STUDY REPORT:
HISTORIC HYDRO-ENGINEERING RESOURCES ASSESSMENT FOR THE WALLACE DAM HYDROELECTRIC PROJECT, GREENE, HANCOCK, PUTNAM, AND MORGAN COUNTIES, GEORGIA

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At TRC, Alvin Banguilan served as Project Manager and Stephanie A.T. Jacobe served as report reviewer.

Abstract

In June 2016, TRC Environmental Corporation (TRC) conducted a historic hydro-engineering assessment of the Wallace Dam Hydroelectric Project (FERC Project No. 2413) (Wallace Dam Project) as part of the Federal Energy Regulatory Commission (FERC) relicensing process. The Wallace Dam Project is a pumped storage project consisting of the dam, a powerhouse, support buildings, and Lake Oconee, a 19,050-acre reservoir. The Wallace Dam Project is located on the Oconee River in Greene, Hancock, Putnam, and Morgan counties, Georgia.

This assessment was conducted to produce photographic documentation of the dam structure, powerhouse, and equipment, and to develop a historic context and engineering analysis that may be used in a future eligibility determination of the Wallace Dam Project for listing in the National Register of Historic Places (NRHP). Because construction of Wallace Dam was completed in 1979 and it is not yet 50 years old, a detailed NRHP evaluation of it was not completed at this time.

An architectural field survey of Wallace Dam documented the existing conditions of the facility and its support buildings. Background research on the history of the dam and its individual components was conducted in the historic photograph archives at Wallace Dam and at the Georgia Power archives in downtown Atlanta.

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CHAPTER I. INTRODUCTION

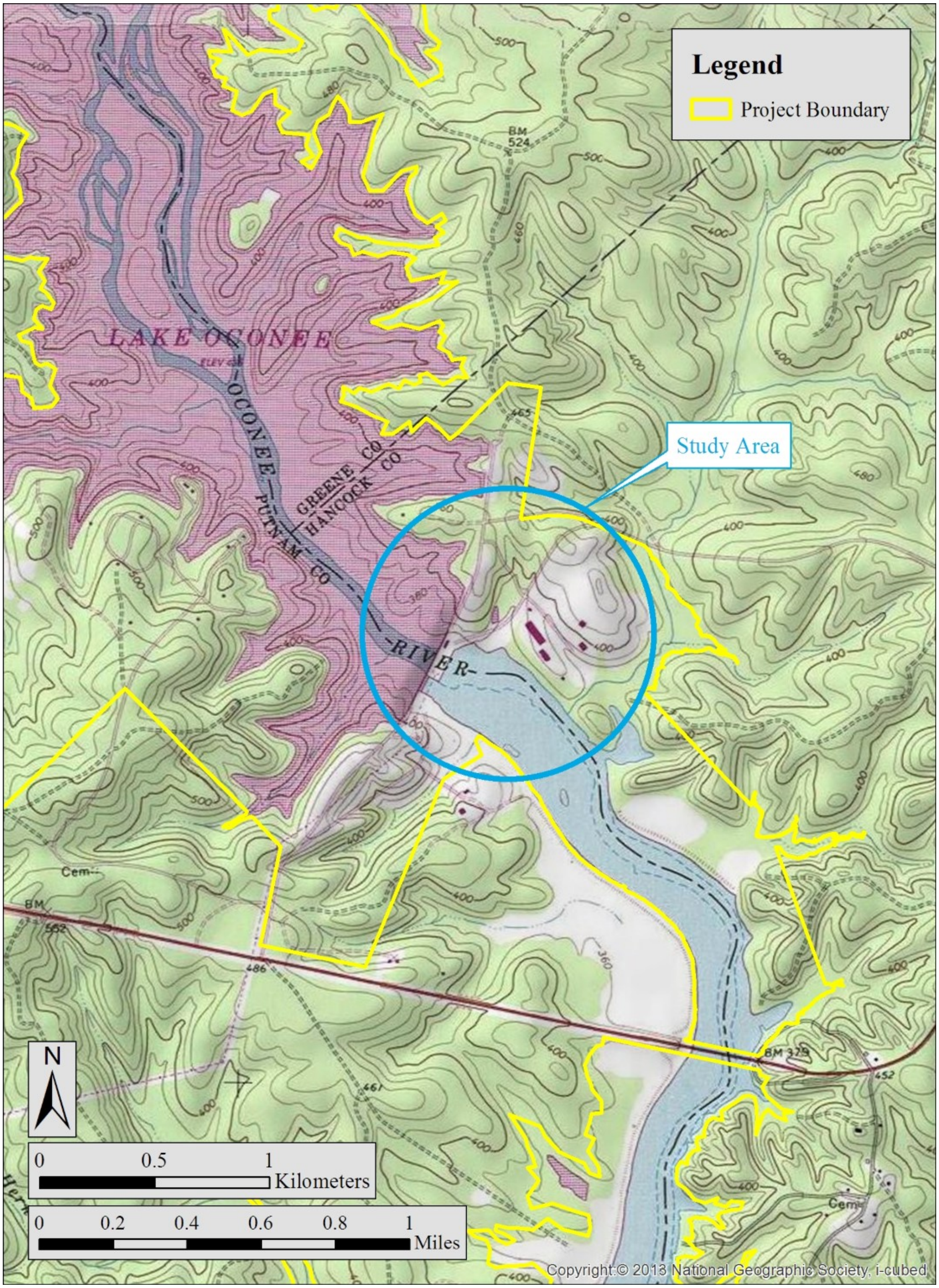
In June 2016, TRC Environmental Corporation (TRC) conducted a historic hydro-engineering survey of the Wallace Dam Hydroelectric Project located on the Oconee River in Greene, Hancock, Putnam, and Morgan counties, Georgia. This survey was conducted as part of the relicensing process between Georgia Power Company (Georgia Power) and the Federal Energy Regulatory Commission (FERC) for FERC Project No. 2413. This assessment was conducted to produce photographic documentation of the dam structure, powerhouse, equipment, and support buildings, and to develop a historic context and engineering analysis that may be used in a future eligibility assessment of the Wallace Dam Project for listing in the National Register of Historic Places (NRHP). Because construction of Wallace Dam was completed in 1979 and is not yet 50 years old, a detailed NRHP evaluation of it was not completed at this time. The project facilities will attain an age of 50 years during the term of the new license.

Wallace Dam is a pumped storage hydroelectric project consisting of a gravity concrete dam with a powerhouse, other support structures, and the 19,050-acre Lake Oconee reservoir. The plant is the newest and largest of the 18 hydroelectric plants in Georgia Power's generating system. It is part of the company's Central Georgia Hydro Group, which also includes Sinclair Dam Hydroelectric Plant (1953) on the Oconee River and Lloyd Shoals Hydroelectric Plant (1911) on the Ocmulgee River. Wallace Dam was completed in three construction periods between 1970 and 1979 under the design and engineering authority of Georgia Power, a subsidiary of the Southern Company. Wallace Dam is located in central Georgia on the Oconee River immediately upstream of Georgia Power's Lake Sinclair.. The dam, powerhouse, and associated support buildings are located in Hancock and Putnam counties, and the Lake Oconee reservoir is located in Hancock, Green, Morgan, and Putnam counties. The location of facility study area and the adjacent portion of the FERC project boundary is shown on the map in Figure 1.

TRC conducted an architectural field survey of Wallace Dam to document the existing conditions of the facility and its support buildings. In addition to the dam and powerhouse, the survey documented the facility's administration building and three support buildings. Background research on the history of the dam and its individual components was conducted in the historic photograph archives at Wallace Dam and at the Georgia Power archives in downtown Atlanta.

To provide an overall historic context for the resources of the Wallace Dam Hydroelectric Project, Chapter II provides the general history of American hydroelectric development from 1880 to the present. This information is largely summarized from Duncan Porter Hay's work, *Hydroelectric Development in the United States, 1880-1940*, prepared for the Edison Electric Institute in 1991, and other sources (Hay 1991). Chapter III provides a historical summary of developments in hydroelectric production in Georgia from circa 1880 to 1955. Chapter IV details the design, construction, and operational history of Wallace Dam. Chapter V describes the current conditions of the Wallace Dam structures, equipment, and support buildings, and is illustrated with current architectural survey photography. Chapter VI provides a historic engineering analysis and conclusion to this report, which is followed by References Cited.

Figure 1. Location of the Wallace Dam Hydroelectric Project and Study Area



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CHAPTER II. AMERICAN HYDROELECTRIC DEVELOPMENT, 1880-1945

In his two-volume work, *Hydroelectric Development in the United States, 1880-1940*, Duncan Porter Hay defined three broad periods in the evolution of hydroelectricity in the United States prior to World War II: a pioneering period (1880-1895); a period of innovation and experimentation (1895-1915); and a period of standardization (1920-1930) (Hay 1991). The standardization of hydroelectric development continued through the World War II and post-war periods as small private power companies consolidated into large corporations that created the foundation of modern power transmission and distribution systems.

The pioneering phase began with Thomas Edison's work with electricity in the late 1870s and 1880s, which spurred the development of waterpower to generate electricity. The earliest hydroelectric plants were direct current (DC) stations built to power arc and incandescent lighting. The first hydroelectric development in America occurred in 1880, when a dynamo was connected to a water turbine by Michigan's Grand Rapids Electric Light and Power Company to power arc lights. The first hydroelectric plant for large-scale commercial power generation in the United States was located at Niagara Falls, New York, where a central powerhouse with a Brush dynamo was installed in 1881 to power the city's street lamps (Bureau of Reclamation 2003).

By the mid to late 1880s, there were approximately 50 electrical generation plants operating or under construction in the U.S. and Canada to meet the demand for electricity for lights and motors. The largest plants were located in Rochester and Niagara Falls, New York; Holyoke and West Somerville, Massachusetts; Lynchburg, Virginia; Columbus, Georgia; and Laconia, Maine. Of the 560 electric companies in the United States listed in the 1889 American Electrical Directory, 200 utilized waterpower for generation of part or all of their current (Hay 1991:15–16).

The true potential of hydroelectric power, however, would not be realized until after the successful commercial demonstration of the use of alternating current (AC) at Niagara Falls in 1895. Nikola Tesla and George Westinghouse won the contract to develop a system for delivering power from their Adams Power Plant at Niagara Falls to Buffalo, New York, some 26 miles away (Figure 2). Tesla and Westinghouse proposed an AC system, over Thomas Edison's proposal for a direct current (DC) system. Unlike direct current, alternating current allowed electricity to be generated at one voltage, increased through transformers to a higher voltage for transmission, and then decreased through transformers for distribution to consumers. AC was also more economical since it could transmit high voltages via copper wires over long distances. This allowed for the possibility of electrical generation at one source, and the transmission of current to consumers in urban areas or to industrial clients. Thus, household lights that operated at 110 volts could be served by the same power source that provided 240 to 2,000 volts for industrial applications. Although many of the design features of the Niagara plant, such as outward flow turbines and external revolving field alternators, were later abandoned, the practical and financial success of the Niagara plant changed the power generation industry and set in motion the electrical revolution in the U.S. (Hay 1991:22, 24–25).

Figure 2. The 1895 Adams Power Plant in Niagara Falls, New York (Source: www.teslauniverse.com)

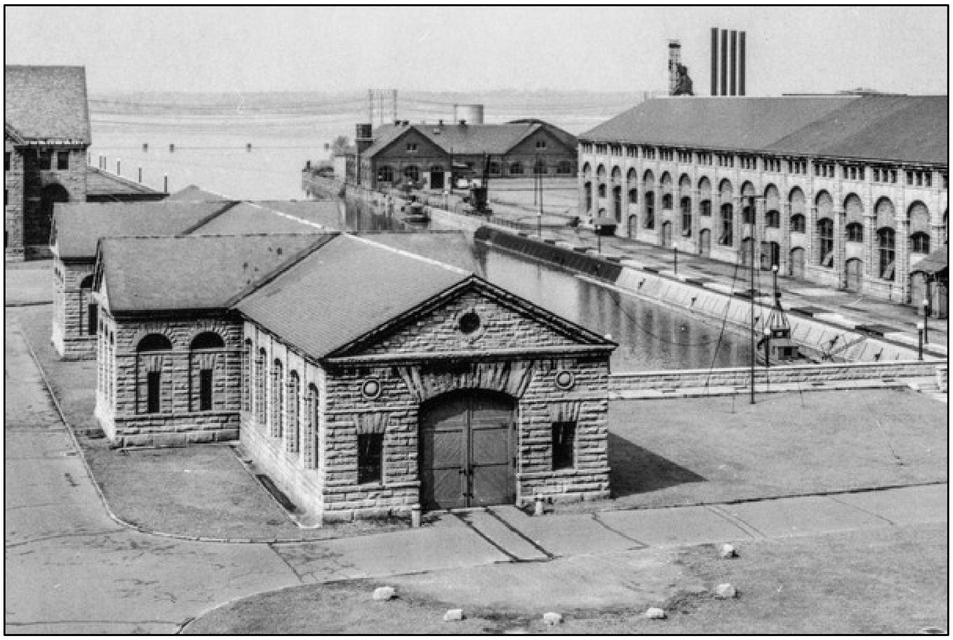
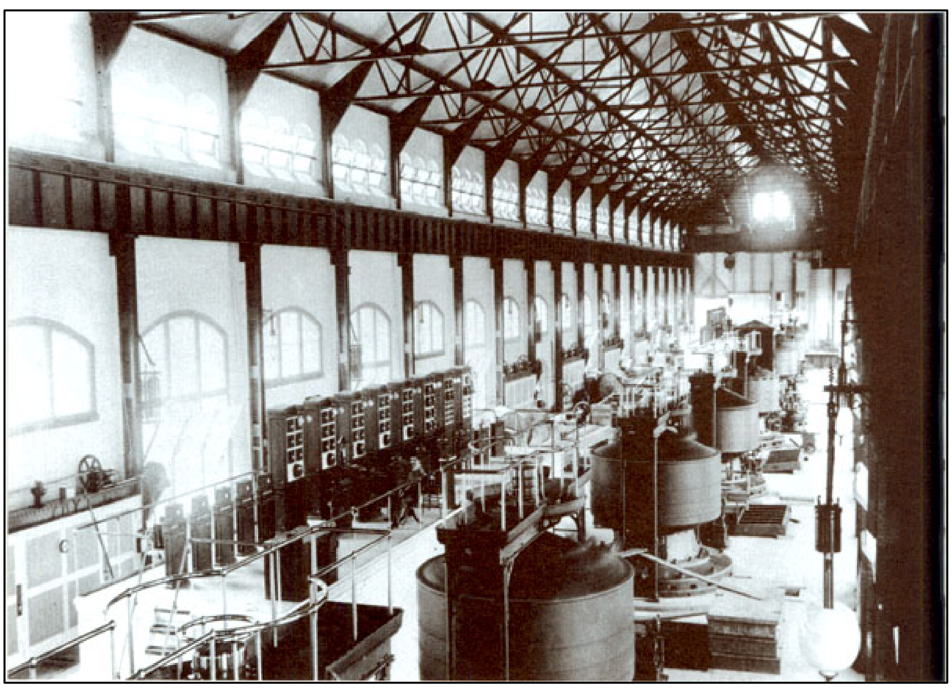


Figure 3. Generators at the 1895 Adams Power Plant, Niagara Falls, New York (Source: www.teslasociety.com)



Tesla and Westinghouse's "universal" system proved to be the most practical solution to providing hydroelectric power to any location, regardless of the availability of an adequate water source. Before AC electric power, factories required a prime mover, such as a waterwheel or steam engine. This source turned "line shafts" with pulleys and leather belts. The shafts were often three inches in diameter, suspended from the ceiling, and ran the entire length of the building. Power was distributed to other floors via holes in the ceiling. Because these shafts were a fire hazard, many factories opted to build expensive belt towers. The entire system worked continuously throughout the building no matter what machines were in use or disuse. If any problems occurred with the system, a full room of machines or the entire factory shut down until repairs could be made (Devine 1983:352). In addition, regular maintenance of the system was time-consuming.

Following this early pioneering phase, hydroelectric projects were constructed at a rapid pace following the successful application of AC systems, and the pace continued up until the beginning of World War I as new developments were introduced and demand increased. By 1896, there were as many as 300 AC plants operating in the United States (Hay 1991:20). At the turn of the century most factories still depended on costly and cumbersome power from steam or coal, which was sometimes used to power electric motors. Only four percent of manufacturing power came from electricity. However, by the 1920s, more than half of industry used electricity, and manufacturing used more power than municipalities, business, and homes combined (Woolfe 1982:230; DuBoff 1967:510).

With the possibility of U.S. involvement in the war in Europe looming, President Woodrow Wilson recognized the potential benefits of hydroelectric power for military purposes and promoted the government-sponsored construction of a dam on the Tennessee River at Muscle Shoals, Alabama, to power nitrate plants there. Between World War I and World War II, hydroelectric dam construction continued with increased standardization of design. Hydroelectric facilities, which could be brought online almost immediately, emerged as producers of power during periods of peak load demand, while coal or gas-powered steam plants were built to cover base load production.

