WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES

Duke Energy Corporation
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February 1, 2024

Electronically Filed

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Filing of Initial Study Report Meeting Summary

Dear Acting Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current 50-year operating license for the Project expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

In accordance with 18 CFR §5.11(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024. As required by the ILP schedule, within 15 days of the ISR filing, Duke Energy held an ISR Meeting at Duke Energy's Wenwood Operations Center in Greenville, South Carolina from 9 AM to 5 PM on Wednesday, January 17, 2024. The meeting included a virtual (Microsoft Teams) option for remote participants.

Pursuant to 18 CFR §5.15(c)(3), Duke Energy hereby files for Commission and stakeholder review the ISR Meeting summary. The ISR Meeting presentation is included as an attachment to the ISR Meeting summary. Duke Energy is filing the ISR Meeting summary with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, Duke Energy is distributing this letter via U.S. mail. Parties interested in the relicensing process may obtain a copy of the ISR Meeting summary electronically through FERC's eLibrary system, or from Duke Energy's public relicensing website (https://badcreekpumpedstorage.com).

Duke Energy is not proposing any substantive modifications to ongoing studies or new studies based on discussion during or feedback on the ISR. As described in Section 1.1 of the ISR, Duke Energy has and will continue to consult with the relicensing Resource Committees voluntarily convened by Duke Energy to facilitate implementation of the relicensing studies and development of Duke Energy's relicensing proposal in the future draft and final license applications. Minor modifications to study methodology as noted in the ISR, primarily including expansions of methods or geographic scope to address specific stakeholder interests or requests relevant to the future environmental analyses that will be performed by FERC and other agencies, have been and will continue to be, as practicable, accommodated by Duke Energy in consultation with the Resource Committees.

The enclosed meeting summary highlights action items (for Duke Energy) that arose from discussions at the ISR meeting. This filing directly addresses several requests from the Commission staff at the ISR meeting, except those that will be provided to FERC by Duke Energy with the Updated Study Report (USR), which is scheduled for filing in January 2025:

- Updated spatial (GIS) data corresponding to study boundaries and proposed project facilities.
- Raw data from the Water Quality Study field data collection effort (Excel file to be filed along with the USR).
- Updates to the Environmental Justice Study Report to account for the most current Census data practicably available.

Duke Energy appreciates the participation of and looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

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Senior Project Manager
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Enclosures

cc (w/enclosures): Jeff Lineberger, Duke Energy
Garry Rice, Duke Energy

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Meeting Summary

Project:	Bad Creek Pumped Storage Project Relicensing (FERC Project No. 2740)
Subject:	Initial Study Report Meeting
Date:	Wednesday, January 17, 2024
Location:	Duke Energy Wenwood Operations Center, 425 Fairforest Way, Greenville, South Carolina and Teams Meeting (virtual option)

In-person Attendees

Alan Stuart (Duke Energy)
John Crutchfield (Duke Energy)
Scott Fletcher (Duke Energy)
Nick Wahl (Duke Energy)
Mike Abney (Duke Energy)
Maverick Raber (Duke Energy)
Ethan Pardue (Duke Energy)
Garry Rice (Duke Energy)
Christy Churchill (Duke Energy)
Jeff Lineberger (Duke Energy)
Kelly Kirven (Kleinschmidt Assoc)
Kevin Nebiolo, PhD. (Kleinschmidt Assoc)
Todd Branham (Long Cane Trails)
Sarah Kulpa (HDR)
Ty Ziegler (HDR)
Joe Dvorak (HDR)
Eric Mularski (HDR)
Jen Huff (HDR)
Kerry McCarney-Castle (HDR)
Erin Settevendemio (HDR)
Bill Green (Terracon)
Mills Dorn (Terracon)
Erika Hollis (Upstate Forever)
Chris Starker (Upstate Forever)
Phil Mitchell (Fisher Knob HOA)
Jennifer Kindel (SCDNR)
Austen Attaway (SCDNR)
Pat Cloninger (SCDNR)
Alex Pellet (SCDNR)
Dan Rankin (SCDNR)
Lynn Quattro (SCDNR)
Sue Williams (AQD)
Gerry Yantis (AQD)
Terry Keane (AQD)
Wes Cooler (Naturaland Trust)
Glenn Hilliard (Foothills Trail Conservancy)
Rowdy Harris (SCPRT)
Andy Douglas (SC Wildlife Federation/ Jocassee Lake Tours)

Virtual Attendees

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Sarah Salazar (FERC)
David Gandy (FERC)
Dustin Wilson (FERC)
Catherine Roberts (FERC)
Mike Spencer (FERC)
Melanie Olds (USFWS)
Bill Ranson (Foothills Trail Conservancy/ Professor Emeritus Furman Univ.)
Jeff Phillips (Greenville Water)
Amy Chastain (SCDNR)
Elizabeth Miller (SCDNR)
Kelly Schaeffer (Kleinschmidt Assoc)
Alison Jakupca (Kleinschmidt Assoc)
Andrew Gleason (Foothills Trail Conservancy)
Lynne Dunn (Duke Energy)

Introduction (9:00 am)

The Bad Creek Pumped Storage Project (Bad Creek) Initial Study Report (ISR) was filed with the Federal Energy Regulatory Commission (FERC) on January 4, 2024 – this meeting is being held to discuss the individual studies and study findings presented in the ISR and receive feedback from relicensing participants/stakeholders as well as FERC under the Integrated Licensing Process (ILP) 18 CFR §5.15.

Alan Stuart (Duke Energy Project Manager) opened the meeting, welcomed participants in the room and online, stated the meeting would be recorded, and provided an overview on meeting facility layout and emergency action responsibilities. He then stepped through the meeting agenda, facilitated participant introductions, and provided a safety moment (frostbite). Sarah Salazar (FERC Project Coordinator) requested that the list of meeting attendees be filed with the meeting summary. A. Stuart confirmed the list of attendees will be included with the filing.

Bill Ranson (via chat) requested a moment of silence in recognition of the passing of Malcolm Schaffer, a well-respected geologist, friend, and colleague who performed most of the geologic mapping and geotechnical investigations for the original Bad Creek Project as well as recent geotechnical feasibility studies for the proposed Bad Creek II Complex (Bad Creek II) while working for Duke Energy then HDR. The group held a moment of silence to honor his life and contributions.

A. Stuart provided a general summary of the project and an overview of specific Project-related components that have changed since filing of the revised study plan (RSP) on December 5, 2022.

1. Expanded Project Boundary

A. Stuart presented a slide showing the proposed expanded project boundary for the proposed second powerhouse Bad Creek Power Complex (Bad Creek II). The existing FERC project boundary is proposed to be expanded by approximately 210 acres to enclose Duke Energy-owned land necessary for construction and operation of the new project facilities and that could potentially be affected by spoil placement from materials excavated for the proposed project expansion.

- S. Salazar asked if Duke Energy could submit a GIS file of the proposed expanded project boundary. A. Stuart agreed. ACTION ITEM – Duke Energy to submit GIS files.
- Chris Starker asked if Duke Energy has ownership of all property in the transmission line corridor or only its rights-of-way, and if so, would lease agreements be needed for the expanded project. A. Stuart noted Duke Energy owns most of the land in-fee-simple, though there is an agreement in place with the George Family to secure five parcels of private land (under purchase option) consisting of approximately 2,100 acres (of which 88 acres is expected to be needed for the expanded transmission corridor). Other than the 88 acres needed, the powerlines will be located in the existing power lines' corridors. The general area of purchase option was highlighted in the Teams Meeting chat.

    - C. Starker asked for clarification that no other purchases would be necessary and that would be the only other land will be acquired for transmission lines. A. Stuart confirmed.
- Rowdy Harris indicated that property is managed as a Wildlife Management Area (WMA) and asked whether Duke Energy will use what they need (88 of the 2100 acres) and allow public access to the remaining portion of the properties. A. Stuart indicated that that is not known but is a possibility.

2. Additional Spoil Area

A. Stuart introduced an additional potential spoil area (Spoil Area J) that has been added since the filing of the RSP (it is an existing spoil area from original construction) and indicated Duke Energy is still evaluating which spoil areas to use for Bad Creek II spoil placement based on natural resources studies and minimizing impacts to those resources as practicable relative to the feasibility of expanded project construction.

3. Temporary Access Road/ Fisher Knob Access Road

A. Stuart described the potential new temporary access road to provide access for residents of the Fisher Knob community during construction of Bad Creek II (while Bad Creek Road is closed to the public). Fisher Knob Access Road will be a connector road extending from Whitewater River Road to the Fisher Knob Community. The road will be predominantly gravel, 3.7 miles long, and would only be maintained during construction. The road would be closed following project construction.

- S. Salazar asked Duke Energy for the GIS files with new proposed spoil area and Fisher Knob Access Road and any other updated GIS layers. A. Stuart noted Duke Energy will share with FERC and also place on the relicensing SharePoint Site for project stakeholders. ACTION ITEM – Duke Energy to submit GIS files.
- Phil Mitchell asked how long the temporary road would be in place and maintained. A. Stuart answered 6 to 7 years (for the duration of construction). P. Mitchell asked if Duke Energy plans on installing a gate from Whitewater River Road/ Rt 130. A. Stuart said while that level of detail hasn't been developed yet, it would be secured since it would provide alternate access to the construction/site.
- P. Mitchell asked where the turn off from Whitewater Road is located. A. Stuart indicated the location on the map and noted it is just above the entrance gate to Fisher Knob, near the Jersey barriers located along highway 130, and would extend south of the old laydown yard into Fisher Knob community (near the existing entrance gate). A. Stuart briefly noted there were two options for access roads and Duke Energy considered the one with the least impacts to streams and natural resources.
- Garry Rice asked for clarification on the length of the access road. (3.7 miles)
- Andrew Gleason asked, for trail maintenance reasons, would the Foothills Trail Conservancy (FTC) use the temporary access road to access Musterground Road site and is the plan to close hiking access during the construction period. A. Stuart noted the current plan is to close public access to Musterground Road because the entrance (parking) area will be part of the active construction site for 6 to 7 years.

- S. Salazar asked for a description of the Fisher Knob community. A Stuart noted it is a residential community with 22 houses (per P. Mitchell) in the community; four of those are rental homes and the rest are vacation homes. There is only one full-time resident (P. Mitchell). There are two new homes under construction for a total of 24 properties in the Fisher Knob Community.
- S. Salazar asked for confirmation that the justification for building the road is to provide access to the residents. A. Stuart noted yes, that is correct, as Duke Energy is concerned about construction traffic and the public sharing the same road. P. Mitchell added there is currently only one way off the peninsula (i.e., Bad Creek Road) and if Bad Creek Road would somehow fail or be impassable, there would be no way to access homes (residents or emergency services). Duke Energy agrees it is important to provide alternate access for homeowners and first responders, but also to minimize impacts to the extent feasible and reiterated the road will not be paved or permanent.
- P. Mitchell asked when Duke Energy anticipates closing Bad Creek Road. A. Stuart noted the access road would need to be developed and in place prior to Bad Creek II construction.
- E. Miller asked for confirmation that Musterground Road would be closed (to the public) for entire construction period (6-7 years). A. Stuart confirmed yes, access would be closed to through-traffic and recreation during construction period. There will be heavy construction traffic in that area due to proposed spoil location J and construction of the new powerhouse and switchyard in the area, therefore, due to safety reasons, Duke Energy plans to shut down access, and acknowledges this will be a temporary impact that needs to be considered in mitigation or enhancement plans for the new license.
- Pat Cloninger noted SCDNR owns land with lake access to Musterground Road. How would access be mitigated/how would DNR be able to access that site? A. Stuart said he was unaware there was access to the lake from Musterground Road and will need to discuss further with the SCDNR. However, A. Stuart noted that the concern is for public access and SCDNR should be able to maintain access in coordination with Duke Energy. ACTION ITEM – Duke Energy and SCDNR to further discuss.
- E. Miller stated that Duke Energy and SCDNR will also need to discuss SCDNR's prescribed burning schedule and management operations in the vicinity of Musterground Road. ACTION ITEM – Duke Energy and SCDNR to further discuss.
- Dan Rankin asked for confirmation that access to the Whitewater River Falls overlook and parking area would also be closed during the construction period. A. Stuart confirmed this is presently the plan and expectation.
- A. Stuart discussed the plan for temporary metal bridges crossing streams along the temporary access road to minimize impacts and added that Duke Energy has expanded relevant relicensing studies (change from RSP) to incorporate additional assessments for water, aquatic, visual, and cultural resources with potential to be impacted by the temporary access road. Additionally, work for Section 404/401 permitting has begun and will consider all potential impacts associated with the proposed temporary access road.

4. Increase in Hydraulic Capacity for Proposed Bad Creek II

A. Stuart noted the proposed maximum hydraulic capacity for Bad Creek II has changed since originally estimated in the Bad Creek II feasibility study for variable speed units, based on information provided by turbine manufacturers. There is a <2 percent difference (increase) in generation and an approximate 9 percent difference (increase) in pumping capacity than originally accounted for in design assumptions. Studies affected by this pumping change include the entrainment study and the CHEOPS study. Additionally, A. Stuart noted Duke Energy also plans to run model scenarios with a previously developed near-field CFD model to estimate the effects of increased pumping capacity (increased generation won't be considered due to marginal increase of <2 percent).

- Microsoft Teams Chat Conversation: S. Salazar asked SCDNR in their comments on the ISR for additional information regarding management goals for prescribed burning and typical frequency of controlled burns near Musterground Road. E. Miller replied SCDNR will need to discuss internally as this will be a 10-Year Plan.
- Erika Hollis asked for clarification that studies completed and included in the ISR did not take into consideration the recently revised generation/pumping capacities. A. Stuart confirmed.
- S. Salazar asked whether pumping/generation increases change the normal/maximum pool elevations for Bad Creek Reservoir or water fluctuation. A. Stuart stated that Duke Energy will continue to operate under the existing (160-foot) operating band for min elevation / max elevations (as defined by the existing license), but Bad Creek II will allow for faster water exchange between the upper and lower reservoirs.
- C. Starker asked whether additional studies (due to recently defined increases in pumping and generation) affect the relicensing timeline and whether there will be an updated ISR or additional studies. A. Stuart noted relevant reports would be updated and re-distributed (i.e., entrainment report is the only affected report that has been distributed thus far; CHEOPS report is not yet drafted and the CFD modelling will be a different effort from the original study under the Water Resources Task 3 report) to the resource committees. The relicensing timeline would not be affected. A. Stuart also stated that the updated reports and consultation with Resource Committees would be included with the Updated Study Report (USR) to be filed with FERC in January 2025. C. Starker asked if Duke Energy would like to see comments now, as well as on the revised report. A. Stuart encouraged submitting comments on the ISR now.
- S. Salazar stated a second season of studies is typical for relicensing through the ILP process; noted the table on page 43 of the ISR outlines the ILP milestones and encouraged stakeholders to refer to the schedule and be aware of milestones so opportunities aren't missed to submit comments and offered participants to reach out to her with process-related questions.

John Crutchfield introduced the individual studies and Duke Energy relicensing leads for each study and also stepped through the ILP Schedule, stating 2023 was the first year of studies and many update meetings were held throughout the year with various resource committees to

gather feedback and foster collaboration as part of the ILP process. Quarterly progress reports were also submitted per the ILP process in 2023.

He then turned the meeting over to Maverick Raber to begin the individual study discussions. The presentation is attached to this meeting summary.

Water Resources (10:00 am)

Task 1 – Existing Summary of Water Quality Data and Standards

M. Raber presented an overview of objectives, methods, and results of Task 1. Task 1 is complete and the final report was filed with the ISR.

- No comments/questions or discussion.

Task 2 – Water Quality Monitoring in the Whitewater River arm

M. Raber presented an overview of objectives, methods, and results of Task 2. A draft report including results of Study Year 1 was filed with the ISR; results of Study Year 2 will be shared with the resource committees and a synthesis of both years of data will be provided in the USR.

- No comments/questions or discussion.

Task 3 – Velocity Effects and Vertical Mixing in Lake Jocassee due to a Second Powerhouse

Joe Dvorak presented an overview of objectives, methods, and results of Task 3.

- C. Starker asked if the increased velocity (in Whitewater River cove flow over the expanded weir) is due to the increased pumping under Bad Creek II or if it is due to the extension of the weir. J. Dvorak noted it's a combination of both; expanding the weir doesn't have any impacts regarding mixing downstream under increased generation, however, it slightly accelerates flow across the top of the weir under maximum reservoir drawdown conditions, which haven't ever occurred.
- Wes Cooler asked what J. Dvorak's opinion on the cost-benefit of expanding the submerged weir. J. Dvorak stated that there are environmental and cost benefits regarding spoil placement and location of placement to consider; however, from a hydraulics standpoint, expanding the weir wouldn't have a significant effect either way. He noted Lake Jocassee has never been drawn down to minimum pond where changes in velocity magnitude would be most evident from the increased generation and pumping under the Bad Creek II scenarios modeled for the CFD studies.

Task 4 – Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS modeling)

Jen Huff presented an overview of objectives of Task 4, work done thus far, and changes to the existing CHEOPS model originally used for Keowee-Toxaway Project relicensing. Sue Williams

confirmed units of measurement. J. Huff stated work is ongoing and results will be shared with resource committees in Spring 2024.

- No comments/questions or discussion.

Task 5 – Future Water Quality Monitoring Plan

M. Raber stated Task 5 will begin this year (2024). Tasks 1-4 objectives were to assess current operations, while Task 5 will be carried out in coordination with resource committees and Section 404/401 permitting activities considering future activities. This task will be broader in scope and will incorporate potential spoil impacts.

- S. Salazar asked about the composition (size class and rock/mineral type) of the spoil materials that will be potentially placed. For example, concerning Spoil Location A on the downstream side of the weir and mixing on the downstream side of the weir, would that have implications for turbidity issues in the Whitewater River cove? (*Note – the word "backside" in reference to the weir was used in this comment; for clarity, significant vertical mixing in the Whitewater River cove is typically limited to the upstream side of the weir [the side closer to the Project], while there is very limited/localized mixing on the downstream side of the weir*). Also, would inherently low pH in the existing bedrock and weathered soils have implications for lowering pH in the water?
- M. Raber answered there is minor mixing (localized eddies) on the downstream side of the weir where rock spoils (mostly boulder-sized) would be potentially placed to extend the weir in the downstream direction. These are the types of impacts that will be addressed in the development of Task 5 of the Water Resources Study; the spoil make-up and locations will be further analyzed under this task. M. Raber agreed that the area is underlain by mostly granitoids with low alkalinity, which results in headwaters low in pH. A. Stuart prompted M. Raber to briefly describe a situation at the Cedar Cliff Hydro project where water quality during and after construction (including placement of rock spoil in a deep reservoir) was evaluated due to high pyrite content in the spoils placed in the reservoir; however, no changes to water quality resulting from placed spoils have been observed.
- E. Hollis asked where the other dam is located – M. Raber stated it is in Tuckaseegee, North Carolina (*for clarity – 16 miles north*) with similar geology and terrain as Bad Creek. R. Maber noted elevated turbidity was an issue at Cedar Cliff during placement of finer grained material. A. Stuart stated there were lessons learned at the Cedar Cliff project (fines were filtered from the rock before placing the rock) that may be applicable to Bad Creek, which could also include some sort of screening or separating out of fines prior to placement in the lake.
- B. Ranson noted the Bad Creek site is underlain predominantly by Toxaway Gneiss (granitic) and some schist, which would have naturally low pH/result in slightly acidic weathered rock/soils.
- S. Salazar mentioned she looks forward to further information and synthesis on these topics and wants to make sure studies or components of studies aren't considered in a vacuum.

- C. Starker asked out of the ten potential spoil sites, how would spoils be placed and is there purposeful intent on location placement, or is it based on convenience since many look like they are on streams/headwaters. M. Raber reiterated the steep topography of the site and associated streams are largely ephemeral and intermittent. Scott Fletcher stated there were eight terrestrial spoil areas assessed and the cover type of most spoil areas consists mostly of mixed hardwood-pine and several areas did have steep ephemeral streams bisecting the site. Most locations, except location J, are mature forested areas. Sarah Kulpa added many of the potential spoil areas correspond to areas of previously used spoil areas (associated with the original construction and noted that several of these areas were revegetated (forested) following Bad Creek Project construction. Placement of spoils also takes into consideration access to excavation areas as well as the limits of topography. M. Raber noted locations will be chosen to minimize impacts, to the extent possible, and these are items/impacts that will be considered under Task 5 (Future Water Quality Monitoring Plan) of the Water Resources Study in 2024.
- C. Starker clarified his earlier question that nothing “intentional” will be done with the spoil material for stream restoration or perhaps enhancements in the Foothills recreation trail corridor. M. Raber stated that from a water resources perspective, spoil placement will also be addressed under the 404/401 permitting, including alternatives analysis for different disposal options. Eric Mularski noted Duke Energy will be working through permitting process with the U.S. Army Corps this year – and not all spoil areas will be used. An Approval for Jurisdictional Determination (AJD) request will be submitted for the 404/401 application as well.
- S. Salazar asked about selection of spoil area placement areas vs. placement out of convenience and wouldn’t a goal of the modeling effort be to determine if adding to the existing submerged weir (Spoil Area A) would mitigate vertical mixing and exchange rates vs. not disposing anything along the weir.
- A. Stuart answered yes, one of the mitigative components to reduce spoils in the uplands is to place more spoils along the weir, which is why Duke Energy performed CFD modeling to ensure that placing spoil at the downstream side of the weir would not have adverse water quality impacts with regard to vertical mixing (per the results of the CFD modeling under Task 3 of the Water Resources Study).
- Sarah Kulpa noted the allocation of spoils in individual spoil locations would also be a function of the excavated material sizes (i.e., finer soils vs. large rock). A. Stuart agreed that the material size and quality will be a limiting factor and consideration in placement.
- S. Salazar noted that while spoils could be considered an impact, there are potential benefits associated with the spoils. A. Stuart noted these factors will be taken into consideration in consultation with stakeholders in the license application and 404/401 permit application.

Break (11:18am)

John Crutchfield said due to short time period prior to the lunch break, the Cultural Resources presentation would occur before lunch rather than afterward, with the Recreation Resources

presentation to begin after lunch. The slight change in the agenda order was noted but otherwise the remaining Resource Committee presentations on the published agenda are in the presented order during the afternoon session.

Cultural Resources (11:29 am)

Christy Churchill provided an overview of the objective, methods, and results of the Cultural Resources Study and introduced Bill Green and Mills Dorn of Terracon who performed the Cultural Resources Survey. She noted the letter for the original Area of Potential Effects (APE) was filed with the State Historic Preservation Office (SHPO) in November of 2022, and in September of 2023, a subsequent letter asking for concurrence on the expanded APE (in alignment with the proposed expanded project boundary) was filed. (*Note: the figure on Slide 151 reads "original project boundary", however, it should read "proposed expanded project boundary"*).

- C. Churchill provided definitions for the SHPO and THPO (Tribal Historic Preservation Office) acronyms.
- Catherine Roberts provided clarification on the term "Paleoindian," which is a somewhat arbitrary term referring to the time around the last glacial maximum around (~10,000 years bp). She stated the ISR indicated this site may not be able to be avoided (Site 38OC249). C. Churchill noted no impact or disruption to this site is anticipated; it's on the edge of the APE and not near any construction.
- C. Roberts stated none of the artifacts shown in the report looked Paleoindian and are probably later as Paleoindian sites are rare. B. Green noted the projectile points shown on Slide 153 could be potential Haw River projectile points due to the distinct notches on the (pre-Clovis, Paleoindian, or early archaic) projectiles, which were found below early archaic points, which is why the report says possible Paleoindian.
- Jennifer Kindel asked if any bats / evidence of bats were noted in the rock shelter? S. Fletcher noted he would carry out a field reconnaissance to confirm bat evidence in the rock shelter and noted there was a bat survey done in 2021, however, this rock shelter was not included in the study. ACTION ITEM – Duke Energy to make a site visit to rock shelter to assess for evidence of bats.
- Andy Douglas mentioned drone sightings were reported over the summer by boaters. A. Stuart said those were probably the drones deployed for the Whitewater River Cove Boat Evaluation survey for the Recreation Study.
- S. Salazar made the correction that the boundary shown on the slide is the proposed expanded APE, not the existing APE. A. Stuart pointed out the two alternatives for Fisher Knob access road on the existing map.
- E. Miller asked for clarification if Duke Energy was going to carry out a full survey of the rock shelter for bats. S. Fletcher said they would add it to their field list and take it under consideration during upcoming study plan development for bat surveys for the 404/401 permit. E. Miller asked if the results would be included as an addendum to the original bat survey (done by ESI in 2021). A. Stuart clarified it might not be an addendum but would be made available the resource agencies.
- Jennifer Kindel reminded the group any bat surveys need to be timed surveys.

- S. Salazar reiterated stakeholder request for bat presence in the rock shelter. Bat presences should be considered along the access road as well since there would be some new clearing.
- S. Salazar noted that on the slide shown (Slide 151), the alternative temporary road access road options are both blue and purple lines. (*Note: the chosen access road option is the purple alternative (northern route), which minimizes impacts to the Howard Creek riparian buffer zone and therefore is the preferred alternative. Both routes are shown on the figure because both routes were surveyed for the Cultural Resources Study*).
- S. Salazar reiterated that any concerns or identification of data gaps should be filed in comments on the ISR meeting summary. And additional information requests or modifications to any of the existing studies need to be submitted in the ISR so modifications can be made in the second year of studies. Please file comments incorporating any additional information that needs to be collected in light of the changes to the Project since the RSP filing.
- S. Salazar asked, regarding drones and associated complaints, whether Duke Energy notifies the public and if not, is that something that can be done to alleviate concerns proactively.
- C. Churchill noted they do notify the FAA but don't notify individuals of the public. The drone Andy Douglas referenced earlier was study related and otherwise, Duke Energy drone surveys are limited to the transmission lines. Homeowners (Fisher Knob) were also made aware of the drones, stakeholders, as well as State Park representatives. Boaters are from all over (out of state) - R. Harris mentioned the only way to make the information available would be to place a flyer at the state park boat ramps, and these do not typically receive much attention from visitors.

<<< Please Note: Duke Energy has redacted the photo of the rock shelter (Site 38OC249) from the ISR meeting presentation (Slide 154) to avoid public disclosure of potential location.>>>

Lunch 11:51 (S. Salazar asked Duke Energy to mute the Microsoft Teams meeting during the lunch break.)

Recreational Resources (12:35)

Task 1 – Foothills Trail Recreation Use and Needs

Kelly Kirven gave an overview of the objectives, methods, and preliminary results of Task 1 of the Recreational Resources Study.

- G. Rice asked about QR codes for the surveys and how effective the QR code surveys were and if during the survey recreationists were asked if they scanned a QR code. K. Kirven noted responses vary depending on recreation site and the 61 surveys they did receive is a good dataset to work with. She indicated many folks don't like to stop to do an in-person survey, so facilitators let them know there were QR codes (and a website address) at the trail heads to take the survey later. K. Kirven noted that based on

Kleinschmidt's experience with these types of surveys, the quality of responses provided later in time (i.e., via QR code or website) can vary and also be disassociated with recreation location. As such, information will be analyzed separately as cell service is limited on the trail and surveys accessed via QR codes were likely filled out later. The carrying capacity will be done in collaboration with Jeremy Wimpey at Applied Trails Research.

- Dustin Wilson noted in the Study Plan Determination (SPD) FERC recommended Duke Energy develop a website for recreationists to access the survey in addition to providing the QR code in the field, mostly because sometimes QR codes aren't self-explanatory. He asked if specific instructions on how to access the survey after scanning the QR code were provided by the facilitators. K. Kirven noted they did not distribute instructions; however, when recreationists encountered a survey facilitator, the facilitator gave them instructions on how to access the survey via the QR code. K. Kirven stated in a previous meeting in consultation with the Recreation and Visual Resources Committee, Duke Energy decided it may be best to not include the survey on the website because that would allow people who had not actually been on the trail to fill out the survey. D. Wilson noted FERC does not recall reading about the decision not to include the surveys on the website and asked that future decisions be included in future filings. (*Note for clarification – not discussed directly during the meeting – while Duke Energy did not provide access to the survey on the relicensing website, the signs posted at trail access locations with the QR code also provided a website address [URL] that users could access directly instead of the QR code to complete the survey. Duke Energy believes that this fulfilled the intent of FERC's comment on the SPD.)*
- D. Wilson mentioned he had questions regarding trail carrying capacity and asked if any representatives from Applied Trails Research were present on the call. K. Kirven asked for FERC to submit their questions to her and she would distribute them to Applied Trails Research. D. Wilson noted that sometimes in order for a carrying capacity analysis to result in long term solutions and in consideration of the public and stakeholders, it is useful for stakeholders to see photographs of groups of hikers to help them provide input on carrying capacity. K. Kirven noted the study is still underway so any input or suggestions FERC has will be considered for incorporation into the study report.
- E. Miller asked if, in addition to the use data collected via traffic counters, there will be additional data collected on the type of recreation activities visitors are participating in on the land accessed via the Musterground Road. K. Kirven acknowledged there are a variety of activities that could potentially occur on the land accessed via Musterground Road, although no additional data collection is planned at this time. E. Miller stated during the study development there was no mention the site would be closed for 6-7 years, so that is a new impact that needs to be taken into consideration. K. Kiven acknowledged due to the evolving circumstances surrounding construction and spoil placement and the many unknowns surrounding the new powerhouse, the 6-7 year closure wasn't determined at of the time of the study plan development however, these impacts will certainly be acknowledged and addressed to the extent possible. *(Note for clarification – not discussed directly during the meeting – the RSP does acknowledge closure as a potential short-term impact to recreational resources, however at the time of*

study plan development, it was anticipated that the Wildlife Management Area lands accessed via Musterground Road would not be affected.)

- Duke Energy will hold a Recreation and Visual Resources Committee meeting to talk through some of the recent changes to plans for Musterground Road access, among other topics.

Task 2 – Foothills Trail Conditions Assessment

K. Kirven gave an overview of the objectives, methods, and results of Task 2 of the Recreational Resources Study. The Foothills Trail (FHT) conditions assessment was performed by Long Cane Trails. She also noted this task is focused on the trail corridor; a draft report has been submitted and Duke Energy is working through submitted comments. Comments were received by the FTC, SCDNR, and Friends of Lake Keowee Society (FOLKS), however, due to the compressed timeline between receiving comments and the ISR filing, there was not enough time to meet with the resource committee, therefore, the draft report was filed with the ISR and a meeting will be held with the resource committee in the near-term to discuss study results and comments. A final report will be filled with the Updated Study Report.

- C. Churchill asked about figure and if the trail (blue line) follows the actual trail. K. Kirven answered it does roughly follow the trail but is not refined. The FTC provided a similar comment. The trail corridor displayed in the figures will be refined in the final report.
- Glenn Hilliard asked how and when will comments on the Task 2 report be considered for incorporation in the report – the FTC provided many additional items for consideration in areas that may need upgrades. K. Kirven noted Duke Energy will hold a resource committee meeting in the near-term to identify maintenance vs. improvements vs. PM&E measures so Duke Energy can decide what upgrades may be incorporated into the study report. ACTION ITEM – Resource and Visual Resources Committee meeting to be scheduled
- D. Wilson noted the FTC provided comments on the PSP stating Duke Energy was interested in transitioning ownership of the trail to the FTC; this should be kept in mind considering there are 89 items identified for improvement along the 43-mile-long section. A. Stuart clarified – Duke was/is considering turning maintenance over to the FTC but has not committed to anything and discussions will continue if that route is chosen; Duke Energy will update FERC on any changes.
- D. Wilson noted along those lines regarding the Whitewater River cove closure and potential mitigation measures to address lack of access to that area, to keep in mind the potential to transfer maintenance to an agency and let FERC know of any mitigatory measures suggested by the agencies so FERC is aware. A. Stuart reiterated Duke Energy's goal is to develop a stakeholder settlement agreement and effectively mitigate to the extent possible and will certainly let FERC know of any proposed mitigation measures.
- S. Salazar noted culvert cleaning is listed as a maintenance item; in the interest of synthesizing information to facilitate the NEPA document there may be a need to consider cleaning of culverts on wildlife (e.g., tricolored bats) and other species that may use culverts for habitat. Fallen trees that are halfway felled could be considered snags

for bat (roosting) habitat. S. Salazar offered that this is just a reminder to not consider any study results in a vacuum.

