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Hydro Generation
996 Old Franklin Turnpike
Rocky Mount, VA 24151
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Kimberly Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington DC 20426

May 26, 2009

RE: Appalachian Power Company
London/Marmet Hydroelectric Project
And Winfield Hydroelectric Project
Projects 1175-013 and 1290-011
Revised Study Plans and Provision of
Additional Information

Dear Secretary Bose:

On behalf of Appalachian Power Company (Appalachian), we are providing in accordance with 18 CFR, Part 5, § 5.13, Revised Study Plans for Appalachian's London/Marmet Project No. 1175 and Winfield Project No. 1290, both of which are located on the Kanawha River in West Virginia. The enclosed revised study plans are included in Schedule A. As part of this filing, we are also responding to the verbal questions raised by Commission staff at the Study Plan Meeting held on February 25, 2009 in Charleston, West Virginia. Those responses are included in Schedule B.

The revised study plans have been modified in response to comments received at the Study Plan Meeting and those subsequently filed with the Commission by the West Virginia Division of Natural Resources and the West Virginia Division of Culture and History.

Under the conditions of 18 CFR, Part 5, § 5.13 the potential applicant must file revised study plans for Commission approval. The revised study plans should include comments on the proposed study plans and a description of the efforts made to resolve differences over study requests. If the potential applicant does not adopt a requested study, it must explain why the request was not adopted, with reference to the criteria set forth in 18 CFR, Part 5, § 5.9(b).

Appalachian's Revised Study Plans are due to the Commission by May 26, 2009 according to the ILP Process Plan and Schedule. We believe that the information provided in this filing is timely and meets the requirements of 18 CFR, Part 5, § 5.13. Any questions regarding this filing and/or other related items should be addressed to the undersigned at the phone number shown or by email at tprogers@AEP.com.

Very truly yours,

Teresa P. Rogers
Process Supervisor I
540-985-2441

Attachments

XC: Kim Carter, Commission
Distribution List

# APPALACHIAN POWER COMPANY
# LONDON/MARMET PROJECT NO. 1175
# WINFIELD PROJECT NO. 1290
# APPLICATION FOR NEW LICENSE
# DISTRIBUTION LIST

| Federal Agencies | |
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| Regional Forester Management Staff | Lands, Watershed & Minerals |
| John Pomponio | Environmental Protection Agency,<br>Division 3 |
| Stephen Romero | U.S. Department of Agriculture,<br>U.S. Forest Service |
| Kamau Sadiki | U.S. Army Corps of Engineers,<br>Office of the Chief of Army Engineers |
| | Federal Emergency Management Agency |
| Malka Pattison | U.S. Bureau of Indian Affairs,<br>Office of Trust Responsibilities |
| Senator Robert C. Byrd | U.S. Senate |
| | U.S. Bureau of Indian Affairs, Solicitors Office |
| David Densmore | U.S. Department of the Interior,<br>U.S. Fish & Wildlife Service |
| | U.S. National Park Service,<br>U.S. Department of the Interior |
| | U.S. Army Corps of Engineers,<br>North Atlantic Division |
| Lex Dixon | U.S. Army Corps of Engineers |
| Ida Doup | Bureau of Land Management,<br>Lands and Renewable Resources |
| Colonel Jeffrey Smith | U.S. Army Corps of Engineers |
| Don Klima | Advisory Council on Historic Preservation, Eastern Office of Project Review |
| Michael Chezik | U.S. Department of the Interior |
| Carol Grundman | U.S. Bureau of Land Management, Eastern States |
| Maryanne Gerbauckas | National Park Service, Regional Office |
| Linda Everly | U.S. Army Corps of Engineers, State District Office,<br>Regulatory Branch/Permits |
| | U.S. Army Corps of Engineers, Divisional Office,<br>Regulatory Branch |
| James Kardatzke | U.S. Bureau of Indian Affairs, Eastern Regional Office |
| Kent Connaughton | U.S. Department of Agriculture,<br>U.S. Forest Service, Regional Office |
| Ginger Mullins | U.S. Army Corps of Engineers,<br>State District Office |

| | |
|---|---|
| Michael Thabault | U.S. Fish and Wildlife Service,<br>Northeast Regional Office |
| Jeff Smith | NOAA Fisheries, Office of Habitat Conservation |
| | NOAA Fisheries,<br>Northeast Fisheries Science Office |
| Peter Lietzke | Federal Energy Regulatory Commission |
| Gary Frazer | U.S. Fish and Wildlife Service |
| Cynthia Wilkerson | National Park Service, Northeast Region |
| Commander Lincoln Stroh | U.S. Coast Guard, MSO Huntington |
| Senator John D. Rockefeller, IV | U.S. Senate |
| | Federal Energy Regulatory Commission,<br>New York Regional Office |
| Tom Chapman | U.S. Fish and Wildlife Service |
| Sean McDermott | NOAA Fisheries, Northeast Regional Office |
| Ken Halstead | U.S. Army Corps of Engineers,<br>Huntington District |
| Gene Gruber | Federal Emergency Management Agency, Regional Office |
| Alan B. Mollahan | U.S. House of Representatives |
| | U.S. Department of Energy |
| Commander Wyman Briggs | U.S. Coast Guard, MSO Pittsburgh |
| | U.S. Environmental Protection Agency,<br>Regional Office |
| | |
| **State Agencies** | |
| Ken Caplinger | WV Department of Natural Resources,<br>Division of State Parks and Forest |
| Richard E. Hitt | WV Public Service Commission |
| Joe Scarberry | WV Department of Natural Resources, Division of Natural Resources, Office of Land and Streams |
| Curtis I. Taylor | WV Department of Commerce, Division of Natural Resources, Wildlife Resources Section |
| Susan Pierce | WV Department of Culture and History,<br>Historic Preservation Unit |
| Michael Hohn | State of West Virginia Geological & Economic Survey |
| Richard Mulfinger | Pennsylvania Fish & Boat Commission |
| Frank Jezioro | WV Department of Commerce, Department of Natural Resources |
| Jeff Herholdt | WV Department of Commerce, Division of Energy |

| | |
|---|---|
| Shirley Stewart-Burns | WV State Historic Preservation Office, The Cultural Center |
| Kerry Bledsoe | WV Department of Commerce, Department of Natural Resources, Wildlife Resources Section |
| Susan Pierce | WV Department of Education and the Arts, State Historic Preservation Office |
| Stephanie Timmermeyer | WV Department of Environmental Protection |
| Lisa McClung | WV Department of Environmental Protection, Division of Water and Waste Management |
| Lyle B. Bennett | WV Department of Environmental Protection, Division of Water and Waste Management |
| Thomas L. Denslinger | Pennsylvania Department of Environmental Protection |
| Fred Cutlip | Intergovernmental Review Community and Industrial Development |
| | |
| **Local Government** | |
| Charlotte Holly, County Administrator | Fayette County |
| Brian Donat, County Administrator | Putnam County |
| Kenneth Eskew, President | Fayette County Commission |
| Mayor | Town of Handley |
| Mayor | City of Marmet |
| Mayor | City of Charleston |
| Manager | City of Dunbar |
| Mayor | City of South Charleston |
| Mayor | Town of Winfield |
| Mayor | City of Nitro |
| Mayor | City of St. Albans |
| Mayor | City of Hurricane |
| | |
| **Non-Governmental Organizations** | |
| Richard Roos-Collins | Natural Heritage Institute |
| Shanda Minney | West Virginia Rivers Coalition |
| Marybeth Beetham | Endangered Species Coalition |
| Bruce Glabe | Appalachian Mountain Club |
| Rebecca Sherman | Hydropower Reform Coalition |
| Ron Scott | Izaak Walton League of America |
| | National Wildlife Federation |
| Serina McLean | American Rivers |
| Robert Proudman | Appalachian Trail Conservancy |
| Rodney Bartgis | The Nature Conservancy |

| | |
|---|---|
| Alan Wentz | Ducks Unlimited |
| | River Conservancy |
| | Sierra Club |
| | Wildlife Habitat Council |
| | The Conservation Foundation |
| | National Parks Conservation Association |
| | National Audubon Society |

**APPALACHIAN POWER COMPANY**
**LONDON/MARMET PROJECT NO 1175-013**
**WINFIELD PROJECT NO 1290-011**
**SCHEDULE A**
**REVISED STUDY PLANS**

## A. PROPOSED STUDY PLAN COMMENTS

Comments on the proposed study plans were filed by the West Virginia Division of Natural Resources and the West Virginia Division of Culture and History. Copies of these comments are included in this filing. A summary of the comments received, listed by Study Plan topic, and Appalachian's response to the comments are described below:

1. Cultural Resources

The West Virginia Division of Culture and History (WVSHPO), by letter dated February 17, 2009, noted its understanding that the Area of Potential Effects (APE) will be determined in consultation with its office and any new construction, including the installation of transmission lines, should be included as part of the study area for both direct and indirect impacts. A conference call with representatives of the WVSHPO took place on April 29, 2009 to determine the extent of the APE. All parties involved in the conference call agreed that the APE should include the project boundaries for each of the three developments excluding all existing transmission corridors. Appalachian clarified the scope of the relicensing efforts to be all existing facilities; no new transmission lines or structures are being proposed.

The Revised Cultural Resource Study Plan is attached.

2. Water Quality

The West Virginia Division of Natural Resources (WVDNR), by letter dated April 23, 2009, recommended that the supplemental and transect information be collected through October 15$^{th}$ as opposed to September 15$^{th}$, as proposed in the Study Plan. According to the WVDNR, October begins a new water year and flows are generally lowest from August through October and should demonstrate the extremes for low dissolved oxygen and high temperature that could be expected during the year.

The recommendation is included in the attached Revised Water Quality Study Plan.

3. Fish Entrainment

No comments were filed with regards to the Proposed Fish Entrainment Study. However, Commission staff, at the February 25, 2009 Study Plan Meeting,

recommended that the table reflecting the number of fish caught and number of fish harvested be modified to reflect the total numbers and total percent harvested.

The recommendation is included in the attached Revised Fish Entrainment Study Plan.

4. Transmission Corridor

The WVDNR, by letter dated April 23, 2009, requests that emphasis be place on the search for Running Buffalo Clover, *Trifolium stoloniferum,* when conducting the botanical surveys at the London Development. Running Buffalo Clover is listed as an endangered species by the U.S. Fish and Wildlife Service and is most frequently found in habitats with filtered sunlight that have had some kind of recent disturbance.

Further, Commission staff, at the February 25, 2009 Study Plan Meeting, suggested that Appalachian consult with the agencies to determine if surveys of federally listed bats were needed. Appalachian consulted with WVDNR and proposes a qualitative survey of the project boundaries and the transmission lines be conducted to document wildlife and botanical species, and the existence of wetlands or ponds. If threatened or endangered species are found, the need for quantitative surveys will be discussed with the U.S. Fish and Wildlife Service and the WVDNR.

The recommendation from the WVDNR to focus on the search for Running Buffalo Clover at the London Development is included in the attached Revised Transmission Corridor Study.

5. Recreation

The WVDNR, by letter dated April 23, 2009, recommended that Appalachian utilize the protocol currently being employed by the Ohio River Fish Management Team at locks and dams throughout the Ohio River in consultation with the WVDNR. In addition, the WVDNR recommended that both the development tailwaters and pools be included in the study and that creel census information be obtained separately for boat, bank, and pier anglers for seasonal and monthly estimates. The WVDNR, further proposes that the study be repeated every five years throughout the duration of the license.

Appalachian had proposed that a Recreation Management Plan be developed in lieu of a Recreation Study. Upon receipt of comments from the WVDNR and the Commission at the February 25, 2009 Study Plan Meeting, Appalachian is now proposing a Recreation Study. To date, the protocol utilized by the Ohio River Fish Management Team has been requested but not received. Appalachian will continue to pursue obtaining the suggested methodology. The Study Plan also includes an angler use survey. The geographic scope is limited to the project boundaries of the projects and not the reservoirs upstream of the dams as they are outside of the scope

of Appalachian's license and responsibilities. Post licensing studies will be considered during the development of the Preliminary Licensing Proposal.

6. London Development Tailrace Fishing Access Feasibility Study

Appalachian had not originally filed a study proposal for the replacement of London Bridge, as Appalachian is currently in the process of evaluating various options for providing access under its current license. London Bridge is a footpath accessing the public recreation facilities within the Project boundary of the London development, which consists of tailrace fishing access. The bridge provides pedestrian access from State Highway 61 over railroad tracks, owned and maintained by the CSX Corporation, to the public recreation facilities. The recreation site was closed temporarily on February 16, 2009 due to the absence of public access from State Highway 61 to the site following the determination by Appalachian engineers that the bridge was unsafe. Currently there is no other legal public access to the site and Appalachian is evaluating various options for providing access to the London development including but not limited to replacement of the bridge or providing an at-grade railroad track crossing.

Appalachian is proposing the London Bridge Feasibility Study in the event the necessary permits cannot be obtained to provide public access within the term of the current license. A Proposed London Development Tailrace Access Feasibility Study is attached.

## B. STUDIES NOT PROPOSED BY APPALACHIAN

1. Peaking Study

The WVDNR, by letter dated December 12, 2008, requested that a study be conducted on the impact of peaking on shoreline and aquatic habitat, aquatic resources, and recreational facilties in the Marmet and London pools and tailwaters. The goal of the study would be to determine the impact of implementing a three-foot peaking provision on flow, habitat, aquatic species, and associated recreation.

Appalachian did not file a Proposed Peaking Study as Appalachian does not intend to retain the 3-foot drawdown of the London pool with the new license. As the drawdown has not been utilized in over 20 years, there will be no change to shoreline erosion, flow, habitat, aquatic species or associated recreation.

# Comments on Proposed Study Plans

**DIVISION OF NATURAL RESOURCES**
***Wildlife Resources Section***
**PO Box 99, 1110 Railroad Street**
**Farmington, WV 26571**
**Telephone (304) 825-6787**
**Fax (304) 825-6270**

**Joe Manchin III**
***Governor***

**Frank Jezioro**
***Director***

April 23, 2009

Hon. Kimberly Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington DC 20426

RE: COMMENTS ON PROPOSED STUDY PLANS
LONDON/MARMET HYDROELECTRIC PROJECT, P-1175-013
WINFIELD HYDROELECTRIC PROJECT, P-1290-011

Dear Secretary Bose,

The West Virginia Division of Natural Resources (WVDNR) is providing comments in accordance with 18 CFR § 5.12 on the proposed study plans submitted by Appalachian Power Company (APC) for the London/Marmet Hydroelectric Project No. 1175, and the Winfield Hydroelectric Project No. 1290 located on the Kanawha River, Kanawha County, West Virginia.

