



Office of the City Clerk

The City of Morgantown

Linda L. Little, CMC
389 Spruce Street, Room 10
Morgantown, West Virginia 26505
(304) 284-7439 Fax: (304) 284-7525
cityclerk@morgantown.com

AGENDA
MORGANTOWN CITY COUNCIL
SPECIAL MEETING
City Hall - Council Chambers
January 16, 2014
7:00 p.m.

1. **CALL TO ORDER**
2. **ROLL CALL BY CITY CLERK**
3. **PUBLIC PORTION**
4. **NEW BUSINESS:**
 - A. Consideration of **APPROVAL** of **A LETTER OF COMMENTS TO THE FEDERAL ENERGY REGULATORY COMMISSION ON PROJECT NUMBER 13762, THE LICENSING OF FREE FLOW POWER TO CONSTRUCT HYDROELECTRIC POWER PLANT ADJACENT TO THE MORGANTOWN LOCK AND DAM.**
5. **ADJOURNMENT**

If you need an accommodation contact us at 284-7439



Office of the City Manager

The City of Morgantown

Jeff Mikorski, ICMA-CM
City Manager

389 SPRUCE STREET
MORGANTOWN, WEST VIRGINIA 26505
(304) 284-7405 FAX: (304) 284-7430

www.morgantownwv.gov

Monday, January 13, 2014

Kimberly Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N. E.
Mailcode PJ – 12.1
Washington, DC 20426

RE: Morgantown Lock & Dam Hydroelectric Project, FERC Project No. 13762

Dear Secretary Bose:

The City of Morgantown has reviewed the Revised Planned Studies Document provide by Free Flow Power dated March 7, 2013. As stated in the RPSD, representatives of Free Flow Power did meet with City Administration in early 2012 to discuss the hydroelectric plans. Additional discussions were expected after that meeting that did not occur, and the City of Morgantown did not provide comments of concern to the Federal Energy Regulatory Commission at that time.

After reviewing the current RSPD the City of Morgantown does have the following concerns regarding the installation of the 3.1 MW hydroelectric power plant at the site of the Morgantown Lock and Dam. These concerns need to be addressed prior to FERC licensing due to the location of the Morgantown Lock and Dam being within a populated area, adjacent to the Morgantown Central Business District, and adjacent to the Morgantown Rail Trail and South University Park. The City of Morgantown requests that mitigation and resource studies must be developed prior to FERC licensing for the following concerns.

1. Ownership of Property.

The location of the hydroelectric power plant, as identified in the proposed RSPD, will displace the City's Rail-Trail whose surface rights are owned by the City of Morgantown through quitclaim deeds from the West Virginia State Rail Authority. Deeds include a reversionary clause that requires the conveyed land must be preserved as an intact corridor for future rail use and provide interim recreational opportunities for the benefit of the public in general. Locating the power plant within the land banked property will eliminate the intact corridor creating a possible reversionary concern. Location of the proposed relocated rail-trail falls on West Virginia Department of Highways property set aside for use as park property.

2. Environmental Impact to Residents

Because the proposed project location is within a 500 feet of residential homes and 1000 feet from the center of a nearby neighborhood, the City of Morgantown requests that Free Flow Power provide information regarding the amount of noise, light, and odor that an operational 3.1

MW power plant produces, and the environmental impacts during construction. The City requests Free Flow Power to provide evidence of a similarly constructed power plant and reimburse the cost sending representatives of the City of Morgantown to visit the similar power plant for a firsthand experience of the environmental impacts generated by the proposed power plant.

3. Economic Impacts on the Community, During & After Construction

The City of Morgantown has spent millions of dollars encouraging the development of the area adjacent to the proposed location (known as the Wharf District) raising it from an abandoned industrial area to a business district and recreational property. Additional private property owners and developers have spent additional millions of dollars building class A office space, a hotel, and a Convention/Event Center. The City of Morgantown is concerned the proposed power plant will have a negative impact on the current and future development of the Wharf District.

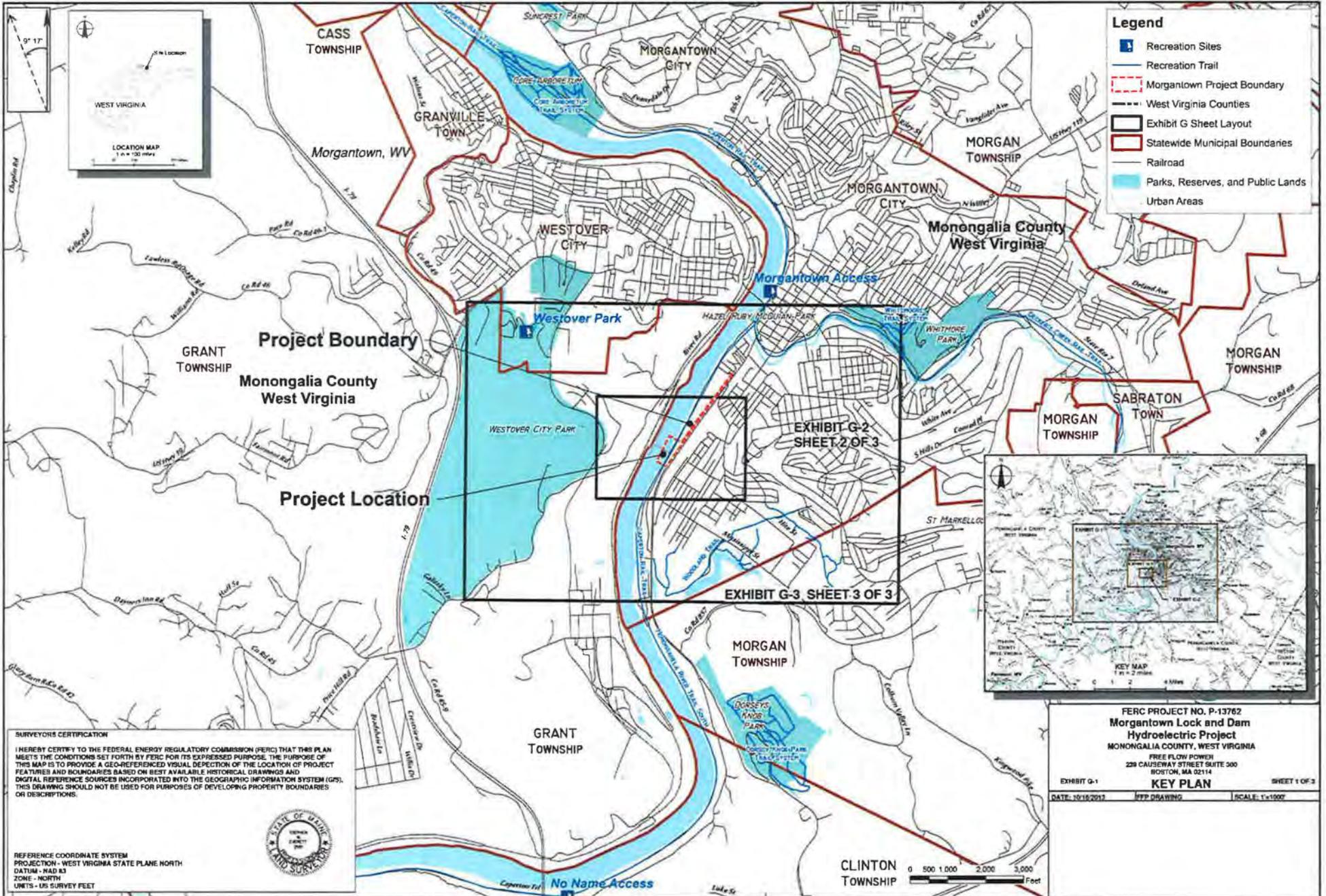
4. Landscaping and Screening

The Morgantown Lock and Dam is located adjacent to University Avenue, a major access road for visitors to the City from Interstate 68. The City of Morgantown is concerned that visually, the power plant will impact the look of the Morgantown riverfront and would like to see what type of landscaping and screening options are available to reduce the visual impact of the power plant.

