Attachment D
Dam Removal Feasibility Study – North Highlands PUBLIC DISCLOSURE

[This page is intentionally left blank.]

PUBLIC DISCLOSURE

NORTH HIGHLANDS DAM: DAM REMOVAL FEASIBILITY STUDY

January 10, 2025

Prepared for:
Troutman Pepper Hamilton Sanders LLP
Atlanta, GA

Prepared by:
Stantec Consulting Services, Inc.

Project Number: 175578493

[This page is intentionally left blank.]

The conclusions in the Report titled North Highlands Dam: Dam Removal Feasibility Study are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any other purposes and any unauthorized use or reliance is at the recipient's own risk. Stantec has assumed all information received from Troutman Pepper Hamilton Sanders LLP (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided by the Client to applicable authorities having jurisdiction and to other third parties in connection with the project, Stantec disclaims any legal duty based upon warranty, reliance or any other theory to any third party, and will not be liable to such third party for any damages or losses of any kind that may result.

Prepared by: 

Signature

Caitlin Pristupa

Printed Name

Reviewed by: 

Signature

Scott Peyton, PE

Printed Name

Approved by: Mark Schillinger Digitally signed by Mark Schillinger Date: 2025.01.10 14:26:34 -07'00'

Signature

Mark Schillinger, PE (GA), CFM

Printed Name

[This page is intentionally left blank.]

Table of Contents

Acronyms / Abbreviations

ADEM	Alabama Department of Environmental Management
CFR	Code of Federal Regulations
CFS	Cubic feet per second
CLOMR	Conditional Letter of Map Revision
CWA	Clean Water Act
DEM	Digital elevation model
DNR	Division of Natural Resources
DOA	Department of the Army
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPD	Environmental Protection Division
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIRM	Flood Insurance Rate Map
Ft	Feet
GA	Georgia
GIS	Geographic Information System
GPC	Georgia Power Company
HPD	Historic Preservation Division
IPaC	Information for Planning and Consultation
LF	Lakefront
LOMR	Letter of Map Revision
LV	Lakeview
M	Million
Mi^2	Square miles
MW	Megawatts
MWh	Megawatt hour
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NWP	Nationwide Permit
O&M	Operation & Maintenance
OPCC	Opinion Of Probable Construction Costs
RM	River Mile
USACE	U.S. Army Corps of Engineers
USFS	United State Forest Service
USFWS	United State Fish and Wildlife Service
USGS	United States Geological Survey
WQC	Water Quality Certification

1 Introduction

Stantec Consulting Services Inc. (Stantec) was contracted by Troutman Pepper Hamilton Sanders LLP (Troutman Pepper LLP) to conduct a feasibility analysis to assess the potential implications and cost drivers of removing North Highlands Dam. North Highlands Dam is one of three developments that make up the Middle Chattahoochee Hydroelectric Project (Middle Chattahoochee Project), which is operated by Georgia Power Company (GPC or Licensee) and licensed for operations under Federal Energy Regulatory Commission (FERC) Project No. 2177.

1.1 Dam Background

North Highlands Dam, located at river mile (RM) 162.5 on the Chattahoochee River, was constructed between 1898 and 1902 as an impoundment to provide hydrostatic head and regulate waters of the Chattahoochee River for the North Highlands hydroelectric plant (GPC, 2002). North Highlands Dam is the southernmost impoundment of the three developments that make up the Middle Chattahoochee Project. The two remaining developments that make up the Middle Chattahoochee Hydroelectric Project include Oliver Dam (RM 163.5) and Goat Rock Dam (RM 172.2).

Approximately one mile of the Chattahoochee River is impounded by the North Highlands dam, creating a 131-acre impoundment. On December 13, 2002, GPC filed an application for a new license pursuant of sections 4(e) and 15 of the Federal Power Act for continued operation and maintenance of the 129.3 Megawatt (MW) Middle Chattahoochee Project with North Highlands contributing 29.6 MW. On December 27, 2004, FERC issued a 30-year new license for the Middle Chattahoochee Project, allowing the Licensee to continue operating and maintaining the existing project. The current operating license will expire December 31, 2034 (FERC, 2004).

North Highlands Dam is a 36-foot-high concrete gravity structure with an Alabama non-overflow section, a curved, free-crest spillway section with 3.1-foot high flashboards, a combined powerhouse and intake section, and a Georgia non-overflow section contiguous with the intake section. The powerhouse facility at North Highlands Dam was built in 1902 and modified in 1963. The powerhouse has four vertical generating units with fixed-blade propeller turbines; Units 1 through 3 are each rated at 9.2 MW and Unit 4 is rated at 2 MW. The total hydraulic capacity of the four units is 13,200 cfs. The powerhouse was designed for remote operation from GPC's Bartletts Ferry Dam but can be manually operated locally (Kleinschmidt, 2020).

Water from the tailrace of the North Highlands development returns to the Chattahoochee River and extends downstream into the now breached City Mills Dam located 1,000 feet downstream at approximately river mile 161.0. As a result of the intentional removal of City Mills Dam in 2013, a weir was constructed across the tailrace channel to maintain tailwater levels at the powerhouse.

1.2 Study Scope

Stantec assessed the concepts for the removal of North Highlands Dam by completing data review and analyses focused on various hydrologic, hydraulic, and community impact parameters. Key considerations in the analysis included financial and logistical factors associated with sediment quantity, , and potential effects on recreational resources. Stantec assessed sediment quantity in the reservoir by conducting a limited bathymetric survey and estimating the amount of sedimentation accumulation since North Highlands Dam construction.

A field reconnaissance to identify and field check notable shoreline developments (including residential homes, public access points, parks, and marinas) was performed by Stantec. Additionally, field personnel collected measurements of the impoundment at strategically selected locations. Topographic mapping, surveying, and hydraulic modeling were not part of the scope.

A planning level, Class 4 Opinion of Probable Construction Cost (OPCC) was developed for full removal of North Highlands Dam that included construction costs and recreational impacts. Permits and agency coordination that could affect implementation of dam removal were reviewed and conceptual figures were created for dam removal.

1.2.1 SHORELINE DEVELOPMENTS AND RECREATIONAL IMPACT

Shoreline developments and recreational opportunities at North Highlands Reservoir were researched when evaluating the impacts of removal of North Highland Dam. Based off desktop investigations and field reconnaissance, the only recreational opportunity near the shoreline of the Reservoir is the Chattahoochee Riverwalk Area, a paved walking trail, that is not anticipated to be impacted by the potential removal of North Highlands Dam. There are no known access points for recreational boating, fishing and swimming. Additionally, there are no shoreline developments (e.g. marinas, homes, parks and hotels). Since the Reservoir has no residential or commercial developments, the impact of removal of North Highlands Dam on properties surrounding the Reservoir was not developed as part of this study.

1.2.2 COST AND IMPACTS

Construction costs were considered as another factor of feasibility. Construction costs were estimated for the removal of North Highlands Dam and a relative cost of maintenance was developed. Removal of additional sediment then estimated herein would increase the construction cost associated with dredging, stabilization, or removal. Actual requirements related to ongoing monitoring, shoreline stabilization, and other restorative work would be determined through the FERC license surrender process.

The economic impact of foregone electrical generation should be considered and will be evaluated by GPC and therefore was not included in this study. Additionally, losses in recreational value, legal costs, public outreach costs, and additional impacts to third parties, such as potential losses in local drinking water supplies, were beyond the scope of this study and were not included in the cost estimates. Natural capitalization was considered but was not included in the cost estimate as it was considered limited in relative benefits compared to the construction costs

2 Existing Site Conditions

2.1 Project Setting

North Highlands Dam is located on the Chattahoochee River near the towns of Columbus, Georgia and Phenix City, Alabama. North Highlands reservoir is in Muscogee County with 131-acres of surface area and approximately three miles of shoreline containing portions of the Columbus Riverwalk Trail and offering shorelines that provide some urban-based shoreline fishing opportunities.