- Kelly noted SCDNR did provide comments on the study report and many of those comments were centered on bat habitat and culverts. License application will include a proposal of maintenance/upgrades for comment/review for FERC's NEPA analysis.
- S. Salazar stated the tricolored bat is now a proposed species for listing under the Endangered Species Act, so FERC will be analyzing that along with other proposed species. FERC plans to update the IPaC report for the project based on new GIS files to get on the record before the second study season begins since the original IPaC is now outdated.
- J. Kindel also mentioned consideration of the gray bat which is a new addition to the species list for South Carolina and agreed with concerns around culverts along the trail.
- E. Miller (via chat) asked if photos of the culverts will be provided. K. Kirven answered the photos are small in the draft report (as insets) but perhaps could include larger versions of photos in an appendix to the final report. ACTION ITEM – topic to be discussed/reviewed at the Resource and Visual Resources Committee meeting.
- A. Stuart asked if is there a certain size criterion for culverts for bat habitat? J. Kindel noted SCDNR and SCDOT have been working together to identify a size criteria. Culverts running under highways with water running through are of key concern. For large colonies, a larger culvert would be needed. A. Stuart asked if this would include all culverts along the 43-mile-long trail. K. Kirven noted the only culverts that would potentially be disturbed (or cleaned) are the ones that were identified as needing maintenance during the assessment and noted that some language could be added into the license that during the license term bat surveys should be conducted prior to culvert cleaning. Todd Branham (Long Cane Trails) indicated none of the culverts he saw along the trail were larger than 24 inches in diameter and all were made of plastic. J. Kindel indicated that plastic culverts are not typically favorable bat habitat, as bats are not likely able to grip plastic for roosting. K. Kirven noted this will be a point of discussion in the upcoming meeting. ACTION ITEM – topic to be discussed at the Resource and Visual Resources Committee meeting.
- Glen Hilliard said in the original Bad Creek license, Duke Energy reserved the right to open/close/move the FHT at any time. He suggested that preserving the trail in perpetuity (conservation easement) would be desirable mitigation for Bad Creek relicensing. C. Churchill mentioned the trail is part of the existing license agreement. K. Kirven noted Duke Energy doesn't plan on closing the trail for any reason (portions of the trail could be closed at times due to safety concerns or maintenance needs) but that a complete trail closure is not a realistic scenario.
- A. Stuart noted the current lease expires in 2027 and at that time another long-term lease would be executed. K. Kirven indicated the FHT is a unique and regionally important recreation source, and preliminary recreation study results support that. G. Hilliard provided clarification on moving the trail – K. Kirven noted the carrying capacity analysis could indicate a need for small portions of the trail being shifted if a rare plant population, safety issue or something similar is identified.

- A. Gleason added not only is the FHT regionally important, visitors from every state and some other countries visit the FHT, attesting to its national importance. K. Kirven agreed – quite a few surveys were submitted by people visiting from other regions.

Task 3 – Whitewater River Cove Existing Recreational Use

Kelly Kirven gave an overview of the objectives, methods, and results of Task 3 of the Recreational Resources Study. This study task is complete.

- C. Churchill asked for confirmation if each dot on the figure shown on Slide 83 represents a boat. K. Kirven confirmed.
- In response to results of boats being displaced for the 5-7 years during Bad Creek II construction, C. Churchill asked if closures are from the entire lake or just Whitewater River cove, because there plenty of other things to do as far as recreating opportunities. Similarly, G. Rice added, boaters are not displaced from the lake, they are only displaced from the small portion of the lake (i.e., Whitewater River cove). K. Kirven clarified/agreed – the rest of Lake Jocassee will still be available to the public; displacement would only be from Whitewater River cove. Most recreationists in the Whitewater River cove were sightseeing as they spent less than an hour in the cove. There are similar types of sightseeing opportunities (i.e., other waterfalls) that would still be open to the public during Bad Creek II construction.
- C. Churchill asked how the study was conducted so the boats weren't counted more than one time. K. Kirven noted this was a challenging task carried out by a Duke Energy data analyst who devised a categorical system so that boats were assigned an identifier so they weren't counted twice.
- D. Wilson noted it would be a good idea as Duke Energy develops a construction/public safety/recreation plan for mitigation to consider different types of signage/online posting other types of recreation / scenic water falls in the area and even locations (lat/long coordinates) that the public could visit while they would not be able to recreate in Whitewater River cove. This is a potential mitigative measure Duke Energy could easily implement. K. Kirven agreed it would be a great idea to provide information on other lake features similar to viewing/recreation in the Whitewater River cove.
- A. Douglas added there is limited parking availability at Devils Fork State Park, which provides the only public access to Lake Jocassee and the Whitewater River cove. The SCPRT (Rowdy Harris) closes down the parking lot when it's full. Since there is limited public access to the lake, there is limited opportunity for increased use. There will be no more additional parking, no additional docks, in the next 5-7 years (i.e., usage is not likely to change). K. Kirven agreed – the lake has very low development and limited access so there's very little room for increased use.
- A. Gleason noted the parking capacity of Devils Fork State Park is not the only deciding factor regarding how many boats are on the lake. Rental boats have increased in the last few years (i.e., boaters who do not park in the lots).

Task 4 – Whitewater River Cove Recreational Public Safety Evaluation

Kelly Kirven gave an overview of the objectives and methods of Task 4 of the Recreational Resources Study. This study will be conducted in 2024.

- C. Starker asked whether response rates were calculated for surveys under Task 1 of the Recreational Resources Study. K. Kirven noted as indicated in previous meetings, there was no response rate (except in person if a person declines the survey). Nothing was sent out with the expectation of getting responses back. Information documenting how many people declined and how many people had taken the survey before was captured. A. Stuart asked if there was a chance that the same person could be asked twice. By using the same three surveyors throughout the study, they were able to recognize folks who had taken the survey before so they weren't double counted; there was also a question on the survey asking visitors about timing or frequency of past visits.
- Gerry Yantis asked if there was a way to indicate how many actual people were in a group (e.g., one person may have done the survey in a group of 10). K. Kirven returned to an earlier slide under Task 1 (slide 67) showing the survey form which asks how many individuals are in the group. Traffic counters were used primarily to collect data about parking area usage to inform analysis of parking lot capacity and adequacy; trail counters were used to count individuals passing by the trail counter.
- No questions specific to Task 4 were received.

Aquatic Resources (1:49)

Mike Abney introduced the Aquatic Resources Study and provided the tasks under the study.

- David Gandy – FERC requests all raw water quality data and any associated metadata (file with USR). ACTION ITEM – Duke Energy to provide raw data to FERC.

Task 1 - Entrainment

Kevin Nebiolo discussed objectives, methods, and results of the Entrainment Study.

- C. Starker asked if regression models (or similar) were used to confirm there was an increased chance of entrainment at lower lake elevation levels? K. Nebiolo answered no, distributions were fit and medians were compared.
- A. Douglas asked about the total population of threadfin shad and how the total population of threadfin shad in the lake is known to estimate the total population that would be entrainable (12 percent). K. Nebiolo noted Duke Energy conducts annual hydroacoustic surveys of pelagic forage fish. A. Douglas noted shad are the primary prey for loons and stated that the majority of shad suffer mortality in the winter, and that is when the loons are present. K. Nebiolo said most shad are entrained in the meteorological fall, from September to November.
- D. Rankin asked if the use of American Shad as a surrogate for Threadfin Shad was based on swim speed or size. K. Nebiolo returned to an earlier slide to review the equation used which involves population growth rates and stated that there is not a discrete population growth rate available in literature or publicly available resources for

Threadfin Shad, therefore they identified several taxonomic surrogates and chose the most conservative option.

- A. Douglas asked if shad are put into the lake every year. D. Rankin answered shad are not stocked, they are a self-sustaining population.
- E. Hollis asked why only Threadfin Shad and Blueback Herring were considered. K. Nebiolo answered that these two species were the most susceptible to entrainment and those for which we have population data. Other species entrained at lower numbers would have to be evaluated as a qualitative analysis involving population parameters and intrinsic properties of the species. A. Stuart clarified that these species consisted of at least 90 percent of the species entrained.
- Jeff Lineberger asked about what sort of driver temperature is for entrainment loss since some large percentage of shad die anyway. K. Nebiolo noted that the analysis did not find a correlation trend between entrainment with temperature in this data set, however he acknowledged that it is a known problem and consideration in entrainment studies.
- A. Douglas asked what percentage of area Whitewater River cove is compared to the entire lake. A. Douglas indicated 12 percent seems very high. K. Nebiolo stated that the data set available is not spatially explicit, just the lake itself. (*Note: Whitewater River Cove is approximately 1.5% of the lake by surface area*)
- G. Rice asked whether the model predicts what does happen or what may happen. K. Nebiolo stated that this predicts what may happen. G. Rice asked if a large event (i.e., 12% of threadfin shad population entrained) happens every year? K. Nebiolo stated no, it does not happen with any regularity. M. Abney also clarified that this analysis assumes 100% mortality, which we know not to be true (another conservative measure). A. Stuart asked D. Rankin how long we have been monitoring the forage fish populations in the lake, which they said is around 30-40 years, and the operation of the facility does not appear to be a threat to the population. D. Rankin also stated that the hydroacoustic monitoring has shown the population to vary widely during that time and is unpredictable from year to year.
- D. Rankin asked, with such wide bounds on the population size, how did the study determine 12 percent? K. Nebiolo stated it was based on the median population size of the data set. D. Rankin wondered if it's the same amount (proportion) of the population every year.
- D. Gandy asked if estimated population growth rates were only from Fishbase or if there was a review of literature. K. Nebiolo indicated they used FishBase and USEPA 316b resources for growth estimates.

Break

Task 2 – Desktop Studies on Pelagic and Littoral Habitat

Erin Settevendemio presented an overview of the objectives, methods, and results of Task 2 of the Aquatic Resources Study.

No further discussion.

Task 3 – Mussel Surveys and Stream Habitat Quality Surveys

Erin Settevendemio presented an overview of the objectives and methods of Task 3 of the Aquatic Resources Study. The draft report has been submitted and comments have been received; Duke Energy will continue to address comments in consultation with the resource committee.

- E. Hollis asked whether mussels were expected to be found. Nick Wahl indicated there have been mussels observed in Lake Jocassee; however, no protected species. Simply because no mussels were found doesn't mean they aren't present.
- S. Salazar – did the stream habitat assessment methods include distinguishing between native and non-native vegetation and do survey reports make note of that? E. Mularski noted the habitat assessment forms didn't have any categories for native vs. non-native vegetation; however, as far as invasive species within the vegetation plots while carrying out the SQT study, no areas were noted where an infestation of non-native species occurred. S. Salazar commented Japanese stiltgrass (*Microstgium vimineum*) was observed and noted in the PAD (Natural Resources Assessment) (in the transmission line corridor); if the new access road is near these locations it would be prudent to keep in consideration of measures for disturbance and spread of non-native invasive species. E. Mularski noted stiltgrass is present all throughout the southeast. E. Settevendemio agreed there was no *Microstegium*, and noted if it's already onsite that Duke Energy would need to keep it in consideration to prevent spreading. E. Mularski mentioned that there are no obvious infestations of non-native species present in the forested areas. Non-native species were observed within disturbed areas on the project site particularly the maintained transmission right of way.

Environmental Justice (2:43 pm)

Alison Jakupca presented an overview of the objectives, methods, and results of the Environmental Justice (EJ) Study and noted that no need was identified for additional outreach efforts beyond those currently being employed by Duke Energy as part of the relicensing. One EJ community based on race identified in Transylvania County, NC - primarily within 5-mile buffer zone (with SW portion in 1-mile buffer zone). Two EJ communities based on low income identified in Oconee County, SC and Transylvania County, NC (both within 5-mile buffer zone). Undeveloped (forested land) around Project and between the Project and EJ communities is an effective PM&E measure.

- D. Wilson noted that due to proposal of new construction (associated with Bad Creek II), FERC requires the larger 5-mile buffer for the EJ communities study. Additional outreach should be addressed for the Bad Creek Project. Typically, members of the EJ communities are not NGOs or member of groups with any type of standing; therefore, FERC would like to see some targeted public outreach in local communities.
    - ACTION ITEM – Duke Energy to conduct additional Public Outreach.
- D. Wilson stated new census data were just released for 2022; FERC suggests rerunning the EJ analysis to see if there are any changes from current results (which used 2020/2021 data). It is likely Duke Energy will need to re-run the EJ study as the

project progresses and census data are updated. D. Wilson suggested new data should be used in USR and again in the PLP/DLA. A. Jakupca noted that re-running the data would also necessitate extensive updates of data tables and maps and questioned the practicality or efficiency of making multiple updates.

  - ACTION ITEM – Duke Energy to identify plan and timing to rerun EJ analysis with updated census data. An updated EJ report will be submitted with the USR using updated census data.

- D. Wilson discussed the potential for adding the proposed Fisher Knob road into the analysis would that increase the radius for potential for EJ communities. A. Jakupca noted the Fisher Knob community is in the 5-mile buffer and the identified EJ communities are well away from Fisher Knob.
- FERC asks in the USR to describe public outreach (where, when, attendance). A. Jakupca asked about timing and when FERC recommends outreach to occur, when new EJ analyses should be run, and how that fits in with the regulatory schedule.
- D. Wilson answered when we reach FLA (which is used for NEPA), FERC would like to see outreach methods and outreach and comments at the FLA stage. So between the USR and FLA FERC would want to have revised map and table using the most updated census block data. In terms of outreach, D. Wilson suggested a community meeting (town hall, school, local community center) near to EJ communities and posting it in these areas (and perhaps not relying on online advertisement or notice). The reason for the meeting is to get some substantive feedback and this feedback could serve to develop a PM&E measure. FERC would like to see these steps taken during an EJ study and acknowledges this is a new resource area for analysis in relicensing so it is not as straightforward as the other studies.
- S. Salazar asked if the Fisher Knob access road is included in the buffer for EJ. A. Jakupca noted yes, it is in the buffer. If the radius were expanded down to the north and south, there would likely be no impacts to EJ communities due to their location in relation to Fisher Knob. S. Salazar asked whether EJ communities would be affected along the hauling routes used by construction vehicles.
- A. Jakupca said trucks would come down Bad Creek Road / Rt 130 and turn directly into the Project. A. Stuart noted any gravel delivered to the site would likely be transported down Rt 130 from the north, noting trucks will be accessing the site regardless of whether it's for the access road or the new construction.
- S. Salazar noted the access road will be built first when considering timing of impacts, and trucks may take a route that may go near one of the EJ communities in the north.
- G. Rice noted we can't control which way haul trucks come to the site. Traffic is generally sparse in the vicinity of the Bad Creek Project.
- S. Salazar noted on other projects, vehicle emissions associated with project construction is a concern (as well as impacts to EJ communities).
- A. Jakupca noted even if the boundary was expanded far beyond the 5-mile buffer, the classification would not fit the "disproportionately high" category.
- D. Wilson thanked S. Salazar for mentioning about haul trucks and haul roads and asks Duke Energy to keep in mind the location of the trucking company location used and quarry location to disclose in the FLA for FERC's NEPA analysis.

Visual Resources (3:32 pm)

J. Huff presented an overview objectives, methods, and preliminary results of the Visual Resources Study; she gave a brief introduction of the nine tasks under the study. She presented preliminary results from early December field work to take day-time and night-time photos. This information was presented in a recent (early January 2024) resource committee meeting but was not provided in the ISR. Based on stakeholder input, key views have been selected and the study will use those confirmed views to perform the remaining study tasks regarding aesthetics for the Project.

- G. Rice asked if a person can only see Project-related features in leaf-off conditions, how important would that impact be if nobody is there to note that impact, and whether there is any way to address that. J. Huff noted we can describe that in the narrative of the report, however, if there were ever an event that would remove most of the vegetation (e.g., ice storm), then more terrain and features would become visible, so this is the conservative approach. G. Rice asked if the new transmission towers look similar to the existing and J. Huff confirmed that they do.
- W. Cooler mentioned a lighting ordinance on a different study stated light should be seen from a site but the source of light should not be seen and believes this to be a good definition for controlling light pollution. People living in remote areas like Bad Creek value darkness and would be happy for anything done to keep light on the Project property. J. Huff noted the site is very hard to see if you actually aren't there on site.
- C. Starker mentioned dark sky lighting and acknowledged there is some lighting necessary for safety. J. Huff noted you can see lights from the inlet/outlet portal, though this light is not as prominent as the house lights at Fisher Knob.
- D. Wilson added he is looking forward to seeing the selected key observation points and noted it would be helpful to have a sense of the height of the spoil site (not just aerial extend), and asked if this could be something (GIS/DEM or a visualization) submitted to FERC. J. Huff answered Duke Energy could include that in the report as a table with the heights – during the study solid structures were modeled as vertical slopes to be conservative (side slopes weren't taken into account). D. Wilson noted that would be very helpful for potential aesthetic impact along with long-term plans for spoils. ACTION ITEM – Duke Energy to include table of spoil pile height in the draft report.

Herptile Survey (3:55 pm)

S. Fletcher presented an overview on objectives, methods, and findings of the Herptile Survey (reptile and amphibians). This survey was not a relicensing study but was performed to support Section 404/401 permitting and based on a request from the SCDNR to document any species listed in the S.C. Wildlife Action Plan (SWAP). A herptile study plan was developed in consultation with the resource committee, including SCDNR and USFWS, and the report was also reviewed by the resource committee. Terrestrial herptile field surveys were carried out on the eight terrestrial proposed spoil locations. During the survey 14 species were identified and the only SWAP species observed was the Eastern Box Turtle. This task is complete and was included as an attachment in the ISR.

Additionally, S. Fletcher indicated Duke Energy will be developing a study plan and carrying out an additional survey for bats due to potential clearing associated with the proposed temporary access road, spoil areas, transmission line, etc. This will also support Clean Water Act USACE 404 permitting to avoid impacts to endangered species, as well as preparation of the Biological Assessment (BA) for submittal to the USFWS [to comply with Section 7 of the ESA] for the 404 permitting. Duke Energy will target filing the study plan in line with the summer survey guidance (to be updated in March) to concentrate on proposed cleared areas. Acoustic work needs to be done in accordance with timing restrictions, so Duke Energy will prepare a study plan with HDR and will submit study plan to meet these time of year restrictions (targeting June). The study plan will include details from the soon-to-be revised (March 2024) Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidance. A. Stuart added that survey will be good for five years from time of survey. With the unified federal agenda, the tricolored bat will receive final listing and the little brown bat will have proposed rule in September 2024 (*Note: since 1/24/2024, the USFWS has stated that there is no current timeframe regarding the listing date*); the hoary bat will also be up for listing in the next couple years and all three of these species were identified in the 2021 bat survey.

Melanie Olds recommends sending proposed study plan to USFWS for approval. S. Fletcher acknowledged and agreed. Duke Energy will send the study plan to the USWFS, FERC, and the Wildlife & Botanical Resource Committee.

S. Salazar noted to SCDNR that FERC's list of comprehensive plans includes the 2015 SWAP and the 2008 SCORP. If these are not the current versions, please update. E. Miller verified the 2015 SWAP is the current version.

S. Salazar provided a segue to a question about tricolored bat seasonal population zones. S. Salazar asked for clarification from USFWS and SCDNR. On a different project, there have been comments on the seasonal population zones for tricolored bats but there were no sources provided where zones occur. Until there is an official publication for FERC to reference, zones need to be identified in coordination with M. Olds/USFWS in the Project vicinity so FERC can assess potential impacts. Duke Energy will take that into account and touch base with M. Olds.

M. Olds stated there is no map for distribution yet but hibernation range for NLEB will be same for tricolored (Blue Ridge portion of the state), and the rest of state will be year-round active for tricolored bat. This may change as more information comes in but that's the current consideration.

S. Salazar said for the other project, there were three zones identified – the true hibernation zone, year-round active zone, year-round zone 2. M. Olds stated South Carolina is year-round active zone 1. There is no zone 2 in the state of South Carolina (however other southern states have all three classifications). S. Fletcher noted this information will be important and will be considered in consultation with USFWS.

S. Salazar asked when Duke Energy plans to file the study plan with the USFWS as FERC will also need to review. Duke Energy is targeting April 15 for the study plan and completing the study in June.

M. Olds agreed it would be best to wait until the new version of the survey guidelines is available (in March) as it will have the dates/maps of seasonal population zones. ACTION ITEM – Duke Energy to file study plan with the USFWS and FERC targeting April 15, 2024.

Additional Comments Submitted During Study Year 1

S. Fletcher presented comment submitted by the S.C. Wildlife Federation regarding blasting effects on wildlife. Duke Energy responded to the comment on December 19, 2023.

- The environmental report to be filed with the license application will contain information regarding blasting and impacts and proposed environmental measures and the BA will have a noise component as well.

S. Fletcher also presented a comment submitted by Advocates for Quality Development (AQD) regarding increased potential for increased runoff and erosion along new temporary roads and spoil areas.

- Most spoil placed in storage will be rock sized and materials will not be placed on slopes due to instability. French drains will be installed over aquatic resource areas. A sediment and erosion control plan will also be submitted for regulatory agency approval; implementing sediment and erosion control best management practices are a standard practice for Duke Energy construction sites.

J. Crutchfield and A. Stuart provided closing comments and reminded participants to sign the attendance sheet. Duke Energy will file the meeting summary and presentation with FERC and upload to the resource committee SharePoint site (along with the meeting recording) within 15 days as dictated by the ILP process.

A. Stuart presented the FERC ILP next steps and stated Duke Energy will start relicensing Settlement Agreement discussions with stakeholders in March. The goal is to have a final agreement by the end of November 2024 to support the Draft License Application development (filing expected March 2025). An independent facilitator will facilitate the discussions in-person. The Settlement Agreement trial balloon (i.e., Duke Energy's non-binding initial set of proposals is being drafted now and will be presented to relicensing participants/potential settlement parties in March 2024). By the end of September 2024, Duke Energy hopes to have the Agreement in Principle, which is the precursor to the Settlement Agreement. A. Stuart acknowledged Duke Energy may need to make some assumptions since not all studies will be complete.

E. Hollis asked how would we proceed if we don't know Bad Creek II will be built? A. Stuart answered we are presently moving under the assumption that Bad Creek II will be built and noted there is still a lot of work to be done.

S. Salazar thanked participants for participation and for questions and comments throughout the relicensing process. Later in the process (next year at this time) after the USR, the milestones won't let up, so everybody is encouraged to stay engaged and spoke a bit about upcoming tasks and milestones.

A. Stuart thanked the FERC staff for their suggestions and recommendations. Duke Energy's goal is to reduce the amount of Additional Information Requests (AIRs) after filing the license application. If Bad Creek II is going to be constructed, Duke Energy would like to start project expansion construction in 2027 to hit internal milestones to support its continued renewable energy commitment.

S. Salazar reminded the participants to feel free to contact her for any process-related questions and added her phone number and email in the meeting chat and requested Duke Energy include her contact information in the meeting summary as well. Sarah.Salazar@ferc.gov; 202-502-6863 ACTION ITEM – Include Sarah Salazar's contact information in meeting summary (completed herein).

Follow up – A. Stuart corrected himself from an earlier statement regarding construction activities related to rock quarry location – the McNeely Quarry is not in Cashiers, it is in the town of Sapphire, relatively close to the Project (9.4 miles northeast from Bad Creek).

A. Stuart offered final thanks and closed the meeting at 4:25 pm.

Bad Creek Pumped Storage Project No. 2740

Initial Study Report Meeting

DUKE ENERGY.
BUILDING A SMARTER ENERGY FUTURE®

JANUARY 17, 2024

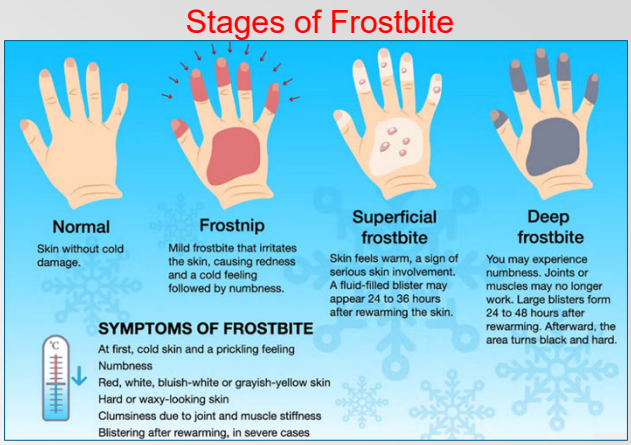
1

Meeting Agenda

- Welcome and Meeting Purpose
- Safety Moment
- Water Resources Study
  - Break
- Recreational Resources Study
  - Lunch
- Aquatic Resources Study
  - Break
- Environmental Justice Study
- Cultural Resources Study
- Visual Resources Study
- Proposed Spoil Area Herptile Surveys
- Closing

2

Safety Moment – FROSTBITE



- **Frostbite** occurs when skin and tissue freezes; commonly affects fingers/toes/ears/extremities. Can cause permanent tissue damage or lead to amputation.
- **Temperatures** below 0°F can cause frostbite **within hours**, however, frostbite can occur over longer periods at temps as warm as 31°F. You cannot get frostbite in temperatures above 32°F (however, you are still at risk for hypothermia if body temperature falls below 95°F).

- **What to do** – If extremities turn red or numb, or you begin to experience pins and needles, get somewhere warm to avoid further damage. Frostnip (or 1st degree frostbite) is usually not permanent, but advanced stages require medical help.
- **Do not** touch or rub skin to try to warm it; unless in life threatening situation, **do not walk** if feet are affected by frostbite to avoid further damage.
- **Do not** place anything **hot** on areas affected by frostbite – skin needs to be warmed up slowly with consistent heat.

https://www.independent.co.uk/news/world/americas/frostbite-symptoms-how-cold-fast-b2002317.html

3

FERC ILP Schedule

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File Notice of Intent (NOI) and Pre-application Document (PAD) (18 CFR §5.5(d))	Licensee	Within 5 years to 5.5 years prior to license expiration	Feb 23, 2022
Initial Tribal Consultation Meeting (18 CFR §5.7)	FERC	No later than 30 days following filing of NOI/PAD	Mar 25, 2022
Issue Notice of NOI/PAD and Scoping Document 1 (SD1) (18 CFR §5.8(a))	FERC	Within 60 days following filing of NOI/PAD	Apr 24, 2022
Conduct Scoping Meetings and site visit (18 CFR §5.8(b)(viii))	FERC	Within 30 days following Notice of NOI/PAD and SD1	May 16-17, 2022
Comments on PAD, SD1, and Study Requests (18 CFR §5.9(a))	Licensee Stakeholders	Within 60 days following Notice of NOI/PAD and SD1	June 23, 2022
Issue Scoping Document 2 (SD2) (18 CFR §5.10)	FERC	Within 45 days following deadline for filing comments on PAD/SD1	Aug 7, 2022
File Proposed Study Plan (PSP) (18 CFR §5.11)	Licensee	Within 45 days following deadline for filing comments on PAD/SD1	Aug 7, 2022
PSP Meeting (18 CFR §5.11(e))	Licensee	Within 30 days following filing of PSP	Sept 7, 2022
Comments on PSP (18 CFR §5.12)	Stakeholders	Within 90 days following filing of PSP	Nov 5, 2022
File Revised Study Plan (RSP) (18 CFR §5.13(a))	Licensee	Within 30 days following deadline for comments on PSP	Dec 5, 2022
Comments on RSP (18 CFR §5.13(b))	Stakeholders	Within 15 days following filing of RSP	Dec 20, 2022
Issue Study Plan Determination (18 CFR §5.13(c))	FERC	Within 30 days following filing of RSP	Jan 4, 2023
Conduct First Season of Studies (18 CFR §5.15)	Licensee	-	Spring-Fall 2023
File Study Progress Reports (18 CFR §5.15(b))	Licensee	Quarterly	Spring 2023 -Fall 2024
File Initial Study Report (ISR) (18 CFR §5.15(c))	Licensee	Pursuant to the Commission-approved study plan or no later than 1 year after Commission approval of the study plan, whichever comes first	Jan 4, 2024
ISR Meeting (18 CFR §5.15(c)(2))	Licensee Stakeholders	Within 15 days following filing of ISR	Jan 17, 2024

4

Resource Committees

Lead Technical Manager
- John Crutchfield

Project Manager
- Alan Stuart

Aquatic Resources
- Mike Abney
- Nick Wahl

Water Resources
- Maverick Raber

Wildlife & Botanical Resources
- Scott Fletcher
- Mike Abney

Cultural Resources
- Christy Churchill

Recreation & Aesthetics
- Alan Stuart
- Ethan Pardue

Operations
- Lynne Dunn
- Alan Stuart

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Bad Creek II Complex –
General Overview and Project Update

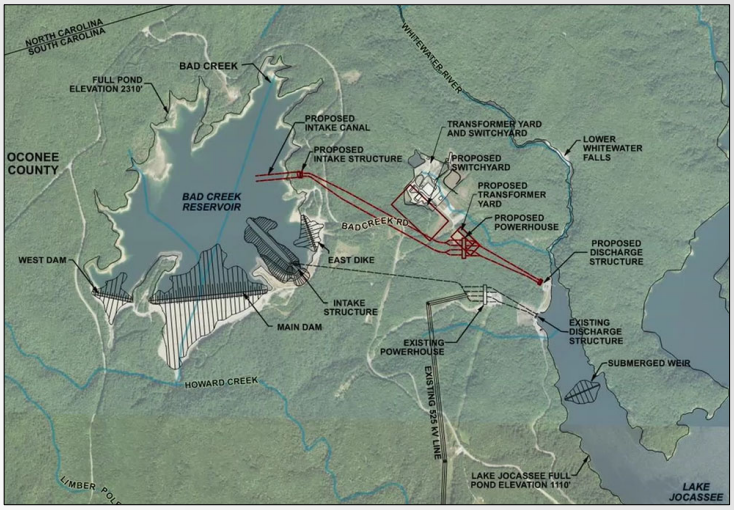
- Proposed Expanded Project Boundary
- Proposed Temporary Access Road (Fisher Knob Access Road)
- Increased Hydraulic Capacity

6

General Project Overview

Existing Bad Creek Powerhouse
- Four units used for peak load generation
- 1,400 MW capacity; 23 hours of storage
- Generates using water from Bad Creek Reservoir
- Pumps back water from Lake Jocassee using excess night/weekend energy

Proposed Bad Creek Powerhouse Addition
- Would essentially double existing Bad Creek capacity
- Utilize existing Bad Creek Reservoir
- Two new underground tunnels and powerhouse (4 Units)
- Additional 1,400 MW capacity; Total site ~3,360 MWs with 11 hours of storage



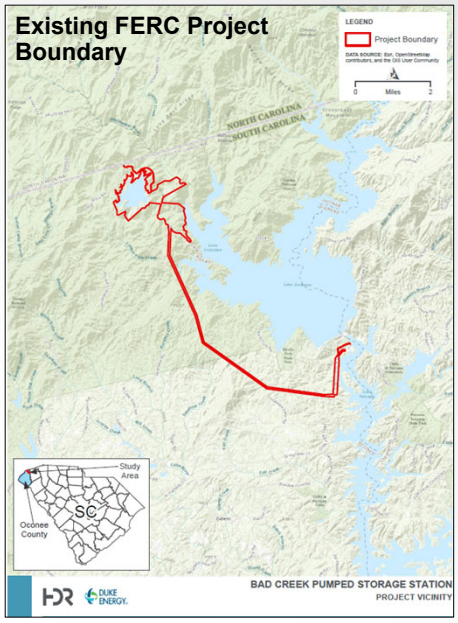
Privileged & Confidential/Attorney-Client Communication; Attorney Work Product

7

Proposed Expanded Project Boundary

8

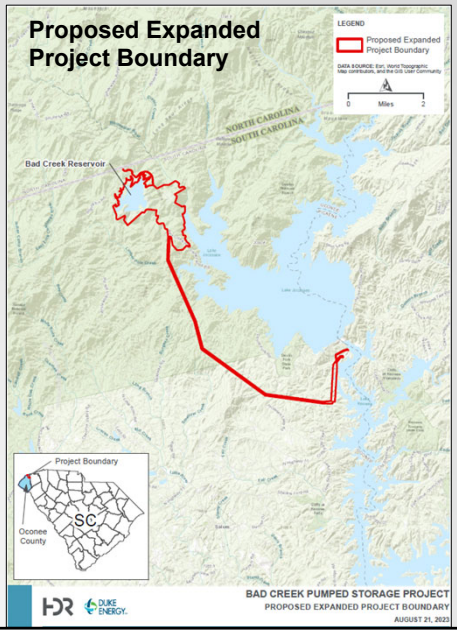
Proposed Expanded Project Boundary for Bad Creek II



Project boundary expanded to include areas potentially impacted from spoil placement

Original: 1,280 acres
Expanded: 1,490 acres

Increase of ~210 acres



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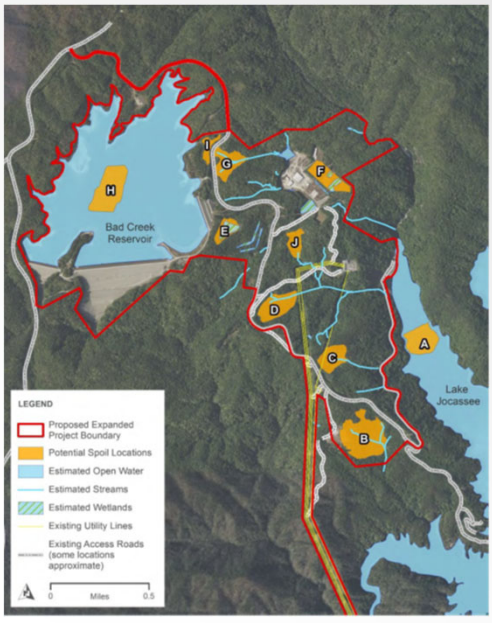
Proposed Expanded Project Boundary for Bad Creek II



- According to preliminary studies, approximately **4 million cubic yards of excavated material** for Bad Creek II construction will need to be deposited at upland spoil locations and/or along the submerged weir in Lake Jocassee.
- Since the RSP filing, **an additional spoil area** related to the construction of a proposed transformer yard (location J) was added and brings the total amount of material to 4.4 million cubic yards.
- Preferred potential areas for spoil placement are **currently under evaluation**.