The hydroelectric industry evolved considerably during the 1930s. New Deal legislation in the wake of the Depression was of particular significance to the future of large-scale hydroelectric projects. The Tennessee Valley Authority (TVA), created in 1933, began an ambitious plan to harness the waterpower of the entire Tennessee River and its tributaries, bringing inexpensive electrical service to industries, towns, and residents of the South, where it had previously only been available in limited areas. At the same time, private electrical companies, which had formed piecemeal prior to World War I to serve individual manufacturers or local governments, were being consolidated into large entities. These companies developed networks to share power across systems for greater efficiency, and often included transportation and manufacturing services in addition to power generation. At the same time, industry fears of government regulation and nationalization of utility services discouraged large investments in private hydroelectric projects (Hay 1991:xii).

On the eve of America's entry into World War II, the share of U.S. electrical power from hydroelectric generating facilities had dropped to about one-third in favor of coal and gas-powered plants. Still, the hydroelectric industry played a key role in the country's efforts during the war. Fontana Dam in western North Carolina, Douglas Dam in eastern Tennessee, and other power projects were rushed to completion to supply vital industries with the power necessary to produce war materiel and conduct nuclear power research at Oak Ridge National Laboratory in East Tennessee. After the war, U.S. efforts to maintain military superiority over the Soviet Union and its allies contributed to a further expansion of hydroelectric capacity, both nationwide and in the Southeast.

The increased demand for power after World War II eventually outstripped the available supply of practical hydroelectric power, accelerating the shift that had begun in the 1930s toward coal- and gas-powered plants as major sources of electricity in the United States. By the 1950s, most of the nation's large hydroelectric installations were owned and operated by federal or state authorities and the lack of available sites for new facilities hindered additional public developments. There remained, however, smaller hydroelectric opportunities built by private power companies around the nation. Small-capacity plants were viewed with favor by private utilities because they could be built faster than large plants and still play an important part of a state or region's power system (EDAW, Inc. 1993)

The Atomic Energy Act of 1954 ushered in a new chapter in the history of electric power production and the utility industry. The act expanded nuclear power development, which was at first limited to the federal government, to include private utilities and industrial groups. The introduction of nuclear power into the power systems of utility companies redefined the future role of traditional power sources, including hydroelectricity. In 1964, Parr Nuclear Station in South Carolina, a joint venture of four utility companies in the Carolinas and Virginia, including Duke Power, was the first nuclear-powered generating station built in the Southeast. More nuclear power stations were constructed in the 1970s and 1980s to meet increasing demand and reduce American reliance on foreign oil (EDAW, Inc. 1993).

Added to this changing landscape of power production in the 1960s was the widespread development of pumped storage hydroelectric technology. First developed in Germany in 1908, pumped storage facilities offered a uniquely effective way to meet demand fluctuations between baseload power production and times of peak demand. These facilities use power during non-peak load times to pump water from a lower reservoir up to a reservoir at a higher elevation, and then use this stored potential energy to generate power during peak demand periods. The essential element in modern pumped storage systems is the reversible Francis-type turbine which, as a single hydraulic unit, performs both pumping and generating functions with a high degree of efficiency and reliability. During times of peak power demand, water is drawn from the upper reservoir through a hydroelectric dam to generate electricity. During the off-peak or baseload times the turbine/generator is reversed and used as a pump to return the water to the upper reservoir. Power for operating the pumps is often furnished by off-peak steam-generated energy or secondary hydroelectric energy (Georgia Power Company n.d.[a]:1-2).

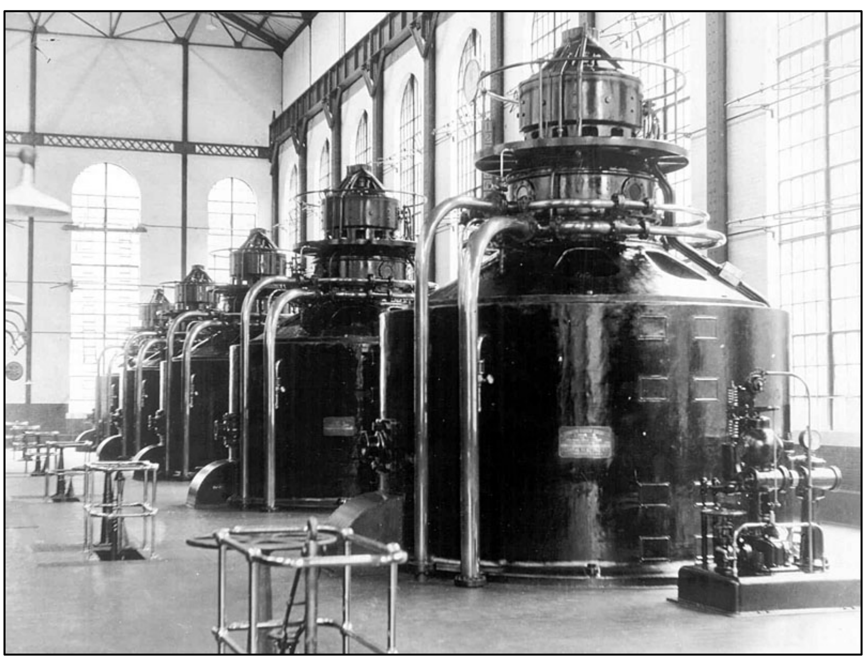
The construction of pumped storage facilities accelerated in the 1960s and 1970s as national population and economic growth increased the demand ratio between electrical peak and baseload periods. These trends combined with the widespread use of air conditioning in the South to create more distinct seasonal demand peaks for electricity. Pumped storage dams were ideal for daily peak demand periods due to their nature as fast-response facilities that could be turned on and off as needed, a quality that larger fossil-fuel and nuclear plants could not match. Pumped storage was also increasingly attractive as part of multi-purpose hydroelectric projects that enhanced the economics of individual sites. Many projects required the construction of new upper reservoirs, but engineers also sought to use existing reservoirs or bodies of water for pumped storage facilities. The use of existing reservoirs was encouraged due to construction cost savings and fewer environmental impacts to project areas (Dames and Moore 1981: 2-8).

CHAPTER III. HYDROELECTRIC DEVELOPMENT IN GEORGIA, 1904-1960s

Georgia Power's first foray into hydroelectric power was in 1904, when the Georgia Railway and Electric Company, a precursor of Georgia Power, entered into an agreement with S. Morgan Smith to purchase power from the Atlanta Water and Electric Power Company's Bull Sluice Hydroelectric Plant, which was then under construction on the Chattahoochee River. Prior to that time, the Georgia Railway and Electric Company had relied on local steam generators to power the city of Atlanta's street cars and streetlights, as well as a provide electrical service to a limited number of commercial and residential customers. The rapid increase in demand for electricity at the turn of the twentieth century, however, strained the capacity of these units and made it clear that new power sources were necessary (Georgia Power 2016).

Under the guidance of president Preston Arkwright, who took over as president in 1902, the Georgia Railway and Electric Company began acquiring regional power companies to boost its capacity and increase its customer base. In 1912, the company purchased the Morgan Falls facility, as well as the ambitious but financially struggling Tallulah Falls Hydroelectric Plant (Figure 4) under construction by the Georgia Power Company, which was formed in 1908. The combined entities were renamed the Georgia Railway and Power Company (GR&PC). The company constructed a 100-mile high-voltage transmission line from the Tallulah plant to an outdoor substation in Atlanta. Both the line and the substation were among the first such features in the country (Georgia Power 2016).

Figure 4. Tallulah Falls Hydroelectric Plant Generators, 1914 (Source: Georgia Power Corporation Archives)



By 1914, five of the six 12,000-kilowatt units at the Tallulah plant were in operation, with a sixth unit added in 1919. The Tallulah Falls project was a remarkable achievement for the time. It included a 126-foot tall, 426-foot long masonry dam, a 1.25-mile tunnel cut through solid rock, and steel penstocks that drop water 608 feet to the powerhouse. At its completion, it was the third largest hydroelectric facility in the country. Over the next 13 years, five additional dams and powerhouses were completed above and below Tallulah Falls to capture the full 1,200-foot fall of the Tallulah and Tugalo rivers between the head of Lake Burton and the tailrace of Yonah Dam (Georgia Power 2016).

In the 1920s, the Georgia Railway and Power Company began to consolidate with utilities in other states to create an interconnected transmission network that allowed power to be transferred where it was most needed. In 1926, the Georgia Railway and Power Company joined several other regional utilities under a holding company called the Southeastern Power & Light Company, the predecessor of the current Southern Company. At that time, GR&PC became Georgia Power. The acquisition of the Central Georgia Power Company in 1927 and the Columbus Electric and Power Company in 1930 added four new hydroelectric facilities to Georgia Power's inventory. Lloyd Shoals Dam, on the Ocmulgee River about 15 miles above Macon, was completed in 1910 by the Central Georgia Power Company to supply the city of Macon. Constructed primarily using mules and wagons, the concrete masonry Lloyd Shoals dam was the largest in the country at the time. The Bartlett's Ferry, Goat Rock, and North Highlands plants, acquired from Columbus Electric and Power Company, were located on the Chattahoochee River near Columbus (Georgia Power Company 2016; Pope 2015; Calhoun 2015).

The expansion of the Georgia Power transmission grid, combined with a campaign urging customers to conserve power, helped the company weather a severe drought that peaked in 1925 with only periodic interruptions of service. As a result of the crisis, Georgia Power shifted its focus to coal-fired steam plants for its base load power generation, with hydroelectric power gradually becoming a supplemental source during peak demand. In 1930, the first of four units was constructed at Plant Atkinson on the Chattahoochee River northwest of Atlanta, followed by new steam plants at Plant Arkwright near Macon and Plant Mitchell near Albany (Manganiello 2015:62–65; Georgia Power Company 2016).

The shift away from privately-funded hydroelectric power that began in the late 1920s continued in the 1930s, as the federal government began a program of multi-use projects under the Tennessee Valley Authority, the Bureau of Reclamation, and the U.S. Army Corps of Engineers. Prior to the Flood Control Act of 1928, the federal government had restricted its water control projects to those that benefitted navigation under the commerce clause and improved harbors as part of national defense. Increasing hostility toward monopolistic industries, coupled with the destruction caused by the Mississippi Flood of 1927, bolstered the position of progressive-minded leaders who envisioned large-scale federally-funded projects that would provide flood protection and resource conservation in addition to improved navigation and hydroelectric power, while improving social and economic conditions through employment and rural electrification.

Private power companies and manufacturing interests fought hard against these federal actions and claimed the TVA experiment would never extend beyond the Tennessee River Valley. However, increased federal involvement in industry prior to and during World War II led to a modified postwar federalism, in which large-scale, multiuse projects were government funded, and the electricity generated was sold to private utilities. Under this model, the Corps constructed hundreds of reservoirs around the Southeast after World War II for a number of purposes, including hydroelectric power. Among these were Clarks Hill (now Thurmond), Russell, and Hartwell lakes on the Savannah River; Lanier, West Point, and George on the Chattahoochee; and Allatoona on the Etowah (Manganiello 2015:73–84, 94, 99–101).

After World War II, Georgia Power revived its Furman Shoals project on the Oconee River, which was previously halted in 1930 by the Great Depression. During this time, power demand was increasing exponentially and Georgia Power was constructing steam plants to meet its customers' needs. The development of hydroelectric power held promise as a source of peak load power that could be rapidly brought online and taken off as needed and involved no additional fuel costs.

Once completed, the Furman Shoals project was renamed Sinclair Dam and Lake. The generators began operation in 1953 with a capacity of 45,000 kilowatts. Lake Sinclair served an additional role in Georgia Power's generation plan by providing cooling water for Plant Branch, a 1-million kilowatt coal-fired generator constructed in the 1960s. The last active unit at Plant Branch was retired from service in 2015 in response to Environmental Protection Agency rules requiring additional environmental controls that were considered cost prohibitive (Manganiello 2015:81–82, 100; Fabian 2015; Georgia Power Company 2016).

The last of Georgia Power's conventional hydroelectric generating projects was Oliver Dam on the Chattahoochee River above Columbus, which went into commercial operation in 1959. The power plant was equipped with three 18,000-kilowatt generating units and one 6,000-kilowatt unit, and was the first completely automatic, remotely-controlled hydroelectric plant in Georgia. By the 1960s, few suitable locations for large hydroelectric dams remained, and the returns on investment were low. While peak load generation was still needed, it became increasingly difficult to justify the expenditure for such facilities. In addition, public opposition to these projects had increased as a result of environmental and social concerns (Maganiello 2015:141–145). As shown in the next chapter, however, investment in a new pumped storage facility at the Wallace Dam site offered an economical alternative to conventional hydroelectric projects and was enhanced by generous investments to mitigate environmental and recreational impacts.

CHAPTER IV. HYDROELECTRIC DEVELOPMENT AT WALLACE DAM

Introduction

Located upstream of Lake Sinclair and just east of Eatonton, Georgia, Wallace Dam is the newest and largest hydroelectric plant in Georgia Power's system. It is part of the Central Georgia Hydroelectric Group, which also includes Sinclair Dam Hydroelectric Plant (1953) on the Oconee River and Lloyd Shoals Hydroelectric Plant (1911) on the Ocmulgee River. Figure 5 is a map showing the locations of all the hydroelectric plants in the Central Georgia Hydroelectric Group.

When the last of its units was brought online in early 1980, Wallace Dam's 321-megawatt generating capacity nearly doubled the total electrical output of Georgia Power's hydroelectric system. Wallace Dam was also Georgia Power's first pumped storage project. At the time of its construction, the dam's pump turbines were the largest ever manufactured by Allis-Chalmers (now Voith Hydro), and the turbines featured innovative individual servomotors for each wicket gate, which open and close to allow water into the turbine. Four of its six turbines are reversible to pump water from Lake Sinclair (lower reservoir) up into Lake Oconee (upper reservoir), which more than doubles Lake Oconee's energy potential (Georgia Power Company n.d.[b]).

Early Power Development on the Oconee River

The Oconee River and its tributaries were used to power mills and small rural industries when the region was first settled in the early nineteenth century. The circa-1845 Curtright Mill was located at Horseshoe Bend of the Oconee River at Long Shoals. The mill produced cotton cloth and yarn and featured a mill village and ferry crossing. Prior to inundation of Lake Oconee, an archaeological investigation of the Curtright Mill site revealed one of the mill's original turbines, which is on display with other historic and interpretive materials adjacent to the parking lot at Wallace Dam administration building (Figures 6 and 7) (Georgia Power Company n.d.[c]).

Georgia Power's early involvement in power projects on the Oconee River began in 1926 with the purchase of pre-existing power plants near Athens, including the Mitchell Bridge Hydroelectric Plant (1896), the Tallassee Plant (1902), and Barnett Shoals (1910). Georgia Power continued to acquire private power plants in the region through the early twentieth century and began construction of a hydroelectric plant at Furman Shoals on the Oconee River in 1929, but the stock market crash and resulting economic conditions of the Great Depression halted construction for nearly 20 years. Construction at Furman Shoals resumed in 1949. The Sinclair Dam and Lake Sinclair were completed in 1953 and later used as the tailwaters and lower reservoir for Wallace Dam (Georgia Power Company n.d.[c]).

