GREGORY B. JARVIS PROJECT RELICENSING FERC No. 3211

Gregory B. Jarvis Relicensing Updated Study Report Meeting

May 2020

NEW YORK STATE OF OPPORTUNITY. | NY Power Authority

Agenda

10:00	Introduction
10:15	Assessment of Fish Entrainment and Turbine Passage Survival
11:00	Reservoir Fluctuation Field Survey – Supplemental Analysis
11:30	Tailwater Water Quality/DO Mitigation
12:00	Closing

Purpose for Meeting

- Updated Study Report Meeting

- Per 18 C.F.R. § 5.15(f):
  - Describe overall progress in implementing the study plan and schedule and the data collected, including an explanation of any variance from the study plan and schedule.

Relicensing Process

Date	Milestone
June 30, 2017	Power Authority filed NOI and PAD
August 29, 2017	FERC issued Scoping Document 1
September 26-27, 2017	FERC held scoping meetings
December 12, 2017	FERC issued Scoping Document 2
October 28, 2017	Public filed comments on PAD and Scoping Document
December 12, 2017	Power Authority filed Proposed Study Plan
January 11, 2018	Power Authority held Study Plan Meeting
March 12, 2018	Public filed comments on Proposed Study Plan
April 11, 2018	Power Authority filed Revised Study Plan
April 26, 2018	Public filed comments on Revised Study Plan
May 11, 2018	FERC issued Study Plan Determination
May 8, 2019	Power Authority filed Initial Study Report
May 22, 2019	Power Authority holds Initial Study Report Meeting

May 2019 to Present

Date	Milestone
June 10, 2019	Power Authority filed Initial Study Report Meeting summary
August 9, 2019	Power Authority filed Initial Study Report Response to Stakeholder Comments
September 6, 2019	FERC issued Determination on Requests for Study Modifications
October 30, 2019	Power Authority filed Fish Entrainment and Turbine Passage Survival Study Report
January 15, 2020	Power Authority filed Dissolved Oxygen Enhancement Study Plan
March 3, 2020	Draft License Application Filed
May 4, 2020	Updated Study Report Filed

Next Steps

Date	Milestone
USR Related Milestones	
May 19, 2020	Updated Study Report Meeting
June 3, 2020	Power Authority will file meeting summary
July 6, 2020	Stakeholders may file comments
August 2, 2020	Power Authority will respond to comments, if warranted
September 1, 2020	FERC will amend approved study plan(s) as appropriate
License Application Related Milestones	
June 1, 2020	Stakeholder comments on the Draft License Application
July 31, 2020	Power Authority will file Final License Application

Assessment of Fish Entrainment and Turbine Passage Survival

Study Schedule

- Status Report Provided at ISR Meeting
- Field measurements of depth and velocity (Task 1) completed in June 2019
- Study Report Submitted to FERC on October 30, 2019

Study Goals & Objectives

- **Assess the potential Project effects of turbine entrainment on fish residing in Hinckley Reservoir.**
- **The objectives were to:**
  - Describe the physical characteristics of the Project, including the intake location and dimensions, trashrack spacing, and depths and velocities near the intake structure;
  - Conduct a literature review for species of interest relative to physiology, behavior, life history, and habitat preferences in the context of downstream passage and turbine entrainment and survival; and
  - Assess the potential for entrainment and estimate turbine passage survival rates for target species, including, but not limited to, Brook Trout, Brown Trout, Rainbow Trout, Smallmouth Bass, and Yellow Perch.
- **Evaluate whether additional downstream passage or protective measures are necessary, and, if so, to determine which measures are appropriate and feasible**

Study Approach/Methodology

- **Project layout and operations data review.**
  - Intake and Turbine Configuration.
  - Depth and Velocity Near Intake.
  - Habitat and Water Quality Conditions.
  - Reservoir Water Levels and Turbine Outflows.
    - Water Surface Elevation Data - Daily for period 1987 – 2018.
    - Turbine Discharge – Hourly from 2006 – 2018.

Study Approach/Methodology

- **Fish Species**
  - Fish Community, Management Goals and Stocking Regime.
  - Target Fish Species Characteristics.
    - Life History
    - Habitat Preferences
    - Swimming Performance
  - Brook Trout, Brown Trout, Rainbow Trout, Smallmouth Bass, Yellow Perch
  - Added Golden Shiner and Pumpkinseed based on historical records of abundance.

Study Approach/Methodology

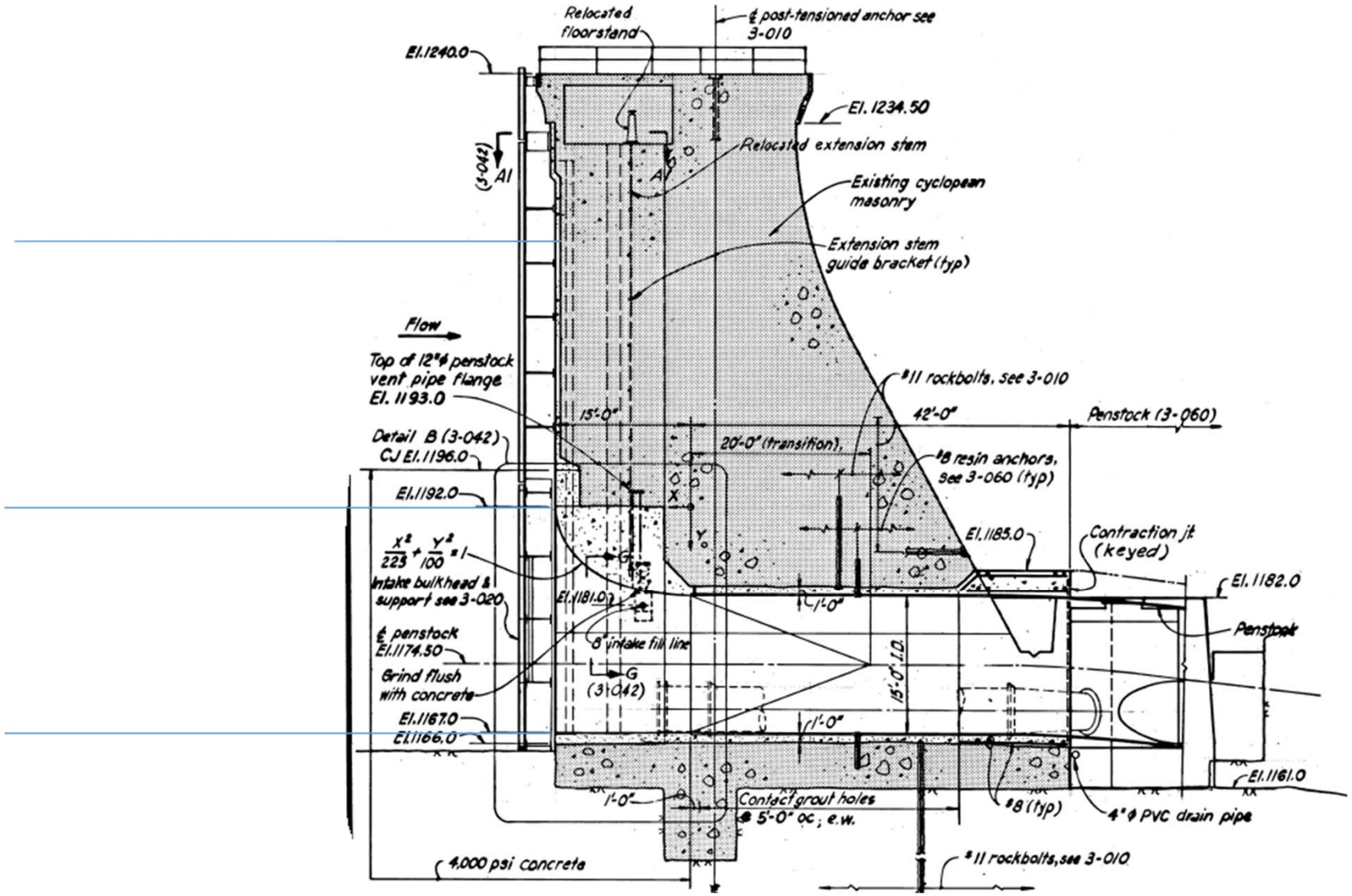
- **Velocity Data Collection**
  - Site-specific field measurements were collected with a boat-mounted Acoustic Doppler Current Profiler (ADCP).
  - Various Turbine Discharge Rates.
  - Calculated Intake Velocities Also Considered in Entrainment Analysis.