5. Transmission Power Lines

The Morgantown Lock and Dam is located adjacent to University Avenue, a major access road for visitors to the City from Interstate 68. It is also within 500 feet of residential homes. To reduce the impact of the power plant to visitors and residents, any power lines as a part of this project would need to be placed underground throughout the whole project area.

Since early 2012, Free Flow Power has not met with the City of Morgantown to explore the City's concerns regarding their project. We would like to see the studies and plans to mitigate the above concerns prior to the FERC licensing.



- Legend**
- Recreation Sites
 - Recreation Trail
 - Morgantown Project Boundary
 - West Virginia Counties
 - Exhibit G Sheet Layout
 - Statewide Municipal Boundaries
 - Railroad
 - Parks, Reserves, and Public Lands
 - Urban Areas

SURVEYORS CERTIFICATION

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 GEO-REFERENCED VISUAL DEPICTION OF THE LOCATION OF PROJECT FEATURES AND BOUNDARIES BASED ON BEST AVAILABLE HISTORICAL DRAWINGS AND DIGITAL REFERENCE SOURCES INCORPORATED INTO THE GEOGRAPHIC INFORMATION SYSTEM (GIS). THIS DRAWING SHOULD NOT BE USED FOR PURPOSES OF DEVELOPING PROPERTY BOUNDARIES OR DESCRIPTIONS.



REFERENCE COORDINATE SYSTEM
 PROJECTION - WEST VIRGINIA STATE PLANE NORTH
 DATUM - NAD 83
 ZONE - NORTH
 UNITS - US SURVEY FEET



FERC PROJECT NO. P-13762
Morgantown Lock and Dam
 Hydroelectric Project
 MONONGALIA COUNTY, WEST VIRGINIA

FREE FLOW POWER
 220 CAUSEWAY STREET SUITE 300
 BOSTON, MA 02114

KEY PLAN

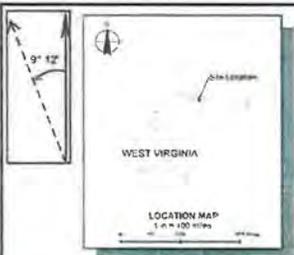
EXHIBIT G-1 SHEET 1 OF 3

DATE: 10/16/2013 RFP DRAWING SCALE: 1"=1000'



EXHIBIT G-2
 SHEET 2 OF 3

EXHIBIT G-3
 SHEET 3 OF 3



N: 7277229.19
E: 11068279.68

Key	Monongalia County Tax Assessor Parcel ID Number	Parcel FPP Description	Type	Acres Within Project Boundary
1	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
2	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
3	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
4	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
5	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
6	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
7	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
8	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
9	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
10	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
11	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
12	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
13	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
14	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
15	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
16	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
17	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
18	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
19	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
20	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
21	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
22	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
23	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
24	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
25	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
26	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
27	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
28	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
29	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
30	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
31	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
32	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
33	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
34	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
35	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
36	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
37	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
38	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
39	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
40	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
41	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
42	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
43	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
44	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
45	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
46	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
47	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
48	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
49	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000
50	000000000	Adjacent portion of agricultural and other land use	Municipal	0.000

Monongalia County West Virginia
GRANT TOWNSHIP

N: 7276094.26
E: 11067774.86

Block/Parcel Segment ID	Description	Length in Feet
1	N63°12'41"W	587.66
2	N20°41'02"E	247.86
3	S33°05'20"W	362.54
4	S33°05'20"W	277.32
5	N34°09'11"E	153.00
6	N34°23'44"E	159.35
7	N05°41'38"E	169.63
8	N33°12'12"E	160.38
9	N33°22'06"E	253.24
10	N36°00'11"E	1109.61
11	S06°12'42"W	35.00
12	S02°16'17"W	1161.77
13	S37°00'00"W	151.33
14	S37°32'12"W	260.00
15	S35°41'20"W	164.56
16	S34°21'43"W	194.09
17	S34°10'49"W	147.20
18	S34°27'22"W	1128.32

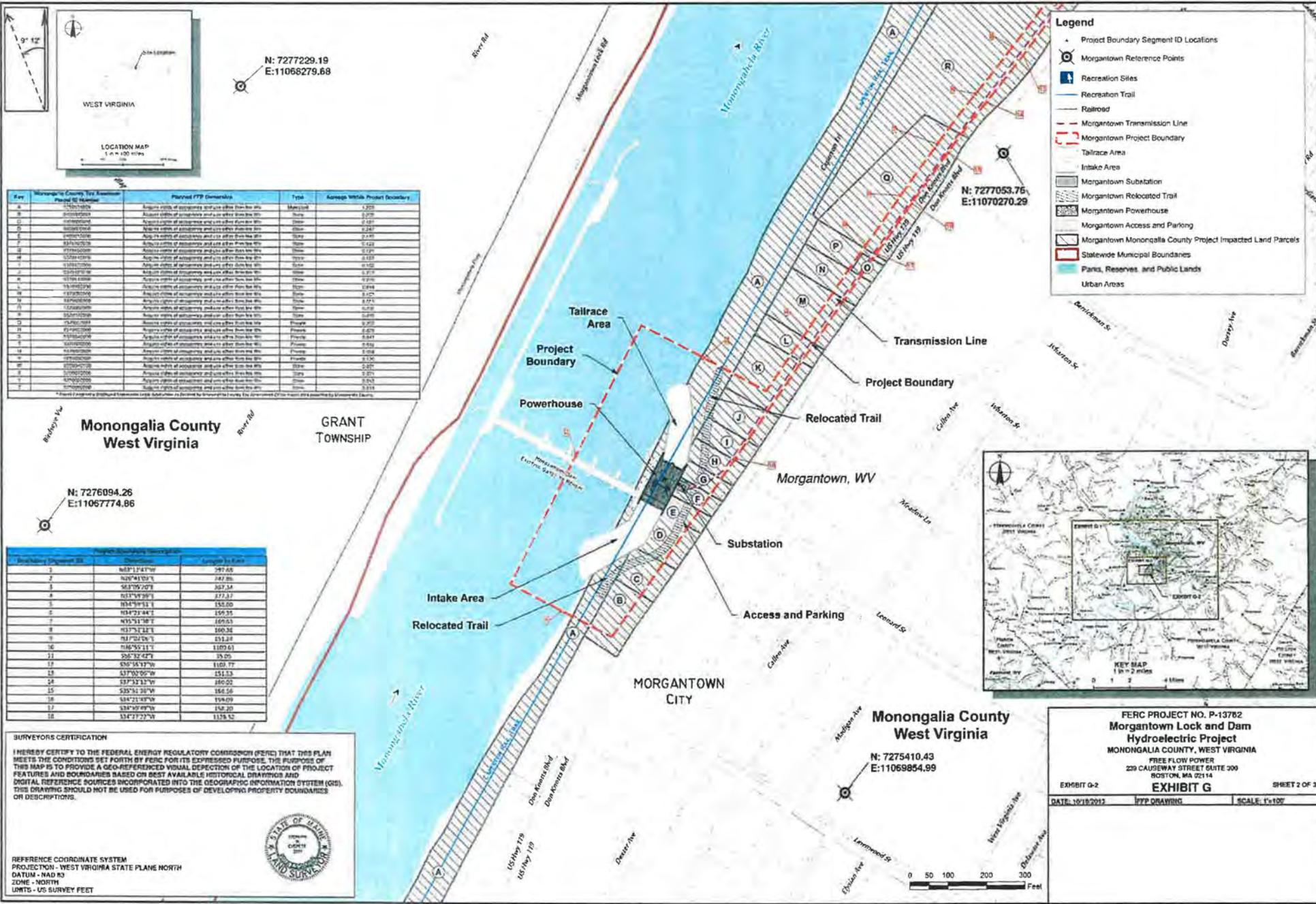
SURVEYORS CERTIFICATION
I HEREBY CERTIFY TO THE FEDERAL ENERGY REGULATORY COMMISSION (FERC) THAT THIS PLAN MEETS THE CONDITIONS SET FORTH BY FERC FOR ITS EXEMPTED PURPOSES. THE PURPOSE OF THIS MAP IS TO PROVIDE A GEO-REFERENCED VISUAL DEPICTION OF THE LOCATION OF PROJECT FEATURES AND BOUNDARIES BASED ON BEST AVAILABLE HISTORICAL DRAWINGS AND DIGITAL REFERENCE SOURCES INCORPORATED INTO THE GEOGRAPHIC INFORMATION SYSTEM (GIS). THIS DRAWING SHOULD NOT BE USED FOR PURPOSES OF DEVELOPING PROPERTY BOUNDARIES OR DESCRIPTIONS.

