Pre-Application Document for Hydropower License Application

Gathright Hydroelectric Project

Hydro Matrix Limited Partnership

Project No. 12737

December 2007

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EXECUTIVE SUMMARY

This Pre Application Document (PAD) commences the first of three steps in the Federal Energy Regulatory Commission's (FERC) process for review of the Hydro Matrix Limited Partnership's (HMP or Applicant) plans for the addition of hydroelectric power at the U.S. Army Corps of Engineers' (Corps) Gathright Dam on the Jackson River in Alleghany County, VA. The main purpose of this document is to advise interested agencies and parties of the features of the existing dam, the proposed plans for adding hydropower to the existing dam, an estimate of potential impacts of the hydroelectric project (Project) and request any plans for studies that are necessary to add critical information about the resources that could be impacted. There will be several opportunities for interested agencies and persons to participate in the licensing process and consult with the Applicant. As further discussed below in the section entitled Application Process Plan and Schedule, reviewers may participate in an upcoming public meeting and site visit to discuss the Applicant's proposal and the PAD. Interested parties may submit written comments suggesting studies that they believe are necessary to determine the potential effects of the Project on resources.

Applicant proposes to install a single turbine and generator in a vertical steel structure (module or power module) attached to the upstream face of the existing intake tower in Lake Moomaw adjacent to the dam. There will be no powerhouse. See Figures in Exhibit F. The module will house 1 turbine with an installed capacity of 3.7 megawatts (MW) and hydraulic capacity of 350 cubic feet per second (cfs). The Applicant plans to build the most economical plant to be competitive in the power market.

The Applicant does not propose to do any studies and is not aware of any studies that should be conducted to provide critical information to determine the potential impacts, which should be determined before licensing. There is sufficient information on water quality and the fishery in the lake and downstream in the Jackson River. Although some fish mortality will probably occur during project operation from fish passing through the turbine, the planned trash racks and depth of the intake should minimize fish entrainment and mortality and prevent this being a serious enough problem to require further studies or mitigative actions to reduce mortality of fish. This issue is discussed in more detail below.

Should reviewers disagree with the applicant and believe that certain studies should be conducted before licensing to assess potential environmental impacts, they should provide that information to the applicant as indicated below.

With the discussion of each potential resource impact in the following document is a statement about planned protection, mitigation and enhancement (PM&E) measures that are part of the Project design, will be added to benefit a particular resource or avoid an impact. The planned studies and mitigation actions are explained in detail in the text and summarized in the section titled Preliminary Impacts and Studies.

The Applicant looks forward to working with interested agencies and persons throughout the licensing process. Should any agency or interested person believe other or different studies are necessary for evaluating potential Project effects before licensing, please discuss such studies in detail in written comments and at the planned public and agency meeting. Any such recommendations will be considered and responded to by the applicant. They will be forwarded to the FERC with the applicant's response for its evaluation of necessary action.

APPLICATION PROCESS PLAN AND SCHEDULE

Accompanying this PAD are the following materials:

1) Notice of Intent to File Application for License;

2) Request for Use of Traditional Licensing Process (TLP);

3) Request for Waiver of Certain Deadlines in the Commission Regulations;

4) Request for Applicant's Designation as the Commission's non-Federal Representative for Purposes of Consultation under Section 7 of the Endangered Species Act; and

5) Request to initiate consultation under Section 106 of the National Historic Preservation Act.

As reflected in the Request for Use of Traditional Licensing Process (TLP Request) and Request for Waiver of Commission Regulations (Waiver Request), the Applicant believes that the simplicity of this Project suggests that TLP will be a more practical process, given a previous license and no complicated issues. Consistent with the Commission's new regulations which provide that the Integrated Licensing Process will be the default process, Applicant is requesting the Commission's approval to use the Traditional Licensing Process, set forth in 18 C.F.R. Part 4, to prepare a license application for this Project. As noted in the TLP Request, interested agencies and persons may comment on this request to use TLP and waive certain regulations to FERC by January 25, 2008.

The Waiver Request seeks Commission approval to modify several TLP review deadlines to allow shorter review periods than in the Commission's regulations because of the simplicity of the project, also the applicant has discussed the project installation plan with key agencies and has not uncovered any issues that appear problematical. The agencies and other reviewers will initially have 90 days to review the PAD including 30 days after the public meeting and site visit. The applicant does not expect any study requests and believes the 30 days allowed for comments on the draft application is sufficient, because it should be quite similar to the PAD, which has a long review period. The Applicant requests the following schedule for the process leading up to filing the final application, as discussed in further detail below.

Pre-Filing Schedule[1]

Entity	Action	Deadline
HMP	File NOI, PAD, TLP Request and Waiver Request	December 26, 2007
Stakeholders	Comment on HMP's TLP Request and Waiver Request	January 25, 2008
FERC	Action on TLP Request and Waiver Request	Dec. 26, 2007 – Feb. 11, 2008
HMP, Stakeholders	Joint Meeting and Site Visit	February 25, 2008
Stakeholders	Comments on HMP's proposal and PAD	March 26, 2008
HMP, Stakeholders	Resolve any study disputes	None expected
HMP	Circulate Draft License Application for Stakeholder Comment	April 10, 2008
Agencies, Tribes	Notify HMP of any Disagreement Regarding Protection, Mitigation and Enhancement Measures	April 25, 2008
HMP, Agencies, Tribes	Hold Meeting, if Necessary, to Resolve Disputes Regarding PM&Es	April 15 – 30, 2008
Stakeholders	Comment on Draft License Application and Study Results	May 10, 2008
HMP	File License Application	May 26, 2008

This PAD is intended to inform the resource agencies and other interested parties of the background information on the existing Project area, describe the planned hydropower installation and its operation, discuss potential impacts of the planned Project and describe any studies that are planned to allow further evaluation of potential impacts.

A public meeting ("Joint Meeting") for agencies, tribes and interested members of the public will be held on February 25, 2008 in Covington, VA about 19 miles from the dam. A public notice will be published in a local newspaper, the Virginian Review. A site visit will be held at Gathright Dam earlier on the same day. If sufficient interest is expressed, the Applicant will hold a second meeting in Richmond to accommodate state agencies and interested persons

[1] As discussed above, the due dates set forth in this table and discussed below are subject to Commission approval as requested in Applicant's Waiver Request.

for which that location is more convenient. The Joint Meeting will include a presentation describing the planned Project with an opportunity for interested stakeholders to ask questions or discuss studies. A summary of the meeting will be prepared and filed with FERC along with a tape of the stated comments for the record. The purpose of the site visit will be to describe the planned installation while identifying key locations relative to the dam facilities and answer any questions about site construction.

After the Joint Meeting, agencies and any other interested parties that wish to make comments should do so within 30 days or by March 26, 2008. As set forth in FERC's regulations, 18 C.F.R. § 4.38(b)(5), each interested resource agency and Indian tribe that proposes additional studies must provide the Applicant with written comments:

(i) Identifying its determination of necessary studies to be performed or the information to be provided by the potential applicant;

(ii) Identifying the basis for its determination;

(iii) Discussing its understanding of the resource issues and its goals and objectives for these resources;

(iv) Explaining why each study methodology recommended by it is more appropriate than any other available methodology alternatives, including those identified by the potential applicant pursuant to paragraph (b)(2)(vii) of this section;

(v) Documenting that the use of each study methodology recommended by it is a generally accepted practice; and

(vi) Explaining how the studies and information requested will be useful to the agency, Indian tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project.

After reviewing comments, the Applicant will prepare a draft license application, which will have a more detailed and possibly revised discussion of the planned Project, its operation and potential impacts. The draft application will also discuss any studies that the Applicant plans to determine the extent of certain impacts and include Applicant's response to any written comments received, as well as copies of the comments. As noted above, Applicant does not propose to conduct any studies prior to filing a final license application. The draft application is expected to be circulated about 2 weeks after the deadline for comments on the PAD or about April 10, 2008.

Interested agencies and stakeholders will then have the opportunity to provide additional written comments on the draft application within 30 days by May 10, 2008. If an agency or tribe has a substantive disagreement with the Applicant's conclusions regarding resource impacts or proposed protection, mitigation and enhancement measures, the agency or tribe should notify the Applicant of the nature of the disagreement within 15 days after the draft application is sent. If, after contacting the agency or tribe, a meeting is necessary, Applicant will convene a meeting with the agency or tribe to resolve any such disagreement consistent with FERC's regulations, 18 C.F.R. § 4. With this schedule and prompt action, the result of

the meeting can be reflected in the agencies' or tribes' comments on the draft license application.

Applicant plans to file a final license application with FERC about 15 days after receipt of comments on the draft license application. The application will include the comments of all interested parties and any additional PM&E's or studies suggested by parties with the Applicant's response.

FERC will review the filed license application and determine if it is adequate or whether additional information is needed before accepting the application. Once FERC accepts the application, it will issue public notice, identifying the dates for further comments, intervention and protests. FERC will direct the applicant to file a final application with any additional information to interested parties. Following receipt of such comments FERC will complete its environmental and engineering analysis of the proposal and alternatives, including preparation of an Environmental Assessment (EA) under the National Environmental Policy Act. Prior to preparation of the EA, FERC will issue a further public notice soliciting final comments, recommendations, terms and conditions, and prescriptions. FERC will then review the record and decide whether, and on what conditions, to issue a license for the Project. Review of the filed license application by FERC staff will probably take a year.

APPLICANT CONTACT INFORMATION

The exact name, business address and telephone number of the Applicant is:

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Gatlinburg, TN 37738
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The applicant will seek to use the benefits of Section 210 of the Public Utility Regulatory Policy Act of 1978 to the extent that it assists power sale and is available.

PROJECT LOCATION, FACILITIES AND OPERATIONS

This proposed Project would install one turbine and generator unit at the Gathright Dam with a capacity of 3.7 MW and maximum hydraulic capacity of 350 cfs. The environmental impacts of the Project will be typical for adding conventional hydropower at an existing flood control dam. However, the installation of a module (explained below) will avoid any excavation and keep flow in the channel presently used for dam releases into the Jackson River. The hydroelectric turbine will be operated with flows normally released by the Corps of Engineers; this is called run-of-river operation. The operating range is from 150 to 350 cfs at pool elevations. There is one proposed exception to current operation. During the winter and late spring, the applicant proposes that flood releases be reduced to 350 cfs when the stored flood has decreased to 2 feet above the target pool elevation (1582 ft. MSL). See the discussion of proposed operation below.

Description of Existing Facilities

The location and facilities of the existing dam are shown in the drawings labeled Exhibit G, as well as in some figures. Gathright Dam is about 19 miles upstream of Covington, VA, and about 43 miles above the mouth of the Jackson River; it is located near Falling Springs, VA. Gathright Dam is the only flood control dam for the Jackson and James Rivers.

The existing Gathright Dam is owned and operated by the Army Corps of Engineers and was constructed for the purposes of flood control, water quality control, fish and wildlife and recreation. The Gathright Project was authorized by Congress in 1946 and construction of the existing dam began in 1965. The Dam was completed in 1979 and the reservoir reached pool in April 1982. Hydroelectric generating facilities have never existed at the site.

Gathright Dam is a rolled rock-filled embankment structure with an impervious core. The dam is 257.0 feet high above the riverbed, 1,172 feet long and 32 feet wide at the crest. The top of the dam is at El. 1684.5 feet.

The emergency spillway is located 2.4 miles south of the dam. It is an ungated and unpaved trapezoidal channel 2,680 feet long and 100 feet wide at crest level, El. 1668.5 feet MSL (all elevations referenced apply to feet above Mean Sea Level). The capacity of the spillway is 6,100 cfs at El. 1679.5 ft. MSL (reservoir elevation during the Probable Maximum Flood).

The total storage in Gathright Reservoir below the spillway design flood pool at El. 1679.5 is 477,800 acre-feet. The allocation of this storage is given in the following table.

Gathright Reservoir Storage Allocation

Pool	Elevations	Acre-Feet	Acres
Surcharge Pool	1610.0 - l679.5	274,200	4,880
Flood Control	1582.0 - 1610.0	79,900	3,160
Conservation Storage	1554.0 - l582.0	60,700	2,530
Inactive Storage	1430.5 - 1554.0	63,000	1,780

The outlet works accomplishes most flood control and water quality regulation. The outlet works consist of an intake tower, an outlet tunnel, a stilling basin and an outlet channel. The 212-foot high intake tower with multi-level gates and twin wet wells allows release of reservoir storage from several elevations of the lake for water quality control purposes. Ten multilevel water quality gates are at elevations ranging from 1494.5 to 1570 feet MSL. The maximum release through the wet well is 1200 cfs; flow is controlled by two gates.

Larger flows are released through the two passageways at the bottom of the intake tower. Flow for flood release through each of the passageways is controlled by two 8-foot by 17.5-foot high hydraulically-operated gates; the sill upstream of these gates is at elevation 1430 feet MSL. Each passageway entrance has an emergency gate for blocking flow from the

conduit intake and a service gate located downstream from the emergency gate for regulating releases. During flood releases through the passageway the emergency gate is fully raised. A 106-foot long, steel-lined transition section affects a gradual change in shape between twin rectangular conduits emerging from the intake tower and the circular outlet tunnel. The 1,075-foot long, 17.5-foot diameter, concrete-lined outlet tunnel is located in the right abutment and discharges into the 321-foot long, 60-foot wide stilling basin. An outlet channel routes the water emerging from the stilling basin into the natural river channel. The total capacity of the outlet works is 17,600 cfs with the reservoir at the top of the conservation pool (El. 1582), and 15,800 cfs with the reservoir at the bottom of the conservation pool (El. 1554).

Description of Proposed Facilities and Equipment

To provide the most cost-effective installation of hydroelectric power at Gathright Dam, the turbine and generator will be installed in a vertical steel structure (module) attached to the upstream face of the intake tower in the stoplog slot or on the tower face upstream. See Exhibit F. The maximum capacity will be 3.7 MW (megawatts). The generator will be directly-connected to a vertical Francis turbine. Electrical power will be transferred from the generator through switchgear and protective relays to a transformer for step-up to 46 kV (kilovolts).

No construction beside the dam or the intake tower is required for installation or removal of a module with its turbine, although minor modifications to the intake tower structure should be necessary to allow the module to move vertically. The modifications include the installation of a redundant permanent hoist at the top of the tower, probably at El. 1615 ft., for lifting the module, a control building to be constructed on the existing intake tower or located within the tower, and the installation of transformer and switchgear equipment at a small substation on the adjacent dam. Minor modification of one stop log passage or on one side of the upstream face in the intake tower will be necessary to control vertical movement of the module. A 46 kV transmission line will deliver the generation to the utility interconnection.

No powerhouse will be built and no modification will be made to the existing structure of the dam. There will be no modifications to the conduit or outlet. The module serves as the intake channel to the turbine and the existing passageway serves at the tailrace. The module will also serve as a stoplog for the passageway it covers.

Approval of the Corps of Engineers will be required for all modifications to the Intake Tower and other dam structures.

Number, type, and rated capacity of turbine and generator

The facility will have one turbine connected to a generator by a vertical shaft. The generator will be rated at about 3800 kW and will be connected to a Francis turbine. The total capacity of the plant is 3.7 MW. Power will be transferred from the generator through both fixed and flexible cables to the top of the intake tower and then by a fixed conduit to the substation located beside the service bridge near the top of the dam, as shown in Exhibit G-1. At the substation, the voltage will be stepped up from 4,170 volts to 46 kV.