The normal full pool elevation of North Highlands reservoir is 268.98 feet. Under normal operation, all flow is passed through the turbines until the hydraulic capacity of the powerhouse is exceeded at which time flow is passed over the spillway. During higher inflow events, spillway flashboards are designed to fail at two loading conditions. The first section of flashboards fail when overtopped by 5.78 feet (elevation 274.76 feet). The flashboard is located along east-west leg of the spillway nearest the west non-overflows structure is 340 feet long as shown in Figure 1 below. The second section of flashboards fail when overtopped by 7.73 feet (elevation 276.71). The 375-foot long gates are located along east-west & north-south legs nearest the powerhouse as shown on Figure 1 (Kleinschmidt, 2020)

The total contributing watershed upstream of the dam site is approximately 4,670 square miles including portions of metropolitan Atlanta and multiple other dams on the mainstem river. There are no un-impounded free-flowing reaches of the Chattahoochee River between the three project impoundments. The North Highlands tailrace flows directly into the tail race weir just downstream. The former City Mills Dam and downstream Eagle-Phenix Dam were intentionally removed in 2013, and now the Middle Chattahoochee is free flowing downstream of North Highlands Dam. The removal of City Mills Dam resulted in the construction of an 11-foot high weir diagonally across the tailrace channel to maintain tailwater levels at the powerhouse.

REDACTED

Figure 1. Plan and Profile of North Highlands Dam from Historic Drawings (GPC, 1963)

The North Highlands Development is part of the Middle Chattahoochee Project, a FERC licensed hydropower project that consists of three hydroelectric developments (North Highlands, Oliver, and Goat Rock), as shown on Figure 2. The Middle Chattahoochee Projects spans over a 16-mile stretch of the Chattahoochee River. The North Highlands Development consists of North Highlands Dam, a 29.6 MW powerhouse, and the 131-acre North Highlands reservoir.

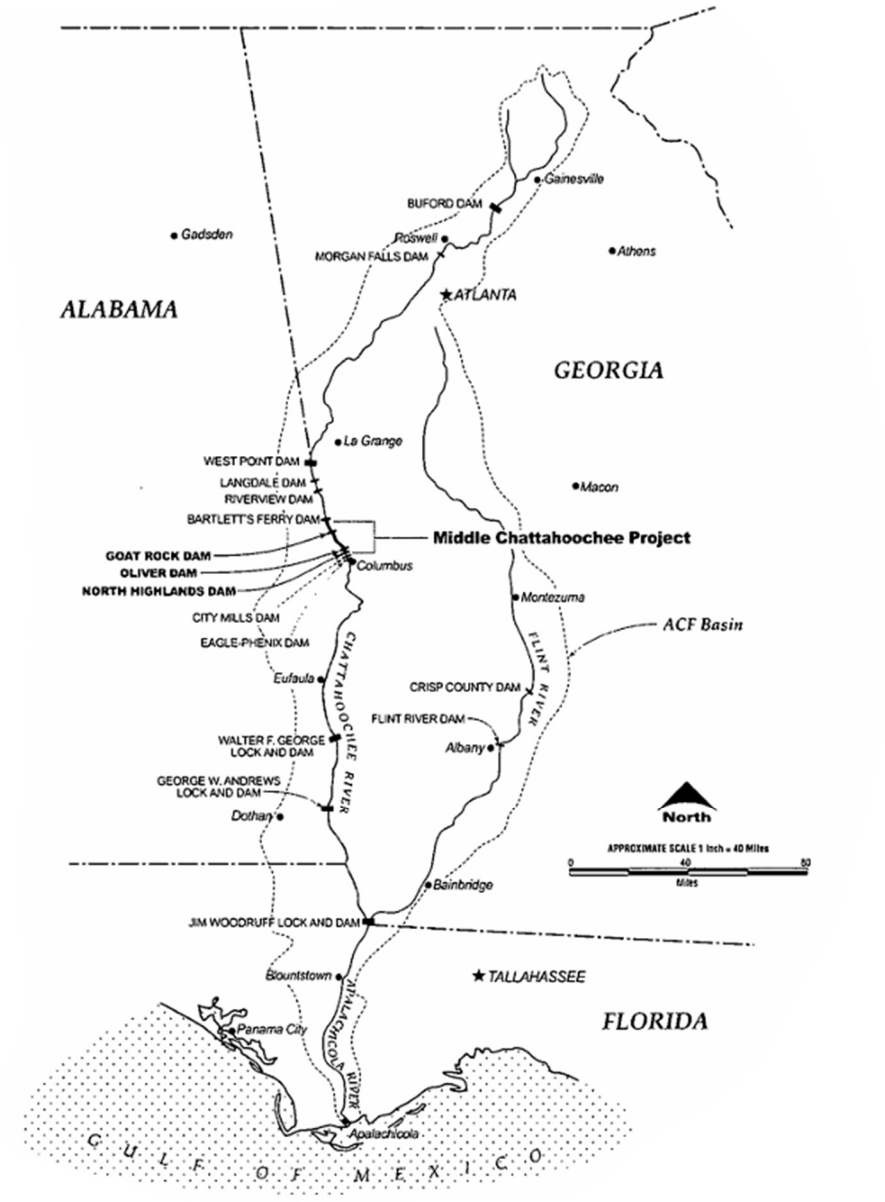

Figure 2. The Middle Chattahoochee Project Overview Map from GPC Applicant-Prepared Environmental Assessment for Hydropower License (2002)

The Middle Chattahoochee Project is operating under its second license from the Federal Energy Regulatory Commission. The original 50-year license expired January 1, 2005, and the new 30-year operating license was issued December 27, 2004, that will expire December 27, 2034 (FERC, 2004).

The North Highlands reservoir is situated within an urban, industrial, and commercial setting, but also is surrounded by strips of mixed forest. The North Highlands reservoir is classified as “Drinking Water” in Georgia and “Public Water Supply” in Alabama, with high priority of protection established by the Chattahoochee River Basin Management Plan (GPC, 2002).

2.2 Basin Characteristics

The drainage area contributing to North Highlands Reservoir is approximately 4,670 square miles with predominantly urban and mixed forest land cover. Figure 3 depicts the North Highlands Dam drainage area and project area. The United States Geological Survey (USGS) StreamStats (2024a) web-based geographic information systems (GIS) application was used to delineate the full contributing watershed above North Highlands Dam. Basin characteristics are summarized in Table 1.

Table 1. Overview of Basin Characteristics of the North Highlands Dam Watershed

Basin Characteristic	Characteristic Description	References
Physiographic Province	*The Chattahoochee River begins in the Blue Ridge physiographic province, characterized by an alluvial zone moving through the Fall Line Sand Hills belt of the East Gulf Coastal Plain Province. North Highlands Dam is located in the Piedmont physiographic province north of the fall line where the Piedmont province transitions to the Coastal Plain province.*	*Brockington & Associates, 2002; Lawton, D.E., 1976*
Topography	*Elevations within the basin above North Highlands Dam range approximately from a maximum of 4459 ft to a minimum of 231 ft.*	*USGS StreamStats (2024a)*
Ecoregion	*Vegetation surrounding North Highlands Reservoir is dominated by overstory species including mimosa, loblolly pine and water oak, as well as shrub species like kudzu in the more disturbed areas and privet and sumac in the cleared uplands (GPC, 2002). Soils are characterized by the abundance of lithic materials contained within both the Piedmont and Coastal Plain provinces. Quartz, quartzite and soapstone are contained within the Piedmont, with intermittent metamorphic rocks. Although chert may be found in the Piedmont province sparingly, it is largely abundant in the valleys of the Coastal Plain province. Soils consist of well-drained sandy soils originally extracted from marine sands, loams, and clays deposited onto crystalline and metamorphic bedrock (Hodler and Schretter, 1986).*	*GPC, 2002; Hodler and Schretter, 1986*
Land Uses	*The North Highlands reservoir is situated within an urban, industrial, and commercial setting, but largely surrounded by mixed forest with approximately 3 miles of shoreline containing portions of the Columbus Riverwalk and urban shoreline fishing opportunities*	*GPC, 2002*
Climate	*Climate in the basin is characterized by a Warm Temperate Subtropical Zone; average annual precipitation received by Muscogee County, Georgia is just over 50 inches. Precipitation peaks in March and July, while October and November are commonly below average.*	*Johnson, 1983*