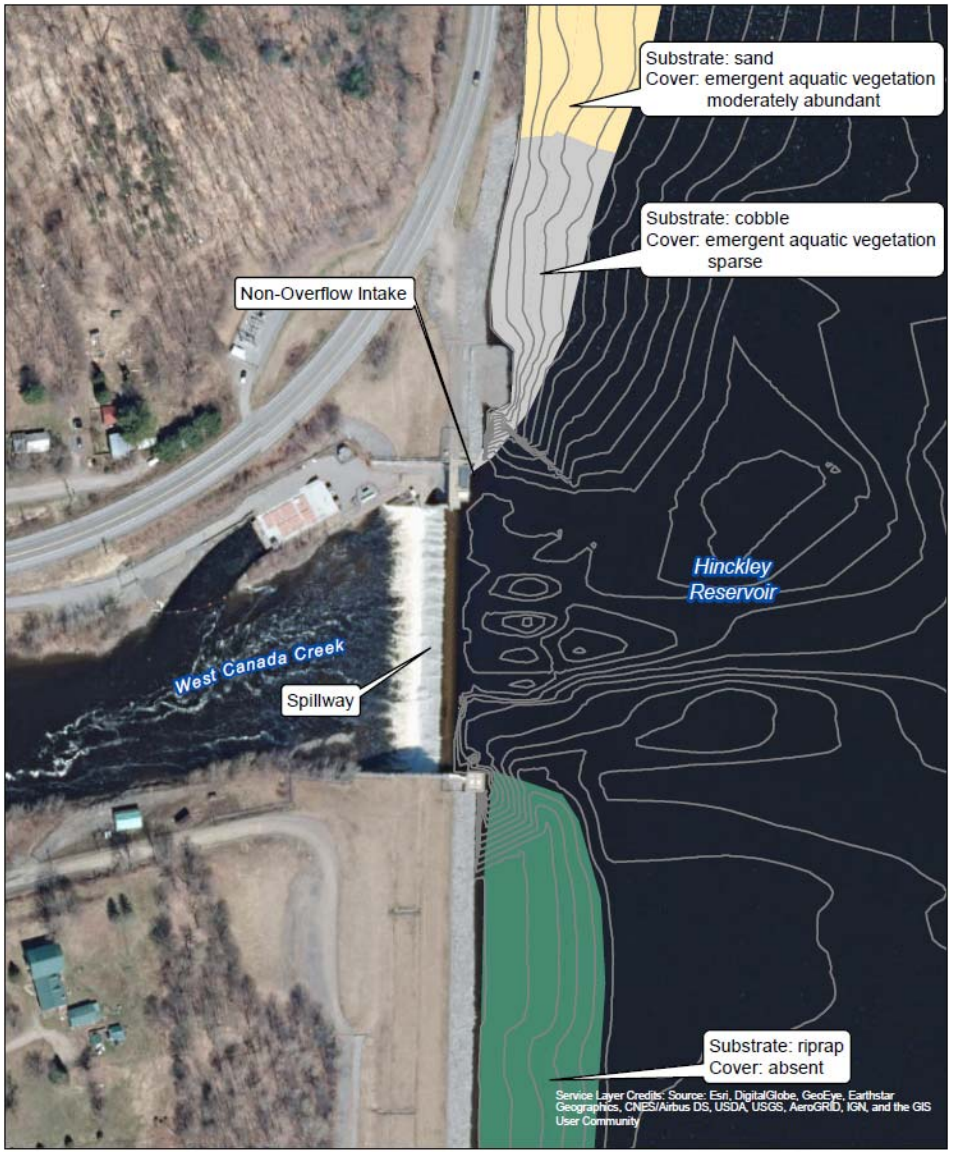
Study Approach/Methodology

- **Estimate Entrainment and Turbine Passage Survival**
  - Qualitative, traits-based evaluation of entrainment.
  - EPRI database.
  - Blade strike probability.

Results- Project Layout & Operations

- **Reservoir**
  - Surface Area = 2,709 acres
  - Bathymetry Survey
  - Habitat – Reservoir Fluctuation Study
  - Water Quality – DO and Temperature Stratification
- **Intake and Trashracks**
  - Common Intake to Both Turbines: 1,192 to 1,167 Elevation
  - Trashracks are 5-3/8” spaced.
  - Calculated intake velocity = 2.57 fps.
- **Turbines**
  - 2 identical Horizontal Kaplan. 257 RPM
  - 1,800 cfs plant capacity


Relocated floorstand
℄ post-tensioned anchor see 3-010
El.1240.0
El. 1234.50
Relocated extension stem
Existing cyclopean masonry
Extension stem guide bracket (typ)
(3-042) A1
Flow
Top of 12"ϕ penstock vent pipe flange El. 1193.0
#11 rockbolts, see 3-010
15'-0"
42'-0"
Penstock (3-060)
Detail B (3-042) CJ El.1196.0
20'-0" (transition)
#8 resin anchors, see 3-060 (typ)
El.1192.0
El.1185.0
Contraction jt (keyed)
$\frac{X^2}{223}+\frac{Y^2}{100}=1$
Intake bulkhead & support see 3-020
El.1181.0
El.1182.0
Penstock
℄ penstock El.1174.50
8" intake fill line
Grind flush with concrete
G (3-042)
15'-0" I.D.
El.1167.0
El.1166.0
1'-0"
1'-0"
Contact grout holes @ 5'-0" oc ; e.w.
#8 (typ)
4"ϕ PVC drain pipe
El.1161.0
4,000 psi concrete
#11 rockbolts, see 3-010


Substrate: sand
Cover: emergent aquatic vegetation moderately abundant
Substrate: cobble
Cover: emergent aquatic vegetation sparse
Non-Overflow Intake
Hinckley Reservoir
West Canada Creek
Spillway
Substrate: riprap
Cover: absent
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Results- Project Layout & Operations

- **Water Levels and Discharges**
  - Operating Diagram
  - Monthly Water Elevation Duration

  - At Max Turbine Discharge, Velocities at Trashracks Calculated = 2.57 ft./s
  - Velocity Duration Analysis

Results – Field Velocity

- **Flow Releases Ranging from 160 cfs to 1,800 cfs.**
  - Depth Averaged Velocities Generally <1.0 ft./s.
  - Max Cellular Velocity = 2.47 ft./s.
- **For the entrainment analysis, the more conservative calculated velocities (maximum of 2.57 ft./s) were used.**

