

# LIMITED HYDROGEOLOGICAL ASSESSMENT REPORT FOR INACTIVE CCR LANDFILL

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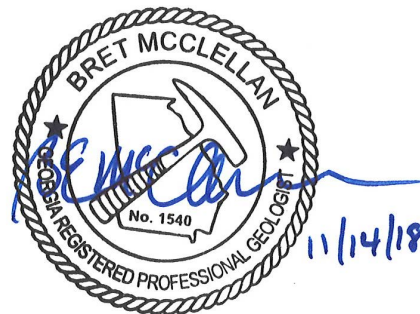
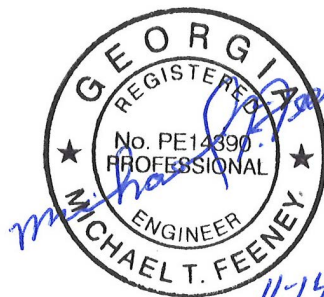
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FORMER PLANT ARKWRIGHT – AP1 LANDFILL  
MACON-BIBB COUNTY, GEORGIA  
FOR



# Georgia Power

November 2018



## JACOBS

## EXECUTIVE SUMMARY

The closure of AP1 Landfill was previously approved by the Environmental Protection Division (EPD), and a Closure Certificate was issued in 2010. This report presents the results of the limited hydrogeological assessment that was prepared to obtain a CCR unit solid waste handling permit, as required by EPD's Solid Waste Management Rule 391-3-4-.10. Georgia Power plans to remove the CCR in AP1 Landfill as part of an updated closure plan for this permit application. The following key points are discussed in the report:

- Small sections of AP1 Landfill, namely the low portions of the slopes along the river, are located within the 100-year floodplain.
- No wetland areas were delineated within the AP1 Landfill permit boundary.
- The site complies with local zoning and land use ordinances.
- The general geology of the site consists of unconsolidated riverine deposits such as clays, silty and sandy clays, silty sands, and sandy silts. More consolidated materials encountered at lower elevations consist of silty sand saprolite and bedrock. Borings performed during a 2018 site investigation indicate the soils are underlain by extremely weathered quartzofeldspathic gneiss, hornblende gneiss, and schist.
- No unstable areas were encountered during the site investigation. Additionally, no pipes, utilities, or other penetrations through or beneath the unit were identified.

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## 1. BACKGROUND AND OBJECTIVE

Commercial operation of Plant Arkwright began in 1941. The operation consisted of four 40-megawatt units and produced approximately 25,000 tons of CCR annually. The plant was retired in 2002 and decommissioned in 2003. Only an active substation remains at the property along with the CCR units, which were utilized for the disposal of the CCR produced onsite. Former Plant Arkwright has multiple onsite CCR units: AP1 Landfill, AP2-DAS Landfill, and AP3 Landfill and Monofill. Only AP1 Landfill will be discussed for the purposes of this report since the other CCR units will be submitted under separate permit applications.

AP1 Landfill was constructed prior to 1958 and was closed with two feet of soil cover and vegetation in 1990. Regrading and stabilization of the riverbank and creek bank occurred in two phases in 2004 and 2007. The stabilization along the riverbank consisted of constructing gabions along segments of the Ocmulgee River, adding riprap to two heavily wooded segments, and planting willows to help further stabilize the riverbank. The Beaverdam Creek bank was stabilized using riprap only. Additionally, the slopes and top of AP1 Landfill were regraded by relocating CCR and placing additional cover soil.

AP1 Landfill was issued a Closure Certificate by EPD on July 30, 2010 under solid waste handling permit number 011-030D(LI). Per Section 391-3-4-.10(9) of Georgia EPD's Rules of Solid Waste Management, all CCR units must complete and submit a CCR permit application by November 22, 2018. Georgia Power plans to remove the CCR in AP1 Landfill, necessitating generation of this report for inclusion in a CCR solid waste handling permit application for an Inactive CCR landfill.

## 2. DESCRIPTION OF GENERAL SITE AREA

Former Plant Arkwright is located in rural Bibb County, Georgia, approximately 6 miles northwest of the city of Macon, Georgia, and occupies approximately 230 acres along the Ocmulgee River. AP1 Landfill is located south of the former plant area and is bordered by the Ocmulgee River, Beaverdam Creek, and a Norfolk Southern Railroad (Appendix A, Figure 1). The CCR waste footprint covers approximately 31.22 acres.

Former Plant Arkwright is in the northern part of Bibb County, which is in the Piedmont province of the Appalachian Highland Physiographic District. The Piedmont Plateau occupies the northern half of Bibb County. The topography is rolling to hilly and the highest parts rise to about 800 feet above sea level. The main streams, having adjusted their courses to the structure of the underlying crystalline rocks, flow eastward to join the through-flowing Ocmulgee River, which receives the entire drainage of the county. Regionally, igneous and metamorphic rocks are exposed in the extreme northern part of Bibb County where the site is located. Many of them are granitic, being true granite, biotite-granite gneiss, or a granite component in a diorite injection complex. All these rocks are highly weathered and where exposed are generally soft and friable (LeGrand, 1962). A geologic map of the area is included as Figure 2 in Appendix A.

The general geology of the site consists of unconsolidated riverine deposits such as clays, silty and sandy clays, silty sands, sandy silts, and minor gravel. More consolidated materials encountered at lower elevations consist of silty sand saprolite and bedrock. Recent and historic borings indicate the soils are underlain by extremely weathered quartzofeldspathic gneiss, hornblende gneiss, and schist.

Groundwater at AP1 Landfill generally flows eastward, with a minor southerly flow component at its southern tip. Figure 3 in Appendix A of this report provides a representation of the site's potentiometric



surface. Data used for generation of the potentiometric contours is provided in Appendix B. Boring logs and temporary well information are provided in the Groundwater Monitoring Plan dated November 2018. The CCR will be removed from AP1 Landfill, which may affect the site's potentiometric surface. However, it is not expected that removal of CCR will affect the general direction of groundwater flow.

### **3. PROXIMITY TO FLOODPLAINS**

Per FEMA Insurance Rate Map 13021C0040G, small sections of AP1 Landfill, namely the low portions of the eastern, western, and southern slopes, are within the 100-year floodplain of the Ocmulgee River (Appendix A, Figure 4). Since CCR will be removed from AP1 Landfill, it will not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in a washout of solid waste.

### **4. PROXIMITY TO STREAMS AND WETLANDS**

An Ecological Resource Survey was completed in 2018 for the former Plant Arkwright property to identify ecological resources including Waters of the United States, state waters, and protected species habitats. AP1 Landfill is located on the western bank of the Ocmulgee River and is bordered by Beaverdam Creek to the south. The Ocmulgee River flows from north to south, and Beaverdam Creek flows from the northwest to the southeast, discharging into the Ocmulgee River near the southern tip of AP1 Landfill. No wetland areas were identified within the AP1 Landfill permit boundary. The Ecological Resource Survey is provided in Appendix C.