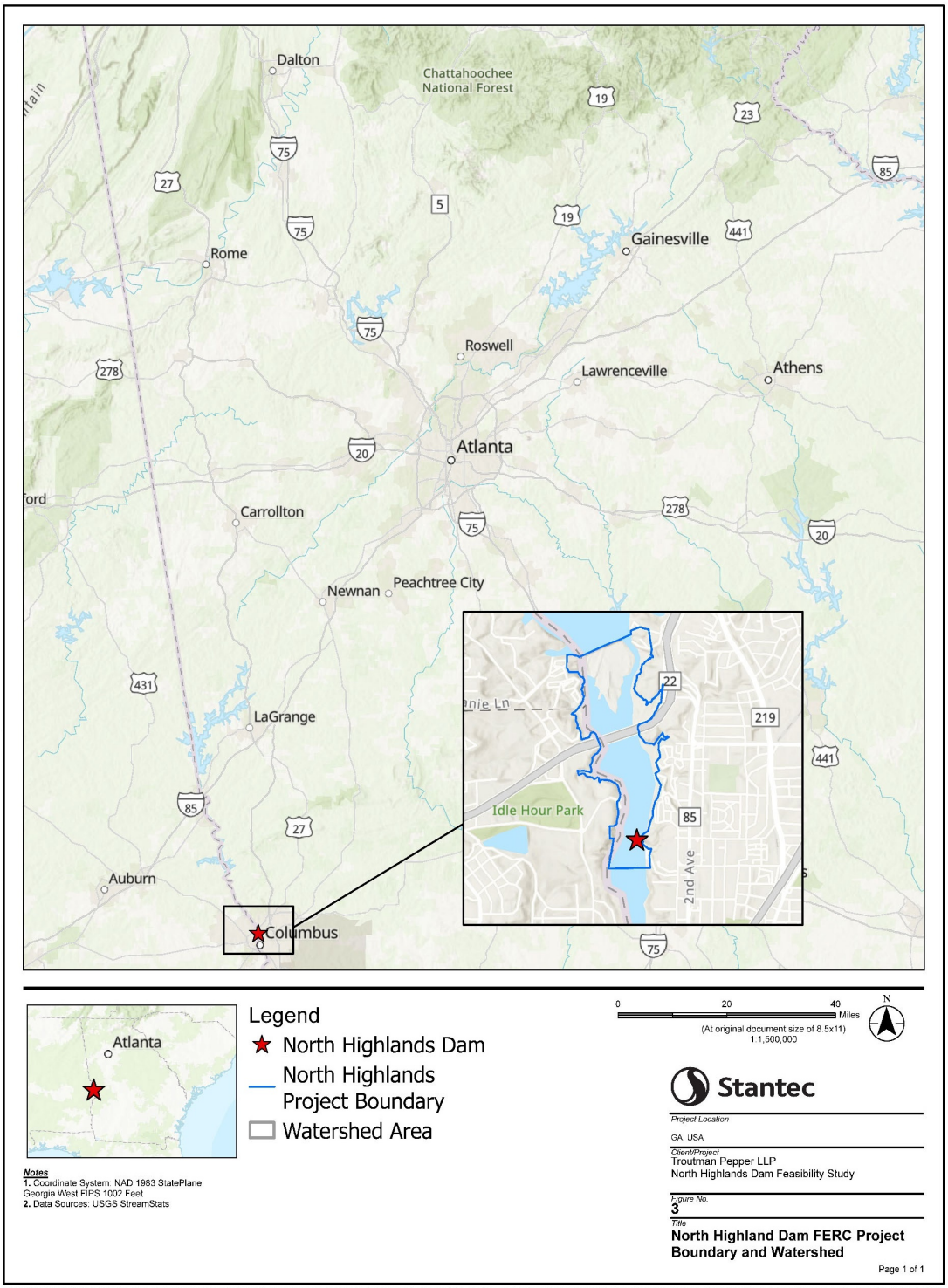

Figure 3. North Highlands Dam Catchment and Project Area

2.3 Shoreline Development, Recreation Resources, and Water Withdrawals

The shoreline of the North Highlands reservoir is generally forested Chattahoochee Riverwalk Area. There are no commercial or residential developments along the shoreline. The primary recreational resource is a 1.2 miles section of the Chattahoochee Riverwalk Trail. The reservoir does not have any public boat launches, camping or day use areas.

Additionally, the North Highlands reservoir serves as a municipal surface water source for the City of Phenix. Phenix City Utilities is permitted by the Alabama Department of Environmental Management (ADEM) to withdraw 9 million gallons per day (MGD) from the reservoir (GPC, 2002). There is no known water withdrawal permitted by the Georgia Environmental Protection Division (GA EPD).

2.4 Existing Conditions of Dam

North Highlands Dam is a concrete gravity run-of-the-river dam with an East and West Non-Overflow structure, a combined Intake and powerhouse structure, and a flashboard regulated Spillway. Construction of the dam and powerhouse took place between 1898 and 1902 with the project redeveloped in 1963 with the construction of a new powerhouse. North Highlands development is founded in bedrock and contains brick foundation box drains with cast iron pipe headers installed at the structure-foundation interface. The east (left) non-overflow structure is a 40 ft long concrete gravity structure with a crest elevation of 290 ft. The west (right) non-overflow structure is a 40 ft long stone masonry gravity structure with a crest elevation of 278 ft. Approximately 900 ft upstream of the right non-overflow section is a 36-inch municipal water intake for Phenix City, Alabama. The curved spillway is 705 ft in length with a maximum structural height of approximately 35.5 ft to the top of the flashboards and is comprised of a combination of stone masonry and cyclopean concrete. While the fixed crest elevation of the spillway is 265.88 ft, the flashboard hinge increases the effective crest elevation to 266.45 ft, with the top of the flashboards at an elevation of 268.98 ft. The powerhouse is located downstream at the end of the spillway containing three vertical 9.2 MW turbine-generator units and one 2.0 MW turbine generator unit (Unit 4). The powerhouse has a total hydraulic capacity of 13,200 cfs. Turbine generator Units 1-3 have three intake gates while Unit 4 has two intake gates, all containing stoplog slots. A 11 ft weir with a crest elevation of 225.5 ft was constructed diagonally across the tailrace in 2013 to maintain a suitable tailwater level for the turbines after the removal of the Eagle-Phenix Dam and City Mills Dam downstream of North Highlands. Additionally, a single trash gate is located at the intake structure, but it is not operated for water level control or discharging of high river flows (Kleinschmidt, 2020).

2.5 Hydrology and Hydraulics

To inform the development of conceptual design for dam removal, river flow patterns for the project area were analyzed. The closest USGS gage (Site No. 02341460) is located approximately two miles downstream of North Highlands Dam at the 14th St. Bridge in Columbus, GA (USGS, 2024b). Data from this gage went back to April 7th, 2014, and was input into RiverMorph Version 5.2.0 (Stantec, 2021) to generate an annual probability exceedance curve based on a Log-Pearson Type III distribution (see Figure 4). The data was also found to be comparable to flow duration curves presented in GPC's licensure application (GPC, 2002) and agreed with the regional curve and bathymetric bankfull estimates presented in Section 3.