1. Water Quality Study Plan, Page 6, Objective 3. APC proposes to "[s]upplement available data by collecting additional water quality data along transects located upstream and downstream of the London, Marmet and Winfield powerhouses from June 15th through September 15th during the study year." The WVDNR recommends that the supplemental and transect information be collected through October 15th. October begins a new water year. Flows are generally lowest from August through October and should demonstrate the extremes for low dissolved oxygen and high temperature that could be expected during the year.

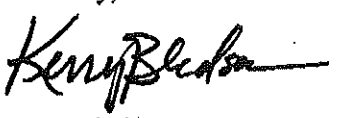
2. Water Quality Study Plan, Page 8, § 7 Schedule. The WVDNR recommends that the collection of water quality information extend to October 15th.

3. Transmission Line Corridor Study Plan, Page 3, § 3 Objectives. The WVDNR requests that emphasis be placed on the search for Running Buffalo Clover, *Trifolium stoloniferum*, when conducting the botanical surveys at the London Development. Running Buffalo Clover is listed as an endangered species by the U.S. Fish and Wildlife Service. It is most frequently found in habitats with filtered sunlight that have had some kind of recent disturbance. In West Virginia running buffalo clover has been found on river terraces, jeep trails, old logging roads, skid roads, and wooded thickets.

4. Recreational Use Plan. On December 12, 2008, the Federal Energy Regulatory Commission (Commission) issued a letter to APC stating that the recreation management plan should be prepared in consultation with the Corps of Engineers and the West Virginia DNR, and should include, at a minimum, any plans for monitoring use of the projects' recreation facilities. On December 12, 2008, the WVDNR filed a letter regarding study requests with the Commission following the provisions of 18 CFR §5.9(b). In that letter the WVDNR recommended that "...APC utilize the protocol currently being employed by the Ohio River Fish Management Team at locks and dams throughout the Ohio River in consultation with the WVDNR." The WVDNR recommended that both the development tailwaters and pools be included in the study. Creel census information should be described separately for boat, bank, and pier anglers, for seasonal and monthly estimates. Initially, we propose that the study be repeated every five years throughout the duration of the license. It is the opinion of the WVDNR that the method presented by the Louis Berger Group in the Study Plan does not adequately measure the recreational use at the three projects or in the tailwaters. The WVDNR again recommends that a methodology be employed that incorporates random stratified sampling to capture weekend, week day, and holiday use. The survey should employ an experimental design that incorporates statistical analysis, and a questionnaire comparable with other West Virginia angler surveys. The angler use methodology should be based on standard practices currently used by the WVDNR. The WVDNR concurs with the other elements of the Recreational Use Study Plan.

Thank you for the opportunity to comment on the proposed study plans. If you have any questions regarding this letter please feel free to contact me at 304-825-6787, or by email at kerrybledsoe@wvdnr.gov.

Sincerely,



Kerry Bledsoe
Wildlife Resources Section

cc: T. Rogers, APC
K. Halstead, USACE
D. Carter, USFWS
L. Bennett, WVDEP
Z. Brown, WVDNR
P. Johansen, WVDNR
B. Preston, WVDNR
W. Kordek, WVDNR

WEST VIRGINIA
DIVISION OF
CULTURE & HISTORY

The Cultural Center
1900 Kanawha Blvd., E.
Charleston, WV
25305-0300

Phone 304.558.0220
Fax 304.558.2779
TDD 304.558.3562
www.wvculture.org
EEO/AA Employer

February 17, 2009

Ms. Teresa P. Rogers
Licensing Coordinator
Appalachian Power
PO Box 2021
Roanoke, VA 24022

Re: London/Marmet (FERC No. 1175), Winfield (FERC No. 1290) relicense
FR#: 08-603-Multi-3

Dear Ms. Rogers:

We have reviewed the above referenced project to determine potential effects to cultural resources. As required by Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations, 36 CFR 800: "Protection of Historic Properties," we submit our comments.

We have reviewed the Additional Information for the Pre-Application Document, Proposed Study Plans. Submitted information indicates that a Cultural Resources Study will be conducted to assess the potential impacts of this project on National Register or eligible cultural resources. Additionally, the Area of Potential Effects (APE) will be determined in consultation with this office. Earlier submittals indicated that the APE would encompass the project boundary, which for each development would include the present buildings and structures associated with the dams as well as, in some cases, the transmission lines (PAD, p. 2-3). Any new construction, including the installation of transmission lines, should be included as part of the study area for both direct and indirect impacts. It is our understanding that we will have the opportunity to review and comment prior to the finalization and implementation of any study plans. We will provide further comments as requested as your project continues.

We appreciate the opportunity to be of service. *If you have questions regarding our comments or the Section 106 process, please contact Shirley Stewart Burns, Historian or Lora Lamarre, Senior Archaeologist, at (304) 558-0240.*

Sincerely,

Susan M. Pierce
Deputy State Historic Preservation Officer

SMP/SSB

# Proposed Studies

- Cultural Resources
- Water Quality
- Fish Entrainment and Impingement
- Transmission Corridor
- Recreation
- London Bridge Feasibility

# CULTURAL RESOURCE

# REVISED STUDY PLAN

**London/Marmet and Winfield Hydroelectric Projects**

**Application for New License**

**FERC Project Nos. 1175 and 1290**

**May 2009**

## Table of Contents

## 1. Introduction

Appalachian Power Company (Appalachian) operates the London/Marmet and Winfield Hydroelectric Projects (Projects), which are licensed by the Federal Energy Regulatory Commission (FERC) as Project Nos. 1175 and 1290, respectively. The existing license for the London/Marmet Project was issued to Appalachian by FERC on September 23, 1983 and expires on January 31, 2014. The existing license for the Winfield Project was issued to Appalachian by FERC on September 26, 1983 and expires on January 31, 2014. Appalachian is applying to FERC for new licenses for the Projects. The default process for the Projects' relicensing is the Integrated Licensing Process (ILP), as defined under the rules and regulations of the Commission (18 CFR Part 5). As part of this licensing process, Appalachian has solicited input from stakeholders including governmental agencies, local governments, non-governmental organizations, and the public to identify potential project-related issues that need to be addressed during the licensing process.

On June 2, 2008, Appalachian distributed a Project Draft Pre-Application Document (PAD) to stakeholders. The document, as well as subsequent stakeholders' comments to the Draft PAD and the Pre-Application Document filed with FERC on August 14, 2008, identified issue(s) associated with cultural resources for which the existing, relevant, and reasonably available information was thought to be insufficient to address. This Cultural Resource Study Plan aims to outline the means to obtain additional information necessary to address the identified issue(s).

Because of the similarities among the developments, one study plan is proposed for both Projects. The particular study objectives are described in Section 3 of this document.

## 2. Background

The Projects are located on the Kanawha River in West Virginia. The London/Marmet Project consists of two developments, the London Development and the Marmet Development. The Winfield Project consists of one development, Winfield, on the Kanawha River, downstream of the London/Marmet Project. The London Development is located at river mile 82.8 near Handley, West Virginia, in Fayette and Kanawha counties. The Marmet Development is located at river mile 67.7 in Marmet, West Virginia, in Kanawha County. The Winfield Development is located at river mile 31.1 in Winfield, West Virginia, in Kanawha and Putnam counties.

The London, Marmet and Winfield Developments are each located at U.S. Army Corps of Engineers' (Corps) dams and locks on the Kanawha River. Appalachian retains licenses to operate the hydroelectric facilities at these Corps facilities.

The London Development Project, which has 3 generating units, has an authorized capacity of 14.4 MW based on the limiting capacity of the generators. Average annual generation for the period 2003 through 2007 was 84,048 kWh.

The Marmet Development, which has 3 generating units, has an authorized capacity of 14.4 MW based on the limiting capacity of the generators. Average annual generation for the period 2003 through 2007 was 82,302 kWh.

The Winfield Development, which has 3 generating units, has an authorized capacity of 14.7 MW based on the limiting capacity of the generators. Average annual generation for the period 2003 through 2007 was 114,090 kWh. Operation of the hydroelectric facilities is keyed off the operations of the Corps' locks at each dam.

The hydro facility operators are in frequent contact with the lockmaster for each facility to ensure coordination of hydro generation and lock operations. In general, as long as the stream flow is less than the full discharge of the turbines (approximately 10,000 cfs), maintenance of the pool elevations within the allowable limits for navigation is the responsibility of Appalachian's power system personnel and plant operators. When stream flow exceeds the maximum turbine discharge, the responsibility for control of the pool elevations passes to the Corps' personnel at the dam. Also, from time to time, the Corps may request Appalachian's plant operators to maintain such water elevations as required for special navigation purposes.

The Corps' London, Marmet, and Winfield locks and dams are part of what was originally called the Great Kanawha Navigation system. Completed in 1898, the system provided year-round water transportation for 90 miles of the Kanawha River from Boomer to Point Pleasant on the Ohio River. The system's 10 original locks and dams were replaced by four high lift dams with German roller gates in the early 1930s. Gallipolis (now called R. C. Byrd Locks and Dam) was built on the Ohio River, and London, Marmet, and Winfield were built on the Kanawha River. The London, Marmet and Winfield lock/dam complexes also include facilities for hydropower generation, which Appalachian operates today. Each of these hydroelectric facilities is located at the left shore (facing downriver) of its respective dam. Beginning in 1989, the Corps improved the RC Byrd, Marmet, and Winfield locks and dams by adding additional lock chambers. Prior to beginning construction of these improvements, the Corps conducted archaeological investigations of the land areas that would be affected by excavation or soil disposal (Maslowski, 2003).

Although a number of significant archaeological sites were identified in association with the Corps' lock and dam expansions and the files of the West Virginia State Historic Preservation Officer (SHPO) map numerous other previously identified sites on the Kanawha River above and below the London, Marmet, and Winfield dams, there are no known archaeological resources within the London/Marmet or Winfield Hydroelectric Project boundaries (Appalachian, 1981a, 1981b).

## 3. Study Objectives

Following are the key objectives associated with the Cultural Resources Study:

1. Verify the Area of Potential Effects (APE) in consultation with the WVSHPO.

2. Include the results of a literature search conducted after the WVSHPO's letter dated May 16, 2008.

3. Identify previously recorded cultural resources in the WVDHR site files that are within the APE and develop a relational database of the cultural resources.

4. Identify locations that have the potential to contain archaeological resources.

5. Conduct an archaeological survey if there is a potential for cultural resources in the APE.

6. Evaluate the National Register eligibility of project facilities and other archaeological or historic resources within the APE, including considering whether they may contributed to a larger district.

7. Evaluate the potential adverse effects that proposed project operations may have on any historic and archaeological properties. The WVSHPO's concurrence on such findings is required.

8. If historic properties are adversely affected by proposed operations or if project facilities are determined to be eligible for National Register, develop a Historic Properties Management Plan (HPMP) specifying how historic properties within the APE would be managed over the term of a new license.

## 4. Relicensing Relevance

Section 106 of the National Historic Preservation Act requires that federal agencies, licensees, and those receiving federal assistance take into account the effect of proposed undertakings on historic properties eligible for, or included in, the National Register.

The proposed Cultural Resource Study will address measures to: determine the extent of the APE; identify historic properties in the APE; assess their eligibility for inclusion in the National Register; assess the potential Project-related effects on the identified historic properties; mitigate any adverse effects; and manage historic properties within the APE over the term of a new license.

## 5. Methods and Geographic Scope

The geographic limits for this study will be the APE for the London/Marmet and Winfield Projects excluding existing transmission corridors. No new transmission lines are proposed.

Prior to conducting the survey and report, Appalachian will consult with the WVSHPO, federally-recognized Indian tribes who have an active interest in the Projects, and the U.S. Army Corps of Engineers (Corps), and interested parties regarding delineation of the APE.

The Cultural Resource Study will incorporate an archeological and historic resource survey for lands within the APE, results of which will be presented in a Cultural

Resources Report. The Cultural Resource Study will also include preparation of a HPMP, if historic properties are adversely affected by proposed operations or if project facilities are determined to be eligible for National Register. The study will be developed in consultation with the WVSHPO, and other interested parties and will include the following components:

## A. Document Previously Recorded Cultural Resources

In consultation with the WVSHPO, Appalachian will develop a relational database consisting of all previously recorded architectural and archaeological cultural resources identified in the survey files of the SHPO. The relational database will include the following information on the previously recorded cultural resources in the SHPO site files, if known: Site number, County, Resource type, Site name, UTM zone, UTM Northing, UTM Easting, USGS Quad, Cultural Era, Site type, Description, Integrity, National Register of Historic Places (National Register) eligibility status, and Comments. The location of the recorded cultural resources will incorporated into a GIS layer.

## B. Identify Historic Properties

A Phase 1 cultural resource survey will be conducted within APE for areas considered as high probability as determined in consultation with the WVSHPO. If sites that appear to contain potentially significant information are located, a more intensive evaluation program will be developed in consultation with the WVSHPO to determine each site's eligibility for inclusion in the National Register. The survey shall be consistent with the Secretary of the Interior's *Standards and Guidelines for Archaeological Documentation* (48 FR 44734-37, September 29, 1983). All archaeological work will be conducted by or under the direct supervision of a qualified archaeologist who meets, at a minimum, the qualifications set forth in the Secretary of the Interior's *Professional Qualifications Standards* (48 FR 44 738-9).

The historical resources survey will inventory and evaluate existing buildings and structures in the APE, specifically but not limited to project facilities.

## C. Develop a Historic Properties Management Plan

Appalachian will consult with SHPO, federally-recognized Indian tribes who have an active interest in the Projects, the U.S. Army Corps of Engineers (Corps), and interested parties to develop a Historic Properties Management Plan (HPMP) specifying how historic properties within the Projects' APE will be managed during the term of the next license. Appalachian will consult Title 36 of the Code of Federal Regulations, Parts 660-66 and 800 and the Advisory Council on Historic Preservations' guidance regarding preparation of HPMPs for hydroelectric relicensing during the development of the HPMP. The HPMP will be developed by or under the direct supervision of a person or persons who meet, at a minimum, the professional qualifications standards for architectural history and archeology in the Secretary's Standards (48CFR 44738-39).

