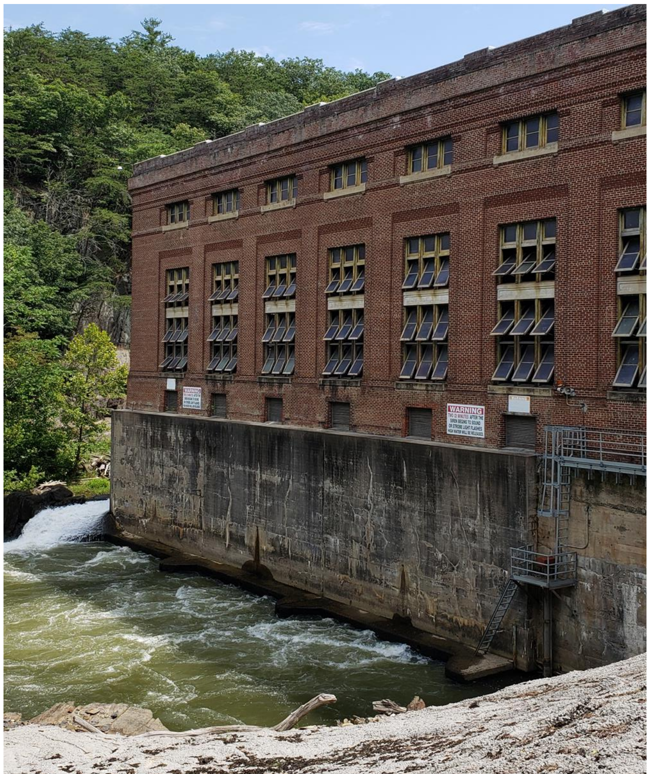

FINAL LICENSE APPLICATION

Volume III of V

Exhibit F – General Design Drawings
Exhibit G – Project Boundary Maps
Exhibit H – Plans and Ability to Operate

Byllesby-Buck Hydroelectric Project
(FERC No. 2514)

February 28, 2022

Prepared by:

HDR

Prepared for:

Appalachian Power Company

APPALACHIAN POWER
An AEP Company
BOUNDLESS ENERGY™

BYLLESBY-BUCK HYDROELECTRIC PROJECT
FERC PROJECT NO. 2514
FINAL LICENSE APPLICATION

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Acronyms and Abbreviations

AEP	American Electric Power
Appalachian or Licensee	Appalachian Power Company
Buck Development	Buck
Byllesby Development	Byllesby
CFR	Code of Federal Regulations
cfs	cubic feet per second
COC	Columbus Operations Center
CEII	Classified Energy/Electric Infrastructure Information
DLA	Draft License Application
DSM	demand-side management
EAP	Emergency Action Plan
EE	energy efficient
EIA	U.S. Energy Information Administration's
FERC or Commission	Federal Energy Regulatory Commission
FLA	Final License Application
IRP	Integrated Resources Plan
kV	kilovolt
MW	megawatts
MWh	megawatt-hours
NERC	North American Electric Reliability Corporation
PMF	Probable Maximum Flood
PFM	Potential Failure Mode
PFMA	Potential Failure Mode Analysis
PJM	Pennsylvania-New Jersey-Maryland Interconnection
Project	Byllesby-Buck Hydroelectric Project
SDR	Supporting Design Report
STID	Supporting Technical Information Document
VDCR	Virginia Department of Conservation and Recreation
Virginia Act	Virginia's recently enacted Grid Transformation and Security Act

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FINAL LICENSE APPLICATION

BYLLESBY-BUCK HYDROELECTRIC PROJECT (FERC NO. 2514)

EXHIBIT F

GENERAL DESIGN DRAWINGS

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Exhibit F - General Design Drawings (18 CFR §4.51(g))

F.1 List of General Design Drawings

The General Design Drawings show overall plan views, elevations, and sections of the Byllesby-Buck Hydroelectric Project (Project) works in sufficient detail to provide a complete understanding of the Project. In accordance with 18 Code of Federal Regulations (CFR) Part 388, Appalachian is requesting that the General Design Drawings for the Project be given privileged treatment because the drawings contain Critical Energy Infrastructure Information. This request for privileged treatment is being made to the Commission in accordance with the Final Rule (Order No. 630-A) issued by the Commission on July 23, 2003 (revised August 8, 2003). Therefore, in accordance with Order 630-A, the Exhibit F General Design Drawings listed below in Table F.1-1 are being filed under separate cover in Volume IV (Controlled Energy/Electric Infrastructure Information [CEII]) of this FLA.

Table F.1-1. Byllesby-Buck Project General Design Drawings

Drawing Number	Title
Sheet F-1	Byllesby Development Plan and Sections
Sheet F-2	Byllesby Development Sections
Sheet F-3	Buck Development Plan and Sections
Sheet F-4	Buck Development Plan and Elevation
Sheet F-5	Buck Development Spillway Plan and Elevation

F.2 Supporting Design Report

18 CFR §4.41(g)(3) requires that an applicant for a new license file with the Commission two copies of a Supporting Design Report (SDR) when the applicant files a license application. An SDR summarizes the studies that have been performed to date and the assumptions that have been made related to the development of the existing Project. The information contained within the SDR demonstrates that the existing structures are safe and adequate to fulfill their stated functions. In conjunction with filing this License Application, the SDR is being filed with the Commission in Volume IV (CEII).

Summary information is provided below for the public volume of this license application.

In 2002, FERC instituted a new program to be used in the context of the Part 12 Independent Consultant Safety Inspection Program entitled "Potential Failure Modes Analysis" (PFMA), which is a dam and project safety tool intended to broaden the scope of the safety evaluations to include potential failure scenarios that may have been overlooked in past investigations. A PFMA is an examination of PFMs for a dam or other water-retaining structure by a core team of qualified persons including subject-matter experts in all relevant aspects of dams and dam safety. The PFMA is intended to enhance understanding of the dam or other water-retaining structures by the owner, identify those ways in which a dam might potentially fail, review the existing surveillance and monitoring program in light of the developed PFMs, and evaluate measures to reduce the risk of failure mode initiation and progression.

In conjunction with these endeavors, FERC also initiated a requirement for development of a Supporting Technical Information Document (STID) for sites subject to Part 12D. The purpose of the STID is to summarize those Project elements and details that do not change significantly between 5-year FERC Part 12 independent consultant safety inspections. The STID includes sufficient information to understand the design and current engineering analyses for the Project such as:

- A complete copy of the PFMA report,
- A detailed description of the Project and Project works,
- A summary of the construction history of the Project,
- Summaries of Standard Operating Procedures,
- A description of geologic conditions affecting the Project works,
- A summary of hydrologic and hydraulic information,
- Summaries of instrumentation and surveillance for the Project and collected data,
- Summaries of stability and stress analyses for the Project works, and
- Pertinent correspondence from the FERC and state dam safety organizations related to dam safety.

The original PFMA sessions for both developments were conducted on April 21, 2004. The original PFMA report was reviewed as part of the 2009 and 2014 Part 12 Inspection. An addendum discussing 18 total PFMs and summarizing the 2014 review was prepared as part of the 2014 CSIR (Kleinschmidt 2014[1]) and incorporated as a supplement to Section 1.0 of the STID. In addition, the 2

[1] Kleinschmidt Associates. 2014. Seventh Part 12 Safety Inspection Report, September 2014.

014 review team made minor revisions to the text of the original PFMA report included in Section 1.0 of the STID (Kleinschmidt 2014).

The most recent Part 12D Inspection was conducted June 11-13, 2019. In conjunction with this 2019 Part 12D Inspection, representatives of GEI, the Owner / Licensee, and the FERC reviewed the PFMA reports and 18 Potential Failure Modes (PFMs) identified during the original 2004 PFMA and 2014 PFMA reviews, considering additional information and studies available since 2014.

The recent PFMA review report was developed in conjunction with the 2020 FERC Part 12D Independent Consultant safety inspection of the Project and it follows the guidance provided in Chapter 14 of the *FERC's Engineering Guidelines for the Evaluation of Hydropower Projects* (*FERC Engineering Guidelines*), last updated May 8, 2017 (Revision 3) and additional guidance developed as the FERC PFMA process has evolved since its initiation. The PFMA review reports are intended to be serve as addendums and are complementary to the initial 2004 PFMA report. Subsequent PFMA reviews are added to the Project's STID to document updated PFM reviews.

The Licensee includes the filing dates with the Commission of the most recent Part 12 Safety Inspection Report, the PFMA Review Memo, and the revised STID (which includes the PFMA Report) in Table F.2-1.

Table F.2-1. Filing Dates for the Most recent Part 12 Safety Inspection Report, PFMA Report, and STID

Document	Commission Filing Date (Byllesby)	Commission Filing Date (Buck)
PFMA Review Memo	September 30, 2019	September 30, 2019
8th Part 12 Safety Inspection Report	September 30, 2019	September 30, 2019
Updated STID	December, 2014	November, 2014

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FINAL LICENSE APPLICATION

BYLLESBY-BUCK HYDROELECTRIC PROJECT (FERC NO. 2514)

EXHIBIT G

PROJECT BOUNDARY MAPS

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Exhibit G - Project Maps (18 CFR §4.51(h)

G.1 Overview

The existing Exhibit G Project Boundary Maps, prepared in accordance with the requirements of 18 CFR §§4.39 and 4.51(h), are attached hereto and incorporated herein. The Project Boundary Maps show the Project vicinity, location, and boundary in sufficient detail to provide a full understanding of the Project and are listed in Table G.1-1. Electronic files are required by Sections 4.39 and 4.41(h) of the Commission's regulations and are being filed with FERC as part of this FLA.

Table G.1-1. Byllesby-Buck Project Boundary Drawings

Drawing Number	Title
Exhibit G – Sheet 1 of 5	Boundary Map
Exhibit G – Sheet 2 of 5	Boundary Map
Exhibit G – Sheet 3 of 5	Boundary Map
Exhibit G – Sheet 4 of 5	Boundary Map
Exhibit G – Sheet 5 of 5	Boundary Map

G.2 Project Boundary Modifications

Corrections to the Project Boundary occurred during the development of these maps to correct conflicts found between the previously FERC-approved Exhibit G drawings and the associated boundary description. Appalachian possesses property or easement rights to all areas within the defined Project Boundary presented in this Exhibit.

Appalachian proposes to revise the Project Boundary to enclose the existing Project facilities listed below that Appalachian understands will be considered by the Commission to be part of the licensed Project:

- The Byllesby switchyard and control house. Since constructed in 1911-1912, the Byllesby and Buck developments have been connected to a single transformer station/switchyard located at the large "control house" building near the Byllesby powerhouse. Project power connects to AEP's 69 kilovolt (kV) distribution system at the single generator step-up transformer located within the Byllesby switchyard (also known as the Byllesby 69 kV substation). The GSU is connected to the single 13.2 kV bus located within the Byllesby control house. The control house is located southwest of the Byllesby auxiliary spillway and several hundred feet back from the river. It is a two-level, rectangular, steel-framed, brick-walled building, surrounded by transformers and other appurtenant equipment. The building's interior contains offices, a maintenance area, and control rooms.

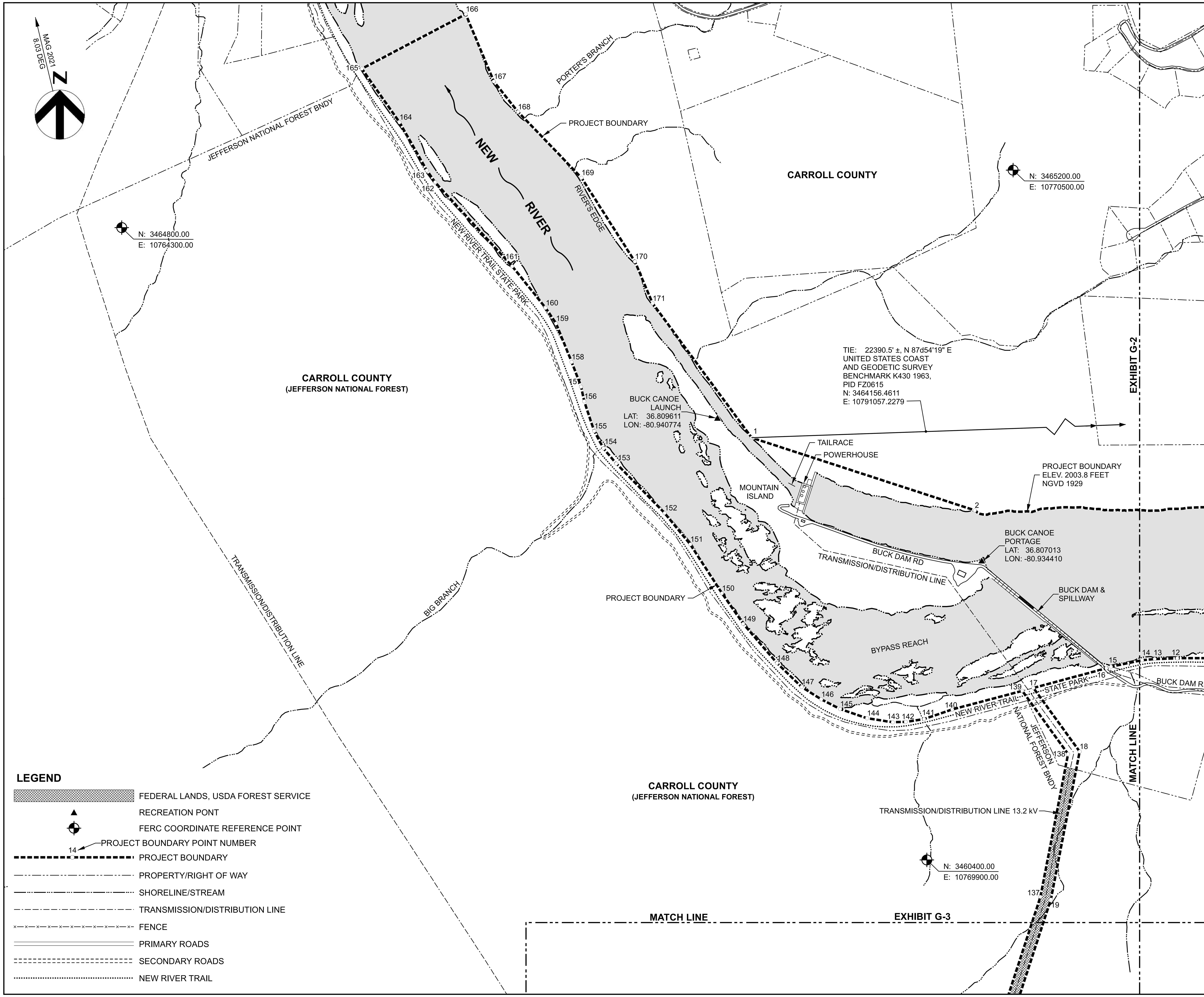
- The two approximately 2-mile-long overhead 13.2 kV lines (Byllesby Buck #1 and Byllesby Buck #2, and associated right-of-way) that start at the 13.2 kV bus within the Buck powerhouse, cross the New River near the Buck spillway, and extend to the 13.2 kV bus within the Byllesby control house. In the past license application and Exhibit A, these lines were referred to as the "13.2 kV Byllesby/Ivanhoe" lines and treated as part of AEP's distribution system. Appalachian believes that these lines should now be considered "primary lines" within the meaning of Section 3(11) of the Federal Power Act.