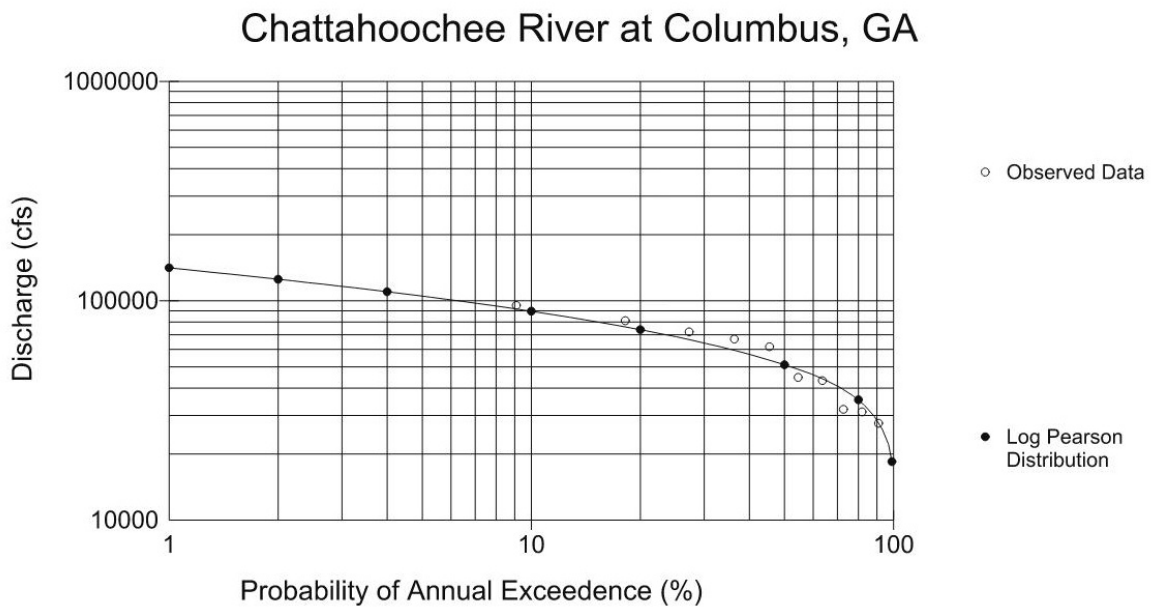

Figure 4. Probability of Annual Exceedance at 14th St. in Columbus, GA

2.6 Sediment Assessment

A bathymetric survey was performed for most of the dam footprint as part of this study in 2023 and by Lowe Engineers in 2013. The two data sets were compared and no discernable differences between the bed elevation were found, see the first section in Figure 6 below. Several factors contribute to lack of sediment storage behind this dam:

- Sediment supply is interrupted by Lake Oliver, which is directly upstream, and other impoundments on the mainstem;
- North Highlands Dam was constructed as a run of the river facility and has little storage capacity. It's small size relative to the river results in low trapping efficiency;

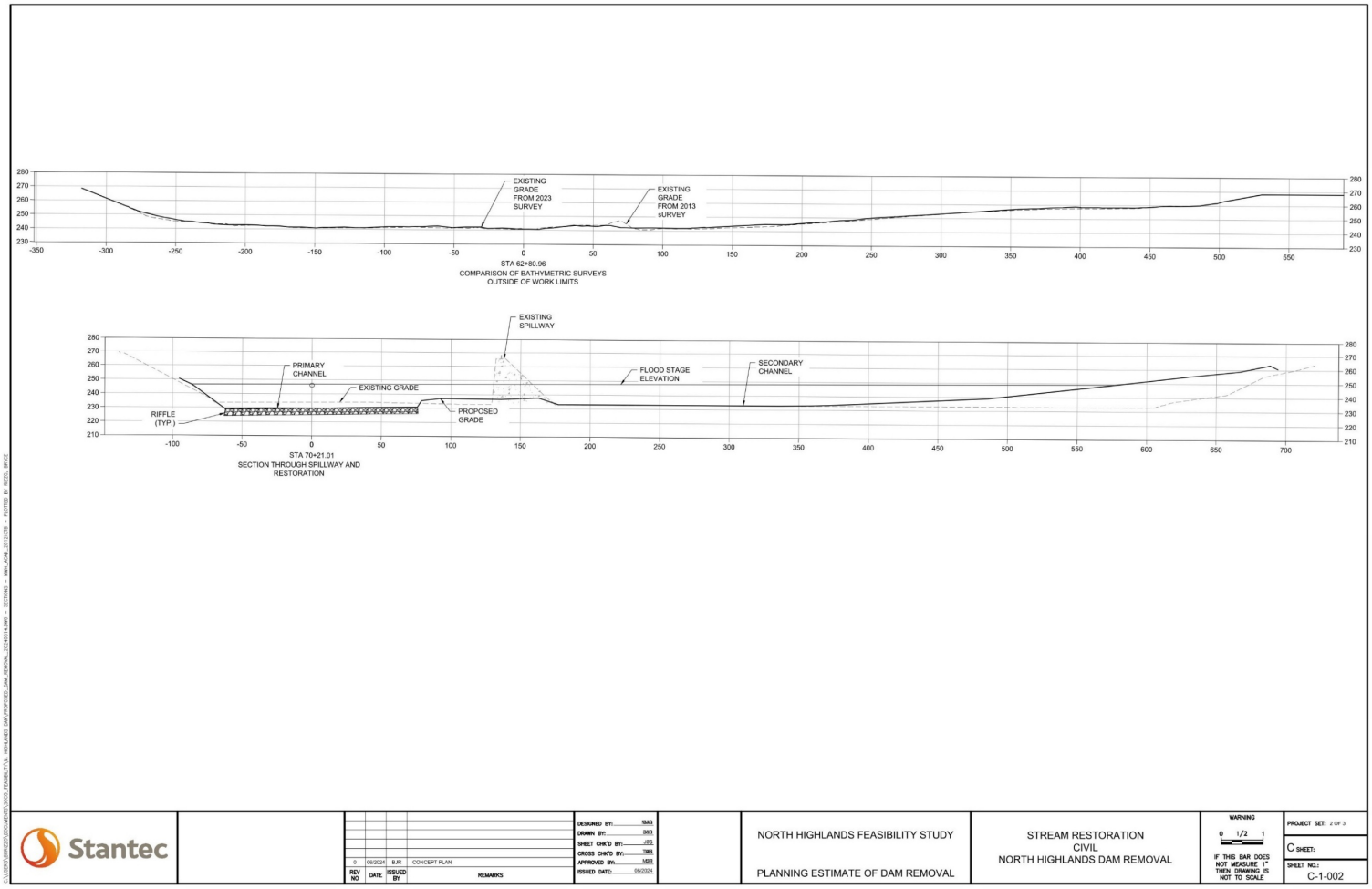

Figure 5. Cross Section Data from the 2013 and 2023 Bathymetric Surveys and b) Proposed Section through the in-line Spillway

2.7 Cultural Resources

Based on cultural resources surveys associated with the licensing studies in the early 2000s, there are at least 34 archaeological sites recommended potentially eligible or eligible for listing in the National Historic Register are within the area of potential effect of the Middle Chattahoochee Project, with most associated with the downstream impoundments. However, none are associated with the temporarily impounded waters of the North Highlands development. Additionally, the hydroelectric facilities including the dams are eligible for inclusion in the National Register of Historic Places as a Historic District. Under the current FERC License, the North Highlands Project has a Programmatic Agreement in place since 2004 that guides management of cultural resources and specifies how to plan and conduct ground-disturbing activities or other actions that may affect any historic properties within the project's area of potential effect. Removal of the dam would result in an adverse effect on a significant historical resource.

2.8 FERC Licensing and Compliance

North Highlands Dam is one of three developments that make up the Middle Chattahoochee Hydroelectric Project (Middle Chattahoochee Project), which is operated by GPC and licensed for operation under Federal Energy Regulatory Commission (FERC) No. 2177. The current 30-year license for the Middle Chattahoochee Project, will expire December 27, 2036, and the relicensing process will need to commence in 2031.

3 Dam Removal Study

This study assessed full removal of dam structure including the spillway, intake, and the non-overflow sections. The result of this approach would be a free-flowing Chattahoochee River through the current reservoir footprint, which over time would evolve to occupy its historic valley.

Construction would begin with the removal of the dam and a slow drawdown of the reservoir elevation over time. Sedimentation behind the dam does not appear to be an issue, so the rate of drawdown would only be limited by amount of flooding downstream that is tolerable. Dredging any material beyond the immediate dam footprint was avoided in this study to reduce construction cost.