The HPMP will, at a minimum, include principles and procedures to address:

a) Completion, if necessary, of the identification of historic properties within the Projects' APE;

b) Continued use and maintenance of historic properties;

c) Maintenance and operation of the Projects, according to the Secretary of Interior's "Standards for the Treatment of Historic Properties" (36 C.F.R. part 68( and applicable National Park Service Preservation Briefs;

d) Treatment of historic properties threatened by project-induced shoreline erosion, other project-related ground-disturbing activities, and vandalism;

e) Identification and evaluation of historic properties, determination of effects, and ways to avoid, minimize or mitigate adverse effects;

f) Consideration and implementation of appropriate treatment that would minimize or mitigate unavoidable adverse effects on historic properties;

g) Treatment and disposition of any human remains that may be discovered, taking into account any applicable state laws and the Advisory Council on Historic Preservation's "Policy Statement Regarding Treatment of Human Remains and Grave Goods" (September 27, 1988, Gallup, NM);

h) Discovery of previously unidentified properties during project operations;

i) Public interpretation of the historic and archaeological values of the Projects;

j) List of activities (i.e., routine repair, maintenance, and replacement in kind at the Projects) not requiring consultation with WVSHPO; since these activities would have little or no potential to affect historic properties;

k) Procedures to address effects during project emergencies; and

l) Coordination with the WVSHPO, federally-recognized Indian tribes who have an active interest in the Projects, and the Corps, and interested parties during implementation of the HPMP.

Appalachian will submit the HPMP, along with the documentation of the views of the SHPO, federally-recognized Indian tribes who have an active interest in the Projects, the Corps, and interested parties, to the Commission for review and approval. If the SHPO has concurred and the Commission determines that the HPMP is adequate, the Commission will forward a copy of the HPMP to the Advisory Council on Historic Preservation (Council) for review. If the Council does not object to the HPMP, the Commission will execute a Programmatic Agreement with the SHPO and Council to

implement the HPMP. The Commission would also include implementation of the HPMP as a condition of the license. If the council objects to the HPMP, the Commission will consult with the Council in an effort to reach agreement on the HPMP. If an agreement cannot be reached, the Commission will request that the Council comment as described below.

If the SHPO has not concurred with the HPMP or if the Commission finds that the HPMP is inadequate, then the Commission will consult with Appalachian and the SHPO to seek agreement on the HPMP. If concurrence is not reached within 45 days, the Commission will request that the Council enter into consultation to seek agreement on the HPMP. If agreement is reached on the HPMP, the Commission will forward a copy of the revised HPMP to the Council for review. If agreement of the HPMP cannot be reached among the Commission, the SHPO, Appalachian, and the Council, the Commission or the SHPO will request that the Council still provide comments; or the Council may terminate consultation and comment *suasponte.*

## 6. Consultation, Analysis, and Reporting of Results

Appalachian will consult with the listed resource agencies in the development of the study plan and in the review of the preliminary study findings and final study report, as determined in consultation with WVDHR. Periodic meetings with these stakeholders will be held as data becomes available. Data collected will be conveyed through update reports and at progress meetings. The data will be made available in printed form or electronically depending on the amount of data to be made available at any time, or the preferences of the stakeholders. A timetable for completing the cultural resource investigations is presented in the table below.

**Table 1. Schedule for conducting the Cultural Resources Study for the London/Marmet and Winfield Projects' relicensing.**

| Activity | Milestones |
|---|---|
| File draft study plan with FERC | January 26, 2009 |
| Initial Study Plan meeting(s) | February 25, 2009 |
| Workgroup meeting(s) | Between March 1, 2009 and April 27, 2009 |
| Stakeholder comments on proposed study plan | April 27, 2009 |
| File Revised Study Plan with FERC | May 27, 2009 |
| Stakeholder comments on revised study plan | June 11, 2009 |
| Commission issues study plan determination | June 26, 2009 |
| Formal study dispute resolution process (if necessary) | July 16, 2009 |
| Pre-study meeting | September 2009 |

| | |
|---|---|
| Begin documentation of existing cultural resources | September 2009 |
| Initiate Phase 1 survey | November 2009 |
| Submit Phase 1 Survey Report | May 2010 |
| Initial Study Report to FERC | June 23, 2010 |
| Initial Study Plan Meeting | 15 days after Initial Study Report Filed – July 8, 2010 |
| Develop HPMP | June 2010 |
| Study Update Meeting | July 2011 |
| Submit draft HPMP | August 12, 2011 |
| Receive comments on draft HPMP | November 10, 2011 |
| Submit revised final HPMP | January 31, 2012 |

## 7. Costs

The estimated cost for performing the Cultural Resources Study components identified in this plan is $155,000. These costs include field studies and labor for both consultants and Appalachian.

## 8. References

Appalachian Power Company. 2008. Pre-Application Document, London/Marmet and Winfield Projects, filed with the Federal Energy Regulatory Commission, August 2008.

# WATER QUALITY
# REVISED STUDY PLAN

## London/Marmet and Winfield Hydroelectric Projects

**Application for New License**

**FERC Project Nos. 1175 and 1290**

**May 2009**

## TABLE OF CONTENTS

# 1. Introduction

Appalachian Power Company (Appalachian) operates the London/Marmet and Winfield Hydroelectric Projects (Projects), which are licensed by the Federal Energy Regulatory Commission (FERC) as Project Nos. 1175 and 1290, respectively. The existing license for the London/Marmet Project was issued to Appalachian by FERC on September 23, 1983 and expires on January 31, 2014. The existing license for the Winfield Project was issued to Appalachian by FERC on September 26, 1983 and expires on January 31, 2014. Appalachian is applying to FERC for new licenses for the Projects. The default process for the Projects' relicensing is the Integrated Licensing Process (ILP), as defined under the rules and regulations of the Commission (18 CFR Part 5). As part of this licensing process, Appalachian has solicited input from stakeholders including governmental agencies, local governments, non-governmental organizations, and the public to identify potential project-related issues that need to be addressed during the licensing process

On June 2, 2008, Appalachian distributed a Project Draft Pre-Application Document (PAD) to stakeholders. The document, as well as subsequent stakeholders' comments to the Draft PAD and the Pre-Application Document filed with FERC on August 14, 2008, identified issue(s) associated with water quality for which the existing, relevant, and reasonably available information was thought to be insufficient to address. This Water Quality Study Plan aims to outline the means to obtain additional information necessary to address the identified issue(s). Because the of the similarities among the developments, one study is proposed to address both Projects. The particular study objectives are described in Section 3 of this document.

# 2. Background

The Projects are located on the Kanawha River in West Virginia. The London/Marmet Project consists of two developments, the London Development and the Marmet Development. The Winfield Project consists of one development, Winfield, on the Kanawha River, downstream of the London/Marmet Project. The London Development is located at river mile 82.8 near Handley, West Virginia, in Fayette and Kanawha counties. The Marmet Development is located at river mile 67.7 in Marmet, West Virginia, in Kanawha County. The Winfield Development is located at river mile 31.1 in Winfield, West Virginia, in Kanawha and Putnam counties.

The London, Marmet and Winfield Developments are each located at U.S. Army Corps of Engineers' (Corps) dams and locks on the Kanawha River. Appalachian retains licenses to operate the hydroelectric facilities at these Corps facilities.

The London Development Project, which has 3 generating units, has an authorized capacity of 14.4 MW based on the limiting capacity of the generators. Average annual generation for the period 2003 through 2007 was 84,048 kWh.

The Marmet Development, which has 3 generating units, has an authorized capacity of 14.4 MW based on the limiting capacity of the generators. Average annual generation for the period 2003 through 2007 was 82,302 kWh.

The Winfield Development, which has 3 generating units, has an authorized capacity of 14.7 MW based on the limiting capacity of the generators. Average annual generation for the period 2003 through 2007 was 114,090 kWh.

Operation of the hydroelectric facilities is keyed off the operations of the U.S. Army Corps or Engineers' (Corps) locks at each dam. The hydro facility operators are in frequent contact with the lockmaster for each facility to ensure coordination of hydro generation and lock operations. In general, as long as the stream flow is less than the full discharge of the turbines maintenance of the pool elevations within the allowable limits for navigation is the responsibility of Appalachian's power system personnel and plant operators. When stream flow exceeds the maximum turbine discharge, the responsibility for control of the pool elevations passes to the Corps' personnel at the dam. Also, from time to time, the Corps may request Appalachian's plant operators to maintain such water elevations as required for special navigation purposes.

Under the current license, the allowable fluctuation of the London pool is three (3.0) feet from elevation 614.0 feet to elevation 611.0 feet, with a maximum drawdown rate of 0.5 feet per hour. Appalachian is not proposing to retain this 3 foot fluctuation under its new license. The allowable fluctuation of the Marmet pool for navigational purposes is three-tenths (0.3) feet from elevation 589.7 feet to elevation 590.0 feet, with a maximum drawdown rate of 0.5 feet per hour. Due to the limited storage capability of the Marmet impoundment, operation of the Marmet hydro facilities must mimic the operation of the London hydro facilities.

The allowable fluctuation of the Winfield pool for navigational purposes is two-tenths (0.2) feet from elevation 565.8 feet to elevation 566.0 feet, with a maximum drawdown rate of 0.5 feet per hour. Due to the limited storage capability of the Winfield impoundment, operation of the Winfield hydro facility must mimic the operation of the London and Marmet hydro facilities.

The West Virginia Department of Natural Resources (WVDNR) indicates that Dissolved Oxygen (DO) is a critical component of water quality that can have an effect on aquatic life. The WVDNR is charged with the protection of aquatic life within the State and is concerned about the maintenance of dissolved oxygen during periods of low flow and elevated temperatures. WVDNR indicates that the Corps has historically been making summer releases from Summersville and Sutton reservoirs to maintain DO levels, and that the Corps has proposed modifying their release plan, which may increase WVDNR's concern about effects of the hydro projects on DO levels.

## 3. Study Objectives

The primary purpose of the Water Quality Study is to provide the information necessary to determine the effect of project operations on upstream and downstream water quality, primarily as it relates to temperature and dissolved oxygen (DO). It will involve synthesizing existing water quality information and, where data is insufficient, performing additional water quality monitoring or new data collection. Specific objectives for this study include the following tasks:

1. Assemble and review available water quality data collected by the Corps, the West Virginia Department of Environmental Protection and other entities, as appropriate.
2. Characterize existing dissolved oxygen and temperature conditions within and downstream of the projects.

3. Supplement available data by collecting DO, temperature and ph profiles from surface to bottom and conductivity at the surface and bottom along transects located upstream and downstream of the London, Marmet and Winfield powerhouses during high temperature / low flow conditions
4. Identify impacts of projects' operations on water quality of reservoir and downstream.
5. Identify measures that could enhance dissolved oxygen concentrations downstream of the powerhouses, and in extreme conditions mitigate natural drought dissolved oxygen depressions, if necessary.

## 4. Relicensing Relevance

The project involves altering reservoir levels and flow releases from the powerhouses, both of which directly affect the hydrology of the Kanawha River downstream of the dam. Manipulation of the hydrology of the Kanawha River may in turn affect water quality, specifically temperature and DO of project waters.

## 5. Methods and Geographic Scope

To accomplish the objectives listed in Section 3, the Water Quality Study will consist of three primary components: 1) a literature / data search, 2) new data collection, and 3) data synthesis / analysis.

**Objective 1:** Assemble and review available water quality data, temperature, DO, pH, and conductivity, collected by the Corps, the West Virginia Department of Environmental Protection (WVDEP) and other entities, as appropriate.

A literature and data search will be conducted to obtain all relevant information related to water quality in the project waters and downstream. This search will be limited to data collected over the last 15 years. Data assembled will include that collected by Corps, WVDEP including any data collected at the request of the Corps, the WVDEP, and the WVDNR. The Corps and WVDEP will be consulted for agreement on whether the studies are acceptable. The evaluation will not be limited to data available from the entities listed above. Data from all the sources will be evaluated for acceptability. Limitations on the ability to compare data collected by different sources will be identified and the reasons for those limitations will be also be presented (e.g. some of the available metals data may refer to "total" quantities" instead of "dissolved quantities").

**Objective 2:** Characterize existing dissolved oxygen and temperature conditions in the Kanawha River (based on information obtained from Objectives 1 and 3).

Data assembled as part of Objective 1 will be analyzed to develop a characterization of the dissolved oxygen, conductivity and water temperature conditions from the pools above the London, Marmet and Winfield dams and below the dams on a seasonal basis. The characterization will consist of existing data and be supplemented with data collected in Objective 3 as needed. This characterization will describe DO and temperature in both horizontal (upstream to downstream) and vertical (water column profiles) dimensions. The characterization will employ graphical and tabular displays of the data that illustrate DO and temperature conditions on a temporal and spatial basis. It is acknowledged that data collected by various entities during different data collection efforts may differ and direct comparisons may not always be possible. Therefore general trends and observations on the spatial and temporal DO and water temperature patterns should also be included.

**Objective 3:** Supplement available data by collecting additional water quality data along transects located upstream and downstream of the London, Marmet and Winfield powerhouses weekly from June 15th through October15th during the study year.

Downstream of the three powerhouses, water quality profile data will be collected weekly at three locations. All samples will be collected in the pre-dawn or early morning hours to represent the lowest portion of the diurnal DO cycle. Measurements will consist of DO, water temperature, pH and conductivity. Measurements in the project discharge will be taken in a location representative of the main flow from the project. Measurements at the three downstream transects will consist of vertical profiles (1-meter increments) at three locations, each shore and mid-river, on each transect.

Water quality data will also be collected at two transects upstream of three powerhouses during the June 15th – October 15th period. The transects will be located in the forebay and .8 km upstream of the dam. Vertical profiles (1 meter increments) will be obtained at four evenly spaced locations on each transect at the upstream location and at two equally spaced locations in the transect in the forebay. Data collected will include DO, pH, and water temperature. Additionally, conductivity will also be measured at the surface and bottom. Monitoring at these upstream locations will occur on the same day as monitoring in downstream areas. However, monitoring in downstream areas should receive preference in terms of the pre-dawn, early morning period.

The profile data will be reviewed weekly with the Corps and WVDEP to determine when implementation of a continuous DO monitor is needed in the discharge. The goal is to target the critical DO condition that may occur during high temperatures and low flows. Triggers that will indicate the need to implement the continuous monitoring include high water temperatures or low DO observed in the discharge.

Upon implementation, the continuous monitor will record DO, pH, and water temperature at 15-minute intervals. The monitor will be maintained and calibrated on a weekly basis or more if needed. As with all field sampling efforts, a GPS unit will be used to record all sampling sites and transects.