The module will consist of a fabricated steel frame, which is comprised of several sections that are bolted together after they are lifted into place for installation. A hoist system will be installed on the top of the intake tower (El. 1615) to raise and lower the module during installation and operation. The hoist installation will have to avoid interference with entrance into the wet wells from El. 1615 ft. MSL. The lower sections of the frame of the module will be covered with plate steel to form the channel carrying water from the desired lake elevation to the turbine as well as forming the support structure around the draft tube below the turbine. The bottom of the module rests on the existing sill of one of the two intake passageways at 1430 feet MSL. See drawings in Exhibit F.

A slide gate, called a spill gate, will probably be built into the downstream side of the module above the turbine to pass water into the existing conduit, bypassing the turbine. The purpose of the spill gate is to allow releases up to 350 cfs, without removing the generating modules or using the water quality gates in the intake tower. This spill gate may not be necessary if the water quality gates can be opened within a short period of time when the turbine shuts down unexpectedly. The purpose of this gate would be to continue flow into the river when the turbine shuts down temporarily because of a load rejection or equipment malfunction. Such shutdowns are infrequent, and load rejections are usually brief. Below the spill gate is the draft tube outlet into the intake tower passageway.

Above the section of the module that is covered with steel plate, which extends to about 1542 feet MSL, the framework is uncovered. Above this elevation, a cylinder gate moves vertically and changes position to allow water to be withdrawn from the reservoir between elevations 1542 and 1570 ft. MSL to meet water quality objectives.

The cylinder gate is a simple tube, open at both ends, that is not attached to the fixed section of the module but moves vertically within the fixed section. A trash rack rests on the top of the cylinder gate; the rack is around and above the top of the cylinder gate. Water that has passed through the intake rack enters the intake channel of the module at the top of the cylinder gate, passing down into the fixed section of the module and through the turbine.

The cylinder gate duplicates the withdrawal of water from the lake that is presently withdrawn from the uppermost part of the lake (elevations 1542 to 1570 ft. MSL). The framework above the fixed section extends to about elevation 1585 ft. MSL and is attached by cable to the hoist frame and hoist motor for lifting and lowering. The dimensions of the module, including the open framework section, are about 7’ wide by 7’ deep by 155 feet high.

The turbine will be attached to a mounting plate above the inlet of the draft tube; the centerline of the runner will be about 10 feet above the bottom of the module at elevation 1440 ft. MSL. A short steel shaft will be bolted to the output flange of the turbine runner and will transfer mechanical (rotational) power to the generator. The generator will be a vertical, synchronous type with solid-state excitation and utility-grade protective equipment. Water-cooled elements will keep the generator from overheating. The generator should transfer enough heat to the water to raise its temperature.

Flow though the turbine will be controlled by the turbine's wicket gates from idle to full output (350 cfs). The wicket gates are nearly flat panels, surrounding the turbine, and are hydraulically efficient to allow water to act directly on the turbine runner. Operation is discussed in more detail below.

The power, monitoring and control cables will pass from the module to the top of the intake tower via a folding cableway, which will not move the cable out of the way during the lifting of the module. The cables will be attached to the structure of the module from the turbine to its top at elevation 1585 ft. MSL; above that level they will be flexible to move as the module is raised or lowered. All control and monitoring cables will be routed to a control room in or on the intake tower. Figure 18 shows a single line diagram for the electrical system.

Turbine and Generator Data

Turbine

Runner diameter (in)	45
Rated head (ft)	140
Design Flow (cfs)	350
Operating speed (rpm)	400
Output at 1582' pool elevation (kW)	3900
Coupling to Generator	Direct

Generator

Generator Type	synchronous
Rated Capacity (kW)	3700
Power factor	< 0.90
Phase/voltage/frequency	3/4160/60
Generator efficiency	98%

Control Space

The generator will be switched at the generator voltage of 4160 volts by means of a circuit breaker located inside the control space. It is proposed to use the generator breaker for switching functions, synchronization and isolation of the generator under short circuit conditions; this breaker will have an adequate interruption rating. A cutout type fuse will also be installed to provide a backup protection against excessive current. The normal power supply for station services will be tapped from the common 4160 volt bus through a fused disconnect switch and a 4160 to 208/120 volt three phase transformer.

Part of the control space may be inside the intake tower, subject to the District's approval, or it may be an outdoor building on top of the intake tower. The applicant prefers to install the control cabinet and breaker switchgear near a control computer inside the intake tower with the Corps' permission. Some control equipment may be designed for outdoor service and placed in the switchyard beside the service bridge. This space (building) will also serve as the site office. Traffic across the dam will not be blocked.

The units will be designed for local automatic/manual starting and stopping either from the control cabinets or from a fixed or remote computer. Water level control in the lake and flow passage through the turbines will be determined by the Corps. The plant will be controlled for either pond level or flow control. The plant will be capable of remote control for shutdown and flow change in one or more units. The plant can run manually or automatically in level control or flow control modes. Wicket gate openings will be varied to pass the desired flow using either control criteria.

The intake tower was designed with stop log slots in front of the emergency gates so that the passageway area could be dewatered for maintenance. It is in these stop log slots that the proposed turbine generator modules will probably be installed or near them on the upstream face of the tower. If the module is placed on the face of the intake tower, a seal will have to be large enough to span the space between the lowered module and the opening of the passageway. Possibly a framework will be lowered to the bottom of the stoplog slot to provide a sealing surface for the seal with the module to prevent water flow around the module and into the passageway. This design will have to be coordinated with the Corps after licensing.

The platform at elevation 1500 ft. MSL above the existing intake rack will be cut to allow the module to be lowered through that platform to the invert of the tunnel intake at elevation 1430 feet MSL. This cutting of a 7' x 7' opening in the platform will be done underwater. It could be done without shutting off flow in the unused gate, but for safety the water quality gates away from the cutting should be used for release when cutting. Cutting should be done in cool weather, when water quality releases are not an issue.

A hoist mechanism will be installed on the platform at elevation 1615 ft. MSL. This hoist will have controls for the moveable tube and be able to lift the module when a large flood release (> 2600 cfs) is necessary. The module will be lifted above the flow path for a release through both of the passageways. The unblocked passageway can be used while the module is lowered for generation. This lifting will only occur a few times a year (< 2% of the time). See Project Equipment description above.

Trash Rack

The trash rack will be designed to have a space between bars of less than 2.5 inches. The final opening size will be coordinated with VA DGIF. The trash rack will be supported by a framework built on top of the cylinder gate. It will rise a few feet above the top of the cylinder gate. The size of the trash rack will limit the velocity in front of the rack to 2 feet per second at maximum flow (350 cfs). This low velocity is used to avoid entrainment or impingement of larger fish on the rack bars on top of the cylinder gate. Another trash rack with 2.5" bar spacing will be placed in front of the gate(s) in the module at elevation 1494.5 ft. MSL.

Passageway in Intake Tower

Water that is discharged from a module will enter the existing conduit or passageway and pass into the dam tunnel. This long tunnel is 17.5 feet in diameter and passes water

through the dam to the discharge chute and stilling basin, which is located on the downstream side of the dam at the tunnel exit. This conduit will require no modifications.

The water exits the stilling basin and enters the river. This discharge chute will require no modifications. No cofferdam will be required

No civil works will be required for the project except for a transformer substation, possibly a control building and a transmission line. The control building will be installed either on top of the intake tower or near the service bridge on top of the dam abutment.

Transmission Line

A new transmission line will be built from the substation to the existing line crossing the road to the gaging station downstream of the dam. The applicant prefers this to be an overhead line. If required by the Corps, it will be built underground. From the substation the new line will pass north of the administration building and beside the maintenance area then down the hill to the road to the tailwater area. Down the hill from the maintenance area, the new line will overbuild the existing poles of BARC Cooperative to reach a substation on the southeast side of Highway 687 just inside Bath County. The overbuilt line will pass over the road to the tailrace, then some private property and then cross the Jackson River.

The private property owner may have BARC bury the existing line on their property, which is being developed. If this occurs, the applicant will bury its line on the private property beside the buried BARC line. If the Corps requires the applicant to bury its line near the administration building, the new line may be buried all the way to the river. It must be on poles to cross the river. After crossing the river, the line will continue to overbuild BARC's existing line up the hill to the other side of Highway 687, where it connects with an existing 46-kV line of BARC. The three-phase line placed on top of the poles will be 46 kV; probably new poles will need to be installed for proper height of the line above the ground. A disconnect acceptable to BARC will be installed where the new line interconnects with BARC's existing line.

New Substation

The power generated at 4160 volts in the generator will be stepped up to 46,000 volts by an outside, pad-mount transformer on the dam near the service bridge support. The location will be determined in consultation with the Corps of Engineers. There will be a fence enclosure around the transformer substation for security and safety. The support for the substation will be a pad placed near the service bridge support. The substation will also include a breaker, visible disconnects and meters.

Lands of the United States

Most land within the project boundary is owned by the United States and managed by the U.S. Army Corps of Engineers, Norfolk District, North Atlantic Division. The U. S. Forest Service manages the adjacent George Washington and Jefferson National Forests and the

public recreation facilities. The project boundary is shown approximately in Exhibit G; this is an unsurveyed estimate of the generating structure, switchyard and transmission line.

The applicant certifies that we will provide exact measurements of the project boundary as constructed within six months of completing construction. The project transmission line corridor will occupy 18 acres; the project area around and beside the existing dam and outlet works will occupy about two acres. The total project area will be 7 acres on federal property. No project land will occupy or contact land that is part of the George Washington National Forest.

There exist sufficient roads to all places needed for the construction and maintenance of this project. No roads will need to be built or modified. The licensee will repair any damage to roads caused by construction.

Project Boundary

The rectangular portion of the Project boundary will enclose the new generating area at the intake tower beside the dam, as shown in Exhibit G-1. This rectangular boundary will encompass part of the dam where the powerhouse will be placed and include a control building, substation and storage area. The location of the storage area will be determined by the Norfolk District.

The linear Project boundary along the transmission line route will be as shown in Exhibit G-2. The transmission line of 46-kV voltage will begin at a dead-end structure in the substation. The route is described in the Transmission Line paragraph above. The interconnection location is an existing 46 kV substation of BARC Cooperative, which is about 2 miles southeast of the dam. The new line will overbuild an existing BARC line except for the first half mile of its route.

Proposed Project Operation

The Project will operate in the run-of-river mode except for the proposed reduced flood release during the winter and late spring, as explained below. This means that the Project will not change the releases from the dam made presently by the Corps of Engineers except for the reduced flood release. The only flow used for generation will be flow normally passed through the dam by the Corps of Engineers. Project operations are designed to avoid significant adverse effects on water quality, upstream flooding or minimum flow passed into the river below the dam. The Corps of Engineers will determine the flow it desires to release or the pool level it wishes to maintain. It will advise the power plant operator, who will make the necessary adjustments in turbine flow to comply with the Corps' instructions.

In addition to maintaining the same flow as presently, the hydro project will withdraw water from the lake at the same elevation as is done presently. This will maintain the temperature and oxygen (DO) criteria required for Trout Waters in VA, as is done presently. Present operation controls temperature by withdrawing water from a gate near the lake surface and

from one or two gates at elevation 1494.5 ft. MSL. The hydro project will duplicate this dual level withdrawal when directed to do so by the District.

The upper withdrawal will be accomplished by having a variable height tube, called a cylinder gate, which can be lifted above the top of the enclosed section of the module, as described in the previous section on new equipment. The cylinder gate will take water in through its open top, which can be positioned at any elevation between 1542 feet MSL, the top of the enclosed module section, and 1570 feet MSL. The bottom of the cylinder gate will be open to pass the water from near the surface into the enclosed section of the module and into the turbine. This withdrawal level varies to duplicate the withdrawal that presently occurs through the six water quality gates between elevations 1570 and 1540 feet MSL in the intake tower, gates 1 through 3 on both sides of the intake tower.

There will also be one or two gates in the enclosed section of the module at elevation 1494.5 ft. MSL to match the lower level withdrawal by the intake tower. The upper and lower withdrawal can be simultaneous in the module as it is in the intake tower. The size of the opening at elevation 1494.5 ft. MSL must sized to take the same proportion of cold to warm water that present operation does. With these features the module can duplicate the operation of the intake tower for water quality.

To avoid cavitation in the turbine it will probably be necessary to lower the service gate to an opening of a few feet during generation. This will cause the water surface to be several feet above the tunnel invert in the space between the module and the service gate. The water surface will be raised to be at the elevation of the turbine runner centerline or a few feet higher. This will cause a water depth of about 10 feet in the passageway. The applicant asks the Corps for permission to operate the service gate in this way.

It is not planned to have withdrawal from the lake by the module at elevations 1510 and 1525 feet MSL, as the intake tower does. These ports in the tower are seldom used for water quality releases and do not seem to be necessary in the module.

There are three flow regimes of operation of the turbines. At less than 350 cfs of dam release, all river flow will pass through the turbine. This condition occurs about 72% of the time. When the river flow is greater than 350 cfs, there will be more river flow than the turbines can pass. This excess flow greater than 350 cfs will be released through the 8 water quality gates in the intake tower that are not blocked by the module until the river release is 1550 cfs (1200 through water quality ports + 350 through turbine). The two water quality gates in the intake tower that are blocked will be one at elevation 1494.5 ft. MSL and one at either 1540 or 1546 feet MSL, depending on which side of the tower the module is located. When river flow is greater than 1550 cfs, the Corps will probably use the unblocked service gate to bypass the power plant. This bypass operation or second flow regime will occur about 26% of the time; it will occur when the dam release is between 350 and 2600 cfs. The third regime occurs when the dam release is greater than 2600 cfs; this is about 2% of the time. The module will be raised. There will be no flow passed through the turbine during this period; all flow will be passed through the dam, as it is presently. See Figure 1.

Proposed Reduced Flood Release in Winter and Spring

The operating plan for the hydro plant will avoid any change in flow release (run-of-river operation) except during the latter part of flood release in the winter and spring. The applicant proposes that the hydro plant be allowed to reduce the flow rate of a flood release during the winter and late spring (Nov. 1 – June 15) when the decreasing lake level is within 2 feet of the target level of 1582 feet. We propose that the reduced release begins at 3 feet above target (1585 feet MSL) in the month of March. This is a temporary allowance and not a permanent or required change in the procedure of flood releases, so it should not require a change in the regulation plan by the Corps. For any stored flood for which the Corps believes it should not reduce the flood release rate as requested, it will make the flood release as is presently done. If the Corps decides they need to make a larger release than 350 cfs when the lake level is between 1584 and 1582 feet MSL, they would cancel the reduced flood release and make a larger release to avoid problems in other aspects of lake operation.

As an example, assume the lake stores a flood and rises 10 feet. The Corps would make the same release as they do presently until the lake level had dropped to 1584 feet MSL or 2 feet (3 in March) above the target pool level. Then they would release 350 cfs, the maximum generating flow, until the pool reached 1582 feet MSL; following that slower flood release, normal operation would continue to maintain the target pool level and other reservoir purposes. This is a not a permanent change in dam operation.