Figure 5. Hydroelectric Plants in the Central Georgia Hydroelectric Group (Source: Georgia Power company n.d.[b])

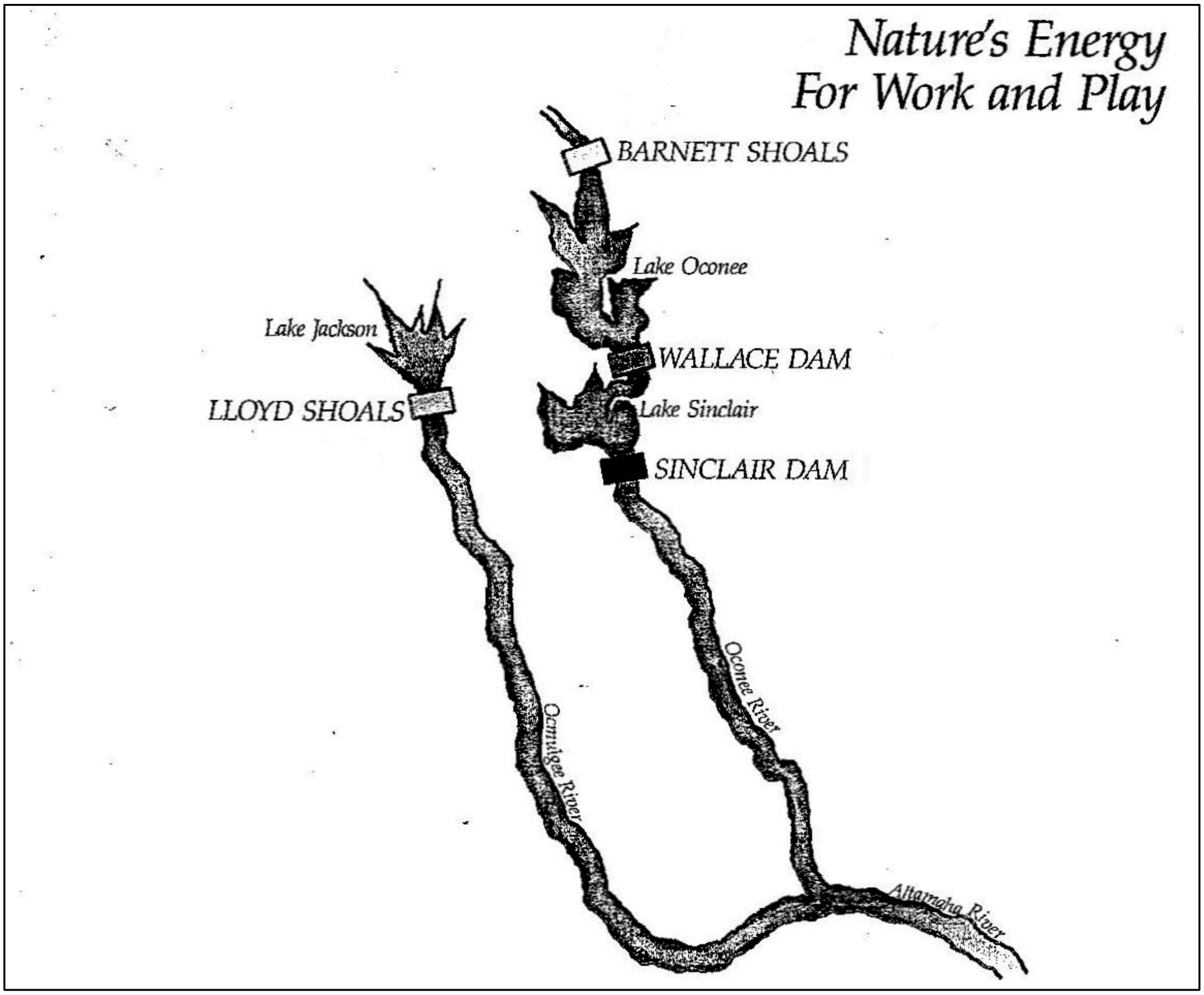


Figure 6. Circa-1975 Archaeological Excavation of a Turbine at the Curtright Mill Site (Source: Georgia Power Company Archives)

Figure 7. Circa-1845 Curtright Mill Turbines on Display at Wallace Dam Administration Building

Preliminary Permit for Wallace Dam, 1963-1965

The demand for electrical energy exploded in Georgia in the post-World War II period, driven by rapid population increases, industrial development, and the spread of air conditioning technology. In an effort to identify locations for new hydroelectric developments to meet this demand, the U.S. Army Corps of Engineers (Corps) conducted studies of potential plant sites in central Georgia, including the Laurens Shoals site on the Oconee River where Wallace Dam is located (Georgia Power Company n.d.[b]). The Corps found the drainage area above this site included 1,830 square miles of watershed and offered a reservoir size of 17,700 acres with a normal full pool elevation of 435.6 feet above mean sea level (MSL). The proposed reservoir had a full storage capacity of 370,000 acre-feet.

The Corps concluded in a 1963 report that Laurens Shoals was the only economically viable site in its study area and recommended construction of a dam by private interests. In response to the Corps' positive report findings at Laurens Shoals, Georgia Power filed an application for a preliminary permit with FERC in September 1963. In the application for the preliminary permit, Georgia Power outlined a broad scope of work to "make surveys, foundation and geological investigations and all studies necessary to adequately determine the most feasible and economic development of the potential power at the site, including economic feasibility studies of both conventional hydroelectric and pumped storage installations. The applicant will also study development of potentialities of the project for public recreational and fish and wildlife purposes, and the requirements to obtain optimum usage" (Southern Company Hydro Services: 29, 37-38). The company estimated that the cost of the preliminary study work, including office planning and field investigations would amount to $50,000. After the application for the preliminary permit was filed, FERC held a public hearing on the application in Athens, Georgia, during two days in November, 1964. Following the public hearing, FERC issued a preliminary permit to Georgia Power for the Laurens Shoals site in May 1965 (Southern Company Hydro Services: 38).

Preliminary Permit/License Application/License Acceptance, 1965-1970

After it received a preliminary permit from FERC in 1965, Georgia Power began an accelerated, one-year study period to complete the necessary engineering, economics, and location studies for the dam at Laurens Shoals, as well as public meetings and consultation with government agencies. This study period was accelerated due to the planned construction of Interstate Highway 20 across the Oconee River in the area proposed to be inundated by the project reservoir. Following these studies, Georgia Power filed an application for a license with FERC in April 1966 to build a combination hydroelectric plant that had both pumped storage as well as conventional hydroelectric capabilities with a total generating capacity of 324 megawatts. The proposed dam at Laurens Shoals would form the upper reservoir, while the existing Lake Sinclair would form the lower reservoir. The site selection was based on the estimated construction costs, the opportunity for a shorter tailrace than other locations, excellent foundation conditions for both concrete and earth filled structures, and other considerations. It was estimated that the plant would cost $46.6 million (Southern Company Hydro Services: 40-44).

Georgia Power's original 1966 design drawings submitted with the license application were signed by E.J. Archbold, Vice President and Chief Engineer (Southern Company Hydro Services: 230). The design placed the powerhouse in the main channel of the Oconee River with a total of six generating units. The dam's four pump-turbine generating units (Units 1-4) were originally located on the west side of the powerhouse, and the remaining two conventional units (Units 5 and 6) were located on the east side of the powerhouse. The spillway area was planned on the east end of the dam with four tainter gates, which would release water when flood-level flows on the Oconee River were more than the dam's hydroelectric units could handle. From west to east, the order of the proposed dam components included a west earth dam abutment; west nonoverflow portion of the dam; the headworks and powerhouse; the east nonoverflow; and the east earth dam abutment (Southern Company Hydro Services: 44-45). A circa-1966 conceptual drawing of the dam is shown below in Figure 8.

Figure 8. Circa-1966 Conceptual Drawing of Wallace Dam and Reservoir (Source: Georgia Power Company Archives)

Economic considerations played a central role in the planning and development of the proposed dam. Several economic factors were favorable for the proposed project, including the fact that the existing

15,000-acre Lake Sinclair would serve as an excellent lower reservoir. The site was also strategically located in central Georgia and could provide stability and emergency startup power for other steam-powered thermal electrical plants in the region, such as the Plant Branch project on Lake Sinclair. Last, the new upper reservoir would provide sites for the construction of new thermal plants in the future (Georgia Power Company n.d.[a]:5).

Early economic studies revealed that a conventional hydroelectric plant at the site was not justified, but that a combination of conventional and pump turbine units was ideal. The plant was proposed to have six generating units, including four combined pump turbine units and two conventional units. When the water level was high in the upper reservoir the pump turbines could generate electricity along with the conventional units. When the water level was high in the lower reservoir, the units could be reversed to pump water back up to refill the upper reservoir. In this way, the project was designed to use the same water repeatedly and ensure that the two conventional units always had an adequate supply of water (Southern Company Hydro Services: 45).

Georgia Power applied for a license to build Wallace Dam in 1966 but the final license was not granted by FERC until 1970. The intervening four-year period involved a series of additional studies and negotiations with the state and local agencies related to the project's impacts on recreation, fish, and wildlife (Southern Company Hydro Services: 46-47). This study period and additional FERC requirements resulted in Georgia Power's purchase of reservoir lands up to the normal full pool elevation, plus an additional 25-foot strip around the entire reservoir for shore-line control. In all, Georgia Power purchased 1,915 acres of land for public recreation, including land set aside for state parks. The company also agreed to lease 10,300 acres of its land in north Georgia to the State Game and Fish Commission as a game management area to mitigate the loss of deer habitat in the reservoir area. The company purchased additional land for three 10-acre public access points on Lake Oconee, plus three 85-acre public parks and an overlook at the dam site. The cost of these recreational areas was $1,954,000, five times the amount originally proposed (Georgia Power Company n.d.[a]: 4-5).

In August 1970, following acceptance of the FERC license, Georgia Power described the proposed project as the largest hydroelectric plant in the company's system, which included 19 other plants. With a planned capacity of 324 megawatts (which was later revised down slightly to 321 megawatts), the proposed plant would nearly double the company's hydroelectric generating capacity and have a massive positive impact on the state's need for new power sources. In addition to the dam's power generation capabilities, the company boasted the recreational opportunities provided by the planned 21,000-acre reservoir. "Completion of this installation," stated Edwin I. Hatch, President of Georgia Power, "will result in one of Georgia's most beautiful and outstanding recreation areas. We are predicting that Laurens Shoals will become known throughout the Southeast as a focal point for thousands of boating, swimming, camping and picnicking enthusiasts… Because of the plant's pumped storage feature the lake level will be extremely stable, enhancing recreation use" (Georgia Power Company 1970: 1).

Ongoing Design Work, 1970-1972

Georgia Power held a meeting in Atlanta, Georgia, in August 1970 to allocate the engineering design and project management work between its staff and that of Southern Company Services. Georgia Power agreed to perform the detailed design and drafting work up to 1973, after which it would hand over all drawings prepared to date and SCS would take over (Southern Company Hydro Services: 49, 60). Georgia Power also agreed to handle the project schedule, turbine technical specifications, and the selection and management of general contractor consultants to build the dam. Specifically, the company's responsibilities included general designs for the overall project and site/access areas as well as for the reservoir, dam, tailrace, powerhouse, mechanical equipment, and electrical systems. For its part, SCS agreed to review the technical specifications of the proposed dam's capacity and generator unit sizes. SCS also accepted the task of contracting with an acceptable foreign manufacturer of the pump turbines, conventional turbines, and generators. The two companies also agreed on scheduled completion dates for all six generator units, which were to be completed by November 1976 (Southern Company Hydro Services: 50).

Georgia Power's conducted the engineering design work through its Civil Engineering Department, which included Phil Cook, Civil Planning Engineer on the Wallace Dam project. By 1979, Mr. Cook was a Civil Engineering Manager on the project and he helped compile the project Completion Reports (Volumes 1 and 2) on the project in 1982. As the pace of construction picked up during the early 1970s, Georgia Power's construction team was expanded on the site with Bill Golden, Engineer, and a team of managers and assistant engineers. On the construction side, Georgia Power's team was led by J.A. Carrington, Project Superintendent, who oversaw a ten-person construction management team and the construction contractors (Southern Company Hydro Services: 16, 58).

With its team in place, Georgia Power conducted additional engineering studies that resulted in the redesign of the original plans for Wallace Dam. In 1972 company issued new design drawings for the first phase of construction. The proposed dam was 2,395 feet long and 120 feet high, with an effective top elevation of 445 feet MSL. From west to east, the revised order of dam components included a west earth dam abutment; west nonoverflow; spillway with five tainter gates; headworks and powerhouse; east nonoverflow; and west earth dam abutment (Georgia Power Company 1972).

The 1972 drawings featured major changes for the placement of the spillway and turbine units. Hydraulic and foundation studies showed that the spillway and tainter gates should be placed on the west side of the powerhouse rather than on the east side as originally planned and shown above in Figure 8. Additionally, the number of spillway tainter gates was increased from four to five to increase the amount of water that could pass during flood events. The spillway dimensions were finalized at 266 feet with five tainter gates, each 42 feet wide and 44 feet high. Working with engineers at the Georgia Institute of Technology, Georgia Power moved the conventional turbine units to the center of the powerhouse (Units 3 and 4) with two pairs of pump turbine units on either side (Units 1, 2, 5, and 6) (Southern Company Hydro Services: 57-59; Georgia Power Company 1972).

Additional plan drawings included the general design of the plant; water diversion scheme studies; foundation studies; geological analysis; soils analysis; and dam stability analysis (Southern Company Hydro Services: 57-59). It was also in 1972 that project was officially named Wallace Dam in honor of C.M. Wallace, Jr., the recently retired Executive Vice President of Georgia Power who was instrumental in filing the preliminary permit and securing the FERC license (Southern Company Hydro Services: 54; Georgia Power Company n.d.[a]:8).

On either end of the dam, Georgia Power designed compacted fill earth abutments on excavated stone foundations. The abutments were capped with one foot of stone gravel bedding and an additional 36 inches of stone riprap. The abutments rose to an elevation of 445 feet and contained a reservoir at a full pool elevation of 435 feet. Just inside the earth dams were the east and west nonoverflow sections. These featured reinforced concrete construction with a top width of 25 feet that tapered out to foundations of bedrock stone (Georgia Power Company 1972).

The dam headworks area was designed with six intake portals, also called intake sections, through which water flowed from the reservoir into the turbine units through steel penstocks. Between the six intake sections were the intake bulkheads, which were recessed from the face of the intake sections. Each intake section included a head gate, trash racks, and stop logs. The stop logs were used to close the intake sections if necessary for repair or maintenance. The headworks intake was constructed of reinforced concrete on a bedrock foundation. It included a headworks inspection gallery, a long and narrow tunnel containing sump pumps and vents to remove moisture that seeped into the bottom of the plant. The headworks measured 531 feet long with intake sections that measured 25 feet wide at the top and tapering out to over 76 feet wide at their base (Georgia Power Company 1972).

Georgia Power integrated the dam powerhouse into the downstream base of the headworks structure. The powerhouse was a reinforced concrete building designed with two primary working levels containing the generator and turbine operating floors, as well as related electrical and mechanical equipment. The powerhouse was divided into six bays with the two center bays containing the conventional turbine units (Units 3 and 4), with pairs of pump turbine units on either side (Units 1, 2, 5, and 6). Water from the reservoir entered the powerhouse through steel penstocks that were built on-site. From the penstocks the water flowed into spiral case structures that narrowed at their base to direct the water into the turbines through wicket gates, which opened and closed to govern the rate of water flow as needed. The water then exited the turbines and flowed into Lake Sinclair via steel draft tubes. Associated equipment in the operating floors included the exciter cabinets that create the magnetic field in the generators, surge arrestors, and governor cabinets that control the wicket gate positions.

Georgia Power ordered six turbines from manufacturer Allis-Chalmers (now Voith Hydro). The company design two conventional turbine units (Units 3 and 4) rated at 56.25 megawatts each and four reversible pump turbine units (Units 1, 2, 5, and 6) rated at 52.2 megawatts each. The conventional units had a capacity of 8,200 cubic feet per second to generate 78,000 horsepower when operating at full efficiency under a head of 89 feet. The pump turbine units had a capacity of 6,500 cubic feet per second to generate 73,000 horsepower when operating at full efficiency under a total dynamic head of 98 feet. The alternating current generators attached to the turbines were manufactured by General Electric in Schenectady, New York. Georgia Power's final design for the powerhouse units had a total installed generating capacity of 321.3 megawatts. Figures 9 and 10 show diagrams of the Wallace Dam pump-turbine and conventional units.