**Objective 4:** Identify impact of projects' operations on water quality of reservoirs and downstream pools.

Potential effects of projects' operations on water quality in the reservoirs and downstream areas will be identified and evaluated. This will evaluation will include water level fluctuation, retention times, and turbine intake withdrawal zones.

**Objective 5:** Identify measures that could enhance dissolved oxygen concentrations downstream of the dams, and in extreme conditions mitigate natural drought dissolved oxygen depressions if necessary.

Based on the results of Objectives 1,2, and 3, the magnitude and frequency of low DO levels downstream of the project will be identified. A literature search to determine the various measures that have been used at other facilities to enhance DO levels would be conducted. Once identified, these methodologies will be assessed in terms of their applicability to the London/Marmet and Winfield Projects regarding physical constraints of the projects' facilities and the potential estimated enhancement.

## 6. Analysis and Reporting of Results

Phase three of the Study will begin with a comprehensive Informational Report that synthesizes existing water quality data. It will include an Excel spreadsheet with all empirical data, and a written analysis that characterizes what is known of temperature and dissolved oxygen conditions within the project area. The report will conclude with recommended revisions or refinements to the data collection phase of the Study Plan based on identified informational gaps. The report will be distributed to stakeholders, who will have an opportunity to comment on the report and make recommendations.

On a weekly basis, water quality profile data from both upstream and downstream of the dams will be provided to the Corps, the WVDEP, and the WVDNR. Periodically during the field season, progress reports that summarize data collected to-date and that document any unforeseen Study Plan revisions, which may have occurred, will be produced.

The Water Quality Study will culminate in a Final Report. Continuous water temperature monitoring data will be tabulated in an Excel spreadsheet. Water quality profiles will be presented in 2-D graphical displays for dissolved oxygen, temperature, pH and conductivity for each transect. The raw data will be provided electronically in tabular form, and will include date, time, sampling location, dam facility operating conditions, depth, temperature, pH, and dissolved oxygen. Also included will be an AutoCAD graphic of sample site locations and profile transect locations that are overlaid on topographic and/or aerial photographs.

The Final Report will conclude with a detailed synthesis and analysis of all the various components of the study, and new and existing data on water quality. An analysis of potential impacts of project operations on water quality downstream of the London, Marmet, and Winfield dams will be provided. If it is determined that project operations are adversely affecting

downstream DO or temperature conditions, potential project modifications to enhance or mitigate for such conditions will be identified.

## 7. Schedule

The following schedule is proposed for the Water Quality Study Plan:

- Collect water quality data along transects located upstream and downstream of London, Marmet and Winfield dams from June 15, 2009 through October 15, 2009 or as determined by the review of existing water quality data.
- At a minimum, study plan progress updates will be provided to the Commission, as well as the stakeholders involved in the relicensing of the Claytor Project, in July 2010 and July 2011, as needed. Additional progress reports will be provided to the stakeholders as information becomes available and meetings will be scheduled with stakeholders at key decision points to seek input and recommendations.
- All information will be made available in printed format as well as electronic format in accordance with the Information Distribution Protocol, and meetings will be scheduled and stakeholders notified in accordance with the Communications Protocol for the relicensing of the London/Marmet and Winfield Projects. Individuals, agencies, governments, etc. will be given at least thirty (30) days time prior to a meeting to review the information to be discussed. Information will also be posted on the web site established for the relicensing of the London/Marmet and Winfield Projects as appropriate.

## 8. Costs

The estimate cost for performing the Water Quality Study components identified in this plan is $500,000. These costs include field studies and labor for both consultants and Appalachian.

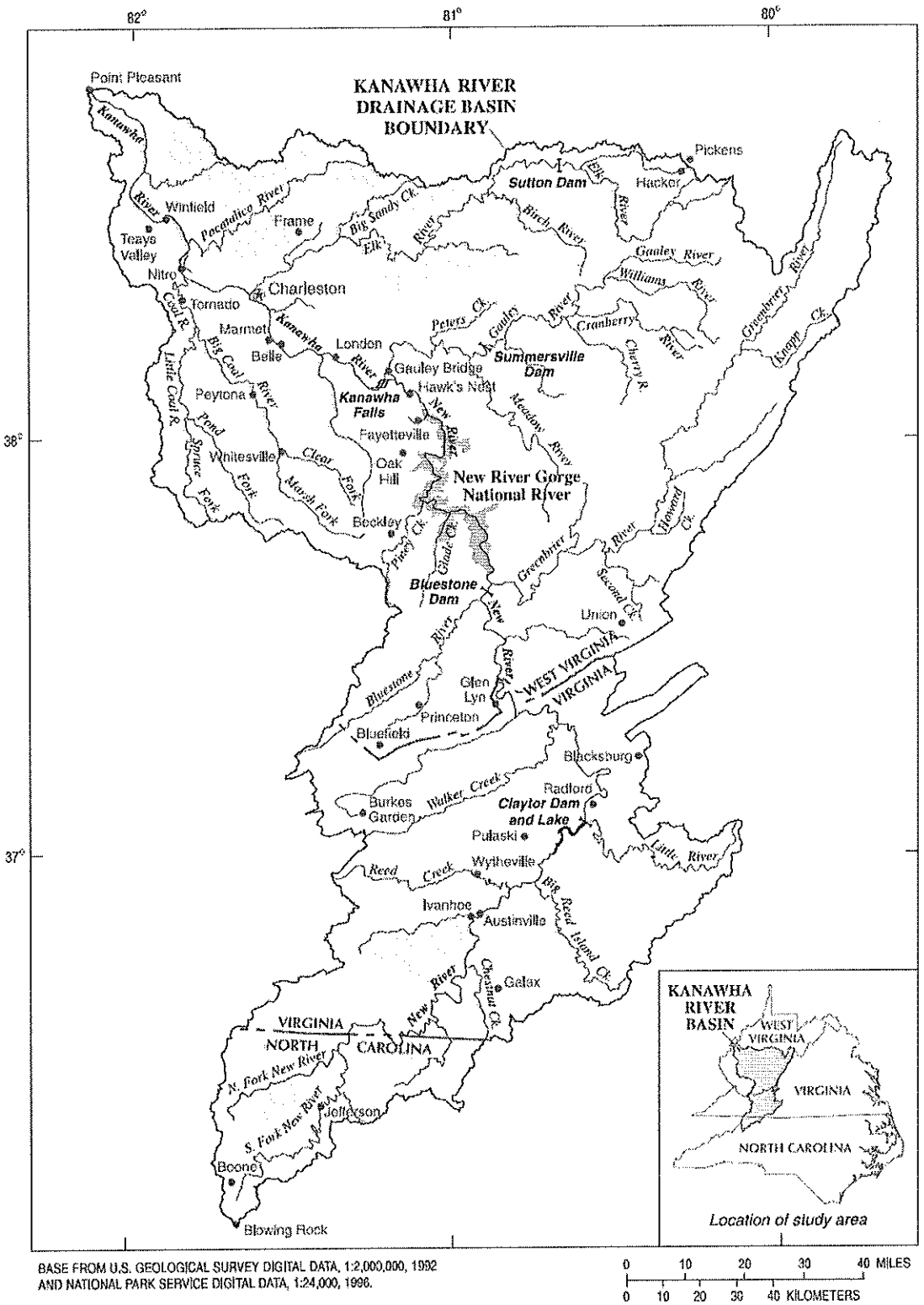



**Figure 1: Streams, towns, and other selected features of the Kanawha River Basin (Source: Messinger and Hughes 2000)**

# FISH ENTRAINMENT

# REVISED STUDY PLAN

**London/Marmet and Winfield Hydroelectric Projects**

**Application for New License**

**FERC Project Nos. 1175 and 1290**

**May 2009**

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## 1.0 Introduction

Appalachian Power Company (Appalachian) is making an application to the Federal Regulatory Commission (FERC or Commission) for a new license for the London/Marmet and Winfield Hydroelectric Projects (FERC Project Nos. 1175 and 1290) on the Kanawha River in West Virginia. Both existing Project licenses were issued to Appalachian by the FERC in September 1983, and both will expire January 31, 2014. The process being utilized to apply for a new license is the Integrated Licensing Process (ILP), as defined under rules and regulations of the Commission (18 CFR Part 5). As part of this licensing process, Appalachian has solicited input from stakeholder meetings, including governmental agencies and non-governmental organizations, to identify potential project-related issues needing to be addressed during the licensing process.

As part of this licensing process, Appalachian filed the Pre-Application Document (PAD) with the FERC in August 2008. In that document, Appalachian presented available information addressing each identified relicensing issue, and also presented its position regarding issues needing further study. Study plans have been prepared to address each issue needing further study. Initial study plan meetings were held with the stakeholders in November 2008. The following study plan addresses the issue of fish entrainment at the London/Marmet and Winfield Hydroelectric Projects.

## 2.0 Background

The London/Marmet and Winfield Hydroelectric Projects are existing conventional hydroelectric projects located on the Kanawha River. The London/Marmet and Winfield Hydroelectric Projects each have three generating units. The units are either Kaplin (propeller turbines with adjustable blades) or propeller turbines. A complete description of the dams, the hydrology of the units, the configuration of the power houses and the dams, and the generating capacity is in the Pre-application Document, Section 2.0. Figure 1 shows the location of the projects on the river.

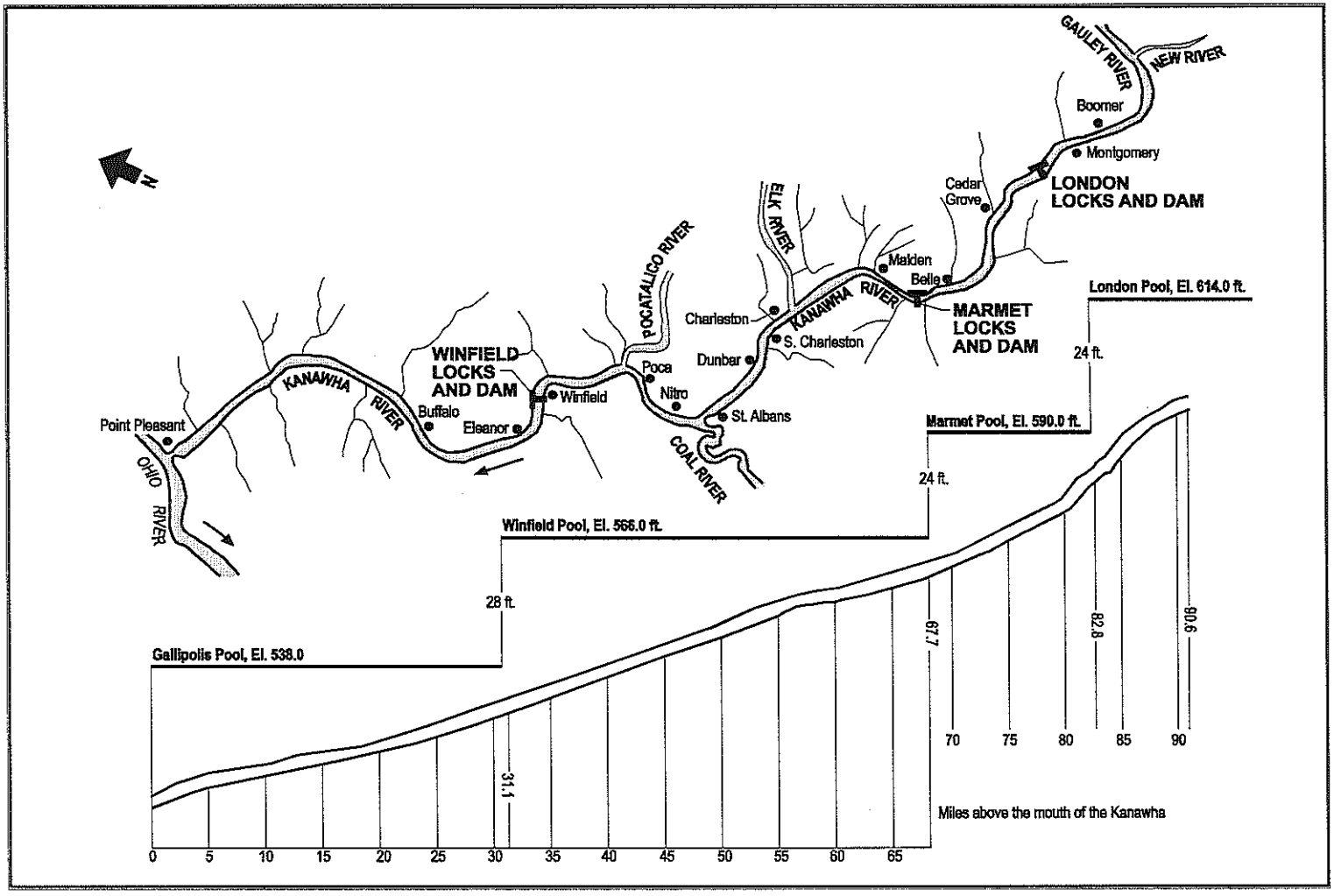



Figure 1 Kanawha River profile. (Source: Corps, 1993)

## 2.1 The London Development

The London Development consists of a powerhouse with appurtenant structures and equipment. The dam and locks that impound the London reservoir, and the reservoir itself, are U.S. government facilities operated by the Corps and are not part of the Commission-licensed Project.

The intake section of the powerhouse is located downstream of the forebay area and is located immediately upstream of the powerhouse and consists of trash racks and head gates. The elevation of the intake invert is at a depth of 27 feet below the normal full-pool reservoir elevation of 614.0 feet. Flow into the powerhouse is controlled by the headgates, which are operated by a motorized hoist at the walkway level. Inlet trash racks are located in front of the intakes.

The trash racks at the London, Marmet and Winfield developments are cleaned using a drag-rake type trash rake. The drag rake moves upstream approximately 25 feet. It lowers to the bottom of the river and drags along the bottom until encountering the bottom of the intake screens. The drag rake then moves up the intake screen, breaks the water surface and continues to the top of the intake screens where a limit switch causes it to stop after dumping its debris/trash into the sluiceway. It then passes over the racks, removing accumulated debris and conveying the debris to a sluiceway that discharges downstream of the powerhouse. The rakes are operated continuously; however the sluiceway is manually operated as-needed. During normal flow conditions, man-made trash larger than a drink can is removed from the sluiceway by hand and placed in a dumpster for disposal. During flood events, all debris is passed downstream.

