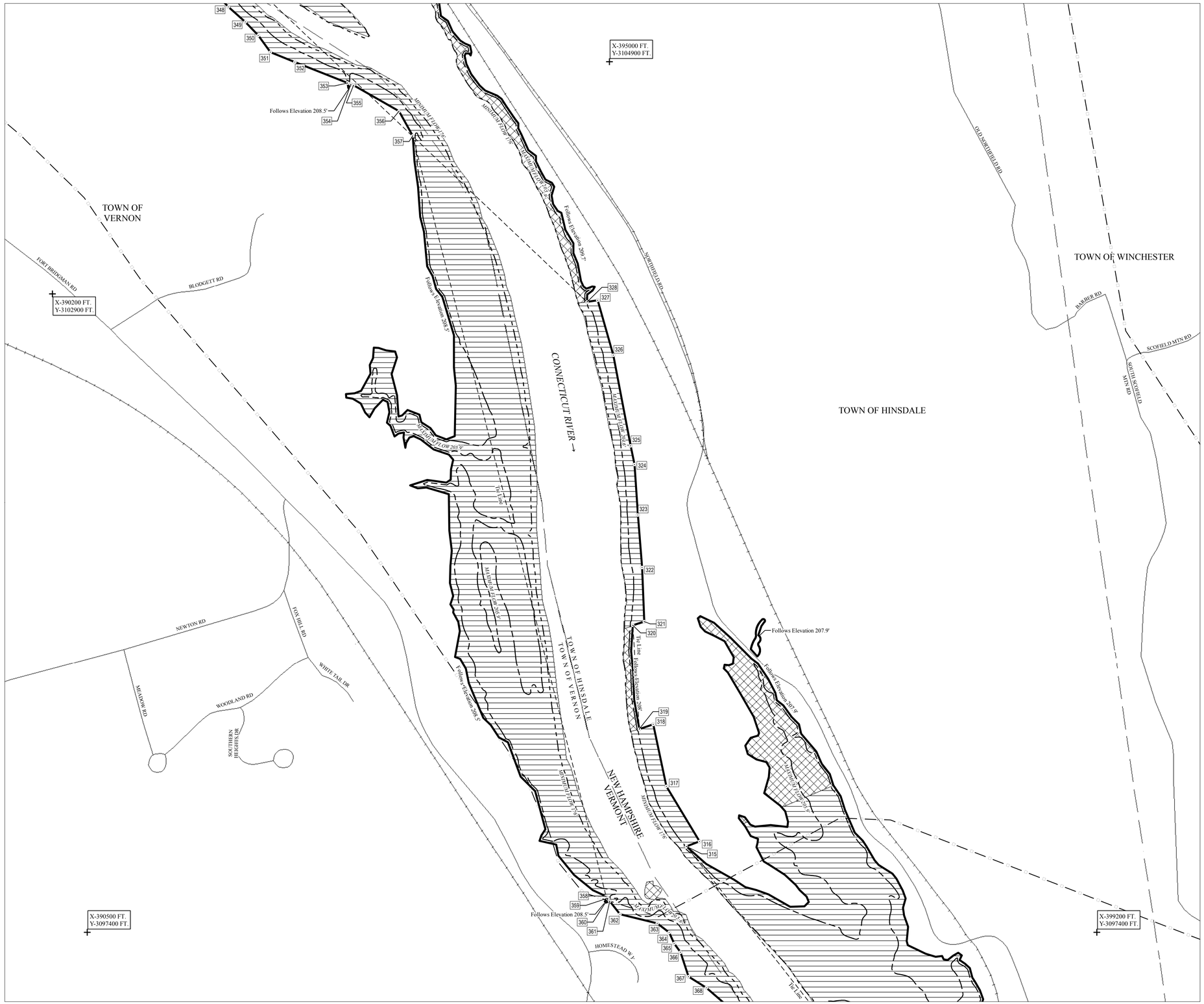

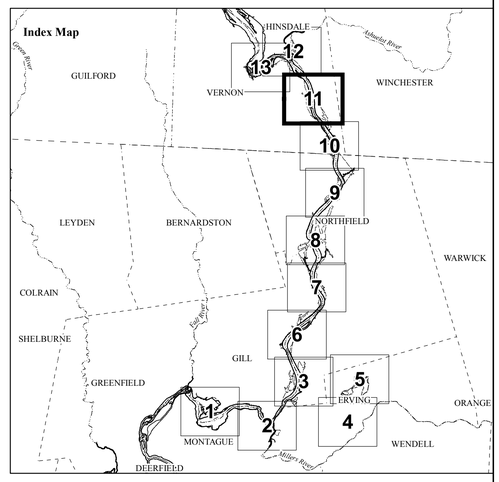

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STATE OF NEW HAMPSHIRE — No. 636 — ARTHUR F. SCIOTTI, JR. — LICENSED LAND SURVEYOR

Northfield Mountain LLC
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
FERC PROJECT NO. 2485

SHEET 11 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-11 — 1 inch = 400 feet — 1:4,800

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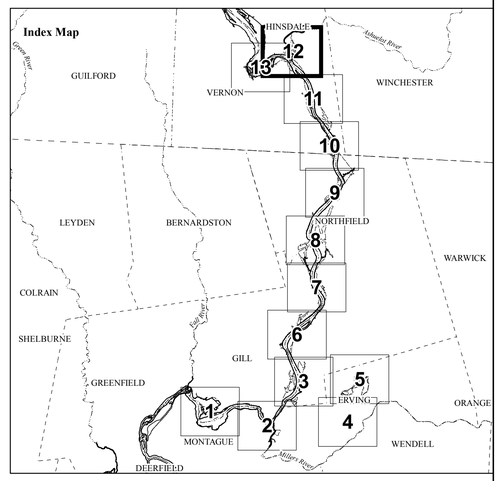

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STATE OF NEW HAMPSHIRE — No. 626 — ARTHUR F. SICILIANO, JR. — LICENSED LAND SURVEYOR

Northfield Mountain LLC
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
FERC PROJECT NO. 2485

SHEET 12 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-12 — 1 inch = 400 feet — 1:4,800

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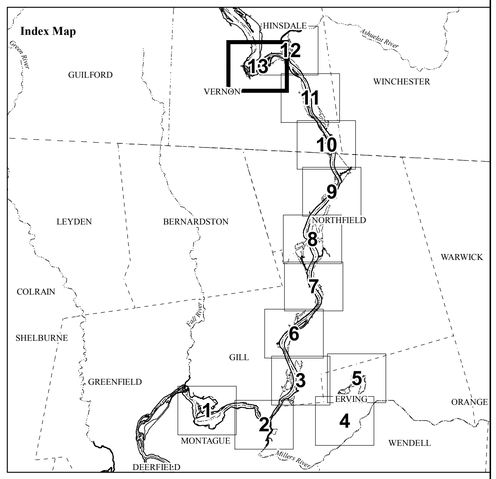

Legend

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MN 14°16' W

Declination changing by 0° 3' E/Year

I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT (FERC #2485) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

STATE OF NEW HAMPSHIRE — NO. 828 — ARTHUR F. SCIOTTINO, JR. — LICENSED LAND SURVEYOR

Northfield Mountain LLC
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
FERC PROJECT NO. 2485

SHEET 13 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-13 1 inch = 400 feet 1:4,800

Path: W:\gis\maps\exhibit_g\nfm_amended\nfm_exhibit_g.mxd

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PROJECT BOUNDARY DATA

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
1	3042973.69	375761.20			Point of Beginning
			N 42-26-44 E	231.98	
2	3043144.87	375917.76			
			S 47-30-41 E	279.68	
3	3042955.96	376124.00			
			S 42-18-35 W	47.28	
4	3042921.00	376092.18			
			S 47-44-43 E	415.17	
5	3042641.83	376399.47			
			S 73-53-26 E	370.70	
6	3042538.98	376755.61			
			N 68-1-31 E	204.39	
7	3042615.46	376945.15			
			S 73-18-46 E	125.36	
8	3042579.47	377065.23			
			S 87-59-56 E	207.16	
9	3042572.24	377272.26			
			S 40-17-53 E	114.43	
10	3042484.96	377346.27			
			S 53-36-7 E	141.98	
11	3042400.72	377460.55			
			N 78-38-35 E	500.00	
12	3042499.18	377950.75			
			S 11-18-5 E	295.10	
13	3042209.81	378008.58			
			S 58-39-6 E	225.20	
14	3042092.65	378200.91			
			N 78-36-47 E	377.92	
15	3042167.27	378571.39			
			N 14-59-18 W	831.79	
16	3042970.75	378356.26			
			N 47-2-36 E	1268.33	
17	3043835.05	379284.49			
			N 42-29-14 W	128.50	
18	3043929.81	379197.70			
			N 43-33-58 E	449.33	
19	3044255.39	379507.37			
			S 29-43-23 E	160.00	
20	3044116.44	379586.70			
			N 47-2-36 E	224.21	
21	3044269.23	379750.79			
			N 1-54-25 E	418.25	
22	3044687.25	379764.70			
			N 1-54-25 E	135.45	Tie Line, Follows elevation 190.4 ft. in between points 22 and 23
23	3044822.62	379769.20			
			N 1-54-25 E	165.65	
24	3044988.18	379774.72			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			N 1-54-25 E	399.80	Tie Line, Follows elevation 190.4 ft. in between points 24 and 25
25	3045387.75	379788.01			
			N 1-54-25 E	156.42	
26	3045544.08	379793.22			
			S 67-7-35 E	195.14	
27	3045468.24	379973.01			
			N 68-20-8 E	1953.78	
28	3046189.53	381788.75			
			S 83-58-46 E	980.00	
29	3046086.75	382763.34			
			N 84-32-37 E	1271.53	
30	3046207.67	384029.09			
			S 39-53-54 E	701.88	
31	3045669.21	384479.30			
			S 39-53-58 E	446.94	
32	3045326.34	384765.98			
			S 39-50-12 E	612.30	
33	3044856.18	385158.22			
			S 36-25-42 W	208.05	
34	3044688.78	385034.68			
			S 58-25-15 E	1308.76	
35	3044003.43	386149.63			
			S 28-47-22 E	451.27	
36	3043607.95	386366.96			
			N 34-53-59 E	244.84	
37	3043808.76	386507.04			
			S 41-24-47 E	132.00	
38	3043709.76	386594.36			
			S 41-24-47 E	51.00	Tie Line, Follows elevation 196.1 ft. in between points 38 and 39
39	3043671.52	386628.09			
			S 41-24-47 E	133.07	
40	3043571.72	386716.12			
			S 77-33-5 E	292.58	
41	3043508.65	387001.82			
			N 49-44-55 E	173.68	
42	3043620.88	387134.37			
			N 85-15-17 E	306.12	
43	3043646.20	387439.43			
			N 37-3-58 E	77.25	
44	3043707.84	387485.99			
			N 6-30-17 W	44.46	
45	3043752.02	387480.96			
			N 79-15-45 E	133.13	
46	3043776.82	387611.75			
			S 24-22-40 E	184.00	
47	3043609.23	387687.70			
			S 74-9-30 E	73.10	
48	3043589.28	387758.02			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 7-26-57 W	341.51	
49	3043250.65	387713.75			
			S 86-33-38 E	52.73	
50	3043247.49	387766.39			
			S 86-33-29 E	3.00	
51	3043247.31	387769.38			
			N 25-55-54 E	557.51	Tie Line, Follows elevation 197.1 ft. in between points 51 and 52
52	3043748.68	388013.17			
			N 77-2-32 E	11.20	
53	3043751.19	388024.09			
			N 28-36-0 E	53.40	
54	3043798.08	388049.65			
			N 13-27-0 E	60.55	
55	3043856.97	388063.73			
			N 7-21-0 W	43.40	
56	3043900.01	388058.18			
			N 20-59-0 W	66.41	
57	3043962.02	388034.40			
			N 30-16-50 W	71.06	
58	3044023.38	387998.57			
			N 13-38-40 W	105.12	
59	3044125.53	387973.77			
			N 6-35-10 E	44.81	
60	3044170.05	387978.91			
			N 22-22-56 E	203.04	Tie Line, Follows elevation 197.1 ft. in between points 60 and 61
61	3044357.79	388056.22			
			N 32-15-12 E	62.86	
62	3044410.95	388089.76			
			N 20-2-15 E	108.28	
63	3044512.68	388126.86			
			N 25-33-24 E	92.73	
64	3044596.33	388166.87			
			N 31-37-10 E	107.49	
65	3044687.86	388223.22			
			N 24-2-44 E	94.26	
66	3044773.94	388261.62			
			N 36-5-25 E	109.84	
67	3044862.70	388326.33			
			N 44-29-7 E	500.21	
68	3045219.57	388676.83			
			N 41-18-51 E	196.16	
69	3045366.91	388806.33			
			N 39-23-8 E	798.93	
70	3045984.39	389313.26			
			N 28-52-29 E	202.37	
71	3046161.60	389410.98			
			N 23-37-10 E	294.77	
72	3046431.68	389529.08			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			N 31-38-50 E	103.98	
73	3046520.20	389583.64			
			N 31-54-35 E	226.68	
74	3046712.62	389703.45			
			N 84-15-22 E	12.08	
75	3046713.83	389715.47			
			N 33-3-0 E	245.06	
76	3046919.24	389849.12			
			N 26-35-0 E	327.70	
77	3047212.29	389995.76			
			N 24-55-45 W	24.44	
78	3047234.46	389985.46			
			N 54-17-5 E	2508.86	Tie Line, Follows elevation 201.5 ft. in between points 78 and 79
79	3048699.03	392022.43			
			N 83-47-0 E	79.89	
80	3048707.68	392101.85			
			R = 830	L = 212.55	
81	3048824.08	392279.00			
			N 64-1-50 E	303.96	
82	3048957.18	392552.26			
			R = 770	L = 406.42	
83	3049221.21	392855.02			
			N 88-3-59 E	72.57	
84	3049223.66	392927.55			
			R = 830	L = 480.48	
85	3048903.24	392578.53			
			S 64-1-50 W	303.96	
86	3048770.14	392305.27			
			R = 770	L = 100.55	
87	3048720.34	392218.00			
			N 83-47-0 E	96.28	
88	3048730.76	392313.71			
			S 17-30-0 W	392.30	
89	3048356.62	392195.75			
			N 83-3-0 E	608.23	
90	3048430.23	392799.50			
			N 84-20-0 E	414.73	
91	3048471.18	393212.20			
			N 0-6-40 W	762.20	
92	3049233.37	393210.72			
			N 88-4-38 E	82.54	
93	3049236.14	393293.21			
			S 0-6-40 E	756.79	
94	3048479.36	393294.68			
			N 84-20-0 E	581.15	
95	3048536.75	393872.99			
			N 4-37-2 E	723.17	
96	3049257.57	393931.19			
			N 88-4-38 E	60.39	