For this proposal, during Nov. 1 through June 15, a flood release that might take 2 days now would take 5 or 6 days with the reduced flood release for minimal inflow. During this longer time, the pool would be slowly lowering from elev. 1584 to 1582 feet MSL, instead of doing so quickly for a larger flood release. The early part of a flood release from the dam release would be from 2000 to 8000 cfs or perhaps a few hundred cfs. As the pool lowered below 1584 ft. MSL, the dam release would be reduced to 350 cfs until the level of 1582 ft. MSL was reached. Then normal operation would resume.

During the rest of the year (June through October) and in winter and spring when no flood release is being made, there would be no change in pool level or release from present operation; this is called run-of-river operation. We do not believe any recreation facilities will be impacted by a slower release of a flood, as proposed. This is discussed in the recreation section below. Appendix D shows how close the campsites are to elevation 1584 feet, so the impact can be observed. However, there is not a permanent change proposed to raise the pool to elevation 1584.

Because this reduced flood release is a deviation from the present operation of Gathright Dam, the applicant suggests that a committee of interested parties annually review the effect of this proposed operation and consider necessary changes so it will avoid adversely impacting other uses of the dam. As requested by the agencies, the applicant will numerically simulate this operation with actual pool and flow data so they can observe the effect; this will be done before the public meeting. This operation does not affect flood storage capability of the facility in a significant way.

The applicant proposes this reduced flood release to increase renewable generation but not adversely impact other project purposes, such as recreation use or flood release. If we have to adjust our proposal, we will work with the agencies to do so. We estimate this change could increase our renewable generation by 10 to 20%.

Presently, there is not a fixed release rate for a stored flood by the Corps. The release rate is determined by the Norfolk District each time a flood is stored. They choose a release rate based on the flooding condition downstream of the dam and on inflow to the reservoir and forecast rainfall. Sometimes the release rate of a flood would be similar to 350 cfs, but certainly not all the time.

The Hydroelectric project will be capable of running unattended and will operate semi automatically. An operator will live nearby and when not at the plant the operator will be on call. Surveillance by the operator will ensure proper functioning of equipment and trash removal. A second operator will be available to assist when needed.

Control of Dam Release

The District will continue to determine the flow to be released at any time from the dam and advise the licensee's operator, who will adjust turbine flow to make that release. The emergency gate downstream of the module will be fully open to allow maximum release through the turbine. The service gate will be partially opened as proposed above to create a tailwater downstream of the turbine. All releases through the emergency, service and water quality gates would be made by the Corps' operating personnel. An operating plan will be negotiated with the Norfolk District to define operating responsibilities of the parties.

When flow through the turbine needs to be reduced or stopped quickly as in a load rejection, a small spill gate on the back side of the intake channel will open automatically into the conduit so to maintain the flow of surface water. This gate will not be necessary if a water quality gate can be opened promptly. This issue will be resolved with the Corps when the operating plan is concluded.

A module will not generate when it is lifted. This will occur only 2% of the time. It should take less than 90 minutes to lift the bottom of each generation module from elevation 1430 feet to elevation 1460 feet MSL or higher if necessary to allow flood passage. The module will move independently using its two redundant hoists. Each hoist will be driven by an electric motor. A backup generator will be used to provide hoist power during an electrical outage.

After the hydro project is in operation, the Corps will not control the dam release below 350 cfs with the water quality gates as they currently do. They will close all the water quality gates and fully open the emergency gate downstream of the module for releases less than 350 cfs; the service gate will be open a few feet to cause about 10 feet of water depth in the passageway. Water will then pass through the project trash rack, into the cylinder gate above the module, down the vertical enclosed channel of the module and into the turbine. After the water has passed through the turbine, it enters the draft tube and is discharged into

the existing passageway just downstream of the stop log slots. The water then passes into the existing conduit then though the open emergency and service gates and continues through the tunnel to the stilling basin. At this point, the water enters the Jackson River downstream of the dam at the same location as it currently does.

Dependable Capacity and Average Annual Energy Production

The average annual energy production for the proposed project is 17,500,000 kWh. The annual plant factor is estimated to be 62%. There is no dependable capacity; the operation will be run-of-river. Figure 1 shows the relation between flow and power, when the hydro plant is operating. It also shows how flow would be used for generation in the three regimes of flow mentioned above and flow duration. Figure 2 shows the monthly energy for the plant. Figure 3 shows capacity versus energy for various amounts of installed capacity. Figure 8 shows the flow duration and flow frequency for the period 1982 through 2006.

Emergency and Normal Operation

As will be required in the license, an operating plan will be arranged with the Corps of Engineers to ensure that operation of the existing dam is not altered in any unacceptable way. This plan will include emergency operating procedures. We will work with Corps' personnel in developing a comprehensive emergency operation plan.

The power plant will be operated separately from the dam gates, using the flow allowed by the Corps; there will be no interference between power operation and dam operation. The Corps will remain in control of the release from the dam.

EXISTING ENVIRONMENTAL INFORMATION AND POTENTIAL RESOURCE IMPACTS

Description of the Locale

The proposed Gathright Project would be located on the Jackson River in Alleghany County in the Commonwealth of Virginia. Lake Moomaw is the second largest impoundment in western Virginia. It covers 2,530 surface acres and has a maximum depth of 152 feet at normal pool of 1582 feet MSL. The impoundment is usually "drawn down" between 10 - 28 feet annually, beginning slowly in June and reaching its lowest level usually by September. There are 43 miles of undeveloped, wooded shoreline. The upstream portion of the lake is bounded on both banks by the Gathright Wildlife Management Area owned by VA Department of Game and Inland Fisheries (DGIF) and the George Washington National Forest (US FS).

The reservoir lies in an area of varying topography, ranging from agricultural lands to rugged undeveloped mountains. The mountains in the vicinity of the Gathright project vary in height from 1,000 to 3,600 feet above the valley floor.

In the immediate project area, about 90 percent of the land is forest; 10 percent is cropland and pasture. About 5,400 of the 18,392-acre T. M. Gathright State Wildlife Management Area are in the Gathright Dam area. This area was a private wildlife preserve for many years. It was purchased in 1958 by the State of Virginia to provide public hunting and for its unique potential as a wild turkey production area

The Jackson River bottoms in the project area are the only open spaces among the forested ridges and hillsides. The present agricultural practices in these open spaces include some cropland beneficial to wildlife and to tree planting for wildlife cover in the Gathright Wildlife Management Area. The entire area is picturesque, somewhat isolated, and in a rugged, rural setting characteristic of the general region. See Figures 12 through 14.

The Gathright Dam area lies within the proclamation boundary of the extensive George Washington National Forest. The heights immediately north and west of the proposed lake form the border between Virginia and West Virginia. This border also forms one boundary between the George Washington and adjacent Monongahela National Forest. To the south lies the Jefferson National Forest. These national forests, which constitute the greater portion of the entire region, are publicly-owned lands largely devoted to the conservation of woodlands, waters, and wildlife, and to promote outdoor recreation opportunities.

The general climate of the region is moderate. Temperatures average about 50° F. A maximum of 99° F and a minimum of -20° F were recorded at Hot Springs, Virginia, which is about 10 miles from Gathright Dam. Precipitation averages about 41 inches annually and this includes an average snowfall of 25 inches. Annual distribution of precipitation is fairly uniform. Duration of the snow pack is not long.

The general climate of mountainous Virginia is favorable to outdoor recreation activity. Using City of Roanoke data for reference, during June, July and August, less than one-

fourth of the days have a maximum temperature exceeding 90° F. Summer nights in the high altitudes are cool. About one-third of the summer days experience precipitation in the amount of .01 inches or more, and most of this is from thundershowers. Since most thundershowers are of short duration, recreation activities at Gathright Dam and Lake Moomaw are not expected to be affected. The maximum rainfall occurs during the winter and spring, and the minimum rainfall occurs in the late summer and autumn. The heaviest precipitation events and those associated with the longest duration are due to low-pressure systems moving slowly from southwest to northeast across the Appalachian Mountain Range. The lake is located within the Valley and Ridge Province of the Appalachian Mountains. The maximum observed rainfall in 24 hours was 5.60 inches and occurred in July 1961 in Charleston, WV.

Geology and Soils

Resource Description

The Gathright Dam is located in the scenic Valley and Ridge Province of the Appalachian Highlands. This Province is characterized by a series of northeast striking, near-parallel ridges and valleys formed in intensely folded sedimentary rock. The Jackson River flows through the proposed lake area in a wide valley of rocks referred to as shales. Near the dam site, the river turns abruptly to the east and flows for more than a mile through an anticlinal sandstone/limestone structure forming Kincaid Gorge. The Gorge breaches the ridge, which is known as Coles Mountain to the North and Morris Hill to the south. The soluble nature of limestone has caused sinks along the crest of the ridges. This Karstic geology presented leakage difficulties during dam construction that had to be stopped with grouting in the abutments.

The overburden soils in the reservoir area are predominantly clays and silts resulting from the weathering of the limestones and shales typical of the area. Sandy soils occur to a much lesser extent. Subsurface drainage is poor in these impervious soils and is generally confined to the extensive network of joints, fractures and channels in the weathered rock.

The banks of Lake Moomaw are consolidated and not subject to erosive failure or slumping. Much of the bank is steep but rocky, so it does not slump.

The proposed transmission line route would pass over the flat river floodplain and traverse some moderately hilly meadows and agricultural fields. Soils along much of the transmission line route are stonier than those on the floodplain.

Potential Impacts

Operation and construction of the Project could potentially cause limited erosion along the transmission line route. Applicant proposes to eliminate or minimize potential erosion through the following methods.

Applicant plans little soil disturbance associated with construction of the transmission line, because there will be little (< 1 acre) tree clearing and new poles will be placed by augering only over a half mile of the 2 miles of transmission line. This minimal clearing is possible, because the line will be built over an existing line owned by BARC Cooperative for most of the route. Some of the existing poles will need to be replaced with higher poles. This action will minimize the bare soil areas that result from pole placement. Bare areas will be vegetated by planting grass or other acceptable plants. Sediment fence will be used where necessary.

The limited placement of new poles will avoid any significant erosion along the transmission line route.

No excavation is necessary for the Project, so subsurface conditions are not critical.

Water Resources

The waters of the Lake Moomaw and the Jackson River above Covington were found to be of good quality for all current and anticipated water uses: dissolved oxygen was quite high and approaching saturation, and other physical, chemical, and biological characteristics indicate a stream of satisfactory water quality for most beneficial uses.

This section discusses characteristics of the Jackson River for flow and water quality, etc. It discusses how the existing dam operation produces good water quality with flow controlled by Lake Moomaw to maintain water quality in the Jackson River and exceeds state standards to promote good trout habitat. It discusses how the proposed project will maintain water quality and flow downstream and in the lake by avoiding changes to the key features of current operation.

There are numerous water quality users along the Jackson and James Rivers downstream, both industrial and municipal, but exceeding state standards has produced a healthy aquatic environment and promoted development along the river.

Water Quantity and Flow

Figure 8 shows the annual flow duration and frequency. Table 10 indicates the minimum, mean and maximum monthly flows at Gathright Dam compiled from data collected by USGS at the Gathright Dam gage since dam operation begun in April 1982. The basin characteristics for the Jackson River at the Gathright Project are further discussed in the section entitled River Basin Description, below.

Figure 15 shows the monthly flow duration for all months at Gathright Dam for the period of regulation, which began in April 1982 with the reservoir reaching its nominal pool elevation of 1582 feet MSL. Figure 16 shows the same monthly flow duration for the low flow period, mainly the summer and fall months. Figure 17 shows the same monthly data for the high flow period, mainly in the winter. These duration curves and those mentioned in the

previous paragraph are from the gage a few hundred feet downstream of the dam. Its drainage area is 345 square miles; average flow is 345 cfs.

Extremes of high flow in the form of disastrous floods have occurred throughout the James River Basin causing loss of human lives and misery. There is the tremendous economic loss in damages to residences, commercial establishments, industries, public buildings, agricultural crops, roads and utilities. This is a major reason for the flood control function of the dam.

The Jackson and upper James Rivers experienced severe conditions of flooding in March, 1913, and March, 1936. Significant but less damaging flooding has occurred on numerous other occasions.

Stream flow records have been maintained on the Jackson River since 1925 at a gage located near Falling Spring. This stream gage, about eight miles downstream from the dam site, measures flow from about 411 square miles of the Jackson River watershed. It was replaced by a gage just below the dam site on the Jackson River, which was used for flow analysis in this project.

The most severe flood, of which there is any current knowledge, occurred in March 1913, when a peak flow of 50,000 cfs was estimated to have occurred at the Falling Springs gage. Bank full capacity is about 13,000 cfs.

The average runoff, as measured at the Falling Springs gage, is about 470 cfs which is about 1.15 cfs per square mile, 15.5 watershed inches per year, and about 38 percent of the rainfall. Average monthly runoff varies from a low of 62.5 cfs in September 1930 to a high of 2,574 cfs in March 1963.

Gathright Dam was built to control such large floods with storage and controlled release. Water quality and release temperature is not a concern for these large releases of stored floods. The cold water from near the bottom of the lake can be low in DO, but its low saturation allows it to aerate quickly when it is exposed to oxygen in a turbulent flow situation as it proceeds downstream. The river drops about 450 feet in the 43 miles to its mouth, so there are numerous riffles to aerate the flow.

The flood release from the dam is limited to 10,000 cfs as long as the pool is below 1610 ft. MSL. Above this level the sluice gates are opened fully to let the flood control pool drain as quickly as possible. The highest the lake elevation has been is 1597.6 feet MSL through the end of 2006. This is considerably below the spillway crest of 1667 feet MSL. The release of most floods is varied to match the inflow and avoid creating a second flood peak downstream in the Jackson and James Rivers. There is no specific flood release rate for smaller floods being evacuated from the reservoir.

Water Quality and Water Quality Standards

Both flood control and water quality are important purposes of Gathright Dam. Flood control prevents devastating destruction and water quality control allows a modern lifestyle in a populated area downstream with the recreation benefit of a well-managed trout fishery.

The water quality of the Jackson River varies with flow and with season. This section of the Jackson River is classified by VA DENR as suitable for fishing and swimming. It is also controlled as Trout Waters for reproducing trout. See Appendix C (Water Quality Standards).

The minimum standard of dissolved oxygen (DO) permitted in the Jackson River by the Commonwealth of Virginia and EPA is an instantaneous value not less than 4.0 mg/l. The special situation of promoting a trout fishery downstream leads to extra regulations to maintain the trout habitat. In practice, the DO minimum level is 5.0 mg/l with a temperature criterion of 60° F at the dam. Minimum flow is 150 cfs at Covington but increases above this in summer months as indicated below. Minimum release at the dam has not been below 100 cfs.

An exotic alga, Didymosphenia geminata, called Didymo is found in the Jackson River downstream of Gathright Dam. It is an invasive species that can be found in cold water streams. Its cause and impact are not known, but it is considered detrimental to benthos species, because it occupies part of the stream bed with blooming growth. It is suspected that high flows reduce the adverse impact of Didymo. The reduced flood release will be examined in the future to be certain it is not causing this problem to become worse.

Low Flow Augmentation, Temperature Control and Minimum Required Flow

Temperature and DO concentration in the river below the dam are controlled carefully by the Corps using a gage at the dam tailrace. These parameters do not decrease below their minimum criteria. How operation of Gathright Dam accomplishes this is explained below and illustrated by USGS data in Table 2.