Figure 9. Diagram of Conventional Turbine Units 3 and 4 at Wallace Dam

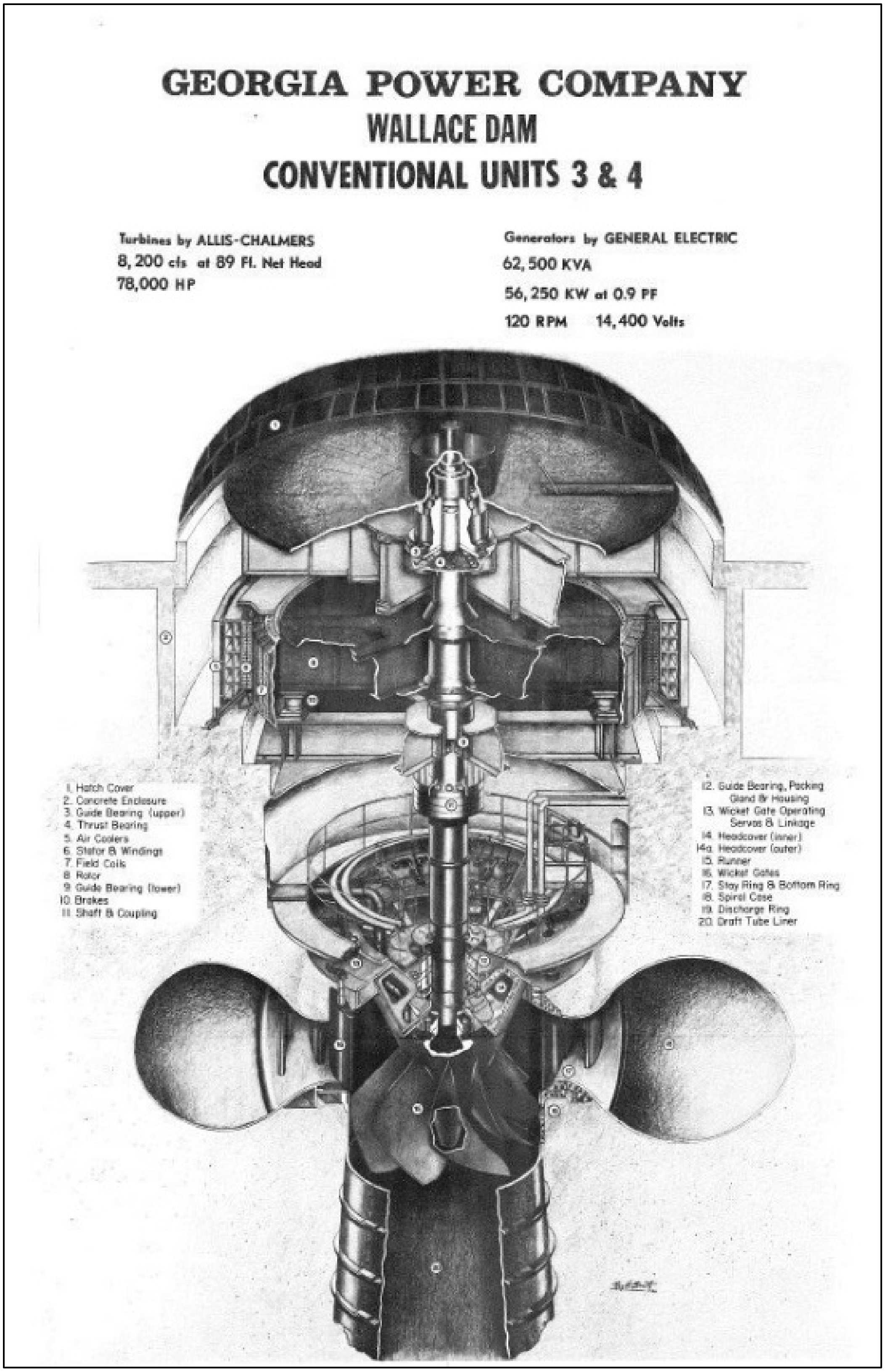
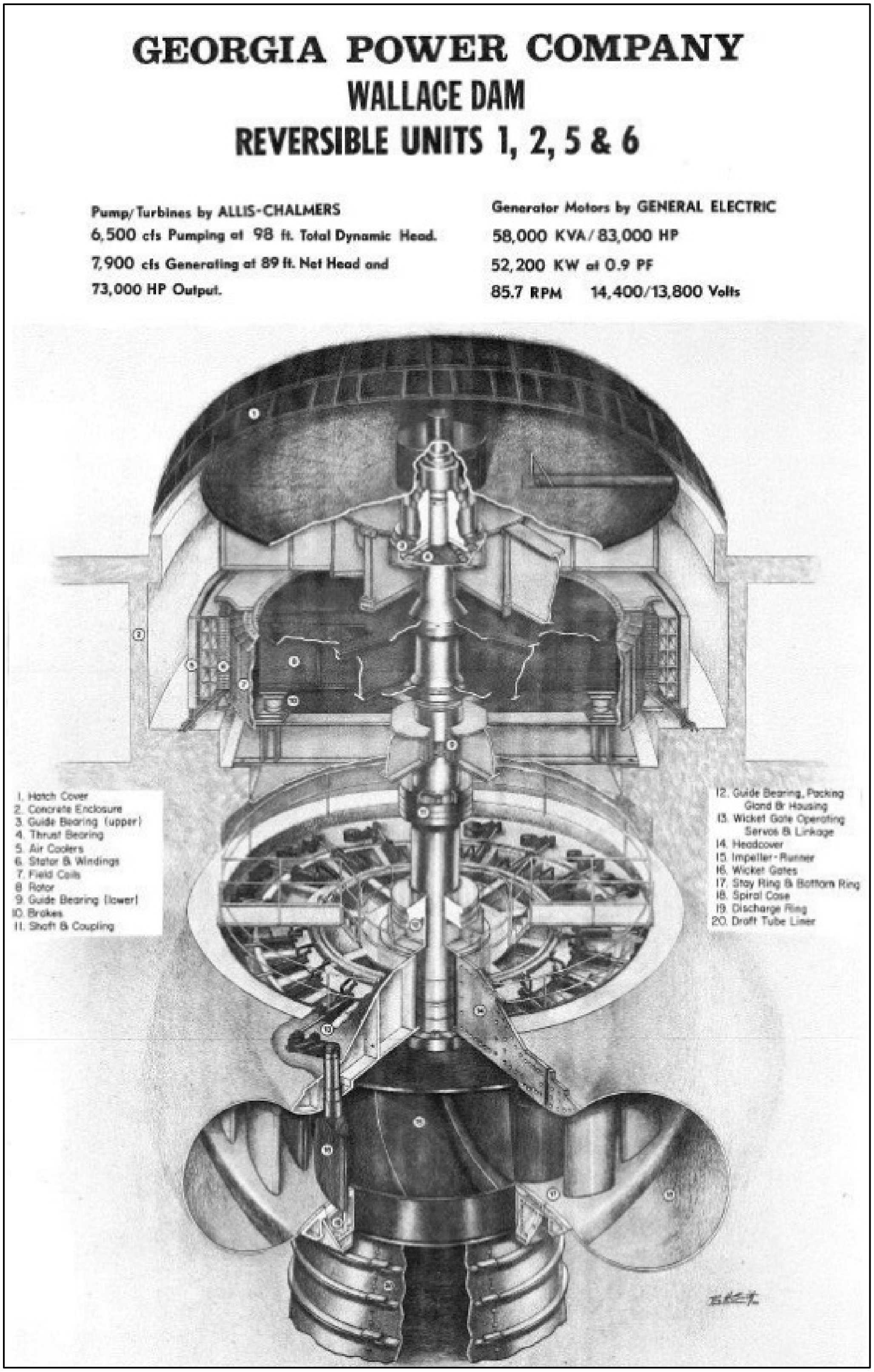


Figure 10. Diagram of Reversible Turbine Units 1, 2, 5, and 6 at Wallace Dam



First Construction Period, 1971-1974

Building activities at the dam site began in September 1971 with the construction of east and west access roads and materials staging areas. Construction of the dam facilities began in July 1972 with the erection of a concrete plant by the project's first general construction contractor, Dravo Corporation (Figure 11). The concrete plant could produce 160 yards per hour with two, four-yard wet mixers, and the control panel had capacity to program 12 different mix designs at once. The batch plant included a five thousand pound capacity ice maker and a water chiller used to maintain a consistent maximum concrete temperature of 70 degrees. For cold weather concrete operations there was a coal-fired boiler, a diesel boiler, and a 5,000 gallon holding tank. The concrete materials needed for construction were sourced from a variety of locations. Cement was in short supply in Georgia, so it was shipped by rail from Wampum, Pennsylvania, to Atlanta, Georgia, and from there was trucked to the dam site. The aggregates were furnished by Hall Aggregate Company from its quarry in Siloam, Georgia. Sand was provided by King Sand Company from the Avant Kaolin Mines near Sandersville, Georgia. The water used to mix the concrete was pumped from the Oconee River into a holding pond to settle before use (Southern Company Hydro Services: 65).

Figure 11. The Concrete Batch Plant, View North (Source: Wallace Dam Photograph Archives)

In March 1972, the Georgia Department of Public Health authorized the impoundment of water at the dam site and Georgia Power initiated a three-stage river diversion scheme. In the first stage, Dravo drove sheet piles into the river bed to erect coffercells and construct adjacent earth embankments. This isolated the initial construction areas on the west river bank and forced the river flow to remain in its main channel to the east. With the coffercells in place, the contractor started excavating foundations of the west nonoverflow structure, the five spillway bays, the west earth dam, and the second stage diversion channel. The contractor followed this work by driving coffercells on the east side of the river where the powerhouse would ultimately be located.

The first stage of river diversion began in August 1972. Dravo began rock excavation in the spillway and west nonoverflow portions of the dam, followed by the first concrete placement in the spillway area (Figure 12). Soon after construction began, Wallace Dam encountered the first of several obstacles that delayed its completion for seven years. First, in a bad omen of events to come, there was a three-day labor strike at the site in October 1972, during which 3,164 hours of labor were lost (Southern Company Hydro Services: 67-69). Far worse, however, were looming national economic conditions caused by increasing interest rates and inflation that drove up the cost of the commercial construction loans that Georgia Power depended on to build the dam. By December 1972, these financial problems forced the company to halt construction operations at Wallace Dam (Southern Company Hydro Services: 72). Figure 13 shows an aerial view of the dam construction progress in January 24, 1973, immediately following the stoppage.

Figure 12. First Stage Diversion Cofferdam and Rock Excavation for Spillway, View East, August 15, 1972 (Source: Southern Company Hydro Services: 238)

Figure 13. Aerial View of River Diversion and Construction Progress as of January 24, 1973 (Source: Southern Company Hydro Services: 240)

Compounding the national economic woes and lengthening the construction delay at Wallace Dam was the oil embargo by the Organization of the Petroleum Exporting Counties (OPEC), which began in October of 1973 and cut off all oil shipments from member nations to the United States. The embargo caused the market price of oil to quadruple to $12.00 per barrel (Southern Company Hydro Services: 78). The oil shock had massive impacts on the United States and world economies as the average price of a gallon of gasoline rose 143 percent over the next year. All industries and economic activities that depended heavily on petroleum were negatively impacted, including private power companies such as Georgia Power that were in the midst of building a new hydroelectric dam. Until the national economy improved and oil prices dropped, the construction of Wallace Dam was halted (Southern Company Hydro Services: 82-83).

During the halt in construction, FERC ordered Georgia Power to spend up to $30,000 on an archaeological survey and historic preservation salvage operations within the Wallace Dam project boundary. This work resulted in the excavation of 28 archaeological sites, including the site of the Curtright Mill discussed previously. Artifacts from the sites were sent to the University of Georgia for curation and research. The effort also led Georgia Power to move the historic Parks Mill House, shown below in Figure 14, out of the Lake Oconee basin before the reservoir was flooded. The house was built by Richard Parks prior to 1820. The Parks family owned a local grist mill on the Oconee River, which formed the center of a small rural community that included a tavern, inn, and ferry (Georgia Power Company n.d.[c]).

Figure 14. Aerial View of the Parks Mill House Before it was Moved Out of the Wallace Dam Reservoir (Source: Wallace Dam Photograph Archives)

Second Construction Period, 1974-1976

Economic conditions improved well enough by July 1974 that construction of the dam was resumed by Georgia Power's second construction contractor, Middle South Constructors, a subsidiary of Hardaway Construction Company of Columbus, Georgia. Middle South cleaned up the dam site, put the concrete plant back into operation, and resumed concrete placement on the west nonoverflow and spillways sections of the dam as shown in the historic photo below in Figure 15. The company also worked on the second stage diversion cofferdams needed to reroute the Oconee River during work. The second stage of the diversion scheme was used to divert the east river channel through the newly constructed spillway foundation piers on the west river bank, as shown below in Figures 16 and 17. This allowed the completion of the spillway, the headworks section of the dam, the powerhouse, the tailrace, the east nonoverflow section, and the east earth dam embankment. The following October, Georgia Power anticipated having the dam completed by 1979 at a cost of $135,000,000 (Southern Company Hydro Services: 86).

Figure 15. Construction of the West Nonoverflow and Spillway Foundations, July 8, 1974 (Source: Southern Company Hydro Services: 244)

Figure 16. Second Stage River Diversion through the Spillway Piers (Source: Southern Company Hydro Services: 248)

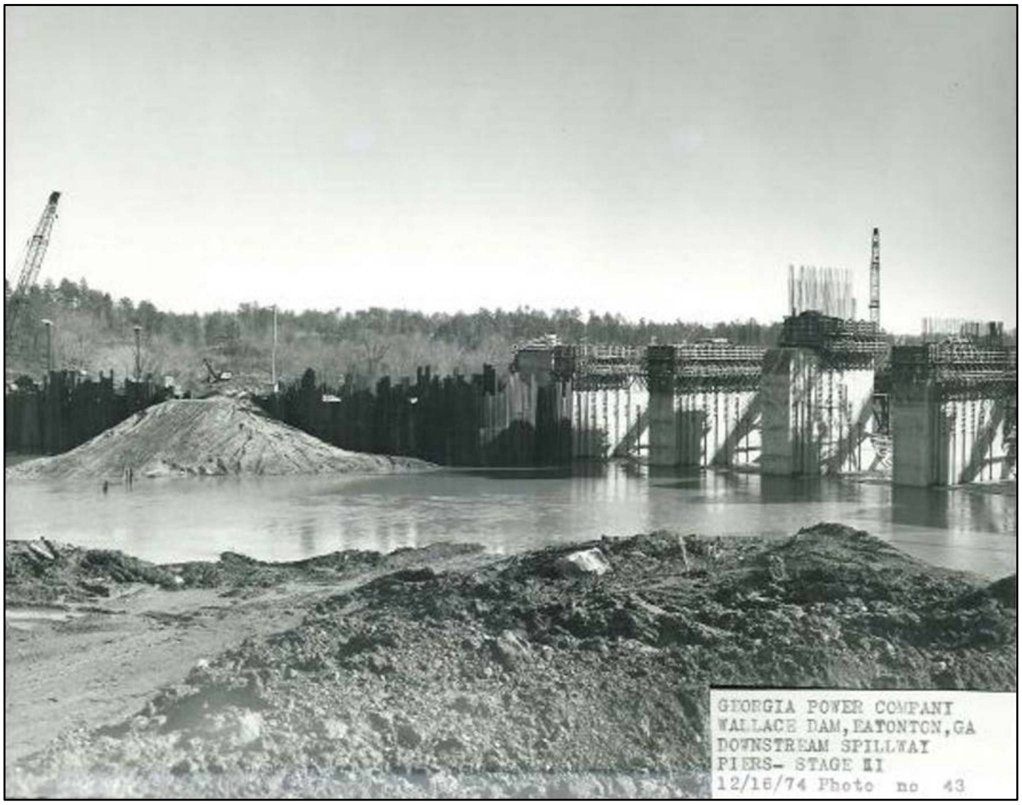
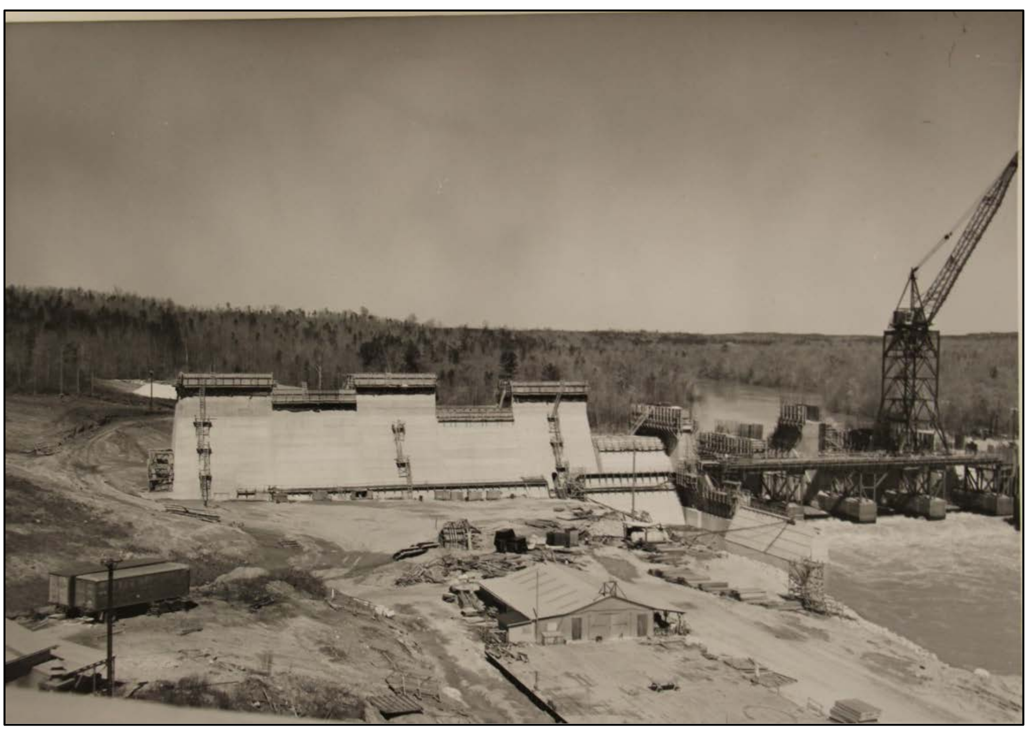


Figure 17. West Nonoverflow Section and Spillway Piers during Second Stage of Construction, March 26, 1975, View Northwest From Concrete Batch Plant (Source: Wallace Dam Photo Archives)



The company's optimism was again interrupted in January 1975 as it was forced to shut down construction activities a second time due to ongoing difficulties with project financing. At this time the project was approximately 17 percent complete. An additional factor that led to the work suspension at Wallace Dam was Georgia Power's need to target its available funds to finish several fossil-fuel powered thermal electrical plants that were under construction at the time (Southern Company Hydro Services: 92, 96-97).