STATE OF MARYLAND
JAMES M. COHEN
2013

REFERENCE COORDINATE SYSTEM
PROJECTION - WEST VIRGINIA STATE PLANE NORTH
DATUM - NAD 83
ZONE - NORTH
UNITS - US SURVEY FEET

Legend

- Project Boundary Segment ID Locations
- Morgantown Reference Points
- Recreation Sites
- Recreation Trail
- Railroad
- Morgantown Transmission Line
- Morgantown Project Boundary
- Tailrace Area
- Intake Area
- Morgantown Substation
- Morgantown Relocated Trail
- Morgantown Powerhouse
- Morgantown Access and Parking
- Morgantown Monongalia County Project Impacted Land Parcels
- Statewide Municipal Boundaries
- Parks, Reserves, and Public Lands
- Urban Areas



FERC PROJECT NO. P-13762
Morgantown Lock and Dam Hydroelectric Project
MONONGALIA COUNTY, WEST VIRGINIA
FREE FLOW POWER
229 CAUSEWAY STREET SUITE 300
BOSTON, MA 02114

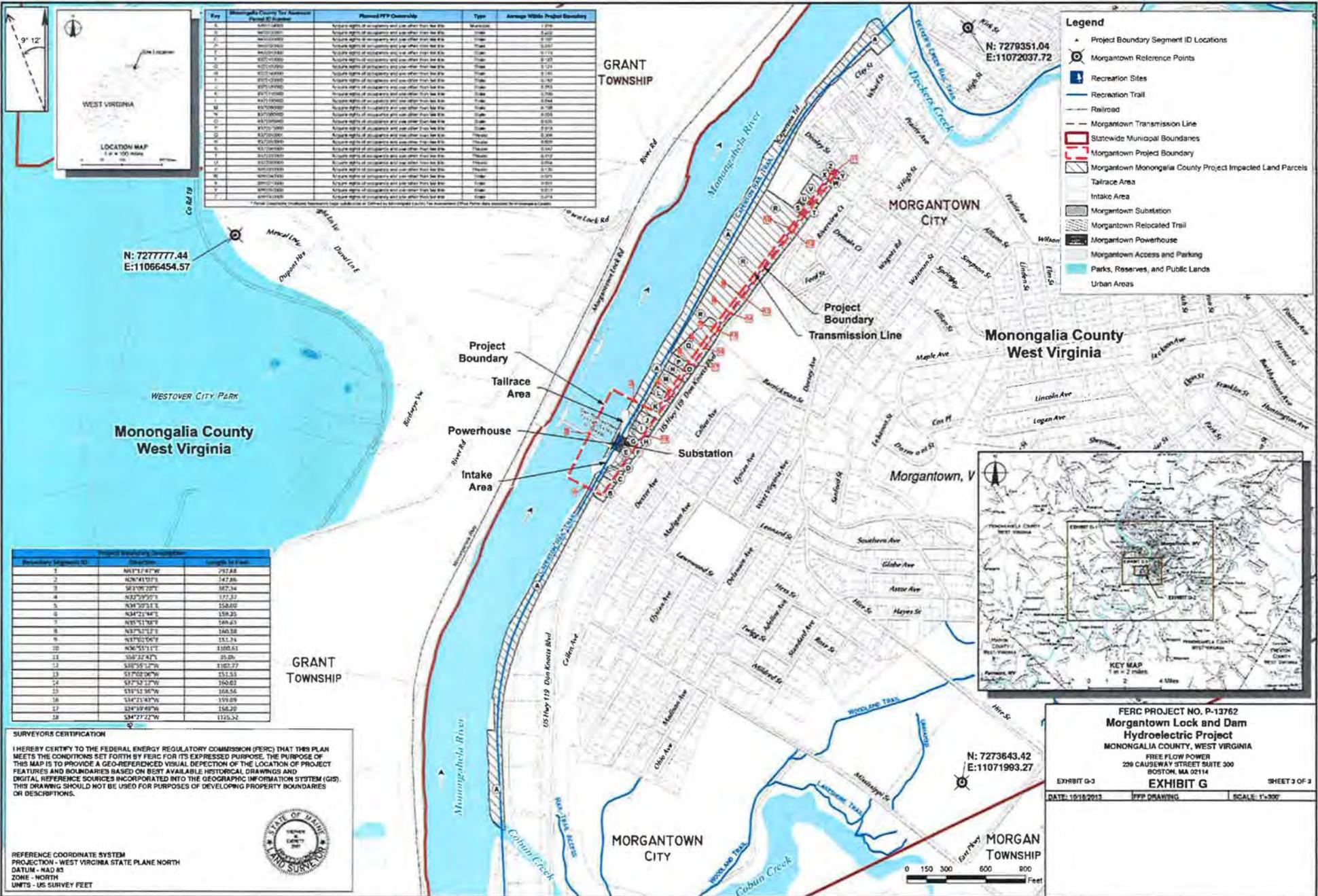
EXHIBIT G-2
EXHIBIT G SHEET 2 OF 3

DATE: 10/18/2013 FPP DRAWING SCALE: 1"=100'

Monongalia County West Virginia

N: 7275410.43
E: 11069854.99





Key	Monongalia County Tax Reference Parcel ID Number	Planned FFP Description	Type	Average Widths Project Boundary
1	845010000	Acquire rights of easements and use other from fee title	Structure	1.270
2	845010000	Acquire rights of easements and use other from fee title	Structure	8.420
3	845010000	Acquire rights of easements and use other from fee title	Structure	3.037
4	845010000	Acquire rights of easements and use other from fee title	Structure	1.173
5	845010000	Acquire rights of easements and use other from fee title	Structure	3.129
6	845010000	Acquire rights of easements and use other from fee title	Structure	3.274
7	845010000	Acquire rights of easements and use other from fee title	Structure	1.341
8	845010000	Acquire rights of easements and use other from fee title	Structure	1.847
9	845010000	Acquire rights of easements and use other from fee title	Structure	2.293
10	845010000	Acquire rights of easements and use other from fee title	Structure	1.366
11	845010000	Acquire rights of easements and use other from fee title	Structure	4.244
12	845010000	Acquire rights of easements and use other from fee title	Structure	4.198
13	845010000	Acquire rights of easements and use other from fee title	Structure	4.054
14	845010000	Acquire rights of easements and use other from fee title	Structure	2.005
15	845010000	Acquire rights of easements and use other from fee title	Structure	2.278
16	845010000	Acquire rights of easements and use other from fee title	Structure	4.206
17	845010000	Acquire rights of easements and use other from fee title	Structure	4.202
18	845010000	Acquire rights of easements and use other from fee title	Structure	2.027
19	845010000	Acquire rights of easements and use other from fee title	Structure	2.176
20	845010000	Acquire rights of easements and use other from fee title	Structure	1.573
21	845010000	Acquire rights of easements and use other from fee title	Structure	1.573
22	845010000	Acquire rights of easements and use other from fee title	Structure	1.573
23	845010000	Acquire rights of easements and use other from fee title	Structure	1.573
24	845010000	Acquire rights of easements and use other from fee title	Structure	1.573
25	845010000	Acquire rights of easements and use other from fee title	Structure	1.573
26	845010000	Acquire rights of easements and use other from fee title	Structure	1.573
27	845010000	Acquire rights of easements and use other from fee title	Structure	1.573
28	845010000	Acquire rights of easements and use other from fee title	Structure	1.573
29	845010000	Acquire rights of easements and use other from fee title	Structure	1.573
30	845010000	Acquire rights of easements and use other from fee title	Structure	1.573