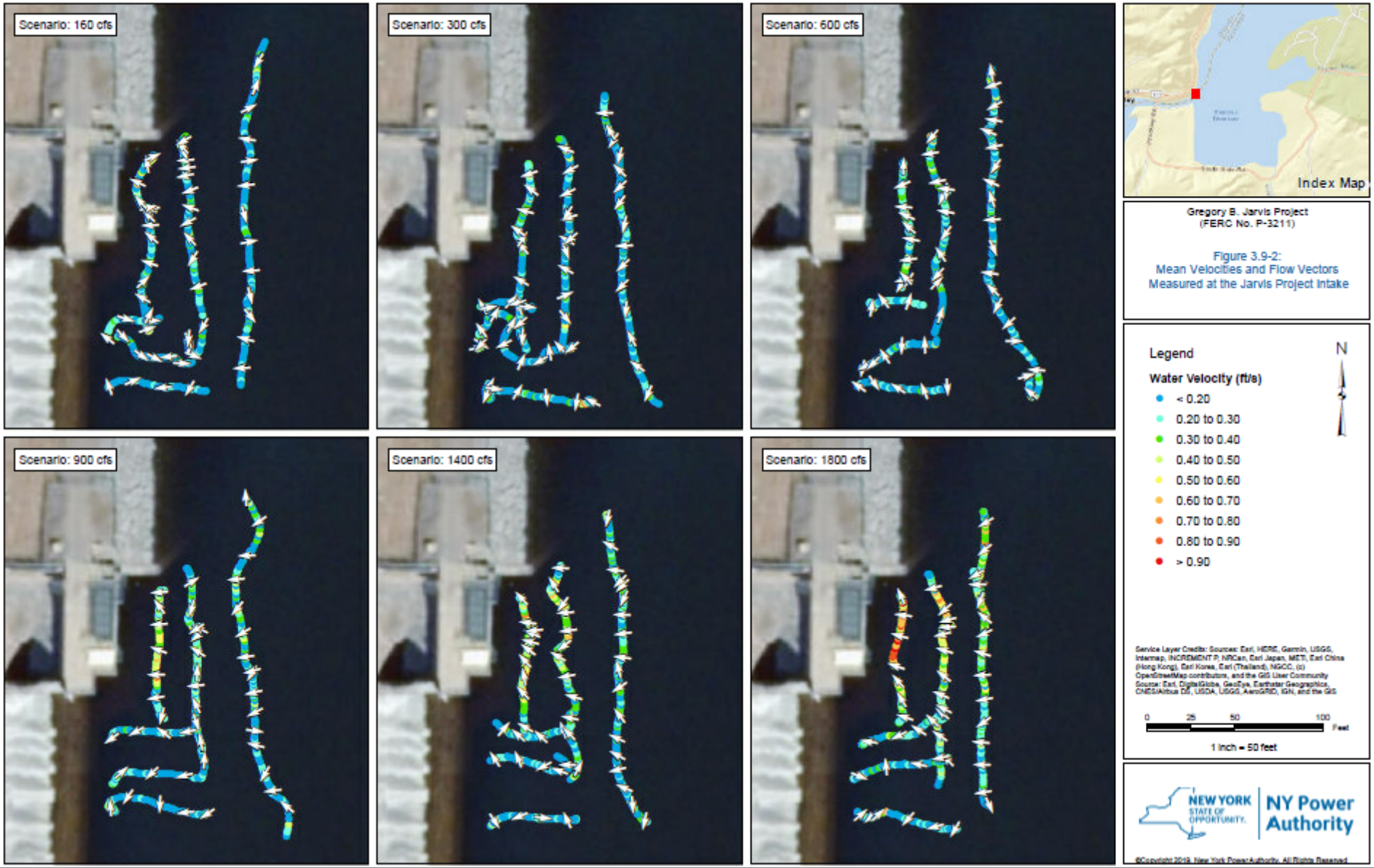

Scenario: 160 cfs
Scenario: 300 cfs
Scenario: 600 cfs
Scenario: 900 cfs
Scenario: 1400 cfs
Scenario: 1800 cfs
Index Map
Gregory B. Jarvis Project
(FERC No. P-3211)
Figure 3.9-2:
Mean Velocities and Flow Vectors
Measured at the Jarvis Project Intake
Legend
Water Velocity (ft/s)
< 0.20
0.20 to 0.30
0.30 to 0.40
0.40 to 0.50
0.50 to 0.60
0.60 to 0.70
0.70 to 0.80
0.80 to 0.90
> 0.90
N
0 25 50 100
Feet
1 inch = 50 feet
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Figure 3.9-3f. ADCP Measurement Profiles at the Jarvis Project Intake During 1,800 cfs Generation

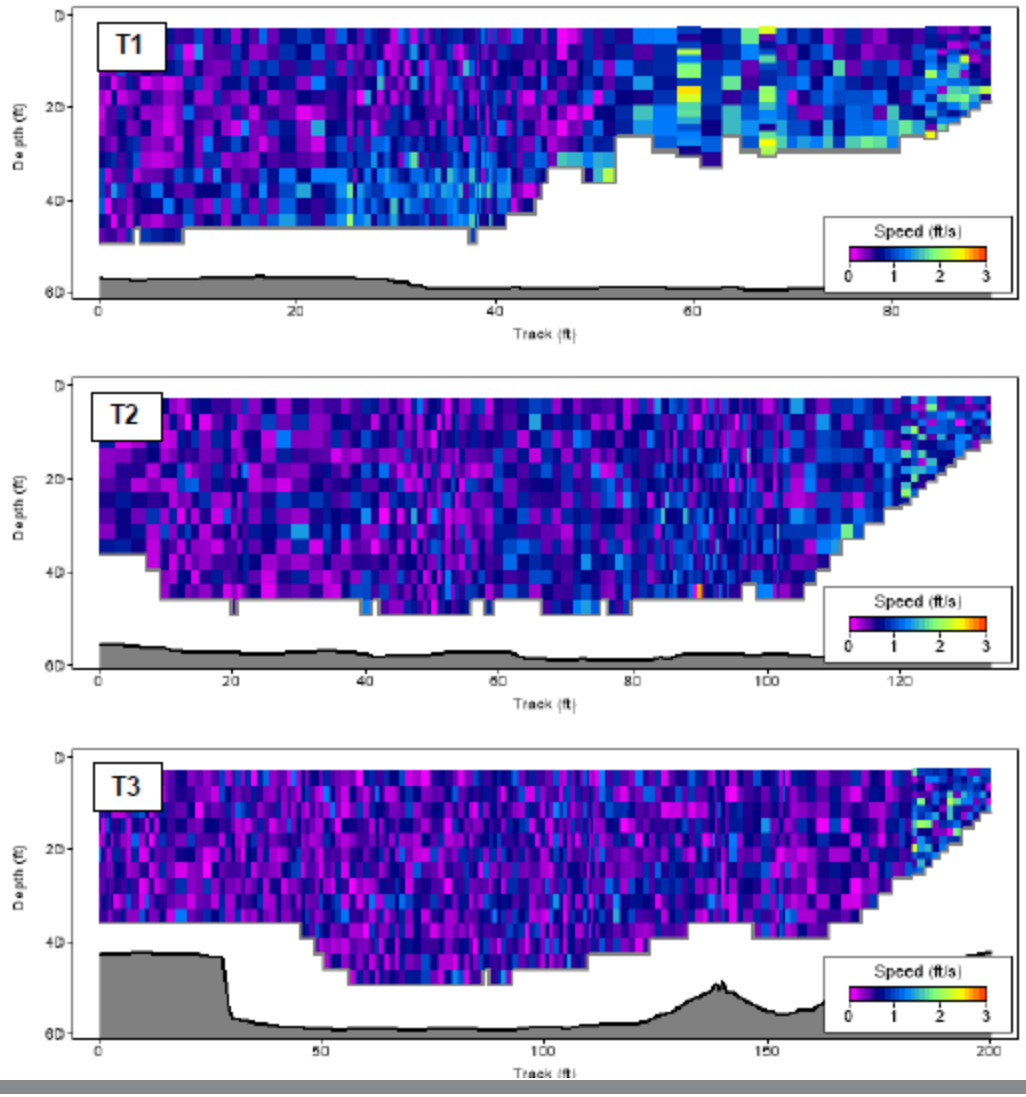


Table 3.8-1. Hourly Intake Velocity and Turbine Operation Statistics by Month (2006-2018)

Month	Median Intake Velocity (fps)	Percent of Time Units are Off-Line	Percent of Time Intake Velocity Exceeds 2 fps
January	1.34	<1%	7%
February	1.30	8%	10%
March	1.40	19%	19%
April	1.57	1%	31%
May	1.28	<1%	9%
June	0.85	1%	3%
July	0.82	12%	5%
August	0.72	16%	1%
September	0.84	21%	1%
October	1.00	13%	3%
November	1.31	1%	5%
December	1.34	2%	4%
Annual	1.20	8%	8%

Results – Entrainment Potential

- **Mixed warm, cool and cold water fisheries**
  - Trout Stocking.
  - Bass, perch and sunfish.
- **Habitat**
  - Habitat Preferences for Adult/Spawning and Juvenile Life Stages
  - Lake Zone and Substrate/Cover Preferences
  - Qualitative Assessment of Entrainment Potential

Results – Entrainment Potential

- **Swim Speeds**
  - Adult fish are unlikely to be entrained because their burst swimming speeds exceed intake approach velocities so they can swim away.
  - Juvenile fish whose burst swimming speeds may be slower than intake velocities are more susceptible to entrainment, but habitat limited for juvenile fish near intake.
- **EPRI Data from other Similar Projects**
  - Qualitative Break Points based on Entrainment Rate
  - Most entrained fish are <8”

Results – Entrainment Potential

- **Other Factors**
  - Large Deep Reservoir
  - Limited Habitat Near Intake
  - Seasonal Water Quality Stratification
  - Seasonal Drawdown – lowest in late winter
  - No Obligatory Migrants
  - Stocked Adult Trout

Results – Turbine Passage Survival

- **EPRI Database**
  - Field Tests on Low Speed Kaplan Turbines.
  - 89-98% survival for entrained fish <8”
  - 77-100% survival for entrained fish >8”
- **Blade Strike Model**
  - 85-93% survival for entrained fish <8”
  - 71-78% survival for entrained fish >8”

Summary

- **Fish entrainment at the Project is expected to be low.**
  - Large Reservoir with Deep Intakes.
  - Lack of object cover or littoral zone habitat near intake.
  - Low Velocity Field in Vicinity of Intake compared to fish swim speeds.
  - Frequency of maximum generation is low.
  - Water quality factor.
- **Any fish passing through Project turbines are expected to have relatively high survival.**