The releases at Gathright Dam are for low flow augmentation and temperature control at Covington. Controlling temperature helps maintain DO at a suitable value. This flow augmentation results in a frequent drawdown of the lake below the target pool elevation of 1582 feet above MSL. The drawdown occurs in the late summer and fall. See Figure 11. The dam release during a low flow period will usually be the full requirement at Covington ignoring intervening inflow, which is likely to be negligible. The table below indicates the required low flow at Covington above Dunlap Creek. This release exceeds average inflow about 100 cfs in July to September.

FLOW REQUIRED AT COVINGTON
FOR FLOW AUGMENTATION (a)

Month	Flow (a) c.f.s.	Month	Flow (a) c.f.s.
Jan	158	Jul	283
Feb	168	Aug	278
Mar	171	Sep	245
Apr	194	Oct	188
May	231	Nov	161
Jun	269	Dec	158

(a) Above mouth of Dunlap Creek.

The minimum required flow is 150 cfs at Covington (upstream of Dunlap Creek); maximum desired temperature is 70° F at Covington; dissolved oxygen should be more than 5 ppm at the gage at the dam tailwater. These are the general water quality objectives for Gathright Dam for maintaining trout waters.

Covington is about 19 miles downstream of the dam; the river will easily increase its temperature between the dam and Covington. The drainage area at Covington is about 100 square miles or 30% greater than at the dam. The 60° F temperature criterion at the dam in summer anticipates a 10° warming before reaching Covington. So the criteria at the dam is 60° F temperature with a DO value more than or equal to 5 ppm (mg/l). The release at the dam is coordinated with inflow between the dam and Covington to meet the flow target at Covington.

Thermal stratification of the lake is expected from mid-June to October; see Figure 10. During this period releases must come from the water quality intakes to meet the objective temperature of 60°F. From October to June stratification does not exist, and release can come from any water quality ports or the service gates. The need for temperature operation of the intake structure is necessary mainly for the trout fishery. Selective withdrawal releases do not improve low flow augmentation, but they help water quality by maintaining a lower temperature and higher DO.

Figure 10 shows the stratification of DO in Lake Moomaw in June through November of 2004. Stratification is weak in June and July but becomes pronounced through the summer and early fall. By mid November, the lake usually turns over and stratification is not evident with isothermal conditions throughout the water column. More water quality data for the lake is provided in Appendix B.

The water quality intake (WQ) gates are located on the upstream and sides of the intake tower. These gates are positioned from 12 feet below the normal lake level (1582 feet MSL) to 87 feet below. This vertical range of gates allows the withdrawal to be made a few feet below the surface and deep in the lake even during a severe drawdown.

The Corps has found that the best way to regulate the temperature of the release and avoid an adverse impact on the lake fishery is to use one upper gate and one or two lower gates. This scheme allows withdrawal of warm, oxygenated water from near the surface and colder water, perhaps with less oxygen, from around elevation 1494.5 feet MSL.

So in summer it is likely for a gate at 1558 ft. MSL, which might be 5 or 10 feet below the lowered lake level, and the lowest gates at 1494.5 ft. MSL to be fully or partially open. The varied opening of these gates at high and low levels provides the desired temperature. The control gates at the bottom of the water quality intakes would regulate the flow. With the hydro project, the turbine wicket gates will regulate flow.

This vertical arrangement of water quality gates is adaptable to the decreasing lake elevation (drawdown) that Lake Moomaw experiences in three of four summers. The two lower gates are usually used with one upper gate varied to match the lake elevation. The gates for opening are chosen by measuring temperature and DO profiles in the lake biweekly during the summer. The thermal stratification in the lake does not change much after it stabilizes in June until turnover in November. This summer water quality operation provides the necessary temperature control for the trout fishery and water quality requirements downstream. It is necessary from May through early December to meet downstream water quality criteria. Turnover usually occurs in November.

Limited agricultural runoff upstream from the Gathright project area, considerable watershed protection by upstream woodlands, and the virtual absence of upstream industry and population centers seem to avoid introduction of excessive nutrients into the lake.

The Corps of Engineers takes extensive measurements of DO and temperature values in Lake Moomaw to assess the stratification of temperature and DO, as shown in Figure 10 and Appendix B. The Applicant analyzed the data from recent years; the results of that analysis are summarized in Figure 10. The profile of temperature is used by the Corps to decide what elevations they need to use to withdraw water from the lake to meet their downstream temperature targets. Experience has allowed them to measure temperature and DO in a profile about every two weeks from June to December. From the measured data operating decisions are made. The downstream gage confirms in Table 2 that withdrawal is occurring from the correct temperature zones to allow water quality criteria to be met.

State Water Criteria

The State of Virginia classifies Lake Moomaw and the Jackson River as suitable for primary contact recreation. This classification requires a dissolved oxygen content greater than 4 mg/l and fecal coliform less than 1000 organisms per 100 ml.

The Jackson River below the dam is controlled to provide habitat for naturally-reproducing trout. The criteria for this upper end of this reach are a minimum flow of 150 cfs, maximum temperature of 60° F and dissolved oxygen greater than 5 mg/l. See Appendix C.

Existing Uses of Project Water

Water of the Jackson River serves several purposes. The primary uses of water at the Gathright site are recreation and the maintenance of water quality and aquatic habitats. The consumption of fish from the river and contact recreation is an approved purpose of this reach the Jackson River. See Appendix C.

The description of low flow operation above indicates how water quality criteria are met.

Covington withdraws water from the Jackson River. Clifton Forge withdraws water from an impoundment on Smith Creek, a tributary of Jackson River. Other subdivisions and communities rely upon groundwater sources. There are two small reservoirs in the area--one for water supply at Clifton Forge, the other, a fishing lake at Douthat State Park.

There are no direct consumptive uses of lake water; the proposed project will not consume any water.

Proposed Uses of Project Water

All of the uses of the Jackson River water described above are expected to continue in the future. Population growth in the region has been gradually increasing, so demands for more water-related supplies and activities are possible. The hydro Project will utilize but not consume flows of the river for hydroelectric power production. This Project proposes to use only run-of-the-river flow (existing releases), which are released currently by Corps of Engineers. Water will not be stored for hydropower purposes; the applicant has requested that some parts of floods in winter and spring be released at a reduced rate to benefit power. See section on Project Operation above for a description of proposed reduced flood flow rate.

The Corps of Engineers will dictate flow release and pool level to the hydropower plant. Generation will be varied as necessary to adhere to the present release and pool level requirements. The turbines will operate 24 hours per day about 98% of the time, utilizing all available flows within the operating range (< 350 cfs) of the proposed power plant. The proposed capability of the Project would take all water about 72% of the time. About 26% of the time, a significant amount of water would be spilled, because the turbines cannot pass all the available river flow. About 2% of the time, there is no generation, and all river flow passes through the intake tower gates as it does presently. See Figure 1 and description above on Project Operation.

Impact of the Project on Water Quality Downstream

The hydropower project should have no adverse effect on water quality downstream of Gathright Dam, since the project will duplicate the level of water withdrawal from the lake as it done presently. Also the flow released from the dam during hydropower operation will be same as occurs presently with the exception of the reduced flow release proposed from November to mid June; see Project Operation above. This reduced flood release should not affect downstream water quality because it will not occur during periods when water quality downstream is in danger of violating its minimum values, and it will always release above the required minimum flow. Water quality conditions downstream and in the lake will not change with hydropower operation.

The module has a cylinder gate at its top that accomplishes the withdrawal from the upper part of the lake during the summer and fall when this is necessary. During the rest of the year from November through early June, the lake should not be stratified. During this period there should be no need to limit withdrawal level to meet water quality criteria. The Corps will decide which gates must be used.

The cylinder gate will have a variable height for its top to allow withdrawal of water from various levels near the surface of the lake. It will also have withdrawal gates at lower levels (1494.5 ft. MSL) to duplicate the dual withdrawal practiced presently. The moveable tube of the cylinder gate will slide vertically inside the fixed module structure so it withdraws from the correct level. The height of the moveable tube will be about 28 feet. When fully raised, the open top of the cylinder gate will be at elevation 1570 ft. MSL. When fully lowered, its top will be at the top of the fixed module, elevation 1542 ft. MSL. The moveable tube will be able to take water into its top to pass to the turbine; the withdrawal level can be any elevation between 1542 and 1570. The moveable tube will duplicate the withdrawal level of the existing WQ gates at elevations 1570, 1564, 1558, 1552, 1546 and 1540 ft. MSL. Gates will be installed in the fixed part of the module to withdraw water from elevation 1494.5 ft. MSL. It should not be necessary to make withdrawals from elevations 1525 and 1510; we will discuss this with the Corps and VA DEQ.

There will be no chemical discharge or other waste discharge into the river. The generating equipment will not heat the water released from the dam. The oxygen absorbed will not change in the released water passing through the turbine, because the same amount of turbulence would occur in the tunnel and tailrace in the outlet works of the dam.

Impact of the Project on Water Quality in the Lake

The hydro project should not adversely impact water quality in the lake. The temporary reduced flood release will cause lake level to decrease more gradually between elevations 1584 ft. MSL and the target level (1582 ft. MSL) than current operation does. This reduced flood release will mean that a flood that was released in one or two days at maybe 1000 cfs would be released at the same rate to reach elevation 1584 feet then the release would slow to 350 cfs. The effect of this reduced flood release for the last two feet (3 feet in March) would extend a flood release from one or two days to five or six days. This reduced flood

release has no capability to affect water quality in the lake. It should avoid slumping of saturated banks, but that is not a problem in the lake. It will cause lower flows to persist downstream for a longer period. With continued inflow into the lake the lake level will remain around the upper part of the range, elevation 1584 feet MSL. A simulation of operation with the reduced flood release will quantify how often this happens.

The reduced flood release does not significantly reduce available flood storage, because it is not a permanent increase the bottom of the flood storage pool. The reduced flood release continues to evacuate the flood storage but at a slower rate. If the Corps believes weather forecasts warrant the normal flood release rate that should be applied. For discussion, even though it is not a permanent pool change, the remaining flood storage between 1667 and 1584 ft. MSL is 98.3 % of storage between 1667 and 1582 ft. MSL.

Since the same amount of water will be released daily in the same amounts and from the same levels as is done currently, the proposed operation will not alter lake water quality parameters, such as oxygen or temperature.

The proposed Project will cause no significant changes in flood elevations upstream of the Project because flood storage will not be compromised. The Project will not have an impact on the effluent levels of the river either upstream or downstream of the site.

Impact during Construction

There will be no change in water quality during construction. There will be no excavation in the construction activity, so no sediment will be released.

401 Water Quality Certification

The applicant will apply to the Virginia Department of Environmental Quality for a 401 permit. The application letter will be filed when the application is filed with FERC.

Aquatic and Terrestrial Wildlife and Botanical Resources

Existing Resources - Terrestrial Vegetation

About 16,000 acres around Gathright Dam are forest. Half of the forest land is in the T. M. Gathright State Wildlife Management Area. This forest land has been carefully managed since l958 and is oriented toward wildlife production and recreational use.

Today much private land near the project area is used for hunting, although some pulpwood from voluntary growth is removed periodically. Lands of the National Forest are under long term management for timber improvement, watershed conservation, and wildlife. The Virginia DGIF manages the Gathright WMA as a wildlife production and hunting area. The DGIF permits removal of pulpwood from the area to improve wildlife habitat and as a source of income to supplement management funds. About 1,240 acres of the Wildlife Management Area is suitable for agriculture, especially the bottomlands along the Jackson

River. This potential is realized by leasing lands for crop production, some of which is left for wildlife. Other land management practices, which favor wildlife, are the planting of cover strips, small grains and stands of pine in the larger open fields. Some open areas are kept mowed to favor small game by control of invading brush.

The type of woody plant species seems to have some dependency on elevation, slope, and exposure. In general, three zones are apparent. These zones and their characteristic tree cover are shown in Table 4.

The dominant undergrowth in those areas above the bottomlands consists primarily of the native group of acid-loving plants. Shrubs characteristic of this group indigenous to the Gathright area include rhododendron, mountain laurel, flame azalea, blueberries and groundcover plants consisting of trailing arbutus and wintergreen. Hundreds of varieties of wild flowers are found throughout this region, both on and above the flood plain. Some of the more outstanding flora displays include the trillium, arum, lily, orchid, saxifrage, pea, rose, buttercup, phlox, mint, snapdragon and daisy families. Recreation use of the Gathright Dam area has continued the present forestry management practice under control of US FS.

Jackson River Fishery

The Jackson River is an excellent smallmouth bass, rock bass, rainbow trout, and brown trout fishery above Lake Moomaw. Below Gathright Dam, six public areas provide access to 18 miles of legally navigable water to Covington. Wild rainbow trout, wild brown trout, smallmouth bass, rock bass (redeye), and redbreast sunfish populate the tailwater below the dam. The DGIF in the 1980's stocked the Jackson River annually with catchable size rainbow and brook trout to maintain a high quality, put-and-take fishery. Over time, the effect of cold releases from Gathright Dam and other management practices have made the trout fishery below the dam self-sustaining. A 12-inch minimum size limit and four fish per angler per day creel limit has been imposed on all trout caught in the tailwater (ref. 7).

Since much of this important fishery is located beside and within the Gathright Wildlife Management Area, public access is available in the upper reaches near the dam. There is wide appeal of trout and smallmouth bass as sport fish. These tailwater species are caught in this reach and trout from the Gathright Wildlife Area are occasionally taken as far downstream as Covington. Between Covington and the dam site, the Jackson River retains excellent habitat as above except that much of the streambank lands are in private ownership, which limits public access.

The U. S. Bureau of Sport Fisheries and Wildlife estimates that Lake Moomaw provides 21,400 man-days of warmwater fishing annually. In addition, the downstream trout fishery is estimated to provide 18,900 man-days annually.

Large, lake-run rainbow trout can be caught in the Jackson River above Lake Moomaw during the winter and spring. Both the brown and rainbow trout have spawning runs up the Jackson River from the lake. The brown trout do so in the fall, and the rainbow do so in the early spring, such as February.

There are no anadromous or catadromous fish in the Jackson River. There are no known migratory or marine fish in the river.

Lake Fishery

Before it was completed, fisheries biologists determined that Lake Moomaw had the potential for a "two-story" sport fishery. This simply means that the reservoir would be deep enough for both warm water fish (bass, catfish, sunfish, crappie) and coldwater fish (trout). With this in mind, the lake was stocked with thousands of largemouth bass, bluegill, redear sunfish, and channel catfish in the early 1980's. The Jackson River was already home to wild populations of smallmouth bass, rock bass, and chain pickerel, so it was expected that these species would acclimate to their new surroundings. Black crappie and yellow perch were later additions to the fishery.

Alewives are members of the herring family and are the backbone of the lake's sport fishery by being its forage base. The alewife has thrived in the clear, deep waters of Lake Moomaw. Alewives are a schooling fish, occupying the open waters of the lake. They grow up to 7 inches, but average 4 - 5 inches long. The alewife is the classic prey species for open water predators such as trout, walleye, and striped bass. In Lake Moomaw, the alewife is the perfect link in the food chain between the microscopic plankton and the lunker brown and rainbow trout. In fact, almost all of the predacious fish species in the lake utilize alewives in their diet. Although they have a reputation for large die-offs during long periods of cold weather, alewives have done extremely well at this mountain reservoir.