Boundary Segment ID	Description	Length in Feet
1	N63°17'41"W	292.88
2	S26°41'07"E	142.86
3	S51°06'07"E	182.34
4	S32°29'57"E	172.33
5	N34°20'31"E	158.02
6	N34°21'44"E	158.25
7	S35°11'30"E	169.43
8	S32°51'13"E	160.58
9	S17°00'56"E	151.24
10	N36°55'11"E	1103.61
11	S35°22'47"E	25.26
12	S38°55'27"W	1102.77
13	S17°02'06"W	151.53
14	S37°32'17"W	160.82
15	S31°51'36"W	168.56
16	S34°21'43"W	159.89
17	S24°59'49"W	154.22
18	S34°27'22"W	1126.52

SURVEYORS CERTIFICATION

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 GEO-REFERENCED VISUAL DEPICTION OF THE LOCATION OF PROJECT FEATURES AND BOUNDARIES BASED ON BEST AVAILABLE HISTORICAL DRAWINGS AND DIGITAL REFERENCE SOURCES INCORPORATED INTO THE GEOGRAPHIC INFORMATION SYSTEM (GIS). THIS DRAWING SHOULD NOT BE USED FOR PURPOSES OF DEVELOPING PROPERTY BOUNDARIES OR DESCRIPTIONS.

STATE OF MARYLAND
 ENGINEER & SURVEYOR
 [Seal]

REFERENCE COORDINATE SYSTEM
 PROJECTION - WEST VIRGINIA STATE PLANE NORTH
 DATUM - NAD 83
 ZONE - NORTH
 UNITS - US SURVEY FEET

FERC PROJECT NO. P-13762
Morgantown Lock and Dam Hydroelectric Project
 MONONGALIA COUNTY, WEST VIRGINIA

FREE FLOW POWER
 229 CAUSEWAY STREET SUITE 300
 BOSTON, MA 02114

EXHIBIT G-3
EXHIBIT G
 SHEET 3 OF 3

DATE: 10/18/2011
 RFP DRAWING
 SCALE: 1"=300'



Appendix C.6 - 34



239 Causeway Street, Suite 300
Boston, Massachusetts 02114

Daniel Lissner
General Counsel

T 978.252.7111
F 617.367.3372
dlissner@free-flow-power.com

www.free-flow-power.com

March 7, 2013

Kimberly Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N. E.
Mailcode PJ – 12.1
Washington, DC 20426

RE: Revised Planned Studies Document:

- **Point Marion Lock & Dam Hydroelectric Project (FERC No. P-13771)**
- **Grays Landing Lock & Dam Hydroelectric Project (FERC No. P-13763)**
- **Maxwell Lock & Dam Hydroelectric Project (FERC No. P-13766)**
- **Charleroi Lock & Dam No. 4 Hydroelectric Project (FERC No. P-13767)**
- **Opekiska Lock & Dam Hydroelectric Project (FERC No. P-13753)**
- **Morgantown Lock & Dam Hydroelectric Project (FERC No. P-13762)**

Dear Secretary Bose,

Free Flow Power Corporation (FFP), on behalf of Solia 8 Hydroelectric, LLC; FFP Missouri 13, LLC; Solia 5 Hydroelectric, LLC; Solia 4 Hydroelectric, LLC; FFP Missouri 16, LLC; and Missouri 15, LLC, is submitting the attached Revised Planned Studies Document (RPSD) for the Monongahela River Hydroelectric Projects in Pennsylvania and West Virginia. The goal of this RPSD is to provide stakeholders an opportunity to comment on the studies that will be conducted in association with the licensing of the above captioned proposed hydroelectric projects (Projects).

Four of the proposed Projects are in Pennsylvania and two are in West Virginia, as listed below. Each of the Projects will be located on the Monongahela River at an existing lock and dam facility owned and operated by the U.S. Army Corps of Engineers.

Docket No.	Project Name	Installed Capacity	Location
P-13771	Point Marion Lock & Dam Hydroelectric Project	6.6 MW	Point Marion, Fayette County, PA (RM 90.8)
P-13763	Grays Landing Lock & Dam Hydroelectric Project	12.9 MW	Grays Landing, Green County, PA (RM 82)
P-13766	Maxwell Lock & Dam Hydroelectric Project	15.4 MW	East Millsboro, Washington County, PA (RM 61.2)
P-13767	Charleroi / Lock & Dam No. 4 Hydroelectric Project	14.9 MW	Charleroi, Washington County, PA (RM 41.5)
P-13753	Opekiska Lock & Dam Hydroelectric Project	3.8 MW	Fairmont, Monongalia County, WV (RM 115.4)
P-13762	Morgantown Lock & Dam Hydroelectric Project	3.1 MW	Morgantown, Monongalia County, WV (RM 102.0)

All Projects will require the construction of a new intake, powerhouse, tailrace, transmission, and appurtenant facility structures. FFP is pursuing licenses from the Federal Energy Regulatory Commission (FERC) to develop the Projects, as well as additional required approvals, including permits from the U.S. Army Corps of Engineers and the States of West Virginia and Pennsylvania.

As part of the FERC licensing process, FFP has previously solicited comments from resource agencies and stakeholders in the preparation of a Pre-Application Document (PAD), which was filed on November 15, 2011; in holding a Joint Agency/Public Meeting in Morgantown, West Virginia on February 22, 2012 and in Belle Vernon, Pennsylvania on February 23, 2012; and in soliciting comments on the PAD and requests for studies by May 23, 2012. The U.S. Army Corps of Engineers (USACE), the U.S. Fish and Wildlife Service (USFWS), the West Virginia Division of Natural Resources (WVDNR), the Pennsylvania Department of Environmental Protection (PADEP), and the public participated in the Joint Agency/Public Meeting and/or submitted written comments and study requests. FFP utilized these comments and study requests in determining the scope of studies that need to be conducted in support of the licensing in order to assess Project-related resource effects. FFP distributed a Planned Studies Document (PSD) on July 10, 2012 and requested that stakeholders provide comments on the proposed studies by September 20, 2012. Additional comments were received from the USACE and are addressed in this RPSD.

FFP is distributing this RPSD to resource agencies and stakeholders at this time in order to provide: (i) a summary of comments and study requests and FFP's response to each (see Appendix A) and (ii) plans for the studies to be conducted prior to these Projects' License Application submittals, including the rationale for each planned study and the methods and scope of each study.

FFP extends its appreciation to resource agencies and stakeholders for their review and consideration of this RPSD, and requests that any resource agency or stakeholder that may have

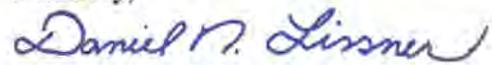
Kimberly Bose, Secretary
March 7, 2013

3

additional comments on the proposed studies described herein notify FFP immediately, as FFP is commencing study activities in accordance with the plans described herein.

If you have any questions regarding this filing, please do not hesitate to contact me at 978-252-7111.

Sincerely,

A handwritten signature in blue ink that reads "Daniel N. Lissner". The signature is written in a cursive style with a large initial 'D'.

Daniel N. Lissner
General Counsel

Kimberly Bose, Secretary
March 7, 2013

4

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list in the captioned proceedings in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure, 18 CFR § 385.2010 (2010).