A floating log boom is located across the forebay opening to prevent the majority of floating debris from reaching the trash racks and intakes. The debris accumulates along the log boom and in front of the dam until the Corps initiates operations to pass the debris downstream. These operations require the powerhouse to shut down temporarily. The gates in the dam are manipulated to draw the debris across the dam to the powerhouse side of the river and then the debris is passed at the gate closest to the powerhouse. Once the debris is passed, the units resume operation.

The powerhouse is located on the left bank (facing downstream) of the river and houses three turbine generating units. The units include two fixed-blade propeller units and one Kaplan-type unit. The turbines of the two propeller units are each rated at 6,600 horsepower (H.P.) (4,950 kilowatts [kW]). The Kaplan unit has a turbine rating of 7,250 H.P. (5,437.5 kW). The units each have generators rated at 6,000 kilovolt amperes (kVA) with a power factor of 0.8. The total authorized capacity of the development is 14,400 kW based on the limiting capacity of the generators.

The draft tubes discharge into a reinforced concrete tailrace that is submerged at a normal tailwater elevation of 590.0 feet. The total hydraulic capacity of the turbines is estimated to be 10,000 cubic feet per second (cfs).

## 2.2 The Marmet Development

The Marmet Development consists of a powerhouse with appurtenant structures and equipment. The dam and locks that impound the Marmet reservoir, and the reservoir itself, are U.S. government facilities operated by the Corps and are not part of the Commission-licensed Project.

The intake section of the powerhouse is located downstream of the forebay area, and is located immediately upstream of the powerhouse and consists of trash racks and head gates. The elevation of the intake invert is at a depth of 27 feet below the normal full-pool reservoir elevation of 590.0 feet. Flow into the powerhouse is controlled by the headgates, which are operated by a motorized hoist at the walkway level. Inlet trash racks are located in front of the intakes to help keep floating debris from entering the units.

Just as at the London Development, the Marmet powerhouse is located on the left bank (facing downstream) of the river and houses three turbine generating units. The units include two fixed-blade propeller units and one Kaplan-type unit. The turbines of the two propeller units are each rated at 6,600 H.P. (4,950 kW) and 7,600 H.P. (5,700 kW), respectively. The Kaplan unit has a turbine rating of 7,250 H.P. (5,437.5 kW). All three units have generators rated at 6,000 kVA with a power factor of 0.8. The total authorized capacity of the development is 14,400 kW based on the limiting capacity of the generators.

The draft tubes discharge into a reinforced concrete tailrace that is submerged at a normal tailwater elevation of 566.0 feet. The total hydraulic capacity of the turbines is estimated to be 10,000 cfs.

## 2.3 The Winfield Project

The Winfield Development consists of a powerhouse with appurtenant structures and equipment. The dam and locks that impound the Winfield reservoir, and the reservoir itself, are U.S. government facilities and are not part of the Commission-licensed Project.

The intake section of the powerhouse is located downstream of the forebay area, and is located immediately upstream of the powerhouse and consists of trash racks and head gates. The elevation of the intake invert is at a depth of 27 feet below the normal full-pool reservoir elevation of 566.0 feet. Flow into the powerhouse is controlled by the headgates, which are operated by a motorized hoist at the walkway level. Inlet trash racks are located in front of the intakes to help keep floating debris from entering the units.

The Winfield powerhouse is located on the left bank (facing downstream) of the river and houses three turbine generating units. The units include two Kaplan-type units and one adjustable propeller-type unit. The turbines of the two Kaplan units are each rated at 9,200 H.P. (6,900 kW). The adjustable propeller unit has a rating of 9,150 H.P. (6,862.5 kW). All three units have generators with ratings of 6,150 kVA at a power factor of 0.8. The total authorized capacity of the development is 14,760 kW based on the limiting capacity of the generators.

The draft tubes discharge into a reinforced concrete tailrace that is submerged at a normal tailwater elevation of 538.0 feet. The total hydraulic capacity of the turbines is estimated to be 10,600 cfs.

## 2.4 Projects' Pools

The pools above the London, Marmet, and Winfield dams provide a homogeneous, low value habitat type that is relatively abundant in the Kanawha River. The approaches to the locks are also of low value due to frequent disturbance by boat traffic and periodic maintenance dredging activity by the Corps. The Corps (1993) reports that the Marmet pool is approximately 25 to 30 feet deep, with a sandy and highly unstable substrate. Except for the littoral zones of the channel borders, it is not considered to provide high quality habitat (Corps, 1993).

## 2.5 Project's Tailwaters

The tailwaters below the impoundments are highly productive and dynamic areas with coarse substrates, swift currents, and relatively shallow depths. The tailwater areas represent a valuable remnant of pre-impoundment conditions, which may be essential for spawning of certain species. The London, Marmet, and Winfield dams provide the only three tailwaters on the 90.7 navigable miles of the river (Corps, 1993).

The mainstem Kanawha River is classified as a large river whose physical conditions favor the development of the phytoplankton community (Corps, 1993). The fish community is dominated by large specimens in the invertivore, planktivore, piscivore, and omnivore feeding guilds. Typical examples from the Kanawha River include redhorses and hogsuckers (invertevores), gizzard shad (planktivores), longnose gar and white bass (piscivores), and channel catfish (omnivores) (Corps, 1993).

Creel survey data collected in 1987 in the Marmet and Winfield tailwaters indicated that channel catfish, white bass, freshwater drum, and crappie comprised 73.2 percent of all fish caught during the 7-month survey period (table 3.4-1). More recently, WVDNR has undertaken programs to restore populations of paddlefish and lake sturgeon to the Kanawha River, and has begun stocking a river-adapted strain of walleye from the New River. WVDNR has been stocking approximately 31,000 walleye fingerlings each year since 2005. Typical walleye are between 10 and 20 inches, and walleye exceeding 20 inches in length are becoming more common (Game & Fish Magazine Online, 2008).

WVDNR reports that a newly described fish species, the diamond darter (*Crystallaria cincotta*), occurs in the Elk River and also could occur in the Kanawha River (email from B. Sargent, WVDNR Natural Heritage Program, Elkins, WV, to F. Winchell, Louis Berger Group, Needham, MA, April 21, 2008). The species has not been found outside of the Ohio drainage of West Virginia.

| Number of Fish Caught | | | | Number of Fish Harvested | | | |
|---|---|---|---|---|---|---|---|
| Species | Marmet | Winfield | Total | Marmet | Winfield | Total | Percent Harvested (%) |
| channel catfish | 2,863 | 5,439 | 8,302 | 1,970 | 1,314 | 3,284 | 39.6 |
| white bass | 2,279 | 3,615 | 5,894 | 1,300 | 992 | 2,292 | 38.9 |
| freshwater drum | 2,143 | 3,081 | 5,224 | 1,647 | 287 | 1,934 | 37.0 |
| crappie | 969 | 1,412 | 2,381 | 708 | 542 | 1,250 | 52.5 |
| smallmouth bass | 1,469 | 470 | 1,939 | 505 | 169 | 674 | 34.8 |
| sauger | 773 | 1,054 | 1,827 | 634 | 497 | 1,131 | 61.9 |
| other | 210 | 1,380 | 1,590 | 79 | 209 | 288 | 18.1 |
| sunfish | 478 | 514 | 992 | 80 | 63 | 143 | 14.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| carp | 158 | 435 | 593 | 100 | 47 | 147 | 24.8 |
| hybrid striped bass | 238 | 301 | 539 | 158 | 127 | 285 | 52.9 |
| flathead catfish | 155 | 292 | 447 | 99 | 102 | 201 | 45.0 |
| rock bass | 311 | 46 | 357 | 123 | 0 | 123 | 34.5 |
| largemouth bass | 135 | 132 | 267 | 76 | 39 | 115 | 43.1 |
| walleye | 61 | 49 | 110 | 44 | 11 | 55 | 50.0 |
| spotted bass | 56 | 36 | 92 | 29 | 23 | 52 | 56.5 |
| Total | 12,298 | 18,256 | 30,554 | 7,552 | 4,422 | 11,974 | |

1987 catch and harvest by anglers in the Marmet and Winfield tailwaters, estimated by species. (Source: Leckie, 1987)

## 3.0 Study Objectives

To evaluate the relative likelihood entrainment and turbine mortality for larval, juvenile, and adult fish species (including channel catfish, white bass, crappie, smallmouth bass, sauger, gizzard shad, bluegill, largemouth bass, and walleye), the primary tasks that will be undertaken are as follows:

1. Perform a literature review of swimming speeds and intake avoidance behavior for juvenile and adult species identified in consultation with the WVDNR. Life history characteristics for the species of interest will be required to determine spatial and temporal use of the river upstream of the powerhouse by the different life stages.
2. Review evidence of any entrainment problems associated with the current operating regime at the London/Marmet and Winfield Projects.
3. Perform a literature review of impingement and entrainment problems at other projects of similar design, and perform a comparative analysis of these facilities with the Projects.
4. Perform intake velocity profile measurements at the Projects during full plant maximum hydraulic capacity and a second series of measurements with two and one hydro unit operating at its MEP. Velocity measurement analysis will be used to establish threshold velocities at the intakes for the evaluated fish species burst and critical or sustained velocities that will be obtained through literature review. The velocity analysis will include a through trash rack velocity assessment.

## 4.0 Relicensing Relevance

Operation of the London/Marmet and Winfield Projects requires passing water through the turbines from the upstream to the downstream side of the dams. The hydroelectric generation process may potentially cause entrainment, and possible injury or mortality of fish species at different life stages residing or moving in the river adjacent to the project intakes. For these reasons, a fish entrainment analysis will be determined to assess of the potential for adverse effects on the Kanawha River fisheries due to physical contact with the turbines.

## 5.0 Methods and Geographic Scope

Kanawha River fishery data necessary for this evaluation are available, thus a desktop study will be conducted using the most complete and current fisheries data. Annual entrainment, hydro unit flow rates, intake characteristics, and turbine passageway characteristics from similar units and projects like the London/Marmet and Winfield Project will be compiled. No fish passage netting studies are necessary, proposed or planned to complete this study due to the availability of existing fish entrainment study results obtained from literature research. If necessary, entrainment rates can be estimated from studies done at other water intakes on the Kanawha River.

### 5.1 Literature Review – Fish Species Behavioral Characteristics

The literature review will include life history characteristics, swimming speeds, spatial and temporal use of the Kanawha River, and intake avoidance behavior for the fish species identified in consultation with the WVDNR. The larval, juvenile and adult life stages will be studied to determine the potential impact for intake screen impingement and/or turbine entrainment. Additional literature is available on both fish swimming speeds, life history characteristics (Kilpatrick 2003; Rash 2003; Haro et al. 2004), and evaluation of entrainment potential (EPRI 1997).

### 5.2 Existing Entrainment Problems at London/Marmet and Winfield Projects

A literature review and investigation will be conducted to determine if existing entrainment problems exist at the Projects. Potential sources for information will include plant personnel observations, personal observations while at the site specific to the intake and downstream banks.

### 5.3 Comparative Analysis with Similar Projects

The Project turbine passage characteristics and intake screen configuration will be used during the comparative assessment. The most complete and current information regarding estimates for entrainment potential and survivability will be assembled from other studies involving similar hydro units and projects. Project and turbine characteristics contributing to entrainment survivability could include turbine type, number of blades, turbine speed, operating head, rated unit flow, and turbine clearances. Contributing injury or mortality factors such as the effects of turbine component strikes, water pressure changes, turbine cavitation, and turbulence within the water column should be evaluated. Annual mortality estimates for the fish species and life stages identified in Section 3.0 will also be calculated.

### 5.4 Velocity Profile Measurements

Velocity profiles will be established along a transect at each of the Projects. Appropriate technology will be applied to measure three dimensional (3-D) velocity vectors.

Engineering analysis shall determine the respective plant operation velocity vectors near the face of the trash racks and through the trash racks.

The three plant operation scenarios are defined as:

- Maximum plant hydraulic capacity with three units operating
- Maximum plant hydraulic capacity with two units operating
- Maximum plant hydraulic capacity with one unit operating

### 5.5 Turbine Blade Strike Probability Analyses

Several researchers have calculated the probability of a fish passing through a hydroelectric plant hitting the leading edge of the turbine blade. These calculations have also been tested at hydro plants to determine if the actual mortality and the predicted mortality are similar. The selection of the method of calculation will be done using the method that was developed to propeller turbines.

## 6.0 Analysis and Reporting of Results

Upon completion of the analysis, Appalachian will prepare a draft report of the results. Preparation of the draft report will be accomplished in consultation with the stakeholders and agencies. Based upon the comments received regarding the draft report, Appalachian will prepare a final report to be incorporated into the final Application for New License.

The report will include the following:

1. A review of the supporting literature.
2. Explanation of the analyses undertaken.
3. Calculation results.
4. Comparative results to other regional and southeastern U.S. projects having similar turbines, hydraulic rates, intakes, and operational characteristics.
5. Entrainment potential and survivability.

6. Intake velocity profiles (graphical and tabular).
7. Fish escape velocity thresholds (graphical and tabular).
8. Through screen velocity (graphical and tabular).

## 7.0 Schedule

The fish entrainment study will be scheduled in 2009. A pre-study meeting will be held in September 2009. Literature review and comparative project analysis will be conducted during the third and fourth quarters of 2009. The intake velocity field study will be conducted in the fall when project inflow is more suitable for maximum plant hydraulic capacity. The second quarter of 2010 will serve as a back up period for the velocity field study. Additional progress reports will be provided to the stakeholders as information becomes available, and meetings will be scheduled with stakeholders at key decision points to seek input and recommendations. All information will be made available in printed format, as well as electronic format. Meetings will be scheduled and stakeholders. Stakeholders will be given at least 30 days prior to a meeting to review the information to be discussed.

## 8.0 References

EPRI (Electric Power Research Institute). 1997. Turbine Entrainment and Survival Database-Field Studies. TR-108630. Final Report. October 1997. Prep. by Alden Research Laboratories, Inc., Holden, MA. Prep. for EPRI, Palo Alto, CA.

Haro, A., T. Castro-Santos, J. Noreika, and M. Odeh. 2004. Swimming Performance of Upstream Migrant Fishes in Open-Channel Flow: A New Approach to Predicting Passage Through Velocity Barriers. Can. J. Fish. Aquat. Sci. 61: 1590-1601.