G.3 Federal Lands Within Project Boundary

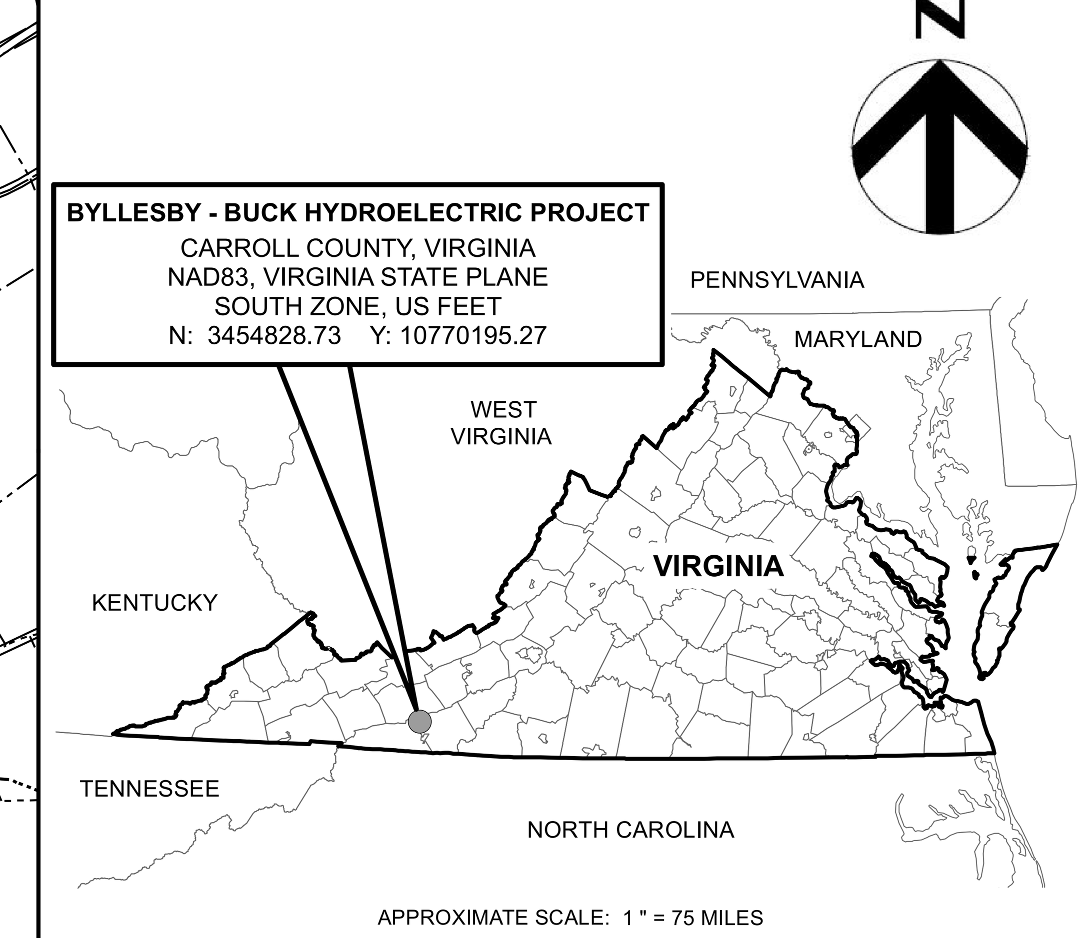
A majority of the land to the west of the Project is owned by the U.S. Forest Service and consists of the George Washington and Jefferson National Forest. The Mount Rogers National Recreation Area, a unit within the Jefferson National Forest and created in 1966, borders the Project to the west. These lands include approximately 100 acres of former Project lands that were transferred by Appalachian to the U.S. Forest Service in 1984, and subsequently removed from the Project boundary, as authorized by FERC order dated December 18, 1984.

The transmission corridor crosses 7.23 acres of federal lands (Jefferson National Forest). Appalachian understands these lands to be held in easement as the corridor pre-dates the Jefferson National Forest.

Based on publicly available parcel data, other areas of the Project Boundary overlap with the proclamation boundary of the Jefferson National Forest, but these lands are not federally held or subject to provisions of the Federal Power Act for licensing projects on federal lands (see 54 FERC ¶61,132 [1991]).



PROJECT LOCATION MAP



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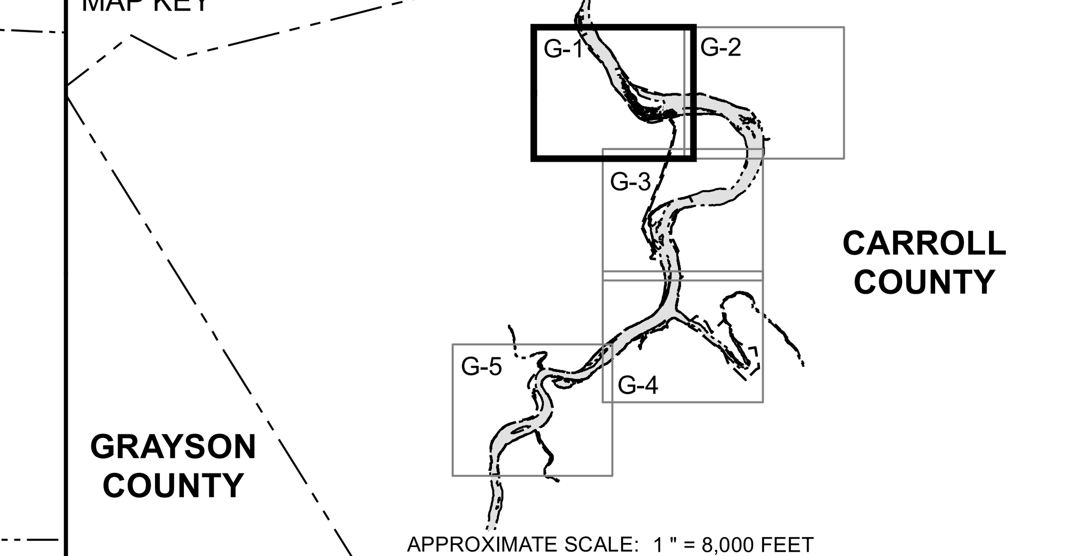


PROJECT BOUNDARY TIE DATA

THE PROJECT BOUNDARY IS TIED TO CARROLL COUNTY NATIONAL GEODETIC SURVEY BENCHMARK K430, 1963, PID FZ0615: N: 3464156.4611 E: 10791057.2279
TIE POINT 1: 22390.5' ±, N 87d54'19" E

REFERENCE COORDINATE METADATA

PROJECTION - VIRGINIA STATE PLANE
DATUM - NAD83, SOUTH ZONE
UNITS - U.S. SURVEY FEET

ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1929, NGVD29.

GEOREFERENCE SOURCE DATA

DIGITIZED DATA:
VIRGINIA GEOGRAPHIC INFORMAITON NETWORK (VGIN) LIDAR POINT CLOUD (LPC),
https://vgin.maps.arcgis.com/home/index.html
REPORTED ACCURACY: EXPECTED TO EXCEED 3DEP, USGS QL2 OR BETTER.

LIDAR ELEVATION DATA: VIRGINIA GEOGRAPHIC INFORMAITON NETWORK (VGIN) LIDAR POINT CLOUD (LPC), 2017 NRCS AND FEMA SOUTH CENTRAL VA AND WV LIDAR. EXPECTED TO MEET USGS 3DEP, QL2 OR BETTER QUALITY LIDAR DATA WITH USGS BASE SPEC V1.2 PRODUCTS.

PROPERTY DATA: VIRGINIA GIS CLEARINGHOUSE
ADDITIONAL DATA: VIRGINIA GEOGRAPHIC INFORMAITON NETWORK (VGIN)
BOUNDARY DATA: FERC EXHIBT G, BYLLESBY / BUCK HYDROELECTRIC PROJECT PROJECT AREA & BOUNDARY MAP, 2514-003-17, NOVEMBER 4 1991

NOTES

1. THE LICENSEE EITHER OWNS IN SIMPLE FEE OR POSSESSES FLOWAGE EASEMENTS OVER ALL LANDS WITHIN THE PROJECT BOUNDARY REQUIRED TO OPERATE THE FACILITY.
2. SEE EXHIBIT G-6 FOR PROJECT BOUNDARY TABLES.

SURVEYORS STATEMENT

I HEREBY CERTIFY TO THE FEDERAL ENERGY REGULATORY COMMISSION (FERC) THAT THIS PLAN MEETS THE CONDITIONS SET FORTH BY FERC FOR ITS EXPRESSED PURPOSE. THE PURPOSE OF THIS MAP IS TO PROVIDE A GEOREFERENCED VISUAL DEPICTION OF THE LOCATION OF PROJECT FEATURES AND BOUNDARIES BASED ON THE BEST AVAILABLE HISTORICAL DRAWINGS AND DIGITAL REFERENCE SOURCES INCORPORATED INTO THE GEOGRAPHIC INFORMATION SYSTEM (GIS). LOCATIONS HAVE NOT BEEN VERIFIED BY PHYSICAL FIELD SURVEYS AND THIS DRAWING SHOULD NOT BE USED FOR PURPOSES OF DEVELOPING PROPERTY BOUNDARY DESCRIPTIONS.

STATE OF MAINE
STEPHEN W. EVERETT 2161
PROFESSIONAL LAND SURVEYOR

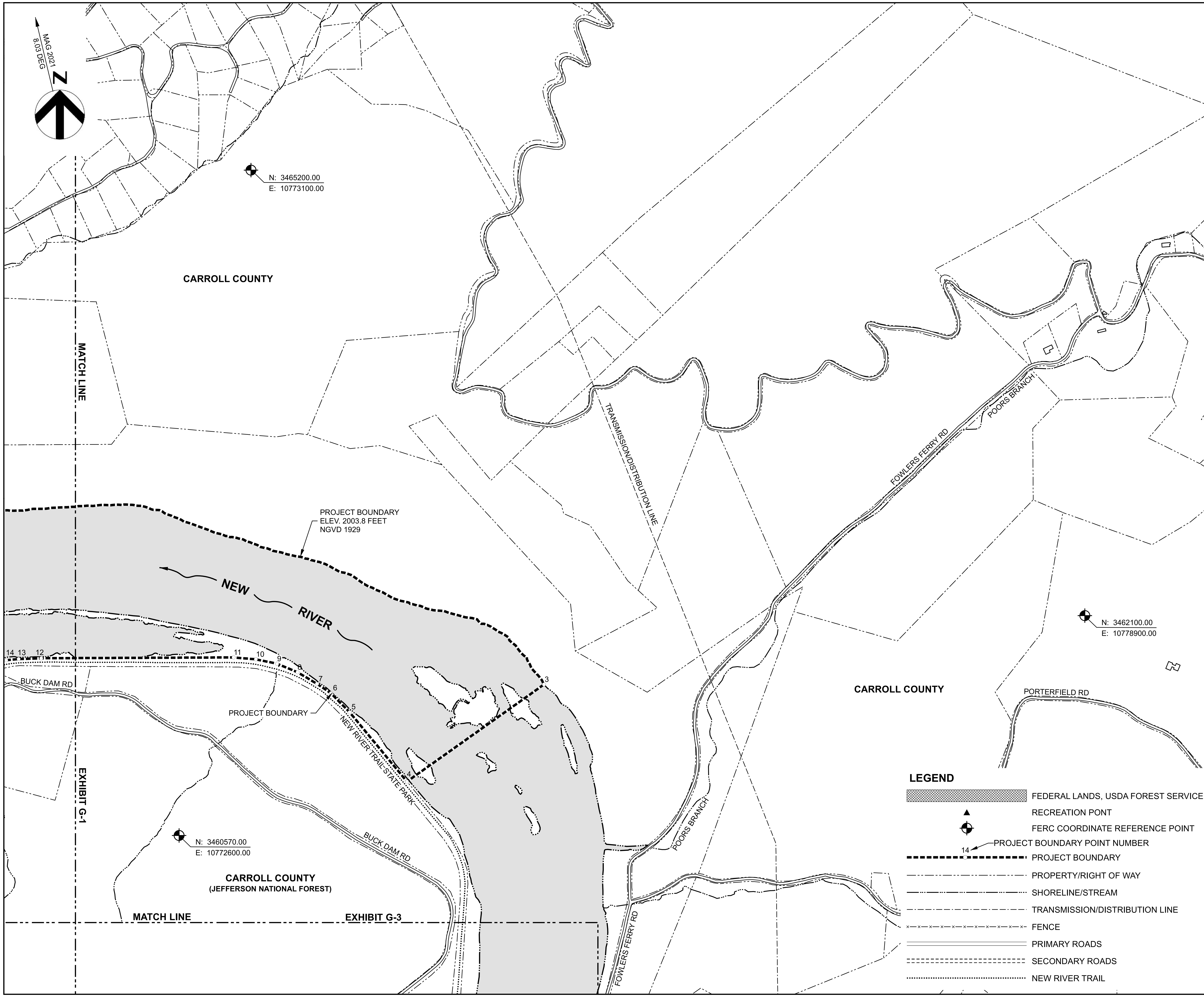
EXHIBIT G-1 **SHEET 1 OF 6**

BYLLESBY - BUCK HYDROELECTRIC PROJECT
VIRGINIA
BOUNDARY MAP

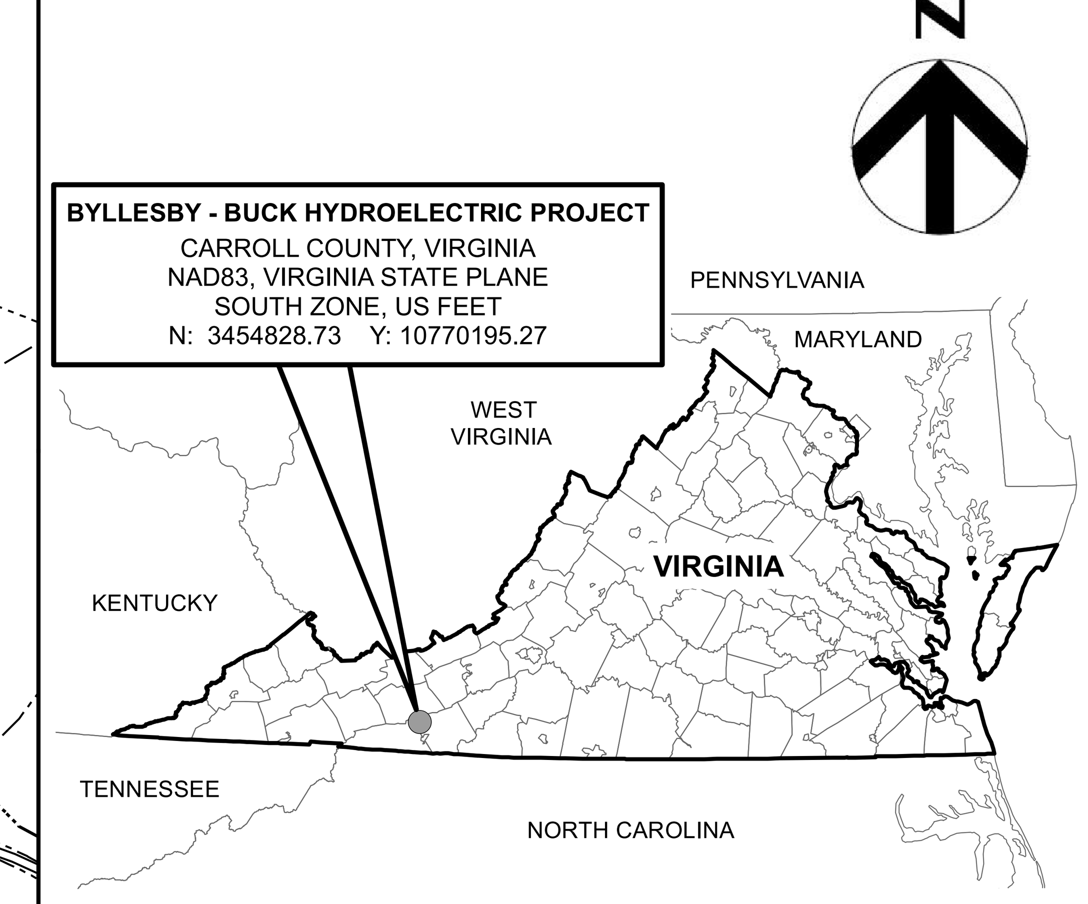
300 200 100 0 300 600 900 1,200

APPALACHIAN POWER COMPANY **FERC No. 2514**

DATE: FEBRUARY 2022	SCALE: 1 " = 300 '	APPROVED: PENDING



PROJECT LOCATION MAP



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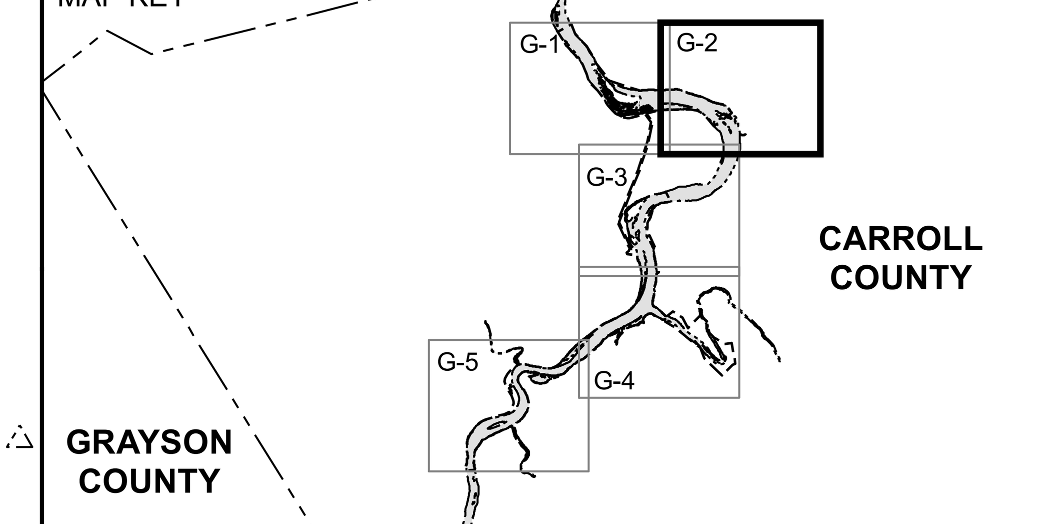

APPROXIMATE SCALE: 1 " = 8,000 FEET

PROJECT BOUNDARY TIE DATA

THE PROJECT BOUNDARY IS TIED TO CARROLL COUNTY NATIONAL GEODETIC SURVEY BENCHMARK K430, 1963, PID FZ0615: N: 3464156.4611 E: 10791057.2279
TIE POINT 1: 22390.5' ±, N 87d54'19" E

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DATUM - NAD83, SOUTH ZONE
UNITS - U.S. SURVEY FEET

ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1929, NGVD29.