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
97	3049259.59	393991.55			
			S 4-37-2 W	638.20	
98	3048623.47	393940.18			
			S 5-6-48 W	346.70	
99	3048278.16	393909.28			
			S 4-17-12 W	345.84	
100	3047933.29	393883.44			
			N 64-18-14 E	177.22	
101	3048010.13	394043.13			
			S 79-44-15 E	451.62	
102	3047929.68	394487.52			
			S 88-51-7 E	917.04	
103	3047911.32	395404.37			
			S 12-39-55 E	603.69	
104	3047322.32	395536.74			
			S 3-46-37 E	373.63	
105	3046949.51	395561.35			
			S 3-46-37 E	134.16	
106	3046815.64	395570.19			
			S 4-30-40 E	883.33	
107	3045935.05	395639.68			
			S 10-49-45 E	1804.15	
108	3044163.05	395978.66			
			S 81-29-23 E	109.01	
109	3044146.92	396086.46			
			N 76-51-21 E	222.74	
110	3044197.57	396303.36			
			S 77-10-15 E	168.17	
111	3044160.23	396467.34			
			S 89-29-40 E	147.42	
112	3044158.93	396614.75			
			N 73-44-56 E	175.20	
113	3044207.96	396782.95			
			N 80-14-34 E	243.22	
114	3044250.26	397036.09			
			S 60-53-0 E	241.86	
115	3044132.57	397247.39			
			S 34-15-0 E	151.14	
116	3044007.65	397332.45			
			S 16-44-0 E	134.90	
117	3043878.46	397371.29			
			S 21-1-0 E	91.55	
118	3043793.00	397404.13			
			S 13-3-0 E	157.56	
119	3043639.51	397439.70			
			N 74-37-20 E	25.00	
120	3043646.14	397463.81			
			N 74-37-20 E	952.02	
121	3043898.61	398381.73			
			N 74-37-20 E	857.75	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
122	3044126.07	399208.76			
			N 74-37-20 E	475.00	
123	3044252.04	399666.75			
			N 74-37-20 E	450.00	
124	3044371.37	400100.63			
			N 74-37-20 E	396.54	
125	3044476.53	400482.97			
			S 16-35-37 E	1480.92	
126	3043057.30	400905.90			
			N 74-8-40 E	1344.65	
127	3043424.69	402199.37			
			N 15-14-20 W	1326.95	
128	3044704.97	401850.58			
			N 3-28-5 E	545.74	
129	3045249.70	401883.59			
			N 35-0-40 E	1086.20	
130	3046139.34	402506.76			
			S 79-56-8 E	236.85	
131	3046097.96	402739.96			
			N 14-53-4 W	211.43	
132	3046302.29	402685.65			
			S 52-30-35 E	1165.28	Tie Line, Follows 40' buffer from brook centerline between points 132 and 133
133	3045593.08	403610.25			
			S 57-42-35 W	191.98	
134	3045490.53	403447.96			
			S 69-16-5 E	78.65	
135	3045462.68	403521.51			
			S 86-21-25 E	200.00	
136	3045449.98	403721.11			
			S 14-46-45 E	177.97	
137	3045277.90	403766.51			
			N 87-24-44 E	90.00	
138	3045281.96	403856.42			
			N 66-44-45 E	54.10	
139	3045303.32	403906.12			
			S 18-46-49 E	574.61	Tie Line, Follows 40' buffer from brook centerline between points 139 and 140
140	3044759.31	404091.11			
			N 64-39-59 E	41.38	
141	3044777.02	404128.51			
			N 18-54-0 W	573.01	Tie Line, Follows 40' buffer from brook centerline between points 141 and 142
142	3045319.13	403942.90			
			N 66-44-57 E	5.86	
143	3045321.44	403948.29			
			N 21-16-8 W	446.13	
144	3045737.18	403786.45			
			S 50-59-25 W	185.05	
145	3045620.70	403642.67			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			N 52-9-17 W	1238.20	Tie Line, Follows 40' buffer from brook centerline between points 145 and 146
146	3046380.36	402664.90			
			N 14-53-4 W	661.53	
147	3047019.68	402494.97			
			N 71-33-7 E	1519.10	
148	3047500.41	403935.98			
			N 16-13-40 W	328.52	
149	3047815.83	403844.17			
			N 73-20-20 E	792.64	
150	3048043.10	404603.52			
			S 28-37-11 E	1604.35	Tie Line, Follows 250' buffer from brook centerline between points 150 and 151
151	3046634.79	405372.00			
			S 15-39-40 E	113.91	
152	3046525.11	405402.75			
			S 15-39-40 E	72.49	
153	3046455.31	405422.32			
			S 15-39-40 E	111.44	
154	3046348.01	405452.40			
			S 15-39-40 E	30.00	
155	3046319.12	405460.50			
			N 25-45-37 E	645.06	Tie Line, Follows Shoreline between points 155 and 156
156	3046900.08	405740.84			
			N 55-55-50 W	70.00	
157	3046939.29	405682.86			
			N 55-55-49 W	20.00	
158	3046950.49	405666.29			
			S 34-4-10 W	170.00	
159	3046809.67	405571.06			
			N 71-12-35 W	289.67	
160	3046902.97	405296.83			
			N 15-39-40 W	65.83	
161	3046966.36	405279.06			
			N 20-11-58 W	1227.57	Tie Line, Follows 250' buffer from brook centerline between points 161 and 162
162	3048118.42	404855.18			
			N 73-20-21 E	74.22	
163	3048139.70	404926.28			
			N 67-39-8 E	299.98	
164	3048253.76	405203.73			
			N 21-10-34 E	3738.71	
165	3051740.00	406554.23			
			N 16-33-10 W	3323.48	
166	3054925.71	405607.36			
			S 73-5-0 W	102.39	
167	3054895.92	405509.40			
			S 73-20-5 W	581.97	
168	3054729.01	404951.89			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 73-26-15 W	234.77	
169	3054662.09	404726.86			
			N 14-49-51 W	21.65	
170	3054683.02	404721.32			
			S 73-46-9 W	1394.60	
171	3054293.20	403382.32			
			S 73-46-23 W	1410.84	
172	3053898.94	402027.71			
			S 73-59-32 W	5371.89	
173	3052417.51	396864.20			
			S 74-14-2 W	1969.94	
174	3051882.24	394968.40			
			S 8-37-6 W	260.03	
175	3051625.15	394929.43			
			N 82-37-38 W	356.35	
176	3051670.87	394576.03			
			S 11-14-16 W	105.29	
177	3051567.60	394555.52			
			N 81-21-57 W	115.10	
178	3051584.88	394441.72			
			S 13-35-45 W	114.54	
179	3051473.55	394414.80			
			S 59-46-19 E	256.53	
180	3051344.40	394636.45			
			S 1-24-2 W	634.85	
181	3050709.74	394620.93			
			S 85-23-59 W	502.96	
182	3050669.13	394119.57			
			S 5-38-13 W	233.82	
183	3050436.45	394096.60			
			S 5-26-49 W	149.41	
184	3050287.71	394082.42			
			S 5-26-49 W	450.00	
185	3049839.75	394039.71			
			N 85-44-46 E	200.00	
186	3049854.58	394239.16			
			N 85-44-47 E	74.66	
187	3049860.12	394313.61			
			N 85-40-20 E	250.54	
188	3049879.03	394563.43			
			S 3-51-53 W	245.88	
189	3049633.71	394546.86			
			S 87-35-23 W	504.52	
190	3049612.49	394042.80			
			S 4-48-9 W	22.00	
191	3049590.57	394040.95			
			S 87-35-23 W	22.00	
192	3049589.64	394018.97			
			N 4-48-8 E	71.54	
193	3049660.93	394024.96			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 88-4-38 W	57.79	
194	3049658.99	393967.21			
			N 5-34-1 E	46.03	
195	3049704.80	393971.67			
			N 84-25-58 W	49.06	
196	3049709.56	393922.84			
			N 86-13-50 W	170.47	
197	3049720.77	393752.74			
			N 25-51-49 W	6.04	
198	3049726.20	393750.11			
			N 87-4-8 W	408.94	
199	3049747.11	393341.71			
			N 0-6-40 W	49.57	
200	3049796.68	393341.61			
			N 87-4-8 W	226.97	
201	3049808.28	393114.94			
			N 66-2-59 W	70.00	
202	3049836.70	393050.97			
			N 4-39-35 W	260.22	
203	3050096.05	393029.83			
			N 15-29-16 E	128.05	
204	3050219.45	393064.02			
			S 83-23-20 W	73.66	
205	3050210.97	392990.85			
			N 40-10-3 E	93.20	
206	3050282.19	393050.96			
			N 45-35-39 E	0.47	
207	3050282.52	393051.30			
			N 7-17-6 E	412.78	
208	3050691.97	393103.64			
			N 5-31-41 W	194.77	
209	3050885.83	393084.87			
			N 17-6-32 W	53.65	
210	3050937.11	393069.09			
			N 7-45-35 W	837.33	Tie Line, Follows elevation 202 ft. in between points 210 and 211
211	3051766.76	392956.03			
			N 2-40-21 E	55.57	
212	3051822.27	392958.62			
			N 10-55-38 W	389.60	
213	3052204.80	392884.76			
			N 1-2-22 E	171.10	
214	3052375.87	392887.86			
			N 27-1-22 E	362.20	
215	3052698.53	393052.42			
			S 80-55-1 W	20.60	
216	3052695.28	393032.08			
			N 31-56-0 W	1946.69	Tie Line, Follows elevation 202.2 ft. in between points 216 and 217
217	3054405.92	391973.10			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 26-34-39 E	65.50	
218	3054405.92	391973.10			
			N 25-42-38 W	419.00	
219	3054783.43	391791.33			
			N 26-46-40 W	1313.32	
220	3055955.89	391199.63			
			N 24-41-40 W	124.80	
221	3056069.28	391147.49			
			N 14-7-0 E	3884.37	Tie Line, Follows elevation 203.1 ft. in between points 221 and 222
222	3059836.32	392094.83			
			N 63-5-20 E	167.00	
223	3059911.91	392243.74			
			N 63-5-20 E	81.80	Tie Line, Follows elevation 203.1 ft. in between points 223 and 224
224	3059948.93	392316.69			
			N 63-5-21 E	22.00	
225	3059958.89	392336.30			
			N 67-50-20 E	611.40	
226	3060189.52	392902.53			
			N 77-15-21 E	16.30	
227	3060193.12	392918.43			
			N 77-15-19 E	79.20	Tie Line, Follows elevation 203.1 ft. in between points 227 and 228
228	3060210.59	392995.67			
			N 77-15-19 E	406.69	
229	3060300.31	393392.34			
			N 56-9-1 E	422.17	
230	3060535.47	393742.94			
			N 46-40-1 E	1060.43	
231	3061263.18	394514.26			
			N 30-22-1 E	93.35	
232	3061343.72	394561.45			
			N 30-22-1 E	26.69	Tie Line, Follows elevation 202 ft. in between points 232 and 233
233	3061366.75	394574.94			
			N 30-22-1 E	118.06	
234	3061468.61	394634.62			
			N 29-48-1 E	507.20	
235	3061908.74	394886.68			
			N 35-36-19 E	565.67	
236	3062368.66	395216.01			
			N 35-36-19 E	169.00	Tie Line, Follows elevation 202 ft. in between points 236 and 237
237	3062506.06	395314.40			
			N 35-36-19 E	149.54	
238	3062627.65	395401.46			
			N 34-8-15 E	734.73	
239	3063235.78	395813.76			
			N 36-49-15 E	391.05	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
240	3063548.82	396048.12			
			N 36-50-34 E	72.20	
241	3063606.60	396091.41			
			S 43-10-38 E	79.94	
242	3063548.30	396146.11			
			N 40-45-11 E	121.77	
243	3063640.55	396225.60			
			N 40-45-11 E	260.00	
244	3063837.51	396395.32			
			N 40-45-11 E	347.08	
245	3064100.43	396621.89			
			N 27-8-11 E	612.05	
246	3064645.11	396901.04			
			N 48-30-40 E	119.94	
247	3064724.56	396990.89			
			N 6-34-40 E	105.55	
248	3064829.42	397002.98			
			N 7-18-40 E	699.65	
249	3065523.38	397092.00			
			N 0-46-20 W	175.00	
250	3065698.36	397089.64			
			N 18-40-16 W	5405.25	Tie Line, Follows elevation 204.5 ft. in between points 250 and 251
251	3070819.08	395359.20			
			N 14-23-47 E	83.21	
252	3070899.68	395379.89			
			N 28-33-47 E	127.88	
253	3071011.99	395441.03			
			N 19-5-47 E	116.16	
254	3071121.76	395479.03			
			N 19-39-8 E	4713.71	Tie Line, Follows elevation 205 ft. in between points 254 and 255
255	3075560.88	397064.24			
			N 84-52-57 E	242.50	
256	3075582.52	397305.77			
			N 1-33-57 E	322.37	
257	3075904.76	397314.57			
			S 67-0-34 W	75.38	
258	3075875.32	397245.18			
			N 86-25-33 W	51.80	
259	3075878.55	397193.48			
			N 86-25-33 W	548.20	Tie Line, Follows elevation 205.4 ft. in between points 259 and 260
260	3075912.72	396646.36			
			N 79-36-2 W	74.30	
261	3075926.13	396573.28			
			N 79-36-2 W	136.80	
262	3075950.82	396438.73			
			N 65-51-29 E	806.11	Tie Line, Follows elevation 205 ft. in between points 262 and 263