### **5. UNSTABLE AREAS**

Onsite soil conditions that may result in significant differential settling, local geologic/geomorphologic features, and human-made surface and subsurface features within the permit boundary were studied during the preparation of this permit application. No unstable areas within the AP1 Landfill permit boundary were identified. In addition, no pipes, utilities, or other penetrations through or beneath the unit were identified.

### **6. ZONING AND NOTIFICATION**

A letter from Macon-Bibb County indicating that the site complies with local zoning and land use ordinances is provided in Section 3 of the permit application.

### **7. CCR DEPTH AND SUBSURFACE SOILS**

Based on a subsurface investigation performed in 2018, the depth of CCR ranges from approximately 37.5 feet below grade in the southern section of AP1 Landfill to approximately 1 foot below grade in its northern section. The average CCR thickness is approximately 17.7 feet. In the central section of the site, there are locations where CCR was not encountered, indicating significant variability in CCR thickness across AP1 Landfill.

Based on borings completed during the 2018 subsurface investigation, soils encountered beneath the bottom of CCR consisted of minor clays with loose silts and sands, indicative of riverine deposits. Weathered rock (schist) was encountered at depths ranging from approximately 36 feet below grade in the northern section of the site to 66 feet below grade in the southern section. Each boring was terminated within the weathered rock zone prior to encountering consolidated bedrock. Per the soil

descriptions generated during drilling, the overburden thickness is at least 36 feet in the northern section of the site and at least 20 feet below the bottom of CCR in the southern section.

Depth to groundwater measurements obtained during the site investigation indicate water levels ranging from approximately 15.4 feet to 22.5 feet below grade in the northern section of the site and approximately 43.5 feet to 53.9 feet in the southern section.

Boring logs generated from the subsurface investigation are provided in the Groundwater Monitoring Plan dated November 2018.

## **8. REFERENCES CITED**

LeGrand, H.E., Geology and Ground-Water Resources of the Macon Area, Georgia; Georgia Geological Survey Bulletin 72, page 35; 1962.

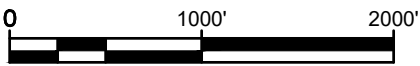
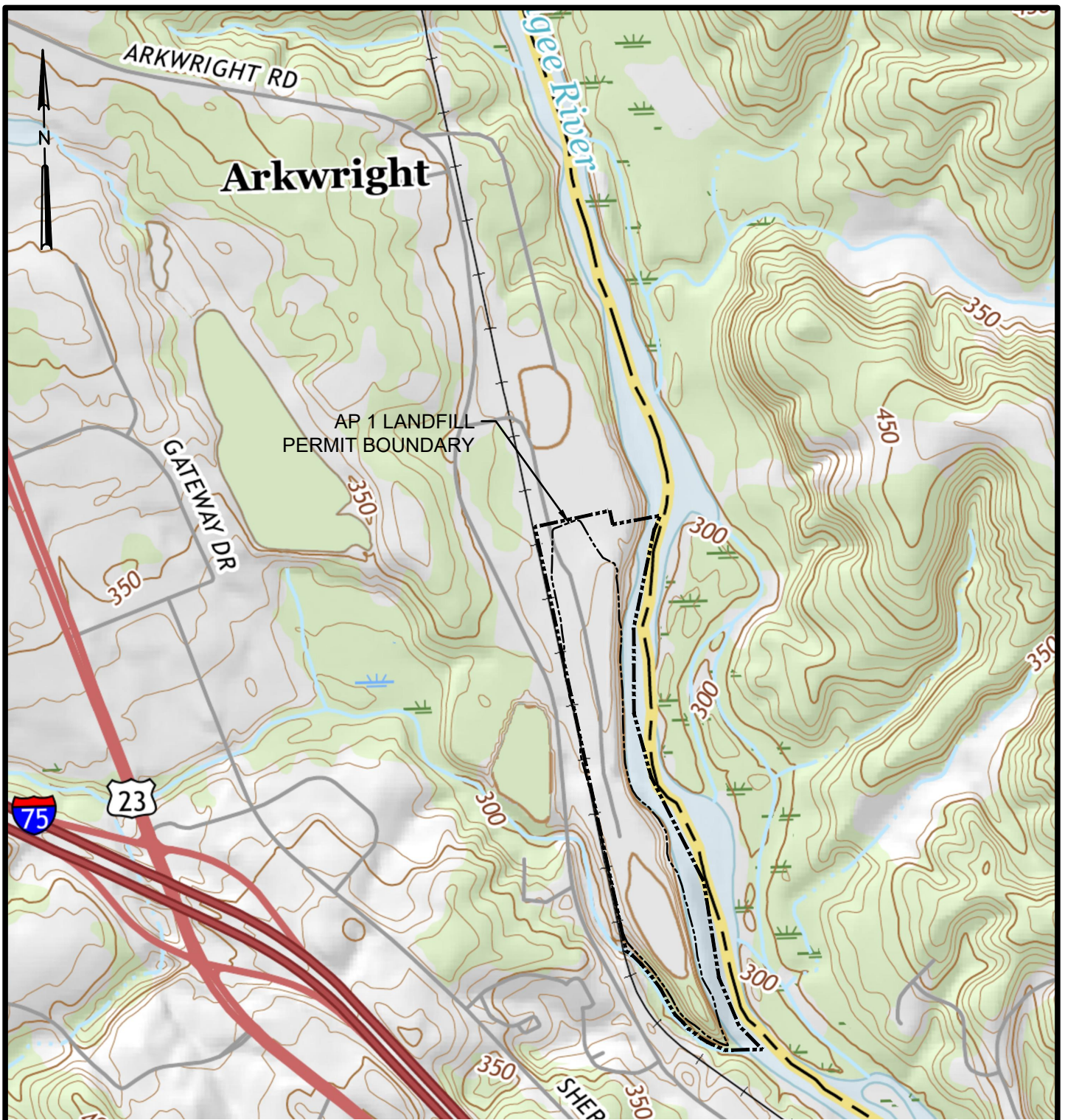
## Appendix A. **Figures**