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Proposed Temporary Access Road

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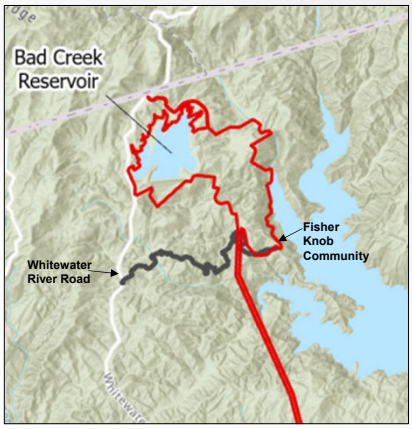
Fisher Knob Temporary Access Road

- Duke Energy is proposing to develop an access road to provide an alternate route to the Fisher Knob Community for use during Bad Creek II construction.



- The proposed gravel service road would be approximately 3.7 miles long, primarily follow an existing unmaintained logging road on property owned by Duke Energy and would only be maintained during construction of Bad Creek II.

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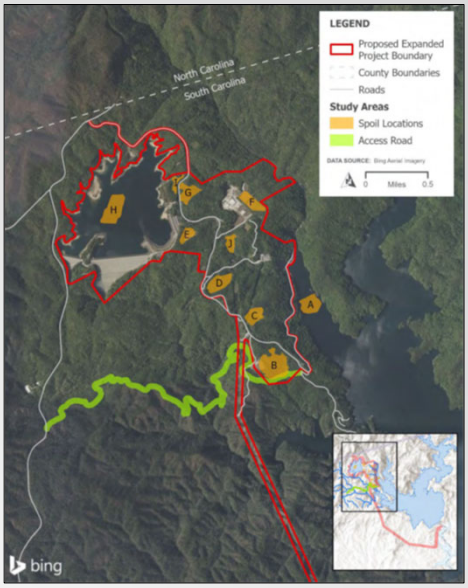
Fisher Knob Temporary Access Road

- The temporary access road would necessarily be constructed in advance of construction for Bad Creek II and prior to the new license issuance – the road is not proposed to be part of the expanded FERC Project boundary.
- The road will use temporary bridges to cross on-site streams.
- Individual study areas for the Water Resources, Aquatic Resources, Visual Resources, and Cultural Resources studies have been expanded since the RSP filing to assess the potential effects of the Fisher Knob Access Road.



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Bad Creek II Maximum Hydraulic Capacity

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Bad Creek I and Proposed Bad Creek II Hydraulic Capacities

	Bad Creek I				Proposed Bad Creek II			
	Generation		Pumping		Generation		Pumping	
	Original (cfs)	Upgraded (cfs)	Original (cfs)	Upgraded (cfs)	Original (cfs)	Updated (cfs)	Original (cfs)	Updated (cfs)
Unit 1	4,000	4,940	3,690	4,060	4,860	5,000	4,120	4,890
Unit 2	4,000	4,940	3,690	4,060	4,860	5,000	4,120	4,890
Unit 3	4,000	4,940	3,690	4,060	4,860	5,000	4,120	4,890
Unit 4	4,000	4,940	3,690	4,060	4,860	5,000	4,120	4,890
Total	16,000	**19,760**	14,760	**16,240**	19,440	**20,000**	16,480	**19,560**

Total Generation Capacity (with BCII): 19,760 + 20,000 = 39,760 cfs
Total Pumping Capacity (with BCII): 16,240 + 19,560 = 35,800 cfs

- Modeled (CFD) versus updated generation capacity is similar (39,200 cfs vs. 39,760 cfs, **<2 percent difference**)
- CFD model to be re-run with updated pumping capacity (32,720 cfs vs. 35,800 cfs, **~9 percent difference**)
- Studies affected by this change (pumping): Entrainment study and CHEOPS study

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Water Resources Study

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Water Resources Study Task Refresher

Study Task	Status
Task 1 – Summary of Existing Water Quality Data And Standards	**Complete**
Task 2 – Water Quality Monitoring in Whitewater River Arm	**Ongoing**
Task 3 – Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse (CFD Modeling)	**Complete**
Task 4 – Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling)	**Ongoing**
Task 5 – Future Water Quality Monitoring Plan Development	**Beginning in 2024**

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Task 1 - Summary of Existing Water Quality Data & Standards

- **Objective:** Compile previously collected water quality data and provide a summary of existing data from Lake Jocassee and Howard Creek under current Project operations and prior to Project operations.
- **Status:** **Complete**

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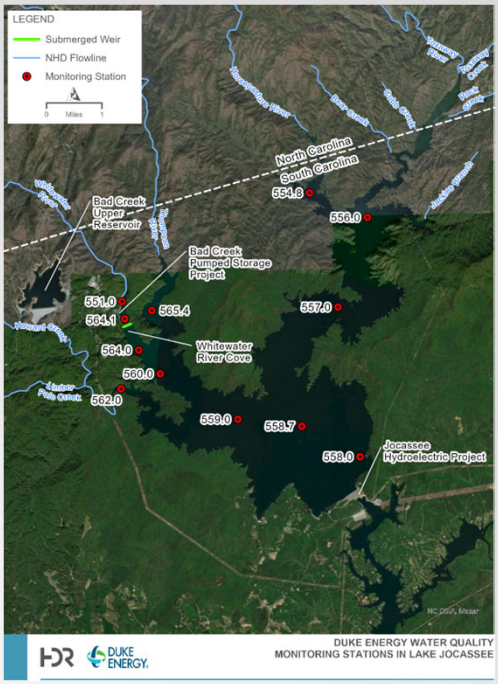
Task 1 – Desktop Methods Summary

- ***Study Area***:
  - The study areas for this desktop review include **Lake Jocassee** and **Howard Creek**.
- ***Data Sources***:
  - Lake Jocassee: Duke Energy water quality data from 12 monitoring stations in Lake Jocassee
  - Howard Creek: Clemson University water quality data from Howard Creek (Abernathy et al. 1994)
- ***Water Quality Parameters***:
  - Temperature, Dissolved Oxygen, pH, Nitrogen, Phosphorus, Chlorophyll a, Conductivity, and Turbidity



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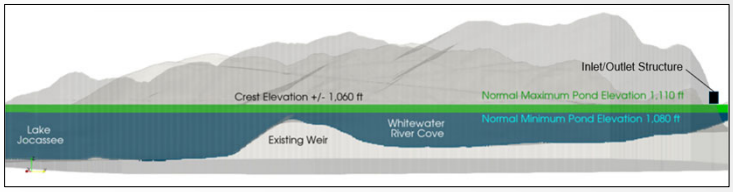
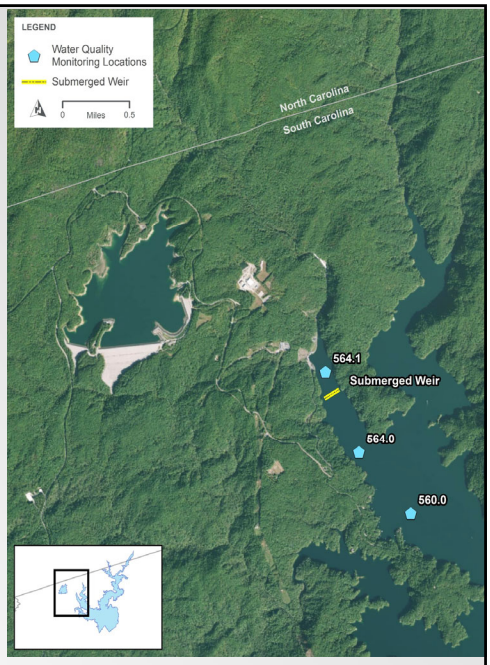
Task 1 – Desktop Methods Summary

- ***Lake Jocassee -*** Data were separated into "pre operations" (<1991) and "post operations" (1991-present) to compare present-day water quality conditions with conditions that existed prior to operations.
  - For the three stations in the Whitewater River cove, a third time period was assessed (1985-1991) to cover the "construction" period upstream and downstream of the submerged weir.



- ***Howard Creek -*** Data were assessed between pre construction (1980/1981) and post construction (1993) downstream of Bad Creek to compare water quality.



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Results Summary – Overall Lake Jocasee

1. There is very little difference in average/max/min values or standard deviations in water temperature or DO between pre and post Bad Creek operation (*with the exception of Station 564.1 discussed on next slide*).

2. There are no discernable patterns (over decades of data) that would suggest Lake Jocassee temperatures or DO are affected by operations or are outside the range of natural conditions.

(Data for water temperature and DO are included below – all other parameters are included in the Final Report.)

Depth-Averaged Temperatures Pre vs. Post Operations

Monitoring Station	Temperature (°C)				Difference
	Pre operations		Post operations		
	Average	Standard Deviation	Average	Standard Deviation	
558.7	12.5	4.9	12.1	4.8	-0.4
558.0	12.9	5.2	13.5	5.4	+0.6
559.0	12.5	5.0	12.1	4.9	-0.4
560.0	11.7	4.6	12.3	4.9	+0.6
562.0	15.3	5.6	16.0	5.3	+0.7
565.4	14.1	5.4	13.1	4.7	-1.0
551.0	13.5	5.8	14.8	7.3	+1.3
564.0	12.1	4.7	12.7	4.9	+0.6
564.1	13.9	5.6	17.2	5.5	+3.3
557.0	11.7	4.5	12.2	4.8	+0.5
554.8	14.6	5.5	14.2	5.3	-0.4
556.0	12.8	4.9	13.4	5.2	+0.6

Surface Dissolved Oxygen Pre vs. Post Operations

Monitoring Station	Dissolved Oxygen (mg/L)				Difference
	Pre operations		Post operations		
	Average	Standard Deviation	Average	Standard Deviation	
558.7	6.9	2.4	6.9	1.9	0
558.0	6.5	2.8	7.0	1.8	+0.5
559.0	6.5	2.7	6.5	2.2	0
560.0	6.7	2.5	6.4	2.3	-0.3
562.0	7.8	2.7	7.9	2.0	+0.1
565.4	7.3	2.9	7.1	2.5	-0.2
551.0	9.9	1.3	9.6	1.6	-0.3
564.0	6.4	3.0	6.2	2.6	-0.2
564.1	7.4	3.2	8.5	0.8	+1.1
557.0	6.8	2.9	6.8	2.3	0
554.8	7.7	3.1	7.4	2.8	-0.3
556.0	7.4	2.9	7.3	2.6	-0.1

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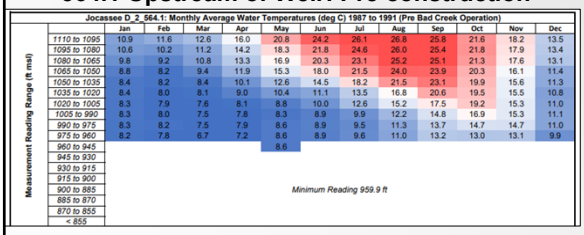
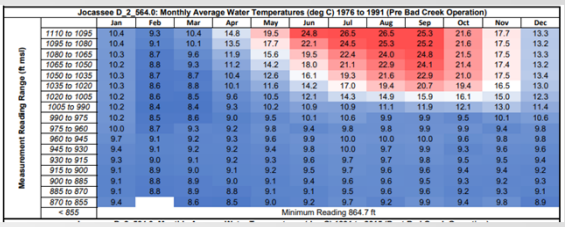
Results Summary - Whitewater River Cove Temperature

- Upstream of the weir (left), the water column is stratified during pre construction but becomes well mixed under post construction.
- Downstream of weir (right), water column is stratified and is similar between pre and post construction.

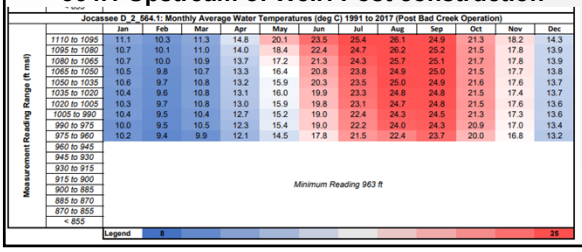
564.1 Upstream of Weir: Pre construction



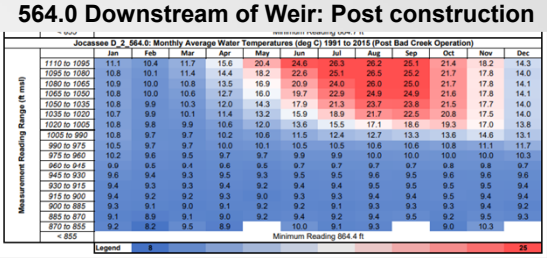
564.0 Downstream of Weir: Pre construction



564.1 Upstream of Weir: Post construction



564.0 Downstream of Weir: Post construction



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Results Summary - Whitewater River Cove Dissolved Oxygen

- Upstream of the weir (left), the water column is stratified during pre construction but becomes well mixed under post construction.
- Downstream of weir (right), water column is stratified and is similar between pre and post construction.

Upstream of Weir: Pre construction

Jocassee D_2_564.1: Monthly Averaged Dissolved Oxygen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.0	10.6	9.8	10.2	9.3	8.7	8.6	5.4	7.9	8.2	8.3	9.2
1095 to 1080	9.8	9.5	10.0	10.2	9.5	8.9	8.7	6.3	7.7	8.0	8.5	9.2
1080 to 1065	10.0	9.7	10.0	10.1	9.5	9.0	8.6	5.9	7.6	8.1	8.6	9.2
1065 to 1050	10.6	10.6	10.2	10.3	9.4	8.5	8.2	5.5	7.5	8.0	8.7	9.7
1050 to 1035	10.7	10.4	10.1	10.3	9.2	7.7	6.8	4.7	7.0	7.8	8.6	9.8
1035 to 1020	10.7	10.2	10.0	9.8	8.7	6.2	5.3	2.7	4.6	7.7	8.5	9.9
1020 to 1005	10.6	10.4	9.8	9.1	7.7	5.1	3.8	2.2	1.0	6.2	8.4	9.8
1005 to 990	10.6	10.2	9.3	8.0	5.8	2.9	1.5	0.9	0.1	1.7	8.1	9.7
990 to 975	10.6	10.0	9.0	7.3	4.1	2.1	0.3	0.3	0.0	0.0	5.4	9.7
975 to 960	10.5	9.9	9.5	8.7	2.8	1.5	0.0	0.4	0.0	0.0	1.9	10.1
960 to 945					2.7							
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 959.9 ft

Downstream of Weir: Pre construction

Jocassee D_2_564.0: Monthly Averaged Dissolved Oxygen (mg/l) 1976 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.7	10.0	10.4	10.5	9.9	8.7	8.6	7.8	8.4	8.3	8.6	9.0
1095 to 1080	9.6	9.6	10.1	10.6	10.1	9.3	9.0	8.1	8.3	8.2	8.6	9.0
1080 to 1065	9.5	9.5	10.0	10.5	10.3	9.8	9.2	7.6	8.3	8.1	8.6	9.0
1065 to 1050	9.5	9.4	9.9	10.3	10.0	9.4	9.0	7.4	7.8	8.1	8.5	9.0
1050 to 1035	9.4	9.3	9.9	10.2	9.4	9.0	8.6	7.1	7.1	8.0	8.7	9.0
1035 to 1020	9.5	9.1	9.6	10.0	8.9	8.5	7.6	6.1	6.2	7.4	8.2	9.1
1020 to 1005	9.5	9.2	9.5	9.6	8.2	7.6	6.7	4.6	4.0	4.8	7.1	8.9
1005 to 990	9.5	9.3	9.4	9.2	7.9	7.3	6.1	3.1	3.3	2.6	4.8	7.5
990 to 975	9.5	9.4	9.2	8.9	7.7	7.3	6.8	3.1	3.5	2.3	2.7	5.6
975 to 960	9.6	9.3	8.6	8.6	7.9	6.6	6.0	3.8	4.1	3.9	3.0	4.3
960 to 945	8.8	9.2	8.7	8.3	7.8	7.0	6.3	4.1	4.9	3.7	3.5	3.4
945 to 930	6.7	9.4	8.5	8.0	7.2	6.2	5.7	3.7	4.2	3.0	2.4	2.2
930 to 915	5.5	8.0	8.3	7.0	6.4	4.9	4.6	2.9	2.9	2.1	1.8	1.5
915 to 900	4.7	5.7	7.4	6.6	5.6	3.8	3.3	2.1	2.1	1.6	1.5	1.1
900 to 885	4.0	4.9	7.4	5.9	5.2	3.2	2.5	1.2	1.5	0.9	1.1	0.6
885 to 870	3.3	4.3	6.1	4.0	3.8	3.1	2.3	0.8	0.7	0.4	0.6	0.7
870 to 855	0.0		7.9	7.2	4.6	1.5	1.7	2.2	0.0	0.0	0.0	0.7
< 855												

Minimum Reading 864.7 ft

Upstream of Weir: Post construction

Jocassee D_2_564.1: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2017 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.2	9.5	9.7	9.7	8.9	8.3	8.2	7.8	7.3	7.5	8.1	8.8
1095 to 1080	9.0	9.4	9.7	9.7	9.0	8.4	8.1	7.6	7.2	7.5	8.1	8.6
1080 to 1065	9.1	9.3	9.6	9.6	9.0	8.5	8.2	7.6	7.2	7.5	8.1	8.6
1065 to 1050	9.1	9.4	9.6	9.6	9.0	8.5	8.3	7.6	7.1	7.5	8.1	8.7
1050 to 1035	9.1	9.4	9.6	9.5	9.0	8.6	8.2	7.5	7.1	7.4	8.1	8.6
1035 to 1020	9.2	9.4	9.6	9.5	9.0	8.6	8.1	7.6	7.1	7.4	8.1	8.7
1020 to 1005	9.1	9.3	9.6	9.4	8.9	8.6	8.1	7.6	7.1	7.4	8.0	8.7
1005 to 990	9.2	9.4	9.6	9.4	8.9	8.6	8.4	7.6	7.1	7.4	8.1	8.7
990 to 975	9.1	9.5	9.6	9.4	8.7	8.6	8.1	7.6	6.9	7.4	8.2	8.7
975 to 960	9.3	9.4	9.8	9.5	8.8	8.3	8.4	7.1	6.8	7.5	8.2	8.9
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												
Legend	0.0											10.0

Minimum Reading 963 ft

Downstream of Weir: Post construction

Jocassee D_2_564.0: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.1	9.3	9.9	9.8	9.0	8.2	8.2	7.9	7.7	7.6	8.1	8.8
1095 to 1080	8.9	9.2	9.8	9.8	9.1	8.5	8.1	7.7	7.4	7.6	8.2	8.6
1080 to 1065	8.9	9.1	9.7	9.6	9.1	8.7	8.2	7.6	7.3	7.6	8.2	8.6
1065 to 1050	8.9	9.0	9.6	9.5	9.1	8.7	8.2	7.6	7.1	7.5	8.1	8.6
1050 to 1035	8.8	9.0	9.5	9.4	9.0	8.6	8.1	7.3	6.9	7.5	8.1	8.6
1035 to 1020	8.8	8.9	9.3	9.3	9.0	8.5	7.8	7.0	6.4	7.3	8.0	8.6
1020 to 1005	8.8	8.8	9.1	9.1	8.9	8.4	7.8	6.9	5.9	6.4	7.6	8.4
1005 to 990	8.8	8.8	8.9	8.8	8.6	8.1	7.6	6.7	5.8	5.3	6.1	7.6
990 to 975	8.3	8.7	8.7	8.4	8.1	7.6	6.8	6.1	5.4	5.0	4.6	5.5
975 to 960	6.8	8.2	8.3	7.9	7.5	6.7	6.0	5.4	4.7	4.1	3.8	3.7
960 to 945	5.7	7.6	7.8	7.3	6.8	5.8	5.3	4.9	4.1	3.3	3.0	2.9
945 to 930	3.6	6.8	7.2	6.5	6.3	5.1	4.8	4.2	3.6	2.7	2.3	2.1
930 to 915	2.7	6.0	6.4	5.3	5.6	4.5	4.0	3.5	2.8	2.3	1.9	1.8
915 to 900	2.1	5.7	5.3	5.0	5.4	4.0	3.9	3.1	2.7	1.9	1.6	1.7
900 to 885	1.7	5.3	4.8	4.1	3.7	2.8	3.4	2.6	2.1	1.5	1.2	1.9
885 to 870	2.3	3.9	3.3	4.4	2.9	2.7	3.0	2.2	2.0	2.2	1.0	1.4
870 to 855	0.1	4.3	3.1	5.2		0.0	0.4	2.8		2.3	0.0	
< 855												
Legend	0.0											10.0

Minimum Reading 864.4 ft

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State Water Quality Standards Compliance – Lake Jocassee

Full period of record	Numeric Surface Criteria (SCDHEC)	No. Samples	Percent of dataset not meeting criteria	Fully Supporting?
DO	At or >6.0 mg/L	4,241	<1.0%	Yes
pH	6-8 standard units	4,253	<1.0%	Yes
Phosphorus	At or <0.02 mg/L	2,228	9.8%	Yes
Nitrogen	At or <0.35 mg/L	545	6.1%	Yes
Chlorophyll a	At or <10 ug/L	1,753	<1.0%	Yes
Turbidity *(Whitewater River Cove only)*	At or <10 NTU	550	<1.0%	Yes

- Parameters without numeric criteria (temperature, DO saturation, conductivity) meet narrative criteria where provided. Where criteria is not provided, because Lake Jocassee supports a diverse, healthy fish community, the water quality parameter is considered to be fully supporting.

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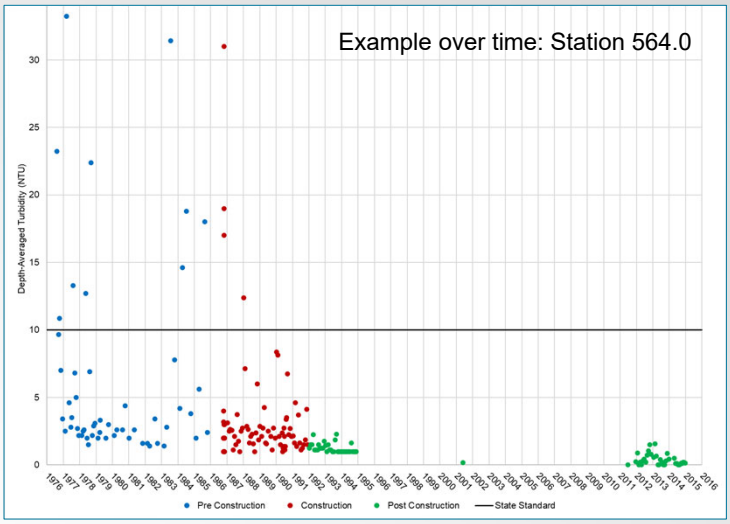
Results Summary - Whitewater River Cove Turbidity

- Where data are available, NTU values are higher during pre construction periods than during construction and post construction periods (see graph below – example from Station 564.0).

- **Future construction activities** at Bad Creek could increase turbidity in the Whitewater River cove; however, these events would likely be short-lived and based on previous data, recovery in the water column is expected to be rapid.
- Along with appropriate BMP measures, impacts are expected to be **temporary and limited** to the Whitewater River cove.



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Howard Creek Water Quality – Methods Summary

- Clemson University monitored water quality before and after Project construction – their results from 1993 are summarized in the Final Report and represent post operational conditions in Howard Creek to provide baseline (current-day) conditions.
- Water quality parameters and sampling locations were determined in coordination and agreement with FERC, SCDHEC, and SCDNR.

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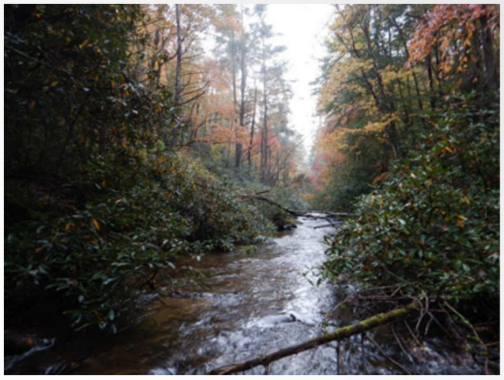
Howard Creek Water Quality



- Results (Abernathy et al. 1994) indicated that even with the major construction of the Project, most baseflow water quality conditions were relatively unchanged during and after construction and post construction water quality conditions were generally similar to pre construction.
- Notable changes included slightly elevated total alkalinity, total hardness, and specific conductance, which were linked to seepage through dams coming into contact with newly placed grout.

- During the 18-year study "Long-term Recovery Monitoring of the Howard Creek Fishery", results showed that Howard Creek has maintained a recovered condition from 1995 to at least 2015 (the last survey period), indicating suitable water quality and habitat.

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Conclusions - Water Resources Task 1

- ***Lake Jocassee – Take home points***
  1. Upstream of the submerged weir, the water column undergoes vertical mixing and there is no indication of stratification (post 1991) regardless of season.
  2. Downstream of the submerged weir, stratification is observed and is consistent between pre and post operation conditions. These results show mixing is confined to the portion of the Whitewater River cove upstream of the submerged weir.
  3. All water quality parameters assessed in Lake Jocassee are fully supportive of designated use classifications.
- ***Howard Creek – Take home points***
  1. Results from Abernathy et al. (1994) indicate most water quality parameters under operational conditions are similar to and fall well within the range of natural/seasonal variation observed under pre operational conditions.
  2. Water quality conditions assessed are fully supportive of designated use (with the exception of pH at times, which is naturally low as mountain streams in the vicinity of Lake Jocassee are typically poorly buffered and have low pH values due to underlying bedrock.)

Based on existing data, it is not expected that the addition of a second powerhouse will affect water quality in Lake Jocassee or Howard Creek.

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Task 2 – Water Quality Monitoring in Whitewater River Arm

- **Objective:** Collect continuous temperature data and periodic DO (bi-weekly) and temperature from three historical locations in the Whitewater River Cove to gather current-day representative (i.e., baseline) water quality information in Summer 2023 and 2024.
  - Intended to provide sufficient information to support an analysis of the potential Project-related effects on water resources in the Whitewater River arm under existing and upgraded unit operations. Specifically, the effectiveness of the existing submerged weir and vertical mixing will be assessed.
- **Status:** Ongoing

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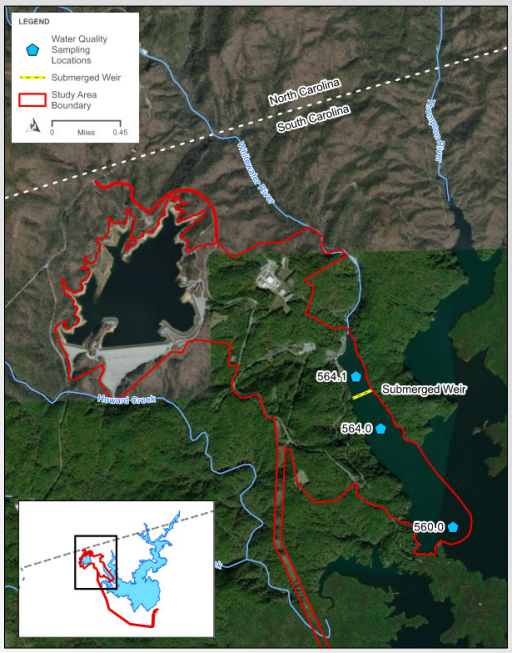
Task 2 – Methods

- Duke Energy collected continuous water temperature data and periodic temp and DO concentrations (bi-weekly) from locations near three historic monitoring stations to determine current-day representative (i.e., baseline) water quality information during the summer of 2023.
- Data collected in 2023 represented conditions under two- and three-unit operations at the Project. Conditions in the Whitewater River arm are reflective of conditions in the upper reservoir.
- The **interim draft report** included in the ISR has preliminary results and a brief discussion from the year 1 study period (June 1 – October 11, 2023); the Updated Study Report will include results from study year 1 and study year 2 (June – September 2024) and will provide a complete assessment of results for both study years.



