IMPOUNDMENT SHORELINE CHARACTERIZATION STUDY

WEST CANADA CREEK HYDROELECTRIC PROJECT

FERC NO. 2701-NY

Prepared for:

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DEFINITIONS OF TERMS, ACRONYMS, AND ABBREVIATIONS

Brookfield	Brookfield Renewable
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
Erie or Licensee	Erie Boulevard Hydropower, L.P.
FERC	Federal Energy Regulatory Commission
ft	foot/feet
GIS	geographic information system
GPS	Global Positioning System
ILP	Integrated Licensing Process
Interested Parties/ Stakeholders	The broad group of individuals and entities that have an interest in a proceeding
MW	Megawatts
NGVD29	National Geodetic Vertical Datum of 1929
NWI	National Wetlands Inventory
NYSDEC	New York State Department of Environmental Conservation
PAD	Pre-Application Document
Project	FERC Project No. 2701, West Canada Creek Project
Project Area	The area within the FERC project boundary
Project Boundary	The boundary line defined in the Project license issued by FERC that surrounds the Project
Project Vicinity	The general geographic area in which the Project is located; the towns of Trenton and Prospect, New York
RTK	Real Time Kinematics
Relicensing	The process of acquiring a new FERC license for an existing hydroelectric project upon expiration of the existing FERC license
Relicensing Participants	Individuals and entities that are actively participating in a proceeding
RSP	Revised Study Plan
SAV	Submerged Aquatic Vegetation
SD	Scoping Document
SPD	Study Plan Determination
Tailrace	Channel through which water is discharged from the powerhouse turbines
UAV	unmanned aerial vehicle
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

Erie Boulevard Hydropower, L.P. (Erie or Licensee), a Brookfield Renewable company (Brookfield), is the Licensee, owner, and operator of the existing West Canada Creek Hydroelectric Project (FERC Project No. 2701) (Project). The West Canada Creek Project consists of two developments, Prospect and Trenton, and is located on West Canada Creek in Oneida and Herkimer counties, New York. A detailed description of the Project is provided in the Pre-Application Document (PAD) (Erie 2018).

The Federal Energy Regulatory Commission (FERC or Commission) issued the current license for the Project on March 18, 1983, which expires February 28, 2023. Erie is pursuing a new license under FERC's Integrated Licensing Process (ILP) and intends to file an application for a new license with FERC before February 28, 2021. On December 11, 2018, Erie filed a Revised Study Plan (RSP), and on March 7, 2019, FERC issued the Study Plan Determination (SPD) approving the RSP with modifications. On October 31, 2019, Erie requested a revision of the Process Plan and Schedule, and on December 5, 2019, FERC granted this revision to change the Initial Study Report filing date to March 7, 2020.

As part of the study implementation and in accordance with FERC's SPD, Erie initiated consultation with agencies regarding aspects of the Project's relicensing studies. FERC identified specific topics for consultation with the U.S. Fish and Wildlife Service (USFWS) and New York State Department of Environmental Consultation (NYSDEC). Accordingly, Erie conducted consultation calls with USFWS and NYSDEC on April 18, 2019, July 16, 2019, and August 9, 2019. Documentation of this consultation was provided in the Study Progress Reports filed with FERC and distributed to the stakeholders on July 29, 2019, and October 31, 2019.

This report describes the methods and results of the Impoundment Shoreline Characterization Study conducted by Kleinschmidt Associates (Kleinschmidt). The purpose of the Impoundment Shoreline Characterization Study is to characterize the littoral habitat within the Project impoundments. Additionally, encounters with wetlands hydraulically influenced by the project, aquatic vegetation, fish spawning beds, and mussel beds were documented. Information regarding the bypass reach and downstream West Canada Creek aquatic mesohabitat substrates and associated transects are provided in the Aquatic Mesohabitat Assessment Study (Kleinschmidt 2020a).

Erie consulted with the NYSDEC and USFWS regarding the status of the shoreline sampling efforts and transect locations (see Study Progress Reports). As discussed during August 9, 2019, consultation call, for the Prospect impoundment transects would include one transect accounting for each major type of shoreline slope/littoral substrate/cover condition documented during the survey with and anticipated minimum of 4 transects. For the Trenton impoundment, as agreed to on the August 9, 2019 consultation call with NYSDEC and USFWS, due to the vertical bedrock walls with no littoral zones and safety concerns associated with access to Trenton, no transects were conducted for the Trenton impoundment. See Section 2.2 for additional information.

2.0 METHODOLOGY

2.1 STUDY AREA

For the first phase of shoreline habitat reconnaissance, the study area included the littoral region of the Prospect and Trenton impoundments within the existing Project boundary. For the second phase of microhabitat field verification and conducting shoreline transects of representative littoral areas, the study area included the Prospect impoundment. As discussed and agreed to with the USFWS and NYSDEC during the August 9, 2019, consultation call[1], no shoreline transects were conducted for the Trenton impoundment, due to the vertical bedrock walls with almost vertical littoral zones and safety concerns associated with access to Trenton. See additional discussion in Sections 2.2.1 and 2.3.

2.2 DATA COLLECTION AND ANALYSIS

Kleinschmidt collected information pertaining to the distribution and abundance of littoral aquatic habitat within the West Canada Creek Project impoundments in two phases. During the first phase, major aquatic habitat classifications were documented using imagery collected via an unmanned aerial vehicle (UAV or drone) flight at both Prospect and Trenton impoundments. During the second phase, the accuracy of information collected in Phase 1 was verified in the field and detailed microhabitat data were collected at five (5) representative transects for the Prospect impoundment.

2.2.1 PHASE 1 – IMPOUNDMENT SHORELINE DOCUMENTATION

Data Collection

Kleinschmidt conducted drone-based shoreline surveys of the Prospect and Trenton impoundments on August 6 and 7, 2019, respectively, to collect imagery of the major aquatic habitat classifications along the Project's impoundment shorelines, and to the extent feasible, document the presence of spawning beds, mussel beds, aquatic vegetation and wetlands. Documentation of the impoundment shoreline fluctuation zones was conducted using aerial imagery captured via an UAV. The flight occurred in the summer during a period of minimum pond (i.e., Prospect minimum surface elevation at approximately 1,156.5 feet[2], 5 feet below full pond elevation and Trenton minimum surface elevation at approximately 1,011.9 feet, 12 feet below full pond elevation) to visually document aquatic habitats

[1] See consultation record in the Study Progress Reports filed with FERC on October 31, 2019.
[2] Elevation data reported in 1929 National Geodetic Vertical Datum (NGSD29).

and natural resources occurring within the fluctuation zone. Imagery of the littoral habitat was collected by flying parallel to the shore. The prevailing water surface elevation in the impoundment was monitored by Kleinschmidt and changes in elevation during the survey were accounted for in the analysis of the data. Data collected during the drone survey were used to categorize shoreline habitats based on substrates, bank slope and in-water cover.

Data Analysis

Prospect Impoundment

For the Prospect impoundment, imagery and video data collected during the drone survey while the impoundment was drawn down to minimum pond elevation, was georeferenced with Geographic Information System (GIS). Imagery and geospatial data were transferred to a GIS format and used to develop visual maps depicting the distribution of habitat features (e.g., slope, substrate, cover) in the study area. Geospatial data were used to present tabular information describing the abundance and quantification of each habitat classification.

The imagery was then reviewed to determine shoreline habitat attributes and aquatic resources including wetlands, observed fish spawning beds, mussel beds, and aquatic vegetation. The imagery data were geo-referenced to denote boundaries where a pronounced change in substrate or littoral slope occurred. These data were used to quantify and map the substrates in the impoundment littoral zone. In addition, these data were used to verify any NYSDEC regulated wetlands (NYSDEC 2018) and USFWS National Wetland Inventory (NWI) (USFWS 2017) identified wetlands within the existing Project boundary and immediately adjacent to (within 1,000 feet) the impoundment shoreline areas.

Habitat classifications, bed slope and substrate, along the impoundment shoreline was determined by examining the drone imagery. The shoreline habitat classifications were identified by assessment of lentic aquatic habitat suitability characteristics. Lentic aquatic habitat suitability is defined primarily by substrate, cover and depth. Each of these habitat parameters were assigned specific attributes for field delineation. These generally included:

- Substrate: fines (sediment, organic detritus or muck, mud, and sand), coarse (gravel, cobble, boulder and rubble) and bedrock;
- Cover type: object cover (i.e., boulder, woody debris, riprap, etc.), overhead cover (i.e., overhanging limbs, structures, etc.); vegetative cover (i.e., emergent and/or submerged);

- Cover density: absent, low, moderate, high; and
- Depth (at normal pool): surface to substrate (feet).