**Figure 1 – Topographical Map of General Area**

**Figure 2 – Geologic Map of General Area**

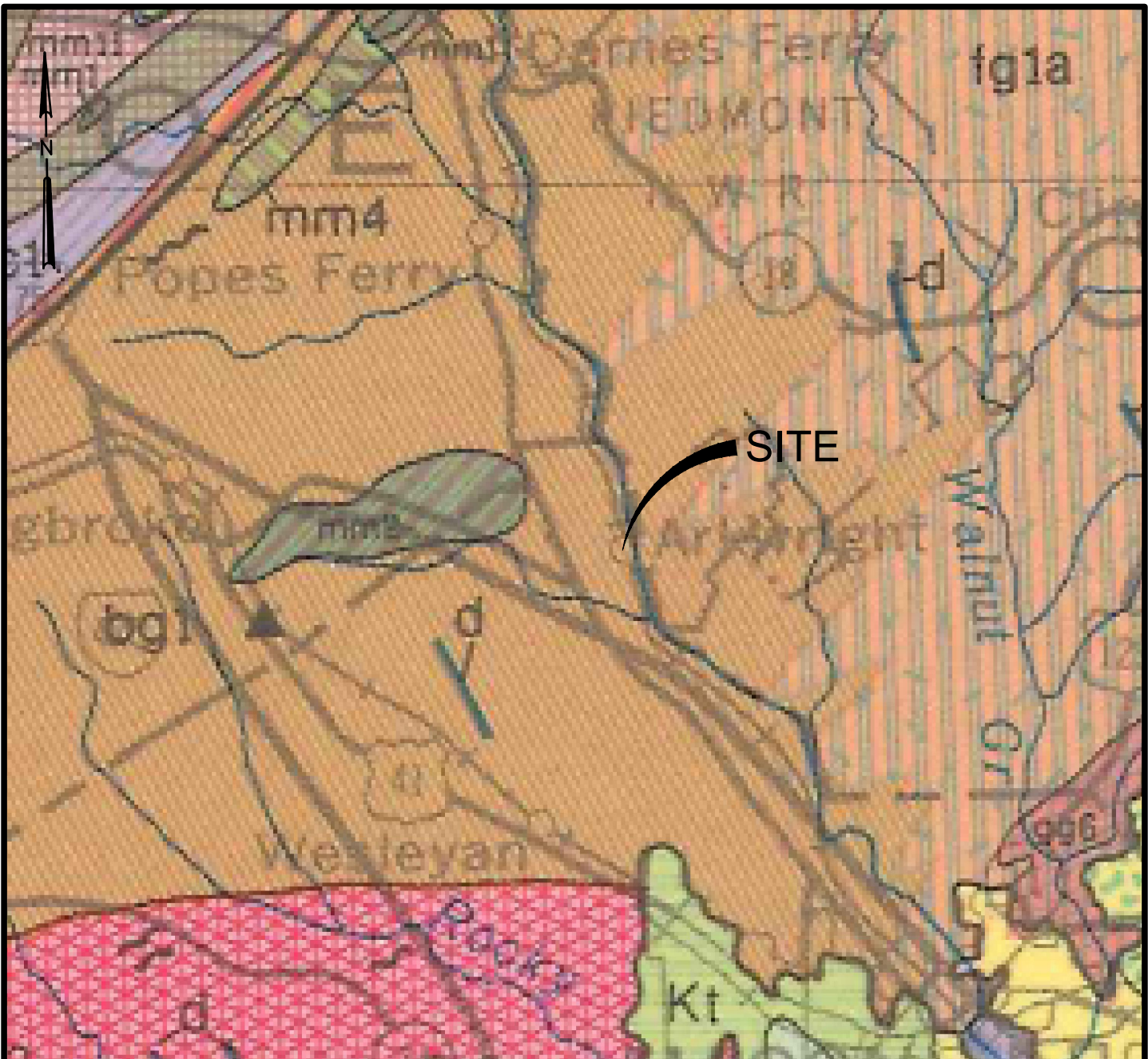
**Figure 3 – Potentiometric Surface Map**

**Figure 4 – Topographical and Flood Plain Map**



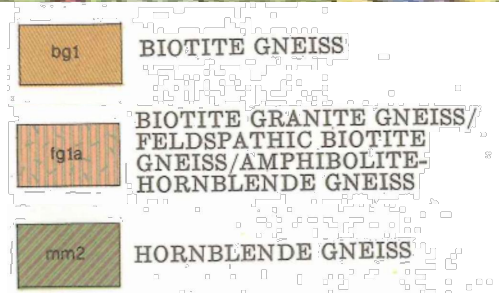
	Former Plant Arkwright AP1 Landfill	PROJECT NO.: 35DK9206 DATE: November 2018 SCALE: AS SHOWN
	Topographical Map of General Area	SHEET NO.: <b>Figure 1</b>





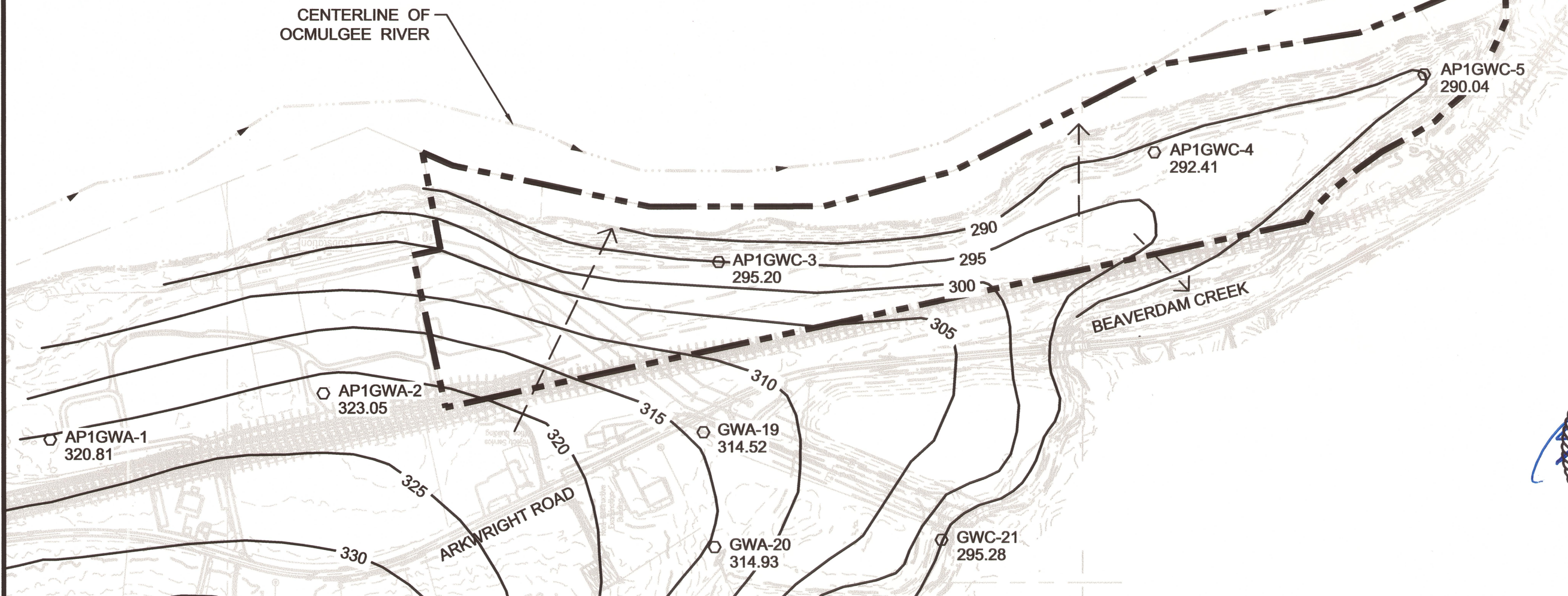
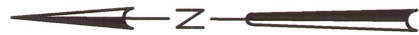
Geological Map of Georgia  
 Atlanta  
 1976  
 Reprinted 1997  
 Georgia Department of Natural Resources