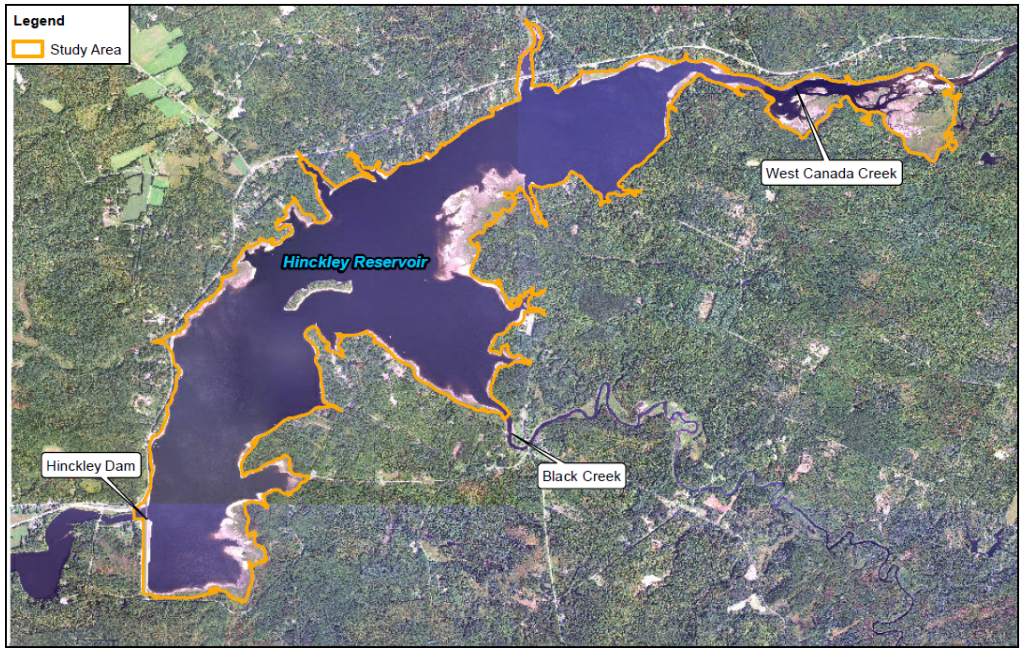
Reservoir Fluctuation Field Study – Supplemental Analysis

Study Goals & Objectives

- **The goal was to supplement the initial *Reservoir Fluctuation Field Study* Report by using existing data to identify the elevation and distribution of aquatic resources affected by water level fluctuations, as recommended by FERC.**
- **The objective was to provide FERC the following requested data:**
  - The total survey area for each of the observed resources and the amount of each substrate class, cover resource, and cover density observed during the study;
  - Revised substrate classification and cover resource figures;
  - An analysis of observed aquatic resources against historical water level data to quantify potential impacts water levels may have; and
  - An analysis of wetland resources against historical water level data to determine the percentage of time wetlands are inundated or exposed at varying elevations.

Geographic Scope

- Hinckley Reservoir from the dam to the upstream extent of the Project boundary.
- Areas immediately adjacent to the shoreline.
- The littoral zone and the exposed shoreline at the time of the survey (i.e., El. 1225 to 1202).



Methodology - General

- Supplemental spatial and statistical desktop analysis using collected field data from the July 16-19, 2018 field survey.
- No additional field work performed for this analysis.
- The analysis utilized the results of the 2018 field survey, bathymetric data, aerial imagery, and historical water level data (January 2001 to December 2019).

Methodology – Cover Resources

- Included cover resources observed between El. 1225 to 1202.
- Classifications consistent with Initial Study: EAV, SAV, FAV, boulder, woody debris and detritus, and bare substrate.
- Abundance within each polygon attributed as absent (0%), very sparse (10%), low (25%), moderate (50%), and high (75%).
- Additional quantitative statistical analysis to calculate and summarize the total area of each resource type.
- Revised figures to symbolize cover resources present at the time of the survey.

Methodology – Substrate Analysis

- Substrate composition between El. 1225 to 1202 was characterized in the Initial Study.
- Classifications include silt/clay, sand, gravel, cobble, boulder, bedrock, and riprap.
- Abundance within each polygon attributed as absent (0%), very sparse (10%), low (25%), moderate (50%), high (75%), and full coverage (100%)
- Revised figures presenting polygons rather than lines.
- Additional quantitative statistical analysis to calculate and summarize the total area of each substrate type.

Methodology – Aquatic Resources

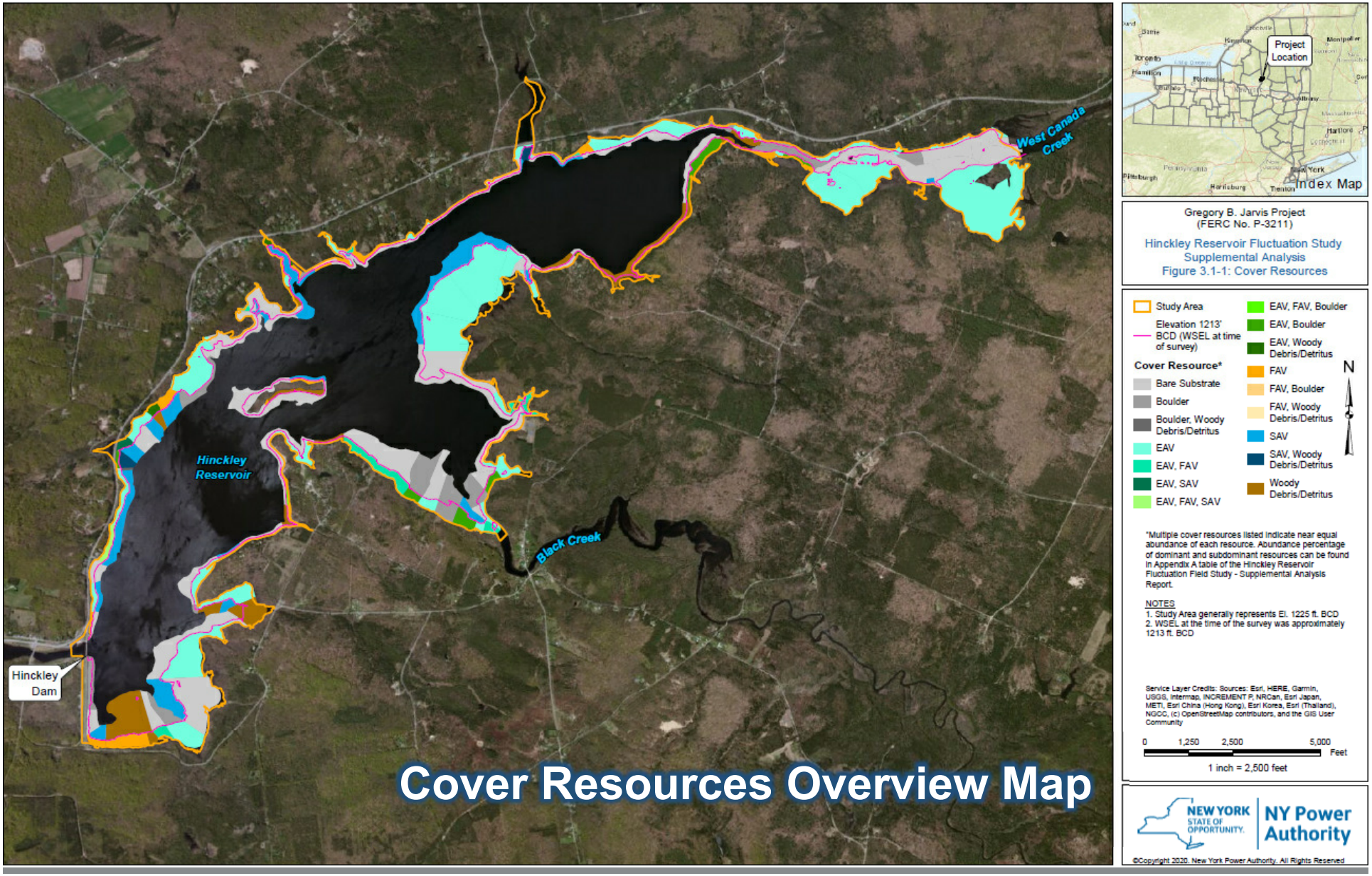
- A total of twenty fish nests and eleven isolated pools previously observed and reported.
- Summary of fish nests, including location and elevation, type of fish, status, and a comparison to historical water surface elevation data was provided in the initial Report.
- Revised figure to clearly identify each of the eleven isolated pools.
- Historical water level information was analyzed to present the percentage of time (on a monthly and annual basis) when isolated pools are likely to be inundated or exposed.

Methodology – Wetland Analysis

- The 2018 survey identified a total of 485 acres of wetlands within the study area.
- Determined wetland elevations and the percentage of time that wetland complexes are inundated or exposed.
- The acreage and total percentage of wetland exposure (i.e., total percentage of the wetland type that is above water) was calculated for each one-foot interval of reservoir elevation on an annual basis.