Habitat was categorized by littoral bed slope (high, moderate, and low), and dominate substrate (coarse and fine) for a total of 6 categories (see Table 2-1).

TABLE 2-1 SHORELINE HABITAT CLASSIFICATION PARAMETERS

HABITAT CLASSIFICTION	GRADIENT	SUBSTRATE
High, Coarse	> 10 percent (6°) slope	Gravel (0.15 inches – 4 inches), cobble (4 inches -10 inches), boulder (>10 inches) and bedrock
High, Fine	> 10 percent (6°) slope	Sand, mud, clay and detritus with a grain size less than 0.15 inches
Moderate, Coarse	between 5 – 10 percent (3 – 6°) slope	Gravel (0.15 inches – 4 inches), cobble (4 inches -10 inches), boulder (>10 inches) and bedrock
Moderate, Fine	between 5 – 10 percent (3 – 6°) slope	Sand, mud, clay and detritus with a grain size less than 0.15 inches
Low, Coarse	< 5 percent (3°) slope	Gravel (0.15 inches – 4 inches), cobble (4 inches -10 inches), boulder (>10 inches) and bedrock
Low, Fine	< 5 percent (3°) slope	Sand, mud, clay and detritus with a grain size less than 0.15 inches

Bed slope was identified by the relative width of the exposed littoral zone at minimum pond elevation, as documented in the drone imagery. Low gradient habitat was identified by a wide expanse of exposed substrate between the shoreline and the edge of the water. High gradient littoral zone appeared as a narrow band of exposed substrate. Substrate within the exposed littoral zone was categorized as coarse or fine. The resulting habitat classifications were measured linearly to calculate the relative proportion of each habitat classification along the impoundment circumference. Areas with wetland features were identified for the Prospect impoundment via a desktop review of GIS layers including aerial imagery, USA topo maps, and the NWI and NYSDEC regulated wetland inventories (USFWS 2017; NYSDEC 2018) and were verified with the UAV imagery. No wetlands or areas with wetland features were identified along the Trenton impoundment due to the steeply sloped, rock gorge shoreline characteristics. Results of the Phase 1 efforts for the Prospect impoundment are provided in Section 3.1.

Trenton Impoundment

For the Trenton impoundment, imagery and video data of the shoreline habitat was collected during the drone survey while the impoundment was drawn down to minimum pond elevation. As summarized in Section 3.2, the Trenton impoundment shoreline is largely uniform with shoreline areas consisting of high, nearly vertical bedrock walls that extend below the water surface resulting in minimal littoral habitat. Due to the vertical bedrock walls with minimal littoral habitat, the gorge-like topography, relatively uniform character of the littoral habitat, and safety concerns associated with access to Trenton, no transects were proposed or conducted for the Trenton impoundment. Kleinschmidt reviewed representative photos taken at the Trenton impoundment (taken during the 12-foot drawdown) and the proposed approach with the USFWS and NYSDEC during the August 9, 2019 consultation call[3]. The agencies agreed to the approach of conducting transects only at the Prospect impoundment and documentation of the Trenton impoundment shoreline via the Phase 1 data reconnaissance. Results of the Phase 1 documentation for the Trenton impoundment are presented in Section 3.2, and additional representative photographs are provided in Appendix A.

2.2.2 PHASE 2 – MICROHABITAT FIELD VERIFICATION

Data Collection

The Phase 2 field verification was conducted on August 20, 2019 and August 22, 2019, during which microhabitat data were collected along five transects at the Prospect impoundment. Transect data were gathered within representative littoral areas for five (5) transects locations to represent the major habitat classifications[4] identified from the drone imagery (see Section 2.3). Each transect extended from top of bank (or to a maximum of 6 feet above the full pond elevation of 1,161.5 feet) to a bed elevation of 3 feet below low pond (1,153.5 feet). Verticals (i.e. elevations) were located along each transect to depict the following reservoir elevations:

- Top of bank;
- Normal full pond -water elevation (i.e., Prospect impoundment at 1,161.5 feet);
- Toe of bank; and
- Elevation 3 feet below normal low pond elevation (i.e., Prospect impoundment at 1,153.5 feet).

[3] See consultation record in the Study Progress Reports filed with FERC on July 29, 2019, and October 31, 2019.
[4] Moderate gradient/fine substrate only represented 1.8 percent of the shoreline and was not sampled with a transect.

Additional verticals were established at intervals wherever micro-changes in slope, substrate embeddedness, or cover were encountered. Elevations were surveyed and georeferenced using a Leica Viva GNSS GS12 GPS Rover with Real-time kinematic (RTK) data processing.

Data Analysis

Bed elevation data collected along the Prospect impoundment's 5 transects were entered into Microsoft Excel and plotted. The resulting plots illustrate a cross section of the represented habitat. Water surface elevation at normal (full pond) and minimum pond elevations are included in the cross-sectional plots to depict the linear extent of substrate exposed to fluctuations in pond elevation. Results for the Prospect impoundment microhabitat field verification are provided in Section 2.3.

2.3 VARIANCE FROM APPROVED STUDY PLAN

As discussed and agreed to with the USFWS and NYSDEC during the August 9, 2019, consultation call, no shoreline transects were conducted for the Trenton impoundment, due to the vertical bedrock walls with almost vertical littoral zones and safety concerns associated with access to Trenton. This was a variance from the approved study plan in that Erie had anticipated transects (less than 2) at the Trenton impoundment. See additional discussion in Section 2.2.1.

3.0 STUDY RESULTS

3.1 PROSPECT IMPOUNDMENT

The Prospect impoundment is approximately 2 miles long, running east to west, from Hinckley dam to the entrance of the Prospect power canal (Figure 3-1). It covers approximately 162 acres at normal pond elevation (1,161.5 feet), with an additional 14 acres in the project power canal and forebay. The current operating range is 5 feet, from 1,161.5 feet to 1,156.5 feet. Shoreline habitat within the Prospect impoundment was documented using an UAV on August 6, 2019, between 10:00 to 16:00. The pond elevation averaged 1,156.5 feet during the time of the drone survey, fluctuating between 1,156.4 and 1,156.9 feet throughout the day of survey (Table 3-1).

TABLE 3-1 PROSPECT IMPOUNDMENT ELEVATIONS DURING UAV AND MICROHABITAT SURVEYS

DATE	TIME (24 HOUR)	AVERAGE POND EL. (FEET)	MIN POND EL. (FT)	MAX POND EL. (FEET)	NET EL. CHANGE (FT)
8/6/2019	10:00-16:00	1,156.5	1,156.4	1,156.9	0.6
8/20/2019	11:00- 19:00	1,160.2	1,160.0	1,160.3	0.4
8/22/2019	15:00- 18:00	1,159.2	1,159.0	1,159.6	0.5

The Prospect impoundment is long and narrow except for an area approximately 4,000 feet downstream of Hinckley dam where the impoundments exhibits an S-curve where it widens to form a deep cove along the southern shoreline (Figure 3-1). Habitat along the shoreline of the impoundment is predominantly forested with areas of development consisting mostly of private homes on the eastern end of the impoundment. The banks along the south shore are steep (generally greater than 10 percent gradient), particularly within the cove area, were the steep slopes extend well inland beyond the riparian zone. The banks of the northern shoreline, overall, have a low gradient with marshy areas particularly in the lower half of the impoundment downstream of the S-curve. The slope of the banks, on both sides of the impoundment, diminish as the impoundment leads into the canal.