APPROXIMATE SCALE: 1" = 2 MILES



<b>JACOBS</b>	Former Plant Arkwright AP1 Landfill	PROJECT NO.: 35DK9206 DATE: November 2018 SCALE: AS SHOWN
	Geologic Map of General Area	SHEET NO.: <b>Figure 2</b>









**NOTES:**

1. GROUNDWATER LEVELS COLLECTED BY ATLANTIC COAST CONSULTING, LLC. ON SEPTEMBER 11, 2018.
2. TOPOGRAPHIC SURVEY PROVIDED BY DONALDSON, GARRETT & ASSOCIATES, INC., JUNE 2018.
3. GROUNDWATER WELLS GWA-19, GWA-20, & GWC-21 ARE AP2-DAS LANDFILL MONITORING WELLS AND WERE USED TO CREATE POTENTIOMETRIC CONTOURS.

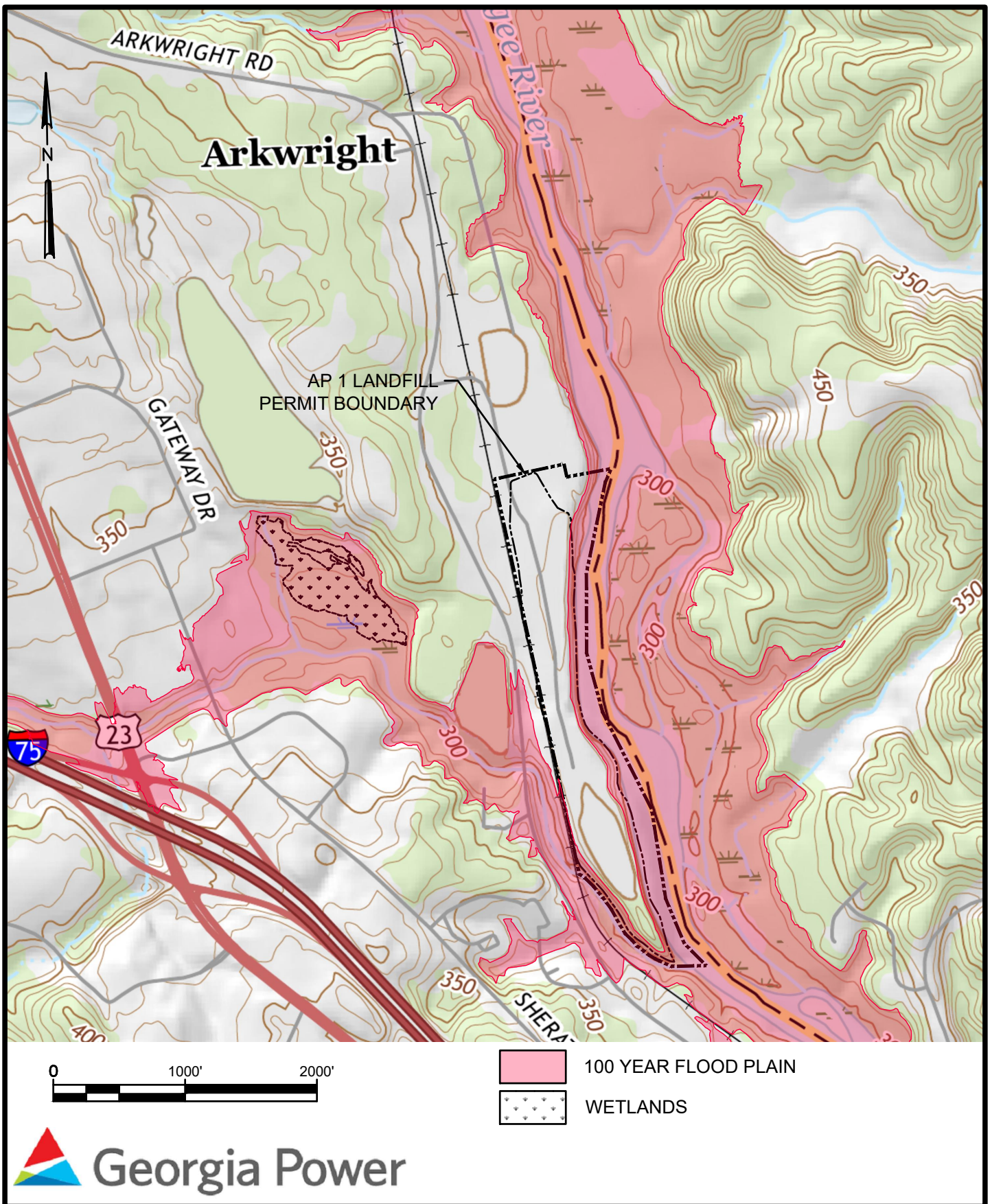
**LEGEND**

-  PERMIT BOUNDARY
-  POTENTIOMETRIC CONTOUR LINE
-  TEMPORARY GROUND WATER MONITORING WELL AND GROUNDWATER ELEVATION
-  GROUNDWATER FLOW DIRECTION



<b>JACOBS</b>	FORMER PLANT ARKWRIGHT AP1 LANDFILL	PROJECT NO.: 35DK9206 DATE: NOVEMBER 2018 SCALE: AS SHOWN
	<b>POTENTIOMETRIC SURFACE MAP</b>	FIGURE NO.: <b>3</b>





<b>JACOBS</b>	Former Plant Arkwright AP1 Landfill	PROJECT NO.: 35DK9206 DATE: November 2018 SCALE: AS SHOWN
	Topographical and Flood Plain Map	SHEET NO.: <b>Figure 4</b>

## Appendix B. Groundwater Data

### Table 1 – Groundwater Well Data



**Table 1. Groundwater Well Data**

<b>Monitoring Well ID</b>	<b>TOC Elevation (ft MSL)</b>	<b>Well Depth (ft BTOC)</b>	<b>Depth to Water (ft BTOC)</b>	<b>GW Elevation (ft MSL)</b>
AP1GWA-1	345.44	37.61	24.63	320.81
AP1GWA-2	341.42	31.19	18.37	323.05
AP1GWC-3	345.93	53.95	50.73	295.20
AP1GWC-4	339.29	51.14	46.88	292.41
AP1GWC-5	347.98	66.91	57.94	290.04

Notes:

1. Groundwater levels were measured on September 11, 2018.
2. TOC = top of casing (i.e., riser pipe).
3. All depths measured in feet below top of casing (BTOC).
4. Elevations measured in feet from mean sea level (MSL) (NGVD 1929).