# TRANSMISSION CORRIDOR

# REVISED STUDY PLAN

**London/Marmet and Winfield Hydroelectric Projects**

**Application for New License**

**FERC Project No. 1175 and 1290**

**May 2009**

## Table of Contents

## 1. Introduction

Appalachian Power Company (Appalachian) operates the London/Marmet and Winfield Hydroelectric Projects (Projects), which are licensed by the Federal Energy Regulatory Commission (FERC) as Project Nos. 1175 and 1290, respectively. The existing license for the London/Marmet Project was issued to Appalachian by FERC on September 23, 1983 and expires on January 31, 2014. The existing license for the Winfield Project was issued to Appalachian by FERC on September 26, 1983 and expires on January 31, 2014. Appalachian is applying to FERC for new licenses for the Projects. The default process for the Projects' relicensing is the Integrated Licensing Process (ILP), as defined under the rules and regulations of the Commission (18 CFR Part 5). As part of this licensing process, Appalachian has solicited input from stakeholders including governmental agencies, local governments, non-governmental organizations, and the public to identify potential project-related issues that need to be addressed during the licensing process.

On June 2, 2008, Appalachian distributed a Project Draft Pre-Application Document (PAD) to stakeholders. Appalachian filed the PAD with the Federal Energy Regulatory Commission (Commission) on August 14, 2008. On December 12, 2008, the Commission issued its Request for Additional Information in which numerous questions were posed with regards to the Projects' associated transmission lines. This Transmission Corridor Study Plan aims to obtain the additional information requested by the Commission. Because of the similarities among the developments, this study plan is being developed for both Projects. The particular study objectives are described in Section 3 of this document.

As defined by the Commission, a primary transmission line is a line that is used solely to transmit power from a hydroelectric powerhouse to a load center or to an interconnection point in a regional power grid. In performing the Commission's analysis, they rely on the fact that without a primary transmission line, there would be no way to transmit the projects' power to market.

## 2. Background

The Projects are located on the Kanawha River in West Virginia. The London/Marmet Project consists of two developments, the London Development and the Marmet Development. The Winfield Project consists of one development, Winfield, on the Kanawha River, downstream of the London/Marmet Project. The London Development is located at river mile 82.8 near Handley, West Virginia, in Fayette and Kanawha counties. The Marmet Development is located at river mile 67.7 in Marmet, West Virginia, in Kanawha County. The Winfield Development is located at river mile 31.1 in Winfield, West Virginia, in Kanawha and Putnam counties.

The London, Marmet and Winfield Developments are each located at U.S. Army Corps of Engineers' (Corps) dams and locks on the Kanawha River. Appalachian retains licenses to operate the hydroelectric facilities at these Corps facilities.

The London Development Project, which has 3 generating units, has an authorized capacity of 14.4 MW based on the limiting capacity of the generators. Average annual generation for the period 2003 through 2007 was 84,048 kWh.

The Marmet Development, which has 3 generating units, has an authorized capacity of 14.4 MW based on the limiting capacity of the generators. Average annual generation for the period 2003 through 2007 was 82,302 kWh.

The Winfield Development, which has 3 generating units, has an authorized capacity of 14.7 MW based on the limiting capacity of the generators. Average annual generation for the period 2003 through 2007 was 114,090 kWh. Operation of the hydroelectric facilities is keyed off the operations of the Corps' locks at each dam.

At the London development, the output of Units 1-3 is stepped up from 4 kV to 46 kV using two three-phase, 12 MVA transformers located at the generating facility. Two 46 kV transmission lines, approximately 0.45 miles in length, connect to the 46kV side of the transformers and terminates at the London Station along a 0.38 mile corridor. This substation is a multi-use facility that is owned / operated / maintained by Appalachian Power Company (a subsidiary of American Electric Power.)

At the Marmet development, the output of Units 1-3 is stepped up from 4 kV to 46 kV using two three-phase, 12 MVA transformers located at the generating facility. One 46 kV transmission line, approximately 0.82 miles in length, connects to the 46kV side of the transformer and terminates at the Belle Station along a 0.78 mile corridor. The other 46kV transmission line is in this same corridor to the Belle Station where it then recrosses the river before tapping into the Bell-Cabin creek circuit. This line is approximately 0.98 mile long and the additional corridor is approximately 0.22 mile. The Belle substation is a multi-use facility that is owned / operated / maintained by Appalachian Power Company (a subsidiary of American Electric Power.)

At the Winfield development, the output of Units 1-3 is stepped up from 4kV to 69 kV using one three-phase, 30 MVA transformer located at the generating facility. The 69 kV side of the transformer is connected to the Winfield 69 kV Station. This GSU and the 69 kV bus are located in the substation that is directly adjacent to the generating facility. From the Winfield station, the one 69 kV transmission line, approximately 3.93 miles in length, terminates at the Bancroft Station. The other 69 kV transmission line, approximately 6.06 miles in length, terminates at the Teays Station. The total corridor length is 9.5 miles. Both substations are multi-use facilities that are owned / operated / maintained by Appalachian Power Company (a subsidiary of American Electric Power).

Following are the key objectives associated with the Transmission Corridor Study.

## 3. Study Objectives

1) Verify the primary transmission lines associated with the London/Marmet and Winfield Projects.
2) Identify the current method of maintaining the lands and any waters under or near the primary transmission lines.
3) Conduct a literature search of the wildlife species located in the area of the transmission lines.
4) Survey each area located under and near primary transmission line to identify wildlife species and describe the plant community, and the location of any ponds or wetlands. At the London development, emphasis will be placed on searching for Running Buffalo Clover, *Trifolium stoloniferum.*
5) Survey the project boundaries and the areas located under and near primary transmission line to identify and map any identified ponds or wetlands.
6) Describe the potential effects associated with the continued operation and maintenance of the projects on terrestrial resources, particularly federally listed bats and plants.
7) Investigate known occurrences of bats, the known occurrences, as well as new or unpublished data, indicating potential occurrences of hibernacula near the transmission lines and their rights of ways as well as habitat use in, or near the transmission lines and their rights-of-way.
8) Document records of communications with the resource agencies and include in the study report.

## 4. Relicensing Relevance

The Commission issued a request for additional information on various aspects relating to transmission lines in Schedule A, which is attached to their letter of December 12, 2008. The additional information is necessary to identify the potential effects associated with the continued operation of the projects.

The proposed Transmission Corridor Study will address which lines are to be considered part of the projects' facilities; identify the wildlife and botanical species under and near the transmission lines; identify the methods of maintaining the areas under and near the transmission lines; determine the potential effects associated with the continued operation and maintenance of the projects on terrestrial resources, particularly federally listed bats and plants and determine the best methods of managing the properties over the term of a new license.

## 5. Methods and Geographic Scope

The geographic limits for this study will be the project boundaries and the area near the rights-of-ways for the identified primary transmission lines. Prior to conducting the survey and report, Appalachian will consult with the Corps, the U.S. Fish and Wildlife Service, the WVDNR to define "near" and to obtain any available information and summaries from existing studies of federally listed bats and plants.

### A. Document Previously Recorded Resources

In consultation with the WVDNR, the Corps, the U.S. Fish and Wildlife Service, Appalachian will research all wildlife species in and near the transmission lines and document all previously known occurrences of federally listed bats under and near the transmission lines.

### B. Survey

A qualitative survey of the project boundaries and the transmission lines determined to be primary transmission lines will be conducted to document wildlife and botanical species, and the existence of wetlands or ponds. The study will focus on running buffalo clover, *Trifolium stoloniferum*.

A trained biologist will walk the length of the transmission corridors noting observations of the species of flora encountered. To document the level of effort utilized during the plant portion of the survey, the site will be traversed in a random manner using a timed meander search (TMS) methodology (Goff 1982). The TMS procedure is a semi-quantitative procedure that focuses on the discovery of threatened or endangered plant species. In this procedure, a randomly patterned meandering route through each transmission right-of-way will allow for maximum coverage of variation within the R/W. To maximize the probability of discovering individual plants or colonies of running buffalo clover, the biologist will adjust the random walk to include habitat most likely to support this species.

The results of the TMS procedure have value in the discovery of an actual threatened or endangered species and also as a means of "documenting a low probability of occurrence of such species if not found during an application of the procedure" (Goff 1982). Plant species observations will be recorded on data sheets along with a time for each species observation. If plant species are observed in the field that cannot be identified in the field, samples will be collected, preserved, and later keyed out for identification using reference materials following field activities.

If threatened or endangered species are found, the need for quantitative surveys will be discussed with the Fish and Wild Life Service and the WV DNR. Currently, there are no field surveys planned for Indiana bats. There is no proposed change in operation or proposed construction that would impact this species. A GPS will be utilized to document the exact location of any wetlands or ponds.

### C. Mapping

If any wetlands or ponds are identified, a surveyor will be obtained to map their exact locations. Digitized information will be obtained in order to assist with the development of a Geographic Information System for the London/Marmet and Winfield Projects.

### D. Analysis

Appalachian will determine the potential effects of continuing to maintain the areas under and near the primary transmission lines on terrestrial resources and identify possible improvements for maintenance over the term of the next license.

## 6. Consultation, Analysis, and Reporting of Results

Appalachian will consult with the listed resource agencies in the development of the study plan and in the review of the preliminary study findings and final study report, as determined in consultation with WVDNR. Periodic meetings with these stakeholders will be held as data becomes available. Data collected will be conveyed through update reports and at progress meetings. The data will be made available in printed form or electronically depending on the amount of data to be made available at any time, or the preferences of the stakeholders. A timetable for completing the cultural resource investigations is presented in the table below.

**Table 1. Schedule for conducting the Transmission Corridor Study for the London/Marmet and Winfield Project relicensing.**

| Activity | Milestones |
|---|---|
| File draft study plan with FERC | January 26, 2009 |
| Initial Study Plan meeting(s) | February 25, 2009 |
| Stakeholder comments on proposed study plan | April 27, 2009 |
| File Revised Study Plan with FERC | May 27, 2009 |
| Stakeholder comments on revised study plan | June 11, 2009 |
| Commission issues study plan determination | June 26, 2009 |
| Formal study dispute resolution process (if necessary) | July 16, 2009 |
| Pre-study meeting | September 2009 |

| | |
|---|---|
| Begin documentation of existing resources | October 2009 |
| Initial Study Report to FERC | June 23, 2010 |
| Initial Study Plan Meeting | 15 days after Initial Study Report Filed – July 8, 2010 |
| Conduct field work | July 2010 |
| Final Study Report | May, 2011 |
| Updated Study Report Meeting | July 8, 2011 |

## 7. Costs

The estimated cost for performing the Transmission Lines Study components identified in this plan is $50,000. These costs include field studies and labor for both consultants and Appalachian.

## 8. References

Appalachian Power Company. 2008. Pre-Application Document, London/Marmet and Winfield Hydroelectric Projects, filed with the Federal Energy Regulatory Commission, August 2008.

Goff, Glenn. 1982. Site examination for threatened and endangered plant species. *Environmental Management* 6(4).

# RECREATION ASSESSMENT AND ANGLER USE

# PROPOSED STUDY PLAN

**London / Marmet Project**
**FERC Project No. 1175**

**Winfield Project**
**FERC Project No. 1290**

**Application for New License**

**May 2009**

## Table of Contents

## 1. Introduction

Appalachian Power Company (Appalachian) operates the London/Marmet and Winfield Hydroelectric Projects (Projects), which are licensed by the Federal Energy Regulatory Commission (FERC) as Project Nos. 1175 and 1290, respectively. The existing license for the London/Marmet Project was issued to Appalachian by FERC on September 23, 1983 and expires on January 31, 2014. The existing license for the Winfield Project was issued to Appalachian by FERC on September 26, 1983 and expires on January 31, 2014. Appalachian is applying to FERC for new licenses for the Projects. The default process for the Projects' relicensing is the Integrated Licensing Process (ILP), as defined under the rules and regulations of the Commission (18 CFR Part 5). As part of this licensing process, Appalachian has solicited input from stakeholders including governmental agencies, local governments, non-governmental organizations, and the public to identify potential project-related issues that need to be addressed during the licensing process

On June 2, 2008, Appalachian distributed a Project Draft Pre-Application Document (PAD) to stakeholders. The document, as well as subsequent stakeholders' comments to the Draft PAD and the Pre-Application Document filed with FERC on August 14, 2008, identified issue(s) associated with recreation and angler use for which the existing, relevant, and reasonably available information was thought to be insufficient to address. A study plan meeting was held February 25, 2009. The following study plan addresses the issues pertaining to recreational use and associated recreational facilities within the project boundary of these two Projects.

## 2. Background

The Projects are located on the Kanawha River in West Virginia. The London/Marmet Project consists of two developments, the London Development and the Marmet Development. The Winfield Project consists of one development, Winfield, located downstream of the London/Marmet Project. The London Development is located at river mile 82.8 near Handley, West Virginia, in Fayette and Kanawha counties. The Marmet Development is located at river mile 67.7 in Marmet, West Virginia, in Kanawha County. The Winfield Development is located at river mile 31.1 in Winfield, West Virginia, in Kanawha and Putnam counties.

The London, Marmet and Winfield Developments are each located at U.S. Army Corps of Engineers' (Corps) dams and locks on the Kanawha River. Appalachian retains licenses to operate the hydroelectric facilities at these Corps facilities.

Operation of the hydroelectric facilities is keyed off the operations of the U.S. Army Corps or Engineers' (Corps) locks at each dam. The hydro facility operators are in frequent contact with the lockmaster for each facility to ensure coordination of hydro

generation and lock operations. In general, as long as the stream flow is less than the full discharge of the turbines maintenance of the pool elevations within the allowable limits for navigation is the responsibility of Appalachian's power system personnel and plant operators. When stream flow exceeds the maximum turbine discharge, the responsibility for control of the pool elevations passes to the Corps' personnel at the dam. Also, from time to time, the Corps may request Appalachian's plant operators to maintain such water elevations as required for special navigation purposes.

## A. Recreational Use and Facilities

Public recreation facilities within the Project boundaries at the London/Marmet and Winfield Projects consist of tailrace fishing accesses at the three developments. Appalachian maintains the three sites. Appalachian leases all three sites to the West Virginia Department of Natural Resources for public fishing purposes. Appalachian is not responsible for public recreation within the reservoirs above the developments.

The London dam tailwater fishing access is located in Fayette County, West Virginia, in the Town of Handley. This site was closed temporarily on February 16, 2009 due to the absence of public access from State Highway 61 to the site. Originally, the public accessed the facility by a footbridge over the railroad tracks. Appalachian engineers determined that the bridge was unsafe and closed it to all use. Appalachian is currently evaluating various options for providing access to the London development including but are not limited to replacement of the bridge or providing an at grade railroad track crossing. The replacement of the London bridge or the provision of alternative recreational access is being addressed via a separate study entitled, the London Bridge Feasibility Study.