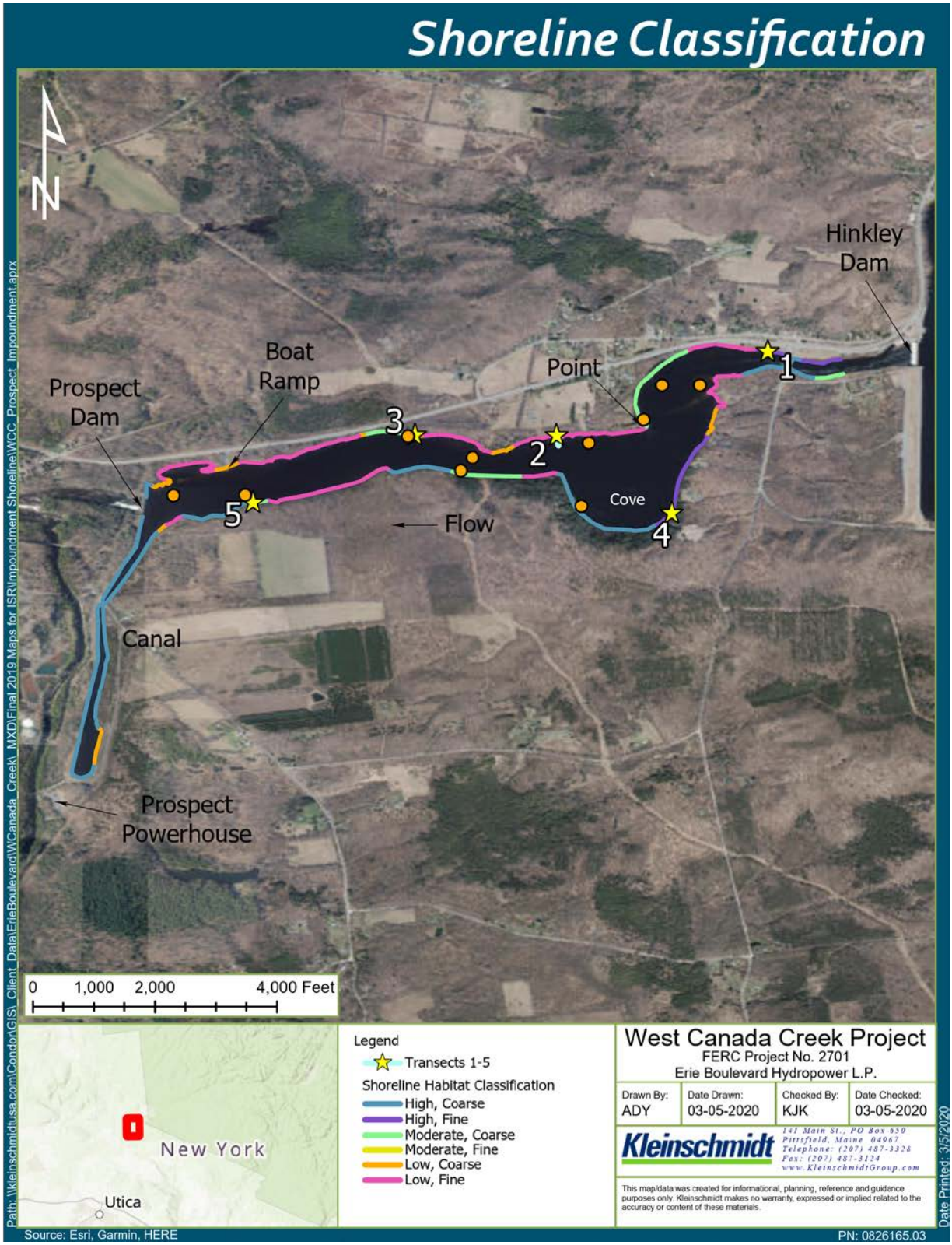

FIGURE 3-1 PROSPECT IMPOUNDMENT HABITAT DISTRIBUTION AND LOCATION OF MICROHABITAT TRANSECTS

3.1.1 PROSPECT IMPOUNDMENT SHORELINE CHARACTERISTICS

Figure 3-1 depicts the distribution of the 6 identified habitat categories. Each habitat classification was mapped around the nearly 6-mile perimeter of the impoundment and canal. Table 3-2 lists the linear distance and relative proportion of each habitat classification. Habitat within the canal was separated from the impoundment habitat due to the unique armored banks spanning both sides of the canal. The canal consisted of 1.2 miles (91 percent) of steep banks armored with cobble riprap, with a small 615-foot section within the forebay of low gradient slope habitat (Figure 3-1, Table 3-2).

TABLE 3-2 PROSPECT IMPOUNDMENT SHORELINE HABITAT CLASSIFICATIONS

LOCATION	GRADIENT	SUBSTRATE	LENGTH (FT)	LENGTH (MILES)	PERCENT
Canal	High	Coarse	6,169	1.2	90.9
Canal	Low	Coarse	615	0.1	9.1
Canal Total			**6,784**	**1.3**	**100**
Impoundment	High	Coarse	7,575	1.4	30.8
Impoundment	High	Fine	519	0.1	2.1
Impoundment	Moderate	Coarse	2,970	0.6	12.1
Impoundment	Moderate	Fine	434	0.1	1.8
Impoundment	Low	Coarse	2,047	0.4	8.3
Impoundment	Low	Fine	11,021	2.1	44.9
Impoundment Total			**24,566**	**4.7**	**100**

Overall, the two most predominant littoral habitat types within the Prospect impoundment included fine sediment substrates of low gradient slope (45 percent) and coarse substrates of high gradient slope (31 percent) (Table 3-2). In the impoundment, high gradient, coarse substrate habitat is largely confined to the southern shore where steep topography extends into the impoundment. Aquatic vegetation was absent in areas with a high gradient and coarse substrate, likely due to the minimal area occurring within the photic zone and poor rooting substrate. Given the steep slope of the littoral bed, relatively little habitat is exposed in these areas when the pond elevation is drawn down (Photo 3-1 and Photo 3-2, see Figure 3-2 for location of representative photos). Within the cove area, the upland and riparian zones are extremely steep and transition into a high gradient littoral zone. Erosion was observed above the influence of the impoundment fluctuation zone in the steep upland zone, depositing sand, gravel and small cobble, as well as organic materials into the impoundment (Photo 3-3).

The northern shore consists predominately of low to moderate gradient littoral zones, except for a stretch of high gradient fine substrate habitat extending from Hinckley dam to approximately 2,000 feet downstream. At this point, a low gradient littoral bed transitions into a moderate gradient, coarse substrate habitat that stretches along the outside bend of the S-curve (Photo 3-4). Around the point, where the impoundment widens to the deep cove, the littoral slope lessens as the habitat transitions into a low gradient reach with fine substrates. This area forms a mud flat that is exposed when the impoundment is drawn down to minimum pond elevation (Photo 3-5). This mud flat extends approximately 1 mile from the point to the Prospect boat launch, where coarse substrate has been placed for armament at the boat ramp. A small shallow cove with fine substrates is located a short distance downstream of the boat ramp. The cove is formed by a peninsula of coarse substrates that is exposed at low pond elevations. A deep cut (approximately 6 feet deep at low pond) at the southern extent of the cove connects the small cove to the impoundment at minimum pond elevation (Photo 3-6).

Another fine sediment flat is located on the inside bend downstream of the Hinckley dam. This flat is formed by sediment deposited from the slower moving water that sweeps around the bend in the impoundment as the river widens. The deposited sediments form two peninsulas that are exposed at low pond elevation (Photo 3-7). The longest peninsula, slightly downstream from the first, is formed by an old railroad bed, for which an old bridge buttress is evident between the peninsula and the north shore (Photo 3-8). The area around these sediment deposits is one of the few stretches along the southern shore that contains a low gradient, fine substrate habitat.

Submerged aquatic vegetation (SAV) beds were widespread within the impoundment. Most SAV occurred in areas of low gradient slope with fine substrates suitable for rooting. SAV was most dense near the minimum pond elevation and decreased in density as depth increased or substrates became unsuitable for rooting (Photo 3-9). Phragmites were the only documented emergent aquatic vegetation (Photo 3-10).

FIGURE 3-2 PROSPECT IMPOUNDMENT PHOTO LOCATIONS

PHOTO 3-1 PROSPECT IMPOUNDMENT SHORELINE HABITAT WITH HIGH GRADIENT SLOPE

PHOTO 3-2 PROSPECT IMPOUNDMENT SOUTHERN SHORELINE APPROXIMATELY 1,500 FEET UPSTREAM OF THE PROSPECT DAM
Note: Transect represents habitat with a moderate gradient slope and coarse substrate.

PHOTO 3-3 EROSION ALONG PROSPECT IMPOUNDMENT WITHIN THE COVE AREA
Note: the erosion originates from an upland area above the influence of the impoundment.