GEOREFERENCE SOURCE DATA

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STATE OF MAINE
STEPHEN W. EVERETT 2161
PROFESSIONAL LAND SURVEYOR

EXHIBIT G-2 **SHEET 2 OF 6**

BYLLESBY - BUCK HYDROELECTRIC PROJECT
VIRGINIA
BOUNDARY MAP

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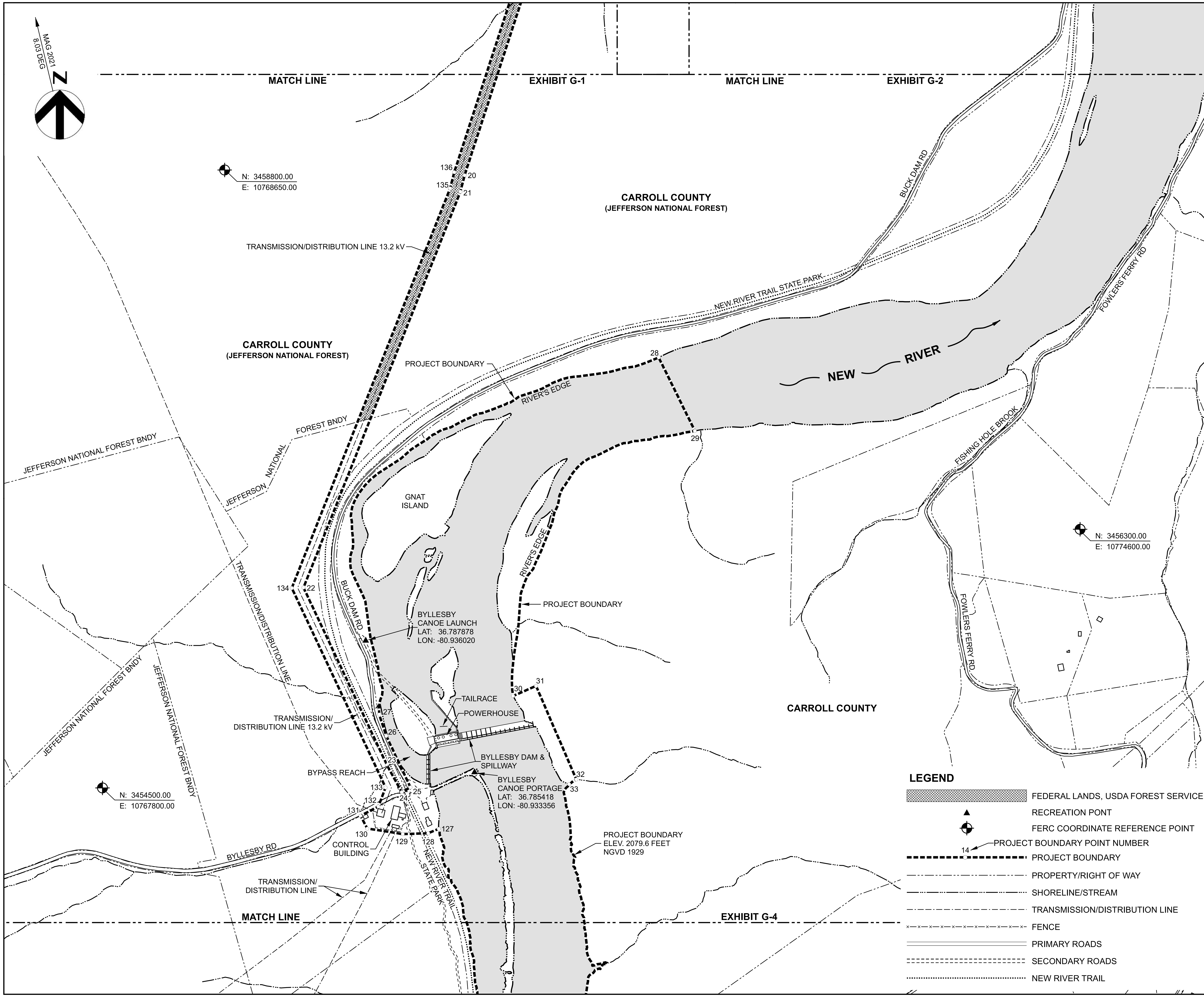
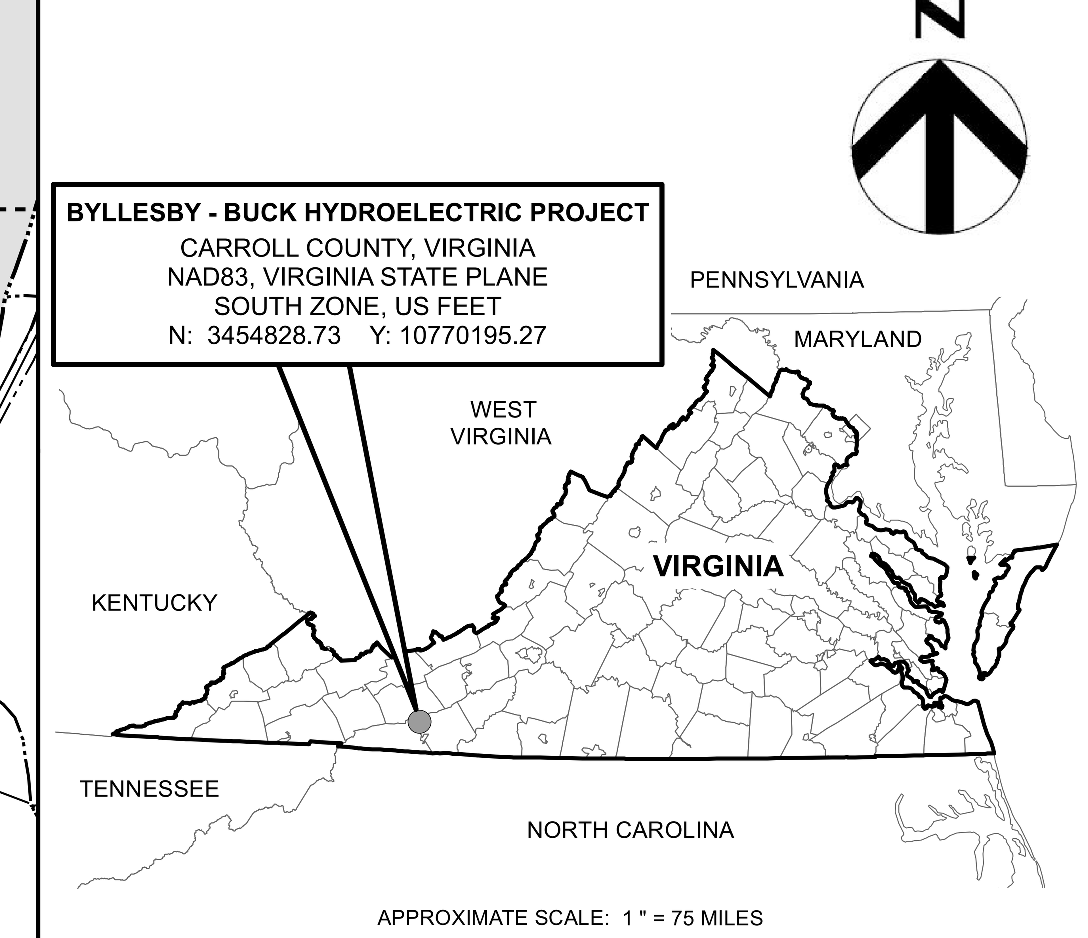
APPALACHIAN POWER COMPANY **FERC No. 2514**

DATE: FEBRUARY 2022	SCALE: 1 " = 300 '	APPROVED: PENDING



PROJECT LOCATION MAP



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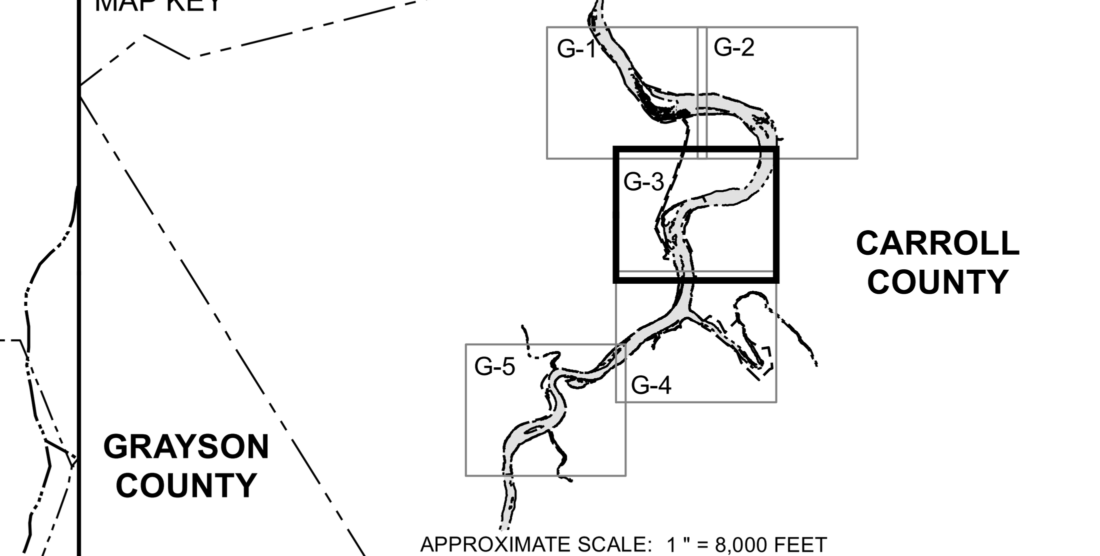

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STATE OF MAINE
STEPHEN W. EVERETT
2161
PROFESSIONAL LAND SURVEYOR

EXHIBIT G-3 **SHEET 3 OF 6**

BYLLESBY - BUCK HYDROELECTRIC PROJECT
VIRGINIA
BOUNDARY MAP

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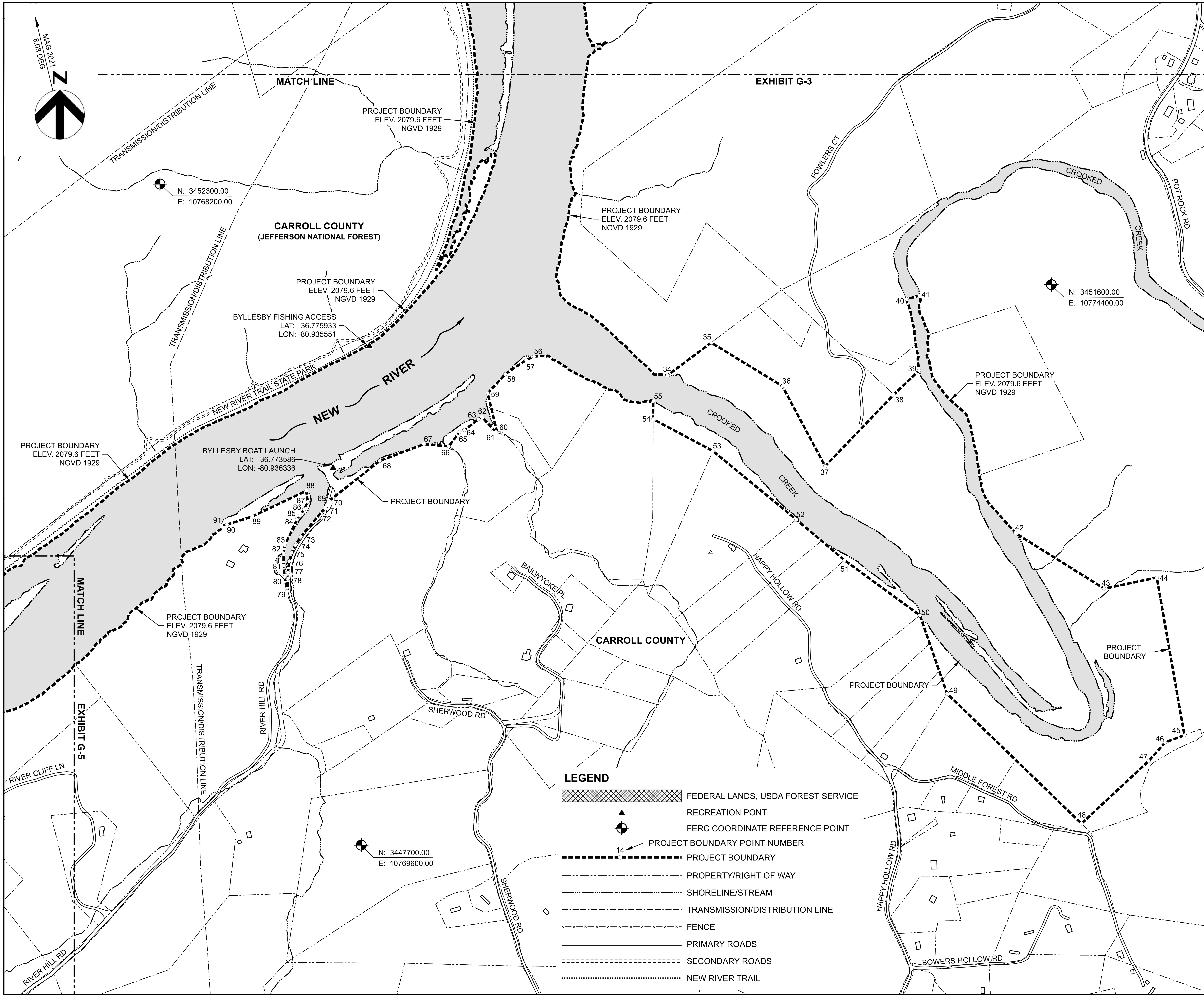
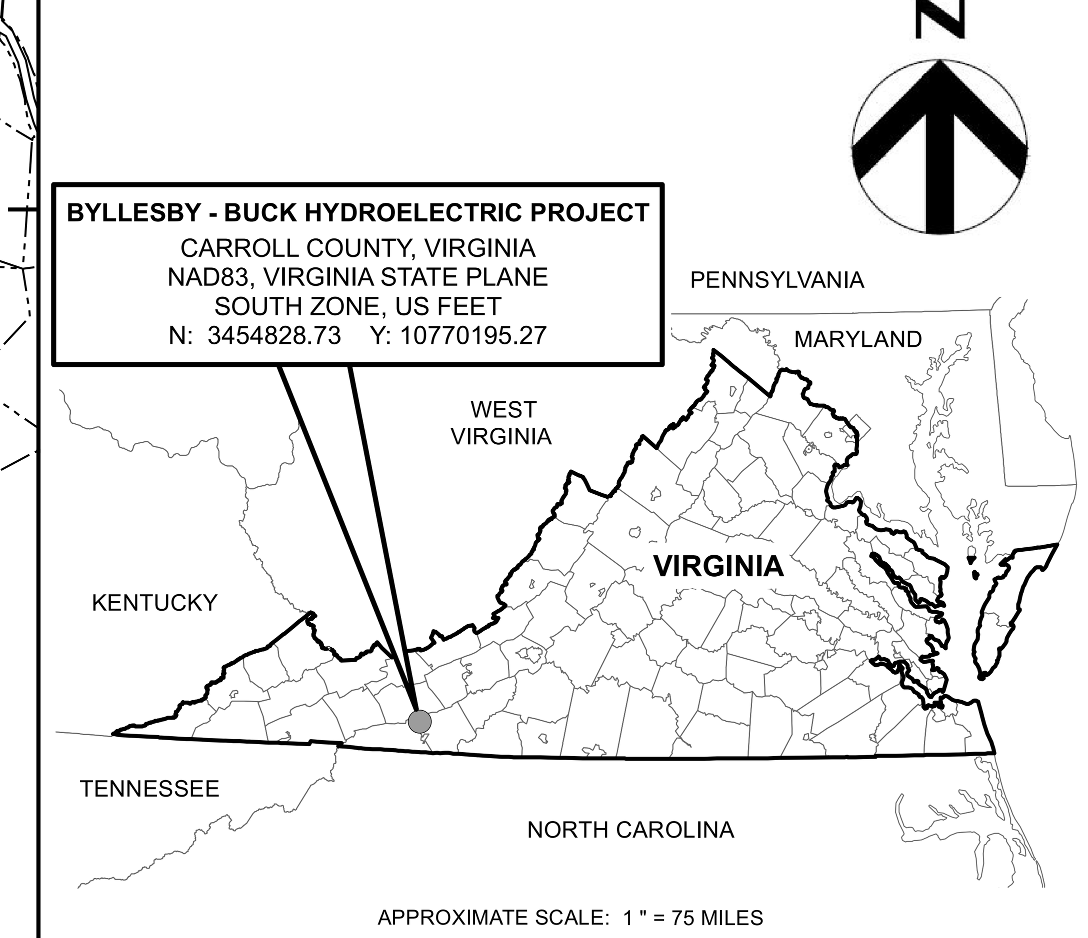
APPALACHIAN POWER COMPANY **FERC No. 2514**

