**SCOTT’S MILL HYDROELECTRIC PROJECT (FERC No. 14425)**

**STUDY PLAN COMMENT RESPONSES**

**VIRGINIA DEPARTMENT OF GAME AND INLAND FISHERIES**

**Study 1- Water Level Assessment**

Liberty University (LU) proposes to locate staff gauges on the left side of the river, immediately upstream and approximately 100 feet downstream of Scott’s Mill dam, and on the right side approximately 50 to 100 feet upstream and downstream of the dam. Two four-foot high gauges will be placed on the left side of the river (north side) on the bank. The bottom elevation of the gauge will be approximately dam crest height in order to capture water levels at the lowest flows and moderately high discharges. The downstream gauge will be similarly placed on the left bank so that the zero point captures the water level during the low summer flows.

Two gauges will be placed on the right bank or on the south side of Daniel Island about 50 feet upstream of the proposed powerhouse location. One gauge will have the zero point at about the dam crest elevation to measure low summer flows. The second 4-foot high gauge will be placed higher on the bank with the zero point just below the four-foot level of the first gauge to provide a continuous record of water levels over about an 8-foor range. This will cover water levels from very low flows to flood flows.

The two downstream gauges will be placed on the right bank downstream of the powerhouse in the vicinity of the tailrace. There will be a similar overlap in gauges heights to span about an 8-foot range in tailwater levels.

The gauges will be surveyed to provide relative water level differences among all gauges and the dam crest elevation.

The gauges will be read manually. The date/hour will be recorded so the data can be correlated with the Holcomb Rock gauge. The goal of this study is to take sufficient readings under various flow conditions to span water levels from flood conditions to low water.

The water levels will be used to verify the coefficient of discharge for the dam. Assuming that sufficient flow ranges are measured, LU will be able to accurately predict upstream and downstream water levels for Holcomb Rock flows.

Periodic measurements of the gauge located near the 7th Street Boat Ramp will also be taken to assist in the overall understanding of streamflow downstream of Scott’s Mill Dam.

To assess post project conditions, LU will consider both flashboard and no-flashboard conditions. For the no-flashboard conditions, LU will be able to manage water levels at the dam crest height until the maximum hydraulic capacity of the turbines is reached (i.e., about 4,500 cfs). For flows above 4,500 cfs, water levels will be a function of the weir equation developed for existing conditions, less the flow that is discharged through the powerhouse. LU will look at the downstream bathymetry and channel hydraulics to estimate backwater conditions on the left side of the river. LU will then be able to determine if some water should be diverted to the left side of the river or if some water should be discharged over the dam to protect water quality and aquatic habitat.

For flashboard conditions, the weir coefficient will be replaced by the discharge coefficient for the proposed flashboards. These coefficients will be obtained from manufacturer data as that information is routinely provided. LU will be able to manage upstream water levels up to the hydraulic capacity of the powerhouse. Above that flow, water will flow over the flashboards. LU’s proposed operations will dictate what the water levels will be up to the hydraulic capacity of the turbines. LU will calculate upstream water levels for flow conditions that exceed the hydraulic capacity of the turbines.

**Study 2 – Bathymetric Survey**

Our sense is that flow patterns upstream near Reusens dam will be dictated by how flow is released over the dam and/or through the turbines. Our initial assessment was that flow patterns upstream of Scott’s Mill would be influenced by powerhouse/spillway releases upstream to just upstream of Woodruff Island. Flow patterns may be a little more complicated if flashboards are installed. Because of the uncertainty of flow patterns at this stage since we do not have the bathymetry, LU agrees to expand the bathymetry effort to Reusens Dam. LU concurs with VDGIF to extend the downstream bathymetry to the mouth of Blackwater Creek.

**Study 3 – Water Quality**

LU agrees that there may be changes in DO and water temperature during low flow and high air temperature conditions. Under current conditions, reaeration of flow is expected downstream of Scott’s Mill even if DO is low immediately upstream. This may not be the case during project operations. LU agrees to monitor DO and water temperature at low flow higher temperature conditions upstream and downstream of Scott’s Mill Dam. LU will also measure water temperature downstream of Reusens Dam to measure DO degradation as flow moves downstream. LU estimates that it would take aseveral days for water to travel from Reusens Dam to Scott’s Mill Dam under existing low flow conditions. This time could be increased if flashboards are installed. Having this information will aide LU in determining potential mitigation measures should DO degrade during post-project conditions. As part of this study LU will investigate mitigation options to protect habitat from decreased DO and higher water temperatures during hot, low flow conditions. Such measures may include discharge of water over the spillway.

**4 – Sediment Analysis**

LU met with Virginia Department of Environmental Qualtiy on April 19. Based on that meeting it was determined that metals analysis of sediments is not warranted.