PHOTO 3-4 PROSPECT IMPOUNDMENT NORTH SHORELINE APPROXIMATELY 2,700 FEET DOWNSTREAM OF HINCKLEY DAM
Note: Represents habitat with moderate slope with fine substrate

PHOTO 3-5 PROSPECT IMPOUNDMENT NORTH SHORE REPRESENTING HABITAT WITH LOW GRADIENT SLOPE AND FINE SUBSTRATE

PHOTO 3-6 PROSPECT IMPOUNDMENT NORTH SHORE SMALL COVE WITH OUTLET LOCATED DOWNSTREAM OF THE BOAT RAMP

PHOTO 3-7 SEDIMENT DEPOSIT PENINSULAS DOWNSTREAM OF HINCKLEY DAM

PHOTO 3-8 PROSPECT IMPOUNDMENT SEDIMENT DEPOSIT AT ABANDONED RAILROAD BED

PHOTO 3-9 PROSPECT IMPOUNDMENT SUBMERGED AQUATIC VEGETATION IN LOW GRADIENT HABITAT WITH FINE SUBSTRATE APPROXIMATELY 2,000 FEET UPSTREAM OF THE BOAT RAMP

PHOTO 3-10 PROSPECT IMPOUNDMENT SHORELINE PHRAGMITES STAND

3.1.2 PROSPECT IMPOUNDMENT WETLANDS

Wetlands within the Prospect impoundment boundary were mapped from the NWI and NYSDEC wetland data and verified by drone imagery. The NWI database (USFWS, 2020) identifies one wetland feature within the Project boundary, and eight NWI identified wetland features within the general vicinity of the Project boundary (Table 3-3 and Figure 3-3). The NYSDEC regulated wetlands within the general vicinity of the Project include five wetlands (R-32 – Class 2, 29.4 acres, HY-1 – Class 3, 35.2 acres, RN-2, Class 3, 13.9 acres, RN-1- Class 3 – 44 acres, and R-38, Class 4, 86.6 acres) encompassing a total of 209.1 acres (CUGIR 2020; NYSDEC 2020) (Figure 3-3). Ten (10) separate areas with wetland features were documented along the perimeter of the Prospect impoundment and power canal (Figure 3-3).

TABLE 3-3 INVENTORY OF NWI WETLANDS WITHIN OR ADJACENT TO THE PROJECT

NWI CLASSIFICATION	TOTAL WETLAND AREA (ACRES)	SYSTEM/ SUBSYSTEM	CLASS	SUBCLASS	WATER REGIME
PFO1E	8.5	Palustrine	Forested	Broad-Leaved Deciduous	Seasonally Flooded/Saturated
PFO1/EM1A	2.5	Palustrine	Forested/ Emergent	Broad-Leaved Deciduous/ Persistent	Temporary Flooded
PSS1E	14.9	Palustrine	Scrub-Shrub	Broad-Leaved Deciduous	Seasonally Flooded/Saturated
PFO1/SS1E	18.6	Palustrine	Forested/ Scrub-Shrub	Broad-Leaved Deciduous/ Broad-Leaved Deciduous	Seasonally Flooded/Saturated
PFO1E	5.2	Palustrine	Forested	Broad-Leaved Deciduous	Seasonally Flooded/Saturated
PEM1/FO1E	3.9	Palustrine	Emergent/ Forested	Persistent/ Broad-Leaved Deciduous	Seasonally Flooded/Saturated
PFO4/1E	12.5	Palustrine	Forested	Needle-Leaved Evergreen; Broad-Leaved Deciduous	Seasonally Flooded/Saturated
PFO4/1E	6.1	Palustrine	Forested	Needle-Leaved Evergreen; Broad-Leaved Deciduous	Seasonally Flooded/Saturated
PSS1/EM1E	3.4	Palustrine	Scrub-Shrub/ Emergent	Broad-Leaved Deciduous/ Persistent	Seasonally Flooded/Saturated

Source: USFWS 2020

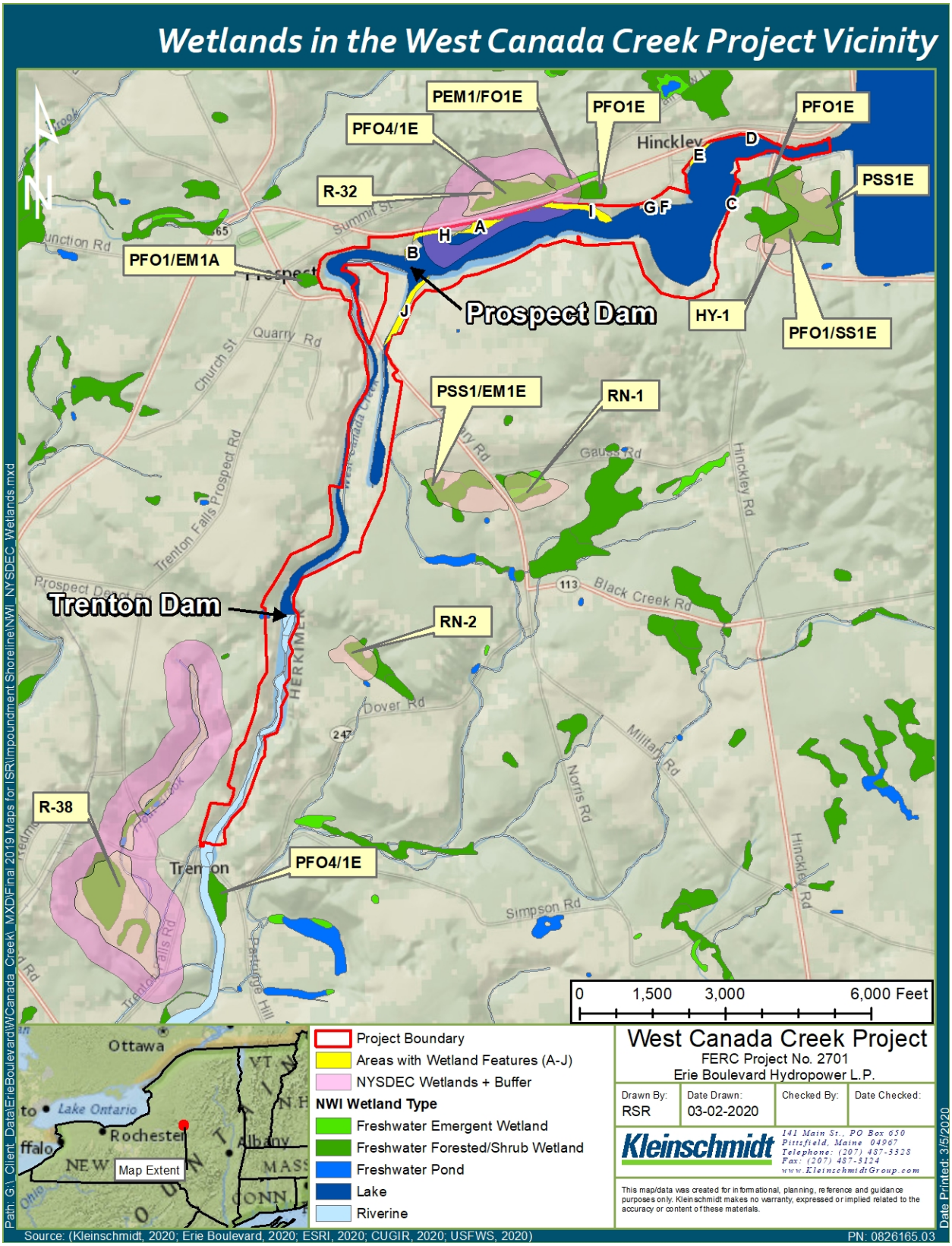

FIGURE 3-3 NWI AND NYSDEC IDENTIFIED WETLANDS AND AREAS WITH WETLAND FEATURES NEAR THE WEST CANADA CREEK PROJECT

3.1.3 PROSPECT IMPOUNDMENT MICROHABITAT

A total of 5 transects were surveyed within the Prospect impoundment on August 20 and 22, 2019 (Figure 3-1, Table 3-4). During the microhabitat survey, pond elevation averaged 1,160.2 feet on August 20 between 11:00 and 19:00, and 1,159.2 feet on August 22 from 15:00 to 18:00. Transects varied in length from 31 feet (Transect 1) up to 196 feet (Transect 2), depending on the steepness of the slope between the headpin and the point where bed elevation reaches 3 feet below the minimum water elevation. Longer transects were required to traverse horizontal flats in areas with a low gradient slope. Table 3-4 provides coordinates for each transect headpin, the transect slope, length, and information describing the habitat each transect represents. Transect cross-sections are depicted in Figure 3-4 through Figure 3-8, with corresponding photos of each transect.