DATE: FEBRUARY 2022	SCALE: 1 " = 300 '	APPROVED: PENDING



PROJECT LOCATION MAP



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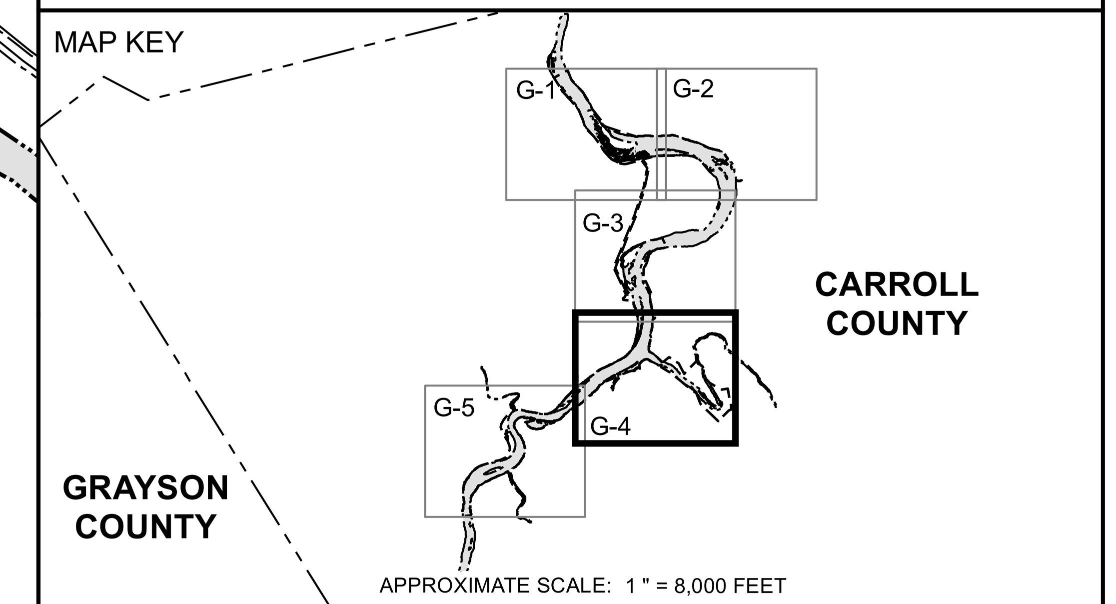

PROJECT BOUNDARY TIE DATA

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DATUM - NAD83, SOUTH ZONE
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STATE OF MAINE
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2161
PROFESSIONAL LAND SURVEYOR

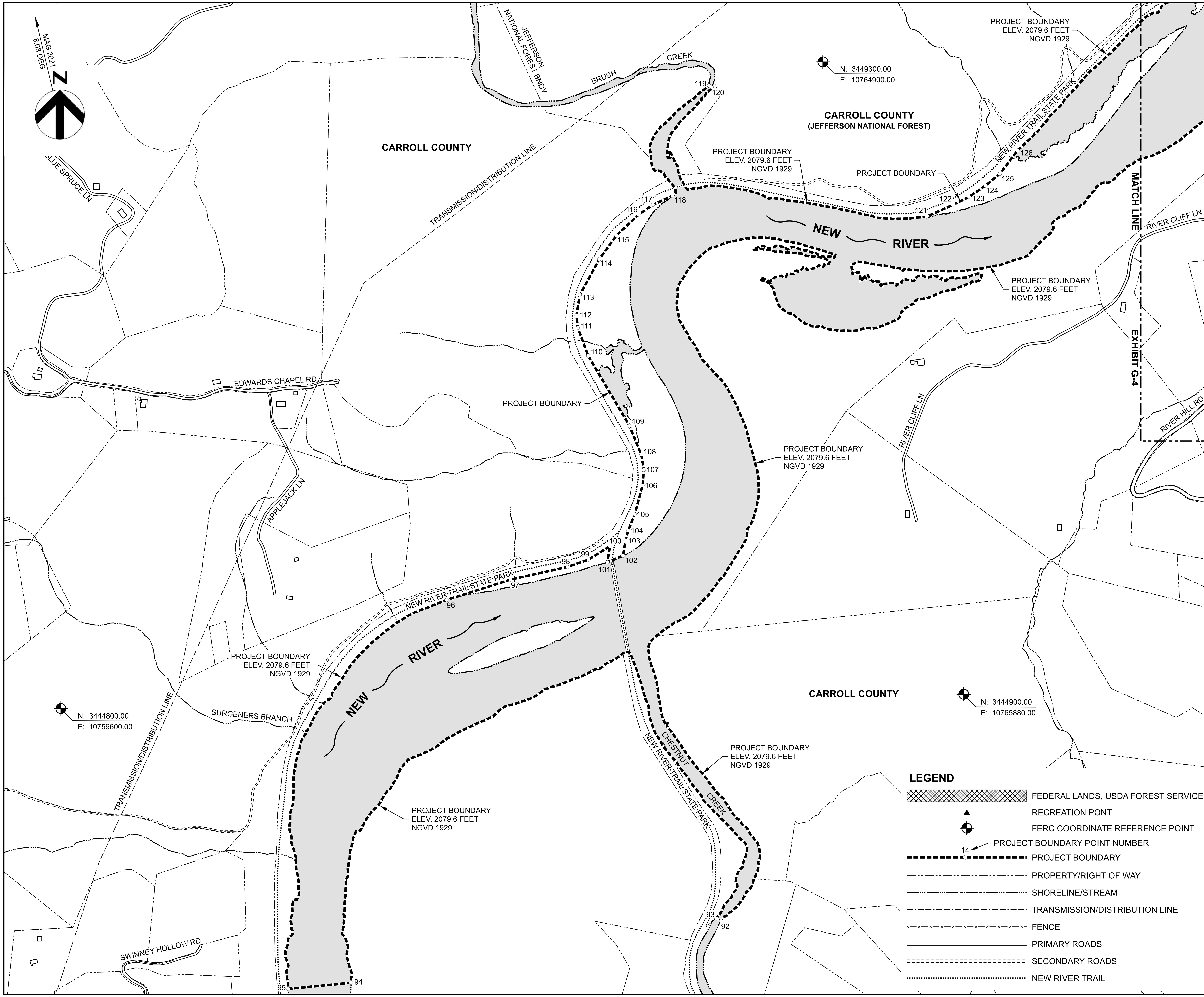
EXHIBIT G-4 **SHEET 4 OF 6**

BYLLESBY - BUCK HYDROELECTRIC PROJECT
VIRGINIA
BOUNDARY MAP

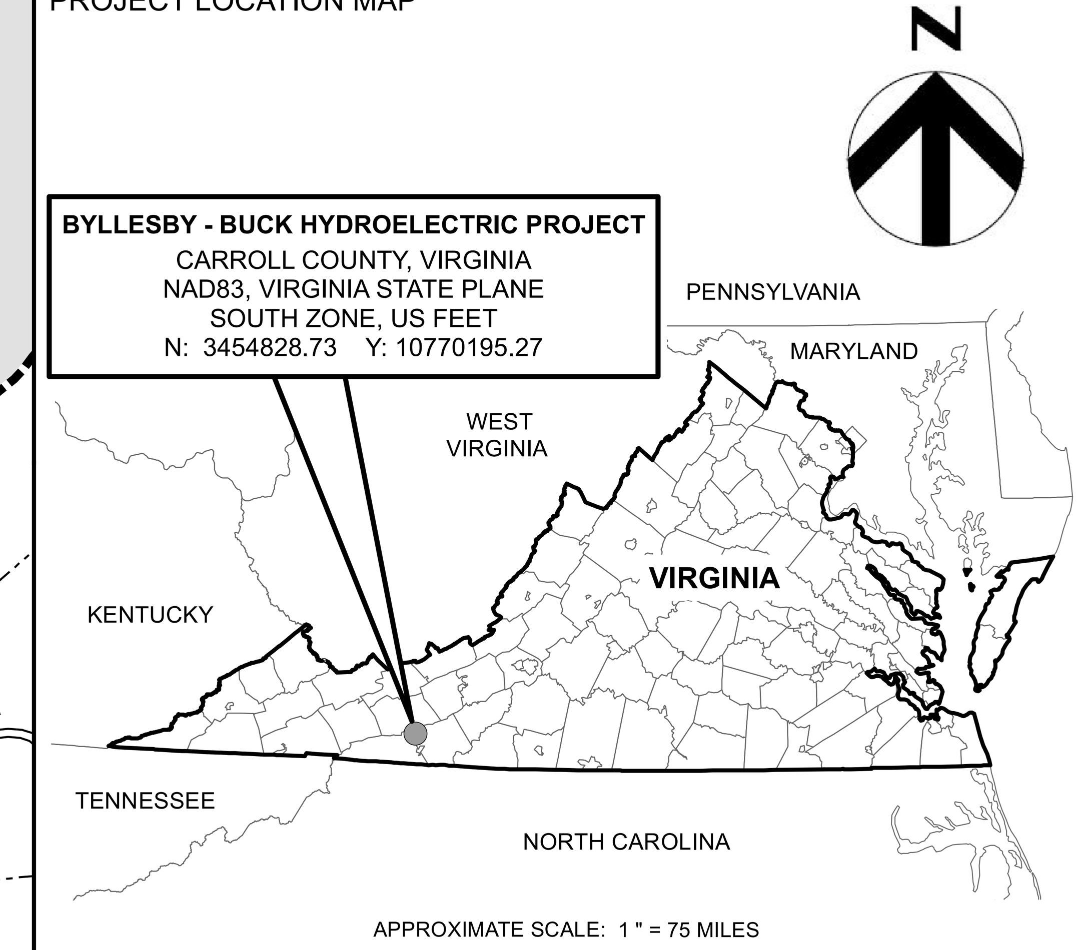
300 200 100 0 300 600 900 1,200

APPALACHIAN POWER COMPANY **FERC No. 2514**

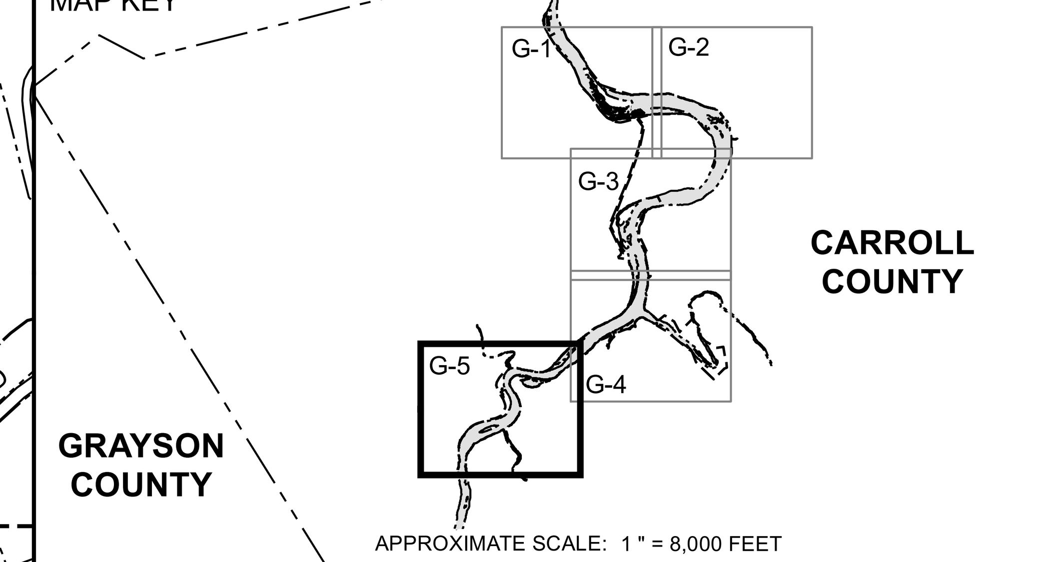
DATE: FEBRUARY 2022	SCALE: 1 " = 300 '	APPROVED: PENDING



PROJECT LOCATION MAP



MAP KEY



PROJECT BOUNDARY TIE DATA

THE PROJECT BOUNDARY IS TIED TO CARROLL COUNTY NATIONAL GEODETIC SURVEY BENCHMARK K430, 1963, PID FZ0615: N: 3464156.4611 E: 10791057.2279
TIE POINT 1: 22390.5' ±, N 87d54'19" E

REFERENCE COORDINATE METADATA

PROJECTION - VIRGINIA STATE PLANE
DATUM - NAD83, SOUTH ZONE
UNITS - U.S. SURVEY FEET

ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1929, NGVD29.

GEOREFERENCE SOURCE DATA

DIGITIZED DATA:
VIRGINIA GEOGRAPHIC INFORMAITON NETWORK (VGIN) LIDAR POINT CLOUD (LPC), https://vgin.maps.arcgis.com/home/index.html
REPORTED ACCURACY: EXPECTED TO EXCEED 3DEP, USGS QL2 OR BETTER.

LIDAR ELEVATION DATA: VIRGINIA GEOGRAPHIC INFORMAITON NETWORK (VGIN) LIDAR POINT CLOUD (LPC), 2017 NRCS AND FEMA SOUTH CENTRAL VA AND WV LIDAR. EXPECTED TO MEET USGS 3DEP, QL2 OR BETTER QUALITY LIDAR DATA WITH USGS BASE SPEC V1.2 PRODUCTS.