**Study 6 – Turbine Entrainment/Impingement**

LU will consult with VDGIF on the turbine entrainment study as the design is developed. The study will be deferred until more information on the design is available.

**Study 7 – Impacts to Aquatic Habitat**

LU has concerns that PHABSIM will not provide the requisite data to evaluate impact to aquatic habitat. To our knowledge PHABSIM does not have the ability to determine flow pattern changes. LU’s proposal is to assess changes in flow patterns and water quality to estimate habitat effects. Under normal flow conditions, LU expects that velocities upstream of the dam will be less than 1 foot per second (e.g., 3,000 cfs average flow divided by 800 foot width and 5 foot average depth). LU will be able to determine post project depth changes and intends to estimate velocity changes. As a check on velocity, LU proposes to collect velocity data during the bathymetry study at various locations in the impoundment and at two cross sections downstream of Scott’s Mill Dam. These velocity measurements can be used as a check on the flow pattern analysis.

**Study 8 – Fish Passage**

We agree that there is some vagueness in the fish passage study as we have not held discussions with the upstream dam owners. We propose to conduct this as an iterative study with VDGIF, USFWS and other parties that have an interest in fish passage. The first part would be to conduct the literature survey and better understand the current status of fish restoration and timing and initial plans for fish passage (e.g., pass American shad upstream of Scott’s Mill only or haul them upstream of Cushaw dam).

We defer to VDGIF on the restoration of habitat between Scott’s Mill and Cushaw Dam. We will work with VDGIF on an initial proposal to pass American eel and Sea Lamprey upstream of Scott’s Mill. Eel and lamprey passage can be incorporated into project construction. We will expand the study to include passage upstream and downstream of Scott’s Mill.

**Study 9 – Mussel Survey**

LU will expand the mussel survey to include the area from Reusens Dam to the mouth of Blackwater Creek.

**VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY**

**Study 1- Water Level Assessment**

LU concurs with DEQ’s recommendations for Study Plan 1. (See response to VDGIF.) LU will correlate the water levels with the Holcomb Rock gauge. LU will also capture water levels during low flow conditions. LU staff or Hurt and Proffitt staff will record water levels.

**Study 2 – Bathymetric Survey**

The bathymetric survey will be conducted by Luke Graham with local support. As a fishing guide, Mr. Graham routinely uses side scan sonar to monitor bathymetry. He is familiar with mapping water depths. LU plans to use a Humingbird Helix Series side scan sonar. LU will be able to distinguish between soft and hard sediments using this type of sonar. LU believes that side scan sonar will provide the needed results in a cost effective manner.

The map will be used in conjunction with upstream water levels to determine flow patterns. LU will use transects, water level differences, river slope, velocity patterns under existing conditions, and proposed project operations to estimate flow patterns. That information will be used to determine water temperature and DO effects.

**Study 3 – Water Quality**

LU concurs that the alternative project layouts should utilize study results. As appropriate, mitigation measures will be undertaken to minimize project effects.

LU anticipates that experienced technicians from Hurt and Proffitt will measure water quality parameters. Resumes will be provided to DEQ at DEQ’s request.

LU concurs that velocity measurements will be valuable in verifying existing flow patterns. Accordingly LU will take velocity measurements at a number of locations upstream of Scott’s Mill Dam and at two cross sections downstream. Because of the relative shallow depth of the river, LU proposes to take velocity measurements at 0.2 and 0.8 depths as that will provide a reasonable average velocity for that location.

LU will explain why this approach is sufficient. Should resource agencies determine that this approach yields insufficient accuracy, a numerical modeling approach could be undertaken. LU will have the necessary information to conduct such modeling with the bathymetry and water level data. Modelers should also be able to estimate Mannings n for the modeling analysis. LU believes that costly modeling is unwarranted because mitigation steps can be undertaken to minimize project effects including passing low flows over the Scott’s Mill Dam during low flow, warm conditions.

**Study 4 – Sediment Chemical Analysis**

During our April 19th meeting, LU discussed the sediment chemical analysis and procedures to minimize re-suspension of materials during construction. Study 4 has been modified accordingly.

**Study 5 – Fish Passage**

LU is proposing an iterative fish passage study approach (see response to VDGIF). We concur that trigger numbers should be developed later in the fish passage study process.

**Study 10 – Wetland Assessment6**

Hurt and Proffitt will work with VDEQ to obtain the jurisdictional wetlands information currently available. LU will modify the study plan to assess if there are rare or endangered species using the vernal pools on Daniel Island.

LU will discuss with VDEQ on how best to incorporate information from the licensing process into the Virginia Water Protection permit application.