Minimal large-scale stabilization and small-scale channel stabilization measures in the remaining normal pool footprint will most likely be required. Seeding and plantings of trees and shrubs was accounted for across the entire dam footprint. As designed, planting in the normal pool footprint will be a large part of the long-term stability. In the short term, management of the sediment during the dam removal, and allowing natural attenuation of instability points will help avoid large-scale restoration. An adaptive management plan was included to address invasive species control and localized instability, usually a 10-year period post construction. This will be determined by the FERC surrender order, 404 permit special conditions, and if any civil infrastructure is threatened. Minimal intervention into stability outside the immediate dam footprint is expected.

The channel design through the dam footprint relies on defining the bankfull discharge. The bankfull discharge is the channel forming flow that maintains channel dimensions. A regional curve was used to obtain typical bankfull cross section geometry for the restored stream following dam removal. Regional curves relate bankfull stream channel dimensions (i.e., width, depth, and area) and discharge to the stream's drainage area. These relationships are empirically derived from longitudinal and cross-section data and are developed for streams in the same physiographic region with similar rainfall/runoff relationships. The North Carolina Rural Piedmont and Mountain regional curves were used to validate the bankfull dimensions of the restored channel for full dam removal (Harman et al., 2000). This regional curve does not represent this size of channel or the region well, but the drainage area (4,630 sq. mi.) of the Chattahoochee River limits the use of any interoperable regional curves. Instead, the bankfull discharge was defined by the reference conditions pulled from the bathymetric survey. The lack of sedimentation behind the dam means that the channel observed within the bathymetric data is most likely the same as the channel conditions after the dam is removed. The regional curve validated the order of magnitude of the design discharge used.

The Dam removal will include near full removal of the structures to return the historical valley width of the Chattahoochee. Remnant structures of potential historical significance, including parts of the dam and structures that may be supporting the former Bibb City Manufacturing facility may need to remain. The grouted riprap weir downstream of the dam will remain and be incorporated into the natural channel design. Otherwise, all infrastructure related to the North Highlands dam will be removed. This valley width will allow overbank flooding above the bankfull discharge to reduce the potential for scour or sediment deposition caused by flow constriction but is sized to reduce required grading. Riffles and pools, designed with the goal of stability and aquatic habitat, will be constructed within this valley. Some of the material

moved during the dam removal will be recovered in order to perform the channel restoration, to be used as bed or bank material based on gradation and cohesiveness. Grade Control structures are proposed to increase the immediate stability of the proposed channel and control the global profile during post-construction channel adjustment; of the proposed channel slope is 3% compared to the slope of the Middle Chattahoochee River outside the dam footprint with an average river slope of 1%. The higher slope of the proposed reach minimizes the construction cost while still proposing a functional natural channel slope. This section of the Chattahoochee River is significantly steep and most likely contains bedrock features in areas where bathymetric survey was not performed. Conservatively, the design did not rely on those potential bed features and further investigations will be required to know more about the below water conditions. As well, further investigation of the dam itself will be required during detailed design to analyze the foundation and subsurface condition of the structure and to minimize design adaption requirements during demolition. A full dam removal concept map is presented as Figure 6 and a vertical profile of the primary channel alignment is presented as Figure 7.