Brown and rainbow trout have been stocked annually since the early days of the lake. Brown trout have done extremely well, and it is not uncommon to catch brown trout in the 3-5 pound range. They are especially active in late winter and early spring, when they can be found in 15-20 feet of water engorging on alewives. Brown trout are abundant, heavy, and a new lake record was set in 2004: 12 pounds, 3 ounces. Rainbow trout are not as abundant, but add an additional salmonid component to the lake. Rainbow trout come in two varieties: McConaughy and Eagle Lake. Biologists determined that a lake-run strain of rainbow trout would thrive in Lake Moomaw as well as the Jackson River above the lake. As it turns out, the McConaughy rainbow has done very well in this system. Those that remain, or return, to the lake can be found in trophy proportions. Eagle Lake rainbow trout have been mixed into the stocking plan. Eagle Lake trout appear to be less migratory and can spend most of their life gaining weight in the deep waters of the reservoir. Brook trout have been periodically stocked to add variety to the coldwater fishery.

Figure 6 summarizes the relative abundance of the main game species in Lake Moomaw as recently determined though gill netting (Ref. 13) by VA DGIF. Brown trout densities are excellent in Lake Moomaw, as is their size distribution. In 2006, 75% of the brown trout catch were over 16 inches (legal size). Also, the mean relative weights of brown trout are over 150, the ratio of the body mass to the length of fish. Fish are considered "plump" with relative weights in excess of 100. Rainbow trout do not fare as well as browns do in the lake, but their presence and extraordinary fighting ability make a worthy component to the

coldwater game fishery. Note the small percent of the catch in Figure 6 that is represented by rainbows. Brown trout are more sedentary and tend to enjoy the confines of the lake, whereas the rainbows like to use Jackson River and Back Creek for migratory purposes. Relative weights for rainbow trout are in the 95-100 range. Although they are not represented in the gillnet data, large schools of alewives are observed during electro-fishing.

Two types of black bass - smallmouth bass and largemouth bass – currently occupy the waters of Lake Moomaw. Smallmouth bass have thrived along the rocky shorelines and steep cliffs. Smallmouth bass can be found deep (25 ft.) in the lake during summer and winter, and moving along the shallows in spring and fall, searching out food and spawning habitat (ref. 7). The black bass fishery at Lake Moomaw is representative of a western Virginia impoundment. Bass densities and growth are very good for smallmouth bass, and moderate for largemouth bass.

In addition to these game species that attract many anglers, DGIF indicates that yellow perch, pan fish, catfish and chain pickerel have attracted anglers to the lake. The state record yellow perch was caught, then surpassed, then caught again at Lake Moomaw in 1999 (2 lbs., 7 oz.). Yellow perch are often taken in late winter either through the ice or drifting minnows in 10 feet of water. Black crappie, bluegill, and redear sunfish are the three big panfish species in Lake Moomaw. Black crappie have done extremely well. As with yellow perch, crappie fishing at Moomaw is most often caught during the waning weeks of cold weather using live bait. The Chain Pickerel haunted the cool waters of the Jackson River prior to lake construction. Once the waters rose, the chain pickerel adapted quickly, and large (4-5 pound) pike were caught with consistency. Chain pickerel love the shallow, weedy areas around mid-lake and Greenwood Point.

Lake Moomaw boasts two types of catfish species: channel catfish and yellow bullheads. Channel catfish have done very well since they were introduced in the early days of the lake. Stumps at the edge of the river channel, as well as old muskrat holes serve as habitat and spawning areas for this popular game fish. Channel catfish in excess of 20 pounds have been caught on cut bait and live bait, but 10-15 pound fish are caught more frequently. Bullheads were abundant in a couple of farm ponds prior to the lake being filled, hence they were introduced accidentally. Yellow bullheads do very well in the shallow flats around mid-lake. They provide good recreation for young fishermen and are a preferred food fish among some of the angling community. Common carp were introduced by anglers in the 1990's and have exploded in terms of size and numbers throughout the lake (ref. 13).

Table 3 lists the fishes present in Lake Moomaw. The success of the lake fishery is evidenced by the lake parking lots filled by anglers on weekends, as noted by the Forest Service in the Recreation section below.

Wildlife

The T. M. Gathright Wildlife Management Area (18,392 acres) is regarded by state wildlife officials as one of the best such management areas in Virginia. The highly productive wildlife area is essentially the result of a diversity of habitat together with good management. The types of habitat, generally corresponding to the woody plant "zones" mentioned previously are summarized as follows.

Location	Habitat
Valley floor	Intermixture of hardwoods and cropland.
Forested hillsides	Brushy field borders to upland hardwoods with scattered pines. Mature, mast-producing hardwoods mixed with shrubs and pines
Bolar Ridge	Cutover mixed stands of pine and hardwood, steep slopes and low soil fertility.
Shale slopes and ridges	Minimal on rock surfaces; ridge tops are generally forested

The U. S. Bureau of Sport Fisheries and Wildlife estimates that the entire Wildlife Management Area sustains about 19,000 man-days of hunting annually. The Bureau also estimates that the lake causes a loss of 10,000 man-days of hunting annually within the State area plus 200 man-days annually on adjacent private lands.

The Gathright State Wildlife Management Area continues its important function of wild turkey and whitetail deer production. The importance of the wildlife area as wild turkey range is considerable, more than any other State-managed area, since Gathright serves as a pool whereby trapped birds are utilized to stock other regions in Virginia. The Bolar Ridge habitat type is the principal turkey range of the Gathright Area.

One of the principal management techniques utilized in the Gathright area is timber sales. Overall forest improvement encouraging wildlife production is the goal. Selective thinning and timber removal promotes desirable species and provides clearings, which are utilized by turkey and whitetail deer. Ridge tops and steep side slopes are unsuited for extensive clearing for forage crop production.

The Department of Game and Inland Fisheries promotes the principal wildlife species -- turkey and deer. Where wildlife is concerned, the principal foods now produced on the bottomlands of the Jackson River are corn and small grains through intentional planting, open grazing areas, planted shrubs such as autumn olive, and the tree-shrub cover along the river. With the possible exception of the planted crops, valuable wildlife foods continue to be present in the uplands as they have been in the past.

Such natural foods are:

Dogwood
Oak
Hickory
Sassafras
Spice bush
Wintergreen
Partridge berry
Persimmon
Wild grape

Groups of pine or hemlock within stands of hardwood are utilized as roost areas by wild turkey and as cover by ruffed grouse. Desirable mast-producing species such as the oaks are encouraged. These are important food producers for turkey, deer and squirrel. Succulent plants and woody brush occupy clearings soon after the timber is removed. This is valuable browsing for deer as well as small game cover. Table 5 lists the principal game species.

Impact of the Project on Fish and Wildlife - Effect on the Lake Fishery

The only effect the proposed operation will have on the lake is the temporary reduced flood release in the winter and spring; this is not expected to have any adverse impact. The reduced flood release allows the pool level to reduce gradually after the most of the stored flood is released. This reduced release will extend a flood release for several days. This reduced flood release is only applicable for the lower 2 feet of the stored flood (3 feet in March). The reduced flood release will be altered in the spring if VA DGIF determines that is necessary to avoid impacts on spawning in the lake. The gradual decrease in the lower 2 feet of the stored flood should not cause spawning problems, because this gradual change at the end of a stored flood release is no more harmful than the fast change in lake level at the end of the flood release presently. Water is withdrawn from the lake in the same amounts and at the same elevations as is done presently. There are no other actions of the hydropower project that could affect the fishery in the lake.

Effect of the Project on the Tailwater Fishery

The hydropower project will not violate the temperature criteria or alter oxygen levels of the dam release. The minimum dam release will be met. The dam release will be the same as present except during reduced flood releases for a few days in the winter and spring, when 350 cfs will be released instead of a larger flood release for a shorter period. This smaller release initially will be followed by several days of constant releases of 350 cfs. This maintenance of the downstream water quality could help the trout fishery sustain itself and provide more fishable flows, but this is not expected to be a large difference. The applicant will avoid any temperature changes downstream (or in the lake) by withdrawing water from the same level in the lake as is done presently. See the previous section on Water Quality.

Impingement and Entrainment

Several features (PM&E's) in the proposed Project inherently will minimize fish entrainment.

The maximum velocity immediately upstream of the trash racks will be about 2 feet per second at the maximum generating flow of 350 cfs, which is less than the normal swimming speeds for adult game fish in the Project vicinity. This velocity is small enough to allow larger fish to escape entrainment, because the swimming speed of adults is consistently greater than 4 feet per second. For 28% of the time, some or all river flow bypasses the turbines providing an alternate exit of water from the dam. During this period, turbine flow is less than maximum flow because of increased tailwater elevation, so intake velocity is less by a small amount. Further, to avoid entrainment of large fish, the bar spacing will be about 2.5 inches. The upstream velocity and trash rack spacing will avoid large fish being entrained or impinged. Small fish can be entrained, but they will not be impinged.

The Applicant believes that the depth of the intake and the swimming speed of the resident fish will avoid any significant amount of entrainment, especially of the fast-swimming game fish. The upper intake will be between 12 (more likely) and 40 feet deep, and the lower intake will be 87 feet deep; these depths are for the lake at the normal pool level, 1582 feet MSL. Therefore, other than a large trash rack with a small approach velocity, the applicant does not propose any additional features or actions to reduce entrainment. If mortality of game fish appears to be a problem after the Project is constructed, the applicant will examine actions with the VA DGIF, the Corps and the Forest Service that would avoid a significant problem.

The VDGIF reports that the river is fishable from minimum flow (150 cfs) to over 500 cfs, at which the river is still within the streambed. The maximum flow is a subjective decision, because different fishermen will view it differently. It is likely that the river is fishable at the preferred generating flow of 350 cfs. Optimum fishing flow is probably about 250 cfs.

There will not be a concern over turbidity during construction. This is because there will not be any excavation beside the river that could introduce soil into the river. A sediment and erosion control plan will be prepared and implemented for the new poles of the transmission line to ensure that no erosion occurs that could enter the river or otherwise be harmful. During operation, there will be no flow changes that could cause bank erosion or release sediment into the river.

Potential Impacts on Terrestrial Wildlife and Botanical Resources

The applicant does not anticipate that the Project will significantly affect terrestrial wildlife and botanical resources.

The transmission line will be approximately two miles long and extend from the substation on the dam crest in a southeasterly direction to interconnect with BARC's transmission line and substation. The proposed path of the line is shown in Exhibit G-2. Because the proposed route will be built over an existing BARC line for most of its length, there will be

minimal clearing. About 2 acres of new clearing is estimated for new transmission line right-of-way.

The half mile length of new poles will be wooden and placed by augering a hole for a single pole. Alternately, this new part of the route might be buried if the Corps of Engineers so directs. This route will be from the abutment next to the dam, which has little tree cover, past the administration building and the maintenance area, then down the hill to the existing BARC line. Approximately 0.5 miles (about 2 acres) of forest, consisting of oak, red cedar, hickory and brush along the transmission line right-of-way, would be cleared for overhead lines. The loss of habitat due to clearing of the transmission line right-of-way would be minimal because little forest habitat will be removed.

Methods of maintaining the right of way will use physical clearing instead of herbicides.

Almost all of the land along the transmission route on the southeast side of the Jackson River is used for agriculture and pasture. The location of the line will not change and will not inhibit continued agricultural and pasture uses.

The wildlife found on the proposed transmission line route are mainly small mammals, such as cottontail rabbits and bobwhite quail. Deer are present in significant numbers. Construction and operation of the line will not affect their migration, food supply or reproduction.

Clearing of the 2 acres of trees that must be cut will occur in the winter to avoid any disturbance to endangered bats.

Overhead transmission lines are a potential electrocution hazard to perching raptors unless properly designed. Because raptors could occur in the Project area, the Applicant will use a transmission line design that would prevent the accidental electrocution of perching raptors. Therefore, the Applicant will design and construct the transmission line in accordance with guidelines set forth in "Suggested Practices for Raptor Protection on Power Lines--the State of the Art in 1981," Raptor Research Report No. 4, Raptor Research Foundation, Inc., 1981.

Wetlands, Riparian and Littoral Habitat

The rugged mountain terrain causes steep stream gradients with frequent high flows, and rocky substrate inhibits the development of wetlands in the project area. Wetlands are only minimally represented around the periphery of the reservoir's pool (1582 ft MSL). For most of the reservoir margin, the steep shoreline gradients and low concentrations of nutrients and organic matter in the rocky clay substrate and water precludes significant growths of semi-aquatic plants characteristic of wetlands. The river morphology upstream and downstream of the lake with rocky substrate is unsuitable for wetland development.

The dominant wetlands near the Project are almost entirely riverine (lacustrine) around Lake Moomaw and the Jackson River upstream and downstream of the dam. There are

numerous small tributaries to the Jackson River that are characterized as riverine. There are minimal palustrine (marshy) areas, principally bordering Lake Moomaw. Figure 9 shows the nearby wetlands from the National Wetlands Inventory produced by U.S. Fish and Wildlife Service. Most of the designated wetlands are the lake, small streams and the major river. The lake and its embayment areas or coves are classified as lacustrine and impounded. The bottom material is generally consolidated sand and rock with some gravel and clay material.

The Project will not impact these upstream embayment areas that are attached to the lake, because the operational mode of the proposed Project is run-of- river. No changes in pool elevations will occur except temporarily. The reduced flood release would keep some areas wet longer by several days in the winter and spring; this should not affect their health. Thus, the upstream and downstream wetlands or embayments will remain in their present state. These embayments have an unknown but small surface area within the 2,350 acres of the lake, which has about 43 miles of shoreline. The existing pool elevation will be maintained and the Project will continue to be operated on a run-of-the-river basis, as described in the Corps' operational manual (ref. 5).

The transmission line will not affect wetlands, because the line supports (poles) are not located near any sensitive wetland areas. The line will cross the Jackson River and two small streams on the southeast side of Highway 687. See Figure 9. The line will overbuild BARC's existing line where it crosses these streams, so no changes will be made in the location of the single wooden poles that support the line. Taller poles will replace the existing poles; no new poles will be placed on the southeast side of the Jackson River. There should be no impact on wetlands because no new poles will be placed near the wetland areas.

The known designated wetlands in the Project area are shown in Figure 9. There are no known littoral areas except the shallows beside the shores of the pools upstream and downstream. The river is classified as riverine and limnetic rather than littoral. The two small streams on the southeast side of Highway 687 are riverine; they were flowing when viewed on December 6, 2007.

There are no coastal zone management areas near the Project or affected by it.

Endangered Species

The endangered species for the Commonwealth of Virginia and the federal government that potentially have habitat near the Project, including its transmission line, are listed in Table 6. This list is downloaded from the website of VA Department of Game and Inland Fisheries; it lists two federally endangered species, which are also state endangered. There are four additional state endangered species listed. The search results done for us by VA Department of Conservation and Recreation show only one federal endangered species (Indiana Bat) in the project vicinity. The recent assessment for an access site in the Project area by U.S. Forest Service lists the same federally-listed endangered species and one sensitive mussel species (ref. 12). These are the Indiana Bat and Yellow Lance, an endangered mussel species known in the area downstream. There are no other listed

species in that report known to have suitable habitat or are known in the vicinity of the Project. This seems to be the most thorough report, so we have focused on those two species in the discussion below.