PROPERTY DATA: VIRGINIA GIS CLEARINGHOUSE
ADDITIONAL DATA: VIRGINIA GEOGRAPHIC INFORMAITON NETWORK (VGIN)
BOUNDARY DATA: FERC EXHIBT G, BYLLESBY / BUCK HYDROELECTRIC PROJECT PROJECT AREA & BOUNDARY MAP, 2514-003-17, NOVEMBER 4 1991

NOTES

1. THE LICENSEE EITHER OWNS IN SIMPLE FEE OR POSSESSES FLOWAGE EASEMENTS OVER ALL LANDS WITHIN THE PROJECT BOUNDARY REQUIRED TO OPERATE THE FACILITY.
2. SEE EXHIBIT G-6 FOR PROJECT BOUNDARY TABLES.

SURVEYORS STATEMENT

I HEREBY CERTIFY TO THE FEDERAL ENERGY REGULATORY COMMISSION (FERC) THAT THIS PLAN MEETS THE CONDITIONS SET FORTH BY FERC FOR ITS EXPRESSED PURPOSE. THE PURPOSE OF THIS MAP IS TO PROVIDE A GEOREFERENCED VISUAL DEPICTION OF THE LOCATION OF PROJECT FEATURES AND BOUNDARIES BASED ON THE BEST AVAILABLE HISTORICAL DRAWINGS AND DIGITAL REFERENCE SOURCES INCORPORATED INTO THE GEOGRAPHIC INFORMATION SYSTEM (GIS). LOCATIONS HAVE NOT BEEN VERIFIED BY PHYSICAL FIELD SURVEYS AND THIS DRAWING SHOULD NOT BE USED FOR PURPOSES OF DEVELOPING PROPERTY BOUNDARY DESCRIPTIONS.

STATE OF MAINE
STEPHEN W. EVERETT
2161
PROFESSIONAL LAND SURVEYOR

EXHIBIT G-5 | **SHEET 5 OF 6**

BYLLESBY - BUCK HYDROELECTRIC PROJECT VIRGINIA BOUNDARY MAP

300 200 100 0 300 600 900 1,200

APPALACHIAN POWER COMPANY **FERC No. 2514**

DATE: FEBRUARY 2022	SCALE: 1 " = 300 '	APPROVED: PENDING

PROJECT BOUNDARY

POINT	COURSE	DISTANCE (FT)
1-2	S 71d58'0.00" E	1632.35
2-3	ALONG 2003.8 CONTOUR	5308.19
3-4	S 54d39'40.30" W	1168.00
4-5	N 39d33'16.59" W	625.96
5-6	N 44d34'54.50" W	185.72
6-7	N 55d47'3.70" W	115.92
7-8	N 59d23'36.74" W	158.14
8-9	N 67d16'13.01" W	153.81
9-10	N 78d15'41.03" W	150.77
10-11	N 85d3'39.06" W	155.86
11-12	S 89d45'13.52" W	1338.12
12-13	S 87d54'16.94" W	157.30
13-14	S 84d55'13.39" W	86.61
14-15	S 78d20'24.66" W	221.53
15-16	S 70d19'53.34" W	34.08
16-17	S 74d56'39.72" W	526.15
17-18	S 35d58'5.13" E	547.70
18-19	S 11d0'51.36" W	1048.47
19-20	S 18d3'22.67" W	1432.12
20-21	S 14d14'46.36" W	117.72
21-22	S 21d36'22.76" W	2963.74
22-23	S 25d10'21.52" E	1364.41
23-24	S 28d28'6.22" E	214.25
24-25	N 61d27'8.86" E	69.94
25-26	N 25d12'4.13" W	394.32
26-27	N 18d26'5.82" W	157.63
27-28	ALONG RIVERBANK	3932.04
28-29	S 26d13'54.30" E	569.94
29-30	ALONG RIVERBANK	2560.84
30-31	N 66d42'0.00" E	174.44
31-32	S 23d18'0.00" E	707.75
32-33	S 56d38'1.59" W	60.37
33-34	ALONG 2079.6 CONTOUR	4337.00
34-35	N 53d7'53.55" E	381.16
35-36	S 58d35'28.09" E	579.79
36-37	S 28d6'49.20" E	632.18
37-38	N 43d46'39.23" E	690.33
38-39	N 46d18'38.86" E	243.43
39-40	ALONG 2079.6 CONTOUR	510.03
40-41	N 73d57'48.53" E	91.83
41-42	ALONG 2079.6 CONTOUR	1876.81
42-43	S 57d58'23.04" E	729.81
43-44	N 78d7'31.65" E	374.24
44-45	S 9d54'39.17" E	1113.28
45-46	S 69d16'11.32" W	143.14
46-47	S 41d32'1.26" W	172.28
47-48	S 47d0'57.79" W	639.33
48-49	N 45d56'28.32" W	1300.38
49-50	N 19d8'54.74" W	577.23
50-51	N 53d50'14.81" W	649.99
51-52	N 49d50'52.85" W	438.22
52-53	N 50d32'45.02" W	751.51
53-54	N 62d0'5.40" W	470.57
54-55	N 0d22'48.83" E	126.63
55-56	ALONG 2079.6 CONTOUR	947.01
56-57	N 66d24'52.43" E	60.55
57-58	S 55d35'29.40" W	174.99

CONTINUED

POINT	COURSE	DISTANCE (FT)
58-59	S 42d46'49.26" W	180.53
59-60	S 13d27'54.57" E	281.73
60-61	N 69d46'31.27" W	8.79
61-62	N 42d44'59.46" W	142.86
62-63	S 58d11'1.86" W	30.18
63-64	S 52d20'18.60" W	122.17
64-65	S 70d20'48.03" W	35.48
65-66	S 36d33'57.42" W	126.07
66-67	N 84d50'42.12" W	173.46
67-68	S 69d13'47.51" W	328.52
68-69	S 51d41'-33.17" W	450.37
69-70	S 21d40'7.54" W	12.00
70-71	S 28d58'20.09" W	20.00
71-72	S 34d16'27.30" W	25.00
72-73	S 40d5'35.80" W	260.00
73-74	S 32d54'35.07" W	70.00
74-75	S 25d22'56.63" W	60.00
75-76	S 16d44'33.87" W	60.00
76-77	S 6d17'30.93" W	80.00
77-78	S 2d41'49.30" E	40.00
78-79	S 5d0'3.38" W	90.42
79-80	N 9d52'46.93" W	100.72
80-81	N 4d53'56.78" W	79.60
81-82	N 0d0'0.00" W	86.10
82-83	N 9d5'24.67" E	57.36
83-84	N 25d22'36.66" E	195.62
84-85	N 36d52'11.63" E	33.99
85-86	N 33d1'26.03" E	54.05
86-87	N 25d33'35.51" E	57.77
87-88	N 7d23'28.53" W	77.00
88-89	S 64d35'2.58" W	415.50
89-90	S 72d13'43.49" W	185.59
90-91	S 81d9'44.29" W	38.49
91-92	ALONG 2079.6 CONTOUR	15897.24
92-93	N 62d47'52.45" W	37.27
93-94	ALONG 2079.6 CONTOUR	5677.64
94-95	S 84d29'59.23" W	439.25
95-96	ALONG 2079.6 CONTOUR	3294.02
96-97	N 72d19'54.37" E	467.30
97-98	N 77d24'23.99" E	404.98
98-99	N 71d1'46.64" E	154.89
99-100	N 57d44'9.45" E	176.80
100-101	S 9d21'5.30" W	113.60
101-102	N 67d36'44.04" E	118.20
102-103	N 9d9'47.23" E	108.55
103-104	N 14d55'52.92" E	70.66
104-105	N 21d48'5.07" E	122.55
105-106	N 15d15'18.57" E	207.58
106-107	N 4d45'48.75" E	109.61
107-108	N 9d51'56.82" W	106.25
108-109	N 22d14'56.39" W	216.37
109-110	N 30d29'20.24" W	565.15
110-111	N 20d24'35.38" W	208.82
111-112	N 6d0'32.75" W	86.96
112-113	N 9d9'44.51" E	142.92
113-114	N 28d36'37.65" E	285.15
114-115	N 35d50'15.49" E	202.12

CONTINUED

POINT	COURSE	DISTANCE (FT)
115-116	N 46d44'8.63" E	212.51
116-117	N 55d42'47.05" E	121.19
117-118	N 64d48'44.12" E	150.82
118-119	ALONG 2079.6 CONTOUR	1045.26
119-120	S 56d49'8.16" E	22.48
120-121	ALONG 2079.6 CONTOUR	2695.54
121-122	N 65d59'7.00" E	207.37
122-123	N 63d26'5.82" E	119.68
123-124	N 55d37'10.65" E	136.91
124-125	N 50d31'39.26" E	130.97
125-126	N 37d9'57.17" E	203.12
126-127	ALONG 2079.6 CONTOUR	9769.53
127-128	S 67d4'23.66" W	79.73
128-129	S 88d11'52.32" W	177.09
129-130	N 81d6'46.14" W	250.00
130-131	N 27d32'51.86" W	100.00
131-132	N 62d27'8.14" E	140.00
132-133	N 20d39'59.05" E	141.25
133-134	N 25d10'21.52" W	1533.98
134-135	N 21d36'20.36" E	2991.12
135-136	N 14d14'46.36" E	115.79
136-137	N 18d3'23.79" E	1429.53
137-138	N 10d57'35.12" E	1012.58
138-139	N 35d58'0.94" W	542.34
139-140	S 75d10'48.78" W	503.89
140-141	S 71d4'31.01" W	206.81
141-142	S 81d20'51.04" W	130.04
142-143	S 88d12'36.46" W	89.47
143-144	N 81d7'9.58" W	181.03
144-145	N 71d3'12.62" W	197.97
145-146	N 62d56'58.09" W	147.48
146-147	N 57d40'49.27" W	162.04
147-148	N 45d57'17.35" W	237.16
148-149	N 40d36'4.60" W	360.72
149-150	N 34d53'26.58" W	258.94
150-151	N 32d55'28.98" W	406.19
151-152	N 39d22'9.64" W	281.97
152-153	N 44d17'33.61" W	480.24
153-154	N 40d6'3.31" W	138.84
154-155	N 28d10'2.30" W	136.28
155-156	N 18d39'2.14" W	218.31
156-157	N 11d55'46.89" W	104.82
157-158	N 20d56"3.97" W	184.16
158-159	N 22d3'0.89" W	288.88
159-160	N 33d52'8.86" W	130.32
160-161	N 38d43'18.48" W	370.47
161-162	N 42d31'17.49" W	794.07
162-163	N 34d54'46.60" W	100.41
163-164	N 29d35'46.89" W	384.92
164-165	N 35d4'47.00" W	455.75
165-166	N 62d17'55.23" E	815.84
166-167	S 22d42'18.35" E	506.86
167-168	S 38d26'29.73" E	270.55
168-169	S 43d54'31.25" E	636.14
169-170	S 32d30'53.91" E	691.79
170-171	S 22d55'27.85" E	316.21
171-1	S 36d24'42.24" E	1161.53

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DATUM - NAD83, SOUTH ZONE
UNITS - U.S. SURVEY FEET

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STATE OF MAINE
STEPHEN W. EVERETT
2161
PROFESSIONAL LAND SURVEYOR

EXHIBIT G-6		SHEET 6 OF 6
BYLLESBY - BUCK HYDROELECTRIC PROJECT VIRGINIA BOUNDARY MAP		
APPALACHIAN POWER COMPANY		FERC No. 2514
DATE: FEBRUARY 2022	SCALE: 1 " = 300 '	APPROVED: PENDING

FERC NO. P-2514 - XXXX

Final License Application

Byllesby-Buck Hydroelectric Project (FERC No. 2514)

Exhibit H

PLANS AND ABILITY OF THE APPLICANT TO OPERATE THE PROJECT

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Exhibit H - Plans and Ability of the Applicant to Operate the Project (18 CFR §5.18(c))

H.1 Licensee's Ability to Provide Efficient and Reliable Electric Service

As a result of the Electric Consumers Protection Act passed by Congress in 1986, the Federal Energy Regulatory Commission (FERC) requires that all existing licensees applying for a new license provide the information as described in the sections that follow.

H.1.1 Future Energy

Appalachian Power Company (Appalachian) has 1 million customers in Virginia, West Virginia and Tennessee. It is part of American Electric Power (AEP), which is focused on building a smarter energy infrastructure and delivering new technologies and custom energy solutions. AEP's more than 18,000 employees operate and maintain the nation's largest electricity transmission system and more than 219,000 miles of distribution lines to efficiently deliver safe, reliable power to nearly 5.4 million customers in 11 states. AEP is also one of the nation's largest electricity producers with approximately 32,000 megawatts (MW) of diverse generating capacity, including 5,300 MW of renewable energy.

Appalachian submitted its 2019 Integrated Resource Plan on May 1, 2019 to the Commonwealth of Virginia State Corporation Commission pursuant to § 56-599 of the Code of Virginia (Appalachian 2019). The Integrated Resource Plan (IRP) provides a forecast (2019-2033) of its load obligations and a plan to meet those obligations by supply-side and demand-side resources to promote reasonable prices, reliable service, energy independence, and environmental responsibility based on current assumptions regarding customer load requirements, commodity price projections, supply-side alternative costs, demand-side management (DSM) program costs and analysis, and the effect of present-day environmental rules and guidelines. The 2019 IRP also addresses the mandates contained in Virginia's recently enacted Grid Transformation and Security Act, which became effective July 1,2018 (Virginia Act), as well as other legal requirements and regulations, and considers the potential cost associated with some form of future regulation of carbon emissions, during the planning period, even though there is considerable uncertainty as to the timing and form future carbon regulation may take. Finally, the 2019 IRP addressed the mandates included in the 2018 Virginia act including:

- The construction or acquisition by Appalachian of at least 200 MW of utility-owned solar located in Virginia prior to 2028;
- In future energy efficient (EE) rate adjustment clause proceedings, Appalachian is required to request State Corporation Commission approval of $140 million in EE programs from July 2018 to July 2027; and
- As part of a five-year battery pilot program deemed to be in the public interest, Appalachian may invest in up to l0 MWs of new battery storage installations.

To meet its customers' future capacity and energy requirements, Appalachian will continue the operation of, and ongoing investment in, its existing fleet of generation resources including the base-load coal units at Amos and Mountaineer, the natural gas combined-cycle (Dresden) facility, combustion turbine (Ceredo) units, and its two gas-steam units at Clinch River. The Company will also continue to operate its hydroelectric generators, including those at Smith Mountain Hydroelectric Project. The Company has a portfolio of 575 MW of purchase power agreements consisting of five wind farms and one hydro-electric facility. During the planning period, contracts covering 455 MW of that amount will expire. In addition, the Company has contracted for the output of the 15 MW Depot solar facility in Rustburg, Va., which it expects will be available in 2021. Another consideration in the IRP is the increased adoption of distributed rooftop solar resources by Appalachian's customers. While Appalachian does not have control over where, and to what extent, such resources are deployed, it recognizes that distributed rooftop solar will reduce Appalachian's growth in capacity and energy requirements to some degree. From a capacity viewpoint, the 2020/2021 planning year is when the Pennsylvania-New Jersey-Maryland Inter(PJM) region of the North American Electric Reliability Corporation (PJM)'s new Capacity Performance construct will take full effect.

Appalachian has analyzed various scenarios that would provide adequate supply and demand resources to meet its projected peak load obligations, and reduce or minimize costs to its customers, including energy costs, for the next fifteen years. The key components of Appalachian's Preferred Plan are as follows:

- Adds at least 200 MW of large-scale solar resources, consistent with directives in the 2018 Virginia Act.
- Continues to diversify Appalachian's mix of supply-side resources through the addition of battery storage, wind and large-scale solar;
- Incorporates demand-side resources, including but not limited to additional EE programs and Volt VAR Optimization installations; and
- Recognizes that residential and commercial customers will add distributed resources, primarily in the form of residential and commercial rooftop solar).