During this second work suspension there was a limited workforce kept on the site to maintain the cofferdam and construction plant, and to receive and store pre-ordered turbine, tainter gate, and powerhouse parts as they arrived. Additionally, Middle South built the warehouse in the East Staging Area in the spring of 1976 (Figure 18). The company poured the concrete foundation and floor slab, and assembled the precast concrete exterior panels. A fire protection water supply pond was created between the East Earth Dike area and the access road to the Powerhouse (Southern Company Hydro Services: 92). The office portion of the building's north end was completed by 1979

Figure 18. The Storage Warehouse under Construction in 1976. The Former Storage Bays Shown at Right were Later Converted into Offices, View West (Source: Wallace Dam Photograph Archives)

Third Construction Period to Full Commercial Operation, 1976-1980

Improved financial conditions led to the third and final phase of Wallace Dam construction from the spring of 1976 to 1979. The last of its generating units was brought online in early 1980. The third stage of river diversion included the closure of the spillway piers using bulkheads and the removal of the coffercells on the east side of the river. At this point, the river flow was passed through two previously constructed sluiceways in the spillway area, which were later closed with concrete to allow the filling of the reservoir (Southern Company Hydro Services: 64-65). Middle South resumed concrete placement and excavation work for construction of the powerhouse, control building, headworks intake, draft tubes, tailrace, spillway gates, and substation. Georgia Power also divided the reservoir area in five parcels and started clearing trees at this time (Southern Company Hydro Services: 106, 109). The optimism and sense of humor shared by workers in 1976 at the resumption of work is shown below in Figure 19. Figure 20 shows the construction progress in July 1978 of the spiral case structures that direct water from the penstocks intakes into the turbine units.

In early 1979, the Wallace Dam project was approximately 85 percent complete and Georgia Power appointed a startup team of hydroelectric engineers to oversee the project and mechanical systems startup. In March of that year, the completed spillway gates were closed to begin the filling of the Lake Oconee reservoir. Construction teams continued placing the last concrete in the dam structure and erected the turbine parts and generators in Units 1-6. By May, the reservoir was nearly full and the control building neared completion (Southern Company Hydro Services: 151-152). Figure 21 shows a turbine runner ready for installation on the deck of the powerhouse. Figure 22 shows the powerhouse bridge crane installing parts into the maintenance bay between Units 1 and 2 on the powerhouse deck. Figure 23 shows the Wallace Dam spillway with tainter gates installed during its final phase of construction in the spring of 1979.

Construction of the main dam structures was complete by the end of 1979 and workers began installing the generating equipment (Figure 24). On December 12 of that year the pump turbine in Unit 6 was first turned on, and a little over a week later it was generating electricity and declared to be in commercial operation. It was soon followed in January 1980 by the pump turbine in Unit 5 as the second unit in commercial operation. Gradually, the remaining four generating units were tested, adjusted, and brought online and into commercial operation by the end of the year.

As Georgia Power finalized work on the dam's mechanical and electrical systems the company also worked to open the project's six associated recreational areas to the public. All site and system startup work at Wallace Dam was completed by the end of December 1980, with minor ongoing work on site repairs, plantings, water fowl refuge areas, and opening the remaining recreation areas (Southern Company Hydro Services: 170-171, 173). Figure 25 shows a 1983 aerial view of the Wallace Dam shortly after completion.

The construction of Wallace Dam took significantly longer and was far more expensive than originally planned in the 1960s. Nonetheless, the plant's completion in 1980 added an essential new hydroelectric generation source to the Georgia Power network during a time of ongoing population growth and rising demand for electricity. Since its completion, the dam has undergone no major structural or mechanical alterations.

Figure 19. Georgia Power Employees Celebrating the Continuation of Work at Wallace Dam in Spring 1976. Pictured in the Background is the West Nonoverflow section and the Spillway Piers (Source: Georgia Power Company Archives)

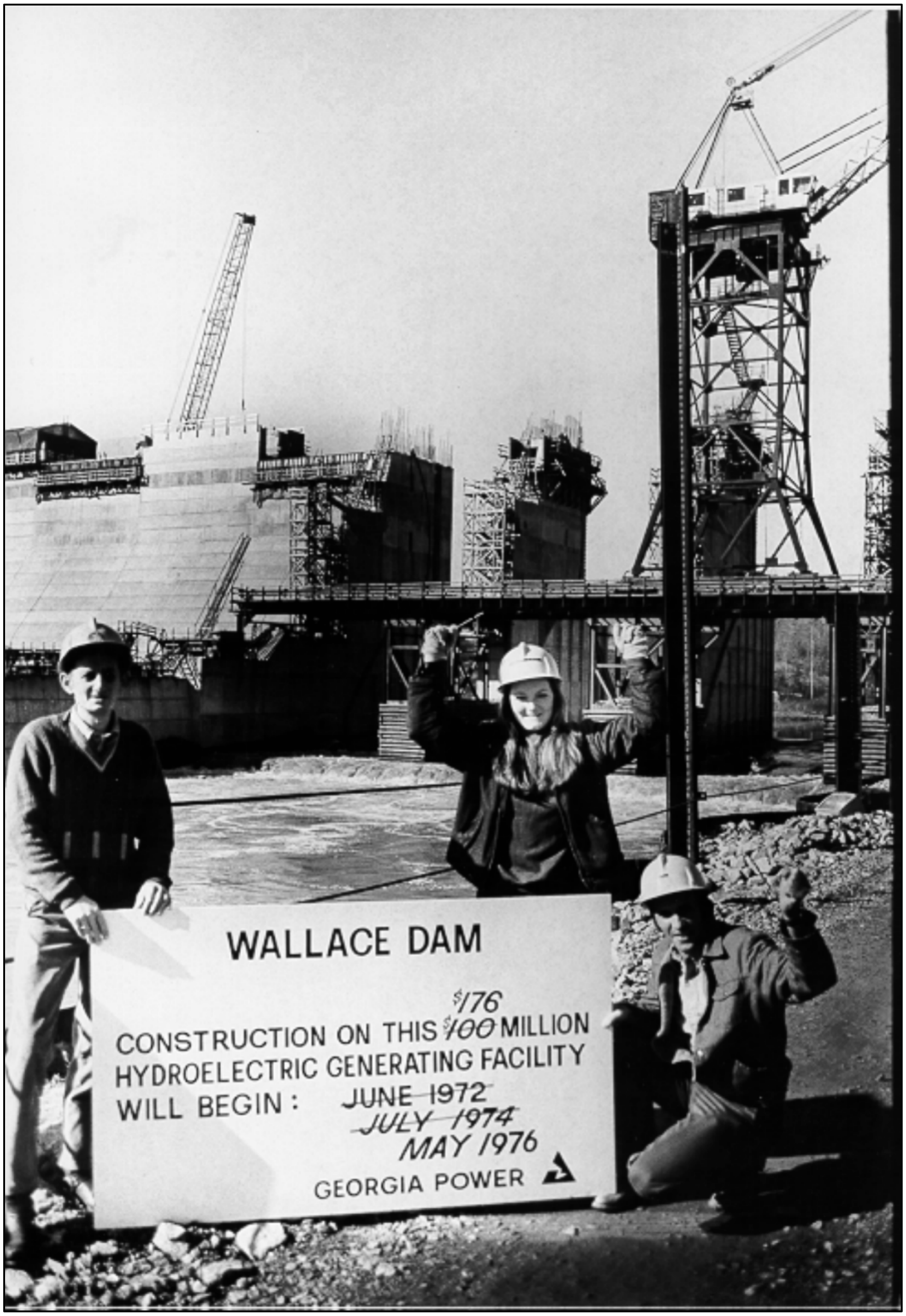


Figure 20. View of the Powerhouse and Intake Spiral Case Structures Under Construction at Wallace Dam, July 1978, View West (Source: Wallace Dam Photograph Archives)

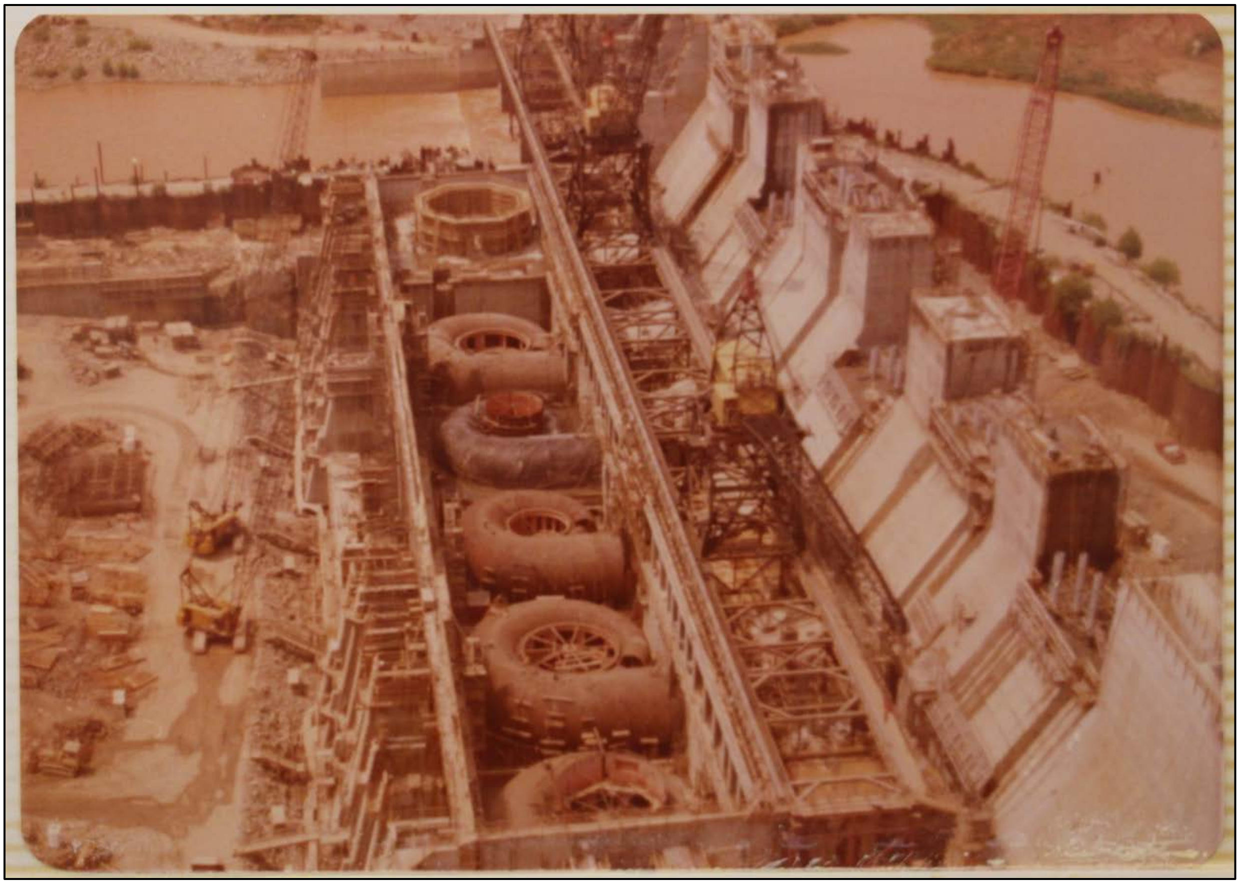


Figure 21. Turbine Runner Readied for Installation at Wallace Dam, 1979 (Source: Georgia Power Company Archives)

Figure 22. Bridge Crane Installing Turbine and Generator Components, 1979 (Source: Georgia Power Company Archives)

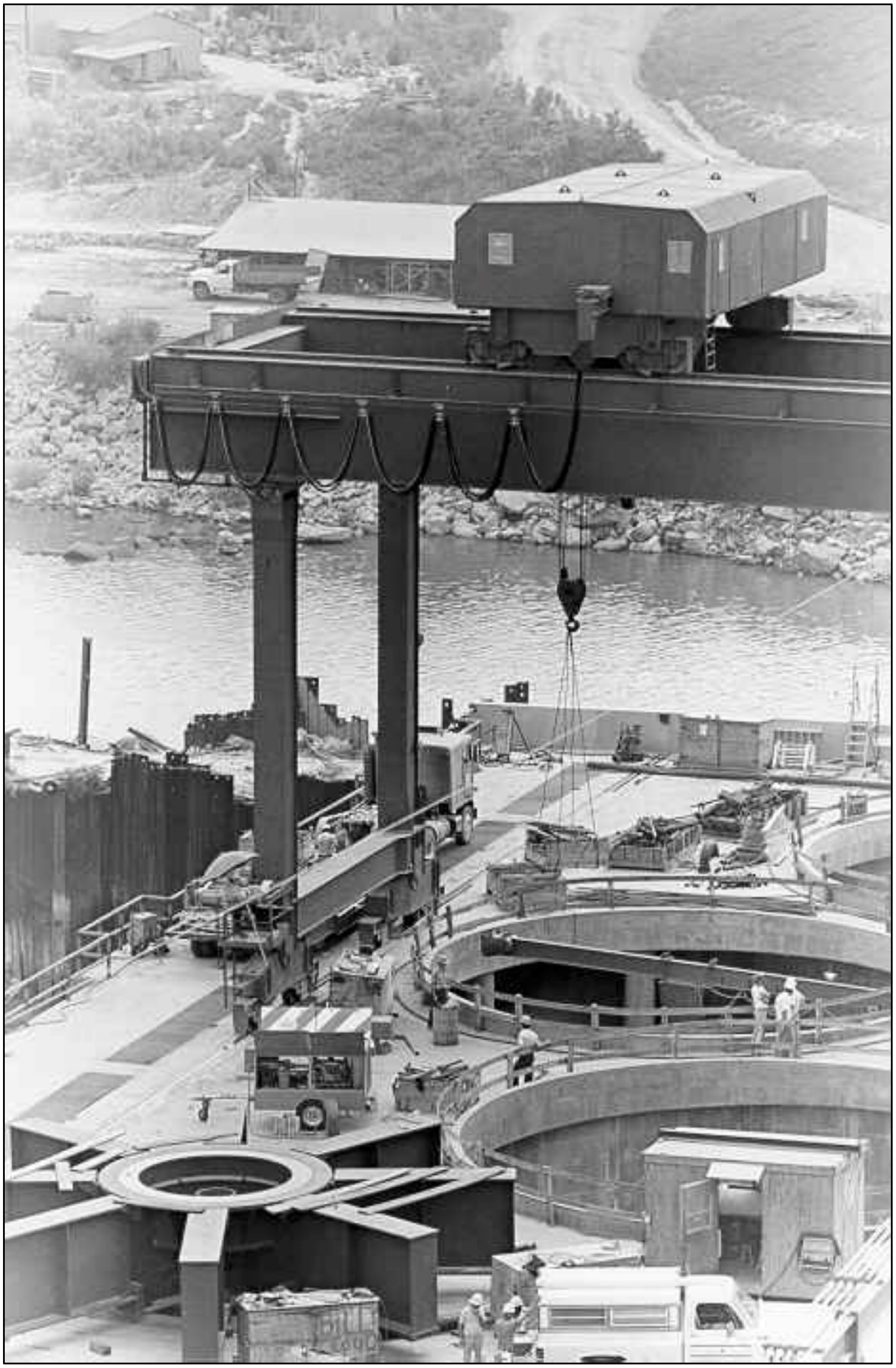
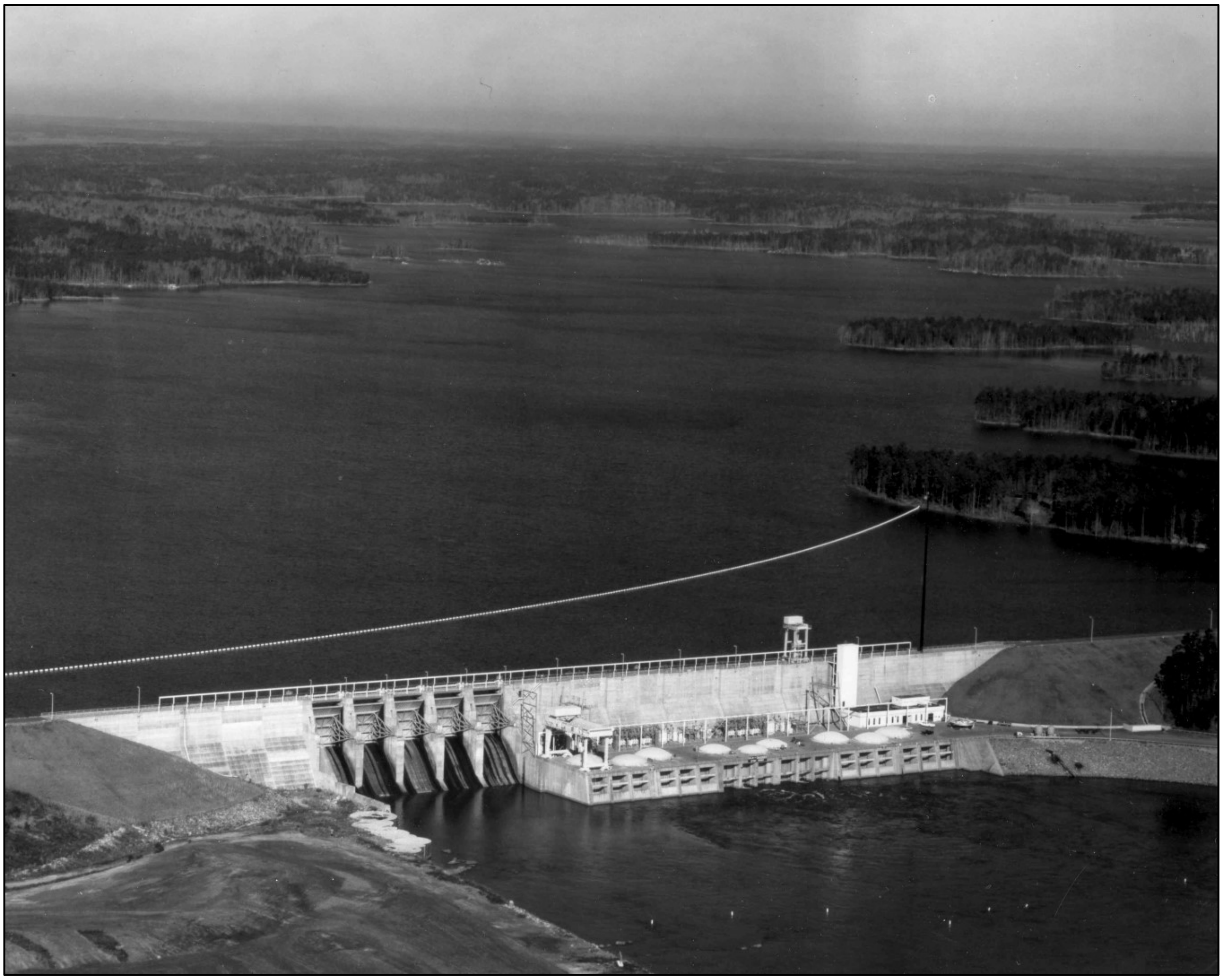