## Appendix C. **Ecological Resource Survey**

# Memorandum



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<b>Subject</b>	Ecological Resource Survey	<b>Project Name</b>	Plant Arkwright
<b>Attention</b>	Bret McClellan	<b>Project Location</b>	Bibb County, GA
<b>From</b>	Stacy Stewart		
<b>Date</b>	October 17, 2018		
<b>Copies</b>	File		

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## **Overview**

Jacobs Engineering, Inc. was contracted to evaluate environmental features located on the Plant Arkwright property in Bibb County, approximately six miles northwest of Macon, Georgia. Field studies to identify ecological resources, including Waters of the United States (US), state waters, and protected species habitat was conducted by Jacobs on March 7, 2018, March 22, 2018, April 10, 2018, May 1-3, 2018, and May 8, 2018.

## **Methodology**

An assessment of jurisdictional Waters of the US within the proposed project area was conducted using the following as aids: US Geological Survey topographic quadrangles, US Fish and Wildlife Service (USFWS) National Wetland Inventory maps, US Department of Agriculture Natural Resources Conservation Service Soil Survey Maps for Bibb County, and aerial photography. Wetland locations were determined using methodologies outlined in the 1987 US Army Corps of Engineers (USACE) Wetlands Delineation Manual and the Regional Supplement to the USACE Wetland Delineation Manual: Eastern Mountains and Piedmont (Version 2.0). This multi-parameter approach requires positive evidence of the following three criteria: hydrophytic vegetation, hydric soils, and wetland hydrology.

Areas were considered jurisdictional wetlands if they exhibited evidence of all three of the above wetland criteria. A low-medium-high rating system was used to evaluate wetland sites in terms of their ability to perform their associated functions. Factors considered included type of habitat (i.e. forested, emergent, etc.), vegetation diversity, hydrology, size, surrounding landscape, wildlife habitat, wildlife corridors, and size/type of stream course.

In addition, the Georgia Environmental Protection Division's (EPD) Guide to Determining State Waters Requiring Buffers and the North Carolina Division of Water Quality (NCDWQ) Methodology for Identification of Intermittent and Perennial Streams and Their Origins (Version 4.11) were used as aids to determine state and federal jurisdiction of drainage features. Areas were considered jurisdictional streams if they exhibited an ordinary high water mark, well-defined channel, and showed evidence of base flow at times other than major storm events.

To prepare field personnel for evaluating protected species habitat, desktop reviews of federal, state, and private published reference material were conducted prior to the project survey. Referenced resources

Plant Arkwright  
Bibb County, GA



included the USFWS Information for Planning and Consultation (IPaC) database for Bibb County; Georgia Department of Natural Resources (GDNR) Element Occurrence by County database; and the GDNR Rare Species Profiles website database.

### **Habitats and Land Use Areas**

Field studies identified three habitat types within the project survey area: ruderal, mixed pine hardwood, and Waters of the US. Land use within the vicinity of the survey area primarily consisted of residential, light commercial development, and roadway/railroad right-of-way (ROW). The following discussion briefly summarizes each habitat type identified within the project survey area.

**Ruderal** – This community is characterized by habitats that are currently manipulated by human activities, including, but not limited to, roadway/railroad ROW, utility ROW, and residential /light commercial properties. Vegetation within this habitat is frequently mowed and includes fescue species (*Festuca* spp.), crabgrass (*Digitaria ciliaris*), annual ragweed (*Ambrosia artemisiifolia*), Japanese honeysuckle (*Lonicera japonica*), dog fennel (*Eupatorium capillifolium*), and goldenrod (*Solidago* spp.).

**Mixed Pine Hardwood** – This habitat type is dominated by early to mid-successional forested areas. Dominant vegetation within this habitat consists of loblolly pine (*Pinus taeda*), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), yellow poplar (*Liriodendron tulipifera*), water oak (*Quercus nigra*), and Chinese privet (*Ligustrum sinense*).

**Waters of the US** – Jurisdictional features present along the project corridor include one open water, one wetland, five intermittent streams, and four perennial streams. A detailed description of each feature is included below in the section titled State and Federal Water Identification and Description.

### **State and Federal Protected Species**

Based on the IPaC database, two federal protected species are known to occur in Bibb County [fringed campion (*Silene polypetala*) and relict trillium (*Trillium reliquum*)]. According to GDNR element occurrence records, two additional state listed species are known to occur within the same quarter quad (Macon NW, Georgia) of the survey area [Altamaha shiner (*Cyprinella xaenura*) and robust redhorse (*Moxostoma robustum*)]. Please see below for a brief description of each protected species.

**Fringed campion** (*Silene polypetala*, federal and state endangered) – The fringed campion is a perennial herb with stems growing up to 16 inches tall and occurs in mature hardwood forests. Within this habitat, it can be found in low-acid sandy loam soils on moist, mid to lower slopes, river-bluffs, well shaded ridge crests, and small terraces. The fringed campion often occurs in association with oak-leaf hydrangea (*Hydrangea arborescens*), blue palmetto (*Sabal palmetto*), and rhododendron (*Rhododendron minus*). The range of the fringed campion is restricted to only Georgia and Florida. Within Georgia, there are about 30 known populations along the Chattahoochee, Flint, and Ocmulgee River drainages and it has been recorded in Bibb, Crawford, Decatur, Houston, Talbot, Taylor, Twiggs, and Upson counties. Threats to this species include logging of hardwood slopes, overbrowsing, and invasion by exotic plants.

Field investigations determined no suitable habitat exists within the survey area for the fringed campion. Forested areas within the Plant Arkwright site were secondary successional and considered to be too disturbed to support this species. Furthermore, no associate species such as oak-leaf hydrangea, blue

palmetto, or rhododendron were identified. Site surveys were conducted during the recommended flowering period, and no individuals or populations of fringed campion were identified.

**Relict trillium** (*Trillium reliquum*, federal and state endangered) – Relict trillium is a perennial herb that produces a hairless, curved stem that measures from two to seven inches long. This species can be found on moist slopes, bottomlands, and floodplains of mesic hardwood forests. It prefers soils ranging from rocky clays to alluvial sands with high organic matter over calcium-rich bedrock such as amphibolite or limestone. This plant can typically be found in the vicinity of creeks or rivers, often in rich ravines and on stream terraces. This species grows with a variety of species in areas that lack fire as a disturbance. Relict trillium may inhabit disturbed areas such as power and sewer ROWs and after activities such as quarrying, agriculture, and road building; however, the moisture regime must remain mesic. The range of this species includes Alabama, Georgia, and South Carolina. In Georgia, there are approximately 40 known populations, eight of which are on protected lands. Threats to this species include clearing of hardwood slope forest, over-browsing by deer, and competition from exotic plants.

Suitable habitat for the relict trillium was observed within the survey area. Field surveys were conducted during the recommended flowering period, and although other trillium species were identified, no individuals or populations of relict trillium were observed.