TABLE 3-4 PROSPECT IMPOUNDMENT SHORELINE TRANSECT LOCATION AND HABITAT CLASSIFICATION

TRANSECT	DATE	WSEL[1]	HEADPIN LATITUDE	HEADPIN LONGITUDE	LENGTH (FT)	TRANSECT SLOPE	HABITAT CLASSIFICATION AND DESCRIPTION
1	8/20/2019	1,159.9	43.3142853	-75.1181904	31	16% (9°)	High gradient slope with fine substrate and SAV
2	8/20/2019	1,159.8	43.3074997	-75.1236795	196	3% (1°)	Low gradient slope with fine substrate with SAV
3	8/20/2019	1,160.1	43.3028535	-75.1238832	57	8% (5°)	Moderate gradient slope with coarse substrate transitioning to fines and SAV below min pond el.
4	8/22/2019	1,156.5	43.3113928	-75.1282693	32	16% (9°)	High gradient slope with gravel and fine substrate
5	8/22/2019	1,158.6	43.304846	-75.138265	49	10% (6°)	Moderate gradient slope with predominantly cobble substrate with moderate SAV cover

[1] Water surface elevation at time of survey. Elevation data reported in 1929 National Geodetic Vertical Datum.

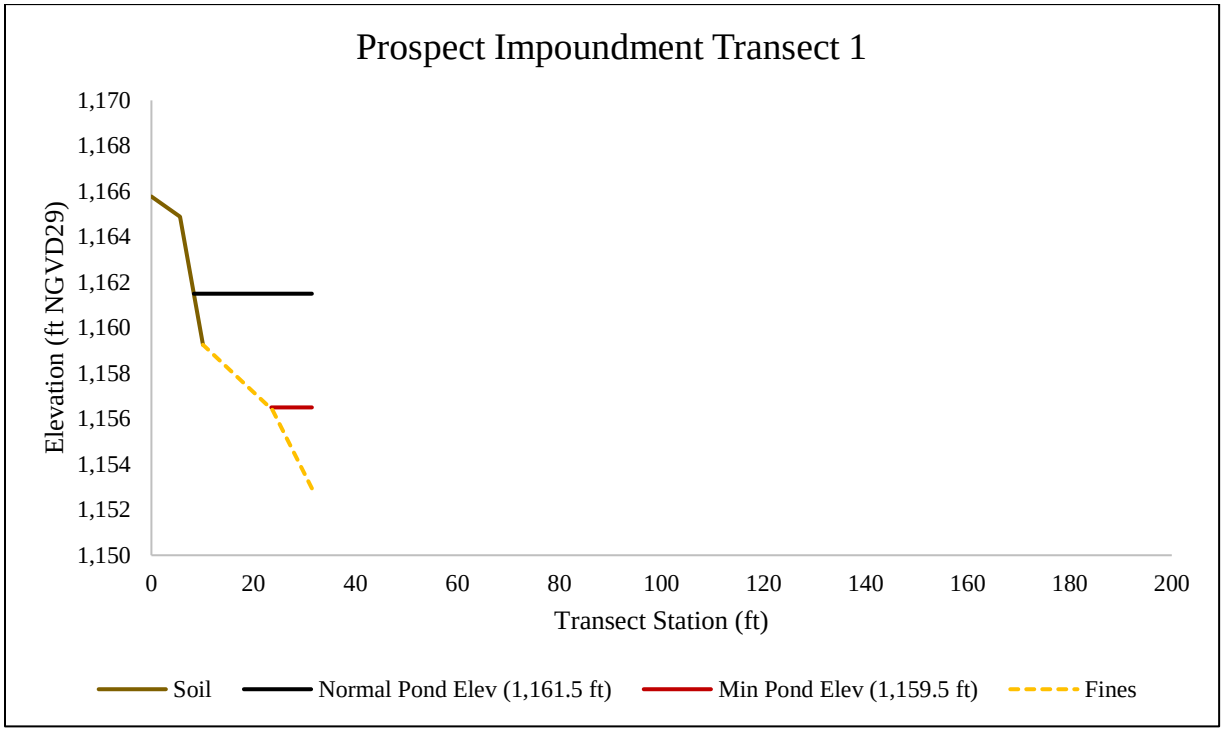

FIGURE 3-4 CROSS SECTION OF TRANSECT 1 IN THE PROSPECT IMPOUNDMENT

PHOTO 3-11 PROSPECT TRANSECT 1 REPRESENTING HABITAT WITH HIGH GRADIENT SLOPE AND FINE SUBSTRATES

Note: SAV was present. The shoreline at this site is in close proximity to a road alignment where shoreline vegetation is maintained.

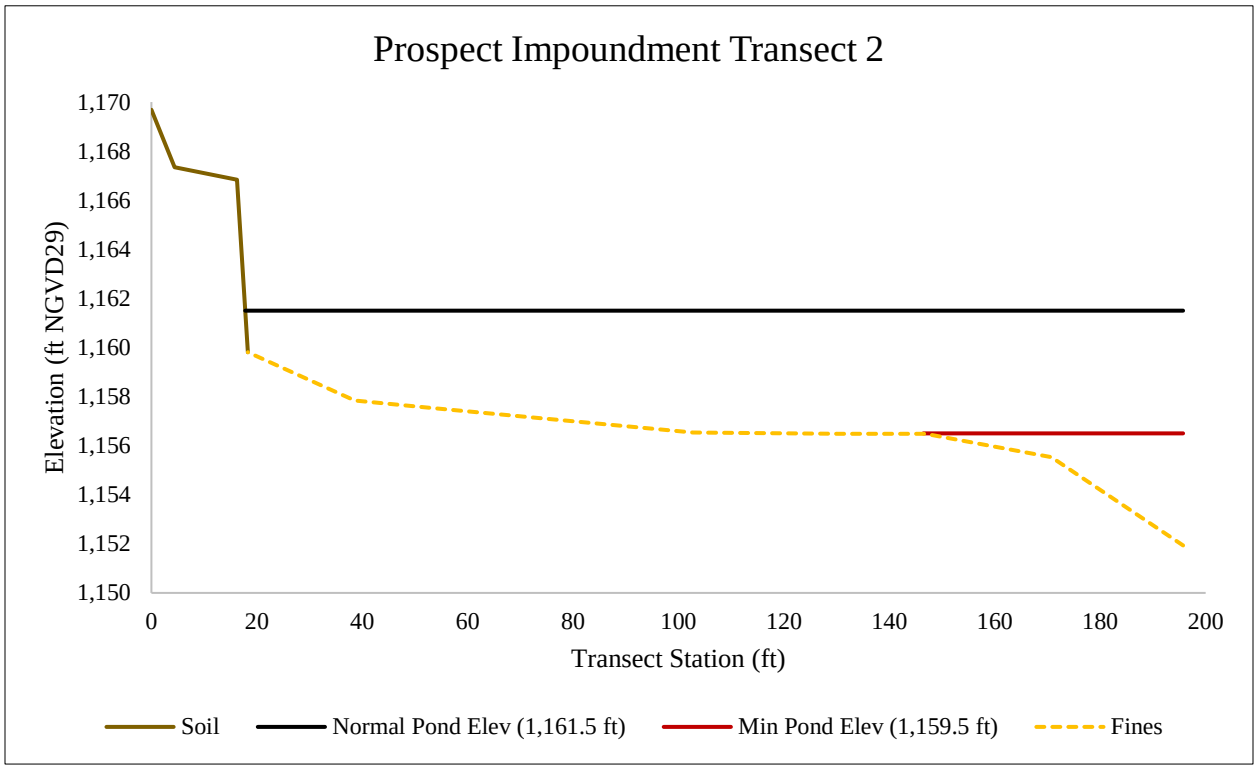

FIGURE 3-5 CROSS SECTION OF TRANSECT 2 IN THE PROSPECT IMPOUNDMENT

PHOTO 3-12 PROSPECT TRANSECT 2 REPRESENTING HABITAT WITH LOW GRADIENT SLOPE AND FINE SUBSTRATE

Note: SAV was present.