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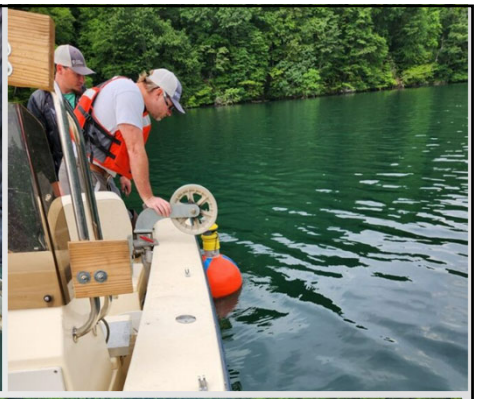
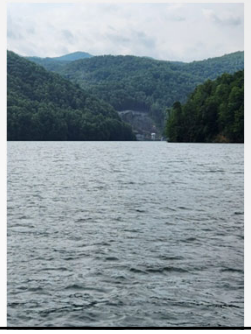
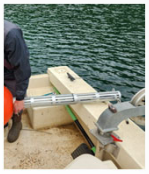
Task 2 – Methods

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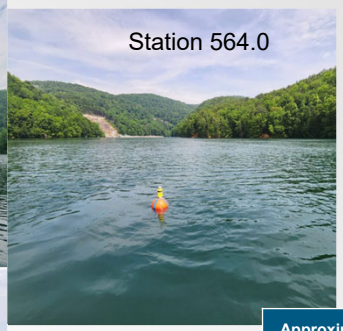
Task 2 – Methods



Field Dates for Water Quality Measurement

Date	Details
June 1	Datalogger deployment
June 13	Data download and vertical profile
June 28	Data download and vertical profile
July 12*	Data download and vertical profile
July 24	Data download and vertical profile
August 10*	Data download and vertical profile
August 21	Data download and vertical profile
September 7	Data download and vertical profile
September 23	Data download and vertical profile
October 11	Datalogger removal

Depth of VuLink Dataloggers

Approximate Water Depth (ft)	Approximate Elevation (ft msl)	Notes
3	1,107	Near surface
30	1,080	Normal maximum Lake Jocassee drawdown elevation
50	1,060	Approximate crest of the submerged weir
70	1,040	Approximately 20 ft below the crest of the submerged weir
100	1,010	Approximate location of thermocline

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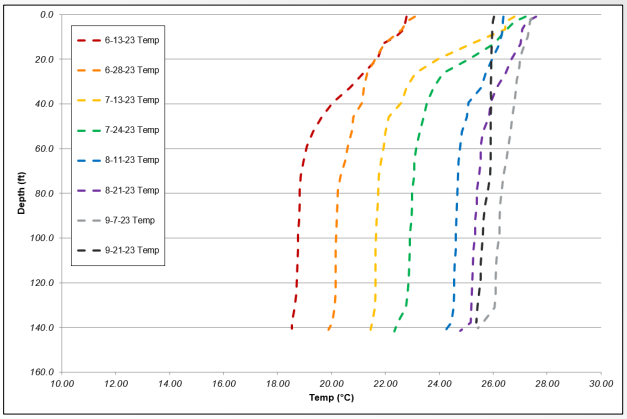
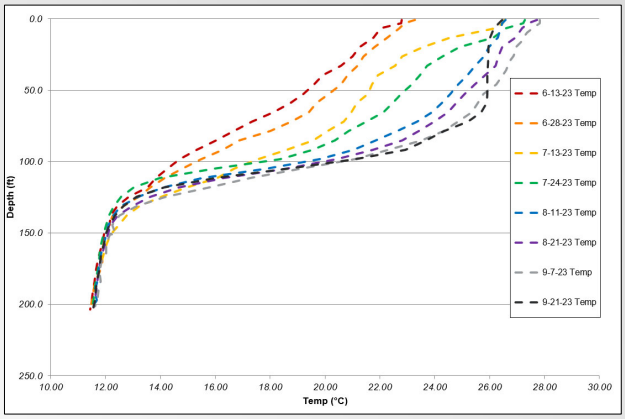
Task 2 – Year 1 Results

Temperature Summary:

- Upstream of the weir (left) the water column is well mixed.
- Downstream of weir (right), stratification is noted.



Station 564.1



Station 564.0

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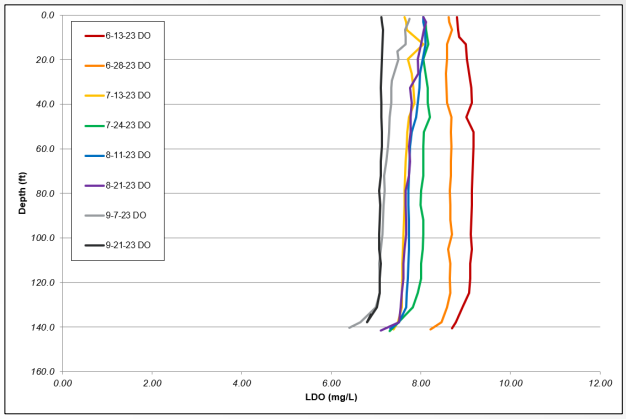
Task 2 – Year 1 Results

DO Summary:

- Upstream of the weir (left) the water column is well mixed.
- Downstream of weir (right), stratification is noted.



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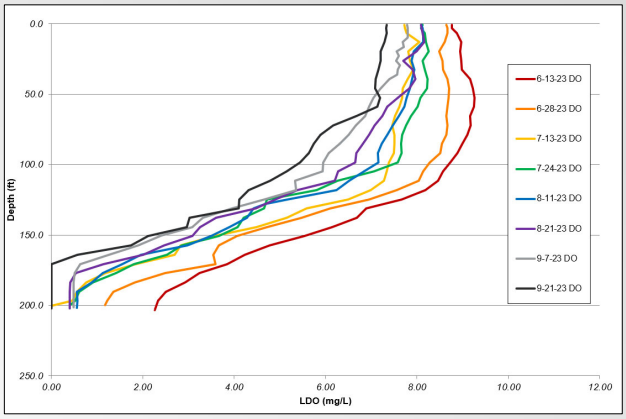

Station 564.0

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Task 2 – Year 1 Conclusions

- Results from water quality monitoring in the Whitewater River cove indicate water upstream of the submerged weir is well-mixed and does not stratify during the summer. Data from monitoring locations downstream of the weir show stratification under all pumping and generation scenarios.
- The second study season (study year 2) will commence in June of 2024 through September 2024 to capture conditions in the Whitewater River cove with all four existing unit upgrades completed.
- A comprehensive data summary will be provided following collection of summer 2024 monitoring data, and the full two-year study report will be provided for resource committee review.

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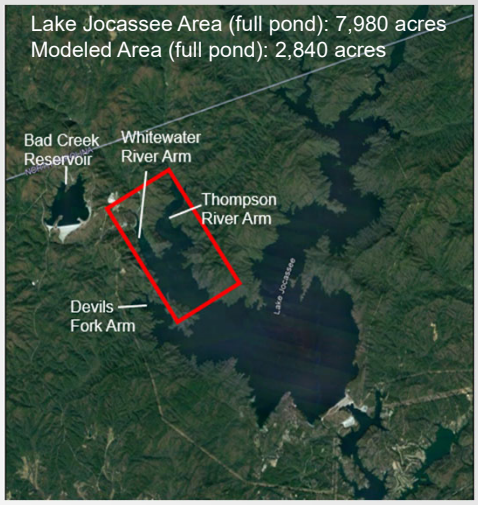
Task 3 - Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse (CFD Modeling)

- **Objective:** Develop CFD model to evaluate flows and extent of vertical mixing in the Whitewater River arm and downstream of the submerged weir due to the addition of Bad Creek II.
- **Status:** **Complete**



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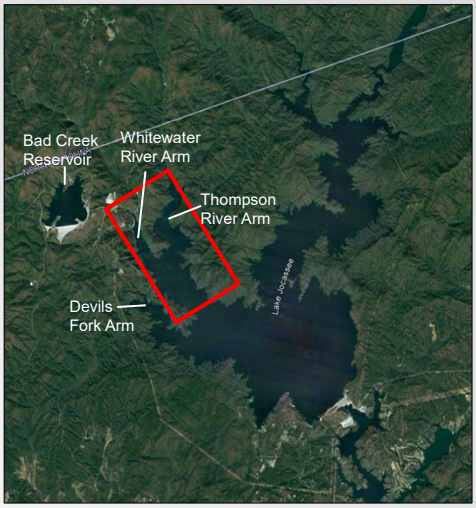
Task 3 – Study Approach

1. 2-D hydraulic model (Innovyze) was developed to help determine the downstream modeling extent (model domain) required for the CFD model.
2. CFD model was developed to evaluate hydraulic effects (depth, velocity, flow patterns) of Bad Creek II operations on vertical mixing in the Whitewater River cove.
3. Sixteen scenarios were evaluated using pumping and generating modes under existing and proposed conditions (including potentially expanded weir).

Lake Jocassee Area (full pond): 7,980 acres
Modeled Area (full pond): 2,840 acres



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Task 3 Methods – CFD Modeled Scenarios

Station	Operating Mode	Submerged Weir Configuration	Scenario	Flow (cfs)	Jocassee Reservoir Elevation (ft msl)
Bad Creek Only	Generating	Existing	1	16,000	1,110
			2	16,000	1,080
	Pumping		7	13,780	1,110
			8	13,780	1,080
	Upgraded Generation	Existing	13	19,440	1,110
			14	19,440	1,080
	Upgraded Pumping		15	15,000	1,110
			16	15,000	1,080
Bad Creek and Bad Creek II	Generating	Existing	3	39,200	1,110
			4	39,200	1,080
	Pumping		9	32,720	1,110
			10	32,720	1,080
	Generating	Expanded	5	39,200	1,110
			6	39,200	1,080
	Pumping		11	32,720	1,110
			12	32,720	1,080

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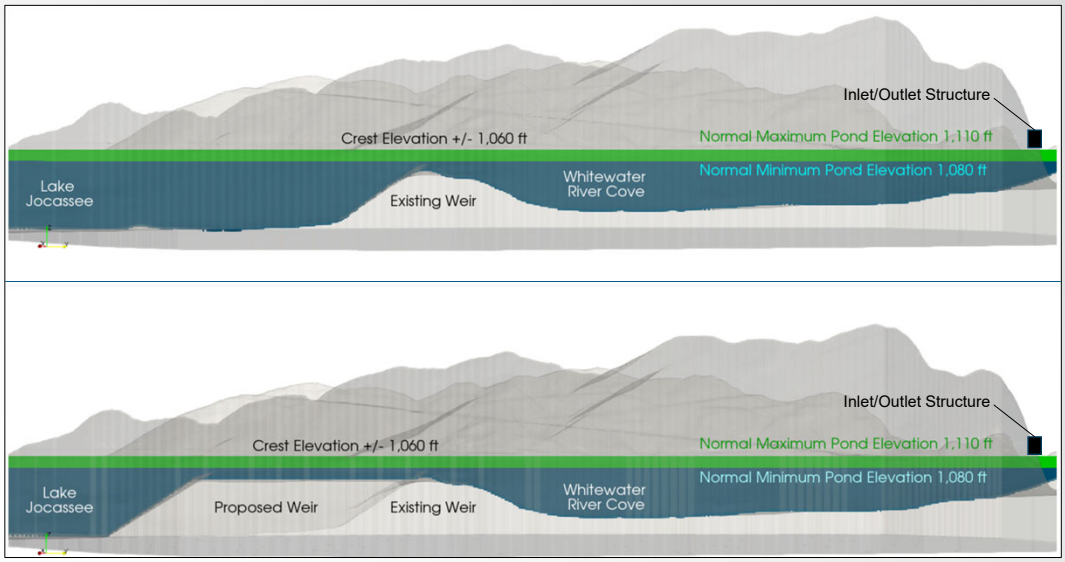
Task 3 Methods – CFD Model Geometries & Scenarios



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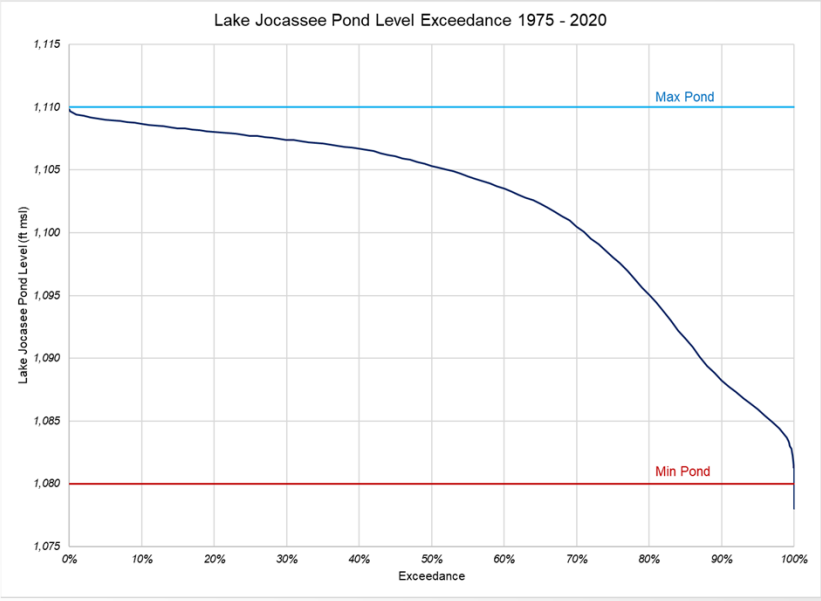
Task 3 – Lake Jocassee Pond Level Exceedance Curve

Note: all modeled scenarios are either at min or max pond elevation.



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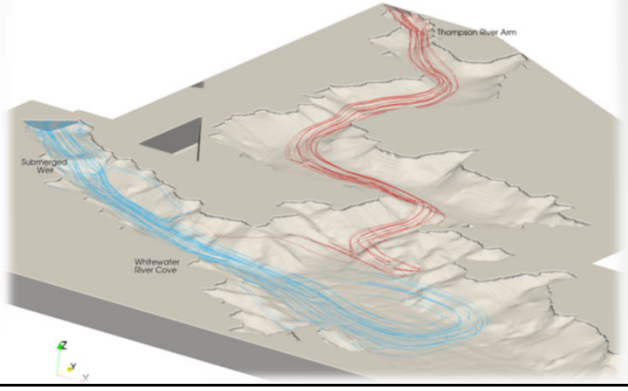
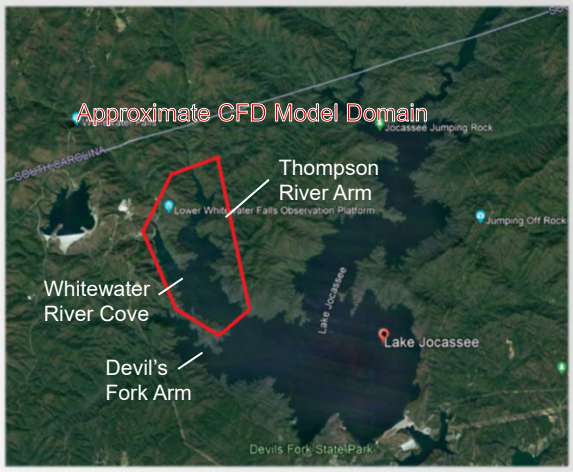
Task 3 Methods – CFD Model Development

- Model domain extends just upstream of confluence with Devil's Fork Arm.
- Inflows and water surface elevations held constant at the inflow boundary.
- Maximum generating/pumping capacity simulated.
- Thompson River flow included (long term average flow).
- Two pond levels modeled.
- Two weir geometries modeled.





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CFD Results

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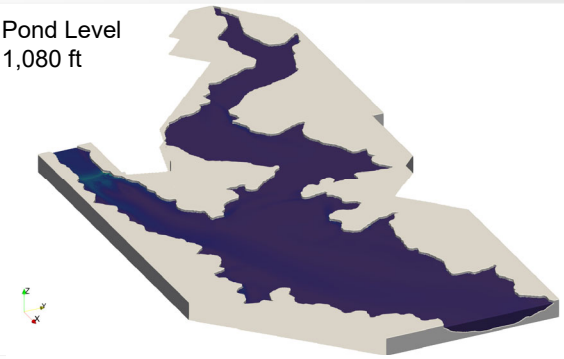
Task 3 Results – Existing Generation

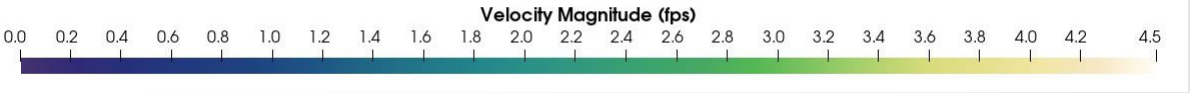
Minimum Pond

Pond Level
1,080 ft



Full Pond

Pond Level
1,110 ft



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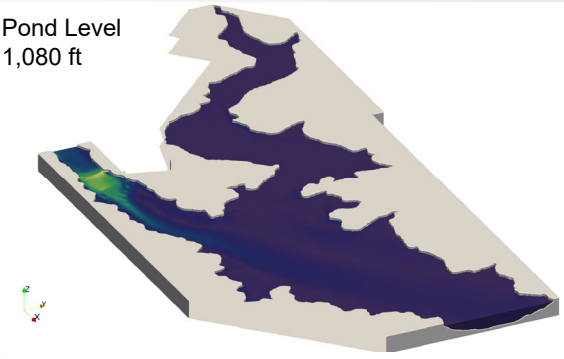
Task 3 Results – Proposed Generation

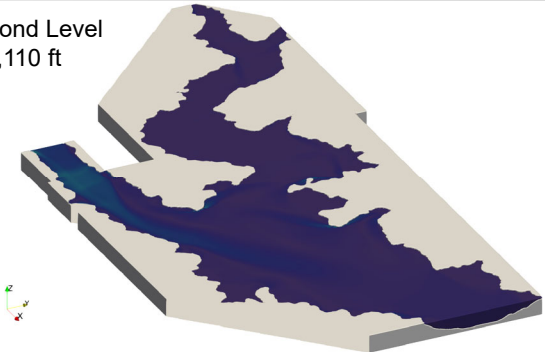
Minimum Pond

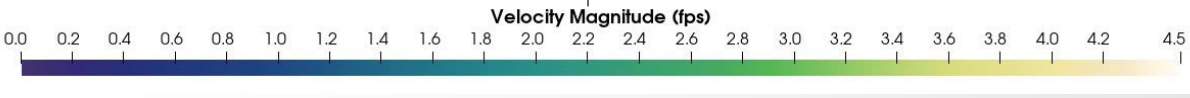
Pond Level
1,080 ft



Full Pond

Pond Level
1,110 ft





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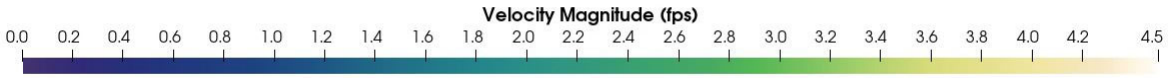
Task 3 Results – Existing Pumping

Minimum Pond

Pond Level
1,080 ft

Full Pond

Pond Level
1,110 ft



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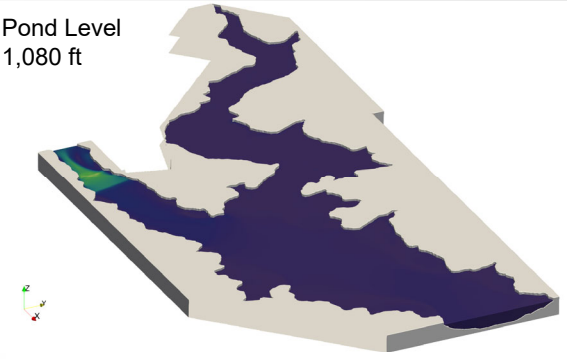
Task 3 Results – Proposed Pumping

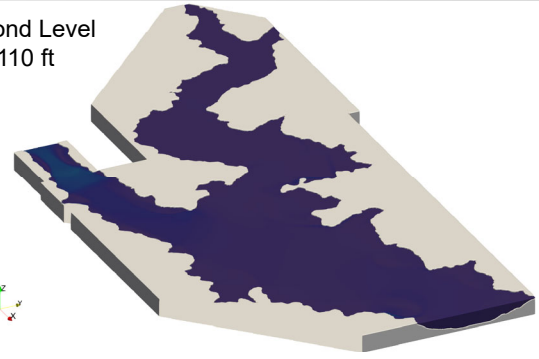
Minimum Pond

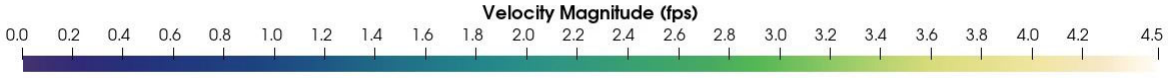
Pond Level
1,080 ft



Full Pond

Pond Level
1,110 ft





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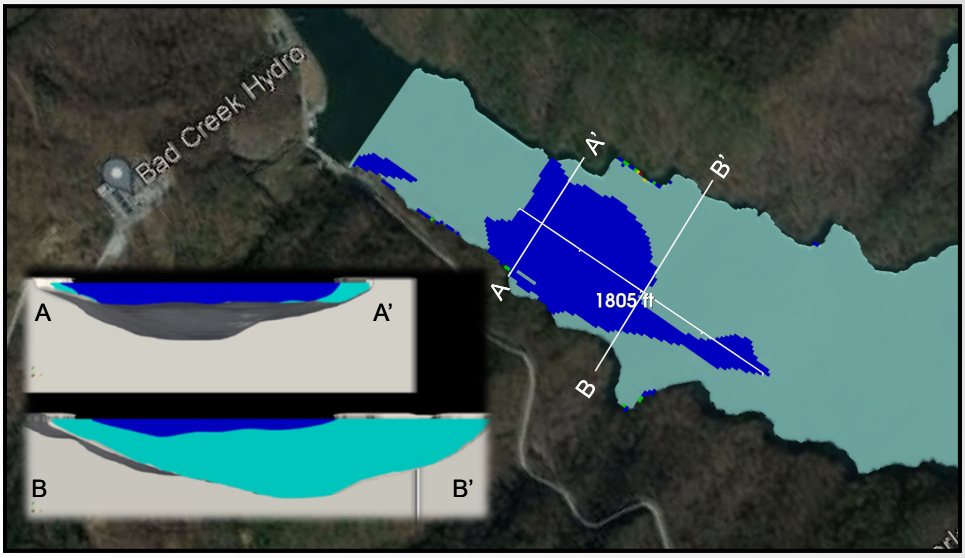
Task 3 Results – Proposed Generation

Results – Proposed Generation at **Full Pond**

- Max velocity approx. 1.3 fps
- Teal: < 1.0 fps
- Blue: 1.0 – 2.0 fps



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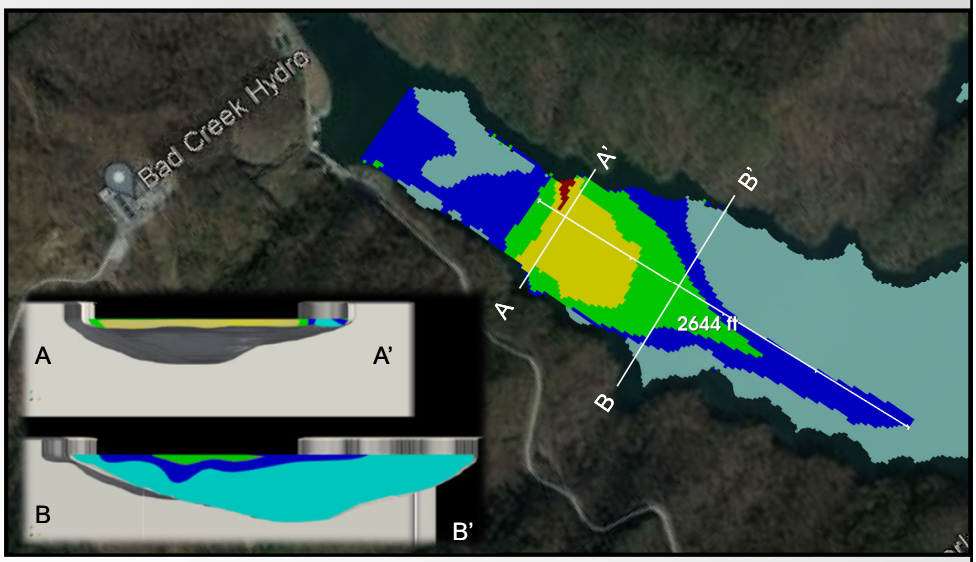
Task 3 Results – Proposed Generation

Results – Proposed Generation at **Minimum Pond**

- Max velocity approx. 4.5 fps
- Teal: < 1.0 fps
- Blue: 1.0 – 2.0 fps
- Green: 2.0 – 3.0 fps
- Yellow: 3.0 – 4.0 fps
- Red: > 4.0 fps



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Effect of Submerged Weir

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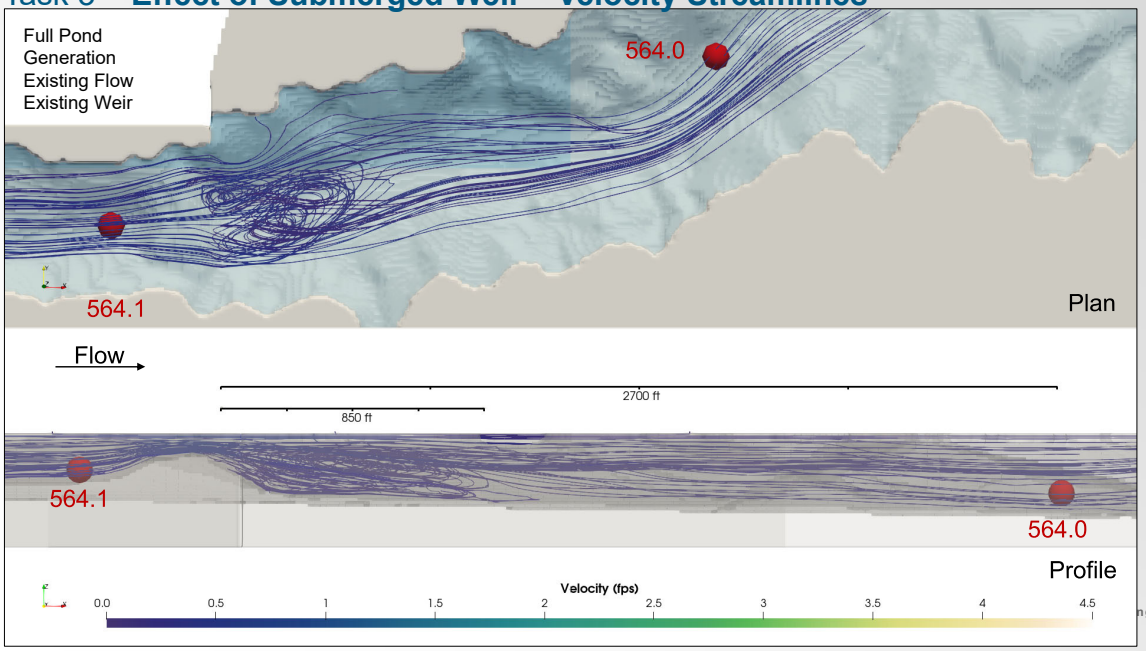
Task 3 – **Effect of Submerged Weir – Velocity Streamlines**



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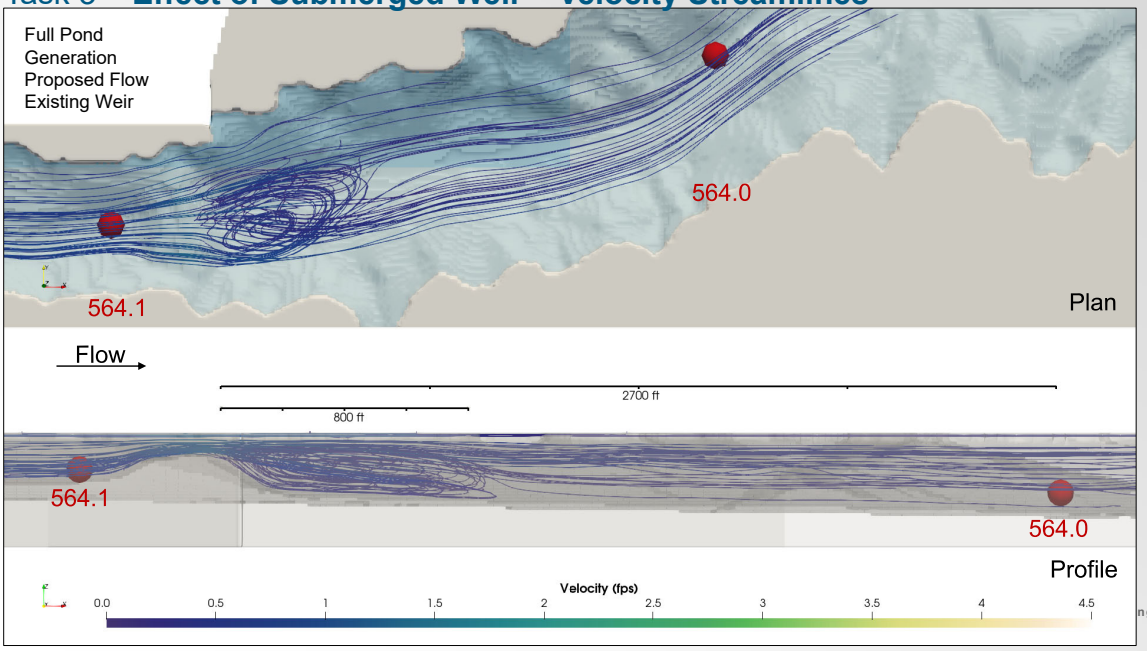
Task 3 – **Effect of Submerged Weir – Velocity Streamlines**



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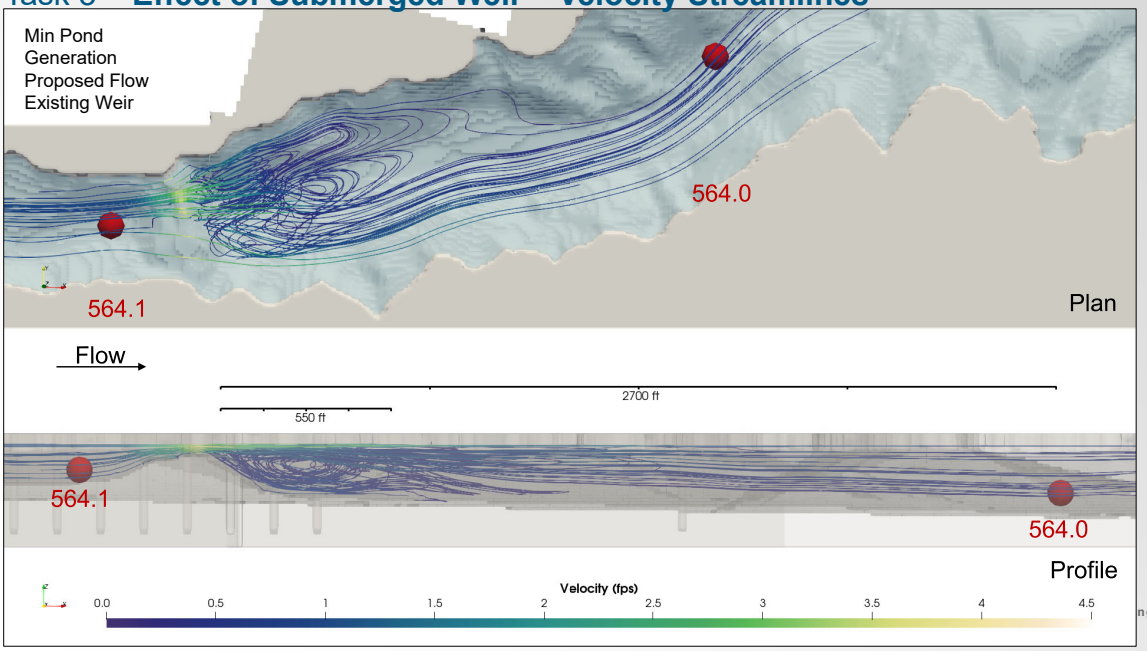
Task 3 – **Effect of Submerged Weir – Velocity Streamlines**



