**SCOTT’S MILL HYDROPOWER PROJECT**

**AGREEMENT in PRINCIPLE**

1.0 Introduction

* 1. Scott’s Mill Hydro, LLC proposes to construct a hydropower facility at the Scott’s Mill Dam site on the James River in Lynchburg, Virginia and agrees to certain conditions and structures at the new hydropower facility in this Agreement in Principal (AIP) with the Virginia Department of Game and Inland Fisheries (VDGIF) and the U.S. Fish and Wildlife Service (USFWS) (collectively referred to as the Parties). This document serves the purpose to guide the Parties to their mutual goals based on the design plans as in the License Application and describes the process for corrective actions, if needed, to reach agreement between the Parties following project construction. The AIP will be signed by the Parties and could accompany a License Application filed with the Federal Energy Regulatory Commission.
  2. The topics for this document cover:

1. Fish Passage
2. Fish Passage: Upstream and Operations
3. Fish Passage: Downstream and Operations
4. Minimum Flow Requirements (Veil Height)
5. Water Quality Standards

7.0 Recreational Enhancements

2.0 Fish Passage

2.1 Scott’s Mill Hydro, LLC (the Project) has agreed to provide upstream and downstream passage of American Eel and Sea Lamprey. The Parties agree to work cooperatively to plan, design and monitor the Project. The goal for fish passage is to achieve safe, timely, and effective fish passage and have an economically viable project. The Parties are willing to assist with the development and review of the computational fluid dynamics model and any necessary adjustments to operation to save time and money during the process. USFWS fish passage engineers will also assist with the initial fish passage design development and review. Various attributes of the newly constructed project will need to be evaluated that include:

1. Computational Fluid Dynamics Modeling (CFD)
   1. All Flow Conditions
2. Fish Passage Design Aspects
3. Turbine Operations
4. Turbine Fish Passage Survival
5. Water Quantity and Quality Conditions

2.2 The Parties will coordinate on the design and implementation of the monitoring for upstream and downstream passage to meet performance criteria. American Eel are expected to be fully successful at passing upstream in the new eelway and downstream through a downstream pathway in the powerhouse similar to a previously tested method on the west coast for safe passage past the turbines and other structures. In addition, maintenance and operational protocols for the new project should be developed and documented with annual reporting to VDGIF and USFWS.

1. Fish Passage: Upstream and Operations

3.1 USFWS and VDGIF requested immediate fish passage for American Eel and Sea Lamprey, and future passage consideration for resident and anadromous fish species. During the construction of the powerhouse; upstream fish passage for American Eel and Sea Lamprey will be constructed on both sides of the James River at the Scotts Mill Dam. During the design and construction of the hydropower facility, the Parties should consider a future passage structure for resident and anadromous fish passage at the Project. The design of these facilities should be closely coordinated with the Parties.

3.2 The farthest downstream unit should have the capability to operate between flows of 200 and 500 cfs, whereas all other units could be fixed blade units operating at about 500 cfs. When flows increase above the hydraulic capacity of the powerhouse and fish passage facility (i.e., 4500 cfs), excess flow may be passed over the dam and through the spillways.

3.3 The Parties need to confirm that safe, timely and effective upstream fish passage is achieved at the Project with a 95% passage efficiency rate required for upstream passage of eel within close proximity to the eelway. The Parties agree to cooperate on a plan to adjust attraction flow, orientation of fish passage entrance or other modifications necessary to improve the conditions of fish passage structures to meet, or periodically approximate >90% of the performance criteria during 2 years of efficiency testing using radio telemetry or netting of marked eels; and later with a permanently installed eel counting device for long term monitoring.

3.4 In the longer term, the Project will coordinate with the USFWS and VDGIF (Agencies) to install upstream passage facilities for resident and anadromous fish species. It is possible that the time frame for this effort will take place within the first ten years of operations. Should American Shad reach Scott’s Mill earlier than 10 years after commencement of project operation, upstream passage will be implemented immediately. Additionally, VDGIF annually samples the James River at multiple locations downstream from the Project in the fall. If juvenile American Shad are found in these samples, that will serve as an indicator that these fish are present up to the Project, and should result in the upstream passage implementation. Juvenile American Shad are recorded as far upstream as Cartersville, VA, but this is still a considerable distance downstream of Scotts Mill Dam. The VDGIF sampling site at Scottsville, VA is about 110 km downstream from Scott’s Mill, and the Agencies agree that if juveniles are captured anywhere from Scottsville or upstream, then we believe it is a reasonable conclusion that American Shad passage is necessary at Scott’s Mill Dam.

Should one or more juvenile American Shad be sampled at or upstream of Scottsville, the parties will consult on the need for and timing of upstream passage. This may trigger additional sampling. If 12 or more juveniles (either in one year or in smaller numbers over 3-4 years) or adults are observed, that should trigger fish passage.

It is envisioned that a longer-term plan for upstream passage may use turbine flows to attract fish to the fishway entrance. It is also envisioned that a nature-like fishway using the Waterworks Canal will be given full consideration as well as other options for upstream passage. The entrance for upstream passage may be immediately downstream of the powerhouse facility and will require CFD modeling with turbine operations to determine the optimal location of the entrance for the upstream passage facility.