**Altamaha shiner** (*Cyprinella xaenura*, state threatened) – The Altamaha shiner is a larger minnow species, reaching lengths of up to 4.3 inches. This species inhabits small streams and tributaries and are often found in small pools with rocky to sandy substrate. This species particularly prefers cool pools that are behind obstacles along and under banks. Altamaha shiners are common to the Piedmont portion of the upper Altamaha River drainage of north central Georgia, from both the Ocmulgee and Oconee River systems. Primary threats to this species are degradation and impoundment of tributary streams in the upper Altamaha drainage.

Suitable habitat for the Altamaha shiner exists within Perennial Stream 2 (Beaver Dam Creek). An aquatic survey would be needed to determine the absolute presence/absence of this species. However, because the species is not federally protected, an aquatic survey is not required for permitting or construction activity on or near Beaver Dam Creek.

**Robust redhorse** (*Moxostoma robustum*, state endangered) – The robust redhorse is a large, freshwater sucker measuring up to 28 inches long that is typically known from habitats in main-stem rivers. This species can be found in riffles, runs, and pools with swift, moderately deep waters over silty to rocky substrate. Populations in the Oconee and Savannah Rivers are frequently found in association with tree snags and woody debris. Historically, the robust redhorse ranged from the Altamaha River in Georgia to the Pee Dee of North and South Carolina in southeastern Atlantic slope river drainages. In Georgia, this species is known to occur in the Oconee River downstream of Milledgeville and the Savannah River downstream of Augusta. Furthermore, spawning has been infrequently observed in the Broad and Ocmulgee rivers. Threats to this species include hazardous industrial spills, habitat degradation from poor land-use practices, excess sedimentation and water withdrawals. Other hazards include predation from introduced species including the blue catfish (*Ictalurus furcatus*) and flathead catfish (*Pylodictis olivaris*).

Suitable habitat for the robust redhorse exists within Perennial Stream 1 (Ocmulgee River), and there are known historical occurrences of this species within the river. The robust redhorse is not federal protected, so an aquatic survey is not required for permitting or construction activities.

### Bald and Golden Eagles

The Bald Eagle Protection Act of 1940 provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds.

**Bald eagle** (*Haliaeetus leucocephalus*, state threatened) – The bald eagle is a raptor with a dark brown body with a white head and tail. The legs, eyes, feet, and bill are yellow. The USFWS removed the bald eagle as threatened under the Endangered Species Act (ESA) on August 8, 2007, and in May 2007 published in the National Bald Eagle Management Guidelines to assist the public in understanding protections afforded to and prohibitions related to the bald eagle under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d) (Eagle Act), the Migratory Bird Treaty Act (16 U.S.C. 703-712), and the Lacey Act (16 U.S.C. 3371-3378). The Eagle Act prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Eagle Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

In Georgia, the bald eagle finds habitat along inland waterways and estuarine areas, selecting areas with low human disturbance, suitable forest structure, and abundant prey. It typically nests in the largest tree in its chosen territory. Nest sites are usually near water, with large individual trees, and little overall human disturbance. This species prefers nest sites within 0.5 miles of water. The bald eagle usually forages within approximately one mile of its nest site during breeding season.

Field studies did not identify any bald eagle specimens or nests within the project survey area. According to GDNR occurrence records, no bald eagle nests are known to occur within the project quarter quad. Additional early coordination for known nests locations within a 3-mile radius should be conducted prior to any construction activities to further ensure no take of the bald eagle.

### Critical Habitat

Critical habitat, as defined under the ESA, identifies specific geographic areas that include physical and biological features essential to the conservation of a federally listed protected species. No designated critical habitat occurs within the vicinity of the proposed project or within Bibb County.

### Essential Fish Habitat

In compliance with the Magnuson-Stevens Fishery Conservation and Management Act, unavoidable adverse impacts to Essential Fish Habitat (EFH) must be identified. The proposed project does not occur in any of the coastal counties of Georgia which contain EFH; therefore, there would be no impacts to EFH.

### State and Federal Water Identification and Description

Field surveys identified a total of 11 jurisdictional Waters of the US: one open water, one wetland, five intermittent streams, and four perennial streams. A brief description of the features identified during field studies is included below.

**Open Water 1 (OW 1)** – Open Water 1 is located upstream of Perennial Stream 4 at the northern end of the site. Open Water 1 is a man-made pond but has both an inlet and outlet stream, making it a buffered state water and a jurisdictional resource. The functional riparian buffer of the pond is greater than 50 feet wide along all banks and is dominated by maintained grass and loblolly pine. This system is considered



somewhat impaired due to buffer maintenance and sedimentation from disturbance upstream. At the time of survey, the water was cloudy but no foul odors were detected. Open Water 1 does not provide suitable habitat for any federal or state protected species.

**Wetland 1 (WL 1)** – One palustrine forested wetland (PFO1B) was located in the central portion of the project survey area downstream of Perennial Stream 4 and upstream of Intermittent Stream 5 and Perennial Stream 2 (Beaver Dam Creek). This forested wetland is dominated by canopy and understory trees consisting of sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), and Chinese privet (*Ligustrum sinense*). In wetter areas, the herbaceous layer is dominated by lizard tail (*Saururus cernuus*) and netted chain fern (*Woowardia areolata*). Hydric soils were identified throughout the area (depleted matrix).

**Intermittent Stream 1 (IS 1)** – Intermittent Stream 1 is a warm water, intermittent stream with a streambed composed of sand (R4SB4). This system is located on the west side of OW 1. The intermittent characteristics observed within this system include the presence of baseflow and wretched vegetation. During the field survey, a NCDWQ data form was completed, which ranked this system as an intermittent stream. The functional riparian buffer of this system is greater than 50 feet wide along both banks and is dominated by maintained grass. This system is considered fully impaired due to buffer maintenance, bank erosion, sedimentation, and a rock ford which has been constructed in the upper part of the channel to allow maintenance vehicles to pass. At bankfull, the channel is approximately 3-4 feet wide and two feet deep with a wetted width of approximately 1-2 feet. At the time of the survey, the depth of the stream was approximately 0.5-1 foot, the water was cloudy, and no foul odors were detected. Intermittent Stream 1 is not listed on the most current 303(d) list. This stream is considered a buffered state water and would require a 25-foot protective buffer. Intermittent Stream 1 does not provide suitable habitat for any federal or state protected species and consideration of fish passage would not be required for this system.

**Intermittent Stream 2 (IS 2)** - IS 2 is a warm water, intermittent stream with a streambed composed of sand (R4SB4). This system is located on the west side of the site near the existing Arkwright-Forest Road 115kV transmission line and flows south to Beaver Dam Creek (Perennial Stream 2). The intermittent characteristics observed within this system include the presence of baseflow and wretched vegetation. During the field survey, a NCDWQ data form was completed, which ranked this system as an intermittent stream. The functional riparian buffer of this system is greater than 50 feet wide along both banks and is composed of maintained utility right-of-way and mixed pine-hardwood species. This system is considered fully impaired due to buffer clearing and maintenance, severe erosion, and sedimentation from disturbance upstream. At bankfull, the channel is approximately 3-5 feet wide and 2-4 feet deep with a wetted width of approximately 2-3 feet. At the time of the survey, the depth of the stream was approximately 0.5-1 foot, the water was cloudy, and no foul odors were detected. Intermittent Stream 2 is not listed on the most current 303(d) list. This stream is considered a buffered state water and would require a 25-foot protective buffer. This stream does not provide suitable habitat for any federal or state protected species and consideration of fish passage would not be required for this system.