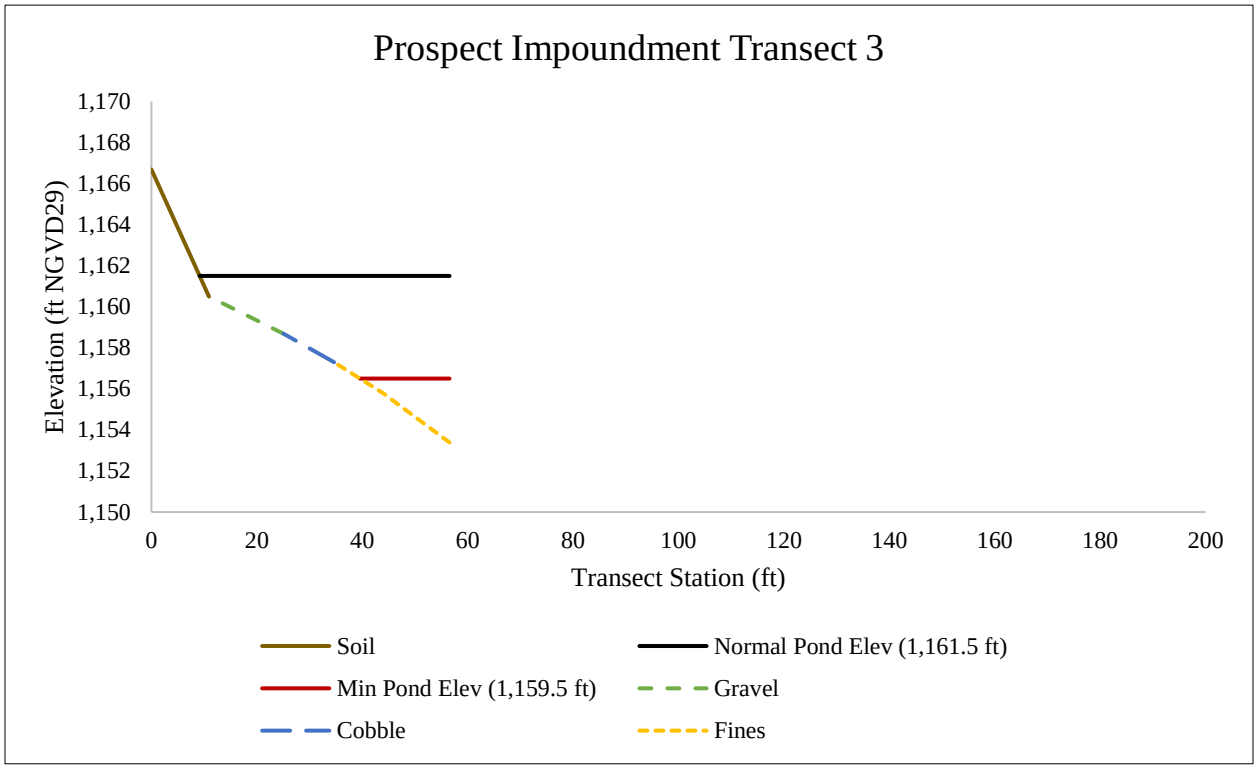

FIGURE 3-6 CROSS SECTION OF TRANSECT 3 IN THE PROSPECT IMPOUNDMENT

PHOTO 3-13 PROSPECT TRANSECT 3 REPRESENTING HABITAT WITH MODERATE GRADIENT WITH COARSE SUBSTRATE

Note: Fine substrate with SAV was observed below the normal pond elevation seen here.

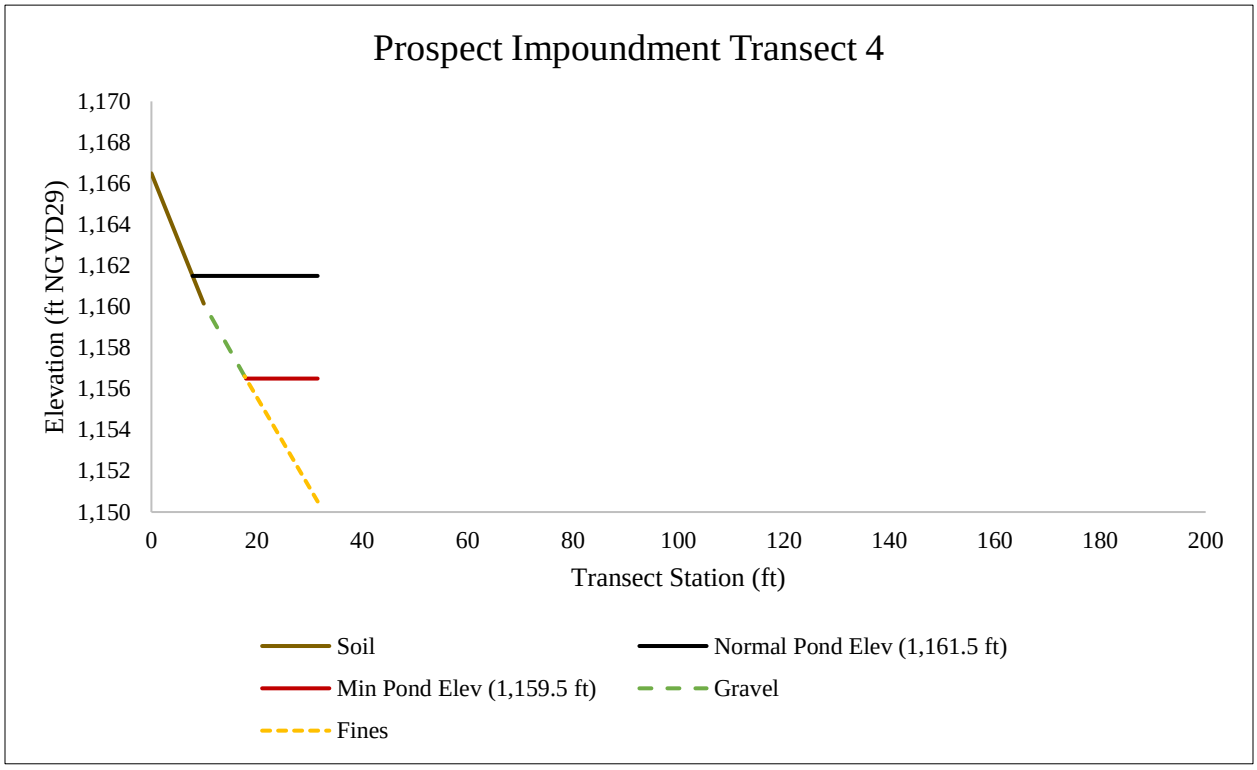

FIGURE 3-7 CROSS SECTION OF TRANSECT 4 IN THE PROSPECT IMPOUNDMENT

PHOTO 3-14 PROSPECT TRANSECT 4 REPRESENTING HABITAT WITH HIGH GRADIENT SLOPE AND FINE SUBSTRATE

Note: Fine substrate and large woody debris observed blow the normal pond elevation seen here.