H.1.2 Increase in Capacity or Generation

During the new license term, Appalachian proposes to modernize the Byllesby and Buck developments to include replacement of Byllesby Units 1, 2, and 4 and Buck Units 1 and 3. All but one (Buck Unit 2) of the seven turbine-generator units installed at the Project are the original major components of the Project as constructed in 1912. Many of the major electrical and mechanical and supporting systems and components of the Development are nearing the end of their useful service life, when compared to industry-recognized standards. The existing vertical Francis units would be replaced by fixed blade Kaplan units. Following completion of the upgrades, the authorized installed capacities for the Byllesby and Buck developments will be 20.3895 MW and 9.435 MW. Due to efficiencies of the Kaplan units and modern components, the upgrades are expected to increase average annual generation at the Project by approximately 25,927 MWh.

H.1.3 Coordination of Operation with Upstream and Downstream Projects

There are a total of seven dams on the New River (Table H.1-1). The non-FERC jurisdictional Fields Dam and the FERC jurisdictional Fries Dam are the only major dams located upstream of the Byllesby-Buck Project. The closest project to Byllesby-Buck is approximately 8 miles upstream of Byllesby at Fries. There are no formal coordination procedures between Appalachian and the operator of the hydro project at Fries and there does not appear to be any effects on the operation of the Project by the operation of the Fries Project. There are three major dams located on the New River downstream of the Project, which are the Claytor (also owned and operated by Appalachian), Bluestone, and Hawks Nest dams. The Claytor Project is approximately 48 miles downstream from the Project.

The Byllesby-Buck Project operates in a run-of-river mode, passing inflow downstream to the Claytor Project. Operations of the Byllesby-Buck Project, as well as for the Claytor Project, are dispatched from the Columbus Operations Center (COC). Outflow from the Byllesby-Buck Project provides the operators for the Claytor Project information relative to flows that can be expected at the Claytor Project, thus allowing operators the opportunity to adjust operations at the Claytor Project to manage the expected inflows. Claytor Lake and operations of the Claytor Project attenuates the influence of Byllesby-Buck Project operations on the New River below Claytor Lake.

Table H.1-1. Dams and Diversions on New River

Development/Dam	Owner	River Mile	FERC Project No.	Expiration of Current License	Capacity (MW)
Fields	Fields Electric	323	N/A	N/A	Unknown
Fries	Aquenergy Systems	303.6	P-2883	2020	5.2
Byllesby	Appalachian Power Company	295	P-2514	2024	21.6
Buck	Appalachian Power Company	292.3	P-2514	2024	8.5
Claytor	Appalachian Power Company	248.8	P-739	2041	75
Bluestone	U.S. Army Corps of Engineers (USACE)	162.4	N/A	N/A	N/A
Hawks Nest	Hawks Nest Hydro	103.57	P-2512	2064	102

H.1.4 Coordination of Operation with Electrical Systems

The Project is integrated with the Appalachian transmission and distribution system and, through it, with the entire interconnected AEP System. The interconnected AEP System provides a means, not only for the delivery of Project power to serve local and system loads, but also for the transmittal of power to the local area when the plant is off the line during maintenance periods and emergencies.

If the Project were to be severed from the interconnected system, additional facilities would eventually need to be constructed to assure reliable and continuous service to Appalachian's customers. While the capacity and energy now being supplied by the Project could be replaced by output from a fossil-fueled, steam-electric generating plant, the distinctive characteristics of hydroelectric generation which contribute to flexible system operation could not be replaced by such an alternative.

The major advantages of a small hydroelectric generating plant over other types of electric generating plants are its ability to supply reactive voltamperes to the local system for voltage regulation, and to be electrically connected in close proximity to the load, thereby reducing energy losses on the transmission and distribution system.

Either a takeover of the Project by the Federal Government or a failure to issue a new license to Appalachian would have a detrimental effect upon Appalachian's system, since the capacity and energy lost due to these actions must be replaced by capacity and energy produced by higher-cost, fossil-fueled, generating units. If such replacement should become necessary, Appalachian would not have the ability to control the plant to optimize its support of the local transmission and distribution system.

H.2 Need for Project Power

Appalachian believes that for the foreseeable future, renewable and emission-free generation from the Project will be required to provide electricity, as well as support system reliability within the region. Should the Project not operate beyond the expiration of the current license, these Project benefits would no longer exist.

Energy and capacity from the Project make a small but important contribution to energy production in the state of Virginia and the regional power grid. Electric generation in Virginia is summarized in the U.S. Energy Information Administration's (EIA's) *State Profile* (EIA 2021) as follows:

> Natural gas (60%) and nuclear power (30%) accounted for 90% of Virginia's in-state electricity net generation in 2020. Renewable energy sources, including biomass (3%), hydroelectric power (2%), and solar (2%), accounted for almost 7%. Coal and, to a much lesser extent, petroleum together fueled less than 4% of in-state generation. (Coal-fired power plants supplied the largest share of the state's net generation until 2009, when coal's contribution fell below that of nuclear power. As coal-fired generation decreased, natural gas-fired generation increased.) In 2019, in-state electricity generation from renewable energy sources also exceeded coal's contribution for the first time.
>
> Virginia's in-state electricity generation increased by 40% between 2010 and 2020. However, electricity consumption in the state is still greater than generation, and Virginia receives additional power from two regional grids. One grid, the PJM Interconnection, supplies most of the state.
>
> In 2020, Virginia replaced its voluntary renewable portfolio goal with the Virginia Clean Economy Act. The Act requires the state's two largest investor-owned utilities, Dominion Energy Virginia and American Electric Power, to retire their carbon emitting electricity generating units and construct, acquire, or purchase Virginia generating capacity that uses solar and wind energy. Dominion Energy Virginia must obtain 100% of its electricity from renewable sources by 2045, and American Electric Power is to meet its 100% renewable target by 2050. The Act establishes an energy efficiency standard that requires that each utility achieve incremental annual energy efficiency savings.

The Project has been supplying power and energy to Appalachian's system since its acquisition in 1926, a period of about 95 years. Because Appalachian is an operating company of AEP, its generation and bulk power transmission facilities are planned and operated as integral parts of the overall AEP System. Therefore the adequacy and reliability of power supply in those portions of Virginia and West Virginia served by Appalachian are dependent not only on the generation and bulk power transmission facilities of Appalachian, but also on such facilities of the entire AEP System. When evaluating the need for generating capacity by Appalachian, this relationship must be recognized as well as the contribution to system generating capability by the Project. Since the electric energy requirements of Appalachian's customers are expected to increase over the foreseeable future, the need for the energy supplied by Project will continue.

Overall, the usefulness of the Project has been demonstrated by its operating history. The Project itself is located very near the areas served by its electric output. This favorable location has enabled Appalachian to use short transmission lines with low transmission costs, higher transmission reliability and higher control flexibility. In addition, the Project uses renewable primary energy resources and produces no atmospheric pollution. The energy production costs for the Project are lower than the replacement energy costs from available sources.

Power produced at the Project is used to meet demand in the PJM region. NERC annually forecasts electrical supply and demand nationally and regionally for a 10-year period. According to NERC's 2019 forecast, the peak season (summer) demand for the PJM region is expected to grow at an annual rate of 0.4 percent from 2020 to 2029 (NERC 2019). The Project serves a role in the regional energy market by providing 30.1 MW of generation capacity. In addition, the 2019 Virginia State Energy Plan sets forth a goal for state utilities to source 30 percent of their electricity from renewable energy sources by 2030 and 100 percent of their electricity from carbon-free sources by 2050. Power from the project would continue to help meet a need for power in the PJM region and the renewable energy goals of the state. The Project would continue to provide low-cost power that displaces generation from non-renewable sources.

The Project has a generating capacity of up to 30.1 MW, compared to a total generating capacity owned by Appalachian of over 6,600 MW. The continued operation of the Project is based primarily on the usefulness to Appalachian and its customers and on the project's low energy production costs, as well as Appalachian's overall need for capacity and energy.

H.2.1 Alternative Sources of Power

The AEP System and its customers have a need for generating capacity, and continued operation of existing renewable generating capacity is necessary to meet established decarbonization targets in AEP's territories. If the System could not rely on the capacity of the Project, it would need to find alternate sources. A comparison of supply-side options is presented in Table H.2-1. In this table, several baseload, peaking, and intermittent options are shown, with the final column representing the levelized busbar cost of energy based on the capacity factors shown here, in current dollars. Capacity and generation to replace the Project may be from any of these resources. This replacement capacity and energy would be developed by Appalachian or purchased from the PJM. If the Project were not relicensed, Appalachian and Appalachian's ratepayers would incur significant additional costs associated with Project decommissioning, which is not considered a relicensing alternative for the purposes of this license application.

Table H.2-1. AEP System - New Generation Technologies, Key Supply-Side Resource Option Assumptions [(a)(b)(c)(d)]

Type	Capability (MW) (e)			Capital Cost (d,f) ($/kW)	Installed Cost (d,f) ($/kW)	Full Load Heat Rate (HHV,Btu/kWh)	Fuel Cost ($/MBtu)	Variable O&M ($/MWh)	Fixed O&M ($/kW-yr)	Emission Rates			Capacity Factor (%)	LCOE (g) ($/MWh)
	Std. ISO	Summer	Winter							SO2 (Lb/mmBtu	NOx (Lb/mmBtu)	CO2 (Lb/mmBtu)		
Base Load														
SMALL MODULAR REACTOR NUCLEAR POWER PLANT, 600 MW	600	600	600	6,500	7,300	10,000	0.96	3.18	100.91	0.000	0.000	0.0	90	129.0
ULTRA-SUPERCRITICAL COAL WITH 90% CO2 CAPTURE, 650 MW	650	630	690	6,300	7,200	12,500	1.97	11.52	62.55	0.013	0.057	20.5	75	170.5
COMB TURBINE H CLASS, COMB-CYCLE SINGLE SHAFT W/90% CO2 CAPTURE, 430 MW	380	370	390	2,500	2,600	7,100	2.89	6.13	28.95	0.001	0.008	11.7	75	84.1
COMB TURBINE H CLASS, 1100-MW COMBINED CYCLE	1,030	1,010	1,070	1,100	1,100	6,400	2.89	1.96	11.82	0.001	0.008	117.1	75	54.5
COMB TURBINE H CLASS, COMBINED-CYCLE SINGLE SHAFT, 430 MW	420	410	440	1,100	1,200	6,400	2.89	2.68	14.80	0.001	0.008	117.1	75	57.9
Peaking														
COMB TURBINE F CLASS, 240-MW SIMPLE CYCLE	230	230	250	800	800	9,900	2.89	0.63	7.34	0.001	0.008	117.1	25	93.5
COMB TURBINES AERODERIVATIVE, 100-MW SIMPLE CYCLE	110	100	110	1,300	1,300	9,100	2.89	4.93	17.11	0.001	0.008	117.1	25	126.9
INTERNAL COMBUSTION ENGINES, 20 MW	20	20	20	2,000	2,100	8,300	2.89	5.97	36.91	0.000	0.020	117.0	25	172.6
Intermittent														
BATTERY ENERGY STORAGE SYSTEM, 50 MW / 200 MWH	50	50	50	1,500	1,470			0	21.69				25	157.0
ONSHORE WIND, LARGE PLANT FOOTPRINT, 200 MW(h)	200	200	200	1,300	1,310			0	23.52				31	31.9
SOLAR PHOTOVOLTAIC, 150 MWAC(i)	150	150	150	1,300	1,200			0	9.91				21	53.0
SOLAR PHOTOVOLTAIC WITH BATTERY ENERGY STORAGE SYSTEM, 150 MWx200 MWh (i)	150	150	150	1,800	1,610			0	30.29				20	85.6

Notes:

(a) Costs and performance data informed by EIA report Capital Cost and Performance Characteristic Estimates for Utility Scale Electric Power Generating Technologies (Feb 2020)
(b) Installed cost, capability and heat rate numbers have been rounded
(c) All costs in 2021 dollars, except as noted. Costs adjustments made based on EIA report Cost and Performance Characteristics of New Generating Technologies, Annual Energy Outlook 2020 (Region 11-PJMW)
(d) $/kW costs are based on summer capability.
(e) All Capabilities adjusted by the Performance Adjustment Factors defined in the reference report (a)
(f) Total Plant Investment Cost w/AFUDC (AEP rate of 6.41%,site rating $/kW)
(g) Levelized cost of energy based on capacity factors shown in table
(h) System in service (COD) 2022, Costs shown in 2022$
(i) System in service (COD) 2021, Costs shown in 2021$

H.2.2 Need, Reasonable Cost and Availability of Alternative Sources of Power

H.2.2.1 Average Annual Cost of Project Power

This section describes the annual costs of the Project as proposed. The estimated average cost of the total Project is approximately $3,562,500 a year, based on average data available to Appalachian for the period 2017 to 2021. The estimated annual costs for the Project are presented in Table H.2-2.

Table H.2-2. Byllesby-Buck Project Current Average Annual Cost

Description	Cost
Cost of capital (equity and debt)	$808,100
Local, state, and federal taxes	$83,920
Depreciation and amortization	$1,692,326
Operation and maintenance expenses, including interim replacements, insurance, administrative and general expenses, and contingencies	$978,154
Total	**$3,562,500**

H.2.2.2 Projected Resources Required by the Licensee to Meet Short- and Long-Term Capacity and Energy Requirements

As previously discussed, the evaluation of the adequacy and reliability of generating capability to meet the current and projected power demands of Appalachian's customers must also take into account the total generating capability of the AEP System in relation to the aggregate AEP System load (including relevant contractual arrangements with non-affiliated systems).

Currently the Appalachian has adequate generation resources to meet its customer's load requirements. Through 2026, Appalachian has capacity resources to meet its forecasted internal demand. In 2027, Appalachian anticipates experiencing a slight capacity shortfall, 75 MW, based upon its assumption regarding the retirement of Clinch River Units 1 and 2 in 2026, and the expiration of wind and hydro contracts totaling 455 MW (nameplate) of renewable generation, during the 2027-2030 timeframe. By 2033, Appalachian has a capacity deficit of approximately 200 MW (Appalachian 2019).

Recognizing its modest capacity deficit position over the planning period, ~200 MW in 2033, Appalachian considered the impact of the resource additions required by the 2018 Virginia Act and resources necessary to satisfy Virginia's voluntary Renewable Portfolio Standard goals. These additions, which include solar, energy storage and energy efficiency resources, are expected to eliminate most of the capacity deficit through the planning period. The solar resources are assumed to provide PJM capacity equal to 51.1 percent of their nameplate rating (or 102 MW for 200MW of nameplate solar). Energy storage will provide 10 MW, and EE will provide approximately 20MW of planning capacity. Taking these resources into account, a resource plan that meets the 2018 Virginia Act would also be compliant with Virginia's voluntary Renewable Portfolio Standard goals, if the plan adds 300 MW of wind resources in 2023 (Appalachian 2019).

H.3 Power Supply at Industrial Facility

Since the Project is not used to supply power to an applicant-owned and operated industrial facility, this section is not applicable.

H.4 Native American Tribe as Applicant

Since the Applicant is not a Native American Tribe, this section is not applicable.

H.5 Impacts of Receiving or not Receiving a License on Licensee's Operations of the Transmission Facility

Either a takeover of the Project by the Federal Government or a failure to issue a new project license to Appalachian would have a detrimental effect upon Appalachian's transmission and distribution system. Consequently, the capacity and energy lost due to either of the two actions would most likely be replaced by the generation from higher-cost, fossil-fueled, steam-electric generating plants, located many miles from the local load area. Some adverse effects of the alternative would include: an increase in line loading; an increase in loading on the nearby Byllesby 88/16-kV transformer; an increase in energy losses; and increased operating expenses. The power that would have been produced from the Project's renewable resource will have to be replaced by power likely generated by the consumption of non-renewable fuels.

At the Project, a suspension of generation would result in less desirable voltage regulation at the Buck 13.2-kV and Byllesby 88-kV, 69-kV, 34.5-kV, and 13.2-kV busses.