Reference 12 is a detailed report on listed species in the dam vicinity. It was prepared by a wildlife biologist at US FS to identify any listed species that might be impacted by a public access site near Johnson Springs on the Jackson River, about 1.5 miles from the dam. He found two species that were of interest: the Yellow Lance mussel (sensitive); and the Indiana Bat (endangered). The report describes 188 listed species that potentially could be in the area, but analysis showed that they were unknown and unlikely to have suitable habitat or be in the area for other reasons. Neither the Indiana Bat (Myotis sodalist) or the Yellow Lance mussel (Elliptio lanceolata) are known in the Project vicinity, but they are known in the general area and their favored habitat is in the area. The Yellow Lance is known downstream about 10 miles near Covington. The Indiana Bat is known several miles away in Bath County. Although the report (ref. 12) considered about 188 listed species, no others were considered to be potentially impacted.

There is no known federally designated critical habitat in the Project vicinity. The applicant has also requested endangered species information from U.S. F&WS. See contact log.

Potential Impacts on Endangered Species

Neither of the two species mentioned above will be impacted by the Project. To avoid any impact to Indiana Bats all tree clearing will be done during the winter, as directed by U.S. F&WS. The endangered bats roost in trees with exfoliated bark during the warmer months and hibernate in the winter. There is little tree clearing planned (~ 2 acres).

The water quality downstream of the dam will not be affected by the Project, so endangered mussels downstream will not be affected. The operational features of the proposed Project avoid impacts on mussel species by avoiding changes in present water quality, which is excellent. The main operational feature is run-of-river operation, which avoids any change in water levels that could strand mussels. Water quality is important also; the Project will continue compliance with Virginia water quality standards. Two parameters are of concern: DO and sediment. There will be no change in flow, DO or temperature during Project operation. Dissolved oxygen and temperature will continue to be monitored downstream of the Project by the Corps; they will direct the withdrawal level from the lake to ensure the correct temperature and DO in the dam release, so it does not change. Presently, these water quality features are at appropriate levels to successfully promote trout habitat in a coldwater environment. The cold temperature near the dam (~ 60° F) is not conducive to good mussel growth, so mussels are found more abundantly downstream in cool-warmwater habitat.

No sediment will be released by the Project during construction or operation; sediment could prevent mature mussels from feeding. Sediment will not be an issue, because no excavation will occur and flows will not increase to those that could erode the bank. The dam release will not change, so there will be no more erosion than presently exists.

Therefore, none of the Project actions can adversely impact downstream mussels of any species.

Recreation and Land Use

The Commonwealth of Virginia has numerous state resort parks, state parks and state recreation areas. Some are in Alleghany County not too far from Gathright Dam, e.g. Douthat State Park about 15 miles to the east. The Jefferson and George Washington National Forests are close to Lake Moomaw; the George Washington Forest surrounds most of the lake and the U.S. Forest Service manages lake recreation facilities. The James River District manages the facilities in Alleghany County, and the Warm Springs District manages the facilities in Bath County.

No national parks are near Gathright Dam, and the Jackson River is not designated or under consideration for designation as a Wild and Scenic River or National Recreation area or a state protected river. There are no Wilderness or National Trail System areas near the Project. The important national recreation areas such as the Appalachian Trail and the Shenandoah National Park, Blue Ridge Parkway and Skyline Drive are many miles from the Project.

The Commonwealth of Virginia does have a comprehensive outdoor recreation plan published by the Department of Conservation and Recreation (ref. 8). The comprehensive plan discusses recreation needs throughout the Commonwealth. The plan has specific suggestions for Region 5 Roanoke Valley – Alleghany Regional Commission, which includes the Gathright Dam vicinity. The plan suggests improved recreation for water-based recreation and access for Lake Moomaw and the Jackson River. Other information in the plan implies this means more flat water boating opportunity is desired. The plan states the Lake's enormous popularity and notes some areas are overcrowded; there is a need for camping facilities, a visitor center, a new group camp and expanded trails. Back Creek and the Jackson River upstream of the lake should be considered for a scenic river development. The existing recreation facilities at Lake Moomaw, Gathright Dam and downstream in the Jackson River do seem to be enjoyed by many for several reasons, especially lake fishing, camping and trout fishing in the Jackson River.

Existing and Planned Facilities for Lake Moomaw

The recreation facilities at the dam are managed by the U S. Forest Service. Several facilities are constructed. Table 1 lists the existing recreation facilities and their features. There are facilities for camping, swimming, boating, waterskiing, sightseeing, hiking and picnicking. There are 7 major area developments on Lake Moomaw; each of these has several subunits that are developed. See Figure 4. Access for fishing and other recreation is limited on the Jackson River downstream of the dam. Forest Service has 6 access points along the Jackson River, but one is undeveloped. The most upstream one is at the tailrace of the dam. These sites allow for fishing, swimming and boat launching.

The popularity of lake recreation facilities can be seen from the use data reported by U.S. Forest Service. They indicate that the parking lots at the boat launch sites are nearly full every weekend in the summer. This includes the 70 spaces at Coles Point, the 30 at Forney Branch and about 30 spaces at Bolar Flat.

Figure 5 shows the campground use at the largest campground on the lake at Morris Hill. There are 3 campgrounds at Bolar Mountain, these opened for a total of 558 days in 2007. Assuming 3.5 people for the total summer use of 7200 campsite-days indicates a total use in 2007of 25,200 camper-days. This is an average of 45 people/day. The McClintic Point Family Campground and Group Camping had 1,240 campsite-days; for 3.5 people per day there were 4,340 camper-days this year. The primitive campground at Greenwood Point has only 5 campsites and no records of visits are kept; the camping is free. Forest Service reports these are nearly full on a lot of weekends in the summer; their season is mainly from Memorial Day to Labor Day.

The day use areas at Bolar Mountain Beach and Picnic Area and the Bolar Flat Marina and picnic area are open from May until October. They reported 3,680 vehicles; for 3 persons per vehicle that would be 11,040 visitors in 2007. Next year US FS plans an additional campground with 31 sites.

Downstream Recreation

Gathright Reservoir inundated most of the present put-and-take trout fishery in Kincaid Gorge of the Jackson River. The Virginia Department of Game and Inland Fisheries (DGIF) has used the multiple level intake tower to pass cold (< 60° F) water into the Jackson River below the dam to near Covington. Since the lake was filled in 1982, the Corps and DGIF has worked together to establish cold water conditions for a self-sustaining trout fishery to replace the one that existed before dam impoundment. DGIF pursued an aggressive stocking program for several years. Initially, the DGIF established a self-sustaining trout fishery by stocking rainbow trout fingerlings, five to six inches long, stocked at the rate of about 350 fish per acre of stream. Approximately 90,000 trout or some 9,000 pounds were required in the estimated 250 acres of suitable river habitat. The result is an outstanding, self-sustaining trout fishery. It is popular with trout fishermen.

The intake tower permits the release of a suitable mixture of cold water from the bottom of the reservoir and warmer water from near the top of the water column, which also contains adequate oxygen, to provide coldwater trout habitat. The temperature control and minimum release is especially important for trout in the summer, when river temperatures rise. The downstream trout fishery takes advantage of the river's expected natural productivity under coldwater conditions.

The downstream fishery also requires that the public must have the access to fish the Jackson River between the dam and Covington. The six access areas mentioned above are about two acres each and are located on the river at the end of existing roads.

The project recreation at Gathright Dam was well planned and built by the U S. Forest Service. As a result, there are not any additions that the applicant is aware need to be made to benefit recreation. The applicant will continue to work closely with U. S. Forest Service and the state agencies on maintaining project recreation at its present successful level.

Land Use

The Gathright Dam is located in a remote and rural area of Alleghany County, Virginia. Land use in the Project area is primarily agricultural and production of forest products. Pastureland and agricultural fields account for about 66 percent of the land use. Forestlands are used for the commercial production of wood and account for about 30 percent of the land use.

Approximately 43.5 miles of shoreline encompass Gathright Reservoir at elevation 1582. Typical of an eastern mountain project, most of this shoreline is very steep. Over 90 percent will contain a water's edge gradient of 15 percent or more. Those developable lands available at the water's edge were limiting factors in developing recreation sites by USFS.

Approximately 1090 acres of project lands were acquired for public access plus an additional 10 acres for fishing sites downstream of the dam.

The site of the proposed Project is federal property managed by the U.S. Army, Corps of Engineers for flood control on the Jackson River. The Corps of Engineers is the authorized land management agency for these lands and is responsible for the relations with other agencies concerning zoning issues and other land use issues. The use of Federal project lands and existing development are limited to the dam, related facilities, transmission line and the maintenance of these facilities. That land use will not change.

The power plant would be mostly out of sight on the upstream face of the intake tower at Gathright Dam, except for the brief periods when the module is raised. No commercial or private buildings or development exist within the Project area. No boat traffic of any kind is permitted close to the intake tower where the power plant (module) would be located.

A Dredge and Fill Permit from the Corps under Section 404 of the Clean Water Act should not be required, because there will be no dredging of material for construction of a powerhouse. A section 10 permit could be required.

Potential Impacts on Recreation and Land Use

The generating unit in the module with its auxiliary equipment will be located on the intake tower and the dam and away from other facilities.

From the bank near the service bridge of the intake tower, the transmission line will proceed toward the maintenance area buildings and descend the mountain until it intersects the existing right-of-way of BARC Coop uphill form the road to the stream gage station. The new line will be placed on BARC's poles in its right-of-way to the BARC substation on the

southeast side of the Jackson River and Highway 687. The transmission corridor is 80 feet wide. Clearing methods will not use herbicides.

The applicant prefers to build this new line above ground. Where the new line meets the road to the tailwater area, it will intersect the existing BARC line mentioned above. From this location the new line will be placed on the BARC poles and proceed to the BARC substation mentioned above. The new transmission line will not affect the aesthetics of the project area. If BARC buries its above-ground line as it nears the Jackson River, the new Project line will be buried beside it.

Effect on Lake and Shoreline Recreation -- The proposed operation will reduce the reservoir level more gradually after a stored flood has been released down to elevation 1584 ft. MSL (1585 in March). For the last two feet of the release of a stored flood, the release rate will be decreased to 350 cfs, the maximum generating flow. This condition is proposed as a temporary action that can be overridden by the Corps, when it believes a faster release is necessary. The reduced flood release would only occur during the period of November 1 through June 15. The effect of the reduced release rate would be to extend the time it takes to evacuate a stored flood and return the lake to the target elevation, 1582 ft. MSL. A release that might take a day or two in current operation could take 5 or 6 days to complete, assuming no inflow.

This proposed operation (reduced flood release) should not impact recreation in any significant way. As shown in Appendix D, the higher pool elevation of 1584 ft. MSL does not flood recreation areas (campsites, picnic areas, etc.) in a detrimental way. Forest Service often has to collect debris after a flood has been released. The slower release would keep some debris floating longer in the lake area inundated between 1584 and 1582 feet MSL. Whether this will deposit more debris on the lake shore in this area is impossible to predict. This longer inundation of the area between elevations 1584 and 1582 feet should not cause more debris to be deposited by that flooded area. The Forest Service should observe the effect of the reduced flood release and consult with the applicant, if the reduced flood release causes more debris deposition on the lake shore.

There should be no other effects on lake recreation than the slowed flood release in winter and spring. For the period when no flood release is occuring (in winter), the lake will be operated as it is presently.

Effect on the Tailwater Recreation -- The downstream recreation users for fishing, boating and swimming should not know there is a hydroelectric project present. The outflow, temperature and DO will be the same. The single exception to this is that during a reduced flood release in winter and spring the high flow flood release would occur for a shorter period and 350 cfs would be released for a longer period.

The temperature and DO of the tailwater will not be changed by the proposed project since releases will be from the same elevation in the lake as presently. This is discussed in the water quality section. The summer releases will always be from the same level of the lake

as is done presently through the water quality ports to assure a 60° F temperature in the release.

There may be some fish passage through the turbines during generation. Passage through the turbine may cause wounding and mortality to passing fish. This is expected to be a minimal effect, because the intakes for power are deep enough in the lake that few fish are at that level. Also trash racks and low velocity will minimize fish entrance into the module.

At higher flows (> 350 cfs), the power plant will either not be generating or will be bypassed by most of the flow (> 350 cfs release). For instance, if the flood release is 1000 cfs, only 350 cfs (turbine flow limit) will pass through the turbine. The excess flow above 350 cfs will pass through the water quality outlet in the tunnel or the large (service) gate without the module.

The applicant does not propose to add any recreation facilities at Gathright Dam or downstream.

There will not be any disruption of recreation at the dam during construction. The generating unit and module will come to the site built and be assembled and installed.

Land use in the Project area will not be affected by the addition of the power Project, because only the intake tower and top of the dam is directly affected by the presence of the module and substation. As explained in the Geology and Soils section, river flow will not change with the power project, so bank erosion will be avoided.

The new transmission line will be built over an existing line for most of the 2-mile route, so it will not impact land use. The area under the transmission line can be used for agriculture, if desired by the owner. The first half mile of the transmission line will be new; it could be on poles or buried. The area of new line will be cleared; the cleared area will be about 2 acres. As stated above, wetlands areas will not be impacted.

Aesthetic Resources

The area surrounding the Project site is rural, rolling, agricultural land with wooded hills bounding both sides of the river valley. In addition to the wooded hills and rolling farmland, the Jackson River, with its unique scenic attributes, significantly contributes to the visual quality of the Project area. The massive dam structure interrupts the continuity of the river at the Project site and disrupts the natural character of the river landscape. This structure is necessary for control of the river flow and storage of floods.

The generating facilities in the module and the module structure will not be visible to the public except for the short period (2%) when the module is raised. Otherwise, the hoist frame will be visible on top of the intake tower at elevation 1615 feet, about 65 feet below the top of the module. However, the rest of the module will be underwater and not visible.

Likewise, the design features of the Applicant's proposed transmission line and switchyard facilities would contrast with the dominant visual elements of the surrounding landscape,

which is forest. See Figures 13 and 14 for views of the transmission line route on the west and east side of the Jackson River. These figures show the existing BARC line that will be overbuilt by the new line, especially on the east side of the Jackson River.

Figure 12 shows the picturesque scenery along the Jackson River downstream of the dam. This crossing is close to the Johnson Spring and the access site for fishing and canoeing named Johnson Springs. Figure 7 shows the intake tower, where the module will be installed.

Potential Impact on Aesthetic Resources

There will be little construction equipment, construction laydown and vehicle parking areas. This is because most of the equipment will come to the site assembled and will be installed with a crane. This temporary inconvenience would last about a year.

The above-water portion of the proposed module is negligible and would not significantly alter views of the intake tower, dam and river, it would not cause any greater level of visual impairment than the existing dam, because (i) it is located immediately adjacent to the dam's spillway section, resulting in a more visually unified appearance; (ii) it has a simple architectural style; and (iii) although large, it would still be in scale with the existing dam. The generation module on the intake tower will cause no distinct visual impact compared to the intake tower. Most of the generation module will be below the lake surface and on the upstream side of the intake tower. The profile of the generation module will be below the profile of the intake tower.

The Project features will be built next to existing features that are similar. Although they do not add beauty to the area, they do not detract further because they are beside similar large existing structures.

The transmission line will pass through forest, over unoccupied fields and be built over an existing line. The transmission line will not be within 200 feet of any house; this reduces aesthetic impact and should avoid any radiation concern from the transmission line.

There will be no need to landfill trash that is removed from the trash racks, because none is expected to be removed.

Moderate, long-term, adverse aesthetic effects could result from the Project's structural additions and site modifications.