Dated: March 7, 2013



Daniel N. Lissner
General Counsel
Free Flow Power Corporation

STAKEHOLDER DISTRIBUTION LIST

FEDERAL AGENCIES

Federal Energy Regulatory Commission
Regional Engineer, New York Regional Office
19 W. 34th St. Room 400
New York, NY 10001-3006

National Association of Regulatory Utility
Commissioners
1101 Vermont Ave, NW
Washington, DC 20005

National Marine Fisheries Service
Regional Director, Northeast Regional Office
55 Great Republic Dr.
Gloucester, MA 01930-2298

Susquehanna River Basin Commission
1721 N. Front Street
Harrisburg, PA 17102-2315

U.S. Army Corps of Engineers
550 Main Street
Cincinnati, OH 45202

U.S. Army Corps of Engineers
Commander, North Atlantic Division
26 Federal Plz, No. 2109
New York, NY 10278-0090

U.S. Army Corps of Engineers
Jeff Benedict
2200 W. S. Moorhead Federal Bldg
1000 Liberty Ave.
Pittsburgh, PA 15222-4186

U.S. Army Corps of Engineers
Christine T. Lewis-Coker
100 Penn Square East
Philadelphia, PA 19107-3390

U.S. Bureau of Indian Affairs
1849 C Street, NW, MS 6557
Washington, DC 20240

U.S. Coast Guard
MSO Pittsburgh
1150 Kossman Bldg.
100 Forbes Ave.
Pittsburgh, PA 15222-1371

U.S. Coast Guard
MSO Philadelphia
1 Washington Ave
Philadelphia, PA 19147-4335

U.S. Coast Guard
MSO Buffalo
1 Fuhrmann Blvd.
Buffalo, NY 14203-3105

U.S. Environmental Protection Agency
Section Chief, Region III
1650 Arch St.
Philadelphia, PA 19103-2029

U.S. Fish and Wildlife Service
Regional Director
300 Westgate Center Dr.
Hadley, MA 01035-9587

U.S. Fish and Wildlife Service
315 Allen St. Ste. 322
State College, PA 16801-4851

U.S. Fish and Wildlife Service
PO Box 67000
Harrisburg, PA 17106-700

U.S. National Park Service
15 State St.
Boston, MA 02109-3502

STATE AGENCIES

Pennsylvania:

Donovan Houck
Pennsylvania Coastal Zone Management Office
400 Market St. 2nd Floor
Harrisburg, PA 17101

Pennsylvania Department of Environmental
Protection
Southwest District Office
400 Waterfront Dr.
Pittsburgh, PA 15222-4739

Director
Pennsylvania Department of Environmental
Protection
PO Box 8554
Harrisburg, PA 17105-8554

Hoss HL Liaghat
Pennsylvania Department of Environmental
Protection
400 Market Street
Harrisburg, PA 17105

Director
Pennsylvania Department of
Conservation/Natural Resources
PO Box 8551
Harrisburg, PA 17105-8551

Pennsylvania Department of
Conservation/Natural Resources
PO Box 2063
Harrisburg, PA 17105-2063

Pennsylvania Fish & Boat Commission
PO Box 67000
Harrisburg, PA 17106-7000

Pennsylvania Fish & Boat Commission
450 Robinson Ln
Bellefonte, PA 16823-8133

Pennsylvania Game Commission
2001 Elmerton Ave
Harrisburg, PA 17110-9762

Pennsylvania Office of the Attorney General
16th Floor, Strawberry Square
Harrisburg, PA 17120

West Virginia:

West Virginia Department of Agriculture
1900 Kanawha Blvd.
East State Capitol, Room E-28
Charleston, WV 25305-0170

West Virginia Department of Education & Arts
Division of Culture & History
Bld. 5, Rm. 205
1900 Kanawha Blvd. East
Charleston, WV 25305

Kerry Bledsoe
West Virginia Division of Natural Resources
PO Box 99
1110 Railroad Street
Farmington, WV 26571-0099

Director
West Virginia Geological and Economic Survey
1 Mont Chateau Road
Morgantown, WV 26508-8079

Fred Cutlip
Intergovernmental Review, Community and
Industrial Development
Building 6, Room 553, S. Capitol Complex
Charleston, WV 25305

West Virginia Press Services, Inc.
3422 Pennsylvania Ave.
Charleston, WV 25302-4633

West Virginia Public Service Commission
Richard E. Hitt, Esq.
General Counsel
201 Brooks St.
Charleston, WV 25301

LOCAL GOVERNMENT

Pennsylvania:

Fayette County
61 East Main Street
Uniontown, PA 15401

Greene County
10 East High Street, Room 103
Waynesburg, PA 15370

Town of Brownsville
232 Brown Street
Brownsville, PA 15417

Borough of California
225 3rd Street
California, PA 15419

City of Monessen
100 3rd Street
Monessen, PA 15062

Borough of Donora
6 Meldon Street
Donora, PA 15033

Washington County
1000 West Beau Street
Washington, PA 15301

Borough of Charleroi
338 Fallowfield Ave.
Charleroi, PA 15022

Borough of West Mifflin
3000 Lebenon Church Road
West Mifflin, PA 15122

City of Clairton
551 Ravensburg Blvd.
Clairton, PA 15025

City of McKeesport
201 Lysle Blvd.
McKeesport, PA 15132

Borough of Baldwin
10 Community Park Dr.
Pittsburgh, PA 15025

Borough of Jefferson Hills
925 Old Clarton Rd.
Jefferson Hills, PA 15025

Borough of White Oak
2280 Lincoln Way
White Oak, PA 15131

Peters Township
610 East McMurray Road
McMurray, PA 15317

Pleasant Hills
410 East Bruceton Road
Pittsburgh, PA 15236

West Virginia:

City of Morgantown
389 Spruce Street
Morgantown, WV 26505

Monongalia County
243 High Street
Morgantown, WV 26505

City of Fairmont
200 Jackson Street
Fairmont, WV 26554

TRIBAL REPRESENTATIVES

Seneca Nation
1490 Route 438
Irving, NY 14081

Tonawanda Band of Senecas
7027 Meadville Road
Basom, NY 14013

Kimberly Bose, Secretary
March 7, 2013

8

OTHER STAKEHOLDERS

Brooks Natural Center
Director, Ogelbay Institute, Ogelbay Park
1330 National Road
Wheeling, WV 26003

The Honorable Alan B. Mollahan
U.S. House of Representatives
2302 Rayburn House Office Bldg.
Washington, DC 20515

The Honorable Joe Manchin
U.S. Senate
303 Hart Senate Office Bldg.
Washington, DC 20510

National Association of Regulatory Utility Commissioners
1101 Vermont Ave, NW
Washington, DC 20005

Regional Director
Lands, Watershed & Minerals
626 E. Wisconsin Ave
Milwaukee, WI 53202-4616

Massachusetts Department of Public Utilities
Director of Electric Power Division
One South Station
Boston, MA 02110

Missouri Office of the Governor
PO Box 720
Jefferson City, MO 65102-0720

Missouri Public Service Commission
Secretary
PO Box 360
Jefferson City, MO 65102-0360

Minnesota Public Utilities Commission
121 7th Place East, Ste. 350
Saint Paul, MN 55101-2163

Wisconsin Valley Improvement Company
David M. Coon
2301 3rd St.
Wausau, WI 54403-3202

REVISED PLANNED STUDIES DOCUMENT

MONONGAHELA RIVER PROJECTS

Point Marion Lock & Dam Hydroelectric Project (FERC No. P-13771)
Grays Landing Lock & Dam Hydroelectric Project (FERC No. P-13763)
Maxwell Lock & Dam Hydroelectric Project (FERC No. P-13766)
Charleroi Lock & Dam No. 4 Hydroelectric Project (FERC No. P-13767)
Opekiska Lock & Dam Hydroelectric Project (FERC No. P-13753)
Morgantown Lock & Dam Hydroelectric Project (FERC No. P-13762)



FREE FLOW POWER CORPORATION
239 CAUSEWAY STREET, SUITE 300
BOSTON, MA 02114

MARCH 7, 2013

REVISED PLANNED STUDIES DOCUMENT

MONONGAHELA RIVER PROJECTS

Point Marion Lock & Dam Hydroelectric Project (FERC No. P-13771)
Grays Landing Lock & Dam Hydroelectric Project (FERC No. P-13763)
Maxwell Lock & Dam Hydroelectric Project (FERC No. P-13766)
Charleroi Lock & Dam No. 4 Hydroelectric Project (FERC No. P-13767)
Opékiska Lock & Dam Hydroelectric Project (FERC No. P-13753)
Morgantown Lock & Dam Hydroelectric Project (FERC No. P-13762)

TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page No.</u>
1	INTRODUCTION	4
1.2	Study Comments Received.....	6
1.3	Studies Proposed to be Completed Prior to Filing of FERC License Applications	7
1.4	Studies and Resource Protection Plans Proposed to be Completed After Receipt of FERC Licenses, Prior to Construction.....	8
1.5	Area of Project Effect and Study Areas.....	10
1.6	Study Reporting	10
2	PLANNED STUDIES	11
2.1.1	Study Goals.....	11
2.1.2	Methodology.....	13
2.1.3	Report	17
2.1.4	Schedule.....	18
2.2	Aquatic Habitat Assessment.....	20
2.2.1	Study Goals.....	20
2.2.2	Study Area	21
2.2.3	Methodology.....	21
2.2.4	Report	22
2.2.5	Schedule.....	22
2.3	Fish Entrainment and Passage Study.....	23
2.3.1	Study Goals.....	23
2.3.2	Study Area	24
2.3.3	Methodology.....	24
2.3.4	Report	27
2.3.5	Schedule.....	29

2.3.6	Literature Cited.....	29
2.4	Mussel Survey	30
2.4.1	Study Goals.....	30
2.4.2	Study Area	30
2.4.3	Methodology.....	30
2.4.4	Report	31
2.4.5	Schedule.....	31
2.5	Recreational Resources Management Plan.....	32
2.5.1	Study Goals.....	32
2.5.2	Study Area	33
2.5.3	Methodology.....	33
2.5.4	Report	34
2.5.5	Schedule.....	35
2.6	Phase I Archeological Survey.....	36
2.6.1	Study Goals.....	36
2.6.2	Study Area	36
2.6.3	Methodology.....	36
2.6.4	Additional Archeological Investigation.....	37
2.6.5	Reports.....	38
2.6.6	Schedules	38
2.7	Historic Resources Study.....	39
2.7.1	Study Goals.....	39
2.7.2	Methods	39
2.7.3	Additional Historical/Architectural Survey.....	39
2.7.4	Report	39
2.7.5	Schedule.....	40
2.8	Terrestrial Habitat and RTE Species Study	41
2.8.1	Study Goals.....	41
2.8.2	Study Area	41
2.8.3	Methodology.....	41
2.8.4	Report	42
2.8.5	Schedule.....	42
2.9	Water Quality Study	43
2.9.1	Study Goals.....	43
2.9.2	Study Area	44
2.9.3	Methodology.....	44
2.9.4	Report	47
2.9.5	Schedule.....	50
2.10	Sediment Quality Survey.....	51
2.10.1	Study Goals.....	51
2.10.2	Study Area	51
2.10.3	Methodology.....	51
2.10.4	Report	52
2.10.5	Schedule.....	52

Section 1

Introduction

1.1 Project Background

Free Flow Power Corporation (FFP), on behalf of Solia 8 Hydroelectric, LLC; FFP Missouri 13, LLC; Solia 5 Hydroelectric, LLC; and Solia 4 Hydroelectric, LLC; FFP Missouri 16, LLC and FFP Missouri 15, LLC is submitting the attached Revised Planned Studies Document (RPSD) for six proposed hydropower projects located on the Monongahela River in Pennsylvania and West Virginia (Projects). The goal of this RPSD is to advise all stakeholders of the studies that FFP plans to conduct in connection with the licensing of these Projects and to afford an opportunity for further discussion in the event that these study plans differ from stakeholders' expectations or requirements. This RPSD is an update to the Planned Studies Document (PSD) distributed to stakeholders and filed with the Federal Energy Regulatory Commission (FERC) on July 10, 2012, and it incorporates additional studies and revised methodologies that were developed in response to stakeholder comments on the PSD, as further described herein.

Four of the proposed Projects are in Pennsylvania and two are in West Virginia, as listed below. Each of the Projects will be located on the Monongahela River at existing lock and dam facilities owned and operated by the U.S. Army Corps of Engineers (USACE).

Docket No.	Project Name	Installed Capacity	Location
P-13771	Point Marion Lock & Dam Hydroelectric Project	6.6 MW	Point Marion, Fayette County, PA (RM 90.8)
P-13763	Grays Landing Lock & Dam Hydroelectric Project	12.9 MW	Grays Landing, Green County, PA (RM 82)
P-13766	Maxwell Lock & Dam Hydroelectric Project	15.4 MW	East Millsboro, Washington County, PA (RM 61.2)
P-13767	Charleroi / Lock & Dam No. 4 Hydroelectric Project	14.9 MW	Charleroi, Washington County, PA (RM 41.5)
P-13753	Opekiska Lock & Dam Hydroelectric Project	3.8 MW	Fairmont, Monongalia County, WV (RM 115.4)
P-13762	Morgantown Lock & Dam Hydroelectric Project	3.1 MW	Morgantown, Monongalia County, WV (RM 102.0)

Table 1-1. FFP's Proposed Monongahela River Projects

All Projects will require the construction of a new intake, powerhouse, tailrace, transmission, and appurtenant facility structures. FFP is pursuing licenses from FERC to develop the Projects, as well as additional required approvals, including permits from the USACE and the states of West Virginia and Pennsylvania.

As part of the FERC licensing process, FFP has previously solicited comments from resource agencies and stakeholders in the preparation of a Pre-Application Document (PAD), which was filed on November 15, 2011; in holding a Joint Agency/Public Meeting in Morgantown, West Virginia on February 22, 2012 and in Belle Vernon, Pennsylvania on February 23, 2012; and in soliciting comments on the PAD and requests for studies by May 23, 2012. The USACE, the U.S. Fish and Wildlife Service (USFWS), the West Virginia Division of Natural Resources (WVDNR), the Pennsylvania Department of Environmental Protection (PADEP), and the public participated in the Joint Agency/Public Meeting and/or submitted written comments and study requests. FFP utilized these comments and study requests in determining the scope of studies that need to be conducted in support of the licensing in order to assess Project-related resource effects. FFP distributed a Planned Studies Document (PSD) on July 10, 2012 and requested that stakeholders provide comments on the proposed studies by September 20, 2012. Additional comments were received from the USACE and are addressed in this RPSD.

FFP is distributing this RPSD to resource agencies and stakeholders at this time in order to provide: (i) a summary of comments and study requests and FFP’s response to each (see Appendix A) and (ii) plans for the studies to be conducted prior to these Projects’ License Application submittals, including the rationale for each planned study and the methods and scope of each study.

1.2 Study Comments Received

A total of six comment letters were received via the FERC dockets for the Projects in response to the PAD, as study requests, or as comments on the PSD. These comment letters are identified in Table 1-2 below and are addressed in the appropriate sections of this RPSD.

Stakeholder	Date
Pennsylvania Department of Environmental Protection	November 23, 2011
West Virginia Division of Natural Resources	April 20, 2012
U.S. Army Corps of Engineers, Pittsburgh District	April 20, 2012
U.S. Fish and Wildlife Service	April 20, 2012
U.S. Army Corps of Engineers, Pittsburgh District	April 23, 2012
U.S. Army Corps of Engineers, Pittsburgh District	September 20, 2012

Table 1-2. PAD Comment and Study Request Letters.

Comments received included study requests, comments on the PAD’s content, and requests for specific protection, mitigation, and enhancement measures. In keeping with the intent of this document, FFP has focused primarily on the study request comments; however, all comments were reviewed to ensure that the type and scope of the proposed studies adequately address all issues, and each comment received is responded to in the table in Appendix A. FFP has utilized all comments and study requests in determining the scope of studies that need to be conducted to assess Project-related resource effects in support of development FERC License Applications.

1.3 Studies Proposed to be Completed Prior to Filing of FERC License Applications

Based upon comments received, FFP will conduct the following nine studies that will be used in the License Applications to assess Project effects:

- Project Hydraulics Study
- Aquatic Habitat Assessment
- Fish Entrainment and Passage Study
- Mussel Survey
- Recreation Resources Management Plan
- Phase I Archeological and Historic Resources Study (and development of draft Historic Properties Management Plan)
- Terrestrial Habitat and Rare Threatened and Endangered (RTE) Species Study
- Water Quality Study
- Sediment Quality Survey

Plans for these nine studies are presented in this RPSD. In addition to the first six studies, which were proposed in the PSD, FFP has modified its study plans to conduct a Terrestrial Habitat and RTE Species Study, a Water Quality Study and a Sediment Quality Survey pre-licensing, in order to address additional concerns raised by stakeholders.