If the Project were relicensed, Appalachian would not be required to reinforce or upgrade its transmission system. Conversely, if the license were not renewed, higher line and transformer loadings would occur on Appalachian's transmission system, resulting in the eventual advancement of infrastructure required to reinforce that system. Dependent on the area's load growth rate and pattern, as well as the outcome of the relicensing application of other hydroelectric projects, additional transmission, distribution, and station facilities would be required to serve the area load sooner than if the Project were relicensed.

H.5.1 Single Line Diagrams

The single-line diagrams for the Project, which present system transmission elements in relation to the Project, are provided in Volume IV of this FLA (CEII]).

H.6 Modifications to Project Facilities and Consistency with Comprehensive Plans

Appalachian has no plans to modify existing Project facilities or operations in a manner that would impact existing comprehensive waterway plans on the New River. The proposed turbine upgrades proposed herein would result in an increase in annual energy generation at the project but require no significant changes in Project operations. The Project facilities and operations described in this license application, inclusive of PM&E measures proposed by the Licensee, are compatible with the comprehensive waterway plans for the New River as defined in Section 10(a)(1) of the Federal Power Act. The comprehensive plan which affects the Project is the Virginia Department of Conservation and Recreation (VDCR) 2018 Virginia Outdoors Plan (VDCR 2018), which presents a recreational needs assessment and identifies recreational priorities for the Commonwealth.

In accordance with 18 CFR §5.6(d)(4)(III and IV), HDR, on behalf of Appalachian, has reviewed the April 2021 FERC List of Comprehensive Plans applicable to Virginia and adopted by FERC under Section 10(a)(2)(A) of the Federal Power Act, 16 USC §803(a)(2)(A). Of the 62 comprehensive plans relevant to Virginia, four are considered applicable to the Project.

These potentially relevant comprehensive plans, listed by state, are presented in Table H.6-1. Based on a review of these comprehensive plans, current and proposed operations of Project facilities have been determined to be consistent with these plans.

Table H.6-1. List of Qualifying Federal and State Comprehensive Plans Potentially Relevant to the Project

Comprehensive Plan
U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.
U.S. Fish and Wildlife Service. n.d. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.
Virginia Department of Conservation and Recreation. The 2018 Virginia Outdoors Plan (SCORP). Richmond, Virginia.
Virginia State Water Control Board. 1986. Minimum instream flow study – final report. Annadale, Virginia. February 1986.
National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993.
U.S. Forest Service. 1978. Mount Rogers National Recreation Area final management plan. Department of Agriculture. Roanoke, Virginia.
U.S. Forest Service. 2004. Revised Land and Resource Management Plan for the Jefferson National Forest. Management Bulletin R8-MB 115A. Department of Agriculture. Roanoke, Virginia.
U.S. Forest Service. 1993. George Washington National Forest revised land and resource management plan. Department of Agriculture, Harrisonburg, Virginia.
Virginia Department of Game and Inland Fisheries. Upper New River Walleye Management Plan, 2017 to 2022. Blacksburg, Virginia.
Virginia Department of Environmental Quality. 2015. Commonwealth of Virginia State Water Resources Plan. Richmond, Virginia. October 2015.
Virginia Department of Game and Inland Fisheries. 2015. Virginia's 2015 Wildlife Action Plan. Henrico, Virginia. September 1, 2015.

In addition to the FERC List of Comprehensive Plans, the VDCR identified three additional Comprehensive Plans or guidance documents that are also applicable to the Project:

- VDCR Division of Planning and Recreational Resources. Virginia Scenic Rivers Program. Richmond, Virginia.
- VDCR Division of Planning and Recreational Resources. Trails, Greenways, and Blueways. Richmond, Virginia.
- VDCR Division of Planning and Recreational Resources. Virginia State Park Master Planning and State Park Design and Construction. Richmond, Virginia.

H.7 Financial and Personnel Resources

Appalachian is dedicated to operating the Project in a safe and reliable manner to provide clean renewable electric energy to the electricity grid. As demonstrated under the existing license, Appalachian has the financial resources to meet the operation, maintenance, and capital requirements of the Project.

Operations, maintenance, environmental and license compliance, modification, technical and administrative activities required for the Project are performed and supported by employees and contractors of Appalachian. Appalachian has available a complete staff of operators and mechanics who are trained and experienced in the operation of hydroelectric projects. Plant operation is automated and can be controlled from the COC, 24 hours a day, seven days a week. Plant operating personnel are onsite at the Byllesby Development or nearby Buck Development four (4) days a week Monday through Thursday for ten (10) hours a day, to perform routine maintenance and surveillance activities. Outside normal work hours and on weekends, plant personnel can be dispatched to the site. Dedicated personnel include supervisory (1), instrumentation and controls (2), and maintenance (3) staff. Operations personnel can be called in from nearby AEP hydroelectric facilities for additional support. If required, Appalachian can contract with consultants and contractors to undertake larger scale maintenance projects. Additionally, Appalachian has available the administrative, licensing, and support personnel that are needed to maintain compliance with the terms of the license.

H.8 Expansion of Project Lands

Appalachian is not proposing any expansion of Project lands (Project Boundary) associated with this license application except modifications as described in Exhibit G to enclose existing licensed Project facilities, including the Byllesby control house and the approximately 2-mile-long transmission line corridor that spans from the Buck powerhouse to the Byllesby switchyard/control house. All facilities are located on lands under Appalachian ownership of right-of-way or easement; therefore no property owner notifications are required. The transmission corridor crosses 7.23 acres of federal lands (Jefferson National Forest). Consistent with FERC guidance, an electronic version of the Project maps, along with the associated data files, are being filed with this FLA.

H.9 Electricity Consumption Efficiency Improvement Program

The planning philosophy of the AEP System has recognized for many years the need to develop both the System's supply and its demand in a compatible manner to optimize the utilization of the

System's investment in power supply facilities, and to thereby reduce, to the greatest extent possible, the cost of electric power and energy to the consumer. Appalachian is actively engaged in administering various commission approved DSM and Energy Efficient (EE) programs which would further accelerate the adoption of energy efficient technology within its service territory.

The 2019 IRP integrates supply- and demand-side resources. Broadly speaking, DSM involves matching customer consumption patterns of electricity as closely as possible to the capabilities of the power supply facilities, while recognizing the customer's desire for the end product, i.e., air conditioning, heating, etc. The principal objective is to reduce the cost of electricity to the consumer through a better utilization of existing power supply facilities; thus delaying the need for such facilities in the future. Appalachian's long term load forecast models account for trends in EE both in the historical data as well as the forecasted trends in appliance saturations as the result of various legislated appliance efficiency standards (Energy Policy Act of 2005, Energy independence and Security Act of 2007, etc.) modeled by the Energy Information Administration. In addition to general trends in appliance efficiencies, the Company also administers multiple DSM programs that the state commissions approve as part of its DSM portfolio. The load forecast utilizes the most current DSM programs, which either have been previously approved by or are pending currently before the Commission, at the time the load forecast is created to adjust the forecast for the impact of these programs. For the recent IRP, DSM/EE programs have been embedded into the load forecast (Appalachian 2019).

DSM programs continue to encourage the wise and prudent use of electricity, stressing activities that are cost-effective, promote efficiency, conserve, and alter consumption patterns. These programs are intended to benefit the consumer and conserve natural resources. To be effective, programs must be tailored to meet local and regional needs. Several specific objectives of DSM programs include:

- Promote energy conservation;
- Strive for retention of existing customers;
- Encourage new off-peak electrical applications
- Promote electrical applications that improve system load

H.10 Names and Addresses of Native American Tribes with land on Which the Project is located or Tribes that May Be Affected by the Project as Proposed

The Project is not located on Native American lands. Appalachian and the Commission consulted with the following federally recognized Native American tribes that may be affected by the Project throughout the relicensing process and in support of cultural resource studies. Points of contact (names) associated with each of these Native American tribes is presented in the Initial Statement of this application and the associated distribution list.

- Catawba Indian Nation
- Delaware Nation
- Pamunkey Indian Tribe

H.11 Safe Management, Operation, and Maintenance of the Project

H.11.1 Operating During Flood Conditions

H.11.1.1 Byllesby

When flows exceed the hydraulic capacity of the units during normal high-water events (approximately 5,868 cubic feet per second [cfs]), the Tainter gates are opened in sequence from right to left towards the powerhouse. Tainter Gate No. 6 is opened first using a dedicated electric hoist and primary power provided through the powerhouse. When Tainter Gate No. 6 reaches the full-open position, the Obermeyer gates are opened. The Obermeyer gates are opened sequentially from right to left beginning with Bay No. 14, furthest from the powerhouse. (As flows recede, the gates are closed in reverse order of opening.) Tainter Gate No. 5 is used to manage river flows while the Obermeyer gates are being opened. The Tainter gates and Obermeyer gates are automated and can be remotely operated from the COC or manually on-site. The sluice gate is operated locally as needed to pass debris. The Obermeyer gates can also be used to sluice debris, as needed. The plant is staffed 24 hours per day, 7 days per week during unusual (i.e., flood) conditions when all the gates are in full-open position.

In advance of a forecast of two or more inches of rain, AEP may determine that a reservoir drawdown below EL. 2,078.2 ft is needed. Agency approval is also required for drawdown below elevation 2,078.2 ft.

During flood-stage flows, all generating units at the powerhouse may be shut down due to the loss of operating head. As the reservoir continues to rise, and with all gates in the full-open position, the main dam flashboards are manually released as required to maintain the reservoir at or below elevation 2,081.5 ft. The Byllesby auxiliary spillway is operated after all Tainter and Obermeyer gates have been opened and release of all wooden flashboard sections, typically at flows in excess of 46,690 cfs. Each flashboard stanchion is released by striking a release pin with a hand-held steel bar, shearing a nail through the pin, allowing the stanchion to drop. The release is accessed via a sleeve through the spillway bridge deck. The flashboard release sequence varies with flashboard sections with old or deteriorated timber members being released first. The flashboards are released only after all six Tainter gates and five Obermeyer gates are fully opened and the reservoir level continues to rise. The Water Filtration Plants at Ivanhoe and Allisonia are notified before releasing flashboards. Prior to releasing the auxiliary spillway flashboards, the Emergency Action Plan (EAP) for the Project is activated.

During extreme flood conditions, once all the flashboards are released, the powerhouse unit head gates are closed, the powerhouse is de-energized and abandoned in preparation of dam overtopping. The powerhouse bulkhead door is closed to minimize flooding of the powerhouse.

The non-overflow (angled bulkhead) section begins to overtop at reservoir EL. 2,085.0 ft rendering the powerhouse and main spillway inaccessible. The spillway walkway and left abutment area are overtopped at reservoir EL. 2,087.5 ft, and flows proceed downstream to the Buck development. The powerhouse generator floor at EL. 2,048.0 ft would be flooded by high tailwater when flows reached 192,000 cfs, based on tailwater rating curves.

H.11.1.2 Buck

During high flows that exceed the hydraulic capacity of the generating units (approximately 3,540 cfs), the Tainter gates are opened in the following sequence: 1, 2, 3, 4, 5, and 6 using a dedicated electric hoist and primary power provided through the powerhouse. The four Obermeyer gates are then operated sequentially 7 through 10 to maintain the reservoir at EL. 2,003.4 ft. (As flows recede, the gates are closed in reverse order of opening.) The plant is staffed 24 hours per day, 7 days per week during unusual (i.e., flood) conditions when all the gates are in full-open position. The Tainter gates and Obermeyer gates are automated and can be remotely operated from the COC or manually on-site. The Obermeyer gates can be used to sluice debris, as needed. The plant is staffed 24 hours per day, 7 days per week during unusual (i.e., flood) conditions when all the gates are in full-open position.

In advance of a forecast of two or more inches of rain, AEP may determine that a reservoir drawdown below EL. 2,002.4 ft is needed. Agency approval is also required for drawdown below elevation 2,002.4 ft.

As the reservoir continues to rise, and with all gates in the full-open position, the flashboards are manually released as required to maintain the reservoir at or below EL. 2,005.5 ft. Each flashboard stanchion is released by striking a release pin with a hand-held steel bar, shearing a nail through the pin, allowing the stanchion to drop. The release is accessed via a sleeve through the spillway bridge deck. The flashboard release sequence varies with flashboard sections with old or deteriorated timber members being released first. The flashboards are released only after all six Tainter gates and four Obermeyer gates are fully opened, and the reservoir level continues to rise. The Water Filtration Plants at Ivanhoe and Allisonia are notified before releasing flashboards. The plant is staffed 24 hours per day, 7 days per week during unusual (i.e., flood) conditions when all the gates are in the full-open position.

During extreme floods, once all the flashboards are released, the powerhouse unit head gates are closed, the powerhouse is de-energized, bulkhead doors closed, and all staff would move upland in preparation of dam overtopping. The powerhouse bulkhead door is closed to minimize flooding of the powerhouse. Prior to leaving the powerhouse, downstream communication is given in accordance with the EAP for the Project.

The main dam non-overflow sections and the spillway abutment at Mountain Island and wingwall sections begin to overtop at reservoir EL. 2,007.0 ft rendering the powerhouse, non-overflow sections and spillway bridge inaccessible. The spillway deck and left abutment are overtopped at reservoir EL. 2,010.0 ft. The powerhouse generator floor at EL. 1986.5 ft would be flooded by high tailwater when flows reached 175,000 cfs, based on tailwater rating curves.

H.11.2 Flood History

H.11.2.1 Byllesby

The flood of record for the Byllesby Development occurred on August 14, 1940. A peak discharge of 155,000 cfs was estimated at reservoir EL. 2,091.5 ft and tailwater EL. 2,045.0 ft (estimated from the tailwater curve). The non-overflow (angled bulkhead) section with a crest elevation of 2,085.0 ft were overtopped by 6.5 ft.

The Potential Failure Mode for Byllesby was developed in 1985 and established a Probable Maximum Flood (PMF) inflow-outflow of 599,000 cfs at a headwater elevation 2,104.4 ft and corresponding tailwater elevation 2,065.9 ft at the main spillway and powerhouse and 2,091.6 ft at the auxiliary spillway dam. During the PMF event, the non-overflow structure overtops by 19.4 ft for a duration of approximately 55 hours. The powerhouse generator floor at EL. 2,048 ft would be flooded by high tailwater. The Inflow Design Flood for the Byllesby Development is equal to the PMF.

Table H.11-1 summarizes the peak discharge measurements and reservoir elevations recorded for each year from 2014-2019.

Table H.11-1. Byllesby Peak Discharges (2014-2019)

Year	Date	Total Peak Discharge (cfs)	Headwater Elevation (ft)	Tailwater Elevation (ft)
2014	10/15/2014	23,115	2,077.43	2,026.22
2015	4/20/2015	30,565	2,081.05	2,027.76
2016	2/4/2016	22,073	2,080.66	--
2017	4/24/2017	31,395	2,081.36	--
2018	10/11/2018	51,520	2,081.20	--
2019	2/24/2019	37,260	2,081.09	--

H.11.2.2 Buck

The flood of record for the Buck Development occurred on August 14, 1940. A peak discharge of 155,000 cfs was estimated at a reservoir EL. 2,009.3 ft and tailwater EL. 1,993.3 ft. The abutments and non-overflow sections with a crest at EL. 2,007.0 ft were overtopped by 2.3 ft.

The Potential Failure Mode for Buck was developed in 1985 and established a PMF inflow of 599,000 cfs at headwater EL. 2,018.7 ft and corresponding tailwater EL. 2,018.4 ft and 2,011.9 ft at the spillway and main dam, respectively. The study determined that the PMF inflow is equal to outflow (the Inflow Design Flood for the Buck Development is equal to the PMF). During the PMF event, the non-overflow structures overtop by 11.7 ft for a duration of approximately 45 hours. The powerhouse generator floor at EL. 1,986.5 ft would be flooded by high tailwater.

Table H.11-2 summarizes the peak discharge measurements and reservoir elevations recorded for each year from 2014-2019.