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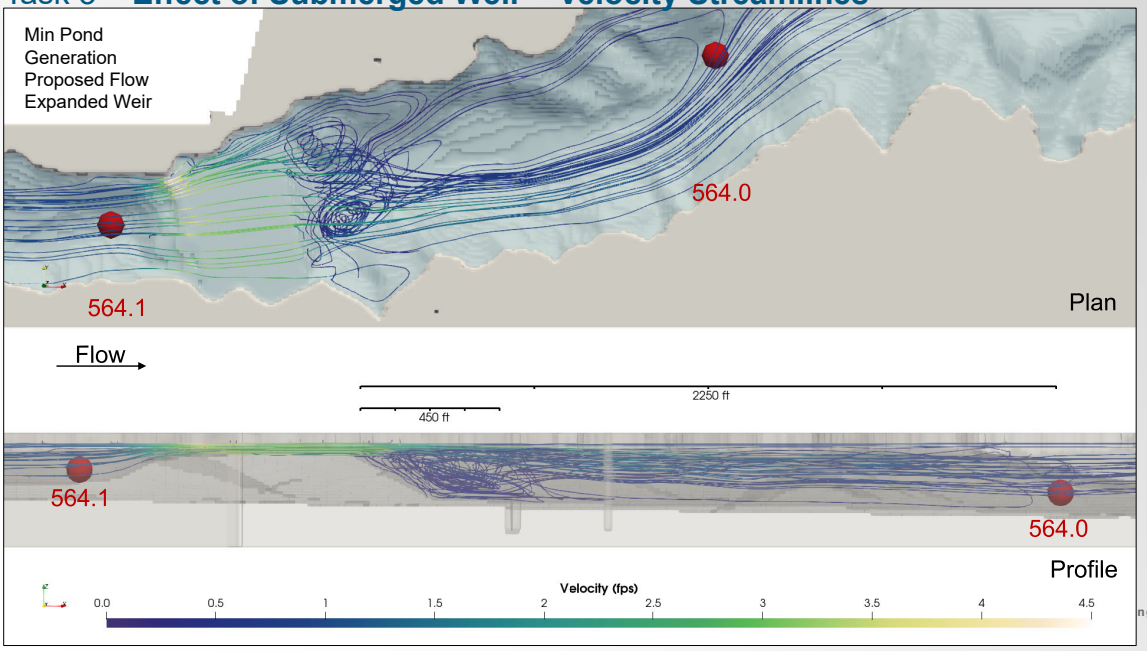
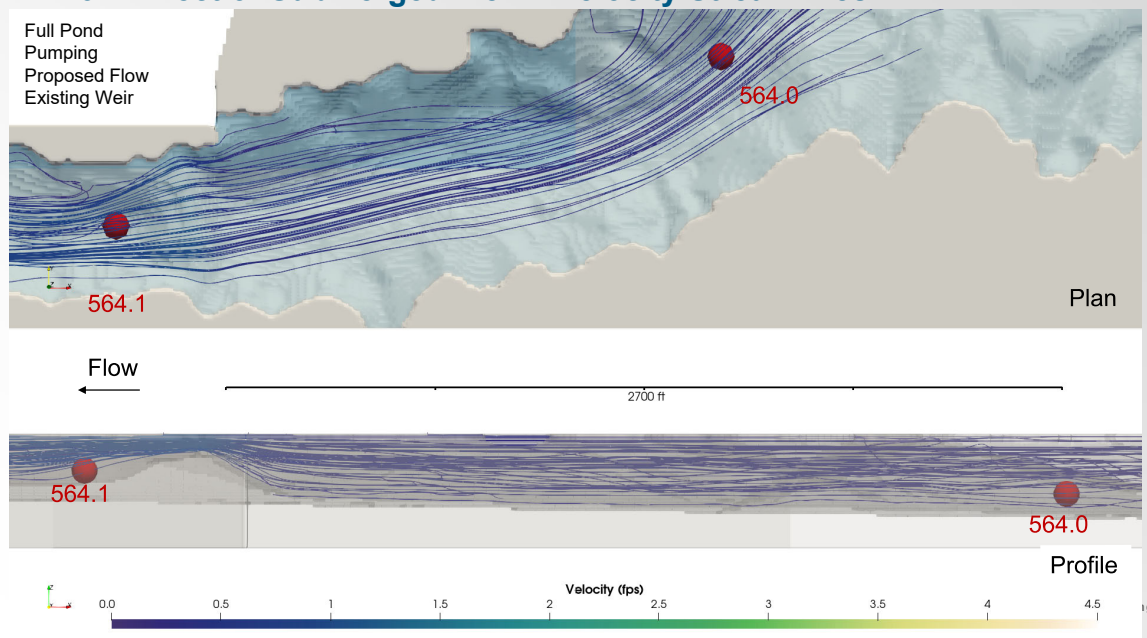
Task 3 – **Effect of Submerged Weir – Velocity Streamlines**



53

Task 3 – **Effect of Submerged Weir – Velocity Streamlines**



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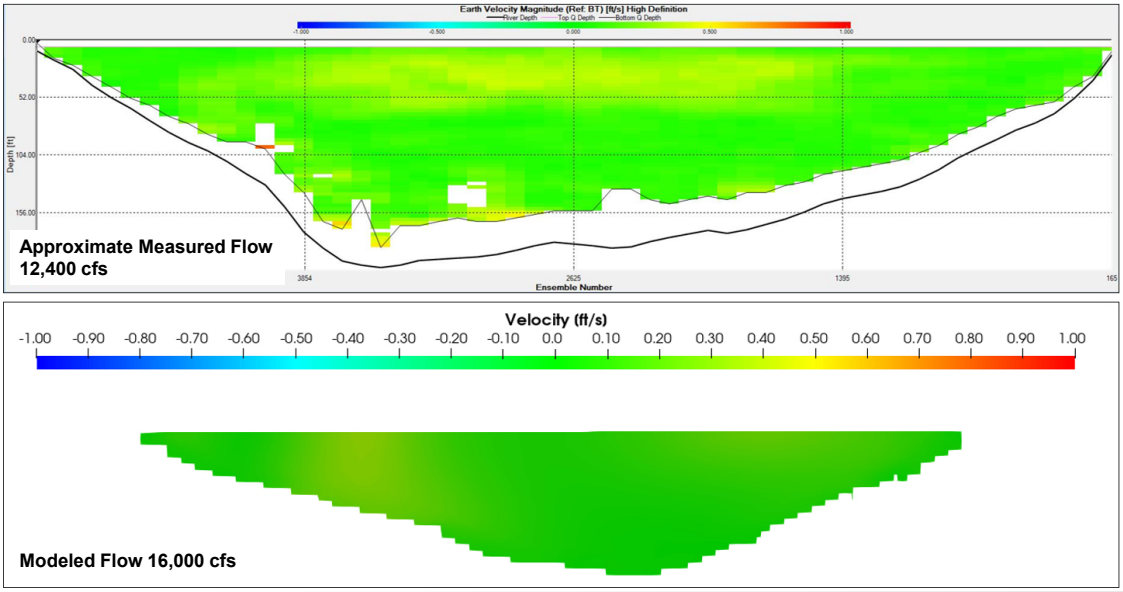
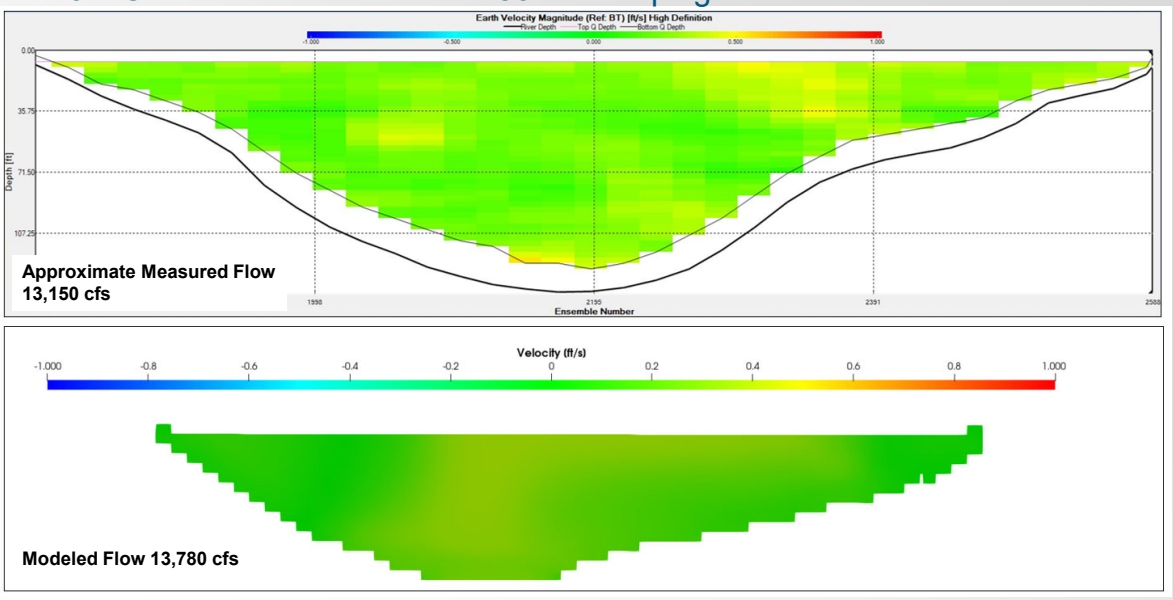
Task 3 – CFD Verification – Station 564.0 Generation



55

Task 3 – CFD Verification – Station 564.1 Pumping



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Task 3 - Conclusions

Generation

- The energy of the water discharged from Bad Creek is dissipated as it flows over the existing submerged weir.
- Similar vertical mixing and flow patterns result from flows over existing and expanded weir.
- Similar vertical mixing and flow patterns result from Bad Creek II powerhouse operations.
- Results indicate Bad Creek II powerhouse operations will not alter existing stratification patterns observed at Station 564.0 (downstream of weir).

Pumping

- Hydraulic impacts due to Bad Creek II pumping impacts limited to Whitewater River Cove upstream of submerged weir.
- Pumping in any configuration does not create mixing downstream of submerged weir.

Take home message: Of the "bookend" scenarios analyzed, combined Bad Creek and Bad Creek II operations (39,200 cfs) with Lake Jocassee at minimum pond elevation (1,080 ft msl) had the greatest effect on Whitewater River cove hydraulics (as expected), however at the downstream model boundary **that effect was negligible**.

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Task 4 - Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling)

- **Objectives:**
  - Use the existing CHEOPS model to evaluate the difference in water **exchange rate, frequency, and magnitude** between Bad Creek Reservoir and Lake Jocassee due to the addition of a second powerhouse.
  - Identify and evaluate impacts, if any, to Lake Keowee as a result of operating an additional powerhouse at the Project.
- **Status:** Ongoing

CHEOPS™
Operations and Planning Model

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Task 4 - Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling)

Performance Measures Worksheet (Excerpt) – Report distributed in Spring 2024

Measure Number	Performance Measures	Criterion (Note 1)	Start Date	End Date	MISC (Note 2)	Baseline	BCII
	Lake Jocassee						
	Elevation - Storage Availability						
1	Maximize adherence to reliably meet all Project-related water demands	Number of years reservoir level at or above 1,108 ft AMSL on May 1	1-May	1-May	5		
	Elevation - Recreation						
2	Minimize restricted recreation	Number of years where cove access (reservoir level below 1,090 ft AMSL) is restricted for more than 25 days (Note 3)	1-Jan	31-Dec	2		
3		Greatest number of days with restricted cove access (reservoir level below 1,090 ft AMSL) during higher use months in any calendar year (Note 3)	1-Mar	31-Oct	5		
4		Greatest number of days with restricted cove access (reservoir level below 1,090 ft AMSL) in any calendar year (Note 3)	1-Jan	31-Dec	5		
5	Minimize restricted boat launching	Number of years where reservoir level is below boat ramp critical level (1,080 ft AMSL) during higher use months for more than 25 days (Note 4)	1-Mar	31-Oct	2		
6		Greatest number of days where reservoir level is below boat ramp critical level (1,080 ft AMSL) during higher use months in any calendar year (Note 4)	1-Mar	31-Oct	5		
7	Minimize effects on recreational boating	Number of days where reservoir level changes more than 1.0 ft in one hour	1-Jan	31-Dec	10		
	Elevation - Natural Resources						
8	Maximize spawning success for black bass and blueback herring (2.5-ft fluctuation band)	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 10 consecutive days at least once (Note 5)	1-Apr	31-May	5%		
9		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 15 consecutive days at least once (Note 5)	1-Apr	31-May	5%		
10		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 20 consecutive days at least once (Note 5)	1-Apr	31-May	5%		
11		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 30 consecutive days at least once (Note 5)	1-Apr	31-May	5%		
12		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 45 consecutive days at least once (Note 5)	1-Apr	31-May	5%		

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Task 5 – Future Water Quality Monitoring Plan Development

- Will be carried out in consultation with Resource Committees in 2024 and in coordination with Section 404/401 activities.

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Recreational Resources Study

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Recreational Resources Task Refresher

Study Task	Status
Task 1 – Foothills Trail Corridor Recreation Use and Needs Study	**Ongoing**
Task 2 – Foothills Trail Corridor Conditions Assessment	**Ongoing**
Task 3 – Whitewater River Cove Existing Recreational Use Evaluation	**Complete**
Task 4 – Whitewater River Cove Recreational Public Safety Evaluation	**Begin in 2024**

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Task 1 – Foothills Trail Corridor Recreation Use and Needs Study

- **Objective(s):** The goals of the RUN Study are to assess current recreation use and identify any future recreation needs along the 43-mile-long segment of the Foothills Trail and associated access areas that are maintained by Duke Energy.
- **Status:** Ongoing

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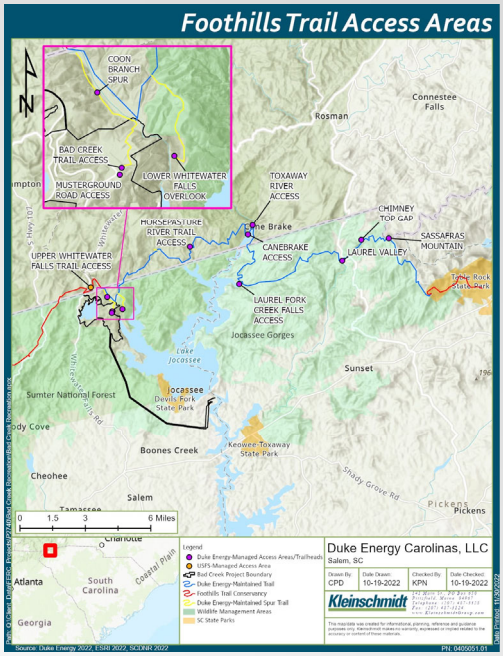
Task 1 – RUN Study Methods Summary

Study Area:

- the 43-mile-long segment of the Foothills Trail and associated access areas on non-Project lands maintained by Duke Energy; the entrance road to Musterground Road; Upper Whitewater Falls Trail Access (US Forest Service)
- 4 trailheads provide vehicular access (Sassafras Mountain, Chimney Top Gap, Laurel Valley, and Bad Creek Hydro Project Trail Accesses)
- 4 trailheads provide boat-in and hike-in only trail access (Horsepasture, Toxaway River, Canebrake, and Laurel Fork Creek Trail Accesses)



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Task 1 – RUN Study Methods

Data Collection Methods:

- Data collection methods include recreation site inventory, traffic counters, trail counters, in-person user surveys, and user surveys accessed via QR Code
- Spot counts were also conducted at Laurel Valley Trail Access to supplement the traffic counter data
- In-person surveys were collected on 30 days (4-hour shifts) between March and November at Laurel Valley, Toxaway River, Horsepasture River, and Bad Creek Hydro Project Trail Accesses
- Signs with QR codes that linked to an online version of the survey were posted at all trail access areas

Table 6-1. Summary of Data Collection Methods

Access Area	Data Collection Methods				
	Recreation Site Inventory	Traffic Counter	Trail Counter	In-Person User Surveys	User Surveys Accessed Via QR Code
Table Rock State Park[a]			*		
Sassafras Mountain Trail Access	*	*	*		*
Chimney Top Gap Trail Access	*		*		*
Laurel Valley Trail Access	*	*	*	*	*
Laurel Fork Creek Falls Spur Trail Access	*		*		*
Toxaway River Trail Access[b]	*		*	*	*
Canebrake Trail Access	*		*		*
Horsepasture River Trail Access	*		*	*	*
Lower Whitewater Falls Overlook	*		*		*
Bad Creek Hydro Project Trail Access[c]	*	*	*	*	*
Coon Branch Spur Trail			*		*
Musterground Road[d]		*			
Upper Whitewater Falls Trail Access[a]		*			

[a] This site is not maintained by Duke Energy.
[b] If water levels on Lake Jocassee do not allow for boat-in access to the Toxaway River Trail Access, surveys will be conducted at an alternative boat-in access point as identified in consultation with the Recreational Resource Committee.
[c] Two traffic counters will be installed near Bad Creek Hydro Project Trail Access, including one south of the parking area and one north of the parking area.
[d] This access road is managed via the Jocassee Gorges Road Management MOA between SCDNR and Duke Energy.

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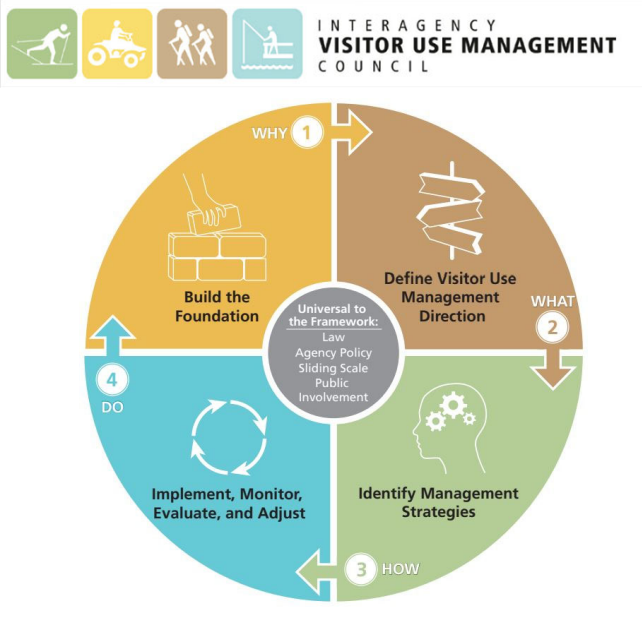
Task 1 – RUN Study Methods Summary

Data Analysis:

- Parking Demand Analysis
- Trail Carrying Capacity Analysis (conducted by Applied Trails Research)
- Future Recreation Use Analysis
- Recreation Needs Assessment



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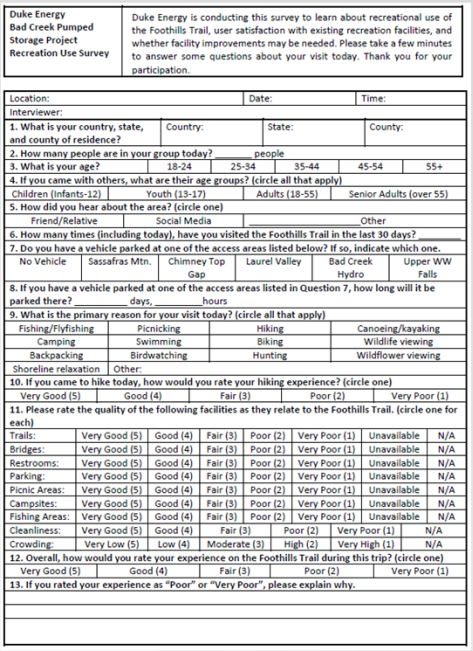
Task 1 – RUN Study Progress

- Data collection is complete
  - Musterground Road counter was removed January 15th
- Preliminary Survey Totals
  - 259 in-person surveys collected
  - 61 QR code surveys collected
  - 320 surveys total
- Data analysis is underway
- Draft report will be submitted for Resource Committee review in 2024
- Final report will be submitted with the USR



Duke Energy Bad Creek Pumped Storage Project Recreation Use Survey	Duke Energy is conducting this survey to learn about recreational use of the Foothills Trail, user satisfaction with existing recreation facilities, and whether facility improvements may be needed. Please take a few minutes to answer some questions about your visit today. Thank you for your participation.

Location:	Date:	Time:
Interviewer:		

1. What is your country, state, and county of residence?	Country:	State:	County:

2. How many people are in your group today? _____ people					
3. What is your age?	18-24	25-34	35-44	45-54	55+

4. If you came with others, what are their age groups? (circle all that apply)		
Children (infants-12)	Youth (13-17)	Adults (18-55)	Senior Adults (over 55)

5. How did you hear about the area? (circle one)		
Friend/Relative	Social Media	Other

6. How many times (including today), have you visited the Foothills Trail in the last 30 days? _____					
7. Do you have a vehicle parked at one of the access areas listed below? If so, indicate which one.					
No Vehicle	Sassafras Mtn.	Chimney Top Gap	Laurel Valley	Bad Creek Hydro	Upper WW Falls

8. If you have a vehicle parked at one of the access areas listed in Question 7, how long will it be parked there? _____ days, _____ hours			
9. What is the primary reason for your visit today? (circle all that apply)			
Fishing/Flyfishing	Picnicking	Hiking	Canoeing/kayaking
Camping	Swimming	Biking	Wildlife viewing
Backpacking	Birdwatching	Hunting	Wildflower viewing
Shoreline relaxation	Other:		

10. If you came to hike today, how would you rate your hiking experience? (circle one)				
Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)

11. Please rate the quality of the following facilities as they relate to the Foothills Trail. (circle one for each)							
Trails:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Bridges:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Restrooms:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Parking:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Picnic Areas:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Campsites:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Fishing Areas:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Cleanliness:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	N/A	
Crowding:	Very Low (5)	Low (4)	Moderate (3)	High (2)	Very High (1)	N/A	

12. Overall, how would you rate your experience on the Foothills Trail during this trip? (circle one)				
Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)

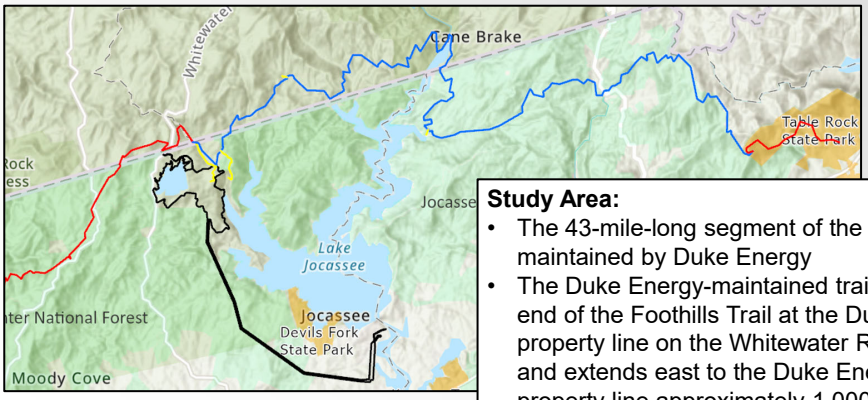
13. If you rated your experience as "Poor" or "Very Poor", please explain why.

Task 2 – Foothills Trail Corridor Conditions Assessment

- **Objective(s):** To evaluate the current condition of the trail surface and corridor included in the 43-mile segment and associated spur trails of the Foothills Trail maintained by Duke Energy and identify key areas of future maintenance needs or improvements.

- **Status:** Ongoing

Task 2 – Foothills Trail Corridor Conditions Assessment



Study Area:

- The 43-mile-long segment of the Foothills Trail and five spur trails maintained by Duke Energy
- The Duke Energy-maintained trail segment begins on the western end of the Foothills Trail at the Duke Energy/US Forest Service property line on the Whitewater River near the Bad Creek Project and extends east to the Duke Energy/Table Rock State Park property line approximately 1,000 feet southwest of the top of Pinnacle Mountain
- The five spur trails include Laurel Fork Falls, Hilliard Falls, Lower Whitewater Falls Overlook, Bad Creek, and Coon Branch

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Task 2 –Trail Conditions Assessment - Methods

- **Methods:**
  - Locate issue/structure along the trail and record GPS waypoint
  - Take photos of significant issues/features for documentation
  - Identify type of issue/structure using categories
  - Measure issue/structure (i.e., bridges, culverts, eroded sections, washouts, wet areas, and diameters of fallen trees)
  - If excessive grade is present (greater than 15 percent slop) in conjunction with erosion, utilize clinometer to measure percent slope
  - Provide additional description/comments about issues/structures identified
- Assessment was completed by Long Cane Trails
- Foothills Trail Guidebook was used as a reference for location descriptions

Trail Assessment Descriptions:

Code	Description
B	Bridges, puncheon, bog bridges, turnpikes. ***Note construction material, length/width (feet) and condition of bridge.***
UC	Unimproved Crossing (stream crossing). ***Note if wading or rock steps and any maintenance required (unstable stepping stones). Note the width of the stream at the crossing point.***
C	Culvert – open or closed drain across the trail. ***Note condition of culvert, length/diameter and if sufficient size for situation.***
E	Erosion - look for exposed roots, rocks, or gullies on trail. ***Describe situation (exposed roots, gullies on tread, located on fall line (going straight down a hill regardless of grade) and length of eroded section (if greater than 25 ft, approximate distance).*** ***If excessive grade (>15% slope) in conjunction with erosion: measure steep slopes with clinometer (if numerous steep rocky slopes, no need to measure each one – note that trail has numerous steep rocky sections)***
EC	Erosion Control Devices – check dams, water bars. ***Note type and condition of structure.***
WO	Washout - section of trail has been mostly/completely washed away. ***Note length/width/depth and any hazards associated with washout. Take photo.***
WA	Wet Area/standing water (larger than 3ft diameter). ***Note length/width. Note any adjacent water feature.***
OB	Obstacle – fallen tree or other obstacle blocking treadway (include broken branches or trees leaning above/across the trail ("widow makers"). ***Note diameter of fallen tree.***
IB	Insufficient Blazing/Marking – if can't see next blaze/marker as you are moving past a blaze/marker or hard to locate next blaze/marker. ***Note if blazes/markers missing or worn off.***
SI	Signage – ***Identify if Trailhead, Directional or Interpretive and if in need of repair. Note type of repair.***
AC	Additional Comment – specific locations that warrant noting such as a scenic vista, unique feature (caves, mines, rock wall) and locations of invasive species. ***Note type of feature and associated details (such as name of invasive species and amount of plants (number, area).***

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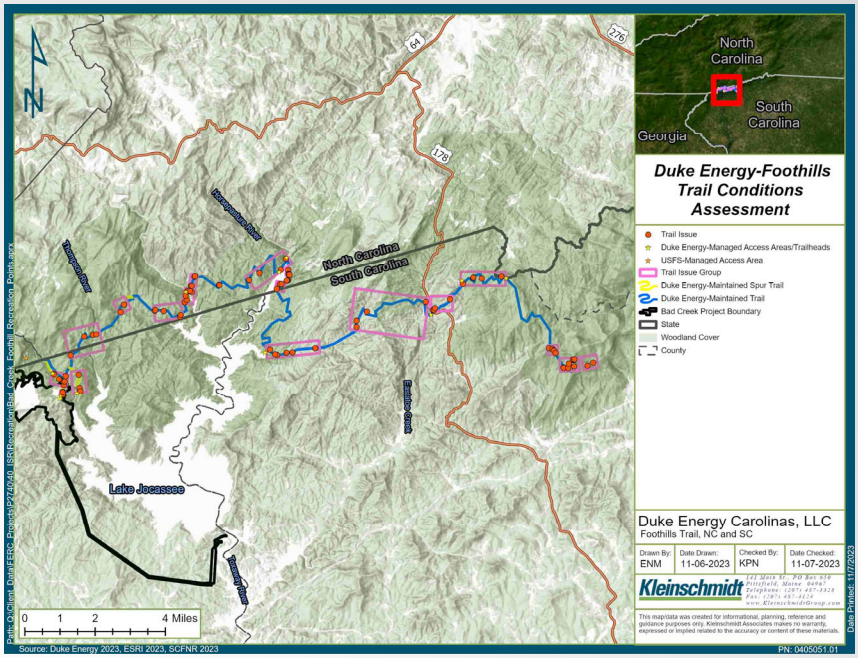
Task 2 –Trail Conditions Assessment - Results

- **Results:**
  - Long Cane Trails identified 89 areas needing maintenance or improvement within the study area.