At this stage in the FERC licensing process, studies are conducted to gather data in order to assess Project effects later, in the License Applications. In addition to the Project effects assessments, any proposed protection, mitigation, and enhancement measures that are determined to be necessary will be addressed in the License Applications.

It is important to note that the potential effects of these Projects on resources and existing uses of Project-area waters will be very different from other hydro projects where a new dam or diversion is required. The Monongahela River dams currently exist and are operated by the

USACE, primarily to provide for navigation. FFP is proposing no change in the volume of water that is released from the dams, or the seasonal/temporal dispatching of those releases, unless directed to do so by the USACE in the future. Thus, it is expected and intended that the Projects will have minimal effects on Project-area resources and will protect existing uses of the Project-area waters. There may be localized changes in flow velocity and direction because the Projects will cause most water to be released from the powerhouse, rather than exclusively over the dam or via gates. These changes will be analyzed in the Project Hydraulics Study and Water Quality Study described herein; however, it is important to note that the potential effects of the Projects, and the focus of the studies necessary to assess the environmental effects of the Projects, is the difference between the current and proposed environmental conditions.

1.4 Studies and Resource Protection Plans Proposed to be Completed After Receipt of FERC Licenses, Prior to Construction

FFP also intends to conduct other studies and to prepare several resource protection plans after the FERC license is issued, but prior to the start of Project construction: Each of these studies or plans are discussed below, along with the rationale for conducting them later in the Project development process.

FFP will propose that each of these studies and plans be required as a condition of its FERC Licenses for each of the six Projects. FFP will request that FERC require that the plans for these studies be developed in consultation with agencies and stakeholders after issuance of the FERC licenses. Study results will be issued for agency and stakeholder review and comment prior to filing with FERC. FERC will require that the studies and or plans be completed prior to authorizing construction to begin. Further, if any of the studies indicate that resource protection or mitigation measures are necessary, such measures will be developed in consultation with affected resource agencies and stakeholders.

A brief description of each study or plan to be prepared after receipt of the FERC Licenses is provided below. Additional discussion will be included in the License Applications.

Invasive Species Survey and Invasive Species Management Plan: FFP will conduct an Invasive Species Survey in the area of the new powerhouse, transmission line and substation. This study will be undertaken post licensing, prior to commencing construction. FFP is proposing to conduct this study post licensing because the exact boundaries of the area that will be affected by new construction or construction related activities is not known at this time. Conducting this study as a post-licensing compliance study prior to construction will ensure that all potentially affected lands are included in the study. In addition, all of the required regulatory approval and final design processes will not be complete for approximately three years. The survey will be followed by development of an Invasive Species Management Plan that will apply to initial Project construction and future activities at the Projects.

Avian Protection Plan: FFP will develop an Avian Protection Plan for the Projects. The Plan will be developed consistent with Avian Power Line Interaction Committee (APLIC) and USFWS guidelines, and will identify protection measures that will be incorporated in the Project design. Measures that will be implemented in the future in association with transmission facility maintenance activities will also be addressed in the Plan.

Transmission Line Maintenance Plan: FFP will develop a Transmission Line Corridor Management Plan. This plan will detail procedures to be implemented to control vegetation along any newly created transmission line corridors that are developed as part of the FERC-licensed Projects.

Erosion and Sedimentation Control Plan: An Erosion and Sedimentation Control Plan, to be implemented during Project construction, will be required by the FERC, the USACE, and the States under their respective regulatory approval processes. Prior to the start of construction, FFP will develop the plan in consultation with all of these agencies, and the plan will address the relevant erosion and sedimentation control requirements of all agencies in one document. This plan will include all provisions necessary to minimize erosion and sedimentation during Project construction and to stabilize banks post-construction. In addition, a sediment testing and

management program that is compliant with applicable state regulations will be included in the Plan.

1.5 Area of Project Effect and Study Areas

The studies discussed herein will be conducted within the Area of Project Effect (APE). The APE includes an aquatic component and a terrestrial component.

The aquatic APE is the water area upstream and downstream of the existing dam that the new hydropower Projects will potentially affect by changing hydraulic conditions (water elevations, flow velocities, or flow directions).

The terrestrial APE generally includes lands within the proposed Project Boundary, including transmission line corridors. The terrestrial APE also includes all lands that may be used for construction access, equipment storage areas, etc., whether or not such lands are included within the Project Boundary.

1.6 Study Reporting

Reports for each study will be prepared and distributed to agencies as drafts for review and comment. In general we expect to issue study reports concurrent with Draft License Applications for each Project, in mid-2013. However, reports for some studies that require late summer fieldwork may not be complete when the Draft License Applications are issued. If necessary, FFP will issue supplements to the Draft License Applications for such studies. In any event, agencies will be provided drafts of all study reports for review and comment, prior to the reports being finalized for submittal to FERC with the Final License Applications in early 2014.

Section 2

Planned Studies

2.1 Project Hydraulics Study

2.1.1 Study Goals

The Monongahela River Projects will operate consistent with USACE-prescribed water level management strategies; however, the Projects may cause localized changes in the velocity and direction of water flow. The WVDNR, USFWS and USACE have commented that these changes could alter aquatic habitat, water quality, sediment movement, and access to and use of existing recreational activities. To develop the data needed to address these potential resource effects in other studies, FFP will conduct a Project Hydraulics Study.

The specific objectives of this study are to:

- Task 1 - Compile available hydrologic and bathymetric data;
- Task 2 - Develop a model of baseline (existing) flow condition upstream and downstream of the dam;
- Task 3 - Develop bathymetric maps for the area upstream and downstream of the dam;
- Task 4 - Determine the upstream and downstream boundaries of the APE;
- Task 5 - Model current and future flow conditions (velocity, direction and depth) in the APE using a two-dimensional model;
- Task 6 - Model changes in sediment movement and deposition (as determined by changes in shear velocities), in the APE using a two-dimensional model;
- Task 7 - Model current and future flood levels in the APE.

In addition, data obtained through the modeling conducted under this study will be used across a range of other studies to assess resource effects. Specifically, the Project Hydraulic Study will provide the following data for each study listed (*task used to develop data noted in parentheses*):

Fish Entrainment and Survival Study

- Future Project hydraulics (water level, flow, direction) under low, high and average flows, to be used in assessing fish movement below the dam and seasonal timing and duration of downstream fish passage under current conditions, and the degree to which fish will pass via USACE's existing operating practices versus through FFP's new Projects under future operations (*Task 5*)

Aquatic Habitat Assessment

- Existing flow and bathymetric data to be used to develop habitat type maps in the APE (*Tasks 1,2,3 and 4*);
- Future project hydraulics (water level, flow, direction) under low, high and average flows to be used in assessing changes to aquatic habitat in the APE (*Task 5*); and
- Results of sediment movement assessment to assess potential changes to aquatic habitat in the APE (*Task 6*).

Mussel Survey

- Existing flow and bathymetric data to be used in assessing habitat potential in the APE (*Tasks 1,2,3, and 4*);
- Future project hydraulics (water level, flow, direction) to be used in assessing effects on to mussel habitat, if present in the APE (*Task 5*); and
- Results of sediment movement assessment to assess potential changes to aquatic habitat in the APE (*Task 6*).

Recreational Resource Management Plan

- Existing flow and bathymetric data to be used in assessing current conditions (*Tasks 1,2,3, and 4*); and
- Future project hydraulics (water level, flow, direction) to be used in assessing effects on existing recreational use due to future Project operations in the APE (*Task 5*).

Cultural Resource Studies

- Hydraulics data, as requested by the contractor, to assess Project impacts to existing historic resources in the APE (*Tasks 1,2,3,4, 5, 6 and 7*).

2.1.2 Methodology

Task 1. Compile available hydrologic and bathymetric data

Hydrologic data representative of Project area flows is available from the U.S. Geological Survey (USGS) and USACE. Some bathymetric data is also available for the Project area. FFP will analyze the data to first determine the APE for each Project.