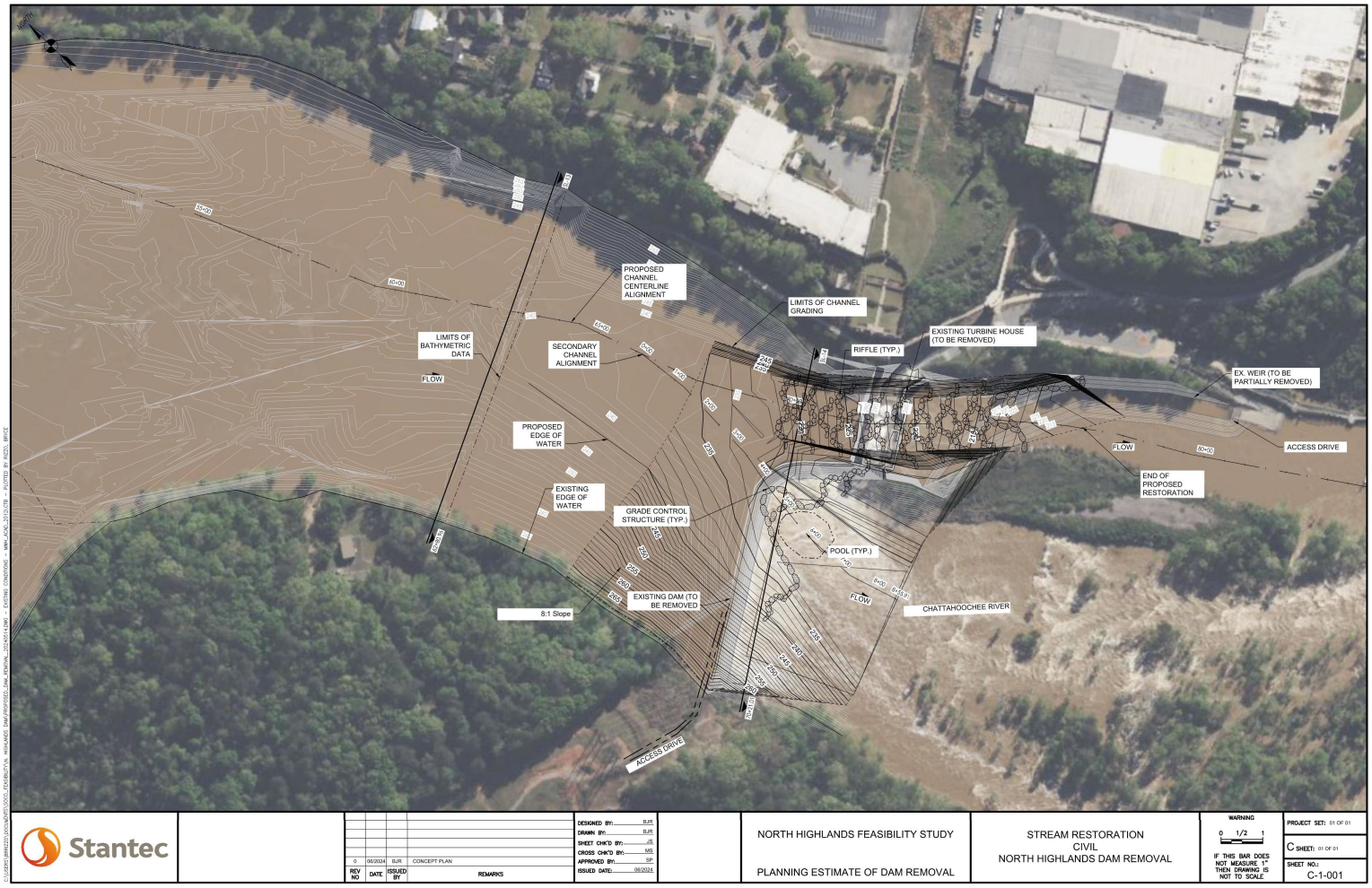

Figure 6. Full Dam Removal Concept Map

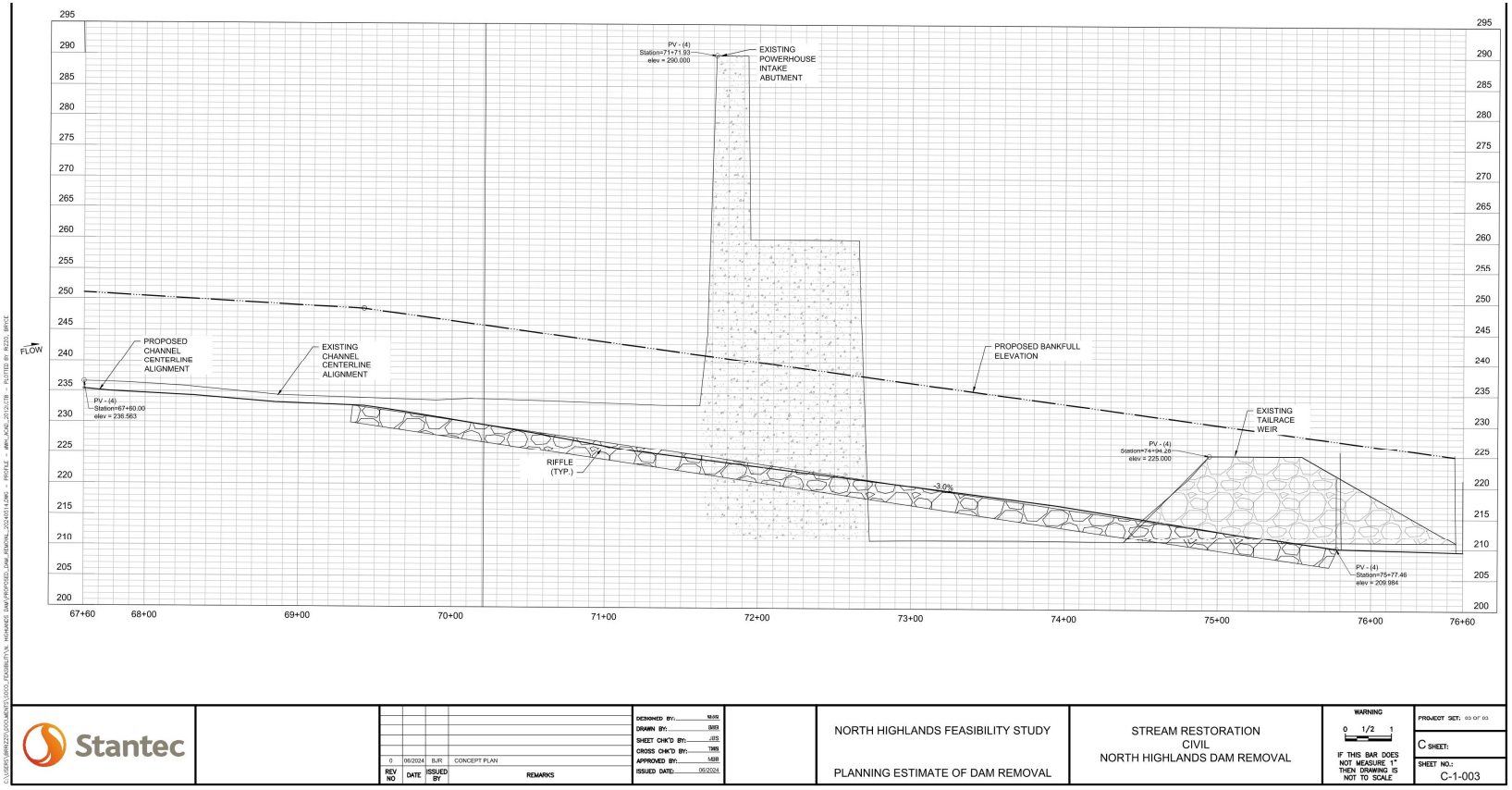

Figure 7. Vertical Profile of the Primary Channel Alignment

4 Evaluation of Dam Removal for North Highland Dam

4.1 Recreation, Residential, Commercial, and Lost Power Generation Impacts

Decommissioning and removal of the North Highlands power generation station and dam would not have very significant adverse effects on the economic, recreational, and aesthetic resources of Muscogee County, Georgia, Russell County, Alabama, and surrounding communities. The main recreational area is the Chattahoochee Riverwalk area, which would be only minimally impacted from the full removal of the North Highlands power generation station and dam. Additionally, residential impacts north of the existing dam and within the impoundment area south of Oliver Dam are limited, as there are no waterfront properties. Lost power generation impacts are discussed in Section 4.1.2.

4.1.1 PROPERTY IMPACTS

Property impacts are not anticipated by the removal of North Highlands Dam as: (i) residences and commercial properties do not directly abut the pool; and (ii) the pool is not accessible by the public or nearby property owners.

4.1.2 FOREGONE ELECTRICITY GENERATION

The economic impact of foregone electrical generation should be considered and will be evaluated by GPC and therefore are not included in this study.

4.2 Construction Costs

A planning level opinion of probable construction cost (OPCC) was prepared for full dam removal. A cost estimate of partial dam removal was not presented as part of this study. The cost estimate for full removal assumes a long enough schedule to allow for natural attenuation of sediment instability behind the dam, and workable access onto the historic floodplain after the draw down. A sediment analysis of the captured fine sediments would be required to understand the stability of these soils. All costs are in 2024 dollars, and escalation is not factored into the costs as no timeline for implementation is suggested by this study. The OPCC includes known major project components, a 15% adaptive management plan, 30% planning level contingency, 15% estimate of survey, studies, design, and permitting professional services,10% construction oversight and owner cost, and a 15% allowance for unknown impact mitigation needs. The Unknown impact mitigation was adjusted to 15% due to the potential impacts to a major highway crossing the reservoir where the removal may impact bridge foundations or piers and require additional stabilization. Detailed cost estimates are presented in Appendix A.

For full dam removal, the total project cost estimated is $144.3 Million with all of that cost associated with construction cost of the dam removal and site reclamation.

To estimate the construction cost of $144.3 Million, a post restoration grading surface was created. The first phase of construction will be the multi-stage draw down of the reservoir. Considerations during this

stage was the Control of Water, Mobilization and temporary site development, excavation/demolition of the Dam and Facilities, and disposal of material. Assumptions made in this phase were:

- The entire structure is to be removed;
- Some of the material excavated in and around the dam site can be reused during the restoration; and
- A reasonably close disposal site can be secured.

After the drawdown of the lake and the excavation of sediment upstream of the dam, the restoration can begin. Potential grade control structures, bank stabilization measures, grading, and planting were priced out during the restoration phase of construction. Planting of the restoration site was included as well as the entire footprint of the normal pool. Planting across the former pool ensures the Chattahoochee River and tributaries successfully stabilize without active restoration installations. Ancillary benefits include increased species diversity and faster upland recovery. This design will achieve dynamic equilibrium with the rest of the Chattahoochee River System. This means long-term costs like site maintenance is not expected. The Chattahoochee River will not be able to provide much sediment because of the upstream dams. The material being placed will have to be larger than the historical Chattahoochee sediments because those sediments are no longer flowing into the reach. This material will have to meet the threshold of movable particles on the river bottom.

As stated above, a cost estimate for partial removal with passive flood control was not performed. The construction cost of this scenario is reasonably similar to full dam removal. Because of the resultant steep section of river, maintenance will most likely be required to maintain the final grade and the long-term cost of this scenario is much higher than full dam removal.

4.3 Regulatory Considerations

If North Highlands Dam were to be fully removed, a number of regulatory approvals would be needed for decommissioning the powerhouse, dam removal, and subsequent restoration actions. The regulatory processes would involve a combination of federal, state, and local regulations. These processes are described in the sections below. Because the North Highlands Dam and powerhouse are part of a FERC-licensed project, the current license would have to be surrendered if a removal was pursued. The FERC surrender process would serve as the main process under which compliance with other environmental regulations would fall under. Based on other decommissioning and dam removal planning projects, a surrender process along with gaining other regulatory approvals would take at least 5 to 10 years, likely incurring costs of millions of dollars in consulting and legal fees.

4.3.1 LICENSE SURRENDER APPLICATION

In order to relinquish the license for the North Highlands development of the current hydropower project, a surrender application in accordance with FERC regulations at 18 Code of Federal Regulations (C.F.R.) § 6.1 and 6.2 would be required. If the surrender process was initiated just prior to relicensing (i.e., within 5 to 5.5 years prior to expiration of the existing license) a Notice of Intent to not seek a new license would also need to be filed. FERC projects have different requirements for license surrender based on the project components, state and federal regulations in the project location, and what the licensee intends to

do with the project after it is surrendered. Both the surrender application and the surrender process are project-specific, with FERC dictating requirements on a case-by-case basis (American Rivers, 2023).