Results – Cover Resources

- **The coverage area of each cover resource type was calculated for the areas above and below the water level at the time of the survey, as well as a cumulative total of the study area.**
  - The study area was comprised of mostly bare substrate (798 acres or 72% of the total study area).
  - Coverage of SAV was generally low and was located primarily in areas below the water surface at the time of the survey (23 acres or 5% of the below water area compared to 2 acres or <1% above water)
  - EAV was located exclusively above the water level at the time of the survey, covering 29% of the El. 1213 to 1225 range, and was most abundant in the area of the West Canada Creek reach.
- **A table summarizing cover resources of each distinct polygon was created.**
- **Figures presenting cover resource composition were revised.**


West Canada Creek
Hinckley Reservoir
Black Creek
Hinckley Dam
Cover Resources Overview Map
Project Location
Index Map
Gregory B. Jarvis Project
(FERC No. P-3211)
Hinckley Reservoir Fluctuation Study
Supplemental Analysis
Figure 3.1-1: Cover Resources
Study Area
Elevation 1213' BCD (WSEL at time of survey)
Cover Resource*
Bare Substrate
Boulder
Boulder, Woody Debris/Detritus
EAV
EAV, FAV
EAV, SAV
EAV, FAV, SAV
EAV, FAV, Boulder
EAV, Boulder
EAV, Woody Debris/Detritus
FAV
FAV, Boulder
FAV, Woody Debris/Detritus
SAV
SAV, Woody Debris/Detritus
Woody Debris/Detritus
N
*Multiple cover resources listed indicate near equal abundance of each resource. Abundance percentage of dominant and subdominant resources can be found in Appendix A table of the Hinckley Reservoir Fluctuation Field Study - Supplemental Analysis Report.
NOTES
1. Study Area generally represents El. 1225 ft. BCD
2. WSEL at the time of the survey was approximately 1213 ft. BCD
Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCO, (c) OpenStreetMap contributors, and the GIS User Community
0 1,250 2,500 5,000 Feet
1 inch = 2,500 feet
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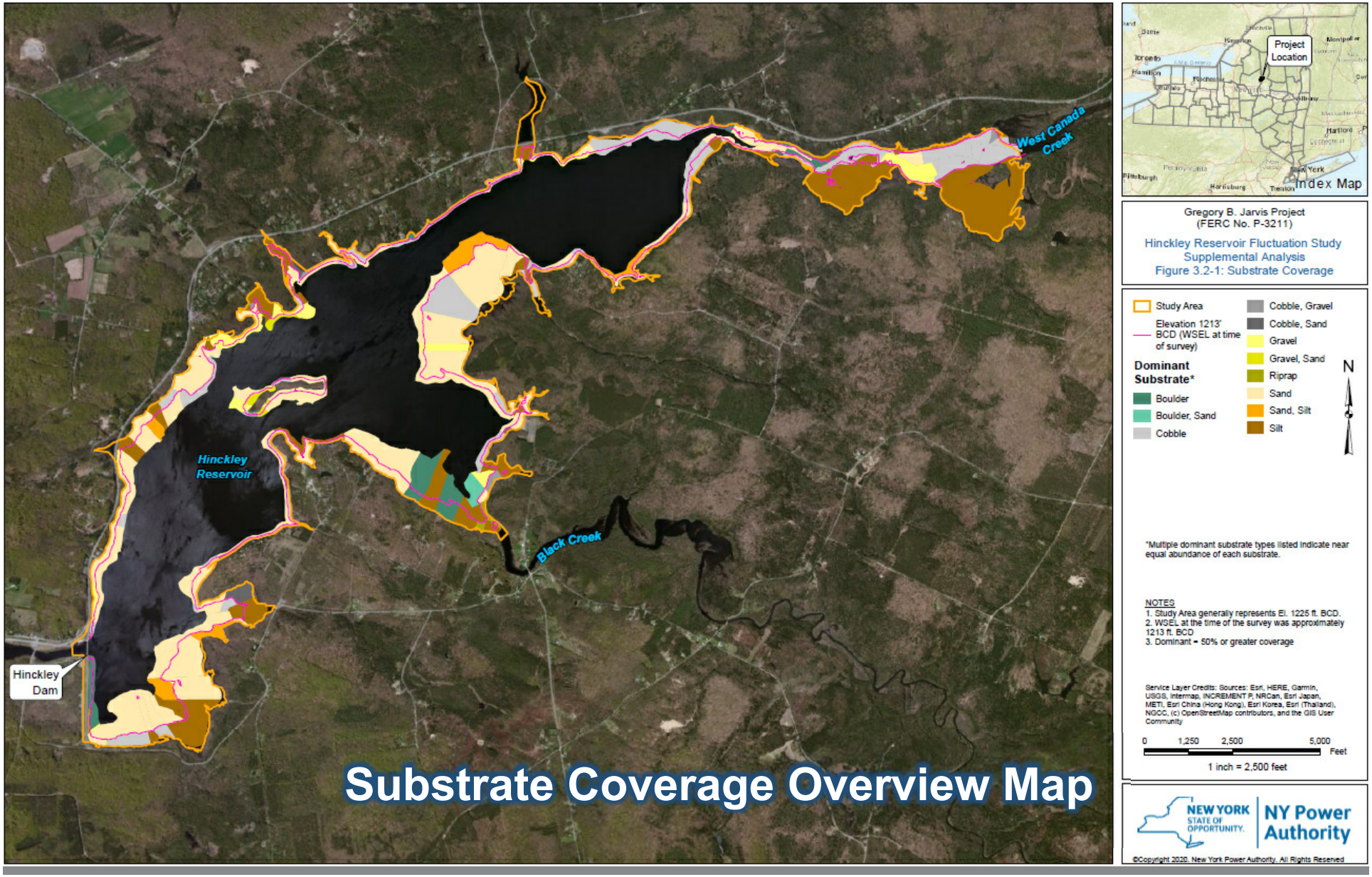
Results – Substrate Analysis

- **The coverage area of each substrate composition was calculated for the areas above and below the water level at the time of the survey, as well as a cumulative total of the study area.**
  - Sand was the dominant substrate in the study area, both above and below the water surface (455 acres or 42% of the total study area).
  - Coverage of boulders, cobble, gravel, and sand was slightly greater below the water than above the water surface, silt was more prominent above the water level.
  - Riprap was found to occur in the area south of the Hinckley Dam and at the Black Creek confluence within the reservoir. In total, riprap comprised less than five acres or <1% of the survey area.
  - The main channel of the West Canada Creek reach is dominated by a cobble substrate while the slightly higher elevation section is characterized by silt.
- **Figures presenting substrate composition were revised.**


Project Location
Index Map
Gregory B. Jarvis Project
(FERC No. P-3211)
Hinckley Reservoir Fluctuation Study
Supplemental Analysis
Figure 3.2-1: Substrate Coverage
Study Area
Elevation 1213' BCD (WSEL at time of survey)
Dominant Substrate*
Boulder
Boulder, Sand
Cobble
Cobble, Gravel
Cobble, Sand
Gravel
Gravel, Sand
Riprap
Sand
Sand, Silt
Silt
N
*Multiple dominant substrate types listed indicate near equal abundance of each substrate.
NOTES
1. Study Area generally represents El. 1225 ft. BCD.
2. WSEL at the time of the survey was approximately 1213 ft. BCD
3. Dominant = 50% or greater coverage
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 1,250 2,500 5,000 Feet
1 inch = 2,500 feet
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West Canada Creek
Hinckley Reservoir
Black Creek
Hinckley Dam
Substrate Coverage Overview Map

Results – Aquatic Resources

- **All observed pools are located in the area of the West Canada Creek reach.**
- **The percentage of time each observed pool's maximum bed elevation is equaled or exceeded was calculated based on historical water surface elevation data.**
  - Monthly and annual percentages were calculated for each pool.
  - Pools generally have a higher likelihood of being inundated by the main reservoir in the months of April, May and June due to the reservoir's operating diagram.
- **Figure revised to label all locations of observed pools.**


West Canada Creek
Pool F
Pool E
Pool C
Pool A
Pool H
Pool G
Pool D
Pool B
Pool I
Pool J
Pool K
Index Map
Approximate Location of Observed Pools
Project Location
Index Map
Gregory B. Jarvis Project
(FERC No. P-3211)
Hinckley Reservoir Fluctuation Field Study
Supplemental Analysis
Figure 3.3-1:
Approximate Location of Observed Pools
Legend
Study Area
Pool Location
N
NOTES
1. The Reservoir Water Surface Elevation displayed in the basemap imagery is 1216 ft BCD. Basemap imagery shown was flown on 9/10/2017.
2. Study Area generally represents El. 1225 ft. BCD.
3. WSEL at the time of the survey was approximately 1213 ft. BCD
Service Layer Credits: Esri, Garmin, GEBCO, NOAA NGDC, and other contributors
0 200 400 800
Feet
1 inch = 400 feet
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Summary of Monthly and Annual Inundation Percentages of Observed Isolated Pools