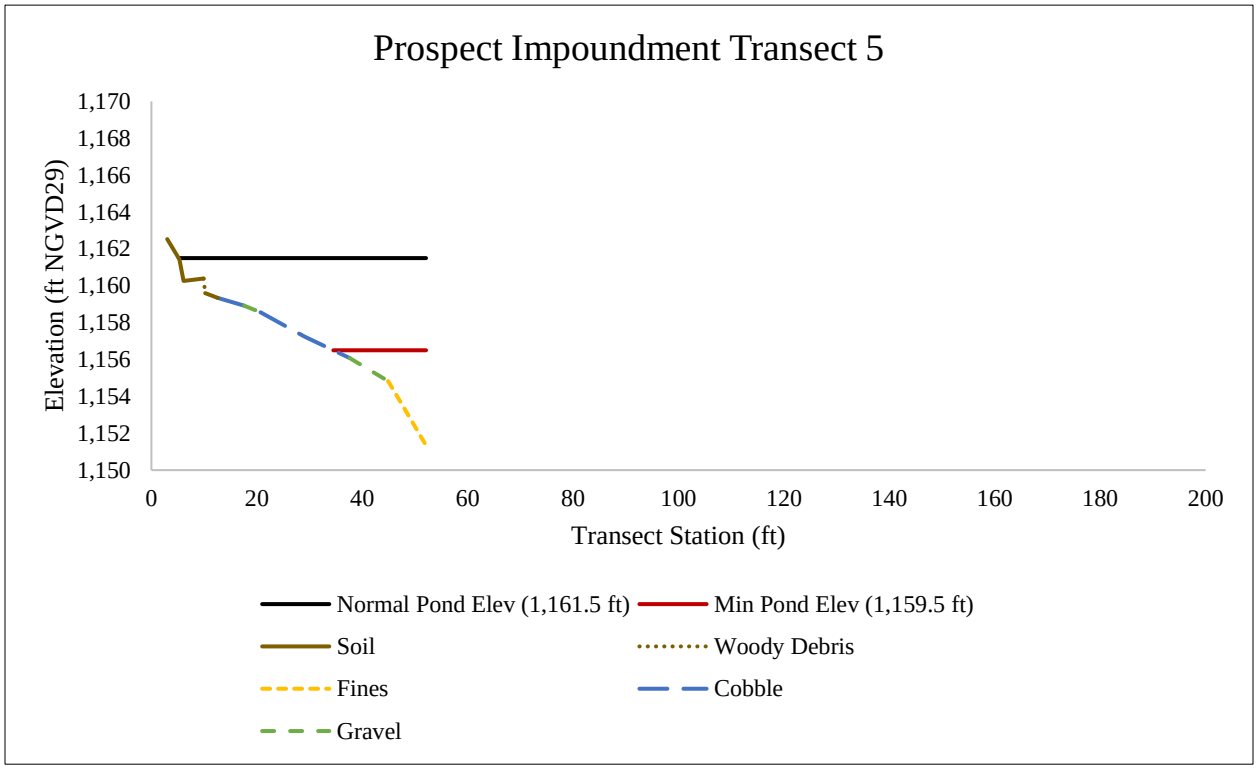

FIGURE 3-8 CROSS SECTION OF TRANSECT 5 IN THE PROSPECT IMPOUNDMENT

PHOTO 3-15 PROSPECT TRANSECT 5 REPRESENTING HABITAT WITH MODERATE GRADIENT SLOPE AND COARSE SUBSTRATE.
Note: SAV was present in low density.

Although no fish spawning beds or mussel beds were observed during this study, habitat for both was present within the impoundment. Areas with fine sediments, appropriate for mussel habitat, were present at each transect (see the West Canada Creek Project, Macroinvertebrate and Freshwater Mussel Survey for additional information; Kleinschmidt 2020b). Even in areas where the littoral zone was predominantly coarse substrate, in the case of Transects 3 and 5, the habitat would transition to fines in deeper areas. Submerged aquatic vegetation (SAV) was observed at all transects except Transect 4. SAV was most predominant in areas with fine sediments, or, in the case at Transect 5, small gravel. Large woody debris was observed at Transect 4 and along the steep banks of the large cove. Old tree roots and stumps were observed at Transect 2 and within the mud flats along the north shore of the impoundment (Photo 3-11 and Photo 3-15). The diversity of substrates, depth, and covers offer a variety of habitat for lacustrine oriented fish species.

3.2 TRENTON IMPOUNDMENT

The Trenton impoundment is approximately 3,000 feet in length, extending from the Prospect tailrace to the Trenton dam, an area of approximately 9 acres at normal pond elevation (Figure 3-9). The upper impoundment is narrow, approximately 50 feet wide, and starts to slightly widen where it bends westward about 1,000 feet downstream of the Prospect powerhouse. The maximum width of the Trenton impoundment is at the dam where it is approximately 260 feet wide (Photo 3-16). Aerial imagery of the Trenton impoundment was captured via an UAV on August 7, 2019. During the time of the aerial survey, the Trenton impoundment was held at the minimum pond elevation (1,011.9 feet), approximately 12 feet below normal pond elevation (1,023.9 feet), ranging from 1,011.7 to 1,012.0 feet between 7:30 and 10:00 AM.

Littoral habitat within the Trenton impoundment is largely uniform with shoreline areas consisting of high, nearly vertical bedrock walls that form a narrow gorge along the length of the impoundment (Photo 3-16). The nearly vertical gorge walls flank the impoundment and extend below the water surface resulting in minimal littoral habitat except in a few areas containing boulder and cobble deposits (Photo 3-17). Boulder and cobble deposits were mostly found in small patches adjacent to indentations in the gorge wall or along the inside bend in the channel, where slower moving waters would deposit coarse sediment and substrate.

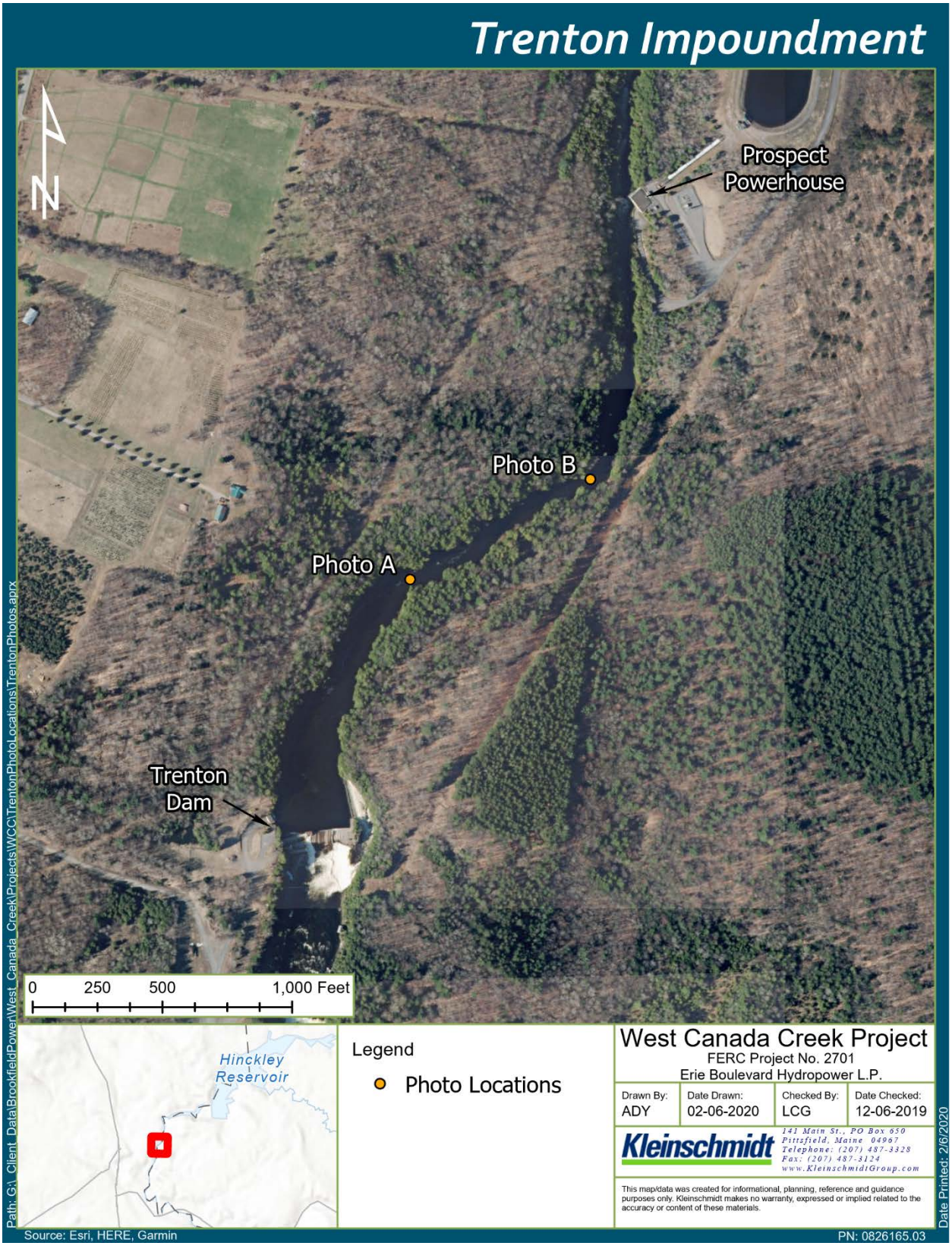

FIGURE 3-9 TRENTON IMPOUNDMENT PHOTO LOCATIONS

PHOTO 3-16 TRENTON IMPOUNDMENT BEDROCK GORGE
Note: For Location see Figure 3-9, Photo A.

PHOTO 3-17 TRENTON IMPOUNDMENT BOULDER AND COBBLE DEPOSITS
Note: For location, see Figure 3-9, Photo B.

4.0 DISCUSSION

4.1 PROSPECT IMPOUNDMENT

Prospect impoundment is a slow-moving flowage with a variety of substrates ranging from cobbles to fine sediment. In general, object cover in the impoundment is moderate and consists of patches of woody debris or SAV beds. Overhead canopy provides cover predominantly for habitat along the south shore of the Prospect impoundment. Bed slope varies throughout the impoundment, with high gradient slopes most prevalent along the south shore, and lower gradient slopes stretching along the north shoreline. Exposure of littoral habitat during pond drawdown depends on the bed slope. Bed slope profiles were measured at 5 representative transects, which exhibited a range of linear habitat dewatering, with a minimum of 10 feet at Transect 4 to as much as 129 feet at Transect 2.