1. Fish Passage: Downstream and Operations

4.1 The Project plans focus the river hydraulic conditions from the downstream portion of Daniels Island to the powerhouse, so most of the water for power generation comes from the mainstem of the James River (looking downstream, river left) and flows into the powerhouse headpond just downstream of the arch section of the Scott’s Mill Dam (river right). The Project will remove most of the arch section of Scott’s Mill Dam leaving only the bottom layer of stones. This will result in a proposed flow velocity of about 2 feet per second (+ 25%) adjacent to operating turbines during the various combinations of powerhouse generation (i.e., 400-4500 cfs) from the arch section and into the headpond. In the event the CFD modeling fails to meet the performance criteria, the Parties will work cooperatively to develop a plan to adjust the flow, operations and all available techniques to meet the fish passage performance criteria.

4.2 The Parties need to confirm that safe, timely and effective downstream fish passage is achieved at the Project with at least a 95% survival rate requirement for downstream passage. The Parties agree to cooperatively develop a plan to adjust attraction flow, orientation of fish passage entrance or other modifications necessary to improve the conditions of fish passage structures to meet the performance criteria with survival testing through both the turbines and spill gate. The preferred method for evaluation is radio telemetry and netting with latent mortality testing for 48 hours.

4.3 The Project will include a downstream fish passage facility at the downstream end of the powerhouse. Modeling will be used to show if the fish passage criteria can be met with the results of the CFD modeling used to design a flow rate near the USFWS flow criteria (+25%). At the upstream end of the head pond and fish passage area, flow intake velocities will be modeled to achieve 2 feet per second (+ 25%) adjacent to operating turbines during the various combinations of powerhouse generation (i.e., 400-4500 cfs). Fish will be guided to an inclined ramp that will be evaluated with the CFD model to determine suitable flow velocities. A weir gate will be installed to pass the required cfs and designed to vary flows so it can be used to meet the fish passage criteria. The required bypass flows will be determined with CFD modeling and evaluated with live fish or suitable surrogate. Fish can be conveyed at 25 feet per second or less within the open channel flume or conduit to meet the performance criteria. The Parties will consider all available techniques and work cooperatively to determine what flow adjustments are needed for the Project to adjust the flow regime to meet performance criteria.

4.4 The maximum intake velocity at each turbine and through the trashracks is proposed at 2 feet per second (+ 25%) during the various combinations of powerhouse generation (i.e., 400-4500 cfs). Louvers will be installed in the trashracks. The spacing between the louvers will be a maximum of 3 inches. All aspects of fish passage will be verified through CFD modeling and fish passage turbine survival testing as part of the Project start-up evaluation.

1. Minimum Flow Requirements

5.1 The depth of the veil will need to be calibrated once the powerhouse is operating. The Parties expect the height of the veil will be at least one inch or higher based upon the results of the flow dynamic and State of Virginia water quality standards. Given that the flow dynamics below Scotts Mill Dam will likely change significantly with the installation and operation of the powerhouse, the Parties agree to undertake a cooperative adaptive management approach to determining an appropriate amount of flow over the dam (i.e., veil height). This approach will combine a wetted perimeter study with a demonstration flow assessment involving the Parties in order to ascertain a flow regime appropriate for maintaining aquatic habitat downstream of the dam. The goal of this flow regime will be to maintain 90% of current habitat conditions (wetted perimeter) while also providing suitable habitat quality based upon best professional judgement (demonstration flow assessment) This work will commence as soon as the powerhouse is operational, and all Parties will participate in the design and implementation of these studies.

1. Water Quality Standard
   1. The installation and operation of the powerhouse has the potential to alter water quality below Scotts Mill Dam in ways that cannot be predicted. These potential alterations are most likely to occur under low flow conditions. Thus, the Parties agree to undertake a limited water quality study (focusing on changes in temperature and dissolved oxygen) under low flow conditions once the powerhouse is operational. The study will compare ambient (upstream) temperature and dissolved oxygen with downstream conditions during normal operations at 90% (+/- 5%) exceedance flows. The Parties agree that water quality alterations of < 0.5 C and < 0.5 ppm are acceptable goals. The Parties also agree to cooperate on the design and implementation of the water quality study. Should the water quality study reveal unacceptable changes in temperature or dissolved oxygen, the Parties agree to utilize an adaptive management approach to rectifying these water quality issues via operational changes, specifically increasing the amount of water passing over the dam or other options that can be mutually agreed upon.
2. Recreational Enhancements

7.1 Currently, no developed recreational facilities are available to the public within the project footprint, so the Parties agree to develop the following recreational access facilities:

1. Boating access facility in the Scotts Mill Dam pool – this will entail a hardened ramp suitable for use by trailer-launched boats, adequate parking to meet the demand, and suitable signage.
2. Bank fishing access below Scotts Mill Dam – this will entail a pier, platform, or walkway below the dam, adequate parking to meet user demands, and suitable signage.
3. Canoe/kayak portage around Scotts Mill Dam – this will entail suitable egress/ingress points, a developed walkway over/around the dam, and suitable signage.

The Parties will cooperatively determine the location and design of these facilities. Construction and maintenance will be the responsibility of Scotts Mill LLC, with consultation among all Parties.