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Trail Issue #	Figure #	Date Assessed	Trail Name	Mile Marker	Latitude	Longitude	Assessment Type	Description/Details
1	Figure 4-2	9/14/2023	Bad Creek Access Spur	0.1	35.01273631	-82.99787808	Culvert, Open Drain	Concrete culvert needs cleaning. Sediment has gathered and is sitting, not allowing water to run down the drain.
2	Figure 4-2	9/14/2023	Bad Creek Access Spur	0.1	35.01296829	-82.99759536	Wet Area / Standing Water	Gravel needs to be added to the section of the trail to raise it approximately 2 inches. This is a very low area with standing water most of the time. In fact, there is some drainage that seems to be serving a purpose in this area also.
3	Figure 4-2	9/14/2023	Bad Creek Access Spur	0.2	35.01339791	-82.9977754	Wet Area / Standing Water	Low part of the trail, and gravel needs to be brought in. Easily accessible from the parking lot. This trail has had gravel on it in the past. It just needs a topping.
4	Figure 4-2	9/14/2023	Bad Creek Access Spur	0.3	35.01449413	-82.99786919	Erosion Control Devices, Other	Someone is putting barricades on the side of the trail, and these need to be removed. There are several in this section of the trail. These, in fact, hold water on the trail versus letting water off the trail. There should be a series of knicks or grade reversals in this section to divert water.
5	Figure 4-2	9/14/2023	Bad Creek Access Spur	0.3	35.01413933	-82.99811383	Steps	The step is rotten and needs to be replaced.
6	Figure 4-3	9/14/2023	Bad Creek Access Spur	0.6	35.01723673	-82.99744404	Signage, Interpretive	Approximately 100 feet of trail has been rerouted. The user can still see the old relays in the corner as well as the old trail. The new trail is working great! The old trail needs to be closed, and the new trail needs to be blazed in the corner, so users know this is the trail. In this particular area, you have not seen a blaze in a while. Blue color is needed to apply a new blaze
7	Figure 4-3	9/14/2023	Bad Creek Access Spur	0.7	35.01869053	-82.99718057	Obstacle, Fallen Tree	A fallen tree across the trail needs to be removed.
8	Figure 4-3	9/18/2023	Coon Branch	0.2	35.01956213	-82.99972003	Bridge, Bridge	The upper railing needs to be replaced on both sides, and two decking boards need to be replaced.
9	Figure 4-3	9/18/2023	Coon Branch	0.2	35.01966168	-82.9999907	Bridge, Bridge	Two 2x4x12 railings need to be replaced.
10	Figure 4-3	9/18/2023	Coon Branch	0.4	35.02183009	-83.00243764	Bridge, Buncheon	Bog Bridge, two feet wide by four feet long, needs to be installed
11	Figure 4-3	9/18/2023	Coon Branch	0.4	35.02160249	-83.00233517	Erosion, Gullie	A major drain needs to be unclogged. It is overflowing and going down the trail. The solution is to simply open the drain up more and get rid of the sediment that is raising the drain up.
12	Figure 4-4	9/14/2023	Lower Whitewater Falls Spur	0.4	35.02155442	-82.99014034	Washout	Trail needs water diversion in the form of grade dips or knicks.
13	Figure 4-4	9/14/2023	Lower Whitewater Falls Spur	0.9	35.01623192	-82.98947331	Washout	Trail needs some steps and grade dips or water diversion features added. Approximately 20 steps needed.
14	Figure 4-4	9/14/2023	Lower Whitewater Falls Spur	1	35.01476505	-82.98918722	Erosion, Gullie	Trail is using an old roadbed that has a gully on each side and very few drains. all drains are clogged and need to be rerouted. New trail limit is very close to the old just elevated on the banks versus in the middle of the old roadbed.
15	Figure 4-3	9/14/2023	Foothills Trail	31.6	35.02092083	-82.99665677	Washout	The trail needs some grade reversals or knicks. Water has gotten on the trail and does not leave for some time, causing a gully if not fixed.
16	Figure 4-5	9/30/2023	Foothills Trail	32.4	35.02958049	-82.99437631	Steps	Replace three steps
17	Figure 4-5	9/30/2023	Foothills Trail	33.3	35.03730923	-82.98769713	Steps	Replace three steps
18	Figure 4-5	9/30/2023	Foothills Trail	33.9	35.03812814	-82.98336354	Steps	One step needs to be replaced.
19	Figure 4-5	9/30/2023	Foothills Trail	34.2	35.03822699	-82.98165951	Steps	Steps need to be replaced.
20	Figure 4-6	9/30/2023	Foothills Trail	35.5	35.04768531	-82.96974848	Obstacle, Fallen Tree	Tree across trail and needs to be removed.
21	Figure 4-6	9/18/2023	Foothills Trail	35.8	35.05077596	-82.96808629	Steps	Two steps need to be replaced.

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Task 2 –Trail Conditions Assessment – Results Summary

- **Summary:**
  - Long Cane Trails identified 89 items within the study area primarily related to trail maintenance and safety
    - 75 on the Foothills Trail
    - 7 on the Bad Creek Access Spur Trail
    - 4 on the Coon Branch Spur Trail
    - 3 on the Lower Whitewater Falls Spur Trail
  - Items identified include culvert cleaning, erosion control, steps replacement, signage improvement, bridge maintenance, fallen tree removal, and trail washout repair
  - The draft report was issued to the RC for review on November 21, 2023, and comments were received from the following entities:
    - Foothills Trail Conservancy
    - SCDNR
    - FOLKS
  - Duke Energy will meet with the RC to discuss study results
  - The final report will be filed with the USR

Key Findings of Foothills Trail Conditions Assessment

Trail	Mile	Key Findings
Bad Creek Access Spur	0.1-0.7	• Culvert Maintenance: A culvert with a clogged drain spanning 80 feet requires cleaning to allow proper water flow. • Wet Areas: Low areas on the trail with standing water need gravel addition to raise and level the path, covering 60 feet and 30 feet sections. • Erosion Control: Removal of barricades placed on the side of the trail to address water retention issues. • Steps Replacement: Several steps need replacement due to rot. • Interpretive Signage: Approximately 100 feet of trail has been rerouted, and new blazes are needed to guide hikers.
Coon Branch Spur	0.2	• Bridge Maintenance: Railing and decking replacement for a bridge, involving handrails and decking boards. • Railing Replacement: Two handrails need replacement.
Coon Branch Spur	0.4	• Bog Bridge Installation: Installation of a bog bridge measuring 4 feet x 2 feet. • Drain Clearing: Major drain unclogging is required to prevent overflow onto the trail.
Foothills Trail	31.6-72.8	• Erosion Control: Multiple sections of the Foothills Trail require erosion control measures such as grade reversals, knicks, or drainage improvements. • Steps Replacement: Various steps along the trail need replacement or repair due to damage. • Fallen Trees: Several fallen trees across the trail need removal. • Bog Bridges: Installation of new bog bridges. • Signage: Adding new trail blazes and interpretive signage. • Brush Removal: Clearing overgrown sections of the trail. • Washout Repair: Addressing trail washouts and water diversion. • New Trail Sections: Creating new trail segments to address erosion and trail conditions.
Lower Whitewater Falls Spur	0.4-1.0	• Washout and Erosion: Trail washouts, the need for stairs, and grade dips have been identified, impacting a significant portion of this spur.

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Task 3 – Whitewater River Cove Existing Recreational Use Evaluation

- **Objective(s):** Establish baseline recreational use within the study area, specifically the level of boating use in Whitewater River cove; and quantify recreational impacts of temporary closures of Whitewater River cove during construction of Bad Creek II Complex.
- **Status:** **Complete**

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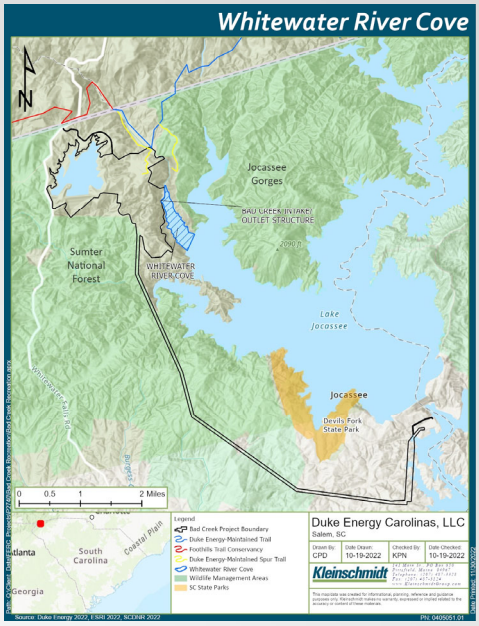
Task 3 – Whitewater River Cove Recreation Evaluation - Methods

- **Study Area:**
  - Whitewater River Cove of Lake Jocassee from 35.00.00.40N, 82.59.29.29W to 35.00.04.69N, 82.59.15.57W



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Task 3 – Whitewater River Cove Recreation Evaluation - Methods

- **Objective 1 Methods:**
  - Duke Energy deployed a drone over the Whitewater River cove to capture aerial images of recreation use and determine the number, type, and location of boats within the study area.
  - Drone flights occurred on 20 individual days between Memorial Day weekend and Labor Day weekend
  - Flights occurred on a mix of weekdays, weekends, and holidays
  - Images were collected approximately every hour generally between 9:00 AM and 4:00 PM.
  - Boats were categorized as:
    - Motorboat
    - Non-motorized boat (such as canoe or kayak)
    - Personal watercraft (such as Jet-Ski)
    - Paddleboard

Flight/Survey Date	Daily High Temperature (°F)	Notes
Sunday, May 28, 2023	63	
Wednesday, May 31, 2023	75	
Friday, June 2, 2023	86	
Saturday, June 3, 2023	88	
Tuesday, June 13, 2023	79	
Saturday, June 24, 2023	82	
Wednesday, June 28, 2023	89	
Saturday, July 1, 2023	93	
Tuesday, July 4, 2023	89	
Friday, July 14, 2023	92	Due to lightning, flights ended at 2:30 pm
Saturday, July 15, 2023	95	Due to storms, flights ended at 3:00 pm
Thursday, July 20, 2023	82	
Saturday, July 29, 2023	90	
Monday, July 31, 2023	89	
Sunday, August 6, 2023	92	
Monday, August 7, 2023	92	
Wednesday, August 23, 2023	86	
Sunday, August 27, 2023	94	Due to weather, flights ended at 2:30 pm
Sunday, September 3, 2023	87	
Monday, September 4, 2023	91	

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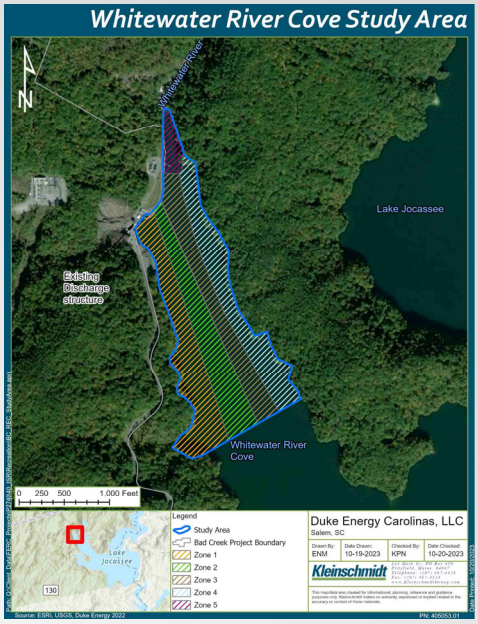
Task 3 – Whitewater River Cove Recreation Evaluation - Methods

- **Objective 1 Methods:**
  - Aerial imagery was analyzed to estimate:
    - Total number of boats present each day
    - Number of boat types captured each day
    - Approximate duration of time each boat spent in Whitewater River cove
  - Study area was divided into five distinct zones to further classify location of boats within Whitewater River cove



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Task 3 – Whitewater River Cove Recreation Evaluation - Methods

- **Objective 2 Methods:**
  - Data were extrapolated to draw conclusions related to the rate and patterns of recreation use in Whitewater River cove
  - Estimates for nighttime and off-season use determined during the 2012 Keowee-Toxaway RUN Study were applied.
  - Estimates for nighttime and off-season use were combined with estimates for peak season daytime use to determine estimate for total use in the Whitewater River cove for 2023
  - Data were escalated based on population projections for 2030 in Oconee County, SC

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Task 3 – Whitewater River Cove Recreation Evaluation – Objective 1 Results

Table 4-2 Total Number of Boats and Boat Types per Flight

Flight/Survey Date	Day Type	Total # of Boats	Total # of Each Boat Type			
			Kayak	Personal Watercraft	Canoe	Motorboat
Sunday, May 28, 2023	Holiday	4	0	2	0	2
Wednesday, May 31, 2023	Weekday	4	0	0	0	4
Friday, June 2, 2023	Weekday	8	4	1	0	3
Saturday, June 3, 2023	Weekend	25	7	0	1	17
Tuesday, June 13, 2023	Weekday	13	3	0	0	10
Saturday, June 24, 2023	Weekend	34	2	1	0	31
Wednesday, June 28, 2023	Weekday	20	0	0	1	19
Saturday, July 1, 2023	Weekend	38	2	3	0	33
Tuesday, July 4, 2023	Holiday	35	1	1	0	33
Friday, July 14, 2023	Weekday	15	0	3	0	12
Saturday, July 15, 2023	Weekend	47	0	10	0	37
Thursday, July 20, 2023	Weekday	12	4	0	0	8
Saturday, July 29, 2023	Weekend	41	0	1	1	39
Monday, July 31, 2023	Weekday	21	1	0	0	20
Sunday, August 6, 2023	Weekend	14	3	6	0	5
Monday, August 7, 2023	Weekday	1	0	0	0	1
Wednesday, August 23, 2023	Weekday	8	0	1	0	7
Sunday, August 27, 2023	Weekend	22	0	1	0	21
Sunday, September 3, 2023	Holiday	48	0	13	0	35
Monday, September 4, 2023	Holiday	30	2	0	0	28
Total		**440**	**29**	**43**	**3**	**365**

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Task 3 – Whitewater River Cove Recreation Evaluation – Objective 1 Results

- **Objective 1 Results:**
  - During the study period, boats in Whitewater River cove were:
    - Motorboats (83 percent)
    - Personal watercraft (10 percent)
    - Kayaks (7 percent)
    - Canoes (less than 1 percent)
    - No paddleboards observed
  - Majority of use was on weekends/holidays (day type) and July (month)
  - Duration of time in cove:
    - 90 percent were <1 hour
    - 9 percent were 1-2 hours
    - 1 percent were >2 hours

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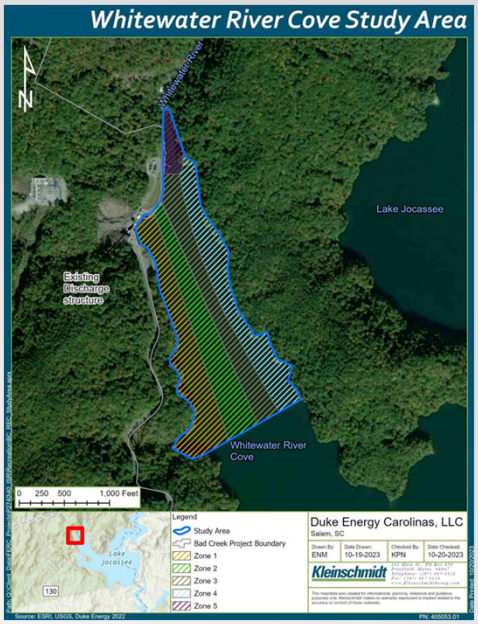
Task 3 – Whitewater River Cove Recreation Evaluation – Objective 1 Results

- **Objective 1 Results:**
  - Boats were observed in the following zones:
    - **Zone 5** (49 percent)
    - **Zone 3** (20 percent)
    - **Zone 4** (17 percent)
    - **Zone 1** (9 percent)
    - **Zone 2** (5 percent)



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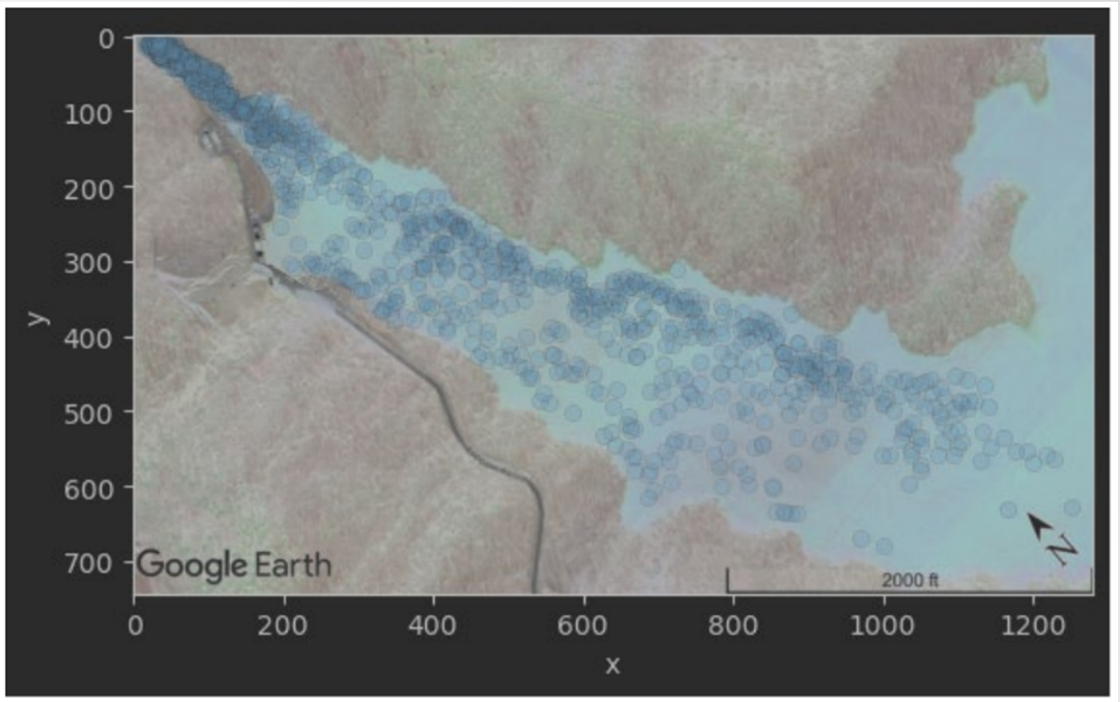

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Task 3 – Whitewater River Cove Recreation Evaluation – Objective 2 Results

- **Objective 2 Results:**
  - Estimated Recreation Use in Whitewater River Cove
    - ~3,647 boats between April-October 2023
    - ~3,756 boats in 2023
  - During construction of Bad Creek II Complex, the cove would be closed to the public for 5-7 years
  - Closure of the cove could displace between approximately 19,895 and 27,852 boats during the construction period

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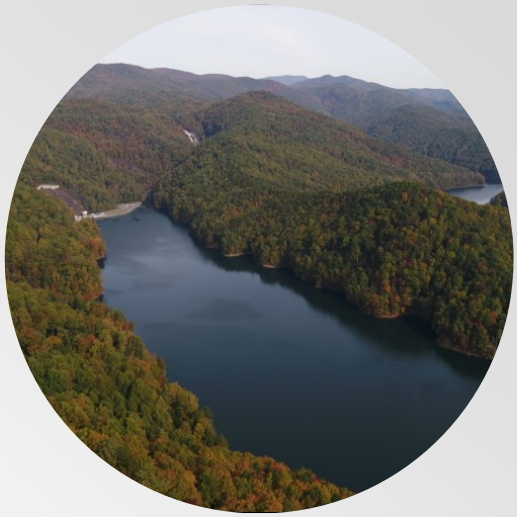
Task 3 – Whitewater River Cove Recreation Evaluation – Summary

- **Summary:**
  - Whitewater River cove is primarily visited by recreators in motorboats
  - Boats tend to follow the eastern shoreline of the cove and congregate in the northern tip of the cove near the waterfall
  - Visitors are assumed to be primarily sightseers (viewing the waterfall) and secondarily fishermen
  - Recreation impacts from Bad Creek II Complex construction:
    - Between 19,895 and 27,852 boats displaced during 5–7-year construction period (approximately 4,000 boats per year)
    - Approximately **1-2 percent of recreation** days at Lake Jocassee lost each year



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Task 4 – Whitewater River Cove Public Recreational Safety Evaluation

- **Objective(s):** Evaluate potential public safety risks that may be created or exacerbated by the Bad Creek II Complex during both the construction and operation phases. The evaluation will include but not be limited to identification of areas where access will be temporarily or permanently restricted to the public as well as a boater safety evaluation for the Whitewater River arm of Lake Jocassee.
  - The desktop study will evaluate impacts of operation of the expanded Project (i.e., two powerhouses) on water velocities released to the Whitewater River cove and impacts to water-based recreation using the CFD model.
- **Status: Future**

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Aquatic Resources Study

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Aquatic Resources Study Task Refresher

Study Task	Status
Task 1 – Consultation on Entrainment	**Complete**
Task 2 – Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat	**Ongoing**
Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna	**Ongoing**

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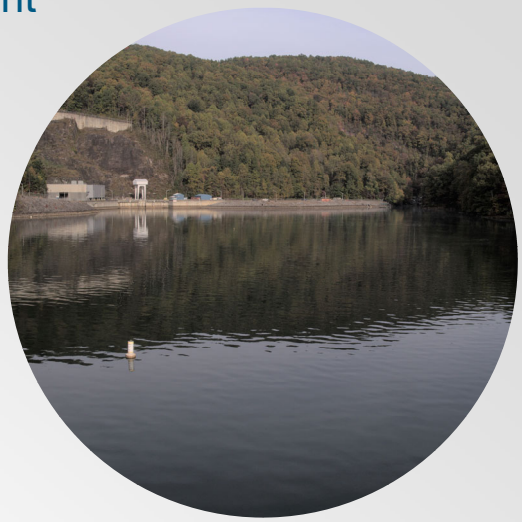
Task 1 – Consultation on Entrainment

- **Objective(s):** Evaluate the potential for increased fish entrainment due to the addition of Bad Creek II Complex and consult with agencies and other Project stakeholders regarding results of the recent desktop Entrainment Study (Kleinschmidt 2021).
- **Status:** **Complete**



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Task 1 – Consultation on Entrainment - Outline

1. Consultation with Stakeholders and Agencies
   a. Resource Committee Discussions held April 6, 2023 Guided Analysis
2. Data & Methods
3. Results
   1. Exploratory data analysis
   2. Simulation Results
   3. Risk
4. Discussion

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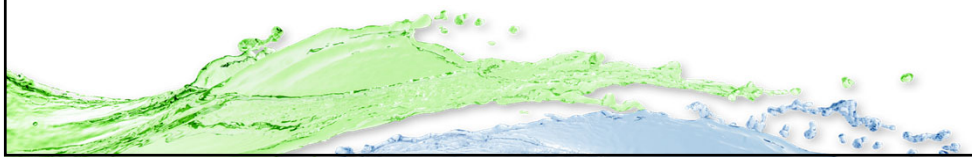
Task 1 – Consultation on Entrainment - Data Sources

- 1973 – 2020 Lake Jocassee Water Quality
  - date\time\elevation\pH\DO\temperature\conductivity
- 1990 – 1994 Jocassee Hydro Plant Log
  - date\time\forebay elevation
- 1991 – 1993 Bad Creek Entrainment Observations
  - date\time\# of contacts
- 2012 – 2014 Operations Period of Record
  - date\time\Unit 1 MW\Unit 2 MW\Unit 3 MW\ Unit 4 MW



Kleinschmidt

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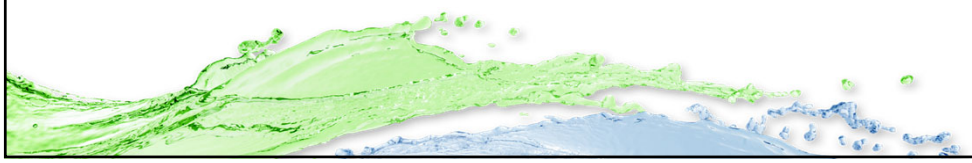
Existing Entrainment Estimators

- Traditional methods multiply entrainment rate (fish/Mft^3) by the total volume of water discharged through a facility within some unit of time
- Produce single point estimate with no uncertainty
- Entrainment rates are highly variable with infrequent, but large events…

Two Potential Problems:

1. If a large episodic event occurs while sampling, the estimate will be biased as this high rate is applied across an entire interval of time

2. Likewise, if no large event occurs while sampling the estimate may incorrectly characterize the facility as having little to no impact



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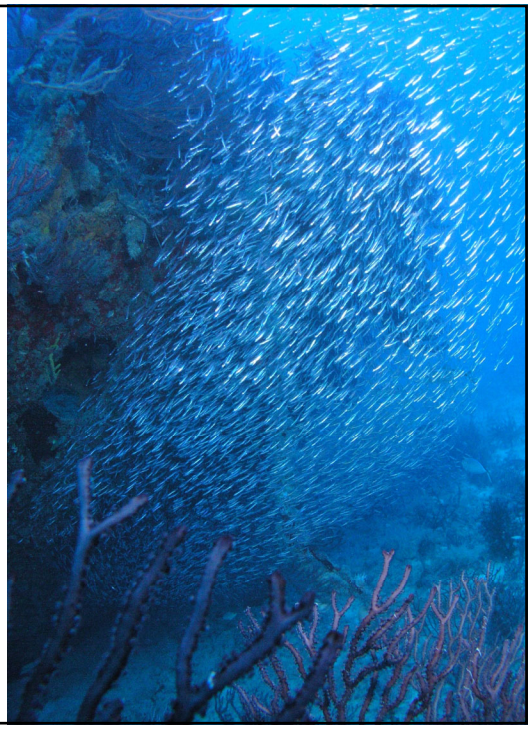
stryke.py

- Individual based model – follows the fate of individual fish in a simulated population as they migrate through a hydroelectric facility
- Population size, entrainment rates, individual lengths, movement, and survival are simulated with Monte Carlo methods
- Python 3.7.x with MS Excel interface

https://github.com/knebiolo/stryke



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Impacts Analysis: Describing Entrainment Events

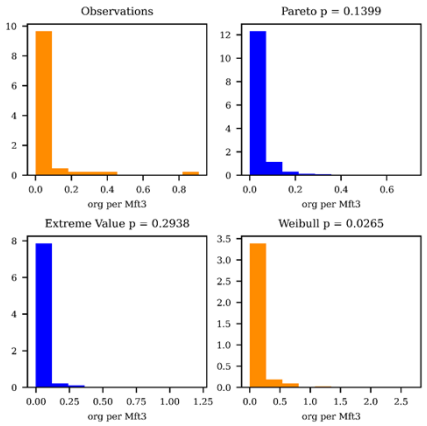
stryke simulates the *magnitude* and *frequency* of entrainment events by sampling from distributions fit to empirical observations

Database of monthly observations from 73 facilities (EPRI 1997)

- Normalized for discharge: fish per Mft^3

Pattern repeated across species and regions

EVT not CLT



how big can an event get and how frequently do they occur?

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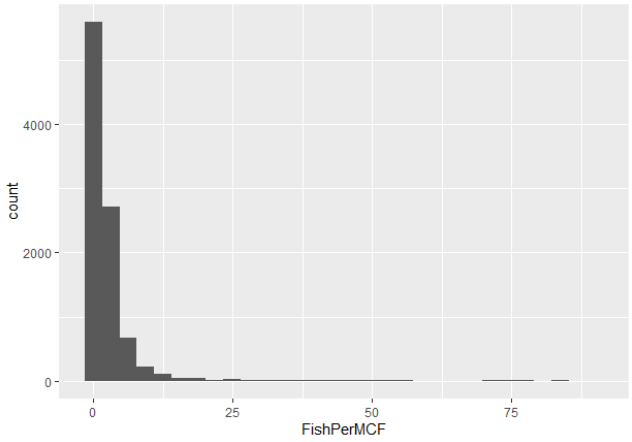
Bad Creek Entrainment 1991 - 1993



Fish Mft^3 – acoustic imaging camera at Bad Creek Pumped Storage

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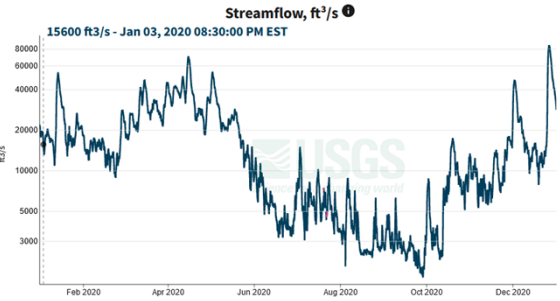
Yearly Entrainment Estimate (Impact)



For every day in a hydrograph → Simulate presence → If present simulate entrainment event → For every fish in event, simulate movement and survival → Σ

X 1000's

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Effects Analysis – Population Resiliency

- Population is resilient if it can replace those lost
- Used population growth rates or doubling rates (FishBase)
- Assume population depleted relative to carrying capacity

$$N_{t+1} = N_t(1 + r) - (E_t + M_t)$$

Where:

- N_t = population in year t
- r = discrete population growth rate
- E_t = entrainment mortality in year t
- M_t = natural mortality in year t

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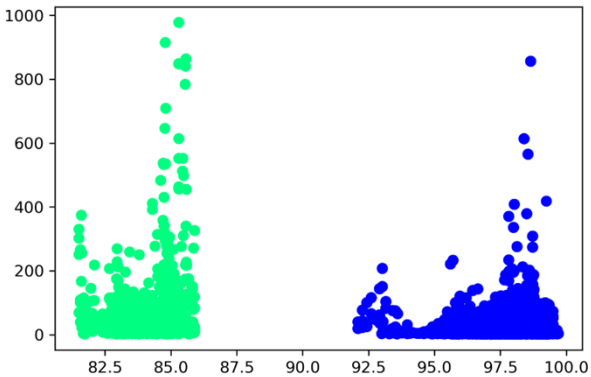
Exploratory Data Analysis: Forebay Elevation

Forebay elevation collected 3 – 4x per day

Low variability within a day allows us to interpolate a forebay observation for every entrainment observation

2 observational modes identified with GMM



Low forebay elevations occurred during meteorological fall (Sep, Oct, Nov)

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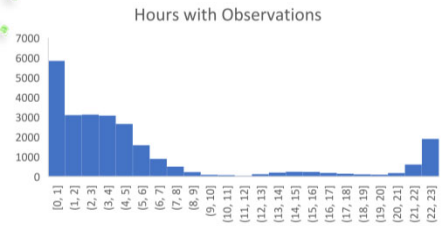
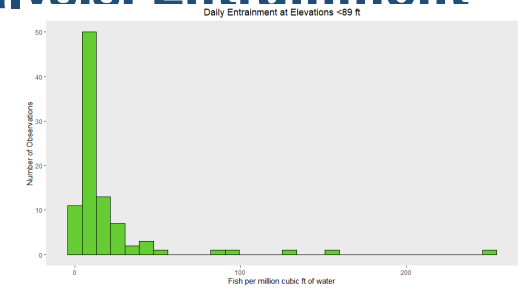
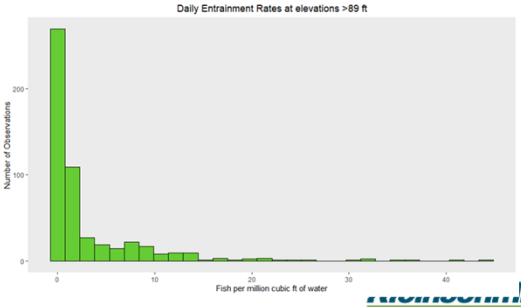
Exploratory Data Analysis: Entrainment Observations

- Separate observations into two datasets (> 89', <= 89')
- Fit seasonal entrainment to log normal distributions







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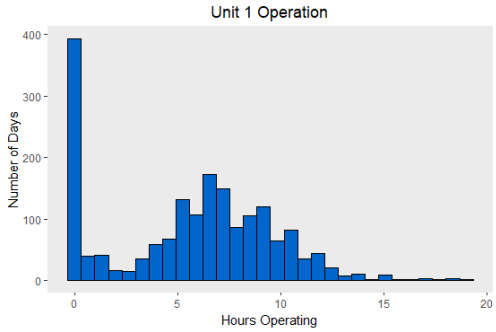
Exploratory Data Analysis: Hours Operated per Unit

- Operations data from period of record indicative of future operations at Bad Creek
- Assume Bad Creek II operated in same manner as Bad Creek I
- Fit seasonal data to log normal distribution for simulation

Season	Minimum	Maximum	Mean	Standard Deviation	Median
Winter	0	19.00	5.34	4.09	5.25
Spring	0	16.80	4.41	3.89	5.25
Summer	0	13.00	7.65	2.95	8.25
Fall	0	17.80	5.13	4.12	5.75



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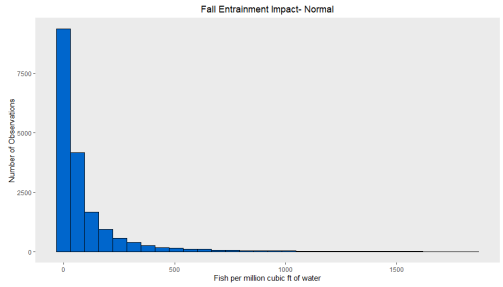
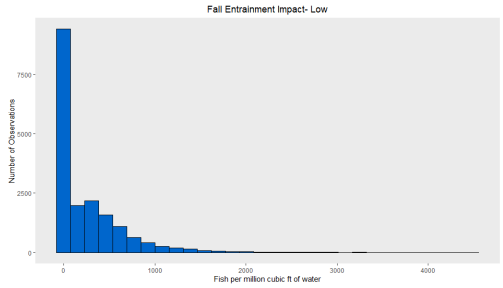
Simulation Results