Figure 23. Wallace Dam Construction Nears Completion in the Spring of 1979 (Source: Georgia Power Company Archives)

Figure 24. Workers Installing a Generating Unit at Wallace Dam, 1979 (Source: Georgia Power Company Archives)

Figure 25. Aerial View of Wallace Dam and Lake Oconee Reservoir in 1983, View Northeast (Source: Georgia Power Company Archives)



CHAPTER V. HISTORIC HYDRO-ENGINEERING RESOURCES ASSESSMENT

TRC conducted the historic hydro-engineering resources assessment at the Wallace Dam Hydroelectric Project in June of 2016. This effort included background research and the photographic documentation of the Wallace Dam and powerhouse, control building, administration building, and support buildings. The assessment of both interior and exterior spaces revealed that the Project is in excellent condition and has not undergone any major structural alterations since its completion in 1979. The following chapter provides architectural descriptions and photographs of the assessed resources at Wallace Dam.

Figure 26 is the most recent (2013) topographic map showing the FERC project boundaries and the locations of surveyed resources at Wallace Dam. The two buildings shown in Figure 26 to the east of the administration building were demolished since the topographic map was created and were not surveyed. Figure 27 is an aerial view of the area showing the locations and footprints of surveyed resources.

Figure 26. Topographic Map of Assessed Resources at Wallace Dam

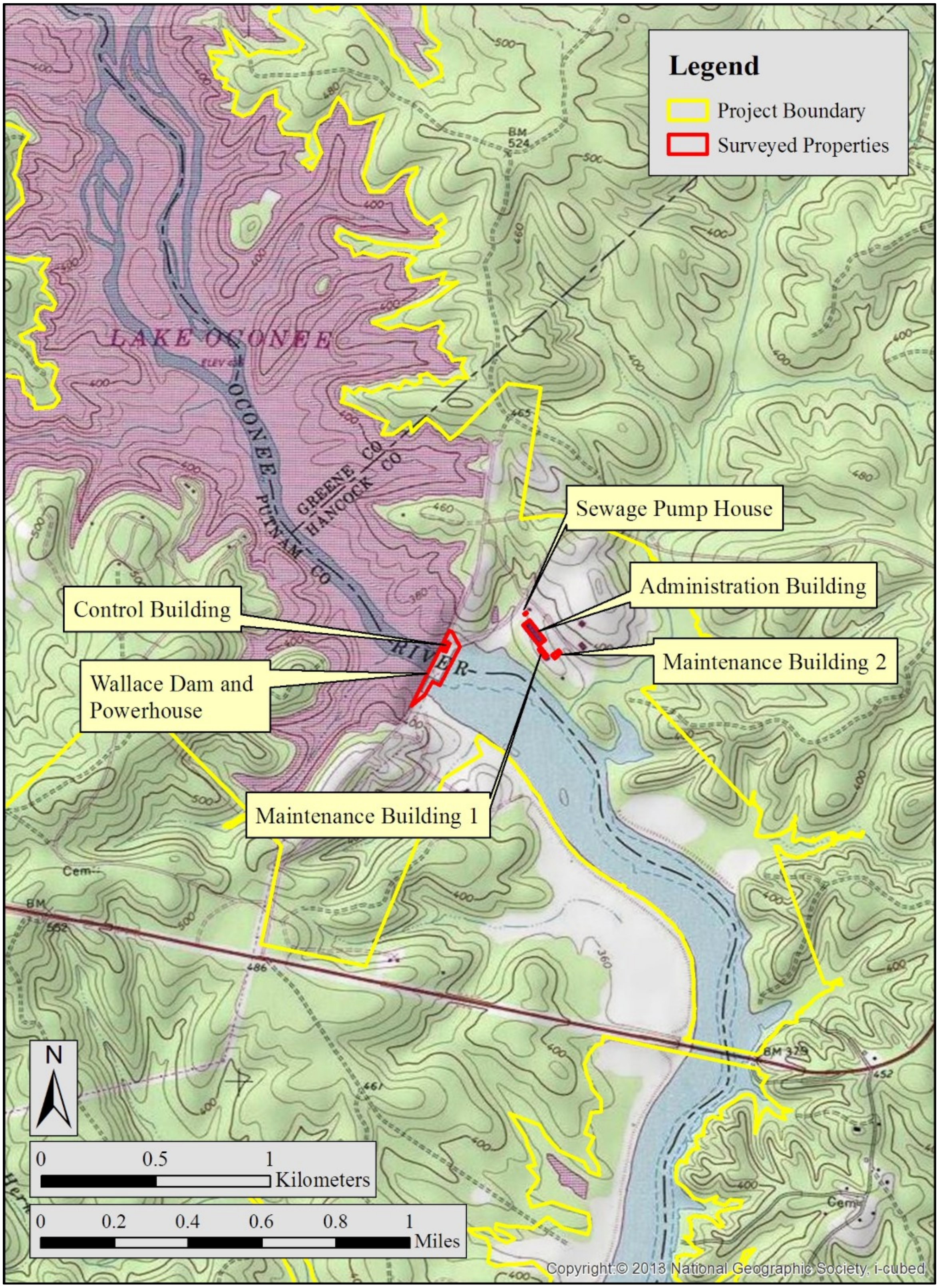


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Figure 27. Aerial View of the Assessed Resources at Wallace Dam

Wallace Dam and Powerhouse

Wallace Dam is located in Central Georgia on the Oconee River approximately 13 miles east of Eatonton and two miles north of Georgia Route 16 (Figures 28-41). The dam, powerhouse, control building, and associated support buildings are located in Hancock and Putnam counties, and the Lake Oconee reservoir is located in Hancock, Green, Morgan, and Putnam counties. The plant's setting is rural and isolated, surrounded by the rolling hills and pine forest of Central Georgia. The Lawrence Shoals Public Recreation Area is located on the shore of Lake Oconee approximately one-half mile northwest of Wallace Dam. This recreation area offers a campground, picnic areas, boat ramps, fishing, and a swimming beach. Lakeside residential housing developments are located further north and west of the dam, but are not generally visible from it.

This is a gravity-concrete type, pumped storage hydroelectric dam that measures 2,395 feet long and 120-feet high with a continuous top elevation of 445 feet. The facility consists of a water intake structure at the top of the dam and generating equipment at its base, which are connected by six steel penstocks. From west to east, the order of dam components includes a west earth dam abutment; west nonoverflow section; spillway with five tainter gates; headworks and powerhouse; east nonoverflow section; and west earth dam abutment. The east earth abutment is 725 feet long and the west earth abutment is 347 feet long. The spillway is 266 feet wide and contains five radial tainter gates that measure 42 feet wide and 48 feet high. The tainter gates are raised and lowered with electric-motor gate hoist mechanisms located above each gate. The west nonoverflow section measures 300 feet long and the east nonoverflow measures approximately 266 feet long. The dam has a 20,000-foot long excavated tailrace leading into the downstream Lake Sinclair, which makes the reservoir available for pumped storage operations. Wallace Dam creates the upper reservoir of Lake Oconee, which is 19,050 acres at full pond elevation of 435 feet, or 10 feet below the crest of the dam. The reservoir extends approximately 40 miles upstream into the counties of Putnam, Hancock, Greene, and Morgan, with a shoreline of 374 miles (Georgia Power Company n.d.[a]:5-6). Wallace Dam displays a purely functional design that does not express any architectural style.

The dam headworks measures just over 531 feet long and is 25 feet wide at its crest. It has a reinforced concrete structure on a foundation of solid stone. It contains six intake portals, also called intake sections, through which water flows from Lake Oconee into the turbine units through penstocks that are encased in concrete. The penstocks are made of welded steel and measure 25'-6" in diameter. Between the six intake sections are the intake bulkheads, which are recessed from the face of the intake sections. Each intake section includes a head gate, trash racks, and stop logs. A traveling gantry crane moves along the crest of the headworks to raise and lower the gates, racks, and stop logs as necessary. At the bottom edge of the headworks is the headworks inspection gallery, a long and narrow tunnel at an elevation of 327.6 feet containing sump pumps and vents to remove moisture that seeps into the bottom of the plant.

The dam contains an integral reinforced concrete powerhouse that is approximately 530 feet long and contains two levels. The powerhouse faces southeast and is divided into six bays, one for each of the generating units. The center two bays contain conventional turbine Units 3 and 4 and measure approximately 81 feet wide and 219 feet deep. The four outer bays contain four pump turbine units and measure 92 feet wide and 219 feet deep. The bottom level of the powerhouse is the turbine floor and contains access to each of the turbine units for repair and maintenance. The turbine floor elevation is 329.5 feet. The turbine floor is also the level where the steel penstocks flow into the turbines through steel, spiral-shaped scroll cases. The third level is the generator floor and provides access to the generator units and connected equipment such as the exciter cabinets that create the magnetic field required for the generators to work, and the governor cabinets, which control the position of the wicket gates that allow water to flow into the turbines. The generator floor elevation is 353.25 feet. Exterior views of the dam and powerhouse are provided below in Figures 28-36, and interior views of the powerhouse, turbine units, and equipment are provided below in Figures 37-41

The powerhouse contains six generating units with original turbines and generators. The two conventional turbine units (Units 3 and 4) are rated at 56.25 megawatts each and the four reversible pump turbine units (Units 1, 2, 5, and 6) are rated at 52.2 megawatts each. The turbines were manufactured by Allis-Chalmers (now Voith Hydro). The conventional units have a capacity of 8,200 cubic feet per second and generate 78,000 horsepower when operating at full efficiency under a head of 89 feet. The pump turbine units have a capacity of 6,500 cubic feet per second and generate 73,000 horsepower when operating at full efficiency under a total dynamic head of 98 feet. The alternating current generators attached to the turbines were manufactured by General Electric in Schenectady, New York. The six units have a total installed generating capacity of 321.3 megawatts.

The powerhouse contains three maintenance bays on the downstream side of the generating units that are used when a unit has to be removed for repairs. Each of the maintenance bays is positioned adjacent to a pair of generating units, so that from an aerial view they appear to be grouped in threes (see Figure 31 above). A 25-ton traveling gantry crane moves back and forth on rails across the powerhouse deck to lift units in and out of the maintenance bays. There is a 230 kilovolt electrical substation on the surface of the powerhouse deck. The substation contains all of the electrical switch and transformer equipment necessary to transmit the power generated at the dam. The substation transmission lines exit the dam area via a transmission corridor that leads south and west toward the town of Eatonton.

Wallace Dam possesses several unique engineering features. It was Georgia Power's first pumped storage hydroelectric project. At the time of its construction, the dam's pump turbines were the largest ever manufactured by Allis-Chalmers (now Voith Hydro). The turbines feature innovative individual servomotors for each wicket gate, which open and close to allow water into the turbine. The individual motors provided economy and simplicity in design compared to previous designs and were reported to be the first used in the United States (Georgia Power Company n.d.[a]:6-7).

Figure 28. Wallace Dam, View Northwest from the Administration Building

Figure 29. The Wallace Dam Powerhouse (Lower Half of Photograph) is Integral to the Structure of the Dam and is marked by the White Dome Covers of the Generating Unit Bays, View Northwest

Figure 30. View of Wallace Dam Showing (From Left to Right) the Gantry Crane, Generating Unit Covers, Headworks, Control Building, and the East Nonoverflow Portion of the Dam. The Gray Rectangular Vertical Structure is an Elevator. View South West.

Figure 31. View of the Powerhouse Deck From Above Showing Generating Unit Covers, Gantry Crane, and Substation, View Southwest

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Figure 32. View East Across Top of Dam Headworks Toward Gantry Crane that Controls Stop Logs, View Northeast

Figure 33. Stop Log Pits, View Northeast

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Figure 34. Top of Elevator Shaft That Connects Power House and Control Building to Top of Dam, View Southeast

Figure 35. Spillway Tainter Gate Hoists, View Southwest

Figure 36. Spillway and Tainter Gates, View West

Figure 37. Interior View of Generator Operating Floor, View Southwest

Figure 38. View of Turbine Shaft in Unit 6

Figure 39. Individual Servomotors Controlling Turbine Wicket Gates in Unit 6

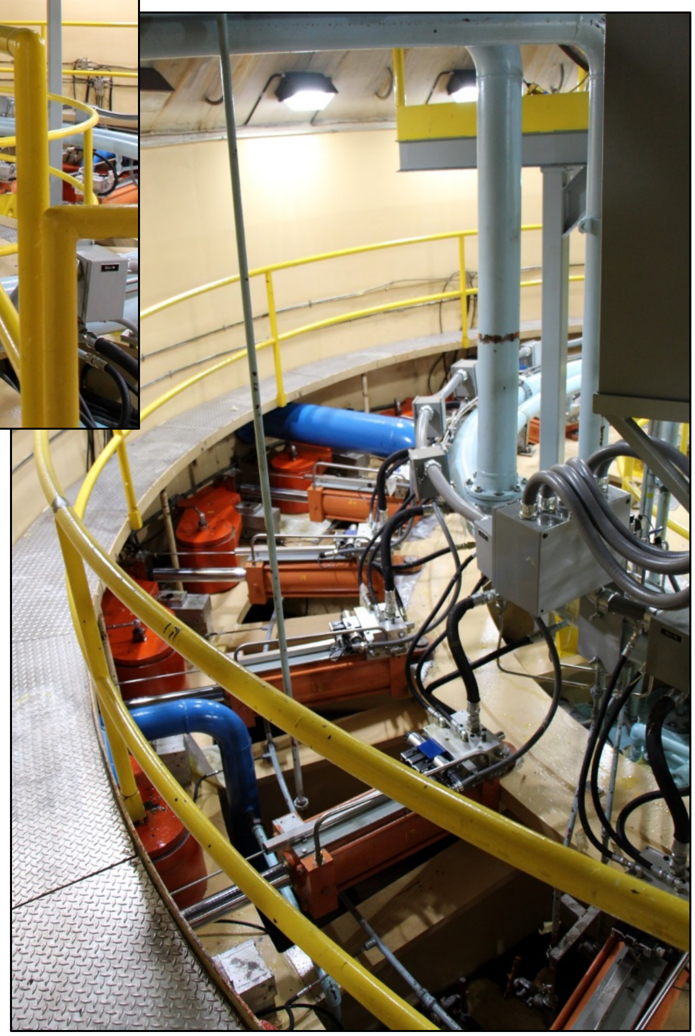

Figure 40. Unit 6 Governor Cabinet Controls the Position of the Turbine Wicket Gates

Figure 41. The Unit 6 Exciter Cabinet Generates the Magnetic Field in the Generator

Control Building

The control building is one story tall and has a flat roof, a precast concrete panel exterior, a concrete block structural system, and a rectangular footprint that sits on top of the east end of the powerhouse (Figure 42 and 43). The building expresses a standardized version of the Brutalist architectural style that was common among public utility facilities across the nation during the 1970s. This style is expressed through its rough-surfaced concrete exterior, flat roof, windows and doors treated as voids in its continuous wall surfaces, and an overall look of weight and massiveness (Whiffen 1992:279). The building is entered through an offset, recessed entrance with a pair of tinted glass doors surrounded by tinted glass panels. It has an overhanging concrete cornice that tapers in at its base. The building has recessed fixed-pane windows with metal casings. The interior floor plan includes an entrance lobby with control room and original control equipment on the west end (Figures 44 and 45), with restrooms and pump room on the east end. There is a rear hallway that extends along the rear (north side) of the building that leads to a staircase and elevator shaft that provide access to the top of the dam and the powerhouse.