Location ID	Pool Depth (ft.)	Maximum Pool Bed El. (ft.)[1]	Percentage of Time the Maximum Pool El. is Equaled or Exceeded by the Water Surface Elevation of Hinckley Reservoir (2001-2019)												
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Pool A	2.5	1220.9	32%	11%	10%	61%	81%	70%	42%	28%	9%	25%	46%	45%	39%
Pool B	8.0	1223.2	18%	4%	7%	53%	54%	44%	22%	15%	3%	17%	27%	24%	24%
Pool C	2.0	1219.6	40%	15%	14%	68%	85%	80%	54%	33%	12%	27%	51%	53%	45%
Pool D	3.0	1218.0	48%	20%	17%	74%	88%	87%	70%	40%	17%	29%	58%	58%	51%
Pool E	2.5	1217.1	51%	23%	19%	76%	91%	90%	76%	45%	22%	32%	62%	61%	54%
Pool F	2.5	1218.0	48%	20%	17%	74%	88%	87%	70%	40%	17%	29%	58%	58%	51%
Pool G	1.5	1218.0	48%	20%	17%	74%	88%	87%	70%	40%	17%	29%	58%	58%	51%
Pool H	2.5	1218.3	47%	19%	16%	73%	87%	86%	67%	39%	15%	28%	57%	57%	49%
Pool I	1.5	1225.2	5%	1%	3%	34%	18%	12%	5%	1%	1%	9%	9%	6%	9%
Pool J	5.5	1217.5	50%	22%	18%	75%	89%	89%	74%	43%	20%	31%	60%	59%	53%
Pool K	3.0	1215.3	57%	26%	25%	81%	93%	93%	85%	57%	32%	39%	67%	68%	61%

Note: The percentages indicate the frequency that each pool is connected to the main body of the reservoir.

[1] Maximum pool bed elevations were derived from the Hinckley Reservoir bathymetric dataset. Depending on the location of the pool relative to the bathymetric survey transect, elevations shown may be reflective of measured survey data or interpolated data derived from GIS. Interpolated data should be considered approximate (e.g., Pool I).

Results – Wetland Analysis

- **Supplemental analysis further investigated the extent of wetland inundation at various water surface elevations.**
- **Each wetland type and the acreage and percentage of total area that is exposed (above water) at one-foot reservoir water surface elevation ranges was calculated using historical water level data.**
  - When the reservoir is at or above the spillway crest elevation of 1225, which annually occurs 10% of the time, 26% of emergent wetlands and 90% of forested/shrub wetlands are exposed.
  - Further demonstrates the dynamic extent of emergent wetlands and reservoir water surface elevations.
  - Forested/shrub wetlands are not strongly affected by reservoir operations.

Summary of Wetland Inundation of Exposure

Wetland Type	Reservoir Water Surface Elevation Range (ft.)	Acreage	Total Percentage of Wetland Exposed (above water)	Annual % of Time Reservoir Water Surface Elevation is Equaled or Exceeded - 2001-2019 (Low Elev. Range)
Freshwater Emergent Wetland	Above 1225	57	26%	10%
	1224-1225	10	31%	18%
	1223-1224	11	36%	25%
	1222-1223	12	41%	32%
	1221-1222	14	48%	38%
	1220-1221	17	55%	43%
	1219-1220	20	65%	47%
	1218-1219	25	76%	51%
	1217-1218	13	82%	54%
	1216-1217	10	86%	58%
	1215-1216	8	90%	62%
	1214-1215	7	93%	65%
	1213-1214	6	96%	68%
	1212-1213	3	97%	71%
	1211-1212	1	98%	74%
	1210-1211	1	98%	77%
	<1210	4	>99%	78%
Forested/Shrub	Above 1225	238	90%	10%
	1224-1225	7	93%	18%
	1223-1224	6	95%	25%
	1222-1223	4	97%	32%
	1221-1222	3	98%	38%
	1220-1221	2	99%	43%
	<1220	4	>99%	44%

Summary

- **Spatial and statistical supplemental desktop analysis utilized the results of the 2018 field data, bathymetric data, aerial imagery, and historical water level data.**
  - The study area is comprised mostly of bare substrate with a low amount of SAV present.
  - Sand is the dominant substrate. Boulders, cobble, gravel, and sand are slightly greater in areas below the water surface than above.
  - Further investigated the location and elevation of observed pools and provided percentages of inundation.
  - Forested/shrub wetlands are not strongly affected by reservoir operations and emergent wetlands are dynamic in relation to reservoir water surface elevations.

Dissolved Oxygen Enhancement Study

Overview

2018 Tailwater Water Quality Study:

- Determine if the Project has an effect on downstream water quality parameters such as dissolved oxygen (DO), temperature, or pH; and
- Determine compliance with New York State Surface Water Quality Standards.

2019 Water Quality Monitoring:

- Voluntary monitoring study to inform water quality dynamics in the tailwater and potential DO enhancement measures to be evaluated in the DO Enhancement Study.

DO Enhancement Study:

- In progress.
- Winter 2021 filing.