If the APEs are found to extend beyond the range of the existing bathymetric data, FFP will then conduct further field measurements to obtain additional bathymetric data within the APE using Acoustic Doppler Current Profiler (ADCP) sonar deployed from a boat. ADCP will allow for the gathering of both bathymetry and flow velocity data along transects. Measurements along three longitudinal axes will also be collected in addition to the lines transversal to the flow.

Task 2. Develop a model of baseline (existing) flow condition upstream and downstream of the dam

The data obtained from USGS and USACE will be used to develop the baseline hydrologic data set that will be used for all modeling. Daily flow and stage data for the entire period of record for the available gages will be incorporated into this dataset.

Models will then be developed to help answer the following questions:

1. What range of flow conditions (and associated velocities and depths) can be expected over the entire study area?
2. How will the operation of turbines affect flow patterns upstream and downstream of proposed hydroelectric installations?

3. How will thermal stratification affect flow patterns upstream of proposed hydroelectric installations?
4. How will lateral flow variability upstream and downstream of proposed hydroelectric installations be altered by turbine operations?

A continuous computer simulation model of the entire study area will be developed using CE-QUAL-W2, a two-dimensional hydrodynamic and water quality model sponsored in part by USACE. This model will simulate the flow of the river throughout the study area, as well as the nutrient and dissolved oxygen dynamics (see Section 2.2 for a discussion on water quality simulation). In free-flowing sections of the rivers, the model will simulate one-dimensional flow (longitudinal variations), as it is not expected that free-flowing sections would be vertically stratified. Based on data obtained from USGS and USACE, the model will also simulate two-dimensional hydrodynamics in impounded river reaches behind the proposed sites for hydropower installations, if the data suggest that specific impoundments are thermally stratified. Thermal stratification, especially with the introduction of new intakes for hydroelectric turbines, can result in variations in flow characteristics between upper and lower flow layers, and this will be included in the modeling on an as-needed basis.

The CE-QUAL-W2 model will also provide the hydraulic basis for water quality simulation (also with the same model, per Section 2.2). Water quality estimates depend on accurate estimates of flow, velocity, and depth to predict travel times, settling rates, re-aeration rates, light penetration, and to support the likelihood of thermal stratification.

The hydrodynamic modeling will be locally supplemented with two-dimensional hydraulic modeling at proposed project sites where lateral flow variations could be appreciably impacted by the installation of hydroelectric turbines. The ADH model (Adaptive Hydraulics Modeling System, developed by the Coastal Hydraulics Laboratory, a member of the Engineer Research and Development Center of USACE) will be employed on sites agreed to between FFP and USACE, ranging in quantity from one to all six, based on initial data and assumptions about how flow and sedimentation patterns are likely to be affected upstream and downstream by turbine

operations. The ADH models will not span the entire river system, but will use input from the CE-QUAL-W2 models as boundary conditions at specific dam sites.

Task 3. Develop bathymetric maps for the area upstream and downstream of the dam

Results of the bathymetric survey will be used to develop bathymetric maps of the APE. The mapping will be done using GIS.

Task 4. Determine the upstream and downstream boundaries of the area of project effect

The APE includes the distance upstream and downstream of the dam that will be affected by changes in hydraulics. The extent of this area will be determined using first by preliminary analysis using available data and textbook-style equations for velocities and mixing lengths. This analysis will assume idealized channel configurations (uniform, simple geometry), and will provide guidelines for areas of focus with the detailed hydraulic and water quality models. The results will be confirmed as the CE-QUAL-W2 model is developed and deployed, both to examine hydraulic characteristics in the river with and without turbine operations, and also the extent of water quality impacts upstream and downstream. In this way, the APE will be initially estimated, and then confirmed/refined as part of the planned modeling activities.

These assumptions of the preliminary analysis are intended to characterize the river flow under simplified hydrodynamic conditions without any influence from other factors related to channel geometry. The estimated size of the area influenced by the Project then becomes site independent since it depends only on the flow without regard on the varying local geometric conditions at each site. This procedure ensures that the overall extent of the area of study is firmly based on the fundamental Laws of Fluid Motion.

Task 5. Model current and future flow conditions and lateral flow variability (velocity, direction and depth) in the area of project affect using a two-dimensional model

Current and future flow conditions (velocity, direction and depth) in the APE will be modeled using a two-dimensional hydraulic model (ADH, as discussed above). This model will be used to determine the differences between baseline and proposed flow conditions in order to assess changes in flow velocity, direction and stage. It will discretize flow both longitudinally and laterally, and assume constant characteristics vertically in each segment.

This two-dimensional numerical flow model will be employed as needed (per agreement between FFP and USACE) at sites where appreciable changes in lateral flow patterns could occur due to turbine operations. The simulated areas will have a computational domain slightly longer than the required area of study, i.e., the model domain will encompass the area of study plus an additional distance upstream and downstream. The model boundaries will be specified with output from the CE-QUAL-W2 model, or some combination of CE-QUAL-W2 output and USGS flow data. The boundaries and the area of interest need to be separated by a distance sufficiently long enough to avoid instability at the boundary propagating into the areas of interest, but also short enough to avoid accumulation of model uncertainty before the areas of interest. Output from the two-dimensional hydraulic model will include the horizontal distribution of flow, depth-averaged velocity and water surface elevation.

Task 6. Assess changes in sediment movement and deposition in the area of project effect using a two-dimensional model

It is unlikely that flood characteristics in the study area would change, since total flow passage during extreme flow events should be neither diminished nor augmented by the presence/operation of turbines. The use of the CE-QUAL-W2 model over the entire river system using continuous flow records will help justify this assertion, as we will be able to compare water levels with and without the presence of turbines.

Task 7. Model current and future flood levels in the area of project effect

Current and future flood levels in the APE will also be modeled using the two-dimensional hydraulic model.

2.1.3 Report

The results of the Project Hydraulics Study will be compiled in a detailed report. The report will document the following for each task:

Task 1 - Compile available hydrologic and bathymetric data

- Hydrologic data set will be presented in an appendix; and
- Bathymetric data collection methods and results will be summarized in an appendix.

Task 2 - Develop a model of baseline (existing) flow condition upstream and downstream of the dam

- Hydrologic data set will be summarized in the report;
- Specific sites will be identified (through consultation with the USACE) for which localized two-dimensional (longitudinal and lateral) hydraulic models will be developed with ADH; and
- Specific sites will be identified for which the CE-QUAL-W2 river model will be discretized vertically to account for thermal stratification.

Task 3 - Develop bathymetric maps for the area upstream and downstream of the dam

- Bathymetric maps for the APE will be presented in the report.

Task 4 - Determine the upstream and downstream boundaries of the area of project affect

- Methods used to undertake the one-dimensional modeling will be presented in the report; and
- Results, including GIS based mapping of the APE, will be included in the report.

Task 5 - Model current and future flow conditions (velocity, direction and depth) in the area of project affect

- Methods used to undertake the two-dimensional modeling will be presented in the report;
- Results, including mapping of current and future flow conditions in the APE will be included in the report; and
- Detailed data for the intake area hydraulics will be presented.

Task 6 - Model changes in sediment movement and deposition in the area of project effect

- Methods used to understand the potential for sediment movement and deposition will be presented in the report;
- Findings on the likelihood of appreciable changes in sediment dynamics will be reported; and
- Any recommendations for additional modeling of sediment transport and deposition will be included.

Task 7 - Model current and future flood levels in the area of project effect

- Simulated water levels with and without the turbines in place and operating will be presented. It is unlikely that the presence of turbines will enhance or diminish the total flow past each dam during extreme events; and
- If simulation results suggest that water levels could change, additional flood modeling will be recommended, but it is assumed that this will happen as a byproduct of simulating the entire system with the CE-QUAL-W2 model.

As noted earlier, the data obtained through this study will be used extensively to assess resource effects in other studies. Those assessments and the data used to develop each will be presented and discussed in those separate study reports.

2.1.4 Schedule

Bathymetric data collection will occur in the winter/spring of 2013, ideally commencing in March 2013. Modeling is anticipated to be completed during the spring/summer of 2013, and

the report will be issued concurrent with the Draft License Applications, which are currently expected to be filed in September 2013, or as a supplement if the study report is not available when the Draft License Applications are issued.