Figure 42. Oblique View of the Control Building, View Northwest

Figure 43. Façade View of the Control Building, View North

Figure 44. Control Building Entrance Lobby, View Southwest

Figure 45. Control Room in the Control Building, View West

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Administration Building

The 1976 Administration Building is a one-story rectangular building that originally functioned as a supply warehouse for the East Staging Area during the construction of Wallace Dam (Figures 46-48). It is a one-story building with a flat roof, precast concrete panel exterior, and a concrete slab foundation. The precast concrete panels on the exterior of the building feature vertical "fins" that extend the full height of the building. The building expresses a standardized version of the Brutalist architectural style that was common among public utility facilities across the nation during the 1970s. This style is expressed through its rough-surfaced concrete exterior, flat roof, and overall look of weight and massiveness (Whiffen 1992:279). The northwest end of the building contains the dam's office and conference room spaces. The southeast end of the building contains a covered loading dock area that leads into warehouse storage and additional support spaces.

Figure 46. Oblique View of the Administration Building Facing the Main Entrance and North Elevation, View South

Figure 47. Oblique View of the Administration Building's North and West (Rear) Elevations, View Southeast

Figure 48. The Administration Building Loading Dock, View West

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Other Support Buildings

Sewage Lift Station

This is a one-story utility building with a side-gable roof in asphalt shingles, a concrete block exterior, concrete slab foundation, and a rectangular footprint (Figure 49). It has an offset entrance on the south elevation. It contains equipment used to pump sewage up and out of the dam control building and power house.

Figure 49. Sewage Lift Station, View Northwest

Maintenance Building 1

This storage and maintenance building was built circa 1976 at the same time as the Administration Building. It is a one-story utilitarian metal building with a side-gable metal roof, metal exterior, steel frame structural system, and a concrete slab foundation (Figure 50). It has five garage bays on its east elevation and is used to store and maintain equipment.

Figure 50. Maintenance Building 1, View Southwest

Maintenance Building 2

This storage and maintenance building was built in 2007. It is a one-story utilitarian metal building with a side-gable metal roof, metal exterior, steel frame structural system, and a concrete slab foundation (Figure 51). It has four enclosed garage bays and one open storage bay on its north elevation and is used to store and maintain equipment.

Figure 51. Maintenance Building 2, View Southeast

CHAPTER VI. HISTORIC ANALYSIS AND CONCLUSION

TRC conducted a historic hydro-engineering assessment of the Wallace Dam Project located on the Oconee River in Greene, Hancock, Putnam, and Morgan counties, Georgia. This assessment was conducted as part of the FERC relicensing process and provided a historic context of the dam's design and construction, and produced photographic documentation of the dam structure, powerhouse, equipment, and support buildings. Because construction of Wallace Dam was completed in 1979 and is not yet 50 years old, a detailed NRHP evaluation of it was not completed. The following analysis may be used in a future eligibility assessment of the Wallace Dam for listing in the NRHP.

Historic Engineering Analysis

The historic context provided in Chapters II-IV suggest a number of historic themes that apply to hydroelectric plants as a resource type. In terms of their function and use, hydroelectric dams are engineering facilities that combine the natural power of moving water and gravity with specialized structures and machinery to produce electricity. In terms of significance, hydroelectric plants often possess primary historical significance in the areas of engineering and industry. For example, a hydroelectric plant may have historical engineering significance if it was the first of its type in a place or region, or if it contains innovative machinery and equipment, or if it represents a historically innovative design that influenced the construction of subsequent plants in the area. Similarly, a hydroelectric plant will have industrial significance if its construction directly resulted in or significantly contributed to industrial growth and development in a particular place or region. A hydroelectric plant may also have secondary significance in the area of architecture if it contains buildings and structures that embody the distinctive characteristics of an architectural type, period, or method of construction.

Wallace Dam was constructed in three phases between 1970 and 1979 and is not yet 50 years old. Despite its relatively recent construction, background research revealed that Wallace Dam possesses historic engineering significance at the state level as the first pumped storage hydroelectric facility built by Georgia Power and for its association with the beginning of pumpedstorage hydroelectric development in the state. The development of Wallace Dam was associated with the increasing demand for electrical power during a time of rapid population growth and with the continuing advancement of hydroelectric engineering in Georgia during the late twentieth century. When the last of its generating units was brought online in 1980, Wallace Dam's 321-megawatt generating capacity nearly doubled the total electrical output of Georgia Power's hydroelectric system, providing a crucial new source of electricity during this time. At the time of its construction, Georgia Power reported that the dam's pump turbines were the largest ever manufactured by Allis-Chalmers (now Voith Hydro), and the turbines featured innovative individual servomotors for each wicket gate, which open and close to allow water into the turbines.

The historically significant components of the facility are those that directly contribute to its function as a pumped storage hydroelectric plant. These components include the dam, the powerhouse, the control building, and associated machines and equipment. Buildings that do not contribute to the plant's historical significance include the administration building, sewage lift station, and the two maintenance garages.

Wallace Dam possesses historical significance but it is not yet 50 years old. The applicable criterion consideration for an NRHP eligibility determination is Criterion Consideration G, which states that a resources less than 50 years old must possess "exceptional importance" to be eligible to the NRHP. Wallace Dam does not meet the threshold of "exceptional importance" because it was but one part of a larger effort by Georgia Power to build hydroelectric facilities in the last half of the twentieth century. The plant does not possess exceptional importance in the overall history of hydroelectric power development during its construction period. The plant should be evaluated for NRHP eligibility when it reaches 50 years of age.

Integrity

Wallace Dam has not undergone any major structural or mechanical alterations since it was constructed in 1979 and it retains excellent physical integrity. The original Allis-Chalmers conventional and pump turbines are still in use, as are the original General Electric generators. The major structural portions of the dam remain unaltered, including the earth dam abutments, spillway, headworks, powerhouse, and nonoverflow sections. The spillway tainter gates, gantry cranes and tracks, stop logs, intake sections, penstocks, draft tubes, and substation have not been significantly altered. Similarly, the dam's control building retains its original design, floor plan, and finishes.

REFERENCES CITED

Bureau of Reclamation

2003 *The History of Hydroelectric Development in the United States*. Bureau of Reclamation Hydropower Program. Available online, http://www.usbr.gov/power/edu/history.htm. Accessed 6 April 2004.

Calhoun, Margaret O.

2015 "Georgia Power Company/Southern Company." *New Georgia Encyclopedia*. Georgia Humanities Council and the University of Georgia Press. Available at http://www.georgiaencyclopedia.org/articles/business-economy/georgia-power-companysouthern-company. Accessed August 5, 2016.

Dames and Moore

1981 *An Assessment of Hydroelectric Pumped Storage*. National Hydroelectric Power Resources Study. Volume X. November 1981. Prepared for The U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia. Available online, http://www.iwr.usace.army.mil/Portals/70/docs/iwrreports/IWR019-000001-000517.pdf. Accessed July 18, 2016.

Devine, Warren D., Jr.

1983 "From Shafts to Wires: Historical Perspectives on Electrification. *Journal of Economic History*. 43(2):347-372.

DuBoff, Richard B.

1967 "The Introduction of Electric Power in American Manufacturing." *Economic History Review, New Series*. 20(3):509-518.

EDAW, Inc.

1993 *Historic Hydro-engineering Report, Sinclair Project (FERC #1951)*. Produced for the Georgia Power Company. On file at the Georgia Power Company Archives.

Fabian, Liz

2015 Georgia Power pulls plug on Plant Branch on Lake Sinclair. *Telegraph (Macon, GA)*. April 15. Online document, http://www.macon.com/news/local/article30226875.html. Accessed January 21, 2016.

Georgia Power Company

1970 "GPC to Build Largest Hydro Plant At Laurenss Shoals on Oconee River." In *Snap Shots*. Volume XLV. No. 8. August 1970.

1972 Wallace Dam Engineering Design Drawings. Available at the Georgia Power Company Engineering Archives.

2016 "History of Georgia Power." Available at https://www.georgiapower.com/docs/about-us/History.pdf. Accessed July 15, 2016.

n.d.[a] "Wallace Dam Hydro Project." Manuscript on file at the Georgia Power Company Archives.

n.d.[b] *Central Georgia Hydro Group*. Brochure on file at the Georgia Power Company Archives.

n.d.[c] *Georgia Power on the Oconee River*. Interpretive sign at Wallace Dam.

Hay, Duncan

1991 *Hydroelectric Development in the United States, 1880–1940*. 2 vols. Washington, D.C. Edison Electric Institute.

Maganiello, Christopher J.

2015 *Southern Water, Southern Power: How the Politics of Cheap Energy and Water Scarcity Shaped a Region*. University of North Carolina Press, Chapel Hill.

Southern Company Hydro Services

2016 *Wallace Dam, FERC Project Number 2413, Construction History*.

Woolfe, Arthur G.

1982 "Energy and Technology in American Manufacturing: 1900-1929." *Journal of Economic History*. 42(1).

APPENDIX A: RESUME OF AUTHOR

DAVID L. PRICE, M.A.

EDUCATION
M.A., History with emphasis in Public History, Middle Tennessee State University, 2005
B.A., American Studies, University of the South, Sewanee, 1999

PROFESSIONAL REGISTRATIONS/CERTIFICATIONS
National Park Service, 36 CFR, Part 61 - Architectural Historian

AREAS OF EXPERTISE
Mr. David L. Price has technical experience in the following general areas:

- Historic Architectural Surveys
- Section 106/110 Compliance
- Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Documentation
- National Register of Historic Places Nominations
- Background History Research

REPRESENTATIVE EXPERIENCE
David Price has twelve years of experience in the cultural resource management industry as a Historian/Architectural Historian. He has conducted dozens of Section 106 and Section 110 review projects across Tennessee and the nation, including architectural history surveys, background history research, National Register of Historic Places (NRHP) evaluations and nominations, and effects assessments. David has also directed several Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) documentation projects, memoranda of agreement, mitigation plans, and public history outreach projects. David has prepared project reports and other deliverables for a variety of clients, including city and county governments, private architecture and engineering firms, the Tennessee Department of Transportation, and Federal agencies such as the USDA Forest Service, Tennessee Valley Authority, National Aeronautics and Space Administration, National Park Service, U.S. Army Corps of Engineers, General Services Administration, and Centers for Disease Control and Prevention. David has detailed knowledge of historic preservation laws and regulations at the federal, state, and local levels.

<u>HISTORIC ARCHITECTURE SURVEYS</u>

U.S. Army Corps of Engineers, Mobile District, Architectural Survey and Evaluation of the Milan Army Ammunition Plant, Gibson and Carroll Counties, TN (Architectural Historian: 2015)
Conducted a historic architecture survey and NRHP evaluation of 99 buildings and structures at the NRHP-eligible Milan Army Ammunition Plant Historic District. Report prepared for the U.S. Army Corps of Engineers, Mobile District.

Davant Plantation Architectural Survey and Evaluation, Jasper County, SC (Architectural Historian: 2015).
Conducted background research, architectural survey, NRHP evaluation, and assessment of effects for an undertaking at Davant Plantation, a historic Lowcountry estate in Jasper County, South Carolina. Report prepared for Davant Plantation.

Architectural History Survey and Evaluation of the U.S. Army Corps of Engineers, Jacksonville District, Real Property in Florida (Architectural Historian: 2014). Completed a statewide survey of Corps properties along Florida's east coast and throughout the Everglades. The project included background research, historic context development, architectural survey, and NRHP evaluations of buildings and engineering structures such as locks, dams, canals, spillways, and jetties.

National Aeronautics and Space Administration (NASA), Architectural Survey and Evaluation of Facilities That Have Reached the Age of 45-50 Years, John F. Kennedy Space Center, Brevard County, Florida (Architectural Historian: 2012).
Conducted a historic architectural survey of 45 buildings and structures that have reached the age of 45-50 years at the NASA's Kennedy Space Center (KSC). The project included background research, historic context development, photographic documentation, and NRHP evaluations of buildings and structures associated with the Space Shuttle Program and the Apollo Program.

National Aeronautics and Space Administration (NASA), Architectural Survey and Evaluation of NASA-owned Facilities at Cape Canaveral Air Force Station, John F. Kennedy Space Center, Brevard County, Florida (Architectural Historian: 2013).
Conducted background research and a historic architectural survey of 11 buildings owned by NASA located at Cape Canaveral Air Force Station (CCAFS). The project included background research, historic context development, photographic documentation, and NRHP evaluations for buildings and structures associated with Project Mercury, the Apollo Program, and the Space Shuttle Program.

National Aeronautics and Space Administration (NASA), Architectural Survey and Evaluation of Facilities That Have Reached the Age of 45-50 Years, White Sands Test Facility, Doña Ana County, New Mexico (Architectural Historian: 2013).
The survey documented 53 buildings and structures at WSTF that were constructed during the Apollo era (1962-1972) and have reached the age of 45-50 years. The survey included background research, historic context development, photographic documentation, and NRHP evaluations for buildings and structures associated with the Apollo Program.

General Services Administration (GSA), Modern-Era Buildings (1950-1979) Region 4 Inventory and Assessment (Architectural Historian: 2010).
Conducted architectural history survey and National Register eligibility assessment of the U.S. General Services Administration's Modern-era buildings in the Southeast Sunbelt (Region 4) to assist in future planning and management of these buildings. The inventory

included 43 Modern-era Federal buildings, many of which contain courtrooms and post offices, constructed between 1950 and 1979 located in Region 4.

City of Gallatin, Historical and Architectural Survey, Sumner County, Tennessee (Architectural Historian: 2008). Conducted historical and architectural inventory of 83 properties within the city of Gallatin. Project included background research, context development, photographic documentation, and NRHP evaluations.

USDA Forest Service, Historic Property Management Plan, Monongahela National Forest, West Virginia (Architectural Historian: 2005). Conducted an architectural survey of 135 historic properties in the Monongahela National Forest (MNF). The MNF extends across 10 counties and covers an area of more than 910,000 acres. The survey produced a comprehensive database of survey forms and photographs on all surveyed properties for the USDA Forest Service.

SECTION 106/110 COMPLIANCE

Tetra Tech, Mountain Valley Pipeline, Architectural Survey and Evaluation, Pittsylvania, Franklin, Montgomery, Roanoke, Floyd, and Giles Counties, Virginia (Architectural Historian: 2015).
Conducted a historic architecture survey and NRHP evaluation of buildings, structures, and cemeteries located in six counties along the pipeline corridor.

Barge, Waggoner, Sumner, and Cannon, Inc., Reconnaissance Architectural History Survey of the Clarksville Gas and Water Interconnect Pipeline Project, Todd County, Kentucky (Architectural Historian: 2014).
Conducted a reconnaissance survey that documented 42 properties containing buildings and structures located within or adjacent to the environmental study corridor.

Tennessee Department of Transportation, SR-353 Bridge Replacement Project Spanning Unnamed Creek, Washington County, Tennessee (Architectural Historian: 2014).
Authored a report presenting the findings of a Section 106 review for a bridge replacement project in Washington County, including background research, including architectural survey and NRHP evaluation.

Fisher & Arnold, Cultural Resources Survey for the Forest Hill-Irene Road Extension, Memphis, Shelby County, Tennessee (Architectural Historian 2013).
Conducted a Section 106 review and architectural history survey for a road extension project in Shelby County, including background research, architectural survey, NRHP evaluation, and assessment of effects. The project was completed on behalf of Fisher & Arnold for review by the Tennessee Department of Transportation.

Tennessee Department of Transportation, Historic Architecture Survey for the Intersection Safety Improvement Project at SR-100 and SR-138 – Toone, Hardeman County, Tennessee (Architectural Historian: 2014).
Conducted a Section 106 review for a safety improvement project and intersection realignment, including background research, architectural survey, NRHP evaluation, and assessment of effects.

Fontana Village, Historic Structures Survey of the Proposed Water Treatment Plant at Fontana Dam, Graham County, North Carolina (Architectural Historian: 2011).
Historic architecture survey and evaluation of a 1942 Water Treatment Plant built by the Tennessee Valley Authority to provide clean drinking water to the Fontana Dam worker construction camp. Project included background research, photographic documentation, report preparation, and NRHP eligibility assessment.

HISTORIC AMERICAN BUILDINGS SURVEY (HABS)/HISTORIC AMERICAN ENGINEERING RECORD (HAER) DOCUMENTATION

Lord Aeck Sargeant, Hassel Island HABS Documentation, St. Thomas, U.S. Virgin Islands (Architectural Historian: 2014).
Directed the archival research, architectural survey, and HABS documentation of British ruins associated with the Napoleonic Wars on Hassel Island in St. Thomas harbor. Owned by the Virgin Islands National Park, the ruins were built and occupied in two phases from 1801-1802 and 1807-1815 and are rare examples of British military ruins from this era on U.S. soil.