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
263	3076280.52	397174.32			
			S 86-25-34 E	1.40	
264	3076280.44	397175.71			
			N 11-30-46 E	7173.61	Tie Line, Follows elevation 205.8 ft. in between points 264 and 265
265	3083309.67	398607.37			
			N 31-43-29 W	86.99	
266	3083383.67	398561.63			
			N 32-19-12 W	91.15	
267	3083460.69	398512.89			
			N 54-20-10 E	830.44	Tie Line, Follows elevation 206.5 ft. in between points 267 and 268
268	3084182.04	399456.40			
			N 25-14-17 E	186.83	
269	3083944.87	399187.57			
			N 48-12-22 E	232.60	
270	3084099.89	399360.98			
			N 49-16-22 E	125.91	
271	3084351.03	399536.06			
			N 34-1-17 E	202.12	
272	3084518.56	399649.14			
			N 49-3-43 W	129.60	
273	3084603.47	399551.24			
			N 19-38-24 E	161.53	Tie Line, Follows elevation 206.6 ft. in between points 273 and 274
274	3084755.60	399605.53			
			S 48-9-2 E	166.40	
275	3084644.59	399729.48			
			N 32-52-58 E	324.29	
276	3084916.92	399905.54			
			N 22-45-58 E	241.57	
277	3085139.67	399999.02			
			N 49-32-2 W	173.30	
278	3085252.14	399867.17			
			N 21-48-19 E	183.66	Tie Line, Follows elevation 206.7 ft. in between points 278 and 279
279	3085422.66	399935.39			
			S 57-10-48 E	170.80	
280	3085330.09	400078.93			
			N 20-3-12 E	149.91	
281	3085470.91	400130.33			
			N 18-21-12 E	249.84	
282	3085708.04	400208.99			
			N 69-45-40 W	121.13	
283	3085749.94	400095.34			
			N 37-8-43 E	508.06	Tie Line, Follows elevation 206.8 ft. in between points 283 and 284
284	3086154.91	400402.12			
			S 67-40-40 E	55.20	
285	3086133.95	400453.18			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			N 48-16-34 E	110.01	
286	3086207.17	400535.29			
			N 40-2-34 E	121.70	
287	3086300.33	400613.58			
			N 12-29-48 W	88.00	
288	3086386.25	400594.54			
			N 8-43-49 W	10.60	
289	3086396.73	400592.93			
			N 9-44-3 W	5011.06	Tie Line, Follows elevation 207.2 ft. in between points 289 and 290
290	3091335.59	399745.64			
			S 86-53-0 E	172.25	
291	3091326.23	399917.63			
			N 26-25-28 W	21.78	
292	3091345.73	399907.94			
			N 41-7-0 W	154.89	
293	3091462.42	399806.08			
			N 38-14-40 W	151.57	
294	3091581.46	399712.26			
			N 38-59-50 W	192.95	
295	3091731.41	399590.84			
			N 36-20-1 W	65.79	
296	3091784.41	399551.86			
			N 42-5-30 W	144.43	
297	3091891.58	399455.05			
			S 64-17-57 W	111.99	
298	3091843.02	399354.14			
			N 6-19-28 W	464.02	Tie Line, Follows elevation 207.5 ft. in between points 298 and 299
299	3092304.21	399303.02			
			N 59-39-57 E	67.25	
300	3092338.17	399361.06			
			N 11-27-33 W	181.17	
301	3092515.73	399325.06			
			N 15-2-33 W	94.09	
302	3092606.59	399300.64			
			N 15-16-33 W	186.18	
303	3092786.19	399251.59			
			N 15-1-33 W	136.13	
304	3092917.67	399216.30			
			N 21-54-33 W	197.19	
305	3093100.61	399142.72			
			N 16-28-33 W	202.19	
306	3093294.50	399085.37			
			N 26-44-33 W	137.33	
307	3093417.14	399023.58			
			N 26-18-3 W	1439.16	Tie Line, Follows elevation 207.7 ft. in between points 307 and 308
308	3094707.30	398385.90			
			N 19-51-20 W	17.53	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
309	3094723.79	398379.95			
			N 35-16-23 W	272.04	
310	3094945.88	398222.85			
			N 33-33-23 W	163.02	
311	3095081.73	398132.74			
			N 35-58-23 W	188.03	
312	3095233.90	398022.29			
			N 41-22-23 W	133.02	
313	3095333.72	397934.37			
			S 47-49-19 W	44.00	
314	3095304.17	397901.76			
			N 38-18-13 W	3612.42	Tie Line, Follows elevation 207.9 ft. in between points 314 and 315
315	3098138.92	395662.68			
			N 68-38-0 E	121.00	
316	3098183.00	395775.36			
			N 31-5-25 W	552.96	
317	3098656.53	395489.81			
			N 11-57-25 W	546.86	
318	3099191.51	395376.51			
			S 70-48-36 W	127.50	
319	3099149.60	395256.10			
			N 3-30-19 W	896.79	Tie Line, Follows elevation 208 ft. in between points 319 and 320
320	3100044.71	395201.26			
			N 71-52-36 E	102.79	
321	3100076.69	395298.95			
			N 2-11-25 W	466.88	
322	3100543.23	395281.11			
			N 4-37-25 W	453.88	
323	3100995.63	395244.52			
			N 3-53-25 W	435.86	
324	3101430.49	395214.94			
			N 11-29-24 W	164.92	
325	3101592.10	395182.09			
			N 10-49-24 W	793.00	
326	3102371.00	395033.18			
			N 15-53-24 W	493.00	
327	3102845.16	394898.20			
			S 81-40-36 W	92.50	
328	3102831.77	394806.67			
			N 46-30-12 W	8971.20	Tie Line, Follows elevation 209.7 ft. in between points 328 and 329
329	3109006.70	388298.86			
			S 65-25-19 W	1466.52	Tie Line, Follows elevation 210.6 ft. in between points 329 and 330
330	3108396.71	386965.23			
			N 30-32-41 W	2.00	
331	3108398.44	386964.22			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 2-35-23 W	2510.02	Tie Line, Follows elevation 211.5 ft. in between points 331 and 332
332	3105890.97	386850.82			
			S 9-42-22 E	56.22	
333	3105835.55	386860.30			
			N 61-42-18 E	189.83	
334	3105925.54	387027.44			
			N 64-16-18 E	191.82	
335	3106008.81	387200.25			
			N 52-52-18 E	213.80	
336	3106137.86	387370.70			
			N 43-54-18 E	223.79	
337	3106299.10	387525.89			
			N 43-43-18 E	145.87	
338	3106404.52	387626.71			
			N 6-50-18 E	118.89	
339	3106522.57	387640.86			
			N 24-0-18 E	137.87	
340	3106648.51	387696.95			
			N 44-30-18 E	77.17	
341	3106703.55	387751.04			
			N 67-14-44 E	2754.08	Tie Line, Follows elevation 210.2 ft. in between points 341 and 342
342	3107768.81	390290.74			
			S 53-14-44 E	36.00	
343	3107747.27	390319.58			
			S 31-16-42 E	27.00	
344	3107724.19	390333.60			
			S 27-7-43 E	2006.99	Tie Line, Follows elevation 210.2 ft. in between points 344 and 345
345	3105938.01	391248.77			
			S 23-6-12 E	113.97	
346	3105833.18	391293.49			
			S 40-58-54 E	254.95	
347	3105640.71	391460.69			
			S 43-27-54 E	369.92	
348	3105372.23	391715.16			
			S 48-37-54 E	195.96	
349	3105242.72	391862.22			
			S 43-50-54 E	158.97	
350	3105128.07	391972.35			
			S 35-52-54 E	179.96	
351	3104982.27	392077.83			
			S 67-52-54 E	226.95	
352	3104896.82	392288.07			
			S 68-27-54 E	489.21	
353	3104717.25	392743.13			
			S 68-27-54 E	29.80	Tie Line, Follows elevation 208.5 ft. in between points 353 and 354
354	3104706.31	392770.85			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			S 68-27-53 E	25.80	
355	3104696.84	392794.85			
			S 60-17-54 E	449.91	
356	3104473.92	393185.64			
			S 29-2-54 E	244.30	
357	3104260.35	393304.26			
			S 14-16-24 E	6758.54	Tie Line, Follows elevation 208.5 ft. in between points 357 and 358
358	3097710.46	394970.60			
			S 34-59-52 E	21.30	
359	3097693.02	394982.81			
			S 37-57-3 E	6.00	
360	3097688.29	394986.50			
			S 37-57-0 E	25.50	Tie Line, Follows elevation 208.5 ft. in between points 360 and 361
361	3097668.18	395002.18			
			S 37-57-0 E	143.01	
362	3097555.41	395090.13			
			S 76-13-0 E	330.39	
363	3097476.70	395411.00			
			S 52-37-0 E	130.15	
364	3097397.68	395514.42			
			S 24-8-0 E	102.52	
365	3097304.12	395556.34			
			S 35-50-0 E	93.11	
366	3097228.64	395610.85			
			S 18-27-0 E	222.26	
367	3097017.80	395681.19			
			S 57-49-0 E	180.21	
368	3096921.82	395833.71			
			S 49-23-0 E	236.28	
369	3096768.01	396013.06			
			S 10-8-0 E	351.42	
370	3096422.07	396074.89			
			S 20-33-0 E	272.32	
371	3096167.08	396170.49			
			S 25-24-0 E	306.36	
372	3095890.34	396301.90			
			S 36-43-0 E	246.29	
373	3095692.92	396449.14			
			S 38-53-26 E	471.25	
374	3095326.13	396745.01			
			N 78-2-35 E	42.73	
375	3095334.98	396786.81			
			S 32-30-26 E	520.33	
376	3094896.18	397066.44			
			N 17-34-30 E	64.71	
377	3094957.87	397085.98			
			N 42-55-0 E	104.00	
378	3095034.04	397156.80			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			S 13-46-51 E	4781.01	Tie Line, Follows elevation 207.6 ft. in between points 378 and 379
379	3090390.70	398295.71			
			S 15-31-13 W	103.27	
380	3090291.20	398268.08			
			S 1-55-47 E	187.07	
381	3090104.24	398274.38			
			S 3-45-25 E	257.41	
382	3089847.38	398291.25			
			S 3-51-49 W	202.80	
383	3089645.05	398277.58			
			S 8-26-49 W	162.52	
384	3089484.29	398253.71			
			S 0-0-49 W	216.00	
385	3089268.29	398253.66			
			S 11-50-11 E	191.71	
386	3089080.66	398292.99			
			S 23-14-55 E	182.45	
387	3088913.03	398365.01			
			S 88-17-22 E	134.50	
388	3088909.01	398499.44			
			S 24-47-58 E	694.75	Tie Line, Follows elevation 207.2 ft. in between points 388 and 389
389	3088278.34	398790.85			
			N 89-10-22 W	83.00	
390	3088279.54	398707.86			
			S 30-5-22 E	209.61	
391	3088098.18	398812.95			
			S 22-21-22 E	193.82	
392	3087918.93	398886.68			
			S 34-15-22 E	115.00	
393	3087823.88	398951.41			
			S 12-20-51 W	3888.58	Tie Line, Follows elevation 206.8 ft. in between points 393 and 394
394	3084025.27	398119.91			
			N 33-9-14 W	106.00	
395	3084114.02	398061.94			
			N 49-14-14 W	481.76	
396	3084428.57	397697.05			
			N 79-25-21 W	64.78	
397	3084440.46	397633.37			
			S 55-32-52 W	529.94	
398	3084140.66	397196.39			
			N 35-13-29 W	8.25	
399	3084147.40	397191.63			
			S 54-54-2 W	369.49	
400	3083934.94	396889.34			
			S 20-48-6 W	14.76	
401	3083934.94	396889.34			
			S 20-48-5 W	861.10	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
402	3083129.97	396583.55			
			S 54-1-35 E	84.59	
403	3083080.28	396652.01			
			S 1-15-58 E	89.91	
404	3082990.40	396653.99			
			S 7-56-25 W	117.37	
405	3082874.15	396637.78			
			S 29-59-25 W	132.76	
406	3082759.17	396571.42			
			S 46-7-25 W	90.38	
407	3082696.52	396506.28			
			S 15-21-25 W	79.75	
408	3082619.62	396485.16			
			S 32-0-25 W	253.60	
409	3082404.57	396350.75			
			S 52-9-25 W	276.43	
410	3082234.98	396132.45			
			S 16-51-25 W	171.36	
411	3082070.99	396082.77			
			S 25-58-25 W	127.01	
412	3081956.81	396027.14			
			N 85-48-37 W	97.54	Tie Line, Follows elevation 206.1 ft. in between points 412 and 413
413	3081963.94	395929.86			
			N 60-50-35 W	131.86	
414	3082028.18	395814.71			
			S 27-40-1 W	387.49	
415	3081684.99	395634.80			
			S 44-42-25 W	395.39	
416	3081403.98	395356.65			
			S 33-42-25 W	524.79	
417	3080967.42	395065.43			
			S 82-54-13 W	174.08	
418	3080945.91	394892.69			
			S 33-46-17 W	114.53	
419	3080850.71	394829.02			
			S 33-46-18 W	43.43	
420	3080814.60	394804.88			
			S 33-46-17 W	125.00	Tie Line, Follows elevation 206 ft. in between points 420 and 421
421	3080710.70	394735.40			
			S 33-46-17 W	446.25	
422	3080339.75	394487.34			
			S 19-53-39 W	756.67	
423	3079628.24	394229.87			
			S 17-15-35 W	993.22	
424	3078679.75	393935.19			
			S 18-18-5 W	114.29	
425	3078571.24	393899.31			
			S 18-18-5 W	380.23	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
426	3078210.24	393779.91			
			S 22-26-5 W	299.71	
427	3077933.22	393665.54			
			S 5-45-5 W	176.83	
428	3077757.28	393647.82			
			S 14-55-5 W	155.85	
429	3077606.68	393607.70			
			S 7-30-5 W	251.75	
430	3077357.09	393574.84			
			S 1-57-55 W	147.86	
431	3077209.32	393569.77			
			S 1-27-5 W	187.82	
432	3077021.56	393565.01			
			S 12-49-55 E	275.73	
433	3076752.72	393626.25			
			S 24-49-55 E	239.76	
434	3076535.13	393726.94			