**Intermittent Stream 3 (IS 3)** – Intermittent Stream 3 is a warm water, intermittent stream with a streambed composed of sand (R4SB4). This system flows south, parallel to IS 2 within the ROW of an existing transmission line. The intermittent characteristics observed within this system include the presence of baseflow and wretched vegetation. During the field survey, a NCDWQ data form was completed, which ranked this system as an intermittent stream. The functional riparian buffer of this system is greater than 50 feet wide along both banks and is composed of maintained utility right-of-way. This system is considered somewhat impaired due to buffer clearing, severe bank erosion, and sedimentation from disturbance upstream. At bankfull, the channel is approximately two feet wide and one foot deep with a wetted width of





approximately one foot. At the time of the survey, the depth of the stream was approximately 0.5 foot, the water was cloudy, and no foul odors were detected. Intermittent Stream 3 is not listed on the most current 303(d) list. This stream is considered a buffered state water and would require a 25-foot protective buffer. Intermittent Stream 3 does not provide suitable habitat for any federal or state protected species and consideration of fish passage would not be required for this system.

**Intermittent Stream 4 (IS 4)** – Intermittent Stream 4 is a warm water, intermittent stream with a streambed composed of sand and mud (R4SB45). This system is located adjacent to Wetland 1 and flows to IS 2. The intermittent characteristics observed within this system include the presence of baseflow and wretched vegetation. During the field survey, a NCDWQ data form was completed, which ranked this system as an intermittent stream. The functional riparian buffer of this system is greater than 50 feet wide along both banks and is composed of mixed pine hardwood species and some areas of maintained utility ROW. This system is considered somewhat impaired due to bank erosion and sedimentation. At bankfull, the channel is approximately 3-5 feet wide and 1-2 feet deep with a wetted width of approximately one foot. At the time of the survey, the depth of the stream was approximately 0.5 foot, the water was cloudy, and no foul odors were detected. Intermittent Stream 4 is not listed on the most current 303(d) list. This stream is considered a buffered state water and would require a 25-foot protective buffer. This stream does not provide suitable habitat for any federal or state protected species and consideration of fish passage would not be required for this system.

**Intermittent Stream 5 (IS 5)** – Intermittent Stream 5 is a warm water, intermittent stream with a streambed composed of sand and mud (R4SB45). This system is located to the south of Wetland 1 and flows to Beaver Dam Creek (Perennial Stream 2). The intermittent characteristics observed within this system include the presence of baseflow and wretched vegetation. During the field survey, a NCDWQ data form was completed, which ranked this system as an intermittent stream. The functional riparian buffer of this system is greater than 50 feet wide along both banks and is composed of mixed pine hardwood species. This system is considered somewhat impaired due to bank erosion and sedimentation. At bankfull, the channel is approximately 4-5 feet wide and 2-3 feet deep with a wetted width of approximately 1-2 feet. At the time of the survey, the depth of the stream was approximately 0.5 foot, the water was cloudy, and no foul odors were detected. Intermittent Stream 5 is not listed on the most current 303(d) list. This stream is considered a buffered state water and would require a 25-foot protective buffer. This stream does not provide suitable habitat for any federal or state protected species and consideration of fish passage would not be required for this system.

**Perennial Stream 1 (PS 1)** - Perennial Stream 1 is the Ocmulgee River, a warm water stream with a substrate composed of sand, silt, and cobble-gravel (R2UB12). The perennial characteristics observed within this system include the presence of baseflow and wretched vegetation. During the field survey, a NCDWQ data form was completed, which ranked this system as a perennial stream. The functional riparian buffer of this system is greater than 50 feet wide along both banks, and is composed of mixed pine hardwood species. This system is considered somewhat impaired due to bank erosion, sedimentation, and pollution. At bankfull, the channel is approximately 150-200 feet wide and 15 feet deep with a wetted width of approximately 140-185 feet. Within the survey area, Perennial Stream 1 is not listed on the most current 303(d) list, but it does become listed approximately 10 miles downstream. This stream is a state water and would require a 25-foot protective buffer. Perennial Stream 1 provides suitable habitat for one state protected species, the robust redhorse. Consideration of fish passage would be required for any proposed impacts to this system.





**Perennial Stream 2 (PS 2)** - Perennial Stream 2 is Beaver Dam Creek, a tributary to PS 1 (Ocmulgee River). Perennial Stream 2 is a warm water stream with a substrate composed of sand and silt (R2UB2). The perennial characteristics observed within this system include the presence of baseflow and wretched vegetation. During the field survey, a NCDWQ data form was completed which ranked this system as a perennial stream. The functional riparian buffer of this system is greater than 50 feet wide along both banks, and is composed of mixed pine hardwood species. This system is considered somewhat impaired due to bank erosion, sedimentation, and roadway pollutants. At bankfull, the channel is approximately 45-50 feet wide and 4-8 feet deep with a wetted width of approximately 30-40 feet. At the time of the survey, the depth of the stream was approximately 1-3 feet, the water was cloudy, and no foul odors were detected. Perennial Stream 2 is not listed on the most current 303(d) list. This stream is a state water and would require a 25-foot protective buffer. This stream does not provide suitable habitat for any federal protected species but does provide habitat for the state protected Altamaha shiner. Consideration of fish passage would be required for any proposed impacts to this system.

**Perennial Stream 3 (PS 3)** - Perennial Stream 3 occurs on the northeast side of the site and is a tributary to PS 1 (Ocmulgee River). Perennial Stream 3 is a warm water stream composed of sand and silt (R2UB2). The perennial characteristics observed within this system include the presence of baseflow and wretched vegetation. During the field survey, a NCDWQ data form was completed, which ranked this system as a perennial stream. The functional riparian buffer of this system is greater than 50 feet wide along both banks, and is composed of grass and mixed pine hardwood species. This system is considered somewhat impaired due to heavy amounts of debris, bank erosion, and sedimentation. At bankfull, the channel is approximately 10-15 feet wide and 3-4 feet deep with a wetted width of approximately 8-10 feet. At the time of the survey, the depth of the stream was approximately one foot, the water was cloudy, and no foul odors were detected. Perennial Stream 3 is not listed on the most current 303(d) list. This stream is a state water and would require a 25-foot protective buffer. This stream does not provide suitable habitat for any federal or state protected species but consideration of fish passage would be required for any proposed impacts to this system.