Cultural Resources

The project will have no impact on any sites listed in the National Register of Historic Places. There are no sites in the project vicinity listed in the National Register of Historical Places; there is one site considered significant by the VA DHR. It is not impacted by the Project.

History

The general area has intermittent history of war from the French and Indian conflict of 1754, to Indian uprisings, to the Civil War. The first white settlement took place in 1746. Early immigrants came mainly from Pennsylvania and New York. A number of forts and blockhouses were built for protection against Indians. It is reported that many disastrous raids took place.

Much of the early activity within the region revolved about the many mineral springs to be found in both Virginia and West Virginia. Road development generally linked the various springs until, in the early 1800's, cross-mountain stage roads were constructed. This was also the era of the great Eastern canals. One, the famous James River-Kanawha Canal, was planned to reach Covington, but because of the railroads it never did.

The furnace at Longdale in Alleghany County supplied many of the cannon and cannonballs to the Confederacy and supposedly supplied iron for the Merrimack, the first ironclad warship. The mines of the Great Lakes region and the furnaces of Pittsburgh brought about the end of Virginia's iron industry.

Covington was designated as a town in 1819 following a sale of lots from 25 acres of land owned by Dr. James Merry and in 1833 was incorporated as a city by the Commonwealth. Before the subdivision of Dr. Merry's land and naming of the town by Acts of Assembly, contemporary records refer to this site as "Mouth of the Dunlap".

Before the formation of Alleghany County, property records and court services for the area were provided from Fincastle, the county seat of Botetourt County. As this involved a two day trip for recordation of deeds or any court business, the formation of the Town of Covington a few years earlier made it desirable and perhaps necessary to provide a nearby location for these services. By further Act of the General Assembly, passed February 15, 1822, the County of Alleghany was attached to the Chancery District Court centered at Lewisburg.

Since the Colonial period, the two-county area, in which the Gathright project is located, has changed names and boundaries several times. The present boundaries were fixed by the Virginia General Assembly in 1922.

From about 1790 to after 1825 the principal cash crop in this area was hemp. Hemp production was encouraged by the state with a bounty being paid from each unit delivered. Locally produced hemp was hauled by wagon to a rope factory in East Richmond. As ship stores accumulated, prices for hemp declined and agriculture shifted to grains, hay, and livestock. Early farmers of the area tried to be as self-sufficient as possible.

In the Civil War, Alleghany County furnished more soldiers to the Confederacy than it had voters. The County suffered greatly in the war due to its location and many years were required for recovery from the losses sustained. During the Civil War, the iron for the

Merrimac came from Longdale Furnace in the county. Regiments from Alleghany County were at the surrender at Appomattox.

Archeological Resources

In 1968 the National Park Service entered into an agreement with the Virginia Polytechnic Institute to survey the entire reservoir area for archeological data. Preliminary results indicate repeated Indian occupation of the reservoir area from early Archaic to late Woodland periods. A total of 32 sites have been located and recorded. Examination of skeletal remains and artifacts indicate that Indian cultural occupations were in existence some 500 to 600 years ago and possibly back as far as 4,000 years or more. A second archeological survey was initiated in the spring of 1972 under the auspices of the State Archeologist, and investigations were scheduled to continue through 1973. Work included extensive trenching of several of the aboriginal sites, which has produced numerous skeletal remains and artifacts related primarily to late Woodland occupation.

The VA DHR did an assessment of the vicinity of the Project near Gathright Dam, including the route of the transmission line. They found only one site that is of historic interest. It is the site of timber crib dam used in a logging operation in the early twentieth century. This site is in the Jackson River on an island about 1.5 miles downstream of the dam; it is outside of the Project Boundary and should not be impacted in any way by the Project. See letter in Appendix A. The applicant knows of no other sensitive historic resources in the immediate vicinity and none within the Project boundary.

Potential Impact on Cultural Resources

Due to the absence of National Register or eligible properties within the Project boundary and near the site, the proposed development is not expected to affect any such properties, either at the generating facilities or in the transmission line right-of-way.

The clearing for the transmission line will be minimal (~ 1-2 acres), because most of the line is built over an existing (cleared) right-of-way and line and is supported by single wooden poles. Only augered holes will be dug for new pole placement over the half mile of the 2-mile long route. These holes will be dug in the existing holes to place the pole deeper. Bare earth around these holes will be seeded with grass or other acceptable plant suitable to the area.

If the line is buried from the substation to its intersection with the existing BARC line, there will be earth disturbance to dig a trench about 3 feet wide and up to 6 feet deep to place the line. The right-of-way width will be considered further to determine if it can be less than 80 feet. Probably it can be reduced in width. Digging this trench for the transmission line would not impact any known historical sites. No bulldozers will be used for the small amount of tree-clearing.

No further archaeological investigations of the proposed right-of-way should be needed. If there are archaeological properties in or near the proposed transmission line right-of-

way, it is unlikely they would be affected by construction of the transmission line in the manner planned. Any suspected historical sites discovered during construction will be reported to the SHPO with further construction avoiding that area, if possible, or being delayed until resolution of the significance of the site is made.

The Indian Tribes that could attach cultural significance to the area of the Project are listed below in the Section on Tribal Resources. There are no known tribal resources or sites of historical significance near the Project. There are a few tribes that the Applicant has contacted that expressed continued interest in the Project plans, especially Cherokee and Shawnee. Only the Cherokee and Shawnee Tribes are expected to possibly have an interest in the Project area. The Applicant will continue to consult with these tribes about the Project plans.

Socio-economic Resources

Alleghany County, Virginia covers 450 square miles and had a population of 12,926 in 2000, an average of 28 people per square mile. The economy of Alleghany County is centered on agriculture, paper production and lumbering.

Alleghany County took its name from the mountain range in which it is located. It was formed by act of Virginia Legislature on January 5, 1822 from parts of Botetourt, Bath and Monroe counties. At that time Monroe was a Virginia county and remained so until the formation of West Virginia in May 1862 during the Civil War.

The county land is nearly 50% in National Forest. The County surrounds one city, Covington, which forms the principal center of population. Covington is excluded from the county population and area.

Covington, a city of the second class and the County seat, was named in honor of General Leonard Covington, hero of the war of 1812 and friend of James Madison and Thomas Jefferson. It had a 2000 population of 6,303 with a density of 1,111 per square mile. The median income for a household in the city was $30,325, and the median income for a family was $36,640. Males had a median income of $30,755 versus $20,316 for females. The per capita income for the city was $16,758. About 10.7% of families and 12.9% of the population were below the poverty line, including 16.1% of those under age 18 and 9.1% of those ages 65 or over.

The Town of Clifton Forge was originally called Williamson after the family which owned the land on which the town was located. However, in 1882 the Chesapeake and Ohio Railway Co. named its new depot there "Clifton Forge" and with the coming of the railroad it became not only a railroad junction, but a junction point. After this, growth was rapid and in 1906 it received a charter as an independent city. In July 2001, Clifton Forge reverted from a city to a town.

The Town of Iron Gate was predicted to be one of the biggest cities in the Commonwealth, but this did not happen. Iron Gate grew from the development of the iron industry, and in the late 1880's a tannery was opened. The tannery operated until 1951.

The biggest boost to industrial progress in the area was the decision in 1899 by the West Virginia Pulp and Paper Company to locate a mill at Covington. The coming of the pulp mill stimulated the development and growth of other industrial and commercial interests.

As of the census of 2000, there were 12,926 people, 5,149 households, and 3,866 families residing in the county. There were 5,812 housing units at an average density of 5/km² (13/sq mi). The racial makeup of the county was 96.35% White, 2.45% Black or African American, 0.21% Native American, 0.24% Asian, 0.02% Pacific Islander, 0.20% from other races, and 0.53% from two or more races. 0.36% of the population was Hispanic or Latino of any race.

There were 5,149 households out of which 29.9% had children under the age of 18 living with them, 63.2% were married couples living together, 8.1% had a female householder with no husband present, and 24.9% were non-families. 22.2% of all households were made up of individuals and 10.5% had someone living alone who was 65 years of age or older. The average household size was 2.46 and the average family size was 2.85.

The age distribution is 22.8% under the age of 18, 6.2% from 18 to 24, 26.8% from 25 to 44, 28.5% from 45 to 64, and 15.7%, who were 65 years of age or older. The median age was 41 years. For every 100 females, there were 99.60 males. For every 100 females age 18 and over, there were 95.30 males.

The economic history of the region was centered about the iron industry. Until 1900, the region was an important producer of iron products through its many mines and furnaces.

Agriculture is important in the watershed, especially livestock and livestock products. Since much of the land surface is forested, forest products account for about 20 percent of all agricultural products sold. Employment in agriculture and forestry has decreased in recent years with increased development. Manufacturing accounts for a large percentage of employment in the zone of influence about Gathright Dam. Industries with the largest employment are textiles, pulpwood and paper. Another significant industry is furniture and wood product manufacturing, which is represented by a number of small establishments.

The median income for a household in the county was $38,545, and the median income for a family was $45,843. Males had a median income of $35,120 versus $20,855 for females. The per capita income for the county was $19,635. About 4.9% of families and 7.1% of the population were below the poverty line, including 8.6% of those under age 18 and 10.8% of those ages 65 or over.

The Virginia counties of Highland, Bath, Alleghany, Botetourt, and Craig; the independent cities of Covington and Clifton Forge; and the entire West Virginia portion of the zone of

influence of the Gathright project are a part of Appalachia. Appalachia is a large area along the Appalachian Mountains; its boundaries have been established by the Congress.

Tribal Resources

Until near the middle of the nineteenth century, Indian tribes roamed through and lived in Virginia. Along the Jackson River, there were numerous settlements. Although there are no reservations or large Indian population centers near the Project, descendants of the former Indian residents remain interested in historical artifacts that might provide information on Indian presence. This interest includes burial sites, old village sites, etc. In 2000, American Indian descendants comprised 0.24% of the population in Alleghany County.

The Applicant asked the VA SHPO (VA DHR) about Indian tribes that might be interested in the vicinity of the Project. The applicant contacted the Cherokee and Shawnee, explained generally the Applicant's plans for the Project and asked if they would be interested in further contact during consultation and if they knew of other tribes that might be interested. Only one tribe indicated they would not be interested in further consultation. Consultation with the Cherokee and Shawnee tribes is active and will continue through the licensing process. In preliminary contact, no tribes indicated specific concerns or study requests; they stated general concerns and statements of interest for the area and a wish to be included in any further consultation.

The absence of any listed historic properties near the Gathright Dam means that there are no known tribal resources near the Project area. Accordingly, there are no known potential Project impacts that might adversely affect any tribal resources.

River Basin Description

Most of the Jackson River Basin is located in Virginia within the northeast portion of the greater James River Watershed. The Jackson Basin lies along the eastern foothills of the Alleghany Mountains principally in Highland, Bath, and Alleghany Counties, Virginia. Smaller portions are in Botetourt and Craig Counties, Virginia, and Monroe County, West Virginia.

The portion of the watershed from Covington north-eastward to the upper end of the watershed is generally forested and in mountainous terrain, which consists of parallel valleys and ridges varying in elevation up to 4,000 feet above mean sea level (ft. MSL). The remainder of the watershed, southwest and south of Covington, is somewhat less mountainous and contains more open and urbanized areas.

From its source, in north-central Highland County, the Jackson River flows for a distance of 90 miles to its mouth near the village of Lick Run. Here, it is joined by the Cowpasture River to form the James River. From the mouth of Back Creek, the Jackson River falls some 600 feet in 55 miles to its mouth. Back Creek is a major

tributary of the Jackson and is upstream of Lake Moomaw. The Bath County Pumped Storage Project is located on Back Creek several miles upstream of the lake.

About midway along the river course, or just south of the Alleghany-Bath County line, the river flows eastward for about three miles, one and one-half miles of which is through a rugged canyon called Kincaid Gorge, generally referred to as the Gorge. The site of Gathright Darn is in this gorge. Downstream from the Gorge, the river flows southward in more open countryside passing through Covington, then eastward until it joins the Cowpasture River.

The drainage area of the Jackson River at Gathright Dam is 345 square miles; the average annual flow is 440 cfs. This is based on the gage at the base of the dam, the Gathright Dam gage. Average, maximum and minimum monthly flows are shown in Table 7. At Covington, where water quality targets are met, the drainage area is about 450 square miles.

Gathright is the only flood storage dam in the James River Basin, which empties into the Chesapeake Bay. There are several fixed crest dams on the James River at Richmond and upstream.

This section summarizes, for each resource discussed above, 1) the potential impacts of Project construction and operation; 2) Applicant's proposed studies to further evaluate potential impacts; and 3) Applicant's preliminary proposed protection, mitigation and enhancement measures to avoid a significant negative impact. The Applicant is unaware of any comprehensive waterway plans or other resource management plans that are relevant to or in conflict with the proposed Project with regard to the resources discussed below. The Virginia Statewide Comprehensive Outdoor Recreation Plan is the "Virginia Outdoors Plan -- 2002" (ref. 8); this document was reviewed and is consistent with the recreation plans for the Project; see Recreation section.

1. Geology and Soils

No potential exists for bank erosion and soil slumping or sliding as a result of the Project. No subsurface work or excavation will be done as part of the project except possibly burying some of the transmission line. Along the transmission line route some erosion is conceivably possible, especially if the line is buried. Sediment release into the river and erosion along the bank should not happen, because flow will not change in the Project. The Applicant will avoid significant problems for this resource by:

(a) implementing a sediment and erosion control plan and a revegetation plan for the transmission line, and, where applicable, use erosion control measures similar to those presented in Virginia's Best Management Practices for Construction Activities; This is most important if part of the line is buried.
(b) minimizing clearing and protecting soils during and after construction of the 2-mile-long transmission line where poles are replaced by seeding bare areas around a new pole;
(c) minimizing the amount of the transmission line that will require clearing by overbuilding an existing line owned by BARC Cooperative.

If additional erosion or sediment control measures are necessary along the transmission line right-of-way, the Applicant will consult with the VA Deparment of Environmental Quality and Natural Resources Conservation Service (formerly SCS) to take corrective actions.

2. Water Quality and Flow

Water released from the powerhouse may potentially violate Virginia Standards for Water Quality with regard to dissolved oxygen (DO) concentration and other standards such as pollutant and sediment release. These potential water quality problems will be avoided by withdrawing water from the elevation and in the same amount as is done presently. No excavation will occur during construction that could cause sediment release.

The Applicant will duplicate the present withdrawal elevation of water from the lake by the intake features of the module, as explained in the equipment section. This action will duplicate temperature and DO in the release from the dam. The flow will also be the same as is done presently with the minor exception of the reduced flood release in winter and spring as explained above. These actions should maintain present water quality in the lake and Jackson River. The reduced flood release will not significantly change flow released from the dam; it may keep the lake elevation close to El. 1584 ft. MSL, if inflow to the lake is substantial after a flood release. The applicant will simulate operation of the reduced flood release to examine how long the pool usually stays elevated during a reduced flood release.

The Applicant proposes to:

(a) minimize or avoid inorganic sediments and other pollutants from entering the river due to construction, operation, and maintenance of the Project by avoiding excavation or flow changes,
(b) withdraw water from the same level of the lake as is presently done to maintain DO and temperature criteria in the release,
(c) release the same flow as is presently released from the dam except during the latter part of a flood release in the winter and spring,
(d) comply with state water quality standards,
(e) withdraw water from the lake and release flow through the turbine as directed by the Corps of Engineers,
(f) establish a committee to review the reduced flood release, as explained in the section on Operation, on an annual basis to ensure that it is not adversely impacting present uses of the lake and river.