The Marmet dam tailwater fishing access is located in the city of Marmet, Kanawha County, West Virginia, off State Highway 61, on 86$^{th}$ Street. This site has a gravel parking area, accommodating approximately 28 vehicles, and a three-tiered concrete fishing pier with metal steps and handrailing.

The Winfield dam tailwater fishing access is located in Putnam County, West Virginia, off State Highway 35, in Winfield. This site has a gravel parking area with space for approximately 28 vehicles and a three-tiered concrete fishing pier with metal steps and hand railings. This site was temporarily closed on September 2, 2008 by the U.S. Corps of Engineers (COE) for construction of improvements to the area, including (1) an ADA access ramp to an ADA fishing platform that is to be located immediately downstream of but not connected to the fishing access facilities provided by APCO at the Winfield powerhouse; (2) paved parking for those with special needs to be located at the northern most end of the U.S. Corps of Engineers (COE) property downstream of the powerhouse; (3) a sixteen feet wide gravel road leading from APCO's parking area to the paved parking; (4) restoration in-kind of APCO's 28-vehicle parking lot that has been disturbed due to construction activities; (5) replacement of the three lights removed from APCO's parking area as a result of construction activities; and (6) landscaping of the COE property.

In 2008, data was collected at all three sites to obtain a representative level of activity during the summer and early fall seasons; considered the peak recreation season. These visits included one holiday weekend to obtain a representative level of activity during peak use in order to fulfill the FERC Form 80 requirements. Spot counts were recorded for all recreation activities, number of users and vehicles, and other associated information utilized to estimate total use.

### B. Angler Use

The fish community in the Kanawha River is comprised of at least 59 species including redhorses, hogsuckers, gizzard shad, longnose gar, white bass, cyprinids, centrarchids, and channel catfish. Creel survey data collected in 1987 by WVDNR in the Marmet and Winfield tailwaters indicated that channel catfish, white bass, freshwater drum, and crappie comprise 73.2 percent of all fish caught during the 7-month survey period.

More recently, WVDNR has undertaken programs to restore populations of paddlefish and lake sturgeon to the Kanawha River, and has begun stocking a river-adapted strain of walleye from the New River. WVDNR has indicated that in one or more years between 2003 and 2007 the agency stocked sauger in the London reservoir; blue catfish, largemouth bass, muskellunge, paddlefish, sauger, shovelnose sturgeon, and walleye in the Marmet reservoir; and blue catfish, largemouth bass, paddlefish, sauger and walleye in the Winfield reservoir.

## 3. Study Objectives

Following is a summary of the key objectives associated with the various components of the Recreation Assessment and Angler Survey Study.

### A. Recreation Facility Inventory

1. Provide a general regional recreation characterization of the water-oriented recreational opportunities within 60 miles of the three developments.

### B. Recreation Use and Needs Assessment

1. Collect information regarding recreational use and user preferences at the tailrace fishing access sites.
2. Characterize existing recreational uses at the tailrace fishing access sites, including by season, by activity, and by time of day.
3. Identify sites that are approaching capacity or are in need of repair or upgrading.
4. Determine the projected usage of public fish cleaning stations, if provided at the fishing access sites.

5. Identify if additional amenities are needed including fish cleaning stations and restrooms.
6. Summarize recreation use/demand from the information collected and the recreational use and needs assessment.
7. Quantify recreational use, demographics, and expenditures associated with the tailrace fishing access sites.

### C. Angler Use Survey

1. Determine any angler species preference, including size of fish caught, released, and harvested for all seasons of the year.
2. Obtain angler demographics and general comments related to the past and current operation of the London, Marmet and Winfield developments, distinguishing between bank and pier anglers.

### D. Future Angler Use Assessment

1. Collect information regarding local and regional population trends and trends in recreation activities throughout the project area.
2. Document trends in future recreation and accepted literature available to make use estimates.
3. Estimate future demand at the fishing access areas.
4. Prepare a future use/demand summary explaining the methods, assumptions, and baseline conditions for the future estimates and study results.

## 4. Relicensing Relevance

The information obtained from the study will assess the current use of the existing tailrace fishing accesses and their effectiveness. The study will identify if additional amenities are needed at these sites. The study will also estimate future use demand at these sites.

## 5. Methods and Geographic Scope

### A. Geographic Scope

The geographic scope of the Recreation Assessment and Angler Use Study will include the tailrace fishing access areas within the project boundary at the Marmet and Winfield Developments. If public access is available at the London Development at the time of the study, the geographic scope will be expanded to include this tailrace fishing access.

### B. Recreation Facility Inventory

A summary of the water-oriented recreational opportunities within 60 miles of the three developments will be provided. This will provide a regional recreation characterization of water related recreation in the vicinity of the Projects.

The results of the inventory will provide baseline information regarding existing recreation facilities and resources in the vicinity of the Project. The inventory information will be assessed in conjunction with the information obtained through the survey (see below).

## C. Recreation Use and Needs Assessment

The recreation use and needs assessment will be developed through site visits to the public access sites within and adjacent to the project boundary at the tailrace fishing areas to identify and characterize the facilities and resources. An inventory form will be used to record the amenities at each site, parking, and other fishing access related information. Information regarding the adequacy and condition of existing recreation facilities, including ADA-accessibility, and safety features and signage designed to protect and inform the recreating public will be collected.

Existing Public Use

Traffic counters, spot counts, and visitor exit interviews from the public tailrace fishing access sites will be used to estimate current recreation use and activity levels. These collection tools will be implemented and data collected from March 1, 2010 to November 30, 2010.

Traffic counters capable of recording the time of each vehicle count will be installed at the sites that are conducive to this form of data collection. These are sites where there is a clearly designated entrance and exit to the recreation site. An assessment will be made in the field regarding the suitability of using a traffic counter at each site.

Spot counts and interviews will be conducted at the tailrace fishing access sites. Spot counts will collect data on the amount of occupied parking spaces, the types of vehicles, state license plates, recreational activities and use numbers, and general climate conditions. Exit surveys will be conducted with visitors to collect data on people's use of the tailrace fishing areas, their attitudes concerning recreation needs and opportunities, safety concerns, and aesthetics. Survey questions will ask the visitors about group size, , duration of and frequency of visits, , satisfaction, expenditures, , and insight into site needs. The goal of each site visit is to capture use numbers from traffic counts, characterize them with spot counts, and obtain as many interviews as possible to get a representative sample of the recreating public and characterize their uses, opinions, attitudes, and experiences.

Following input from the WVDNR, a stratified random sampling scheme, such as by month, time of day, and location, will be developed to gain representative responses from the visitors. A sampling day will begin either ½ hour after sunrise or end ½ hour before

sunset and will focus either on the AM or PM time period. Fourteen (14) weekdays and 6 weekend days will be randomly selected for spot counts and interviews each month. The details of the survey tool questions and site stratification will be discussed with the work group prior to the beginning of field work. Once a total use estimate is made at the end of the study, the confidence interval for interview results relative to the overall use estimate (population) will be characterized.

The results from the public site interviews will also cross reference their home zip code to capture the distance people are willing to travel to use the facilities. The results from the exit interviews, spot counts, and traffic counts will be used as baseline conditions for future population and use discussion and analysis (discussed under section D).

The expected results will be:

- Visitor profile information including results of interviews.
- Characterization of existing recreational visitation based on the assessment of information gathered via spot counts and traffic counter information
- Characterization of existing recreational use and user preferences based on exit interviews and survey information.
- Section within final report summarizing the results of recreation demand information.

The results of the studies can be used to develop preliminary protection, mitigation and enhancement measures, provide baseline information, and will provide a context for decisions regarding recreation resource management at the three areas.

## D. Angler Use Survey

A creel survey will be conducted at the tailrace fishing areas. The angler survey will be conducted from March 1, 2010 through November 30, 2010.

The study will utilize WVDNR recommended sampling weights. Five (5) weekdays and 5 weekend days a month will be randomly selected. Sampling will be mandatory on Memorial Day, 4th of July, and Labor Day. Each survey day will be classified as either morning (A.M) or afternoon (P.M) with start times weighted as recommended by WVDNR. The length of the survey day will be determined by the average amount of daylight for the month minus ½ hour after sunrise and ½ hour before sunset and divided by 2.

An angler use survey questionnaire will be developed in consultation with WVDNR. At a minimum, the surveys will include questions in order to obtain the following information:

- Pier angler effort, catch, harvest and release efforts
- Angler's species preference
- Angler demographics

- Trip expenditures and percentage of expenditures within 20 miles of the fishing access
- Awareness of WVDNR fish consumption advisories and resulting changes in fishing habits
- Opinions and attitudes with regard to sociological aspects of their fishing experience
- Striped bass and hybrid striped bass angler's size preferences
- Angler's need for a fish cleaning station and restroom facilities

The expected results will be:

- Document angler use of the tailrace fishing accesses
- Section in final report summarizing angler use including information obtained from the surveys as discussed above.

### E. Future Angler Use Assessment

Future angler demand at the London/Marmet and Winfield Projects will be evaluated by assessing future demand for angler activities and population trends for the expected term of the new license (to year 2060). Population estimates for the counties surrounding the Project will be obtained from the State of West Virginia. Growth in angler activities and the angler use projections for the anticipated growth in angler use through 2060 will be developed. Current use estimates will be projected with indexed values of expected changes in the number of angler days for given activities at the Project to project future angler use in the Project for 10 year increments out to 2060.

The expected results will be:

- Data tables of expected population growth in Putnam, Fayette, and Kanawha counties in 10 year increments to 2060.
- Data tables of expected activity use in 10-year increments to 2060.
- Section within final report summarizing the results of projected angler use at the Projects.

## 6. Consultation, Analysis and Reporting of Results

Appalachian will consult with the appropriate resource agencies and interested parties in the development of the study plan and in the review of the preliminary study findings and final study report. Data collected will be conveyed through update reports and at progress meetings. The data will be made available in printed form or electronically depending on the amount of data to be made available at any time, or the preferences of the stakeholders. Updated study reports and meetings to discuss study progress as well as to discuss the preparation of the final report will be held in accordance with the requirements of 18 CFR § 5.11.

A pre-study meeting will be held in September 2010 to discuss specific questions and review the survey tools necessary to gather information regarding the recreation resources and use and angler use at the tailrace fishing accesses. Study preparers will then finalize the survey tools and data gathering techniques to be applied for the Recreation Assessment and Angler Use Study.

Study plan progress updates will be provided to the Commission, as well as the stakeholders involved in the relicensing of the London/Marmet and Winfield Projects, in July 2010 and July 2011. Additional progress reports will be provided to the stakeholders as information becomes available and meetings will be scheduled with stakeholders at key decision points to seek input and recommendations. All information will be made available in printed format as well as electronic format in accordance with the Information Distribution Protocol for the relicensing. Meetings will be scheduled and stakeholders notified in accordance with the Communications protocol for the relicensing. Individuals, agencies, governments, etc. will be given at least thirty (30) days time prior to a meeting to review the information to be discussed. Information will also be posted on the web site established for the relicensing (www.kanawhahydro.com) as appropriate.

The Recreation Assessment and Angler Use Survey Study will be completed according to the milestones shown in Table 1. The schedule for the components of the recreation study is based on an anticipated starting date for the field studies of March 2010.

**Table 1. Schedule for conducting the Recreation Assessment and Angler Use Survey Study for the London/Marmet and Winfield Hydroelectric Projects relicensing.**

| Activity | Deadline |
|---|---|
| File revised study plan with FERC | May 27, 2009 |
| Stakeholder comments on revised study plan | June 11, 2009 |
| Commission issues study plan determination | June 26, 2009 |
| Formal study dispute resolution process (if necessary) | July 16, 2009 |
| Begin field studies and literature-based review | March 2010 |
| Study Plan Progress Update Meeting | July 8, 2010 |
| Initial Study Report to FERC | June 23, 2010 |
| Initial Study Report Meeting | 15 days after Initial Study Report Filed |
| Initial Study Report Meeting Summary and Modifications to Study Plan (if necessary) – filed with FERC | |
| Complete Field Studies | November 1010 |
| File Updated Study Plan | June 2011 |
| Hold Updated Study Report Meeting Summary | July 2011 |

## 7. References

Appalachian Power Company. 2008. Pre-Application Document, London / Marmet and Winfield Hydroelectric Projects, filed with the Federal Energy Regulatory Commission, August 2008.

# London Development Tailrace Fishing Access Feasibility

## Proposed Study Plan

**London/Marmet Project**
**FERC Project No. 1175**

**Application for New License**

**March 2009**

## 1. Introduction

Appalachian Power Company (Appalachian) operates the London/Marmet Project, which is licensed by the Federal Energy Regulatory Commission (FERC) as Project No. 1175. The existing license for the London/Marmet Project was issued to Appalachian by FERC on September 23, 1893 and expires on January 31, 2014. Appalachian is applying to FERC for a new license for the Project. The default process for the Project's relicensing is the Integrated Licensing Process (ILP), as defined under the rules and regulations of the FERC (18 CFR Part 5). As part of this licensing process, Appalachian has solicited input from stakeholders including governmental agencies, local governments, non-governmental organizations, and the public to identify potential project-related issues that need to be addressed during the licensing process

On August 14, 2008 Appalachian filed its Pre-Application Document with the FERC. On February 25, 2009, Appalachian held a Study Plan Meeting and participants identified issues associated with public access to the public recreation facilities at the London Development. The following study plan addresses the issues pertaining to the replacement of the London Bridge or the provision of alternative public access.

## 2. Background

The Project is located on the Kanawha River in West Virginia. The London/Marmet Project consists of two developments, the London Development and the Marmet Development. The London Development is located at river mile 82.8 near Handley, West Virginia, in Fayette and Kanawha counties. The Marmet Development is located at river mile 67.7 in Marmet, West Virginia, in Kanawha County.

The London and Marmet developments are each located at U.S. Army Corps of Engineers' (Corps) dams and locks on the Kanawha River. Appalachian retains licenses to operate the hydroelectric facilities at these Corps facilities.

The London Development Project, which has 3 generating units, has an authorized capacity of 14.4 MW based on the limiting capacity of the generators. Average annual generation for the period 2003 through 2007 was 84,048 kWh.