Development of a surrender application is complex and requires extensive consultation and multiple studies with resource agencies and local stakeholders. The surrender application must identify all project features to be removed including the dam, reservoir, power plant, transmission lines and recreation features and how they will be disposed. Major components of a surrender application include:

1. Removal Plan: For a dam removal, the plan will include details on how the dam and associated structures will be removed and a proposed timeline for removal. A proposed timeline and sequencing of removal activities. The plan will also need to cover current and future safety concerns for the project area.
2. Environmental Impact Description: This description outlines the anticipated effects on dam removal on the baseline environmental conditions of the project area. Effects may include sediment, hydraulic, biological, and recreational impacts.
3. Project Description: Includes description of all components of the project, physical structures, hydraulic impacts of the project on the waterbody, and history of the project.
4. Relevant Consultations with Resource Agencies (see Section 4.3.2)

In general, after extensive consultation with stakeholders and development of a removal plan, once filed with FERC the license surrender process would follow these typical steps:

1. License Surrender Application Submitted to FERC
2. After a public comment period, FERC will review comments and decide if a National Environmental Policy Act (NEPA) document (an environmental assessment (EA) or environmental impact statement (EIS)) will be required, or additional information or studies are needed.
3. NEPA Document Drafted
4. 30-60 Day Comment Period on Draft NEPA Document
5. Within 60 days of close of comments, resource agencies must file conditions.
6. FERC publishes final NEPA document within 90 days of agencies filing conditions.
7. FERC issues a final decision on the surrender application with required mitigation measures for the North Highlands development.
8. Agencies and others have the opportunity to challenge FERC's final decision.

Once the comment periods have closed on the license surrender application and NEPA document, it may take additional time for FERC to render a final decision on the fate of the license. If FERC approves the surrender application, the licensee must comply with all terms of the license and surrender application before the license is officially surrendered for the North Highlands development.

4.3.2 AGENCY CONSULTATIONS ASSOCIATED WITH DAM REMOVAL

As described above in the license surrender application process, consultation with relevant federal, state (Georgia and Alabama), and local resource agencies is necessary as part of the surrender process. The following sections overview the regulatory drivers leading to important consultations that would be necessary for planning a dam removal. Each of these individual permits or agency consultants will require approvals and mitigation measures.

Clean Water Act 404 Permit

Section 404 of the Clean Water Act (CWA) authorizes the discharge of dredged or fill material to waters of the United States and is administered by the Department of the Army (DOA) through the U.S. Army Corps of Engineers (USACE). DOA permits can be divided into two basic groups; General Permits and Individual Permits. General Permits are issued for small impacts and Individual Permits are issued for projects with greater impacts or those with classes of actions not authorized under NWP. The USACE has developed a Nationwide Permit (NWP) program that authorizes approximately 54 specific activities. The program has a list of general conditions that must be met by all NWP's. In addition, each NWP has its own list of specific conditions and authorizations. If a proposed activity can be conducted within the constraints of the general and specific NWP conditions, a permit is issued. The selected scenario may qualify for NWP 27 only if it will have a minimal effect on water quality. A minimal effect is defined by as an activity that permanently impacts 0.1 acres or less of Waters of the United States, permanently affects 300 linear feet or less of stream, and does not result in any permanent secondary effects to Water of the United States. It is likely that all scenarios will exceed the impact limits set for a general permit and require preparation of an individual 401 Water Quality Certification (WQC).

Clean Water Act 401 Water Quality Certification

Section 401 of the CWA requires state agencies to certify that a federally issued Section 404 CWA permit will not result in a violation of state water quality standards. Each individual state has the option of placing restrictions on usage of the NWP's under its 401 CWA authority. This authority is administered by the GA EPD and ADEM.

A 401 WQC application requires additional information not involved in a 404 Pre-Construction Notification (PCN). The application includes discussion of avoidance and minimization measures. The applicant is responsible for issuing a public notice of the application after determination by the GA EPD and ADEM that the application is complete. The Individual 401 WQC application review process may require up to 120 days to complete.

Section 7 of the Endangered Species Act

The Federal Endangered Species Act (ESA) [16 U.S.C.1531 et seq.] became law in 1973 and provides for the listing, conservation, and recovery of endangered and threatened species. The USFWS is the agency responsible for protecting and monitoring populations of listed endangered species. Section 7(a)(2) of the ESA states that each Federal agency shall insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species, or result in destruction or adverse

modification of designated critical habitat. A federal action includes approval of a permit or license, including Section 404 permits under the CWA.

National Historic Preservation Act

Section 106 National Historic Preservation Act (NHPA) requires Federal agencies to identify historic properties potentially affected by undertakings, and to seek ways to avoid, minimize, or mitigate any adverse effect on these properties. In cases where the project may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized until the requirements of Section 106 of the NHPA have been satisfied. The Georgia Department of Community Affairs' Historic Preservation Division (HPD) is the official historic preservation agency of the state of Georgia. The Alabama State Historic Preservation Office (SHPO) may also be contacted during the Section 106 review process.

As described in Section 2.7 there are at least seven archaeological sites eligible for listing in the National Historic Register are within the area of potential effect of the Middle Chattahoochee Project, with the potential for two of these being associated with the North Highlands Dam. A complete inventory of the National Register of Historic Places database will need to be conducted for the Project area to identify historic and archaeological resources potentially impacted by the Project. Additionally, a Phase I Cultural Resources Survey may be required since the Project involves public land. A Phase I investigation generally involves a literature review of site records, aerial photographs, maps, and other relevant cultural resources records. If potential impacts to historic features are identified, coordination with HPD will determine what mitigation measures would be required for powerhouse decommissioning and dam removal. The age, history, and configuration of this dam may require extensive mitigation of the adverse effects to this structure.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) process would be undertaken by FERC as the lead agency and other Federal and State Agencies being invited to cooperate. The environmental review under NEPA can involve three different levels of analysis: 1) Categorical Exclusion Determination, 2) Environmental Assessment (EA)/Finding of No Significant Impact, and 3) Environmental Impact Statement (EIS). The purpose of the EA is to evaluate if the action will cause significant environmental impacts, in which case more detailed analyses of project environmental effects are conducted through the EIS process. In this case, it is very likely an EIS would be required given the severity of the likely environmental impacts. The EIS is a more rigorous document than the EA and is published for public review and comment for a minimum of 45 days.

Federal Emergency Management Agency (FEMA) Map Revisions

The FEMA process to modify existing floodplain maps would need to be completed to account for the effects of the dam removal. To update a FEMA Flood Insurance Rate Map (FIRM) for a dam removal, existing condition and proposed conditions models would be completed based on detailed hydraulic and hydrologic analyses. The FEMA process would include development of maps based on proposed condition as part of the Conditional Letter of Map Revision (CLOMR) process which would need to be approved by FEMA. During this process, notifications to impacted property owners would be coordinated with local jurisdictions where property owners would have the opportunity to provide comments. Due to the complexity of the removal of North Highlands Dam and associated floodplain impacts and coordination with multiple parties, the CLOMR process could take years. After the CLOMR is approved, the project could commence. After completion of the project, a Letter of Map Revision (LOMR) would be completed which is utilized to formally update the maps. The LOMR would be updated map based on constructed conditions (compared to the CLOMR which utilizes proposed conditions).

4.4 Other Considerations

In the process of obtaining regulatory approvals, it is likely that resource protection plans will be needed for protection of sediment and soil resources, vegetation and wildlife and fishery resources as well as cultural resources and public safety. In addition, a construction plan that addresses transportation, staging areas, and/or spoil area is needed, and restoration will be likely required. There may also be additional, unforeseeable mitigation necessary following dam removal. Determining the type and scale of these mitigations is beyond the scope of this work, however the owner should be aware of this uncertainty and potential additional risk. Unforeseeable mitigation may be requests from regulators that go beyond the normal burden for a construction project because of the size and scale of the project. Also, dam removal may expose bridge piers or foundations for highway US-80 which could require additional stabilization. A 15% contingency for unknown impact mitigation needs was estimated to account for potential burdens such as this.