Table H.11-2. Peak Discharges (2014-2019)

Year	Date	Total Peak Discharge (cfs)	Headwater Elevation (ft)	Tailwater Elevation (ft)
2014	10/15/2014	24,021	2,004.54	1,964.91
2015	4/20/2015	30,600	2,005.03	1,966.47
2016	2/4/2016	22,137	2,003.38	1,965.24
2017	4/24/2017	32,801	2,005.43	1,967.34
2018	10/11/2018	51,601	2,005.35	1,968.91
2019	2/24/2019	37,977	2,003.21	1,966.35

H.11.3 Emergency Action Plan

Both developments are classified as “high hazard” based on the 1992 Dam Break Analysis for the Project. The analysis considered a domino or cascade-type failure of both the Byllesby and Buck under normal (fair weather) and PMF condition more critical than failure of each dam individually. The analysis concluded that the domino failure scenario will cause significant impact to the public safety and property extending 45 miles downstream to the Claytor Hydroelectric Project in Radford, Virginia. The current Emergency Action Plan is dated November 1, 2018.

There are no proposed changes to the operation of the Project or downstream development that would affect the existing EAP on file with the FERC.

H.11.4 Warning Devices for Downstream Public Safety

Appalachian maintains public safety measures at the Project for public safety upstream, in the vicinity of, and downstream of the Project pursuant to FERC's regulations at Part 12 and a Public Safety Plan on file with the FERC Atlanta Regional Office. As provided for in this Public Safety Plan, requisite upstream reservoir boat warning buoys with connection cables are in place to limit boat access. Public warning signs are posted on the upstream and downstream sides of the dam. Flashing lights and sirens are installed on each spillway and powerhouse and are activated when gates are initially opened and when a unit starts. There are also video cameras at various locations around the site that are monitored remotely by the COC.

The plant operators are trained to notify the COC in the event of an emergency. The COC monitors forebay, tailwater, and generation conditions at the dam on a 24-hour basis. The COC responds to observations from the plant personnel and conditions they detect through monitoring devices or alarms, such as:

1. An unexplained rapid decrease in forebay elevation.
2. An unexplained rapid increase in tailwater elevation.
3. An unexplained reduction in load of any generating unit at the plant.

The EAP was last revised and reprinted in November 2018. An up-to-date copy of the EAP is kept in the powerhouse control room, along with a posted telephone contact list. The EAP includes the necessary notifications to alert and warn the downstream populace, state, and local governments of possible flood conditions. The notifications to the downstream populace are issued by the National Weather Service.

H.11.5 Monitoring Devices

The Project is maintained by Appalachian in accordance with industry standards and monitored as described in the Dam Safety Surveillance and Monitoring Plan that is maintained for the Project and is on file with FERC's Division of Dam Safety and Inspections – Atlanta Regional Office.

Monitoring devices at the Project includes instrumentation and controls associated with powerhouse operations, water level sensors, deformation monitoring survey monuments, and seepage monitoring.

- The headwaters and tailwaters are monitored by radar transducers in the forebay and the tailrace. This data is continuously monitored by the COC and can also be viewed with monitoring equipment at the powerhouse. If readings are detected outside the normal operating limits for each development, plant personnel are notified to verify the conditions at the plant. High and low water alarms are activated at the COC if the headwater elevation rises or drops outside established emergency levels.
- Survey monuments are installed for measuring vertical and horizontal (upstream-downstream) deformation.
  - Byllesby Development: Nine object points are installed on the spillway: three on the auxiliary spillway, and six on the main spillway piers. Vertical deformation (settlement) is also measured at one additional point on the powerhouse intake and sixteen points inside the powerhouse generator floor. Three benchmarks located off water-retaining structures are used for vertical and horizontal control.
  - Buck Development: Eight object points are installed on the crest of the dam: one at the powerhouse intake, one on the sluice gate section, one on the right non-overflow structure, and five on the spillway piers. Vertical deformation (settlement) is also measured at three monitoring points on the paved fill area downstream of the left non-overflow structure adjacent to the powerhouse. Inside the powerhouse, horizontal offset measurements across the vertical construction and contraction joints and vertical deformation is measured at 24 points located on the generator floor. Two benchmarks located off water-retaining structures are used for vertical and horizontal control.
- Seepage monitoring is ongoing at the Byllesby Development non-overflow structure-abutment rock interface. A catch basin has been constructed to collect seepage with a plastic pipe discharging the water downstream of the powerhouse.

H.11.6 Employee Safety and Public Safety Record

Appalachian 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.

Safety is paramount in the operation of the Byllesby-Buck Project, for both employees and the general public. Over the last fifteen years, there was only 1 recordable injury that resulted in days away from work. Additionally, there have been no fatalities on Project lands or waters. Per VDWR, there have been no boating accidents within the last ten year period (2011-2021) (VDWR defines a "reportable" incident as one with vessel damage over $2,000, injury beyond first aid, death, or missing person).

H.12 Current Operation of the Project

The Project has been operated in a manner consistent with the requirements of the current license. Details regarding operation and constraints of the Project are discussed in Exhibits A and B of this application. The Project will continue to operate in a manner consistent with the requirements of the current license until the new license is issued, after which time the Project will be operated in accordance with the requirements and conditions of the new license.

H.13 Project History

The Byllesby Buck Hydroelectric Project was constructed in 1912 for H. M. Byllesby & Co. by the engineering and construction firm of Viele, Blackwell & Buck. In 1911, H. M. Byllesby & Co. had incorporated the Appalachian Power Company to develop electric power sites on the New River. In 1924, Appalachian Power and American Gas & Electric formed a joint venture to acquire electric properties in Virginia and West Virginia. A new company, Appalachian Electric Power Company, was formed by American Gas & Electric to operate electric plants and transmission systems and, in 1926, it took control of the Byllesby/Buck project. The current Appalachian Power Company is the successor to Appalachian Electric Power.

Very little has changed at the Project since construction was completed in 1912. The original turbine units are still in service at both the Byllesby and Buck developments, with the exception of Buck Unit 2, which underwent runner replacement in 2004, and Byllesby Unit 4, which is out of service. All four Byllesby generators are original equipment, as ·are two of the three Buck generators. In 1944, Buck Unit 2 generator was rebuilt, and the nameplate rating was increased from 2,070 kilowatts to the current rating of 2,835 kilowatts.

Over time, the original mud sluices at both developments became inoperable and were filled with concrete. A vertical drop sluice gate was installed at Byllesby. The date of installation is uncertain. Various other modifications or repairs to structures have been made to the developments since 1912, such as repair work on spillway piers at Byllesby. Major structural work performed has included the replacement of the old spillway bridge at Buck with a new prestressed concrete bridge in 1988, and installation of post tensioned rock anchors at major water-retaining structures (both developments) in 1992-1993.

Additional major improvements to the Byllesby Development during the previous license term include the following:

- Installation of an Obermeyer (pneumatic) gate in one (previously flashboard) spillway bay in 1998;
- Replacement of spillway Gates No. 1, 4, 5, and 6 in 2004;
- Headgate replacement for Units 3 and 5 in 2006-2008;
- Automation of the six spillway Tainter gates to allow for operation from the COC in 2010 and installation of new spillway gate operators in 2012; and
- Installation of new Obermeyer gates to replace flashboard sections in spillway Bays 10-13 in 2016-2018.

Additional major improvements to the Buck Development during the previous license term include the following:

- I.P. Morris vertical Francis turbine runner for Unit 3 replaced with a new vertical Francis turbine runner from American Hydro in 2006.
- Automation of the six spillway Tainter gates to allow for operation from the COC in 2010;
- Installation of new Obermeyer gates to replace flashboard sections in spillway Bays 7-10 in 2017-2019.

Programs relating to the operations and maintenance of the Byllesby/Buck project include regular inspections of the generating units, regular diving inspections, surveys twice yearly of established deformation points, annual structural inspections and reports, and routine monitoring and calibrating of recording equipment. Any major repairs or modifications identified during these inspections are coordinated with AEP Service Corporation which provides engineering support. Major milestones, repairs, and upgrades that have occurred at the Project since the last relicensing are listed in Table H.13-1 and Table H.13-2.

Table H.13-1. Major Repairs and Upgrades Since Previous (1991) Relicensing at Byllesby

Timeframe	Upgrade / Repair/ Milestone
1992 and 1993	To address the dam's stability and factors of safety under the Probable Maximum Flood loading conditions, post tensioned rock anchors were installed September 1992 and April 1993 in all water retaining structures.
1993 and 1994	Concrete restoration was conducted to repair freeze-thaw damage and spalled areas. Other improvements included underpinning the toe of the main spillway and concrete (to address undercutting), and pressure grouting the powerhouse substructure to control leakage.
1998	An Obermeyer (pneumatic) gate was installed in the main spillway. The gate replaced the flashboards in one spillway bay.
2000	The main spillway and auxiliary spillway timber walkways were replaced with steel grating.
2002	Concrete restoration on the downstream face of angled bulkhead was performed.
2003	Spillway Gates No. 2 and 3 were repaired. The lower section of the skin plate and all the vertical rib supports were replaced and repainted. The bottom and side seals were also replaced.
2004	Spillway Gates No. 1, 4, 5, and 6 were replaced.
2006	Concrete restoration was performed on the upstream side of the spillway crest. The concrete slab on the west side of powerhouse at the generator floor level was replaced. The trash racks in front of all 4 units were replaced and the steel support members were repaired or replaced as required.
2007	Concrete restoration was performed on the downstream spillway surface at the main spillway flashboard section Bay 8. Concrete restoration was also performed on the main spillway right abutment wall. The Unit 4 headgate installation was completed
2008	The Unit 3 headgate installation was completed as well as replacement of the Unit 1 and 2 headgates.
2010	Six spillway gates were automated so they could be operated from the COC. In addition, repairs were made to the concrete caps over two post tensioned anchor heads.
2012	New spillway gate operators were installed on all six spillway gates.
2014	The forebay was dredged and the intake structure and screens were repaired. Concrete restoration of the downstream face of spillway bay 15 was performed. All flashboards on the main spillway and auxiliary spillway were replaced and repairs were made to all four generating units.
2013	Due to heavy rains in January, the right and left non-overflow bulkheads were overtopped and the powerhouse flooded by 6 inches. Repairs were mad and the forebay was returned to normal operating level in December 2013.
2014	Repairs were made to the intake structure.
2015	Spillway Tainter gate anchors were installed.
2016	Two new Obermeyer gates were installed to replace the stanchion flashboards in Bays 12 and 13.
2018	Two new Obermeyer gates were installed to replace the stanchion flashboards in Bays 10 and 11.

Table H.13-2. Major Repairs and Upgrades Since Previous (1991) Relicensing at Buck

Timeframe	Upgrade / Repair/ Milestone
1993	Post tensioned rock anchors were installed between April and November in all water retaining structure to address potential stability concerns under the Probable Maximum Flood loading.
1993 and 1994	Concrete restoration was conducted consisting of epoxy grouting for leakage control through structures and filling the undercut area of the spillway toe with concrete.
2001	The monitoring program for the piezometers in the spillway and main dam was discontinued based on recommendations made in the Fifth Part 12 Safety Inspection Report by the independent consultant.
2002	Concrete repairs to deck on top of the north non-overflow bulkhead section were performed. The deck was chipped down 6 inches and repoured. The concrete caps over the post-tensioned anchors heads were also restored.
2007	The concrete caps over six post tensioned anchors in the main spillway were restored.
2010	Six spillway gates were automated so they could be operated from the COC.
2012 and 2013	Repairs were made to the concrete caps over several post-tension anchors where the concrete was cracked or eroded. Concrete restoration was also performed on the two left spillway bay downstream surfaces.
2013	Due to heavy rains in January, the right and left non-overflow bulkheads were overtopped and the powerhouse flooded by 6 inches. Repairs were mad and the forebay was returned to normal operating level in December 2013.
2014	Repairs were made to the intake structure.
2015	Repairs were made to the gate hoist anchorage.
2017	Two new Obermeyer gates were installed to replace the flashboards in Bays 7 and 8.
2019	Two new Obermeyer gates were installed to replace the stanchion flashboards in Bays 9 and 10.

H.14 Summary of Generation Lost at the Project Due to Unscheduled Outages

A summary of unscheduled total station outages for the Project over the past five years is provided in Table H.14-1.

Table H.14-1. Unscheduled Total Station Outages (2017-2021)

Outage Start Date	Outage End Date	Duration (Hours)	Cause
Both Developments Offline			
07/23/2017 23:08:00	07/24/2017 00:31:00	1.4	Electrical HEA.
04/04/2018 08:12:00	04/04/2018 09:12:00	1.0	Station power shut off due to work on Byllesby/Buck battery energy storage system.
10/11/2018 10:07:00	10/15/2018 07:52:00	93.8	Power Failure. Tree fell through power line going from Byllesby to Buck. Damaged fiber optic cable caused plant to lose all communications.
10/15/2018 07:53:00	10/16/2018 09:01:00	25.1	High water.
12/09/2018 09:03:00	12/09/2018 15:09:00	6.1	Both plants tripped offlline possibly due to power failure.

Outage Start Date	Outage End Date	Duration (Hours)	Cause
Byllesby Development Only Offline			
12/10/2017 09:12:00	12/10/2017 10:47:00	1.6	Plant tripped off-line. Possible current imbalace.
01/02/2018 04:56:00	01/02/2018 06:38:00	1.7	Plant tripped offline. Reason unknown at this time.
09/12/2018 22:52:00	09/25/2018 16:26:00	305.6	Plant Had to secure barge infront of units in preparation for possible high flows due to Hurricane Florence.
12/23/2018 09:21:00	12/23/2018 16:52:00	7.5	Plant tripped due to UPS failure.
03/08/2019 10:22:00	03/08/2019 11:51:00	1.5	Plant trip d/t AC power fail.
05/23/2020 16:18:00	05/23/2020 21:00:00	4.7	High water/debris.
06/02/2021 02:48:00	06/02/2021 09:16:00	6.5	Plant tripped off with HEA.
06/11/2021 23:05:00	06/12/2021 12:19:00	13.2	Plant trip, loss of field
Buck Development Only Offline			
12/09/2017 09:51:00	12/09/2017 11:38:00	1.8	Plant offline due to Byllesby Line CB A opening. Possibly winter storm related.
05/14/2018 04:04:00	05/14/2018 16:57:00	12.9	Buck units tripped. Backup battery charger failed causing instrumentation to be lost.
07/05/2019 21:00:00	07/05/2019 23:18:00	2.3	Plant trip - exciter
09/29/2019 20:57:00	09/29/2019 22:52:00	1.9	Plant tripped off. Suspect 13 KV circuit outage.
02/18/2021 08:42:00	02/18/2021 20:22:00	11.7	Plant trip - reason unknown

H.15 Record of Compliance

To the best of Appalachian's knowledge and based on a review of historical records, Appalachian has been and continues to be in compliance with the applicable terms and conditions of the FERC license, and there have been no license violations or recurring situations of non-compliance over the license term. License variances have been sought in a timely manner as needed to facilitate maintenance requiring deviation from normal project operating conditions.

H.16 Actions that Affect the Public

Appalachian holds that past actions and future actions related to the Project will not adversely affect the public. To the contrary, Appalachian believes that actions by the Licensee are favorable to the public in that the Project provides clean, renewable electric energy as well as other non-power benefits associated with the Project.

H.17 Ownership and Operating Expenses Affected by Transfer of License

The Licensee is applying for a long-term license to continue to maintain and operate the Project. Additionally, there is no competing application to take over the Project. Because there is no proposal to transfer the Project license, this section is not applicable to the Project.

H.18 Annual Fees Under Part I of Federal Power Act

The Licensee does not presently and has not historically paid any annual fees under Part I of the Federal Power Act for federal or Indian lands associated with the Project.

H.19 References

Appalachian Power Company (Appalachian). 2019. Integrated Resource Planning Report to the Commonwealth of Virginia State Corporation Commission. Case No. PUR-2019-00058. May 1, 2019. Accessed 8/17/2021. URL: https://scc.virginia.gov/docketsearch/DOCS/4j__01!.PDF

Energy Information Administration (EIA). 2021. Virginia State Profile and Energy Estimates. Online [URL]: https://www.eia.gov/state/analysis.php?sid=VA. (Accessed February 12, 2022).

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