			S 22-19-55 E	73.93	
435	3076466.74	393755.03			
			S 48-26-55 E	137.86	
436	3076375.30	393858.20			
			N 41-10-4 E	19.98	
437	3076390.34	393871.35			
			S 13-54-54 E	136.19	
438	3076258.15	393904.11			
			S 49-23-54 E	95.85	
439	3076195.78	393976.88			
			S 71-29-58 E	179.50	
440	3076138.82	394147.10			
			N 49-57-42 E	90.00	
441	3076196.72	394216.01			
			S 40-20-18 E	60.00	
442	3076150.98	394254.84			
			S 24-11-40 E	6.30	
443	3076145.24	394257.43			
			S 1-6-39 W	5723.32	Tie Line, Follows elevation 205.2 ft. in between points 443 and 444
444	3070423.04	394146.54			
			S 7-56-50 W	108.60	
445	3070315.49	394131.53			
			S 14-44-2 E	331.99	
446	3069994.42	394215.96			
			S 30-22-36 E	247.36	
447	3069781.02	394341.05			
			S 16-55-10 W	228.96	
448	3069561.97	394274.42			
			S 10-2-51 E	153.20	
449	3069411.12	394301.15			
			S 3-52-37 E	193.08	
450	3069218.48	394314.20			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 7-19-45 E	160.70	
451	3069059.10	394334.71			
			S 4-21-38 E	175.89	
452	3068883.72	394348.08			
			S 9-5-49 E	189.48	
453	3068696.62	394378.04			
			S 16-40-58 E	451.01	
454	3068264.60	394507.52			
			S 20-57-0 E	341.58	
455	3067945.61	394629.65			
			S 36-25-0 E	88.02	
456	3067874.78	394681.90			
			S 36-25-0 E	83.55	Tie Line, Follows elevation 204.5 ft. in between points 456 and 457
457	3067807.54	394731.50			
			S 36-25-0 E	32.30	
458	3067781.55	394750.68			
			S 23-17-0 E	186.98	
459	3067609.80	394824.59			
			S 34-23-0 E	103.03	
460	3067524.77	394882.77			
			S 34-15-45 E	1200.03	
461	3066533.00	395558.37			
			S 30-12-34 E	360.62	
462	3066221.36	395739.82			
			S 30-12-34 E	30.20	Tie Line, Follows elevation 203.8 ft. in between points 462 and 463
463	3066195.27	395755.02			
			S 30-12-35 E	23.30	
464	3066175.13	395766.74			
			S 22-49-34 E	340.06	
465	3065861.71	395898.67			
			S 3-0-3 E	1044.49	Tie Line, Follows elevation 203.8 ft. in between points 465 and 466
466	3064818.66	395953.36			
			S 23-31-26 W	57.10	
467	3064766.30	395930.57			
			S 40-0-26 W	635.34	
468	3064279.66	395522.13			
			S 63-20-39 E	24.29	
469	3064268.76	395543.83			
			S 63-20-39 E	153.71	
470	3064199.80	395681.21			
			S 44-27-52 W	1193.60	Tie Line, Follows elevation 203.8 ft. in between points 470 and 471
471	3063347.94	394845.15			
			N 35-0-34 W	135.54	
472	3063458.96	394767.39			
			S 51-48-26 W	780.93	
473	3062976.10	394153.64			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			S 52-32-24 W	16.00	
474	3062966.37	394140.94			
			S 50-47-3 W	2662.56	Tie Line, Follows elevation 203.3 ft. in between points 474 and 475
475	3061282.97	392078.11			
			S 44-29-15 W	115.58	
476	3061200.52	391997.12			
			S 71-54-11 W	163.06	
477	3061149.87	391842.13			
			S 61-24-15 W	330.13	
478	3060991.85	391552.27			
			S 55-52-15 W	60.13	
479	3060958.12	391502.50			
			S 46-43-52 W	340.28	Tie Line, Follows elevation 203.3 ft. in between points 479 and 480
480	3060724.88	391254.73			
			S 34-9-14 W	57.20	
481	3060677.55	391222.62			
			S 37-14-15 W	280.11	
482	3060454.54	391053.12			
			S 35-21-15 W	130.05	
483	3060348.47	390977.87			
			S 29-3-15 W	150.06	
484	3060217.30	390905.00			
			S 58-23-15 W	146.06	
485	3060140.74	390780.62			
			S 35-3-15 W	190.07	
486	3059985.14	390671.45			
			S 47-21-16 W	43.92	
487	3059955.39	390639.15			
			S 47-21-15 W	66.70	Tie Line, Follows elevation 203.3 ft. in between points 487 and 488
488	3059910.20	390590.09			
			S 47-21-15 W	74.45	
489	3059859.77	390535.33			
			S 46-46-15 W	163.06	
490	3059748.08	390416.52			
			S 49-1-15 W	184.07	
491	3059627.37	390277.56			
			S 40-23-15 W	270.10	
492	3059421.64	390102.55			
			S 43-43-15 W	280.11	
493	3059219.20	389908.96			
			S 23-8-15 W	130.05	
494	3059099.61	389857.86			
			S 46-36-45 E	110.50	
495	3059023.71	389938.16			
			S 27-10-7 W	1806.19	Tie Line, Follows elevation 202.7 ft. in between points 495 and 496
496	3057416.81	389113.46			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 86-46-16 W	94.35	
497	3057411.49	389019.26			
			S 86-32-41 W	98.85	
498	3057405.53	388920.59			
			S 28-5-19 E	554.28	
499	3056916.54	389181.57			
			N 89-50-41 E	392.42	
500	3056917.61	389573.98			
			S 44-9-19 E	440.15	
501	3056601.83	389880.60			
			S 14-45-19 E	666.32	
502	3055957.49	390050.31			
			S 17-27-19 E	961.18	
503	3055040.58	390338.63			
			S 24-15-19 E	533.81	
504	3054553.90	390557.92			
			N 77-4-28 E	263.82	
505	3054612.91	390815.05			
			S 11-17-32 W	6793.49	Tie Line, Follows elevation 201.8 ft. in between points 505 and 506
506	3047950.98	389484.88			
			S 79-34-12 W	152.80	
507	3047923.31	389334.61			
			S 17-16-12 W	449.50	
508	3047494.08	389201.17			
			S 28-56-12 W	373.32	
509	3047167.37	389020.55			
			S 29-59-56 W	357.13	
510	3046858.08	388841.99			
			S 23-58-7 W	287.42	
511	3046595.45	388725.24			
			S 36-32-14 W	738.03	
512	3046002.46	388285.87			
			N 61-21-35 W	1040.13	
513	3046500.99	387373.01			
			S 10-56-24 E	742.50	
514	3045772.00	387513.92			
			S 51-5-4 E	425.66	
515	3045504.61	387845.12			
			S 51-5-4 E	389.64	
516	3045259.86	388148.28			
			S 88-39-33 W	1995.70	Tie Line, Follows elevation 200 ft. in between points 516 and 517
517	3045213.14	386153.15			
			N 67-46-9 E	90.96	
518	3045247.55	386237.35			
			N 67-46-9 E	211.10	
519	3045327.42	386432.76			
			N 12-47-0 W	90.76	
520	3045415.93	386412.67			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			R = 1673	L = 462.56	
521	3045851.94	386262.71			
			N 68-19-10 W	465.01	
522	3046023.72	385830.60			
			N 6-15-35 E	645.08	
523	3046664.95	385900.92			
			N 26-20-57 W	176.20	
524	3046822.84	385822.72			
			S 74-3-25 W	218.92	
525	3046762.71	385612.22			
			N 56-15-33 W	155.89	
526	3046849.29	385482.59			
			N 27-59-33 W	112.65	
527	3046948.76	385429.72			
			N 71-1-33 W	108.46	
528	3046984.02	385327.15			
			N 83-33-33 W	72.40	
529	3046992.15	385255.21			
			N 67-7-33 W	59.42	
530	3047015.24	385200.46			
			S 66-11-27 W	81.39	
531	3046982.38	385126.00			
			N 71-14-33 W	65.66	
532	3047003.50	385063.83			
			N 3-45-33 W	98.27	
533	3047101.56	385057.39			
			N 68-20-33 W	744.71	
534	3047376.39	384365.25			
			N 31-57-33 W	179.96	
535	3047529.07	384270.00			
			N 66-57-33 W	332.20	
536	3047659.08	383964.30			
			S 74-22-27 W	344.14	
537	3047566.38	383632.88			
			S 86-57-28 W	57.02	
538	3047563.36	383575.94			
			N 80-19-33 W	196.53	
539	3047596.38	383382.21			
			N 67-56-33 W	122.74	
540	3047642.47	383268.45			
			S 62-38-27 W	83.69	
541	3047604.01	383194.13			
			S 71-29-27 W	274.83	
542	3047516.76	382933.52			
			N 83-14-33 W	96.77	
543	3047528.15	382837.42			
			S 74-7-27 W	230.89	
544	3047464.98	382615.34			
			S 78-21-27 W	266.64	
545	3047411.17	382354.19			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 82-21-27 W	105.86	
546	3047397.09	382249.27			
			S 89-13-0 W	216.78	
547	3047394.13	382032.51			
			S 89-31-10 W	374.00	
548	3047390.98	381658.53			
			N 83-47-50 W	209.10	
549	3047413.57	381450.66			
			N 87-37-9 W	176.30	
550	3047420.90	381274.51			
			S 72-49-48 W	433.00	
551	3047293.07	380860.81			
			S 68-49-27 W	499.94	
552	3047112.47	380394.64			
			S 70-1-45 W	565.88	
553	3046919.19	379862.80			
			S 53-58-9 W	263.55	
554	3046764.17	379649.67			
			S 62-10-47 W	271.36	
555	3046637.52	379409.68			
			S 63-21-50 W	280.41	
556	3046511.80	379159.03			
			S 48-28-50 W	594.61	
557	3046117.65	378713.84			
			S 71-43-0 W	154.38	
558	3046069.22	378567.25			
			S 5-54-14 E	25.95	
559	3046043.41	378569.92			
			S 77-37-41 W	360.47	
560	3045966.17	378217.83			
			N 22-50-24 W	322.96	
561	3046263.80	378092.46			
			N 67-35-4 E	191.74	
562	3046336.92	378269.71			
			N 71-49-4 E	269.17	
563	3046420.91	378525.44			
			N 6-3-30 W	64.00	
564	3046484.56	378518.69			
			N 4-48-30 W	256.55	
565	3046740.20	378497.18			
			N 4-48-30 W	365.87	
566	3047104.78	378466.51			
			N 45-24-20 E	161.94	
567	3047218.48	378581.82			
			N 29-16-0 E	191.73	
568	3047385.73	378675.55			
			N 46-18-0 E	213.40	
569	3047533.17	378829.83			
			N 42-33-0 E	172.53	
570	3047660.27	378946.50			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			R = 1240	L = 97.29	
571	3047713.69	378865.21			
			N 54-26-22 W	768.14	
572	3048160.40	378240.33			
			R = 1737	L = 286.60	
573	3048307.13	377994.52			
			S 28-51-9 W	292.64	
574	3048050.81	377853.31			
			S 28-51-8 W	27.00	
575	3048027.16	377840.28			
			N 54-36-59 W	935.32	Tie Line, Follows elevation 187.5 ft. in between points 575 and 576
576	3048568.75	377077.72			
			N 79-53-25 W	518.89	
577	3048659.82	376566.89			
			S 20-40-12 E	191.69	
578	3048480.48	376634.56			
			S 37-3-2 E	173.27	
579	3048342.19	376738.96			
			N 87-32-13 W	1097.25	Tie Line, Follows elevation 187.5 ft. in between points 579 and 580
580	3048389.33	375642.73			
			N 30-6-30 E	104.60	
581	3048479.82	375695.20			
			N 65-33-50 W	351.87	
582	3048625.38	375374.85			
			S 23-25-50 W	150.08	
583	3048487.67	375315.18			
			N 65-34-50 W	32.24	
584	3048501.00	375285.82			
			S 24-25-11 W	77.28	
585	3048430.63	375253.87			
			N 70-13-20 W	553.76	
586	3048618.00	374732.78			
			N 64-18-22 W	130.01	
587	3048674.37	374615.63			
			R = 787	L = 70.19	
588	3048638.57	374555.28			
			S 61-52-44 W	512.00	
589	3048397.25	374103.73			
			R = 318	L = 296.97	
590	3048395.26	373817.26			
			N 2-44-16 W	140.20	Tie Line, Follows shoreline in between 590 and 591
591	3048535.30	373810.56			
			N 9-3-33 W	967.56	
592	3049490.78	373658.20			
			N 23-43-20 E	163.41	
593	3049569.13	373375.00			
			N 78-27-37 E	356.15	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
594	3049575.93	373373.58			
			S 11-46-2 E	6.94	
595	3049531.12	373154.09			
			N 78-27-48 E	224.02	
596	3049275.75	373059.95			
			N 20-14-14 E	272.17	
597	3049274.84	373050.11			
			N 84-40-28 E	9.88	
598	3049286.81	373046.65			
			S 16-6-46 E	12.46	
599	3049268.98	372924.67			
			N 81-41-1 E	123.28	
600	3049259.74	372801.74			
			N 85-42-14 E	123.28	
601	3049260.46	372678.46			
			S 89-39-56 E	123.28	
602	3049268.34	372555.44			
			S 86-19-54 E	123.28	
603	3049226.90	372553.56			
			N 2-35-39 E	41.49	
604	3049214.61	372536.34			
			N 54-29-42 E	21.15	
605	3049217.12	372528.73			
			S 71-44-30 E	8.01	
606	3049110.47	372369.39			
			N 56-12-20 E	191.74	
607	3049143.73	372347.13			
			S 33-47-39 E	40.02	
608	3049112.38	372299.66			
			N 56-33-45 E	56.89	
609	3049112.38	372299.66			
			S 56-33-46 W	18.75	
610	3049102.05	372284.02			
			S 50-12-15 W	63.62	
611	3049061.33	372235.14			
			S 38-14-45 W	27.03	
612	3049040.10	372218.40			
			S 51-47-12 E	350.00	
613	3048823.60	372493.40			
			S 38-14-45 W	200.00	
614	3048666.53	372369.60			
			S 51-47-12 E	508.41	
615	3048352.03	372769.06			
			S 38-28-20 W	300.55	
616	3048116.73	372582.08			
			S 51-47-12 E	185.93	
617	3048001.72	372728.17			
			N 38-23-20 E	132.00	
618	3048105.18	372810.14			
			S 51-29-36 E	189.33	