Public outreach would need to be a major program for any removal option. Change in residential shoreline use of the reservoir and overall recreational use of the impoundment will significantly impact current and future residents and visitors.

5 Summary and Conclusions

Stantec used available data and studies on existing site conditions, data from a field reconnaissance, and bathymetric survey to consider partial and full dam removal for North Highlands Dam. Partial removal was eliminated from further consideration for the purposes of this study and did not have a concept design or cost estimate developed. Full dam removal was evaluated on impacts to recreational and residential developments, ecological effects, and regulatory considerations.

Table 2 summarizes the impacts of full dam removal of North Highlands Dam.

Table 2. Summary of Project Outcome

Item	Full Dam Removal
Recreational Value	Wadable River, hiking, river fishing
Water Supply	Loss of water supply source to local communities
Hydrogeneration	Loss of hydrogeneration
Sediment Stability	Sediment stability assumed to be reached over time and would not require any long-term maintenance, however, would likely require some minimal dredging and stabilization during construction.
Project Impact Cost	$144.3 Million for construction and removal. Costs associated with losses in hydrogeneration, recreational value, and additional impacts were not included in the estimate.
Maintenance	Restoration of natural channel properties eliminates maintenance requirements
Regulatory Process	License surrender application process

The concept design presented in Section 3 served as a planning level design and was used to develop the construction cost estimate for dam removal. Cost estimates for construction represent best available data for 2024 prices. Cost estimates associated with loss of hydrogeneration have not been included in this study but will be evaluated by GPC as part of the 2025 IRP. Dam removal was estimated to cost approximately $144.3 Million including cost associated with construction cost of the dam removal and restoration/stabilization efforts.

Stantec's review of available data and studies, existing site conditions and shoreline developments, economic impact, regulatory considerations, and engineering considerations suggests full dam removal is feasible but would need to be balanced with other considerations (e.g. cost of removal, FERC requirements). The removal of the dam could have some recreational benefits and reduce the operation and maintenance costs. That being said, the existing dam appears to be operating as originally designed and sedimentation within the upstream pool does not appear to be threatening the future operation of the dam.

[This page is intentionally left blank.]

6 References

American Rivers. (2023). Practitioner's Guide to Hydropower Dam Removal.

Brockington and Associates, Inc. (2000). Archaeological and Historical Study Report: Middle Chattahoochee Project (FERC #2177), Muscogee and Harris Counties, Georgia Lee and Russell Counties, Alabama

Brockington and Associates, Inc. (2002). Historical Properties Management Plan: Middle Chattahoochee Project (FERC #2177), Muscogee and Harris Counties, Georgia Lee and Russell Counties, Alabama

Edwards, Pamela J.; Watson, Edward A.; Wood, Frederica. 2019. Toward a Better Understanding of Recurrence Intervals, Bankfull, and Their Importance. Journal of Contemporary Water Research & Education. 166(1): 35-45. https://doi.org/10.1111/j.1936-704x.2019.03300.x.

FERC. (2004). 109 FERC ¶62,246 Order Issuing New License

FERC. (2006). 114 FERC ¶62,219 Order Modifying and Approving Recreation Plan

Georgia Power Company. (2012). Chattahoochee Hydro FERC Project Number 2177, Volume 1 Public.

Georgia Power Company. (2002). Final License Application Middle Chattahoochee Project (FERC No. 2177).

Georgia Power Company. (1963). Middle Chattahoochee Development North Highlands Project: General Plan, Elevation, & Typical Sections of Dam.

Hodler, T., & Shretter, D. (1986). The Atlas of Georgia. The Institute of Community and Area Development, University of Georgia, Athens.

Johnson, John, H. (1983). Soil Survey of Muscogee County, Georgia. United States Department of Agriculture, Soil Conservation Service, Washington, D.C.

Kleinschmidt Associates. (2020). Ninth Part 12 Safety Inspection Report Middle Chattahoochee Hydroelectric Project FERC No. 2177-GA North Highlands Development

Lawton, D.E.. (1976). Geologic Map of Georgia. Georgia Department of Natural Resources, Atlanta, Georgia.

Randle, T. (2015). Large-scale dam removal on the Elwha River, Washington, USA: Erosion of reservoir sediment. Geomorphology.

RiverMorph, LLC (2021). RiverMorph Professional Version 5.2.0.

US Geological Survey (USGS, 2024a). USGS Stream Stats. Accessed June 2024. https://streamstats.usgs.gov/ss/

US Geological Survey (USGS, 2024b). USGS Gage No. 02341460. Accessed August 2024.

Appendix A – Cost Estimate

[This page is intentionally left blank.]

Opinion of Probable Construction Cost

Client	Troutman Pepper LLP
Project Name	Feasibility Study - Dam Removal
Location	North Highlands Dam Columbus, GA
Facility	North Highlands Hydroelectric Plant
Date	January 10, 2024
Project No.	175578493

Dam Removal					
Activity	**Units**	**Quantity**	**Unit Cost**		**Total**
Phase 1 Dam Removal					
Mobilization	LS	1	3,300,000	$	3,300,000
General and Temporary Works	LS	1	3,210,000	$	3,210,000
Control of Water	WK	40	105,000	$	4,200,000
Dam Removal	CY	95,365	60	$	5,720,000
Demolition (Parking, Drive, Etc.)	CY	50,000	45	$	2,300,000
Turbine Removal & Disposal	LBS	1,715,221	3	$	5,878,391
Generator Removal & Disposal	LBS	1,046,033	3	$	3,584,957
Electrical Equipment & Disposal	LS	1	5,086,012	$	5,086,012
Mechanical System Removal & Disposal	LS	1	1,291,941	$	1,291,941
C&D Hauling & Disposal	CY	49,068	25	$	1,230,000
Slope Armoring	CY	46,296	173	$	8,010,000
Phase 2 Stream Restoration and Sediment Removal					
Riffle	CY	8,900	173	$	1,540,000
Grade Control Structure	EA	31	630,000	$	19,530,000
Toe Wood Structure	LF	1,500	1,800	$	2,700,000
Live Branch Layering	LF	36,000	120	$	4,320,000
Dredge, Dewater, Haul Sediment	CY	8,900	75	$	668,000
Onsite Fill Material Processing	CY	4,450	60	$	267,000
Channel Restoration Fine Grading	SY	65,117	45	$	2,930,000
Lakebed Stabilization & Revegetation	AC	190	10,000	$	1,900,000
Archeological Observation	LS	1	352,000	$	352,000
			Base Construction	$	78,000,000
			Adaptive Management: Invasive Species, Site stabilization (15%)	$	11,700,000
			Construction Contingency (30%)	$	23,400,000
			Design, Studies, and Permitting (Lump Sum) (15%)	$	11,700,000
			Construction Oversight and Owners Cost (10%)	$	7,800,000
			Unknown Impact Mitigation Needs (15%)	$	11,700,000
			Total Project Construction Estimate	$	144,300,000
Non-Construction Costs					
Loss in Power Generation	Developed separately by GPC				-
Public Outreach and Coordination: Legal Services	Not quantified in this study				-
			Total Project Impact Estimate	$	144,300,000

General Notes:

1. The estimate is a Class 4 Opinion of Probable Construction Costs based on conceptual design from August 2024. If a dam removal occurs, additional studies, design, permitting, and third-party coordination would be required to refine the estimate.

2. Costs associated with sediment management are preliminary and could be substantially modified based on items such as material quantity, selection of on-site vs. off-site disposal, selection of dredging equipment, and sediment characteristics (geotechnical and environmental). Sediment volumes were based on removal for just a portion of the overall Lakebed sediments along the main section of the River closer to North Highlands Dam.

3. Potential third party costs such as potential loss of water supply were not calculated as part of this Study.

[This page is intentionally left blank.]