- **Highest probability of entraining fish occurs in fall when forebay levels are low**

Season	Forebay level	Median Entrained	Probability 10 entrained	Probability 100 entrained	Probability 1000 entrained
Winter	High	18,344	0.512	0.445	0.380
Spring	High	23,389	0.19	0.09	0.04
Summer	High	32,684	0.56	0.48	0.40
Fall	High	16,977.5	0.54	0.43	0.33
Fall	Low	46,052.5	0.56	0.51	0.45





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Population Vulnerability

- **Potentially, up to 12% of threadfin shad population lost to entrainment every year**
- **< 1% of blueback herring population lost**

Species	Categorical discrete growth rate (min)	Species-specific discrete growth rate (min)	Estimated Population 2001-2020 (millions)	Annual Entrainment Loss Estimate	Proportion of Annual Population Lost to Entrainment (PL)	Annual population multiplier including entrainment (categorical)	Annual population multiplier including entrainment (species-specific)
Blueback Herring	1.17	1.20	3.7	0.03	0.00	1.16	1.19
Threadfin Shad	1.17		0.52	0.06	0.12	1.05	

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Conclusions

- **Exploratory data analysis shows that if Lake Jocassee operates at a lower elevation (< 89') probability of entrainment increases**
- ***"The expected entrainment rate of 12% for Threadfin Shad is close to the expected annual increase for the slowest recovery surrogate, American Shad, indicating that entrainment mortality may keep the population from substantial increase, but is not likely to cause the population to decrease, unless combined with other impacts."***

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Task 2 – Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat

- **Objective(s):** Assess changes to (1) pelagic and (2) littoral aquatic habitat in Lake Jocassee resulting from the expanded underwater weir and additional discharge, using models developed for the Water Resources Study and Keowee-Toxaway Hydroelectric Project (KT Project) relicensing.
- **Status:** Ongoing

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Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna

- **Objective(s):** Evaluate potential direct impacts to aquatic habitat (including wetlands) related to Bad Creek II Complex construction activities and weir expansion by quantifying and characterizing surface waters, including resource quality.
- **Status:** Ongoing

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Task 3 – SCDNR Consultation

- **May 2023**: SCDNR requested that Duke Energy use the Stream Quantification Tool (SQT) to evaluate streams potentially impacted by Bad Creek II Complex construction activities
- **May 24 and June 21, 2023**: consultation calls held with SCDNR regarding SQT methodology and memo of proposed survey approach
- **July 12, 2023**: site visit with Lorianne Riggin (SCDNR) to streams within two representative potential spoil locations
- **August 3, 2023:** finalized stream survey approach memo shared with SCDNR and the Aquatic Resources Resource Committee

Note: consultation is ongoing

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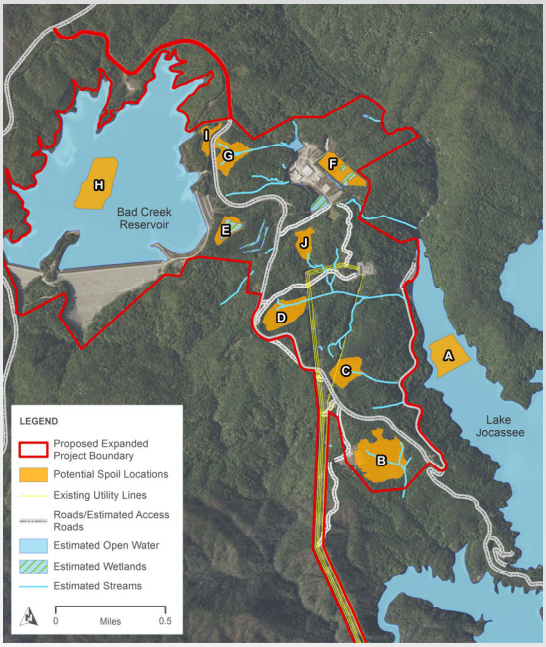
Task 3 Methods – Potential Spoil Locations

- Stream habitat assessments
  - NC Stream Assessment Method (NCSAM) and USEPA Rapid Bioassessment Protocol (RBP)
- Mussel surveys
  - Streams within spoil locations
  - Lake Jocassee shoreline in the vicinity of Bad Creek II inlet/outlet and submerged weir



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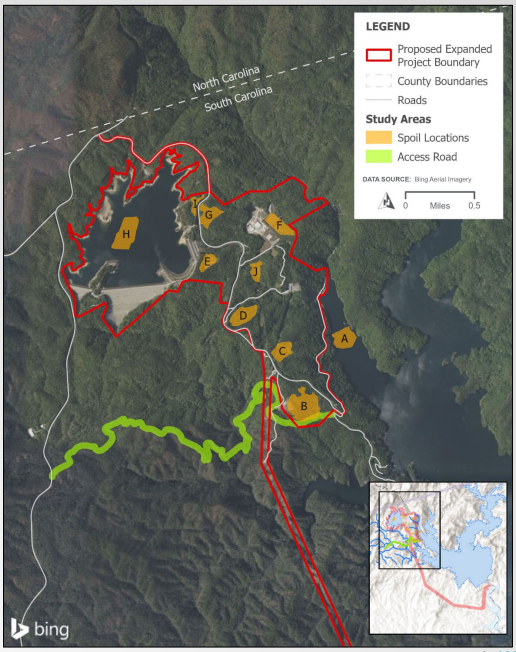
Task 3 Methods – Potential Temporary Access Road

- Stream habitat assessments – all stream crossings
  - NCSAM & USEPA RBP
  - SC SQT
- Biological surveys - Howard Creek and Limber Pole Creek (in support of SQT)
  - Electrofishing surveys
  - Macroinvertebrate sampling

Sampling completed for reaches upstream and downstream of the potential temporary access road crossing.



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Task 3 Results

Completed Field Studies

Location	Task	Timeframe			
		July	August	September	October
Spoil Locations	Stream habitat assessments (NCSAM + USEPA RBP)			■	
	Mussel surveys	■			
Temporary Access Road	Stream habitat assessments (NCSAM + USEPA RBP)				■
	Stream geomorphic and riparian vegetation surveys (SQT)				■
	Fish community sampling (SQT)	■		■	■
	Macroinvertebrate sampling (SQT)		■		
	Mussel surveys	■		■	

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Task 3 Draft Results – Stream Habitat Assessments

USEPA Rapid Bioassessment Protocol

Stream Name / Location	Stream Type	Total Score	Condition Category*
Streams within Potential Spoil Locations			
Stream 4 - Spoil Location G	Intermittent	105	Suboptimal
Stream 4a - Spoil Location G	Perennial	137	Suboptimal
Stream 17 - Spoil Location C	Perennial	143	Suboptimal
Stream 19 (Devils Fork) - Spoil Location B	Perennial	155	Optimal
Streams potentially crossed by the Temporary Access Road			
Stream 1 (Limber Pole Creek)	Perennial	170	Optimal
Stream 7 (Howard Creek)	Perennial	183	Optimal
Stream 12	Intermittent	112	Suboptimal
Stream 15	Perennial	119	Suboptimal
Stream 16	Intermittent	117	Suboptimal
Stream 17 (Devils Fork)	Perennial	140	Suboptimal

*Condition categories include Poor, Marginal, Suboptimal, and Optimal

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Task 3 Draft Results – Stream Habitat Assessments

North Carolina Stream Assessment Method

Stream Name / Location	Stream Type	Overall Functional Rating
Streams within Potential Spoil Locations		
Stream 4 - Spoil Location G	Intermittent	Medium
Stream 4a - Spoil Location G	Perennial	Medium
Stream 17 - Spoil Location C	Perennial	High
Stream 19 (Devils Fork) - Spoil Location B	Perennial	High
Streams potentially crossed by the Temporary Access Road		
Stream 1 (Limber Pole Creek)	Perennial	High
Stream 7 (Howard Creek)	Perennial	High
Stream 12	Intermittent	Medium
Stream 15	Perennial	High
Stream 16	Intermittent	High
Stream 17 (Devils Fork)	Perennial	High

*Functional ratings include Low, Medium, or High

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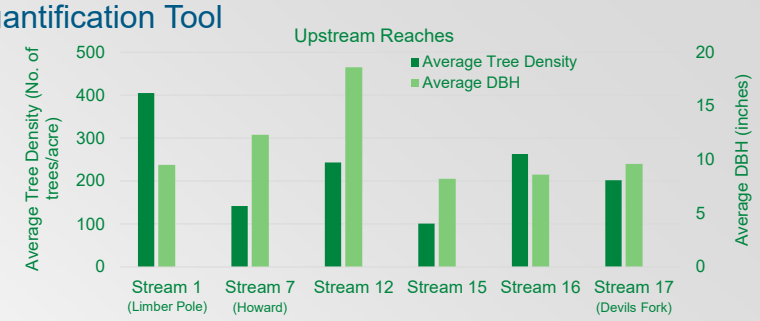
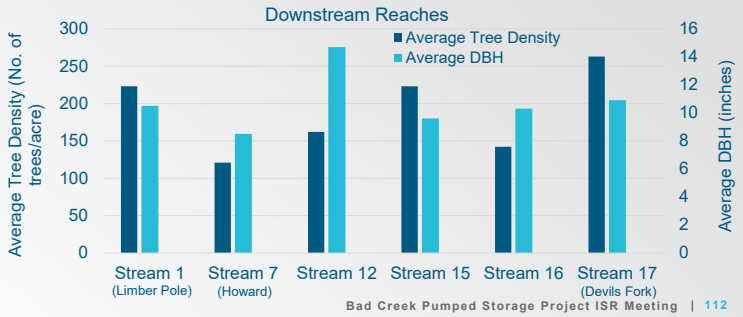
Task 3 Draft Results – Stream Quantification Tool

Riparian Vegetation Surveys

- Stream buffers well vegetated
  - Mature trees
  - Some areas of dense shrubs (e.g., rhododendron)
- Average Tree Density
  - Upstream: 101 to 405 trees/ac.
  - Downstream: 121 to 263 trees/ac.
- Average DBH
  - Upstream: 8.2 to 18.6 inches
  - Downstream: 8.5 to 14.7 inches





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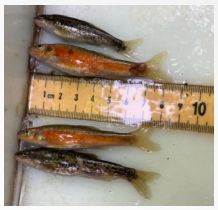
Task 3 Draft Results – Stream Quantification Tool

Fish Community Sampling

- Limber Pole Creek
  - No fish collected
- Howard Creek

Reach	Average Density (No. fish/100 m)	
	Rainbow Trout	Western Blacknose Dace
Upstream	17.2	57.7
Downstream	11.5	54.5



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Task 3 Draft Results – Stream Quantification Tool

Macroinvertebrate Sampling

Metrics	Limber Pole Creek		Howard Creek	
	Upstream	Downstream	Upstream	Downstream
Total No. of Organisms	163	161	319	246
Total No. of Taxa	35	29	39	39
EPT Index	27	21	30	28
South Carolina Bioclassification	Excellent/Fully Supporting			

Habitat Type	Limber Pole Creek		Howard Creek	
	Upstream	Downstream	Upstream	Downstream
Root Banks	Good	Good-Fair	Good-Fair	Good
Logs, Sticks, Snags	Good	Good-Fair	Good-Fair	Good-Fair
Rock/Gravel Riffle	Good	Excellent	Excellent	Excellent
Mature Leaf Pack	Poor	Poor	Poor	Poor
Aquatic Vegetation	Good-Fair	Nonexistent	Poor	Poor
Braided Channel	Nonexistent	Nonexistent	Nonexistent	Nonexistent
Pine Needles in Stream	Nonexistent	Nonexistent	Nonexistent	Nonexistent
Velocity/Flow	Good	Good	Good	Good
Sedimentation	Little or none	Moderate	Little or none	Little or none

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Task 3 Draft Results – SQT Analysis*

SQT Results

Stream/Creek	Reach	Rosgen Classification	Catchment Assessment	SQT Existing Condition Score	Maximum SQT Existing Condition Score	Percent Stream Functionality
Stream 1 (Limber Pole Creek)	Upstream	B4c	Good	0.58	0.8	73%
	Downstream	B4c	Good	0.53	0.8	66%
Stream 7 (Howard Creek)	Upstream	B4c	Good	0.60	0.8	75%
	Downstream	B4a	Good	0.58	0.8	73%
Stream 12 (UT to Howard Creek)	Upstream	A4	Good	0.39	0.6	65%
	Downstream	B4a	Good	0.47	0.6	78%
Stream 15 (UT to Devils Fork)	Upstream	G5	Good	0.36	0.6	60%
	Downstream	A1a+	Good	0.35	0.6	58%
Stream 16 (UT to Devils Fork)	Upstream	A4	Good	0.40	0.6	67%
	Downstream	G4	Good	0.37	0.6	62%
Stream 17 (Devils Fork)	Upstream	A4	Good	0.38	0.6	63%
	Downstream	B5a	Good	0.43	0.6	72%

*Consultation with the SCDNR is ongoing and final results will be presented in the USR.

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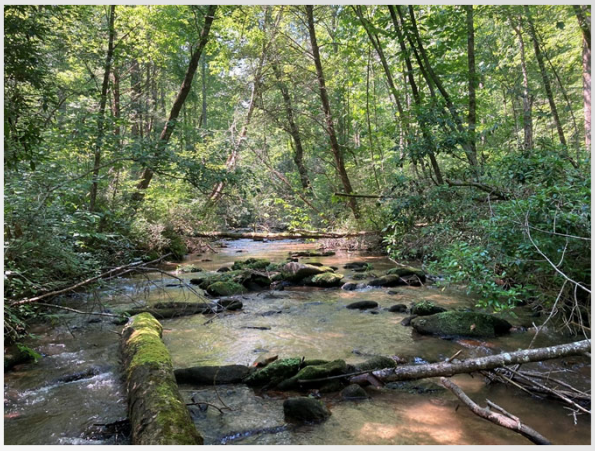
Task 3 – Mussel Surveys

- Upland spoil locations
  - No suitable mussel habitat present
- Potential Temporary Access Road - Howard Creek + Limber Pole Creek
  - No mussels observed
- Lake Jocassee – shoreline in the vicinity of the proposed Bad Creek II inlet/outlet structure and in the vicinity of the underwater weir
  - No mussels observed



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Task 3 Conclusions

- **Stream Habitat Assessments**
  - Streams within spoil locations and those potentially crossed by the temporary access road generally represent *stable, fully functioning conditions.*
  - Characteristics across stream habitat quality rating methods which reduced overall scores included lack of baseflow (i.e., intermittent streams), natural entrenchment, streambank erosion, and/or limited quantities of large woody debris.
- **Mussel Surveys**
  - No mussel habitat present in upland spoil locations
  - No mussels observed in Howard Creek, Limber Pole Creek, or Lake Jocassee

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Environmental Justice Study

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Environmental Justice Study

Objective(s): There are 5 main study objectives:

1. **Identify presence of environmental justice communities** that may be affected by the relicensing and proposed project expansion.
2. **Identify the presence of non-English speaking populations** that may be affected by the project.
3. **Identify the presence of sensitive receptor locations** in the geographic scope.
4. **Discuss the effects of the relicensing** on any identified environmental justice communities and any affects that are disproportionately high and adverse and potential effects on non-English speaking communities and sensitive receptor locations.
5. **Identify mitigation measures** to avoid or minimize project effects on environmental-justice communities, non-English speaking communities and sensitive receptor locations, if present within the geographic scope

- **Status: Complete**

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Environmental Justice Study

FERC has identified that an Environmental Justice review is pertinent to its NEPA analysis for the relicensing and proposed Complex development.

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What is Environmental Justice?

Environmental Justice (EJ) - The fair treatment and meaningful involvement of all people regardless of race, color, culture, national origin, income, and educational levels with respect to the development, implementation, and enforcement of protective environmental laws, regulations, and policies.

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Additional Terms Included in the Analysis

Fair Treatment - The principle that **no group of people**, including a racial, ethnic or a socioeconomic group, **should bear a disproportionate share of the negative environmental consequences** from industrial, municipal and commercial operations or the execution of federal, state, local and tribal programs and policies.

Disproportionate Effects - Term used in Executive Order 12898 to describe situations of concern **where there exists significantly higher and more adverse health and environmental effects on minority populations, low-income populations or indigenous peoples**.

Sensitive Receptor Locations - Sensitive receptors include, but are not limited to, **hospitals, schools, daycare facilities, elderly housing and convalescent facilities**. These are areas where the occupants are more susceptible to the adverse effects of exposure to toxic chemicals, pesticides, and other pollutants.

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PRE-APPLICATION DOCUMENT

Bad Creek Pumped Storage Project
FERC Project No. 2740

Oconee County, South Carolina

Prepared by: HDR Engineering, Inc.

Background and Existing Information

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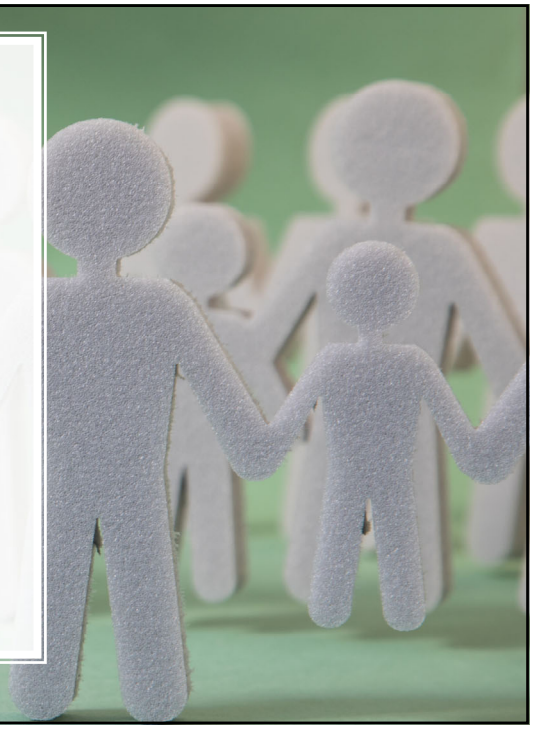
Study Goals and Objectives

As previous noted, there are 5 main study objectives:

1. **Identify presence of environmental justice communities** that may be affected by the relicensing and proposed project expansion.
2. **Identify the presence of non-English speaking populations** that may be affected by the project.
3. **Identify the presence of sensitive receptor locations** in the geographic scope.
4. **Discuss the effects of the relicensing** on any identified environmental justice communities and any affects that are disproportionately high and adverse and potential effects on non-English speaking communities and sensitive receptor locations.
5. **Identify mitigation measures** to avoid or minimize project effects on environmental-justice communities, non-English speaking communities and sensitive receptor locations, if present within the geographic scope



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Study Area

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Project Nexus

- Project construction, operation, and maintenance has the potential to affect human health or the environment in environmental justice communities.
- Examples of resource impacts may include, but are not necessarily limited to, project-related effects on: subsistence fishing, hunting, or plant gathering; access for recreation; and construction-or operation-related air quality, noise, and traffic.

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Methodology

Consistent with Environmental Protection Agency's *Promising Practices for EJ Methodologies in NEPA Reviews* (2016), the EJ Report will include the following:

Step 1: A table of racial, ethnic, and poverty statistics for each state, county, and census block group within the geographic scope of analysis. (Source: U.S. Census Bureau Data).

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	RACE AND ETHNICITY DATA										LOW-INCOME DATA
Geography	Total Population (count)	White Alone Not Hispanic (count)	African American (count)	Native American/ Alaska Native (count)	Asian (count)	Native Hawaiian & Other Pacific Islander (count)	Some Other Race (count)	Two or More Races (count)	Hispanic or Latino (count)	Total Minority (%)	Below Poverty Level (%)
State											
County or Parish											
Census Tract X, Block Group X											

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Methodology (cont.)

Step 2: Utilizing data within Step 1 to identify environmental justice populations by block group by applying the following methods to minority populations:

- 50% Analysis Method
- Meaningfully Greater Analysis Method

Step 3: Utilizing data within Step 1 to use the "low-income threshold criteria" method to identify environmental justice communities based on the presence of low-income populations.

- the percent of the population below the poverty level in the identified block group must be equal to or greater than that of the reference population (county)

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Methodology (cont.)

Step 4: Identify non-English speaking groups within the geographic scope of analysis **that would be affected by the project**.

Describe planned outreach efforts if these groups exist within the geographic scope.

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Reporting: Map Development

Map Components

- FERC Project Boundary
- Project construction areas
- Identify block groups of EJ communities based on the presence of minority population, low-income population, or both
- Sensitive receptor locations (e.g., schools, day care centers, hospitals, etc.)

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Reporting: Sensitive Receptor Locations

A table of distances of sensitive receptor locations from project facilities and proposed facilities.

Discussion of project-related effects on these locations.

Discussions of PM&E measures to avoid or minimize potential effects.

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Reporting: Potential Project Effects Discussion

A discussion of potential project-related effects on any environmental justice communities, non-English speaking groups and sensitive receptor locations for all resources where there is a potential nexus between effects and communities/locations.

For any identified effects, describe whether or not any of the effects would be disproportionately high and adverse on environmental justice communities.

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Public Outreach

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Protection Mitigation and Enhancement Measures

To avoid and/or minimize project effects on identified communities:

- Environmental justice communities
- Non-English speaking groups
- Sensitive receptor locations

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RESULTS

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Results

One EJ community based on race identified in Transylvania County (NC) – primarily within the 5-mile buffer zone, with southwest portion in 1-mile buffer zone

Two EJ communities based on low income identified in Oconee County (SC) and Transylvania County (NC) – both within 5-mile buffer zone

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Table 6.1 Race and Ethnicity, Low Income, and English-Speaking Data for the 5-Mile Radius Around the Bad Creek Project

Geographic Area	Total Population (count)	White Alone, not Hispanic (count)	African American/ Black (count)	Native American/ Alaska Native (count)	Asian (count)	Native Hawaiian & Other Pacific Islander (count)	Some Other Race (count)	Two or More Races (count)	Hispanic or Latino (count)	Total Minority Population (%)	Below Poverty Data (%)	Non-English Speaking Persons Aged 5 Years and Greater (%)
Georgia	10403847	5485855	3244348	19382	410705	5164	32810	213189	992394	47%	14%	1%
Rabun County	16645	14598	316	55	188	0	41	113	1334	12%	16%	0%
Census Tract 970202, Block Group 1	1348	1335	0	0	0	0	0	0	13	1%	14%	0%
North Carolina	10264876	6474688	2165301	112504	290525	5640	22962	230591	962665	37%	14%	1%
Jackson County	42938	34635	928	3283	302	0	56	1182	2552	19%	18%	0%
Census Tract 950900, Block Group 2	1425	1410	0	0	0	0	0	0	15	1%	9%	0%
Macon County	34813	30998	541	240	302	0	91	201	2440	11%	14%	0%
Census Tract 970502, Block Group 1	2128	2023	6	0	18	0	0	0	81	5%	9%	0%
Transylvania County	33775	30528	1560	89	47	17	0	410	1124	10%	13%	0%
Census Tract 960600, Block Group 3	1143	1019	0	0	19	0	0	0	105	11%	18%	0%
South Carolina	5020806	3196421	1333876	14748	78102	3784	9139	99278	285458	36%	15%	0%
Oconee County	77528	65463	5288	231	570	11	44	1686	4235	16%	16%	0%
Census Tract 030200, Block Group 1	1340	1261	0	0	0	0	15	36	28	6%	9%	0%
Census Tract 030100, Block Group 2	679	671	0	0	0	0	0	0	8	1%	12%	0%
Census Tract 030100, Block Group 1	1167	1142	7	0	0	0	0	4	14	2%	8%	0%
Census Tract 030200, Block Group 5	872	872	0	0	0	0	0	0	0	0%	6%	0%
Census Tract 030200, Block Group 2	1109	1090	16	0	0	0	0	3	0	2%	25%	0%
Census Tract 030200, Block Group 3	1201	1201	0	0	0	0	0	0	0	0%	8%	0%
Pickens County	124029	106292	8392	306	2424	26	178	1854	4557	14%	17%	0%
Census Tract 010200, Block Group 2	2267	2216	24	0	0	0	0	0	27	2%	9%	0%
Census Tract 010100, Block Group 1	1443	1331	76	0	16	0	0	20	0	8%	4%	0%
Census Tract 010200, Block Group 1	2279	2164	27	0	0	0	0	20	68	5%	14%	1%

Source: U.S. Census Bureau 2020a, 2020b, 2020c

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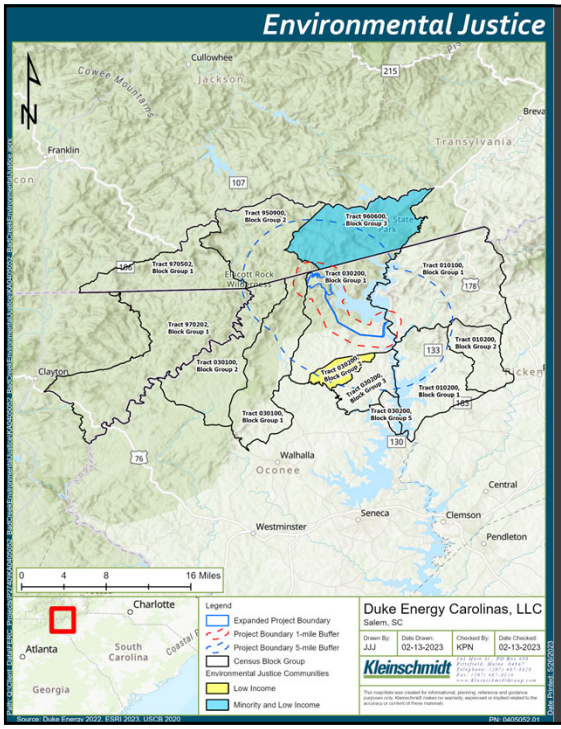
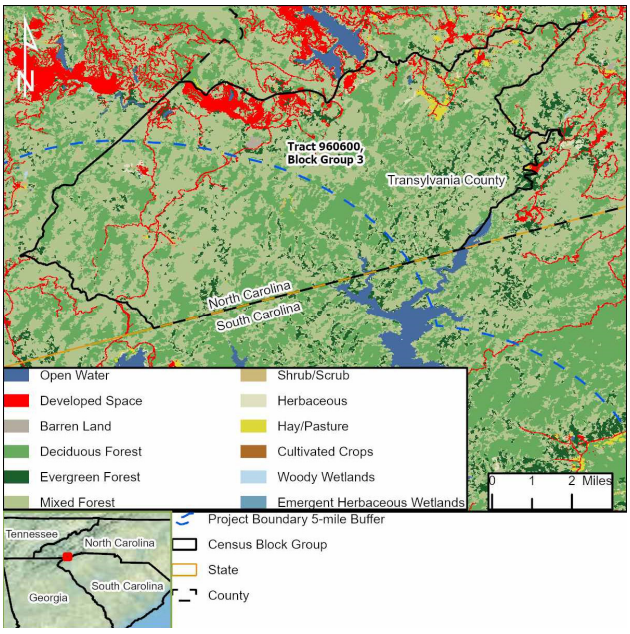


Environmental Justice Communities

139

Land Cover Data Surrounding EJ Census Block – Transylvania County



140

Development Surrounding Oconee County Low Income Census Block

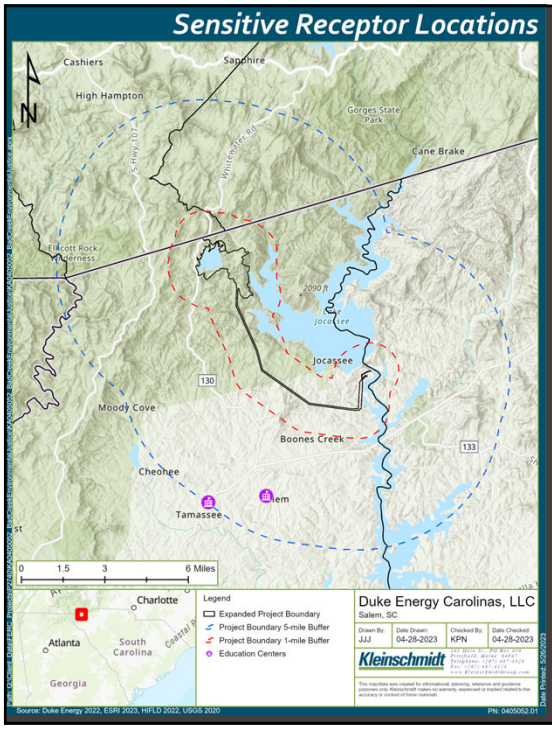
141

Results (cont.)

One block group includes a small population of non-English speaking individuals in Pickens County (SC) representing 1% of the population (23 people).

Two sensitive receptor locations within the 5-mile buffer zone; none within the 1-mile radius

142



Sensitive Receptor Locations

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Analysis of Relicensing the Project as it Currently Operates on EJ Communities

- No substantive impacts from noise.
- No impacts to air quality, subsistence fishing, traffic, or aesthetics.
- No impacts to non-English-speaking communities and sensitive receptor locations.

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Analysis of Relicensing the Project with Construction of Bad Creek II Complex on EJ Communities

NOISE

- Direct impacts from noise isolated to upper reservoir inlet/outlet construction.
- Land use surrounding upper reservoir within identified EJ community indicates little to no residential development.
- Indirect and cumulative impacts not anticipated.

AIR QUALITY

- Short-term construction-related air pollution has the potential to impact EJ communities in the vicinity of the upper reservoir inlet/outlet work.
- The distance between EJ populations and the construction site, generally greater than one mile, will serve to mitigate potential direct and indirect impacts.
- Not likely that short duration of exposure from construction will contribute to cumulative impacts.

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Subsistence Fishing

Fishing not permitted within upper reservoir but nearby sites within the buffer zone provide potential opportunities.

No direct, indirect, or cumulative impacts anticipated.

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Effects of Project Construction on Local Traffic, Road Networks, and Aesthetics

- Unlikely EJ communities impacted by work at the powerhouse location due to the distance between construction and identified EJ populations.
- Impact to traffic and local roads from work conducted at the upper reservoir inlet/outlet location within identified EJ census blocks is anticipated to be minimal.
- Disposal of excavated soils may temporarily impact aesthetics, streams and lands in the expanded Project Boundary, local water quality in and immediate downstream of the Whitewater River cove, or construction traffic.
- Following construction there will be no impact to local roads or traffic.

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Analysis of Relicensing the Project with Construction of Bad Creek II Complex on EJ Communities (cont.)

NON-ENGLISH-SPEAKING COMMUNITIES

- One small population located in Pickens County (SC) representing one percent of the population block group (approx. 23 people).
- Primarily outside of the 5-mile radius – impacts not anticipated to this group.

SENSITIVE RECEPTOR LOCATIONS

- Nearest sensitive receptor location is a school located approximately four miles from proposed construction site.
- Unlikely that construction would have an effect on the sensitive receptor location due to the distance between the two sites.

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Summary

- The existing Bad Creek Project's continued operation is not expected to cause any effects on the parameters analyzed.
- The impacts to EJ communities from construction of the Bad Creek II Complex would be minimal due to the distance between construction activities and the nearest residential areas with EJ populations.
- No need was identified for additional outreach efforts beyond those currently being employed by Duke Energy as a part of the relicensing process.