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
619	3047987.31	372958.30			
			N 38-18-24 E	88.82	
620	3048057.00	373013.35			
			R = 1493	L = 376.99	
621	3047797.77	373285.68			
			S 53-38-47 E	142.46	
622	3047713.33	373400.42			
			R = 28.5	L = 31.715	
623	3047718.48	373430.08			
			N 64-5-10 W	16.23	
624	3047725.57	373415.48			
			S 88-27-13 E	87.82	
625	3047723.21	373503.27			
			S 2-28-0 W	294.75	
626	3047428.73	373490.59			
			S 71-19-40 E	168.80	
627	3047374.69	373650.50			
			S 63-31-0 E	18.00	
628	3047366.66	373666.61			
			S 62-7-30 E	190.15	
629	3047277.76	373834.70			
			N 43-39-30 E	17.22	
630	3047290.22	373846.58			
			S 19-10-53 E	702.37	Tie Line, Follows elevation 188 ft. in between points 630 and 631
631	3046626.85	374077.36			
			N 41-15-14 W	79.51	
632	3046686.63	374024.93			
			S 54-19-3 W	15.79	
633	3046677.42	374012.11			
			S 24-31-27 W	106.28	
634	3046580.72	373967.99			
			S 21-35-0 W	73.22	
635	3046512.64	373941.06			
			S 54-36-40 W	68.97	
636	3046472.70	373884.83			
			S 70-23-9 E	19.51	
637	3046466.15	373903.21			
			S 19-53-21 W	15.00	
638	3046452.04	373898.11			
			S 32-56-42 E	82.46	
639	3046382.84	373942.95			
			S 32-7-5 E	75.83	
640	3046318.62	373983.27			
			S 52-49-0 E	102.13	
641	3046256.90	374064.64			
			S 7-21-59 E	62.44	
642	3046194.97	374072.64			
			S 33-10-59 E	105.13	
643	3046106.99	374130.18			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			S 0-2-17 W	295.74	
644	3045811.25	374129.99			
			N 70-20-15 W	80.00	
645	3045838.17	374054.65			
			S 19-39-45 W	173.53	
646	3045674.76	373996.27			
			S 15-51-52 W	61.44	
647	3045615.66	373979.47			
			S 34-4-40 W	56.15	
648	3045569.15	373948.01			
			S 25-0-24 E	110.00	
649	3045469.46	373994.51			
			S 27-23-36 W	144.00	
650	3045341.61	373928.26			
			N 58-58-50 W	407.95	
651	3045551.83	373578.65			
			S 10-49-13 W	508.90	
652	3045051.98	373483.12			
			S 31-51-47 E	264.25	
653	3044827.56	373622.62			
			N 77-10-55 E	98.54	
654	3044849.42	373718.70			
			N 29-48-25 E	264.08	
655	3045078.56	373849.97			
			N 38-28-55 E	192.53	
656	3045229.28	373969.77			
			S 7-34-25 W	91.21	
657	3045138.86	373957.75			
			S 1-38-25 W	123.67	
658	3045015.24	373954.21			
			S 4-54-25 W	197.44	
659	3044818.53	373937.32			
			S 44-28-5 E	170.34	
660	3044696.97	374056.65			
			S 40-46-5 E	263.46	
661	3044497.44	374228.69			
			S 37-3-58 W	197.94	
662	3044339.49	374109.39			
			S 7-31-59 W	239.82	
663	3044101.74	374077.95			
			S 21-24-0 E	250.35	
664	3043868.66	374169.30			
			S 27-6-30 E	254.33	
665	3043642.27	374285.19			
			S 42-53-0 E	248.18	
666	3043460.42	374454.08			
			S 4-4-0 W	251.88	
667	3043209.18	374436.22			
			S 47-45-42 E	356.10	
668	3042969.80	374699.86			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			N 42-26-9 E	100.03	
669	3043043.63	374767.35			
			S 47-45-42 E	140.00	
670	3042949.52	374871.00			
			S 67-22-13 E	148.36	
671	3042892.44	375007.94			
			N 42-16-47 E	253.36	
672	3043079.89	375178.38			
			N 82-13-22 E	85.95	
673	3043091.52	375263.54			
			S 47-47-7 E	62.82	
674	3043049.32	375310.07			
			S 85-23-51 E	123.83	
675	3043039.38	375433.50			
			N 54-57-28 E	120.08	
676	3043108.33	375531.81			
			N 75-27-28 E	66.00	
677	3043124.90	375595.69			
			S 47-35-0 E	224.19	To point of beginning