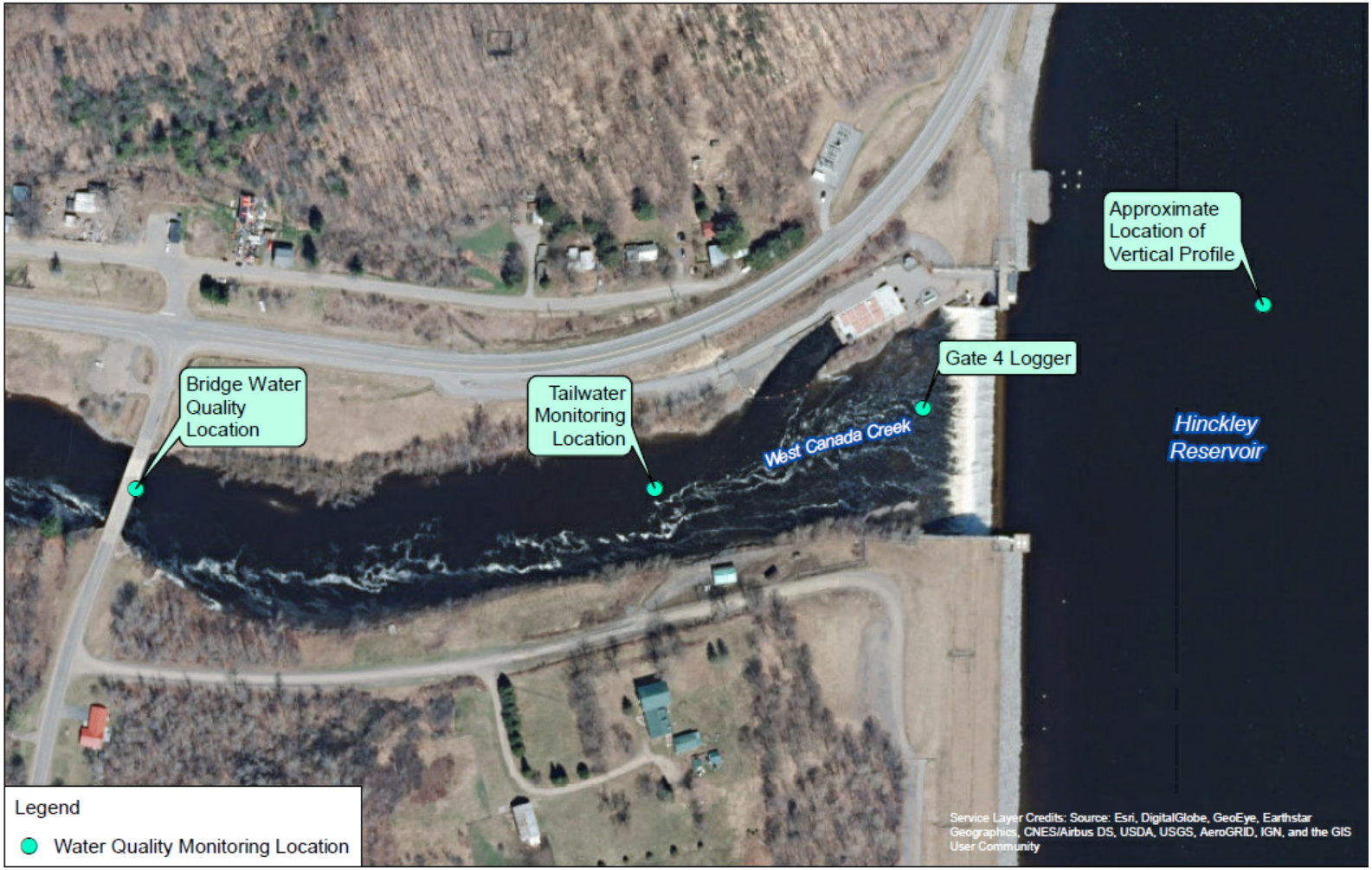
Summary of 2018 Monitoring

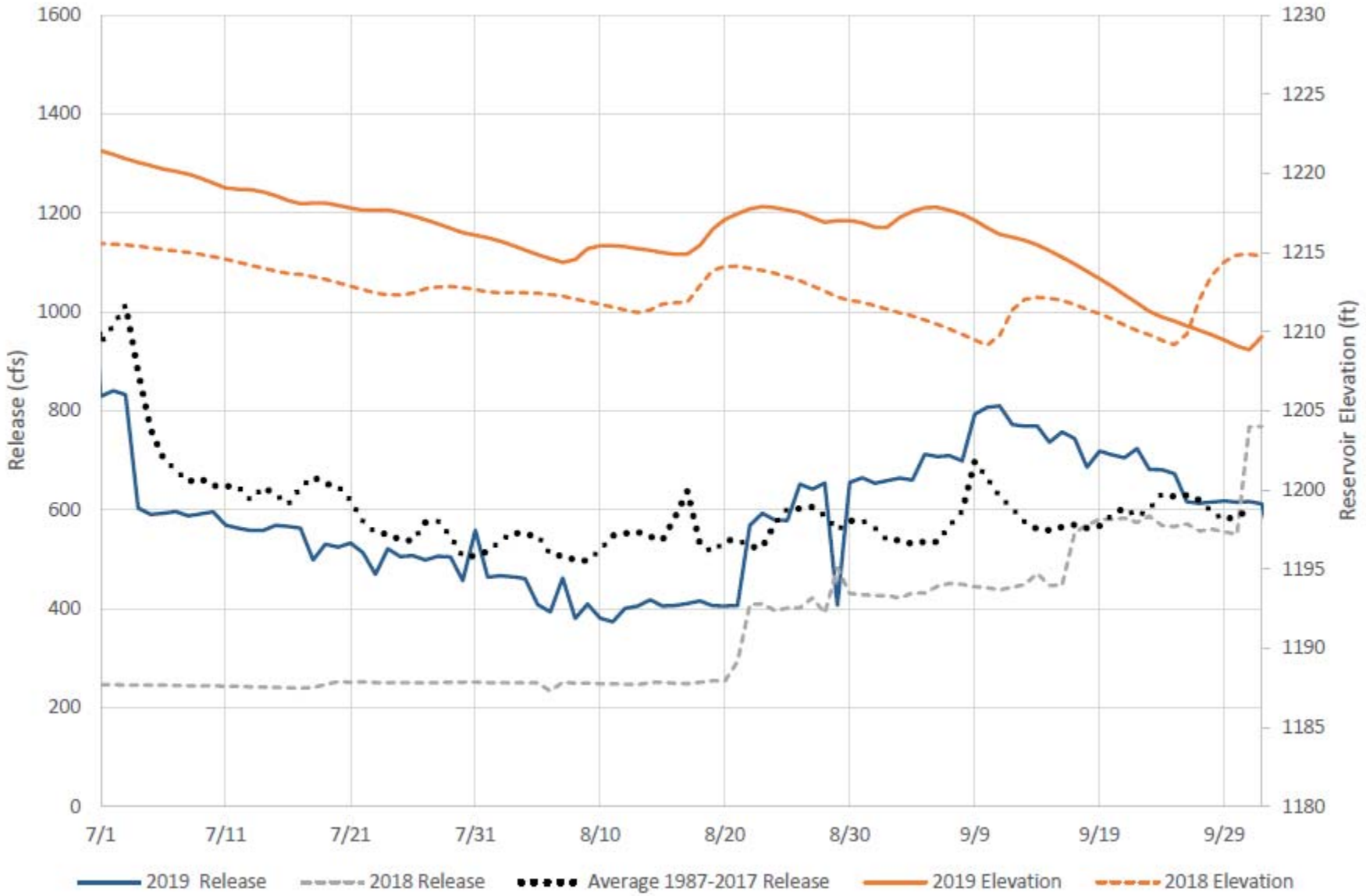
- DO concentrations periodically fell below the NYS Surface Water Quality Standards during the 2018 study period, only when turbines were operating.
- Low DO concentrations in the tailwater are likely attributed to hypoxic conditions in the deeper portions of the Hinckley Reservoir, and lack of reaeration through the turbines.

Summary of 2019 Monitoring

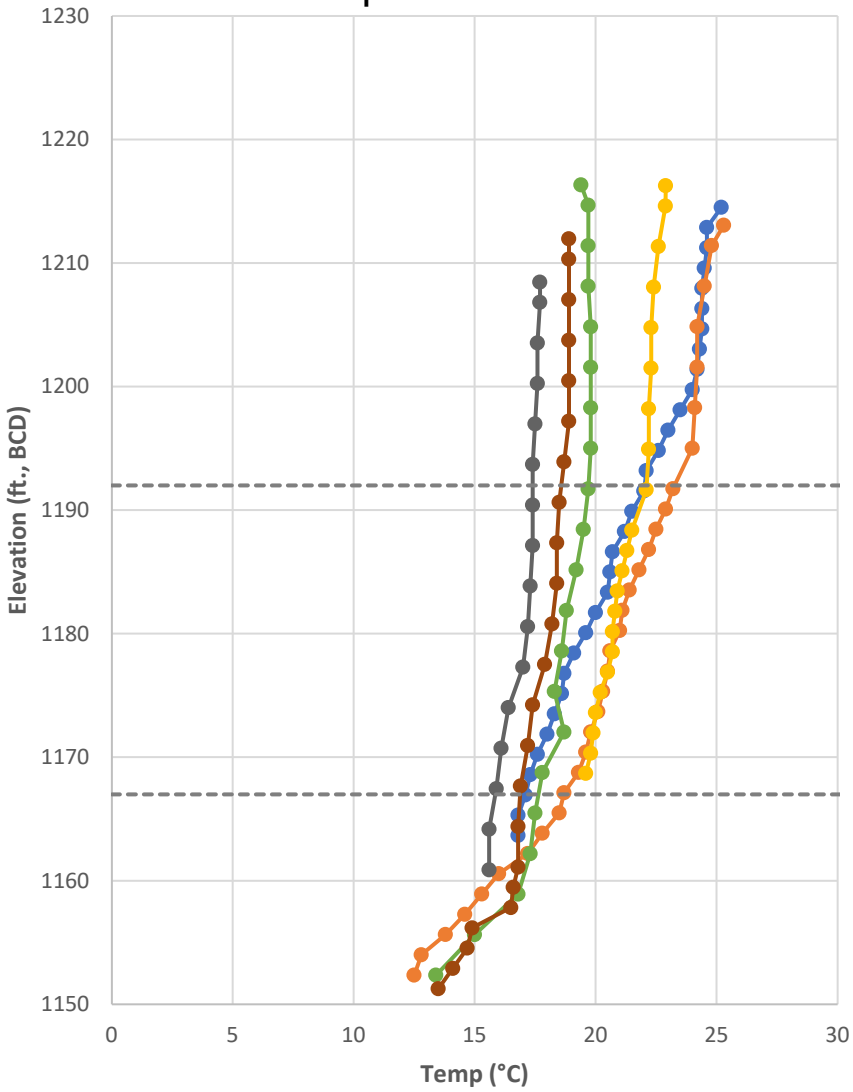
- Voluntarily conducted from July 24 through October 2, 2019.
- DO/temperature continuously recorded at one location, two discrete sites.
- New site further downstream, discrete only.
- DO and temperature profiles twice per month.
- Gate 4 Release Testing.