Transects 1, 3, 4, and 5 represent habitat with high to moderate gradient that exposes an average of 21 feet of linear habitat at minimum pond elevation. The exposed substrate within these areas is predominantly coarse, composed of cobble and gravel, with the exception of Transect 1, which exposed a short stretch of fine substrate. In general, in-water cover within high to moderate gradient habitats were limited to large woody debris and water depth, for which fluctuating pond elevations had little effect. SAV density was minimal in these areas due to the limited areas of suitable depth within the photonic zone. Habitat near Transect 1 did support SAV due to the fine sediment substrate offering adequate rooting substrate.

Transect 2, representing very low gradient habitat, resulted in the most habitat exposed at minimum pond elevation (129 feet), exposing exclusively fine substrate. SAV beds, woody debris, and root wads provided cover in this shallow area. Although expanses of this habitat were exposed at minimum pond elevation, dense SAV beds below this elevation remain watered and provide adequate habitat cover.

Aquatic fauna may offer impoundment habitats for spawning, nursery, and /or foraging. The use will vary according to species and life stage (Smith, 1985; Werner, 1980). Ambush predators such as Chain Pickerel require object cover such as boulders woody debris or vegetation. SAV beds and wetland areas with emergent Phragmites offer ample feeding grounds for these predators. Pumpkinseed sunfish and Yellow Perch were two of the most common species found

in the Prospect impoundment (see Fish Assemblage Assessment Report, Kleinschmidt 2020d). Perch species, such as Yellow Perch, extrude egg masses that adhere to aquatic vegetation during incubation. Although some SAV beds are exposed with the fluctuation of the pond elevation, the abundance of Yellow Perch suggests the adverse effects to the perch population is negligible.

No spawning nests were observed during the survey on August 6, 2019, nor within the 5 transects. Lithophilic spawning species such as centrarchids (i.e., sunfish) have specific substrate and depth-driven requirements for nesting. Centrarchids typically build their nests in shallow areas with sand or gravel substrates. Despite the lack of documented spawning beds, the abundance of Pumpkinseed sunfish (Lepomis gibbosus) observed during the 2019 Fish Assemblage Assessment (Kleinschmidt 2020d) is evidence that the drawdown is having a negligible effect on the population of nest building species within the Prospect impoundment. The surveys were conducted in the late summer, after spawning beds had been abandoned and observations of spawning beds may have been obscured by vegetation and algal growth.

No mussels were observed via the drone or transect surveys. However, a mussel survey conducted in September, revealed a healthy, reproducing population of Lake Floater (Pyganodon lacustris) within the Prospect impoundment. Mussels were documented at all ten sample locations throughout the impoundment (see Macroinvertebrate and Freshwater Mussel Survey Report, Kleinschmidt 2020b).

Review of drone imagery identified ten (10) areas with wetland features along the shoreline of the impoundment. NWI and NYSDEC identified wetlands in the impoundment area appear to be mostly forested with small areas of scrub-shrub and emergent wetland.

4.2 TRENTON IMPOUNDMENT

The Trenton impoundment is comprised of a deep, narrow, bedrock gorge downstream of the Prospect tailrace and then slightly widens near the Trenton dam. The habitat is mostly uniform throughout the impoundment, with little to no littoral zone due to the vertical gorge walls. In-water cover in the Trenton impoundment is sparse, limited to small sporadic areas of cobble and small boulder, occurring along the margins of the gorge walls. Water depth is the most prevalent form of habitat cover. Since the gorge walls extend well past the water line, little habitat is exposed as pond levels fluctuate, and pools are deep enough that little cover is lost.

5.0 REFERENCES

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APPENDIX A

REPRESENTATIVE PHOTOS OF THE TRENTON IMPOUNDMENT

Photos A-1 through A-6 provide representative photos taken at the Trenton impoundment during the 12-foot drawdown on August 7, 2019, for the Impoundment Shoreline Characterization Study. Figure A-1 denotes the locations of these photos.

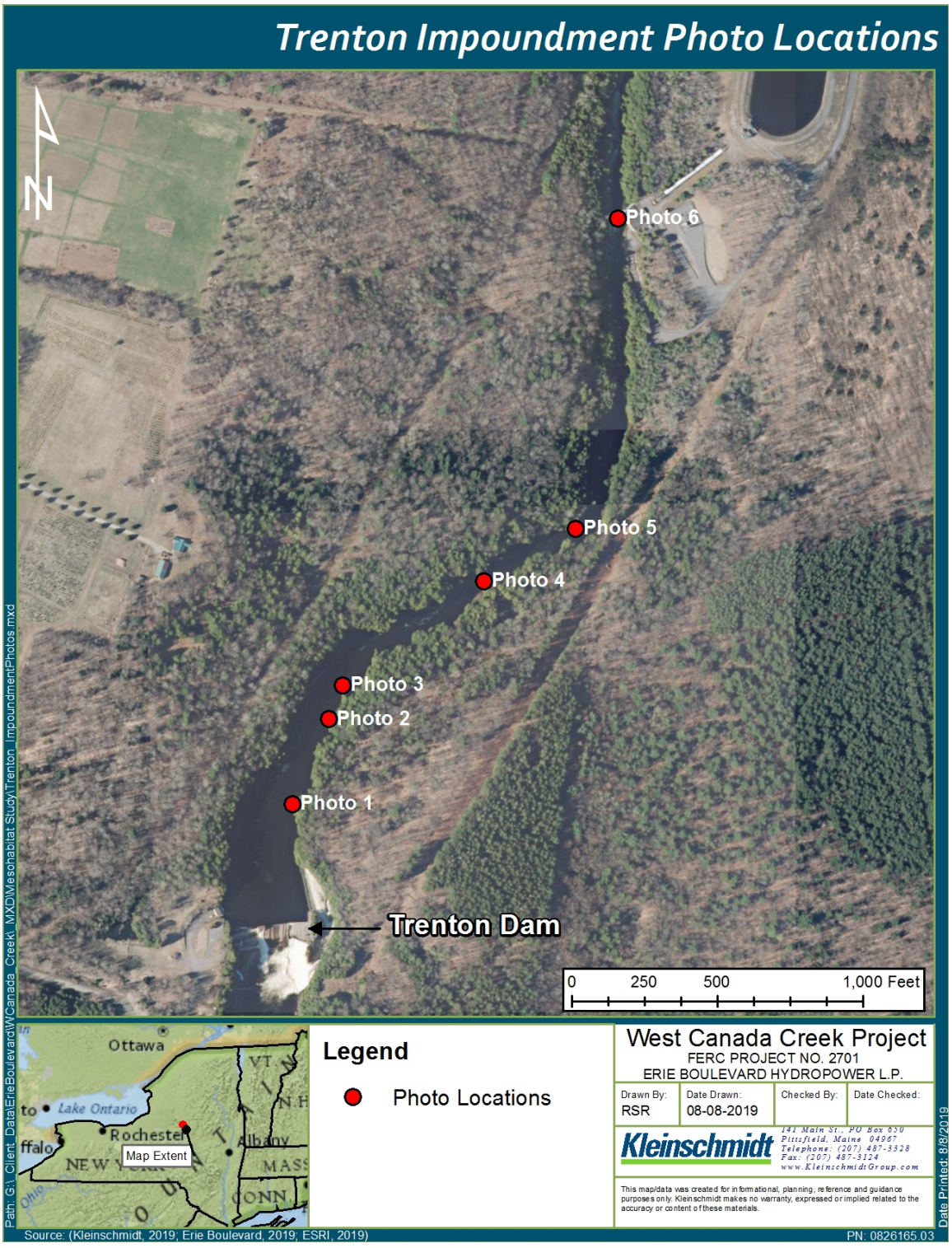

FIGURE A-1 LOCATION OF TRENTON IMPOUNDMENT AUGUST 7, 2019 FIELD STUDY PHOTOS

PHOTO A-1 LOWER TRENTON IMPOUNDMENT SHORELINE

PHOTO A-2 LOWER TRENTON IMPOUNDMENT LOOKING DOWNSTREAM TOWARDS DAM

PHOTO A-3 LOWER SECTION OF TRENTON IMPOUNDMENT

PHOTO A-4 MIDDLE SECTION OF TRENTON IMPOUNDMENT

PHOTO A-5 MIDDLE SECTION OF TRENTON IMPOUNDMENT

PHOTO A-6 UPPER TRENTON IMPOUNDMENT DOWNSTREAM OF PROSPECT TAILRACE