Parcel A					
Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
1A	3048695.69	3048695.69			Point of beginning Parcel A
			N 33-18-33 W	143.04	
2A	3048815.23	3048815.23			
			N 32-28-46 E	100.00	
3A	3048899.59	3048899.59			
			N 57-31-14 W	112.44	
4A	3048959.97	3048959.97			
			N 58-3-58 W	247.11	
5A	3049090.67	3049090.67			
			N 66-5-23 E	65.77	Tie Line, Follows elevation 187 ft. in between points 5A and 6A
6A	3049090.67	3049090.67			
			S 18-46-0 E	172.83	
7A	3048927.03	3048927.03			
			S 80-18-16 W	104.13	
8A	3048909.49	3048909.49			
			S 46-26-18 E	103.45	
9A	3048838.20	3048838.20			
			S 22-44-13 W	59.81	
10A	3048783.04	3048783.04			
			S 9-1-41 E	105.50	

Parcel A					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
11A	3048678.85	3048678.85			
			N 82-31-6 E	87.46	
12A	3048690.24	3048690.24			
			N 61-52-44 E	21.00	
13A	3048700.14	3048700.14			
			S 28-7-16 E	100.00	
14A	3048611.94	3048611.94			
			N 61-52-44 E	150.00	
15A	3048682.64	3048682.64			
			N 60-50-56 E	26.79	To Parcel A point of beginning

Parcel B					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
1B	3046336.37	3046336.37			Point of beginning Parcel B
			S 19-37-36 W	78.64	
2B	3046262.30	3046262.30			
			S 70-9-2 E	60.00	
3B	3046241.93	3046241.93			
			S 19-37-37 W	92.00	
4B	3046155.27	3046155.27			
			S 70-9-3 E	157.40	
5B	3046101.83	3046101.83			
			N 25-59-43 W	174.15	
6B	3046258.36	3046258.36			
			R = 261	L = 106.10	To Parcel B point of beginning

Parcel Excluded From Project Boundary					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
E1	3048838.55	3048838.55			Point of beginning Excluded Parcel
			N 85-2-50 E	876.24	
E2	3048914.20	3048914.20			
			N 8-0-0 E	570.41	
E3	3049479.06	3049479.06			
			N 82-0-0 W	530.00	
E4	3049552.81	3049552.81			
			S 87-11-0 W	330.00	

Parcel Excluded From Project Boundary					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
E5	3049536.59	3049536.59			
			S 7-59-5 W	704.89	To excluded parcel point of beginning

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Amended Final Application for New License for Major Water Power Project – Existing Dam

Northfield Mountain Pumped Storage Project (FERC Project Number 2485)

EXHIBIT H- PLANS AND ABILITY OF APPLICANT TO OPERATE THE PROJECT

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXHIBIT H – PLAN AND ABILITY OF APPLICANT TO OPERATE THE PROJECT

The following excerpt from the Code of Federal Regulations (CFR) at 18 CFR § 5.18(c) describes the required content of this Exhibit.

(i) Information to be supplied by all applicants. All Applicants for a new license under this part must file the following information with the Commission:

(A) A discussion of the plans and ability of the applicant to operate and maintain the project in a manner most likely to provide efficient and reliable electric service, including efforts and plans to:

(1) Increase capacity or generation at the project;

(2) Coordinate the operation of the project with any upstream or downstream water resource projects; and

(3) Coordinate the operation of the project with the applicant's or other electrical systems to minimize the cost of production.

(B) A discussion of the need of the applicant over the short and long term for the electricity generated by the project, including:

(1) The reasonable costs and reasonable availability of alternative sources of power that would be needed by the applicant or its customers, including wholesale customers, if the applicant is not granted a license for the project;

(2) A discussion of the increase in fuel, capital, and any other costs that would be incurred by the applicant or its customers to purchase or generate power necessary to replace the output of the licensed project, if the applicant is not granted a license for the project;

(3) The effect of each alternative source of power on:

(i) The applicant's customers, including wholesale customers;

(ii) The applicant's operating and load characteristics; and

(iii) The communities served or to be served, including any reallocation of costs associated with the transfer of a license from the existing licensee.

(C) The following data showing need and the reasonable cost and availability of alternative sources of power:

(1) The average annual cost of the power produced by the project, including the basis for that calculation;

(2) The projected resources required by the applicant to meet the applicant's capacity and energy requirements over the short and long term including:

(i) Energy and capacity resources, including the contributions from the applicant's generation, purchases, and load modification measures (such as conservation, if considered as a resource), as separate components of the total resources required;

(ii) A resource analysis, including a statement of system reserve margins to be maintained for energy and capacity;

(iii) If load management measures are not viewed as resources, the effects of such measures on the projected capacity and energy requirements indicated separately;

(iv) For alternative sources of power, including generation of additional power at existing facilities, restarting deactivated units, the purchase of power off-system, the construction or purchase and operation of a new power plant, and load management measures such as conservation: The total annual cost of each alternative source of power to replace project power; the basis for the determination of projected annual cost; and a discussion of the relative merits of each alternative, including the issues of the period of availability and dependability of purchased power, average life of alternatives, relative equivalent availability of generating alternatives, and relative impacts on the applicant's power system reliability and other system

operating characteristics; and the effect on the direct providers (and their immediate customers) of alternate sources of power.

(D) If an applicant uses power for its own industrial facility and related operations, the effect of obtaining or losing electricity from the project on the operation and efficiency of such facility or related operations, its workers, and the relate community.

(E) If an applicant is an Indian tribe applying for a license for a project located on the tribal reservation, a statement of the need of such Indian tribe for electricity generated by the project to foster the purposes of the reservation.

(F) A comparison of the impact on the operations and planning of the applicant's transmission system of receiving or not receiving the project license, including:

(1) An analysis of the effects of any resulting redistribution of power flows on line loading (with respect to applicable thermal, voltage, or stability limits), line losses, and necessary new construction of transmission facilities or upgrading of existing facilities, together with the cost impact of these effects;

(2) An analysis of the advantages that the applicant's transmission system would provide in the distribution of the project's power; and

(3) Detailed single-line diagrams, including existing system facilities identified by name and circuit number, that show system transmission elements in relation to the project and other principal interconnected system elements. Power flow and loss data that represent system operating conditions may be appended if applicants believe such data would be useful to show that the operating impacts described would be beneficial.

(G) If the applicant has plans to modify existing project facilities or operations, a statement of the need for, or usefulness of, the modifications, including at least a reconnaissance-level study of the effect and projected costs of the proposed plans and any alternate plans, which in conjunction with other developments in the area would conform with a comprehensive plan for improving or developing the waterway and for other beneficial public uses as defined in Section 10(a)(1) of the Federal Power Act.

(H) If the applicant has no plans to modify existing project facilities or operations, at least a reconnaissance level study to show that the project facilities or operations in conjunction with other developments in the area would conform with a comprehensive plan for improving or developing the waterway and for other beneficial public uses as defined in Section 10(a)(1) of the Federal Power Act.

(I) A statement describing the applicant's financial and personnel resources to meet its obligations under a new license, including specific information to demonstrate that the applicant's personnel are adequate in number and training to operate and maintain the project in accordance with the provisions of the license.

(J) If an applicant proposes to expand the project to encompass additional lands, a statement that the applicant has notified, by certified mail, property owners on the additional lands to be encompassed by the project and governmental agencies and subdivisions likely to be interested in or affected by the proposed expansion.

(K) The applicant's electricity consumption efficiency improvement program, as defined under Section 10(a)(2)(C) of the Federal Power Act, including:

(1) A statement of the applicant's record of encouraging or assisting its customers to conserve electricity and a description of its plans and capabilities for promoting electricity conservation by its customers; and

(2) A statement describing the compliance of the applicant's energy conservation programs with any applicable regulatory requirements.

(L) The names and mailing addresses of every Indian tribe with land on which any part of the proposed project would be located or which the applicant reasonably believes would otherwise be affected by the proposed project.

(ii) Information to be provided by an applicant licensee. An existing licensee that applies for a new license must provide:

(A) The information specified in paragraph (c)(1) of this section.

(B) A statement of measures taken or planned by the licensee to ensure safe management, operation, and maintenance of the project, including:

(1) A description of existing and planned operation of the project during flood conditions;

(2) A discussion of any warning devices used to ensure downstream public safety;

(3) A discussion of any proposed changes to the operation of the project or downstream development that might affect the existing Emergency Action Plan, as described in subpart C of part 12 of this chapter, on file with the Commission;

(4) A description of existing and planned monitoring devices to detect structural movement or stress, seepage, uplift, equipment failure, or water conduit failure, including a description of the maintenance and monitoring programs used or planned in conjunction with the devices; and

(5) A discussion of the project's employee safety and public safety record, including the number of lost-time accidents involving employees and the record of injury or death to the public within the project boundary.

(C) A description of the current operation of the project, including any constraints that might affect the manner in which the project is operated.

(D) A discussion of the history of the project and record of programs to upgrade the operation and maintenance of the project.

(E) A summary of any generation lost at the project over the last five years because of unscheduled outages, including the cause, duration, and corrective action taken.

(F) A discussion of the licensee's record of compliance with the terms and conditions of the existing license, including a list of all incidents of noncompliance, their disposition, and any documentation relating to each incident.

(G) A discussion of any actions taken by the existing licensee related to the project which affects the public.

(H) A summary of the ownership and operating expenses that would be reduced if the project license were transferred from the existing licensee.

(I) A statement of annual fees paid under part I of the Federal Power Act for the use of any Federal or Indian lands included within the project boundary.

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1 INFORMATION TO BE SUPPLIED BY ALL APPLICANTS

The Federal Power Act (FPA) requires applicants for a new license to provide certain information, including information about the applicant's record as the current licensee of the Project. Pursuant to 18 C.F.R. Section 5.18(c), this information is provided in this Exhibit. 18 C.F.R. Section 16.10(a) requires all applicants for a new license to provide certain information such as the need for Project power and the examination of alternative sources; plans to modify an existing Project; an applicant's ability to operate and maintain the Project; and the applicant's electrical efficiency programs. This information is included in Section 1.0 of this Exhibit. Pursuant to 18 C.F.R. Section 16.10(b) 5.18(c)(1)(ii), Section 2.0 contains information to be provided by an applicant who is the existing licensee for a Project and discusses Northfield Mountain, LLC's (hereinafter referred to as "FirstLight" or the "Applicant") safe management, operation, and maintenance of the Northfield Mountain Pumped Storage Project (Northfield Mountain Project or Project); operational history and programs to upgrade Project operation and maintenance; compliance with the current licenses; and actions related to the Project that affect the public.