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Cultural Resources Study

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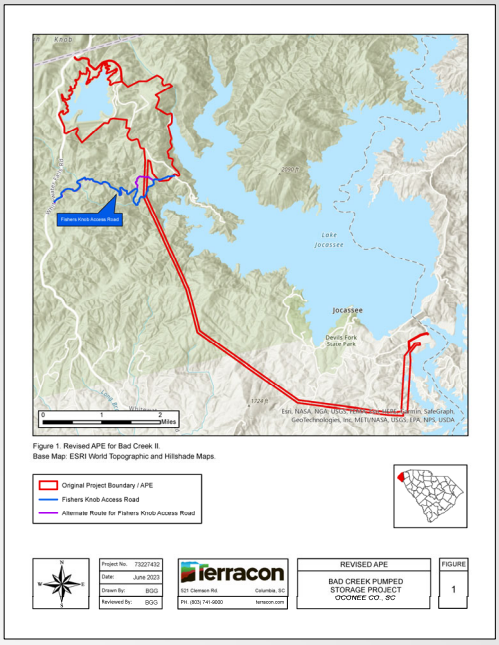
Task 1 – Area of Potential Effects Determination

- **Objective:** In consultation with the State Historic Preservation Officer (SHPO), Indian Tribes, and other stakeholders, Duke Energy will determine and document the Area of Potential Effects (APE).
- Initial consultation letter submitted on November 28, 2022. Revised letter submitted on September 25, 2023, that expanded the APE to include Fisher's Knob Access Road.
- In consultation with the above, the APE is defined as all lands within the project boundary
- **Status:** **Complete**



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Task 2 – Cultural Resources Survey

- **Objective:** Identify historic properties within the APE.
- Archaeological and architectural surveys conducted between April 17 and June 10, 2023.
- Archaeological methods included the excavation of 3,026 shovel tests in areas containing slopes of less than 15%.
- This was supplemented by pedestrian survey in areas where slopes were not dangerous, as well as drone and helicopter surveys to look for rockshelters and large outcrops that could contain petroglyphs.
- Phase II testing conducted at site 38OC249.
- **Results:** Identified one isolated find – a Middle Archaic projectile point, tested site 38OC249, and identified five historic-age architectural resources in the APE.

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Task 2 – Cultural Resources Survey

Table 1. Cultural Resources within the APE.

Resource No.	Description	NRHP Eligibility	Management Recommendation
38OC249	Early Archaic through Mississippian rockshelters	Eligible	Avoidance or Mitigation
38OC250	Mississippian habitation site	Not Relocated	No Effect
IF-1	Morrow Mountain point	Not Eligible	No Additional Work
0156	Bad Creek Reservoir	Not Eligible	No Additional Work
0157	Bad Creek Powerhouse	Not Eligible	No Additional Work
0158	Control Room Building	Not Eligible	No Additional Work
0159	Laydown Yard Building	Not Eligible	No Additional Work
0198	Jocassee Hydroelectric Station	Eligible	No Effect

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Task 2 – Cultural Resources Survey

- Site 38OC249 – Paleoindian(?) through Mississippian Period series of rockshelters.
- Excavated six 1-x-1-meter units.
- A total of 585 artifacts were found in stratigraphically intact deposits up to 120 cm deep (the maximum depth we were allowed to excavate).
- Botanical samples submitted to the University of Tennessee. Wood samples identified as yellow pine, red oak, chestnut, hemlock, and interestingly spruce/larch that is indicative of colder climates. Also recovered hickory nutshell and one plum pit.
- **Results:** Site is eligible for inclusion in the National Register of Historic Places. Site will be avoided by any ground disturbing activities but periodically monitored for unlawful artifact collecting.

Photo Redacted

(CUI/PRIV)

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Visual Resources Study

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Visual Resources Study Task Refresher

Study Task	Status
Task 1 – Existing Landscape Description	Complete
Task 2 – Seen Area Analysis	Complete
Task 3 – Field Investigation	Complete
Task 4 – Key Views Selection	Ongoing
Task 5 – Existing Visual Quality Assessment	Ongoing
Task 6 – Visual Analysis	Ongoing
Task 7 – Visual Management Consistency Review	Ongoing
Task 8 – Mitigation Assessment	Ongoing
Task 9 – Conceptual Design of the Bad Creek II Complex	Ongoing

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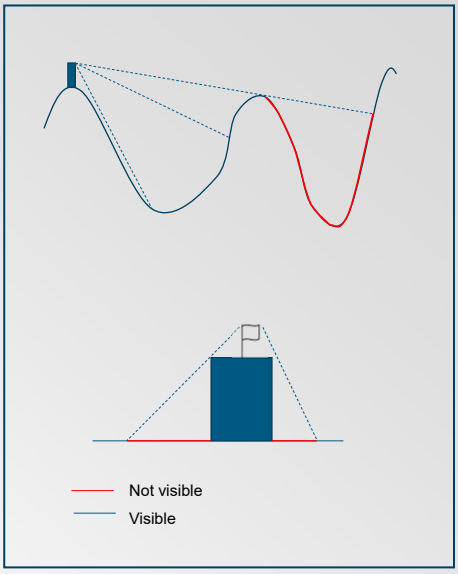
Tasks 2 - Seen Area Analysis

Objective: Identify areas from which Bad Creek II would be visible

Methodology:

- Geographic Information System (GIS): ESRI ArcGIS Pro Viewshed Analysis Spatial Analyst Tool
- USGS Digital Elevation Model (DEM)
- Conservative analysis
  - Bare earth basis (trees, structures)
  - Atmospheric effects (clouds, humidity, fog)
  - Revegetation of spoils area
  - Structure design



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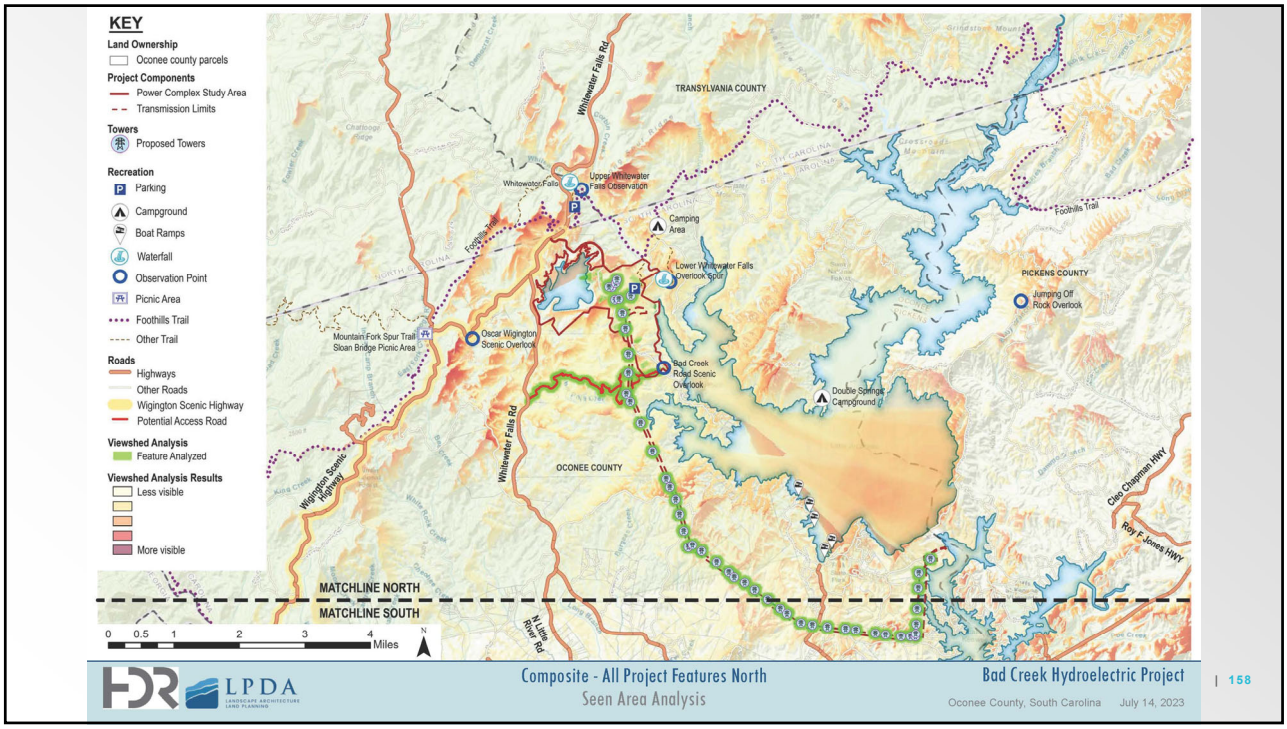

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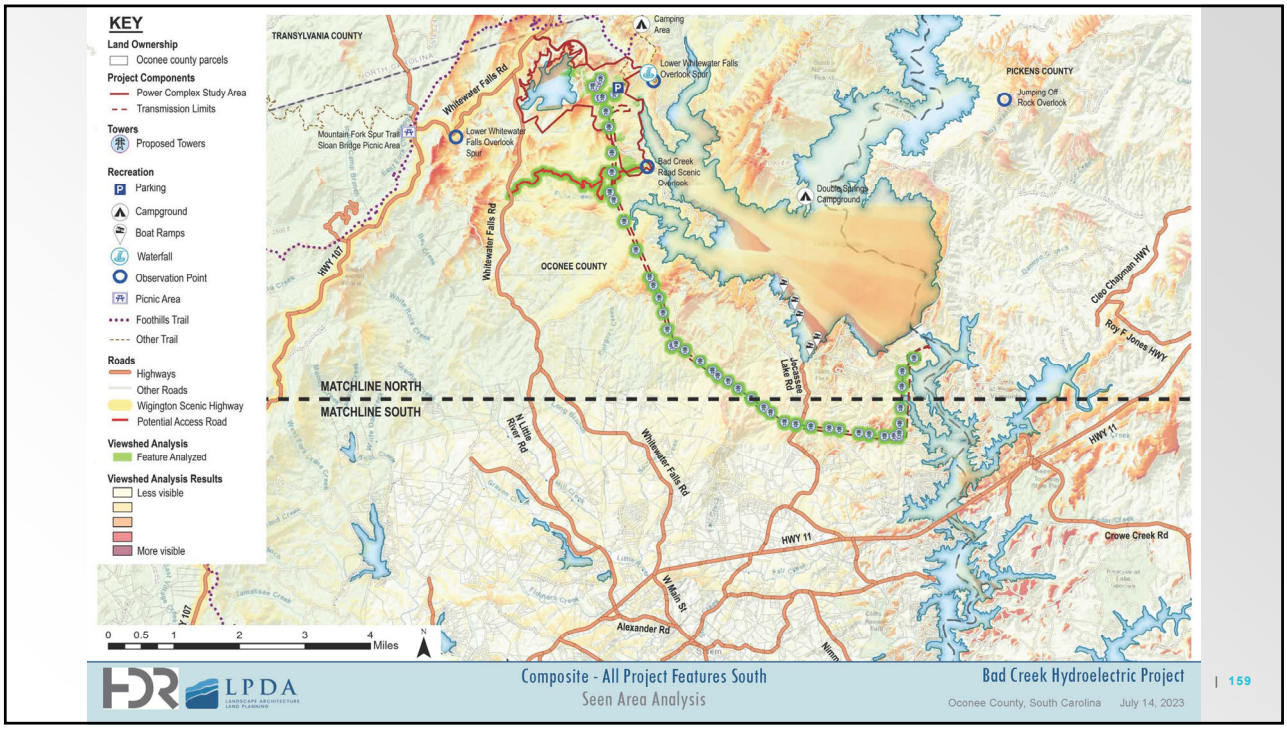
KEY
Land Ownership
Oconee county parcels
Project Components
Power Complex Study Area
Transmission Limits
Towers
Proposed Towers
Recreation
Parking
Campground
Boat Ramps
Waterfall
Observation Point
Picnic Area
Foothills Trail
Other Trail
Roads
Highways
Other Roads
Wigington Scenic Highway
Potential Access Road
Viewshed Analysis
Feature Analyzed
Viewshed Analysis Results
Less visible
More visible
TRANSYLVANIA COUNTY
PICKENS COUNTY
OCONEE COUNTY
MATCHLINE NORTH
MATCHLINE SOUTH
Camping Area
Lower Whitewater Falls Overlook Spur
Mountain Fork Spur Trail
Sloan Bridge Picnic Area
Bad Creek Road Scenic Overlook
Double Springs Campground
Jumping Off Rock Overlook
Whitewater Falls Rd
HWY 107
N Little River Rd
Jocassee Lake Rd
Cleo Chapman HWY
Roy F Jones HWY
HWY 11
Crowe Creek Rd
W Main St
Alexander Rd
0 0.5 1 2 3 4 Miles
N
LPDA
Composite - All Project Features South
Seen Area Analysis
Bad Creek Hydroelectric Project
Oconee County, South Carolina July 14, 2023
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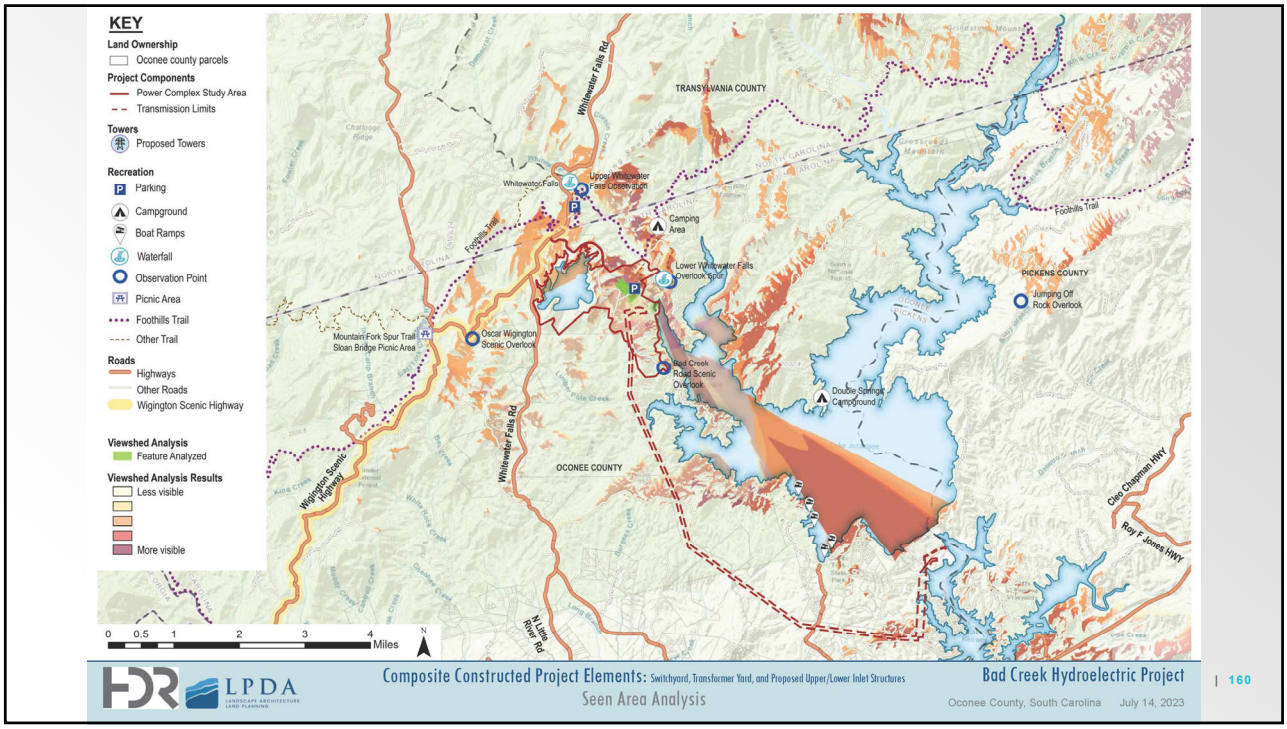
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PICKENS COUNTY
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Whitewater Falls Rd
Upper Whitewater Falls Observation
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Bad Creek Road Scenic Overlook
Double Springs Campground
Jumping Off Rock Overlook
Foothills Trail
Wigington Scenic Highway
Cleo Chapman HWY
Roy F Jones HWY
N Little River Rd
0 0.5 1 2 3 4 Miles
N
LPDA
Composite Constructed Project Elements: Switchyard, Transformer Yard, and Proposed Upper/Lower Inlet Structures
Seen Area Analysis
Bad Creek Hydroelectric Project
Oconee County, South Carolina July 14, 2023
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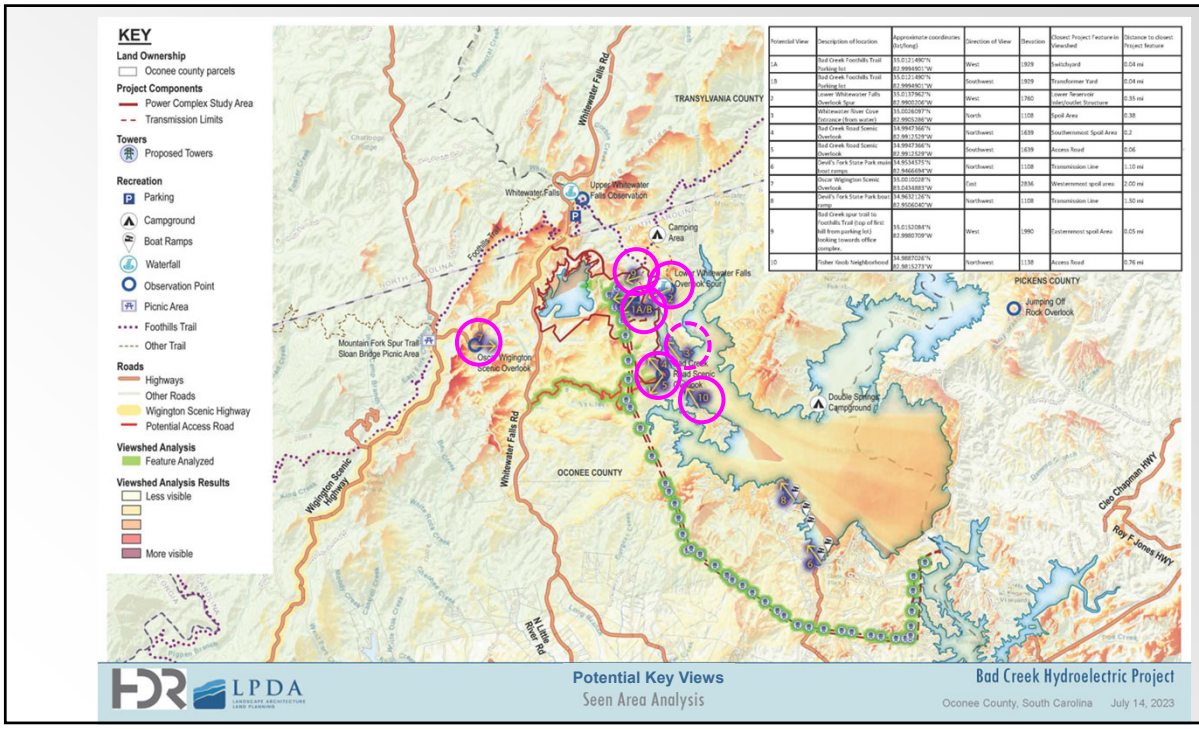
Task 4 – Key Views Selection

2-Step Process

- Initial pre-selection by Resource Committee (July 27, 2023)
- Finalized following fieldwork (January 11, 2024)

"The objective will be to identify a set of Key Views (**up to four**) that adequately covers the range of visibility and potential scenic and visual impacts for the Project. Considerations that will be used in selecting specific Key Views **include viewing distance, to ensure adequate representation of potential foreground, middleground, and background views of the Project features; viewing direction; and the types of viewer groups** (typically including residents, recreational users and motorists) that might experience views of the Project facilities."

161



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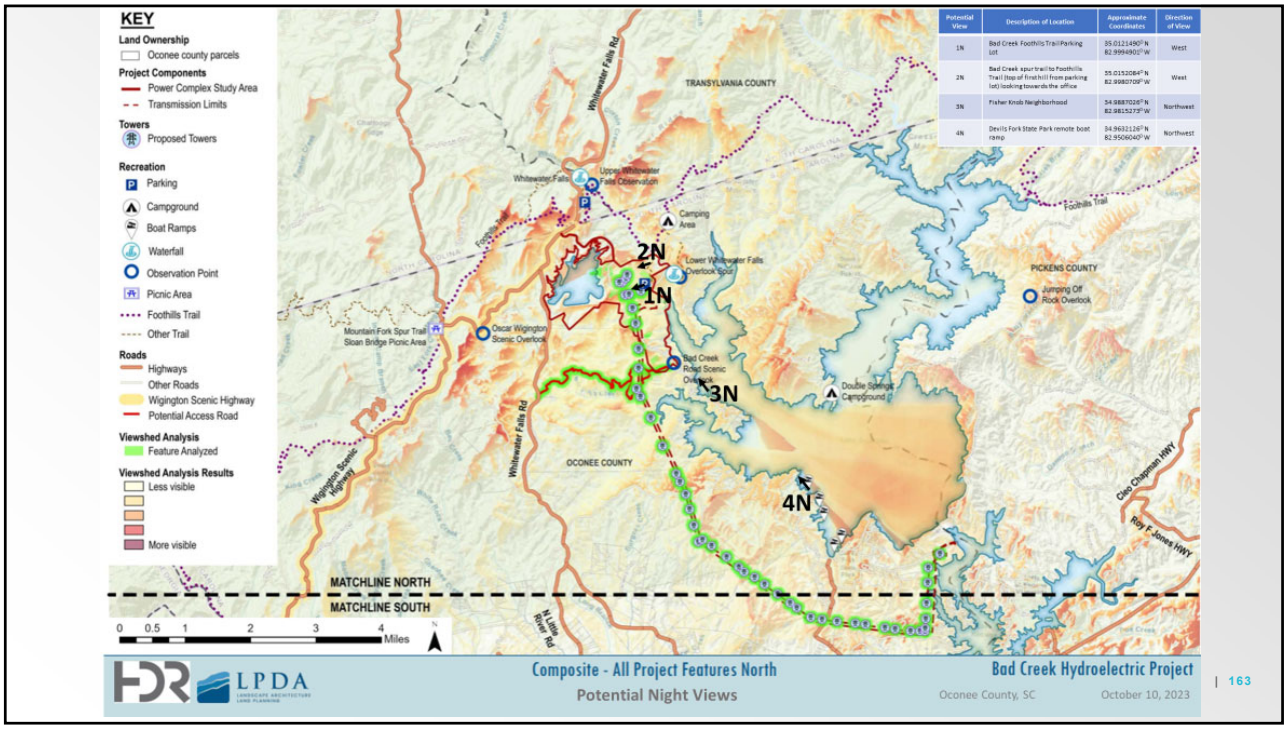

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Task 3 – Field Investigations

- **Date: December 6, 2023**
- Time:
  - Daytime session 10:00 am – 1:30 pm
  - Night session 6:00 pm – 9:30 pm
- Conditions:
  - Daytime session: Sunny with scattered cloud cover; 50-60% humidity; winds 10-20 mph
  - Night session: Clear with thin clouds; 60-70% humidity; winds 7-8 mph; no moonlight

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Visual Resources Study: Next Steps

- Task 5 – Existing Visual Quality Assessment
- Task 6 – Visual Analysis
  - Develop visualizations
- Task 7 – Visual Management Consistency Review
- Task 8 – Mitigation Assessment
- Task 9 – Conceptual Design of Bad Creek II Complex
- Task 10 – Report (2nd quarter, 2024)

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Additional Field Surveys

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Proposed Spoil Area Herptile Surveys

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Proposed Spoil Area Herptile Surveys

Based on a request from the SCDNR and to support Clean Water Act Section 404 U.S. Army Corps of Engineers permitting, Duke Energy and HDR evaluated the terrestrial reptile and amphibian (i.e., herptile) resources that may experience direct impacts from the proposed construction of an additional power plant complex adjacent to the existing facility (i.e., Bad Creek II Power Complex). These impacts would be associated with spoil placement of excavated material from construction of the Bad Creek II Complex.

- **Objective(s):** The objective of the herptile survey is to document any South Carolina Wildlife Action Plan (SWAP) Herptile Species of Concern and other reptile and amphibian species that occur within the proposed spoil areas and in the project vicinity.
- **Status:** **Complete**

Southern Gray-Cheeked Salamander-Area I

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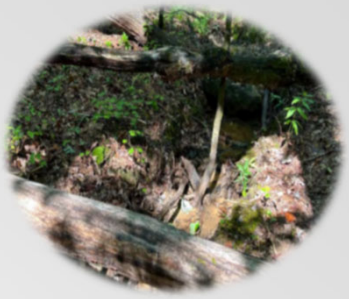
Proposed Spoil Area Herptile Surveys

Methodology

- Terrestrial herptile field surveys of the eight proposed terrestrial spoil areas (Proposed Spoil Areas B, C, D, E, F, G, I, and J) were conducted from September 11-13, 2023.
- The survey methodology consisted of traversing transects through the specified areas to ensure that sufficient visual coverage was obtained. The herptile surveys were conducted through visual encounter or patch sampling at specific microhabitats (e.g., rock ledges, rock piles, logs, wet depressions). Transects were generally spaced 75-feet apart depending on habitat type and/or visibility.



Representative Habitat-Area C

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Proposed Spoil Area Herptile Surveys

Methodology

- Observed species and their locations were recorded using a handheld GPS. Vegetation cover type and specific habitats/substrates were noted for individual spoil areas, as well as incident observations of other wildlife species.
- Observed specimens that could be captured were taxonomically identified with photographic documentation. No voucher specimens were collected as part of this survey.
- Herps were also documented during the aquatic surveys conducted in the summer and fall of 2023. Survey study plan and results were reviewed by the SCDNR and the Wildlife & Botanical Committee.

Representative Habitat-Area B

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Proposed Spoil Area Herptile Surveys

Results: Over the three-day survey period, all eight terrestrial potential spoil sites were surveyed by Duke Energy and HDR personnel. The only herptile species observed on the SWAP Priority Herptile Species List was the Eastern Box Turtle. The table below provides all 14 amphibian and reptile species observed and the proposed spoil area in which they were observed.

Common Name	Scientific Name	Spoil Areas*
Green Anole	*Anolis carolinensis*	B and G
Eastern Fence Lizard	*Sceloporus undulatus*	B
Red-spotted Newt	*Notophthalmus viriascens*	D
Red Salamander	*Pseudotriton ruber*	G
Southern Gray-cheeked Salamander	*Plethodon metcalfi*	C, D, G, and I
Southern Appalachian Salamander	*Plethodon teyahalee*	E
Chattooga Dusky Salamander	*Desmognathus perlapsus*	C and G
Seal Salamander	*Desmognathus monticola*	B and I
Black-bellied Salamander	*Desmognathus quadramaculatus*	G and I
Eastern Copperhead	*Agkistrodon contortrix*	B
Black Racer	*Coluber constrictor*	E
Eastern Box Turtle	*Terrapene carolina*	B and I
Fowler's Toad	*Anaxyrus fowleri*	I
Green Frog	*Rana [Lithobates] clamitans*	G

Chattooga Dusky Salamander- Area G

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Additional Comments for Discussion

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Additional Comments for Discussion

Agency	Date	Comment
SC Wildlife Federation	12/4/2023	Has Duke Energy determined the impact of any potential seismic activity (non earthquake type disturbances such as blasting for the new turbine project). concern was impact on birds, aquatic critters, mammals, etc. The concern is regarding disruption during the critical springtime mating and nesting season.

Response sent December 19, 2023 to Wildlife and Botanical RC

Potential impacts to wildlife resources as a result of seismic activity from underground blasting for the proposed Bad Creek II Complex were not directly identified by the FERC in their Scoping Document 1 or Study Plan Determination. In Scoping Document 1, FERC staff did identify effects of noise during Bad Creek II construction, and Project operation and maintenance activities on wildlife as a Terrestrial Resources potential impact. **The environmental report (18 CFR §5.18(b)) to be filed with the license application will contain information about the affected environment; analysis of anticipated continuing or new environmental impacts due to operation or proposed changes thereto; proposed environmental measures and measures recommended by relicensing participants; and unavoidable adverse impacts that may occur despite recommended or proposed environmental measures.**

Blasting associated with construction of the new underground powerhouse would be a **temporary impact** and will be evaluated through review of relevant published research on the effects of noise on wildlife (e.g., Shannon et al. 2016), anticipated noise levels (decibels) associated with the type of blasting expected at the Project, projected frequency of blasting, and considering of time of year.

Effects of Bad Creek II construction on seismic activity in the project area was identified by FERC as a potential Geology and Soil Resources impact in Scoping Document 1. Duke Energy notes that prior to construction, detailed construction plans in conformance with FERC's dam safety regulations and guidelines will be prepared for review by FERC's Division of Dam Safety and Inspections.

Graeme Shannon, Megan F. McKenna, Lisa M. Angeloni, Kevin R. Crooks, Kurt M. Fristrup, Emma Brown, Katy A. Warner, Misty D. Nelson, Cecilia White, Jessica Briggs, Scott McFarland and George Wittemyer. 2016. A Synthesis of two decades of research documenting the effects of noise on wildlife. Biol. Rev. 91, pp. 982-1005. Doi: 10.1111/brv.12207.

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Additional Comments for Discussion

Agency	Date	Comment
AQD	12/5/2023	Was there any assessment of the terrain around the spoils areas and the temporary roads that would identify higher risk area (e.g., extremely steep drops and/or channels that would cause high velocity of water risking erosion and silt entering the streambeds)? For such high-risk area, would there be additional measures installed to prevent disturbance or damage to the streambeds and the aquatic life?

Response for discussion:

- The majority of excavated material will be rock, which will be deposited in potential spoil areas and designed to decrease the potential for runoff and sedimentation to adjacent waters. Materials will not be placed on slopes with high gradient due to instability. French drains will be installed over aquatic resources impacted (filled) by overburden materials to maintain downstream flows.
- Hydrologic analyses will be conducted to accurately size pipes and implement outfall protection measures to reduce velocities during storm events and disturbance to downstream streambeds to help protect instream habitats for aquatic life.

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FERC ILP Schedule Next Steps

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File ISR Meeting Summary (18 CFR §5.15(c)(3))	Licensee	Within 15 days following ISR Meeting	Feb 1, 2024
Comments on ISR Meeting and Additional or Modified Study Requests (18 CFR §5.15(c)(4))	Stakeholders	Within 30 days following filing of ISR Meeting Summary	Mar 1, 2024
File Response to Comments on ISR and Meeting Summary (18 CFR §5.15(c)(5))	Licensee	Within 30 days following filing of ISR Meeting Comments	Apr 1, 2024
Resolution of Meeting Summary Disagreements and Issue Amended Study Plan Determination (if required) (18 CFR §5.15(c)(6))	FERC	Within 30 days following filing of response to ISR Meeting Comments	May 1, 2024
Conduct Second Season of Studies (if necessary)	Licensee	-	Spring-Fall 2024
File Updated Study Report (USR) (18 CFR §5.15(f))	Licensee	Pursuant to the approved study plan or no later than 2 years after Commission approval, whichever comes first	Jan 3, 2025
USR Meeting (18 CFR §5.15(f))	Licensee Stakeholders	Within 15 days following filing of USR	Jan 18, 2025
Deadline to File Preliminary Licensing Proposal (PLP) or Draft License Application (DLA) (18 CFR §5.16(a))	Licensee	No later than 150 days prior to the deadline for filing the FLA	March 3, 2025
Comments on PLP or DLA (18 CFR §5.16(e))	Stakeholders	Within 90 days following filing of PLP or DLA	June 2, 2025
Deadline to file FLA (18 CFR §5.17)	Licensee	No later than 24 months before the existing license expires	July 31, 2025

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Questions and Action Items

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