National Aeronautics and Space Administration (NASA) Facilities, John F. Kennedy Space Center and Cape Canaveral Air Force Station, Brevard County, Florida (Architectural Historian: 2012-2014).
Directed the archival research, architectural survey, and HABS/HAER documentation of the following historic NASA facilities located at Kennedy Space Center and Cape Canaveral:

- Hangar S (HABS)
- The Beach House (HABS)
- Hangar AF (HAER)
- Parachute Refurbishment Facility (HAER)
- Solid Rocket Booster Assembly and Refurbishment Facility (HAER)
- Hypergol Maintenance Facility (HAER)
- Hangar AE (HAER)

NATIONAL REGISTER OF HISTORIC PLACES NOMINATIONS

- **Blountville Historic District (Update and Boundary Adjustment)**, Blountville, Sullivan County, Tennessee
- **Experimental and Safety Research Coal Mine**, Bruceton, Allegheny County, Pennsylvania
- **Mine Roof Simulator**, Bruceton, Allegheny County, Pennsylvania
- **Atlas E Missile Complex, SA-9 (Site A)**, Reardan, Lincoln County, Washington
- **University of the South Archaeological and Historic District (Draft)**, Sewanee, Tennessee
- **John C. Spence House**, Murfreesboro, Tennessee

BACKGROUND HISTORY RESEARCH

Tennessee Department of Transportation, Phase I Archaeological Survey of SR-458 (U.S. 64) Proposed Southern Bypass, Bolivar, Hardeman County, Tennessee (Historian: 2015).
Conducted archival research on the history of a Civil War-era fort identified during archaeological testing of the proposed southern bypass in Bolivar, Tennessee. Background history research revealed the fort was one of several earthworks structures built by the Union force that occupied Bolivar and Hardeman County during the war, and that it was built using formerly enslaved African-American laborers, or "contrabands." Prepared a written historic context for the archaeological survey report.

Tennessee Valley Authority, Geophysical Survey of Hiwassee Island (40MG31), Meigs County, Tennessee (Historian: 2015).
Conducted background research on the historic Cherokee and later Ango-American occupations of Hiwassee Island. Research included visiting regional libraries, county offices, and local depositories to complete a history of the island's ownership, collect historic maps, and examine newspaper and other records related to the island's history and resources. Prepared a written historic context for the geophysical investigation report on the island.

Tennessee Valley Authority, Archaeological Survey and Delineation of the Reservation Bluff Cemetery (1MS449) in Guntersville, Marshall County, Alabama (Historian: 2014).
Conducted background history research on Reservation Bluff Cemetery, a cemetery associated with the founding of Guntersville, Alabama, and historic Cherokee leaders John and Edward Gunter. Project included researching historic maps, local histories, completion of a chain-of-title ownership history for the cemetery parcel, and preparation of a written historic context.

U.S. Army Corps of Engineers, Native American Cultural Overview Report, Louisville, Huntington, and Nashville Districts (Historian: 2011).
Conducted background history research on the history of Native American tribes and tribal history in these three USACE Districts.

OTHER TECHNICAL REPORTS

2014 **Architectural Historian.** *Historic Architectural Survey for the Elizabethton Walking/Biking Trail, Phase V, Elizabethton, Carter County, Tennessee.* Submitted to the City of Elizabethton and the Tennessee Department of Transportation.

2014 **Architectural Historian.** *Historic Architecture Survey for the SR-353 Bridge Replacement Project, Washington County, Tennessee.* Submitted to the Tennessee Department of Transportation.

2013 **Architectural Historian.** *United States Army Pine Bluff Arsenal, Arkansas, Integrated Cultural Resources Management Plan (ICRMP).* Submitted to TetraTech.

2013 **Architectural Historian.** *United States Army Milan Army Ammunition Plant Tennessee, Integrated Cultural Resources Management Plan (ICRMP).* Submitted to TetraTech.

2013 **Architectural Historian.** *Cultural Resources Survey for the Forest Hill-Irene Road Extension, Shelby County, Tennessee.* Submitted to Fisher & Arnold.

2013 **Architectural Historian.** *Cultural Resource Survey for the Dodson Chapel Pipe Improvement, Davidson County, Tennessee.* Submitted to Smith, Seckman, Reid, Inc.

2012 **Architectural Historian.** *Management Summary: Architectural Survey and Evaluation of 41 Facilities*
That Have Reached the Age of 45-50 Years, John F. Kennedy Space Center, Brevard County, Florida. Submitted to InoMedic Health Applications, LLC and John F. Kennedy Space Center.

2012 **Architectural Historian.** *History Survey and Evaluation, Hypergol Module Processing South (M7-1212) and Boresight Control Building (M7-0867), John F. Kennedy Space Center, Brevard County, Florida.* Report submitted to InoMedic Health Applications, LLC and John F. Kennedy Space Center.

2011 **Historian.** *Phase I Archaeological Survey of 2,912 Acres at Fort Bragg, Hoke, and Cumberland Counties, North Carolina.* Report submitted to the US Army Command, Fort Worth, and the Department of the Army – Fort Bragg.

2011 **Historian.** *Oh Susannah, Where Art Thou? An Archaeological Subsurface Examination of the Area 2A Parcel On The Fort Lee Military Reservation Prince George County, Virginia.* Report submitted to VERSAR.

2011 **Historian.** *Archaeological Phase II Testing of Historic Sites 1MA747, 1MA748, and 1MA779, Redstone Arsenal, Madison County, Alabama.* Report Submitted to Redstone Arsenal and U.S. Army Environmental Command.

2011 **Architectural Historian.** *Historic Structures Survey of the Proposed Water Treatment Plant Fontana Dam, Graham County, North Carolina.* Report submitted to the Town of Fontana Dam.

2011 **Historian.** *Archaeological Reconnaissance, Survey, and Testing at Center Hill Lake, DeKalb and White Counties, Tennessee.* Report submitted to USACE Nashville.

2011 **Historian.** *Archaeological Subsurface Surveys of Potential Mortuary Areas And Select Parcels On The Fort Lee Military Reservation, Prince George County, Virginia.* Report Submitted to VERSAR.

2010 **Historian.** *Cultural Resource Investigations and Geophysical Survey Along the Cumberland River.* Report submitted to John Milner Associates.

2010 **Historian.** *Grave Identification Survey, Fort Lee Adams Roundabout, Prince George County, Virginia.* Report submitted to the Federal Highway Administration.

2010 **Architectural Historian.** *Phase I Archaeological Survey of the Proposed Access Road and Parking Area, Lake Lynn Laboratory Spring Hill Township, Fayette County, Pennsylvania.* Report submitted to Jacobs Engineering.

2010 **Architectural Historian.** *Archaeological Data Recovery at the U.S. Marshals Service Additions, U.S. Courthouse, Key West, Monroe County, Florida.* Report submitted to General Services Administration.

2010 **Historian/Architectural Historian.** *Nashville Riverfront Park: Cultural Resource Context and Research Design Davidson County, Tennessee.* Report submitted to Hargreaves and Associates.

2009 **Historian.** *Archaeological Inventory and Evaluation for the U.S. 74 Monroe Connector, Mecklenburg and Union Counties, North Carolina.* Report submitted to PBS&J.

2009 **Architectural Historian.** *Phase I Cultural Resource Survey of a 13.5-mile Water Pipeline Lauderdale County, Mississippi.* Report submitted to Environmental Consulting & Technology, Inc.

2009 **Historian/Architectural Historian.** *Documentation and Evaluation of Coopertown (8DA6767) and the Airboat Association of Florida (8DA6768) and an Assessment of Effects from Modifications to Tamiami Trail, Miami-Dade County, Florida.* Report submitted to URS Corporation.

2009 **Historian/Architectural Historian.** *Atlas E Missile Site 9, National Register of Historic Places Nomination, Lincoln County, Washington.* Report submitted to Potomac Hudson and the General Services Administration for CDC/NIOSH.

2009 **Historian.** *Atlas E Missile Site 9, Oral History Project.* Conducted 10 oral history interviews with individuals associated with the Atlas E Missile Site 9, Reardan Missile Site Laboratory, Lincoln County, Washington. Report submitted to Potomac Hudson and the General Services Administration for CDC/NIOSH.

2009 **Architectural Historian.** *Atlas E Missile Site 9 Preservation Plan, Reardan Missile Site Laboratory, NIOSH Spokane Research Laboratory, Lincoln County, Washington.* Report submitted to Potomac Hudson and the General Services Administration for CDC/NIOSH.

2009 **Architectural Historian.** *Management Summary: Archaeological Inventory and Evaluation of the US 74 Monroe Connector.* Report submitted to Post, Buckley, Shuh & Jernigan, Inc.

2009 **Architectural Historian.** *Mine Roof Simulator, National Register of Historic Places Nomination, Pittsburgh Research Center, Pittsburgh NIOSH Campus, Allegheny County, Pennsylvania.* Report submitted to CDC/NIOSH.

2009 **Architectural Historian.** *Mine Roof Simulator Preservation Plan Pittsburgh Research Center, Pittsburgh NIOSH Campus, Allegheny County, Pennsylvania.* Report submitted to CDC/NIOSH.

2009 **Historian/Architectural Historian.** Cultural *Resource Baseline Inventory of the Battle of Blountville Sullivan County, Tennessee.* Report submitted to Sullivan County, Tennessee.

2009 **Historian.** *Phase I Archaeological Survey of Parcel ED-3 and Historic Assessment of the Happy Valley Worker Camp, Roane County, Tennessee.* Report submitted to SAIC for the Department of Energy.

2009 **Historian/Architectural Historian.** *Beaman Park to Bells Bend: A Community Conservation Project.* Report submitted to the Land Trust of Tennessee.

2009 **Historian**. *Management Summary for the Phase I Archaeological Survey of Extended Parcel ED-3, Roane County, Tennessee.* Report submitted to SAIC for the Department of Energy.

2009 **Architectural Historian.** *Archaeological Work Plan: Cultural Resource Baseline Inventory of the Battle of Blountville.* Report submitted to Sullivan County, Tennessee.

2009 **Architectural Historian.** *Phase I Cultural Resource Survey of a 40-mile CO2 Pipeline, Lauderdale, Clarke, and Jasper Counties, Mississippi.* Report submitted to Environmental Consulting and Technology, Inc.

2009 **Architectural Historian.** *Artifact Curation Plan for the Bruceton Research Center, CDC/NIOSH, Pittsburgh, Pennsylvania.* Report submitted to Potomac Hudson for the General Services Administration.

2008 **Architectural Historian.** *True Tennessee: Natural and Cultural Resources of the Lick Creek Valley, Hickman County.* A community-based effort to document the cultural and natural resources of the Lick Creek Valley, Hickman County, Tennessee. Report prepared for The Land Trust for Tennessee.

2008 **Architectural Historian.** *Management Summary of the Phase I Cultural Resource Survey of a 40 mile CO2 Pipeline, Lauderdale, Clarke, and Jasper Counties, MS.* Report submitted to Environmental Consulting and Technology, Inc.

2008 **Architectural Historian.** *Reardan Missile Silo Laboratory Preservation Plan, National Institute for Occupational Safety and Health (NIOSH) of the Centers for Disease Control and Prevention (CDC), Spokane, Washington.* Report submitted to Potomac Hudson Engineering for the General Services Administration.

2008 **Architectural Historian.** *Historical and Architectural Survey, City of Gallatin, Sumner County Tennessee.* Report submitted to City of Gallitan, Tennessee.

2008 **Architectural Historian.** *Experimental and Safety Research Coal Mines, National Register of Historic Places Nomination Update and Boundary Increase.* Report submitted to General Services Administration and Potomac Hudson Engineering.

2008 **Architectural Historian.** *Historic Resource Inventory West Virginia Central and Pittsburg Railway, Tucker County, West Virginia.* Report submitted to USDA Forest Service Monongahela National Forest.

2008 **Historian.** *Phase 1 Archaeological Survey: Rehabilitation for FDR 597 from SR 1179 to FDR 544*. Report submitted to Kimley-Horn and Associates.

2008 **Historian.** *Phase I Archaeological Survey of Parcel ED-3 and Historic Assessment of the Happy Valley Worker Camp, Roane County, Tennessee*. Report submitted to SAIC for the Department of Energy.

2008 **Historian.** *Archaeological Data Recovery of Site 1Mb418, Gulf Brick and Tile Factory, Thyssenkrupp Steel Mill Development*. Report submitted to U.S. Army Corps of Engineers, Mobile.

2008 **Architectural Historian.** *Historic Resource Inventory West Virginia Central and Pittsburg Railway, Tucker County, West Virginia*. Report submitted to USDA Forest Service Monongahela National Forest.

2007 **Architectural Historian.** *Beaman Park to Bells Bend: A Community Conservation Project*. Report submitted to the Land Trust for Tennessee.

2007 **Architectural Historian.** *Cultural Context and Archaeological Research Design, South Knoxville Waterfront Project*. Report submitted to Hargreaves and Associates.

2007 **Historian.** *Mapping and Determination of Boundaries of the Richards Cemetery at the Crossing at Hickory Hollow, Davidson County, Tennessee*. Report submitted to Littlejohn Engineering Associates.

2007 **Architectural Historian.** *An Architectural Historical Assessment of the GSA Warehouse Property, Springfield, Virginia*. Report Submitted to Tetra Tech.

2007 **Historian.** *Archaeological and Historical Assessment of Selected Timber Stands in Occoneechee State Park (OSP) and Wildlife Management Area (OWMA)*. Report submitted to U.S. Army Corps of Engineers, Wilmington.

2007 **Historian/Architectural Historian.** "*Home of the Engineers": The History and Architecture of the Engineer Proving Ground, Fort Belvoir, Virginia*. Popular history publication.

2007 **Historian.** *Rappahanock River National Wildlife Refuge*. Report submitted to the Federal Highway Administration.

2007 **Architectural Historian.** *Historic Resources Survey, Tennessee State University Agricultural Extension Farm, Cheatham County, Tennessee*. Report submitted to Littlejohn Engineering, Nashville, TN.

2007 **Architectural Historian.** *Historic Resources Survey National Forest Road 597, Uwharrie National Forest, Montgomery County, North Carolina*. Report submitted to Kimley-Horn and Associates.

2006 **Architectural Historian.** *Historic Context, Ammunition Storage District, Glynco Naval*. Report submitted to Dial Cordy Associates and US Army Corps of Engineers, Savannah.

2006 **Architectural Historian.** *An Architectural Survey of the Engineer Proving Ground, Fort Belvoir, Fairfax County, Virginia*. Report submitted to Tetra Tech and the USACE-Mobile.

2006 **Architectural Historian.** *Experimental Mine Preservation Plan: Bruceton Research Center, Pittsburgh NIOSH Campus, Allegheny County, Pennsylvania*. Report submitted to General Services Administration Southeast Sunbelt Region by Potomac-Hudson Engineering, Inc.

2006 **Architectural Historian.** *Cultural Resources Assessment of the National Institute for Occupational Safety and Health (NIOSH) Center for Disease Control and Prevention (CDC) National Sites and Facilities: Cincinnati, Ohio; Morgantown, West Virginia; Pittsburgh, Pennsylvania; and Spokane, Washington.* Report submitted to General Services Administration and Potomac Hudson Engineering.

2006 **Architectural Historian.** *University of the South Domain Archaeological and Historic District.* Architectural resource survey and draft National Register of Historic Places nomination.

2006 **Architectural Historian.** *Phase II History/Architecture Investigations Standard Report: MOT-Great Miami Boulevard, City of Dayton, Montgomery County, Ohio.* Prepared for Miami Valley Regional Planning Commission, Dayton, Ohio.

2005 **Architectural Historian.** *Historic Property Management Plan, Monongahela National Forest, West Virginia.* Conducted an architectural survey of 135 historic properties in the Monongahela National Forest (MNF). The MNF extends across 10 counties and covers an area of more than 910,000 acres. The survey produced a comprehensive database of survey forms and photographs on all surveyed properties for the National Forest Service.

SPECIALIZED TRAINING

- The Section 106 Essentials, Advanced Training, Advisory Council on Historic Preservation, 2008

PROFESSIONAL AFFILIATIONS

- Tennessee Preservation Trust
- Historic Nashville, Inc.
- Southeast Society of Architectural Historians
- Vernacular Architecture Forum

PRESENTATIONS

"The Architecture of Spaceflight: Historic Properties at NASA's John F. Kennedy Space Center in Florida and White Sands Space Harbor in New Mexico"
Presented to the annual conference of the Southeast Society of Architectural Historians (SESAH - 2012).

"Rural Landscape Preservation in Davidson County, Tennessee: The Beaman Park to Bells Bend Community Conservation Project"
Presented to the Tennessee Preservation Trust annual statewide conference (2008) and the National Trust for Historic Preservation annual conference (2010).

"Sandstone Piety: Architecture and Landscape at the University of the South, Sewanee, Tennessee"
Results of the architectural history survey and evaluation of the University Domain, presented to the Sewanee Trust for Historic Preservation (2006) and to the annual conference of the Southeast Society of Architectural Historians (2006).