1.1 Efficient and Reliable Electric Service

1.1.1 Increase in Capacity or Generation

The Project's four reversible pump-turbines (Units 1, 2, 3, and 4) underwent efficiency improvements with the replacement of the turbine runners, and rewind of the motor generators[1]. No further modifications are proposed.

At this time, FirstLight has no plans to increase the capacity of the Project.

1.1.2 Coordination with any Upstream or Downstream Water Resource Projects

The Project operates within the Independent System Operator-New England ISO-NE region. ISO-NE coordinates the hydroelectric resources in New England in a manner designed to maximize the efficient delivery of power.

The Project is a pumped storage facility that operates in concert with the Turners Falls Project. FirstLight continually evaluates the volume of water in Turners Falls Impoundment (TFI) storage versus the volume of water in the Upper Reservoir to ensure there is sufficient volume in the TFI to fill the Upper Reservoir, if needed. The current FERC licensed operating range of the TFI, as measured at the Turners Falls Dam, is between elevation 185 and 176 feet; however, FirstLight typically operates the TFI above elevation 179 to 180 feet to maintain sufficient head to push water through the gatehouse leading to the power canal and the Cabot Station/Station No. 1 facilities.

1.1.3 Coordination of Operations with Electrical Systems

FirstLight coordinates operation of the Project with other electrical systems through its participation in the markets operated by ISO-NE.

[1] On August 17, 2011, and supplemented on January 17, 2012, February 14, 2012, and February 24, 2012, FirstLight filed an amendment application to revise the authorized installed capacity of Northfield Mountain. FERC issued an order amending the license and revising annual changes on March 23, 2012. On June 10, 2016, and in an errata issued on June 15, 2016, FERC issued an order amending the license upon completion of the final unit efficiency upgrade.

1.2 Need for Project Electricity

1.2.1 Cost and Availability of Alternative Sources of Power

FirstLight is not a utility with retail load obligations. If power from the Project were not available for sale into the markets operated by ISO-NE, the services the Project provided to the grid, including meeting peak energy demands, capacity, ancillary services including locational forward reserves, real-time operating reserves and regulation, would need to be provided from other, higher cost existing generation sources or from new generation sources available to the system operator. Due to Northfield's size and operating flexibility without its capabilities ISO-NE would need to put on-line many additional fossil fueled generators in order to replace the ramping capability of Northfield. This would significantly increase costs and emissions on a daily basis and would be less effective. As an example, on September 2, 2010, a day when Northfield station was out of service, ISO-NE was unable to restore the system generation and load balance within 15 minutes following a loss of generation, despite calling on many smaller units to replace Northfield. This resulted in a penalty for ISO-NE for violation of an operating requirement of the North American Electric Reliability Corporation (NERC).

1.2.2 Increase in Costs if FirstLight is not Granted a License

The Project is the largest source of offline, fast start operating reserve, one of the most flexible facilities to meet peak energy demands, and the largest dispatchable demand (and associated synchronized reserve) available to ISO-NE. Without the Project, ISO-NE would need to rely on more expensive, less flexible and emitting resources, including fossil fueled generation, to provide needed operating reserves and peak demand energy. Without the Project, ISO-NE would likely need to operate other resources less efficiently in the absence of its quick response dispatchable demand (pumping) to accommodate unforecasted increases in supply, including renewables, or decreases in demand. In addition, the Project contributes to increased interface capability and as such is designated as critical to maintaining Interface Reliability Operating Limits, IROL-critical. Because of the complexity of the New England power system and the confidentiality of costs of alternative resources, true costs associated with not relicensing the Project are not able to be determined

1.2.3 Effects of Alternative Sources of Power

Effects on Customers

The primary purpose of the Project is to supply peak demand energy, operating reserves, capacity, regulation, and other ancillary services to the ISO-NE, a regional transmission organization that coordinates the movement of wholesale electricity in Maine, New Hampshire, Vermont, Massachusetts, Connecticut and Rhode Island.

The Project provides important energy, operating reserves and operational flexibility to ISO-NE system operation. The fact that ISO-NE, as part of its daily operational planning processes, can rely on the Project to supply these operational flexibilities from a certain fuel supply is of high value to ISO-NE and the New England region. In many periods, this significant supply of operational flexibility has avoided the commitment of many other less flexible resources to provide for a more efficient system dispatch. [2]

This ability to meet peak demand provides rapid response power resources to the grid to assure reliable operation and prevent regional blackouts.

[2] This critical role is evidenced by the inability of ISO-NE to restore system balance within the North American Electric Reliability (NERC) criteria during a system disturbance on September 2, 2010 during a period when Northfield station was on a dewatering outage as noted above. See September 13, 2013 memo entitled from NERC to the FERC explaining the nature of the conditions, the inability of ISO-NE to restore system balance and the associated fine assessed for the reliability violation.

Storage provides other important reliability benefits to the system. These include helping to manage light load, or excess generation conditions and the ability to respond very quickly to energy and operating reserve activation needs on the power system during any time of the day or year. The value of the Project was demonstrated following the August 14, 2003 major blackout in the New York ISO (NY-ISO) grid. On August 15, ISO-NE parted all electrical ties to the New York electrical system to prevent the blackout from spreading further in New England. When it was time to rejoin the two power grids, ISO-NE requested the connection be made at the Project's substation. This facility was selected because:

- it is located at the junction of three 345 kV lines;
- it has a major tie line with the NY-ISO;
- the transmission company switchyard located at Northfield Mountain had the equipment necessary to synchronize the two electric grids, and
- the Project generators were large enough to make changes in both frequency and voltage.

Once the lines were energized, final adjustments were made by having the Project reduce generation to allow for a smooth synchronization of the two systems. The interconnection of the two systems allowed NY-ISO to begin restoration of the north portion of the NY power grid.

More recently, on April 1, 2020, a fault in the switchyard of a New England nuclear plant caused that plant to trip offline. Despite the loss of over 1,200 MW of power, within seconds the Northfield Mountain and Bear Swamp pumped storage projects were called upon to fill the energy gap. To put the magnitude of the Northfield Mountain Project into perspective, New England's largest operating lithium battery, a 6 MW battery in Nantucket, can only provide 0.5% of the power of the Northfield Mountain Project[3].

In the aggregate across New England, operating battery storage can only currently supply 20 MW of capacity (through 2019), or 1.7% of the storage ability of the Northfield Mountain Project. Another factor is that existing lithium ion battery storage systems offer shorter sustainable discharge durations, whereas the Northfield Mountain Project can provide power to the grid for a much longer period of time on a single charge.

The Northfield Mountain Project's storage capability has other significant advantages. It can store renewable carbon-free energy from solar, wind and hydro generation during periods of low demand for delivery during peak demand to avoid generation from gas and oil-fired units. In addition, ISO-NE's operation of a system with significant intermittent renewables such as solar and wind will require fast response resources such as the Northfield Mountain Project to fill the power gap when these sources are not producing power. It is expected that these intermittent sources will continue to grow in the future including thousands of megawatts of wind turbines along the Massachusetts and Rhode Island coasts and thousands of megawatts of solar energy.

The Project provides an important source of electricity during times of peak demand and fast start and fast ramping capability to manage system ramping needs. In order to replace this important service, ISO-NE would need to modify its management of energy production. Alternative sources of power may need to throttle their production levels, which could reduce their overall efficiency.

[3] See October 2019 Utility Dive article, "There once was a 48MWh Tesla battery on Nantucket, which saved National Grid $120M in its budget," Utility Dive (Oct. 10, 2019),https://www.utilitydive.com/news/Tesla-national-grid-battery-energy-storage-8hour-long-duration-dieselgeneration-system-nantucket/564428/.

Effects on the Applicant's Operating and Load Characteristics

Replacing the Project with an alternative facility would result in a change of the system load characteristics by reducing the available offline fast start reserve, peak demand generation and generation ramping and price responsive demand (pumps). The Project provides ISO-NE with peak demand energy, capacity, operating reserves, ancillary and regulation services. The above services are beneficial to the reliability and efficiency of the ISO-NE electric grid. The Project also provides ISO-NE with the ability to bring units to the electric grid quickly in support of a grid disturbance such as a loss of a major unit or other change of load occurrence. The magnitude of Northfield's contributions can best be illustrated through the significant number of alternative resources that were called to address a system disturbance on September 2, 2010. On that date, in the absence of the Project, which at the time was on an outage, ISO-NE requested increased output at "146 dispatchable generation units, 92 of which were already on-line, while 54 were off-line fast-start units" yet was still unable to restore system balance within NERC criteria.[4]

Effects on Communities Served

If FirstLight were not to receive a new license and the Project was taken over by the Federal Government or decommissioned, there would be a significant loss of tax revenues. In 2019, the Project contributed approximately $10,522,000 in local property tax and $100,000 in state tax. The governmental entities affected by this loss in revenue would ultimately have to seek a reduction in expenses or an increase in other sources of revenue. Also, according to the state's Executive Office of Labor and Workforce Development, FirstLight is one of the largest employers in Franklin County. In 2019, of the $10,522,000 paid in local property tax, majority was paid to the towns of Erving ($9,002,000) and Northfield ($1,513,000). In 2019, FirstLight paid approximately 85% and 19% of the entire tax revenue in Erving and Northfield, respectively.

Additionally, loss of the license may result in a less reliable and efficient energy grid with the absence of the Project. Also, it is likely that many of the Project's recreation facilities would no longer be available to the community.

1.3 Need for Project Power, Reasonable Cost and Availability of Alternative Sources of Power

1.3.1 Average Annual Cost of Power

The average annual cost of the power produced by the Project includes capital cost, operating cost, and O&M cost associated with Project relicensing, including proposed Protection Mitigation and Enhancement (PM&E) measures. As described in Exhibit D, FirstLight has performed an analysis of the costs of producing Project power.

1.3.2 Projected Resources Required to Meet Capacity and Energy Requirements

The Project serves a significant role in the ISO-NE regional transmission grid by providing peak demand energy, capacity, locational forward reserve market and real-time reserves, ancillary and regulation services.

1.3.3 Resource Analysis and System Reserve Margins

The Project, as a pumped storage facility, is well-suited to meet energy demands as its typical operation dictates that it produces power during periods of high demand or periods of high energy ramping needs.

[4] Ibid. Page 13.

1.3.4 Load Management Measures

Load management is conducted by the ISO-NE, wherein the energy needs on a short-term basis are coordinated.

1.4 Use of Power for Applicant-Owned Industrial Facility

FirstLight does not directly use power generated by the Project to operate its own industrial facilities.

1.5 Need for Power if Applicant is an Indian Tribe

FirstLight is not an Indian tribe applying for a project on a tribal reservation; therefore, this section is not applicable.

1.6 Effect of Operations and Planning of the Applicant's Transmission System of Receiving or not Receiving the License

1.6.1 Effects of Power Flow Redistribution

FirstLight does not own or operate a transmission system. However, if FirstLight were not to receive a new license for the Project, ISO-NE would lose a resource that is valuable to its system. For example, on September 2, 2010 ISO-NE was unable to recover a source loss and restore balance over the AC electrical ties with New York within the fifteen minutes required by North American Electric Reliability Corporation reliability standards following a system disturbance. Had the Project been available,[5] this likely would not have occurred.[6]

1.6.2 Advantages of the Applicant's Transmission System

FirstLight does not own or operate a transmission system.

1.6.3 Project Single-Line Diagram

The single-line diagram for the Project is shown in Figure 1.6.3-1; however, the figure is included in Volume 2 of Exhibit H because it contains Critical Energy Infrastructure Information.

1.7 Plans to Modify Existing Project Facilities

FirstLight has no plans to modify the generation facilities associated with the Project; however, FirstLight is proposing to expand the Upper Reservoir storage capacity to operate between elevations 1004.5 and 920 feet (the current license operating range is 1000.5 and 938 feet). FirstLight is also proposing construct a barrier net for fish passage protection and modify recreation facilities.