2019 Monitoring

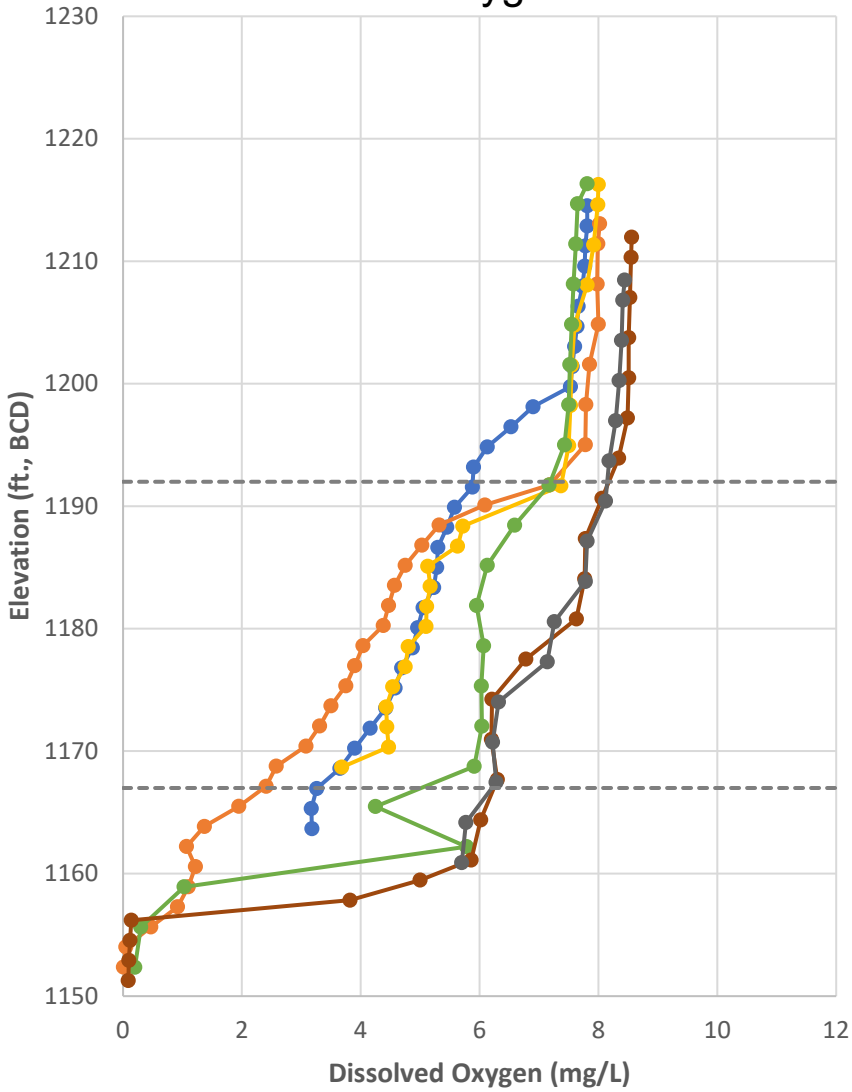



1600
1400
1200
1000
800
600
400
200
0
Release (cfs)
1230
1225
1220
1215
1210
1205
1200
1195
1190
1185
1180
Reservoir Elevation (ft)
7/1
7/11
7/21
7/31
8/10
8/20
8/30
9/9
9/19
9/29
2019 Release
2018 Release
Average 1987-2017 Release
2019 Elevation
2018 Elevation

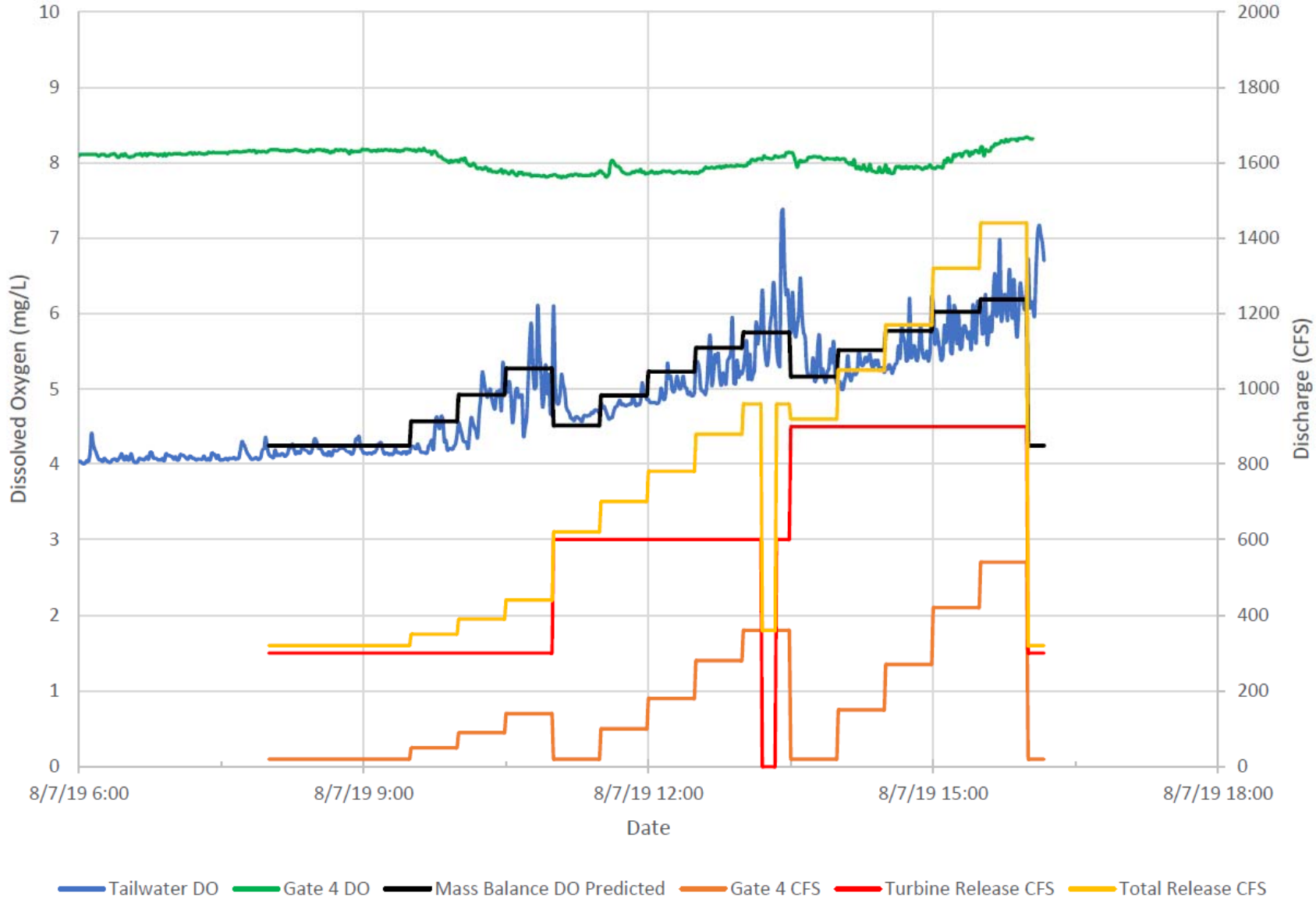
Temperature Profiles



Dissolved Oxygen Profiles



7/24/2019 8/6/2019 8/23/2019 9/5/2019 9/18/2019 10/2/2019 Top of Intake Bottom of Intake


10
9
8
7
6
5
4
3
2
1
0
Dissolved Oxygen (mg/L)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Discharge (CFS)
8/7/19 6:00
8/7/19 9:00
8/7/19 12:00
8/7/19 15:00
8/7/19 18:00
Date
Tailwater DO
Gate 4 DO
Mass Balance DO Predicted
Gate 4 CFS
Turbine Release CFS
Total Release CFS

Summary of 2019 Monitoring Results

- Higher inflows and periods of turbine generation.
- Reservoir profiles found seasonal stratification.
- Low DO in the tailwater was measured.
  - Instantaneous DO measurements were generally below the NYS Water Quality Standard of 5.0 mg/L through August 23.
- Gate 4 testing data showed potential for DO enhancement.

DO Enhancement Study

FERC Study Request:

- July 9, 2019 study request.
- Both USFWS and NYSDEC concur with the Study Plan as proposed.
- Approved in the FERC's September 6, 2019 Determination on Requests for Study Modifications.

Study Goals & Objectives

- Assess potential DO enhancement options to inform the need for license conditions.

- Assess the feasibility, potential effectiveness, and cost of various DO enhancement measures, including operational and physical options.

Study Progress

- **Task 1: Literature Review of Potential Re-aeration Methods**
  - In progress.
  - The outcome will be the identification of those DO enhancement measures with the most potential for further investigation at the Project.
- **Task 2: Evaluate Gate 4 Releases (Mass Balance Equation)**
  - Performed to predict the DO concentration of water downstream of the tailwater under various Gate 4 and turbine releases.
  - Tests were performed on August 7, 2019.
  - Results demonstrated that DO enhancement is possible when the turbines are operating if Gate 4 releases are provided.

Study Progress

- **Task 3: Desktop Feasibility Study**
  - In progress.
  - DO enhancement measures identified in Task 1 will be studied.
  - Will use cost information from the literature search to estimate capital, operation, and maintenance costs as well as potential impacts on generation.
- **Task 4: Report**
  - Will describe the results of the desktop feasibility evaluation.
  - For each potential enhancement measure, the technical feasibility, predicted effectiveness, and estimated costs (including loss of generation revenue) will be presented.
  - Winter 2021.

Closing

Recap of Next Steps

Date	Milestone
USR Related Milestones	
May 19, 2020	Updated Study Report Meeting
June 3, 2020	Power Authority will file meeting summary
July 6, 2020	Stakeholders may file comments
August 2, 2020	Power Authority will respond to comments, if warranted
September 1, 2020	FERC will amend approved study plan(s) as appropriate
License Application Related Milestones	
June 1, 2020	Stakeholder comments on the Draft License Application
July 31, 2020	Power Authority will file Final License Application

Project Website

https://jarvis.nypa.gov/