Public recreation facilities within the Project boundary of the London Development consist of a tailrace fishing access. Appalachian leases the site to the West Virginia Department of Natural Resources for public fishing purposes. Historically, the public accessed the facility over a footbridge constructed in 1935 over railroad tracks, which are owned and maintained by the CSX Corporation. Based upon the results of an engineering assessment, Appalachian determined that the bridge had deteriorated to the point where access by the public was discouraged due to safety concerns thus requiring that the bridge access be closed. The recreation site was closed temporarily on February

16, 2009. Appalachian is currently in the process of evaluating various options under its current license for providing access to the London development that can be used by the public to access the tailrace fishing area. These options include but are not limited to replacement of the bridge or providing an at-grade crossing accross the existing railroad tracks. This feasibility study is being developed in the event that it appears that the access issue will not be resolved prior to issuance of the new license.

## 3. Objectives

The objective of this feasibility study is to identify, analyze and compare alternatives for providing public access to the London tailrace fishing access and to identify the preferred means to re-establish access to the London tailrace fishing access. The preferred option should provide public access to the tailrace fishing area, have minimal adverse impacts and intrusion on the environment, and have acceptable capital and maintenance cost implications.

An assessment will be made to identify the feasibility of various options for providing public access to the London tailrace fishing pier. Options will include replacing the bridge or providing an at-grade crossing for the public.

For each option identified, the following activities will be completed:

a. Prepare a site plan showing the tailrace fishing area, the access location, and availability of parking.
b. Conduct an environmental assessment of each access option.
c. Compile a list of required local, state, or federal permits.
d. Identify and describe any additional environmental studies needed for each access option.
e. Document the need for and location of additional property rights (site plan) that would need to be acquired.
f. Develop capital and maintenance estimates associated with each access option
g. Develop a schedule for implementation.
h. Prepare a pros and cons analysis of each access option.

## 4. Relicensing Relevance

The analysis developed from the study will assess the various alternatives for providing public access to the public recreation facilities located at the London Development or for providing alternative access.

## 5. Geographic Scope and Methods

A. Geographic Scope

The geographic scope of the London Public Access Feasibility Study will include the project boundary at the London Development and its current and potential accesses.

B. Methods

Implementation of the London Feasibility Study will include research and documentation of the current situation, land rights and licensing requirements. Efforts to obtain an at-grade crossing from the CSX Corporation will continue in order to determine the feasibility of the alternative. London Bridge replacement plans that have been developed to date will be analyzed. The need for local, state, and federal permitting requirements will be researched and documented. Opportunities and obstacles with implementing each proposal under the current license or the proposed license will be reviewed, analyzed and documented.

## 6. Consultation, Analysis and Reporting of Results

Following the assessment contained within Section 3, a report will be developed outlining the options. Appalachian will consult with WVDNR and other interested stakeholders regarding the report.

The London Public Access Feasibility Study will be completed according to the milestones shown in Table 1.

**Table 1. Schedule for conducting the London Public Access Feasibility Study for the Relicensing of the London/Marmet Project.**

| Activity | Deadline |
|---|---|
| File revised study plan with FERC | May 27, 2009 |
| Stakeholder comments on revised study plan | June 11, 2009 |
| Commission issues study plan determination | June 26, 2009 |
| Formal study dispute resolution process (if necessary) | July 16, 2009 |
| Begin Analysis | August 2009 |
| Initial Study Report to FERC | June 23, 2010 |
| Initial Study Report Meeting | July 8, 2010 |
| File final Study Plan | May 2011 |
| Hold updated study report meeting (as needed) | July 8, 2011 |

A final report will be developed outlining the feasibility assessment of the various access options and the preferred option. The final report will contain documentation of consultation with WVDNR and other interested stakeholders. The final report will include a schedule for implementing the preferred option, drawings and site plan, and the associated costs for inclusion in the London/Marmet Application for New License.

## 7. References

Appalachian Power Company. 2008. Pre-Application Document, London / Marmet and Winfield Hydroelectric Projects, filed with the Federal Energy Regulatory Commission, August 2008.

**APPALACHIAN POWER COMPANY**
**LONDON/MARMET PROJECT NO 1175-013**
**WINFIELD PROJECT NO 1290-011**
**SCHEDULE B**
**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

## Recreation Resources

1. Commission staff requested at the February 25, 2009 Study Plan Meeting that Appalachian describe the capacity (in percent) of the recreation facilities. The final report was not available at the time of January 23, 2009 filing but was included in the Commission Form 80 filed in March of 2009.

2. Commission staff questioned at the February 25, 2009 Study Plan Meeting if public parking would be available at the London Development if an at-grade crossing were obtained from the CSX Corporation. Parking will be addressed in the London Development Tailrace Fishing Access Feasibility Study.

## RTE Resources

3. Commission staff suggested that Appalachian contact the WVDNR to determine if any studies on mussels had been conducted within the reservoir below Marmet. Appalachian contacted the WVDNR regarding unionid mollusc studies in the Kanawha River. The WVDNR has conducted surveys annually from 2005 through 2008. These studies were required of the U.S. Army Corps of Engineers. The unionid mollusc fauna of the Kanawha River appears to be well characterized and no additional studies are being proposed by Appalachian.

## Transmission

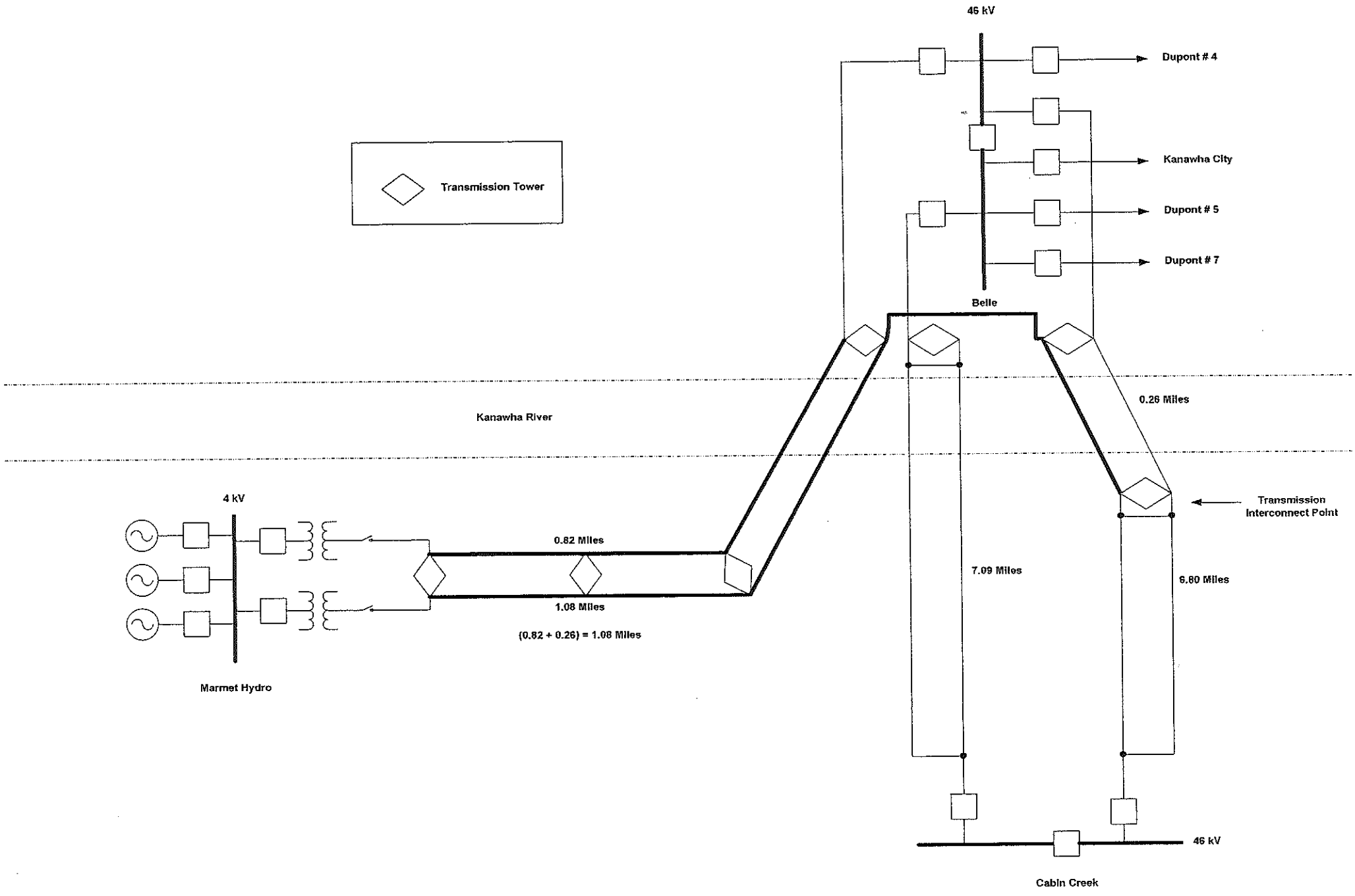
4. Commission staff requested clarification of the one-line diagram of London with regards to the No.2 46kV transmission line. According to the one-line diagram , the No. 2 line is 0.45 mile of which 0.17 mile is copper and 0.28 mile is aluminum conductor steel reinforced.

5. Commission staff noted that Marmet includes a jumper and questioned the length of the line from the generator to the jumper tower. Attached please find a simplified drawing which clarifies the known/available distances. Should this information be insufficient in answering the Commission's questions, Appalachian's Electrical Supervisor is available to meet at the site with

Commission staff to better describe the current scenario and answer any questions.

6. The Commission questioned the possibility of connecting South Buffalo with Teays in order to obtain electricity. The one-line diagram that was filed with the Commission on January 23, 2009 is not a geographical diagram. South Buffalo is a considerable distance away and thus it would not be feasible to tie into the Teays station. The Milton-Barcroft line is the main line and it loops into the Winfield Development. Should the dam cease to operate, the station would still be needed as breakers are located therein and are needed for the protection of that line. Teays, is a distribution substation tapped off the Milton-Barcroft line. A map depicting the geographical location of Winfield, Teays, and the general proximity of South Buffalo is attached.

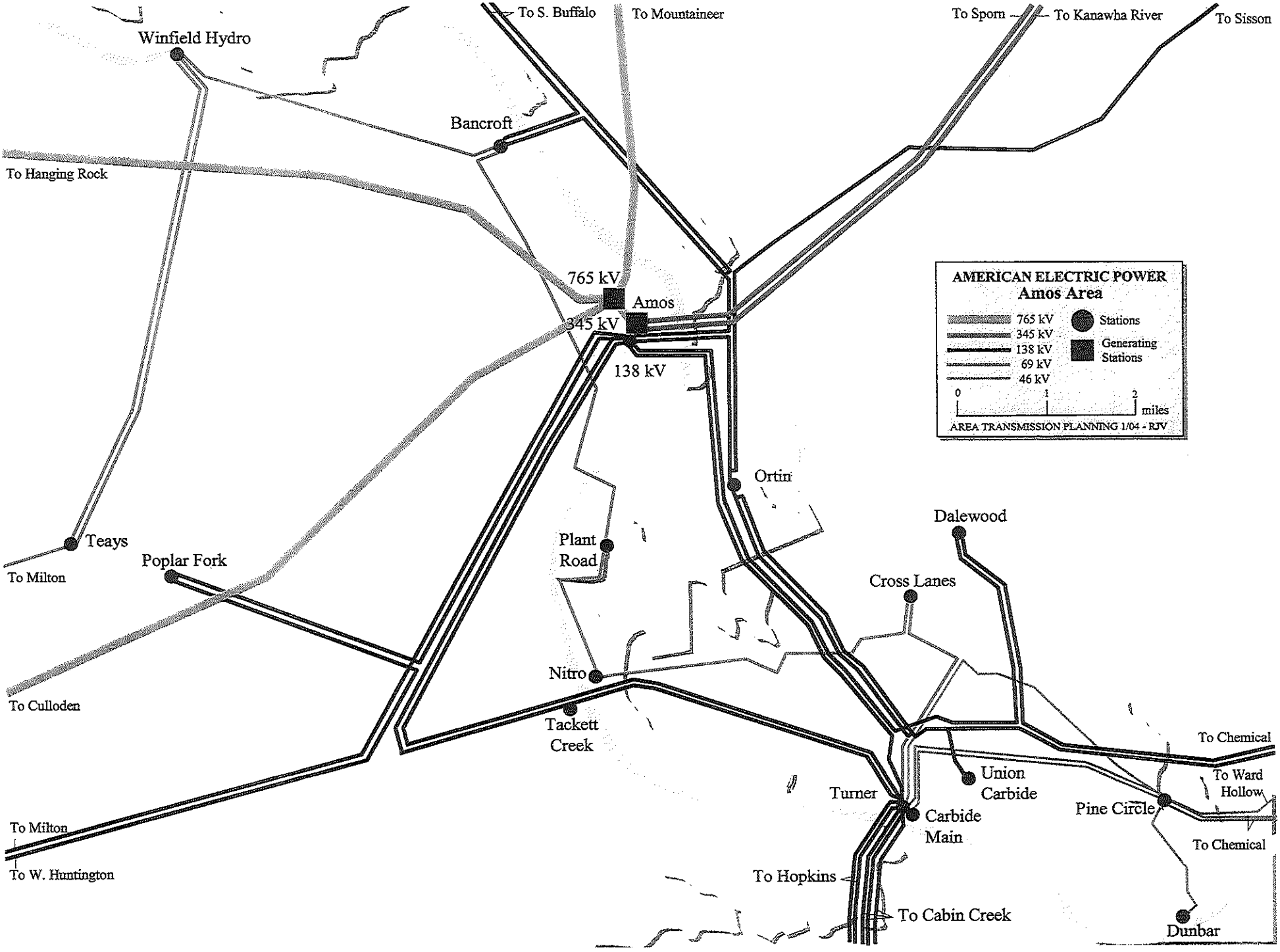
# Marmet
# Simplified Drawing




Simplified Drawing

# Marmet

Map Depicting
Winfield, Teays and South Buffalo
Stations


To S. Buffalo
To Mountaineer
To Sporn
To Kanawha River
To Sisson
Winfield Hydro
Bancroft
To Hanging Rock
765 kV
Amos
345 kV
138 kV
AMERICAN ELECTRIC POWER
Amos Area
765 kV
345 kV
138 kV
69 kV
46 kV
Stations
Generating Stations
0
1
2
miles
AREA TRANSMISSION PLANNING 1/04 - RJV
Ortin
Dalewood
Teays
Poplar Fork
To Milton
Plant Road
Cross Lanes
Nitro
To Culloden
Tackett Creek
To Chemical
Union Carbide
To Ward Hollow
Turner
Carbide Main
Pine Circle
To Chemical
To Milton
To W. Huntington
To Hopkins
To Cabin Creek
Dunbar