1.7.1 Proposed Fish Passage Protection Measures

Install Barrier Net. FirstLight proposes to install a barrier net in front of the Northfield Mountain Project intake/tailrace to prevent the entrainment of migratory fish when the Northfield Mountain Project is pumping. The net will be approximately 30-foot-high by 1050-feet-long wide with 3/4-inch mesh from top to bottom. The net will be positioned approximately in line with the river shoreline upstream and downstream of the Northfield Mountain Project tailrace. The net will be anchored at each end of the net at

[5] The Northfield Mountain Project was out of operation from May 1 to November 17, 2010.
[6] This event was reported at the November 17, 2010 NEPOOL Reliability Committee. ISO New England, Inc., September 2, 2010 DCS Event (Nov. 17, 2010), *available at* http://www.iso-ne.com/static-assets/documents/committees/comm_wkgrps/relblty_comm/relblty/mtrls/2010/nov172010/090210_dcs_event.ppt.

the shoreline with additional anchoring along the base of the net to prevent migrants from passing under the net.

FirstLight proposes to have the barrier net in place from August 1 to November 15 each year.

1.7.2 Proposed Recreation Features

FirstLight proposes the following recreation features described below.

Relocation of the Boat Tour Dock at Riverview. The proposed barrier net would be in place from August 1 to November 15 during a portion of the summer recreation season. The current layout of the barrier net encloses the existing Boat Tour Dock. Given this, FirstLight proposes to relocate the dock further upstream of its current location. It would entail extending the existing road further north.

Create a New Access Trail with Stairs for a Put-In at Riverview. A new put-in would be located off of Pine Meadow Road, where Fourmile Brook discharges into the TFI. The site would entail establishing a 6-foot wide stone path to timber and concrete stairs leading to a put-in on the northern bank along the brook. Pine Meadow Road would be widened to add approximately seven (7) parking spots and a sign (Project Name and FERC No.) would be installed near the stone path.

Formal Access Trail and Put-In at Cabot Camp. FirstLight proposes to create a 200-foot long, 10-foot wide formal path leading from the Cabot Camp parking area to an access point on the Millers River just upstream of the confluence with the Connecticut River. There is currently an informal path in this area. A sign (Project Name and FERC No.) and directional portage sign would be installed along the formal path leading the public from the parking lot directly to the 10-foot-wide gravel path leading to the water's edge.

Conceptual level drawings of the proposed recreation features are included in Recreation Management Plans developed for the Northfield Mountain Project.

1.8 Conformance with a Comprehensive Plan for the Waterway

The Project will be operated under the terms and conditions of a license issued by the Commission, which will be based on the Commission's determination of the license terms and conditions which are best suited to comprehensive development of the waterway. The cumulative environmental impacts of the Project in the context of the Connecticut River Basin are addressed in Exhibit E.

1.9 Financial and Personnel Resources

1.9.1 Financial Resources

FirstLight and its parent company, FirstLight Power Inc., which is a Delaware corporation, have the financial resources to operate the Project during the term of the new license.

1.9.2 Personnel Resources

FirstLight employs approximately 53 full-time employees to operate and maintain the Northfield Mountain Project with support personnel at the Turners Falls Project. On-site staff are fully qualified to handle all aspects of the operation and maintenance of the Project. The Project is fully equipped to allow staff to perform virtually all routine maintenance functions. All personnel receive training commensurate with their responsibilities in an ongoing effort to improve their ability to operate the Project in the safest and most efficient manner possible.

In addition to FirstLight employees, FirstLight also contracts with local outside entities to provide maintenance support for the Project.

1.10 Project Expansion Notification

As noted in Exhibit G, FirstLight proposes to add 135.5 acres of land south of the Northfield Switching Station located in the Towns of Northfield and Erving in Massachusetts. These lands are currently owned by Eversource and are necessary to include recreation trails associated with the Northfield Mountain Trail and Tour Center that are not currently enclosed in the Project Boundary. FirstLight notified Eversource via certified mail prior to the filing of this Amended Final License Application.

1.11 Electricity Consumption Efficiency Improvement Program

1.11.1 Customer Energy Efficiency Program

Not applicable. FirstLight does not have load asset customers except wholesale entities.

1.11.2 Compliance of Energy Conservation Programs with Regulatory Requirements

Not applicable.

1.12 Indian Names and Mailing Address

There are no federally recognized Indian Tribes with lands occupied by the Project, or which would otherwise be affected by the relicensing. Nevertheless, FirstLight has included the following tribes in the distribution of this license application:

Federally recognized tribes in Massachusetts include:

Wampanoag Tribe of Gay Head (Aquinnah)
Lee Ander Wander
Chief of Staff
20 Black Brook Road
Aquinnah, MA 02535-1546
cos@wampanoagtribe.net

Mashpee Wampanoag Tribe
483 Great Neck Road
South Mashpee, MA 02649
trish.keliinui@mwtribe-nsn.gov

There are no federally recognized tribes in New Hampshire or Vermont.

There are no state recognized tribes New Hampshire. There is one state recognized tribe in Massachusetts and four in Vermont as shown below. Other tribes that may potentially be interested in the relicensing are listed below:

Massachusetts Recognized Tribes

Nipmuc Nation
25 Main Street
South Grafton, MA 01560
info@nipmucnation.org

Vermont Recognized Tribes

Elnu Abenaki Tribe
Chief Roger Longtoe Sheehan
Tribal Headquarters
5243 VT Route 30
Jamaica, VT 05343
gitceedadann@yahoo.com

Nulhegan Abenaki Tribe
Chief Don Stevens
156 Bacon Drive
Shelburne, VT 05482
chiefdonstevens@comcast.net

Koasek of the Koas of the Abenaki Nation
Chief Shirly Hook
188 Allen Bent Road
W. Braintree
Roxbury, VT 05669
shirly480@gmail.com

Missisquoi Abenaki Tribe
Chief Richard Menard
P.O. Box 133
Swanton, VT 05488
richard.menard@abenakination.com

Other Potentially Interested Tribes

Abenaki Nation New Hampshire
262 Lancaster Road
Whitefield, NH 03598
Kcicasco@aol.com

Ms. Bonney Hartley
Stockbridge-Munsee Community
400 Broadway #718
Troy, NY 12181
bonney.hartley@mohican-nsn.gov

Narragansett Indian Tribe
Chief Sachem: Anthony Dean Stanton
Narragansett Indian Longhouse
4425-A South County Trail
Charlestown, RI 02813
adstanton@nitribe.org

Nolumbeka Project
91 Main Street
P.O. Box 285
Greenfield, MA 01302
nolumbekaproject@gmail.com

Koasek Traditional Band
P.O. Box 147
Post Mills, VT 05058
n.pero@aol.com

2 INFORMATION TO BE SUPPLIED BY APPLICANTS THAT ARE EXISTING LICENSEES

2.1 Measures Planned to Ensure Safe Management, Operation and Maintenance of the Project

2.1.1 Existing and Planned Operation of the Project during Flooding

This information is detailed in Exhibit B of this Amended Final License Application.

2.1.2 Downstream Warning Devices

FirstLight is in compliance with all Emergency Action Plan (EAP) requirements and has systems in place to notify emergency response teams and homeowners downstream in the unlikely event of a dam breach scenario. The Project is monitored from the Northfield Control Room, which is staffed with full-time operators 24 hours/day 365 days/year.

2.1.3 Operational Changes that Might Affect the Emergency Action Plan

No operational changes are proposed that might affect the existing EAP at the Project. The Project's EAP is reviewed and tested annually and updated as required. FirstLight has sought and received temporary amendments from FERC to utilize more of the Upper Reservoir storage capacity by increasing its operating limits from 1000.5 to 938 feet to 1004.5 to 920 ft. As part of this process, FirstLight completed revised Dam Breach Analyses using the as-built condition to store water to elevation 1004.5 ft. The dam breach analysis and inundation mapping were filed and approved by FERC to permit use of the additional storage capacity.

2.1.4 Existing and Planned Monitoring Devices

The Project has Surveillance and Monitoring Plans (SMP) filed with FERC. The purpose of the SMP is to describe the existing SMP Program for the Project, relate the instrumentation and monitoring to the Potential Failure Mode Analysis (and any identified Potential Failure Modes), and relate the instrumentation and monitoring to design assumptions for the Project structures. A separate Dam Safety Surveillance and Monitoring Report (DSSMR) is prepared annually to present data and interpretation for

observations and measurements recorded to date and recommend improvements or changes to the program as appropriate. Since the Project is subject to 5-year inspections under Part 12D of the FERC regulations, updates to the SMP will be prepared and submitted as needed to the FERC. The SMP is reviewed with the FERC engineer during the annual operation inspection of the Project and reviewed by the Independent Consultant during the 5-year inspection.

2.1.5 Employee Safety and Public Safety Record

FirstLight manages the Project consistent with its long-standing commitment to employee safety. This commitment begins with compliance with applicable local, state, and Federal regulations regarding the safe operation of industrial and electrical facilities. As FirstLight operates the Project's generation facilities, this commitment is implemented primarily through a rigorous safety program adopted by FirstLight. Detailed inspection and maintenance programs ensure employee safety relative to operating equipment and facilities. The safety program involves employee training sessions, as well as making safety information available to employees. For the period 2015-2019, there were no lost time incidents at the Project involving FirstLight employees.

FirstLight places a high priority on public safety. It maintains public safety measures (lighting, signage, markers, audible warnings, fencing, etc.) consistent with plans filed with the FERC's New York Regional Office (NYRO). In accordance with 18 CFR 12.10, FirstLight files public safety incident reports with the NYRO.

2.2 Current Operations

Operation of the Project is described in Exhibit B of this Amended Final License Application.

2.3 Project History

A complete Project history can be found in Exhibit C of this Amended Final License Application.

2.4 Generation Losses over Previous Five Years

There have been several unscheduled outages at the Project during the five-year period of time from 2015-2019 (Table 2.4-1). The table includes outages lasting 24 hours or more at the Project.

Table 2.4-1: Unscheduled Outages lasting more than 24 hours at the Northfield Mountain Pumped Storage Project 2015-2019

Outage Start	Duration (hrs)	Unit	Description
12/05/2017	81.18	Unit 1	Lower Guide Bearing Cooling Water Leak Repair
02/02/2018	30.58	Unit 1	Turbine Bearing Replacement
05/29/2018	96.35	Unit 4	Rotor Ground- Loose Material Migration

2.5 Compliance with Terms and Conditions of Existing License

FirstLight has never been found to be in non-compliance with the terms and conditions of the current license. Over the term of the current license, the Project has been subject to FERC's standard operational and environmental inspections. Any compliance-related issues noted either during the inspections or through self-reports of deviation have been promptly addressed by FirstLight.

2.6 Action Affecting the Public

As a major presence in the region, FirstLight plays a prominent role in ensuring the efficient, productive use of water for hydroelectric generation and recreation. The Project also provides electricity that contributes to the stability of the regional power system. This alone significantly affects the general public by providing a low-cost and renewable-energy source to FirstLight's wholesale customers and contributing to regional emissions reduction, and the balance of regional power supply and demand.

In addition to operating the Project for hydroelectric generation, FirstLight also manages the Project to provide additional benefits to the local community, natural resources, recreation, environmental education, and the region at large.

Visitors frequent the Project year-round to enjoy the many recreational opportunities available, including boating, fishing, hiking, hunting, and camping. The Project also supports other day-use and overnight-use activities such as wildlife viewing and picnicking. In addition to the benefits that FirstLight provides to the area's natural resources and the recreating public, the Project contributes to the public benefit through the employment of fulltime and seasonal staff.

2.7 Ownership and Operating Expense Reductions if the Project License was Transferred

If the Project license were transferred to another entity, FirstLight's cost of operating and maintaining the Project (see Exhibit D) would be eliminated.

2.8 Annual Fees for Federal or Indian Lands

FirstLight does not pay annual charges for Federal or Indian tribal reservation lands.

Figure 1.6.3-1: Northfield Mountain Pumped Storage Project Single Line Electrical Diagram

This figure constitutes Critical Energy Infrastructure Information (CEII) in accordance with 18 C.F.R. §388.113(c) and has been removed from the public version of this PAD.

The material is contained in Exhibit H Single Line Diagram (CEII), the non-public version filed with the Commission.

Procedures for obtaining access to CEII may be found at 18 CFR § 388.11