3. Fishery

The fishery could be impacted by entrainment leading to mortality of fish in the turbines or reduction in water quality. The Applicant proposes to design the trashrack to minimize entrainment of adult fish with a low velocity at the trashrack and suitable bar spacing. The applicant proposes to maintain present water quality as explained above.

To minimize operation-related impacts on the fishery at Gathright Dam, the Applicant proposes to:

(a) maintain present water quality downstream of the dam with regard to DO and temperature and to avoid inorganic sediments and other pollutants from entering the river,
(b) intake water from lower elevations of the lake, as is done presently, to minimize fish presence near the intakes,
(c) install trashracks with bar spacing (2.5“ or less) to keep large fish out of the turbines,
(d) minimize fish entrainment with a velocity at the trash racks of 2 feet per second or less.

4. Endangered Species

Two endangered or threatened species that are listed by federal and state agencies could be in the vicinity of the Project. The Project must avoid significant impacts to these species. These are a sensitive mussel and an endangered bat species. The endangered species listed by the federal government and the VA Department of Game and Inland Fisheries are shown in Table 6. Neither of these species is known to be present in the Project area, but they are in the vicinity, and the habitat is suitable for them. No other listed species should be present in the Project area and potentially affected. No further studies of endangered species are considered to be necessary. The actions listed below will be taken to avoid an impact regardless of the known presence of the endangered species.

The Applicant will implement operational methods and construction features to avoid or minimize any impact on endangered species in the Project area. The Applicant will:

(a) operate the Project in a run-of-river mode maintaining the water quality that is presently released by the Corps,
(b) not release sediment and pollutants into the river or increase temperature during construction and operation,
(c) cut trees only during winter months to avoid impacting bat roosting habitat,
(d) over build an existing transmission line with higher poles to avoid augering for new poles and clearing of additional right-of-way, and
(e) clear only about 2 acres for tree removal along the transmission line route.

The run-of-river operation with present water quality and avoiding sediment release will avoid impacts on mussels. Minimal clearing done only in the winter will avoid impacts to endangered bats. Most of the transmission line would overbuild an existing transmission line; the Applicant does not expect to do any clearing for most of the two-mile length of the line.

5. Terrestrial resources

Design and management methods along the transmission line could impact terrestrial resources, such as raptors and small mammals and birds.

The Applicant proposes the following actions to avoid adverse impacts to terrestrial resources:

(a) raptor-proof the new line on the proposed 2-mile-long overhead transmission line,
(b) maintain the transmission line right-of-way without using herbicides,
(c) revegetate bare areas from transmission line construction, and
(d) minimize clearing by overbuilding an existing transmission line for most of the route.

6. Aesthetic Resources and Land Management

Design of the powerhouse and land management practices, without implementation of the proposed actions, could adversely affect aesthetic and visual resources and could lead to reduction in recreational enjoyment of the Dam area.

The Applicant proposes the PM&Es and Project modifications to avoid any adverse impacts:

(a) place most of the generating equipment out of sight on the intake tower,
(b) plant bare areas near the powerhouse and along the transmission with grass or other acceptable vegetation where burying or bare spots occur,
(c) use single wood-pole structures and overbuild an existing transmission line to minimize the visual appearance,
(d) avoid herbicides and minimize clearing for the transmission line by choosing a route over an existing line for most of the route, and
(e) minimize visual intrusion of the transmission line by overbuilding an existing line.

7. Cultural resources

There are no known (listed) archaeological sites that could be affected by the Project area, so no studies or surveys are considered necessary. However, the Applicant must inform the appropriate authorities (SHPO and THPO) if burial or other sites are found during excavation and stop work in that area until a recovery plan is agreed upon.

The Applicant proposes to:

(a) construct the approximate 2-mile-long transmission line by overbuilding an existing line, using its right-of-way and single wood poles for most of the route,
(b) avoid clearing of most of the route by using an existing line and its right-of-way,
(c) cut trees where necessary (about 2 acres) with chainsaws and avoid excessive ground disturbance, and
(d) advise interested agencies and parties and stop work in the area if unknown archaeological sites or burials are found during construction.

8. Recreation

With implementation of Applicant's proposed project features, recreation in the Project area should not be adversely affected by construction and operation of the Project.

The Applicant proposes to:

(a) maintain water quality downstream to avoid any impact on the trout fishery,
(b) construct generating and transmission facilities away from recreation use sites, and
(c) implement reduced flood release in a way that avoids impacting recreation facilities.

Summary Of Contacts

The Applicant contacted numerous agencies to obtain current and updated data about the resources near the Gathright Dam. The applicant also discussed the Project plan and the similarity to existing operation of the dam. Below is a summary of contacts during the preparation of this document made with agencies and Indian tribes.

VA DGIF. Spoke with Paul Bugas and Larry Mohn several times about Project plan and operation and advised them that HMP planned to install trash racks with a velocity of 2 feet per second in front of the trash racks and 2.5 inches bar spacing. Requested and received recent information on fisheries. Met with them to discuss the Project. Also contacted Ray Fernald in the Richmond office about review of draft license documents.

Contacted Shirley Dressler and discussed our request for data on endangered species. Send her maps of the Project features. Susan Watson did a search of their database for relevant information on VA listed endangered species near the existing dam. The VA DGIF website provided much data on species that are listed by Virginia as endangered or of special interest.

VA Department of Historical Resources (SHPO). Spoke with Joanna Wilson, Roger Kirchen and Quatro Hubbard. Asked about expected cultural impacts and transmission line clearing. Sent maps of the proposed Project features and description of the plan with a request for an Archives Search by VA DHR. Requested information on Indian Tribes with possible interest in the Project. Learned that we should receive historical review from DHR, which we did, before requesting SHPO's clearance.

U.S. Army, Corps of Engineers. Spoke and met with Owen Reece, Bill Witt and Mark Hudgins about Project operation, installation, equipment and similarity to the plan at Jordan and Colebrook Dams. Received recent water quality data, intake tower and other dam drawings, etc. Made a site visit with those individuals to discuss the Project and visit the existing facilities.

Indian Tribes. Called Eastern Cherokee Band, Eastern Shawnee and Absentee Shawnee tribes but received no response from Eastern Cherokee. Also tried to reach VA organization of Indian tribes, which appears to be coastal tribes; they have a web site but no telephone number. None of the agencies knew of tribes that had known sites or an interest in Gathright Dam. Spoke with Cherokee Nation in OK; they wish to have further contact. Keetoowah Band of Cherokee did not desire further contact. Spoke with Shawnee Tribe, and they wish further contact and felt that the other two Shawnee bands would also. They suggested the Tuscarora tribe in NY might be interested, but we were unable to contact them.

U.S. Fish and Wildlife Service. Contacted Sumalee Hoskin in the Gloucester, VA office and discussed features of Project. She agreed to send info on Endangered Species.

VA Department for Environmental Quality, Division of Water. Spoke about Project plans and asked about special information that should be in the license application. Discussed Water Quality Certificate for the Project, which Applicant must seek during license application preparation.

U.S. Forest Service. Spoke several times to Sharon Mohney of James River District and Dawn Coulson of Warm Springs District. Received extensive information on recreation at the lake and dam. Discussed project features, especially reduced flood release rate in winter and spring and its potential effect on recreation. Met with them, the Corps of Engineers and VA DGIF at their office in Covington. Got additional contacts of stakeholder entities from Forest Service.

Stakeholder Groups. Spoke with Wesley Dew of American Bass Association of VA. He thought the Project had little impact and would work well with current recreation activity at the lake and downstream. He indicated he fished downstream and in the Lake, but mainly in the Lake.

Spoke with Tad Roberston, president of Covington Chapter of the Izaak Walton League. We discussed the simple plan at Gathright; he was concerned that a conventional powerhouse might be planned. He thought the proposed plan had little chance of interfering with present recreation use.

Spoke extensively with John Ross, Chairman of Trout Unlimited in VA. Answered his questions in an e-mail about the plan. We discussed the operating plan, but Ross did not think of any significant concerns at this time. He mentioned the Dydimos issue of alga in the Jackson River. He suggested that a committee of interested parties, such as DGIG, Corps, US FS, TU, etc. meet frequently to discuss the effect of the reduced flood storage. Price agreed and included this proposal in this PAD.

Described the Project plan to Linda McDaniel, concessionaire of the marina in Lake Moomaw. She indicated she would like to review the draft documents. Price advised her to mention the project to any other lake users that might be interested.

REFERENCES

1. "Master Plan for Gathright Dam" Design Memo 14, prepared for U.S. Army, Corps of Engineers, February 1972.

2. Owen Reece, U. S. Amy Corps of Engineers, Private Communication.

3. "Periodic Inspection Brochure No. 1, Gathright Dam", U. S. Army, Corps of Engineers, Norfolk District, October 1978.

4. Larry Mohn and Paul Bugas. Fishery Biologists, Virginia Department of Game and Inland Fishery. Private Communication.

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Table 1 Recreation Facilities Around Lake Moomaw

Developed Recreation Facilities (U. S. Forest Service Information)

Recreation Sites											
Coles Mtn. Picnic Area	●	-	●	●	●	●	●	-	-	F, C	-
Fortney Branch Marina	L	-	-	●	●	●	●	-	-	V, F	-
Longdale	-	-	●	-	●	●	●	-	-	F, C	-
Morris Hill Campground	-	F	●	-	●	-	-	-	●	C	●
Visitor Center	-	-	●	-	-	●	-	-	-	C	-
Blowing Springs	-	●	●	●	●	●	-	-	●	*V*	●
Bolar Mtn Campground 1	*A*	*F*	●	●	●	-	●	-	●	*C*	●
Bolar Mtn Campground 2	*A*	*F*	●	●	●	-	●	-	●	*C*	●
Bolar Mtn Campground 3	*A*	*F*	●	●	●	-	●	-	●	*C*	●
Bolar Flat Marina	*L*	-	-	●	●	-	-	-	-	*C*	-
Bolar Flat Picnic Area	-	-	●	●	●	●	-	-	-	*C*	-
Bolar Mtn Beach	-	*F*	●	●	●	-	●	-	-	*C*	-
Bolar Mtn Picnic Area 1	-	-	●	●	●	●	-	-	-	*C*	-
Bolar Mtn Picnic Area 2	-	-	●	●	●	●	-	-	-	*C*	-
Bubbling Springs	-	●	●	-	-	●	-	-	-	*V*	-
Hidden Valley	-	*F*	●	●	●	●	-	-	●	*V*	●
Locust Springs	-	●	●	●	●	●	-	-	-	*V*	-

F= Fee Area C= Flush Toilets: Vault Toilets L= Launch Ramp A=Carry Down Access ● = Available

Source: U.S. Forest Service, 2007

Table 2 Average Water Quality Downstream of Gathright Dam

	DO (mg/l)	Temp (℃)	Flow (cfs)	Spec Cond (uS/cm)
Jan	12	5	234	151
Feb	12	5	470	144
Mar	12	6	738	134
Apr	11	9	589	129
May	10	13	423	130
Jun	9	14	286	131
Jul	9	15	292	135
Aug	9	15	284	137
Sep	9	14	254	141
Oct	9	14	187	141
Nov	10	12	157	149
Dec	10	9	152	152

USGS Gage 02011800 JACKSON RIVER Below GATHRIGHT DAM

Latitude 37°56'54", Longitude 79°56'58" NAD27
Drainage area 345 square miles

Gage datum 1,400.00 feet above sea level NGVD29

Mean of daily mean values for each day from 1996-10-01 to 2001-09-30

uS/cm = microsiemens per centimeter at 25 °C

TABLE 3

List of Fishes in Lake Moomaw

Gamefish:

Brook trout

Brown trout

McConaughy Rainbow trout (lake-run strain)

Smallmouth bass

Largemouth bass

Rock bass

Black Crappie

Bluegill

Redbreast sunfish

Redear sunfish

Pumpkinseed

Channel catfish

Chain pickerel

Forage fish:

Alewife

Blueback herring

Various species of minnows

Other:

Fallfish

Yellow bullhead Catfish

Yellow Perch

Table 4. Type of Tree Growth in Project Area

Area borderimg Jackson River	**Slopes between river** zone and up1and forest	**Heavily wooded** upland forest
Eastern hemlock Red maple Flowering dogwood **Hickories** White & chestnut oak Tulip poplar American hornbeam Sycamore American beech **Black walnut** **Black locust** **Black willow** Slippery Elm Alder	Eastern hemlock Red maple Flowering dogwood Hickories White & chestnut oak Tulip poplar American hornbeam Sycamore American beech **Black walnut** **Black locust** Pines Redbud **Northern red oak** Serviceberry Black gum Sweet birch Wild black cherry Sugar maple Sassafras Sumac Cedar	Eastern hemlock Red maple Flowering dogvood **Hickories** White & chestnut oak Tulip poplar American hornbeam Pines Redbud Northern Red Oak **Serviceberry** Black gum Sweet birch

Table 5 Representative Wildlife Species
Gathright Project Area

Type	Species
Small and upland game	Cottontail rabbit
	Gray squirrel
	Raccoon
	Bobwhite quail
	Mourning dove
	Ruffed grouse
Big game	Whitetail deer
	Wild turkey
	Black bear
Furbearers	Beaver
	Mink
	Muskrat
	Common skunk
Other	Gray fox
	Opossum
	Woodchuck
	Bobcat

Table 6 Federal and State Endangered Species in Lake Moomaw Area

The following data was collected from the VA DGIF Website on Sept. 23, 2007

Known or likely to occur within a 3 mile radius of Lake Moomaw (reservoir)
in Alleghany County, Bath County, VA

Status	Tier	Common Name	Scientific Name
FESE	I	Bat, Indiana	Myotis sodalis
FESE	II	Bat, Virginia big-eared	Corynorhinus townsendii virginianus
FSSE	I	Wren, Bewick's	Thryomanes bewickii
FSSE	I	Coil, shaggy	Helicodiscus diadema
FSSE	II	Shrew, American water	Sorex palustris
FSSE	II	Vole, rock	Microtus chrotorrhinus

FE= Federal Endangered SE= State Endangered FS = Federal Special Concern

VA Wildlife Action Plan: Tier I Critical Conservation Needed; Tier II Very High Conservation Needed

The above list differs from information provided by VA Department of Conservation and Recreation, which only identified the Indiana Bat as Endangered. It also differs from the assessment by U.S. Forest Service in Reference 12, which identifies Indiana Bat as the only federally endangered species in the vicinity and yellow lance mussel as the only federally sensitive species in the project area.

Table 7 Mean Monthly Flow

Based on data from USGS gage 02011800 on Jackson River downstream of Gathright Dam, 1982 to 2007. Drainage area is 345 square miles.

Month	Min Flow (cfs)	Average Release (cfs)	Max Flow (cfs)	Required at Covington
Jan	115	451	6790	158
Feb	112	588	6280	168
Mar	115	824	5980	171
Apr	123	720	7630	194
May	199	602	5590	231
Jun	154	436	5150	269
Jul	226	292	1070	283
Aug	188	294	5180	278
Sep	148	278	3510	245
Oct	133	208	2350	188
Nov	115	333	8670	161
Dec	115	334	5510	158
Average		444		