**Perennial Stream 4 (PS 4)** - Perennial Stream 4 originates at the base of OW 6, at the north end of the site. Perennial Stream 4 is a warm water stream with a substrate composed of sand and mud (R2UB23). The perennial characteristics observed within this system include the presence of baseflow and wretched vegetation. During the field survey, a NCDWQ data form was completed, which ranked this system as a perennial stream. The functional riparian buffer of this system is greater than 50 feet wide along both banks, and is primarily composed of maintained grasses. This system is considered fully impaired due to impoundment, channelization, and culverting. At bankfull, the channel is approximately 5-6 feet wide and 1-2 feet deep with a wetted width of approximately 3 feet. At the time of the survey, the depth of the stream was approximately four to six inches, the water was clear, and no foul odors were detected. Perennial Stream 4 is not listed on the most current 303(d) list. This stream is a state water and would require a 25-foot protective buffer. This stream does not provide suitable habitat for any federal or state protected species but consideration of fish passage would be required for any proposed impacts to this system.

### **Non-jurisdictional Drainage Features**

A total of 11 non-jurisdictional drainage features were identified within the project survey area. These features did not exhibit an ordinary high water mark, base flow, hydric soils, well-defined channel bed/bank, or wretched vegetation. These features were also discontinuous and not directly connected to other aquatic features within the survey area. The location of each feature was collected for documentation purposes



only and no additional information regarding these features would be required for permitting or construction activities.

## **Permitting Overview**

The discharge of dredge or fill material within waters of the U.S. is regulated by the USACE under the Clean Water Act (33 U.S.C. 1344). Impacts to jurisdictional systems require authorization under Section 404 of the Clean Water Act. Typically, minor impacts or fill activities may be eligible for permitting under the Nationwide Permit (NWP) program. Typically, NWPs can be utilized for up to 0.5 acre of jurisdictional waters/wetland impacts and 300 linear feet of perennial, intermittent, and ephemeral stream impacts for single and complete projects. Depending on the extent of the activity, some minor impacts (typically less than 0.10 acre or 100 linear feet) may be conducted without formal notification to the USACE (with some exceptions due to proximity to protected lands). However, use of any NWP in USACE Savannah District requires notification to EPD. Use of an NWP permit requiring pre-construction notification (PCN) to the USACE, requires mitigation of impacts (typically in the purchase of credits), inter-agency review, and up to a 90-day review period by the USACE and other commenting regulatory agencies. Impacts exceeding the limits of a NWP would require an individual permit from the USACE. Impacts exceeding 0.1 acre of wetlands or 100 feet of stream would require the purchase of compensatory mitigation credits.

Disturbance to the twenty-five foot State stream buffer would require a stream buffer variance to the Georgia EPD. Buffer variance requests require a mandatory 30-day public notice period and typically take 4-6 months for agency approval. Depending on the nature of the project and the application criteria, additional mitigation credits may be required by EPD.



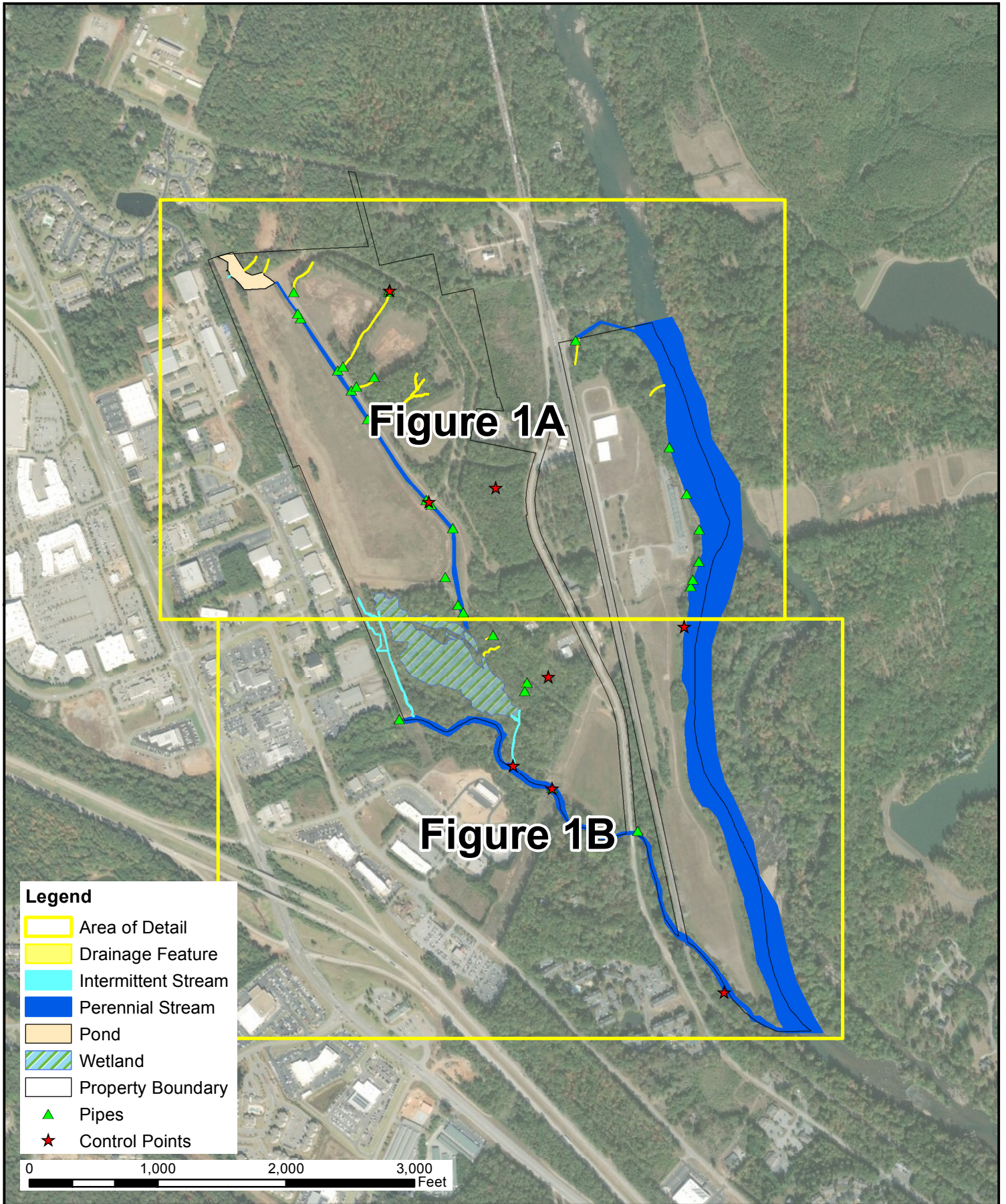
# Memorandum

Ecological Resource Survey

## Figures

Plant Arkwright  
Bibb County, GA





**Legend**

- Area of Detail
- Drainage Feature
- Intermittent Stream
- Perennial Stream
- Pond
- Wetland
- Property Boundary
- Pipes
- Control Points

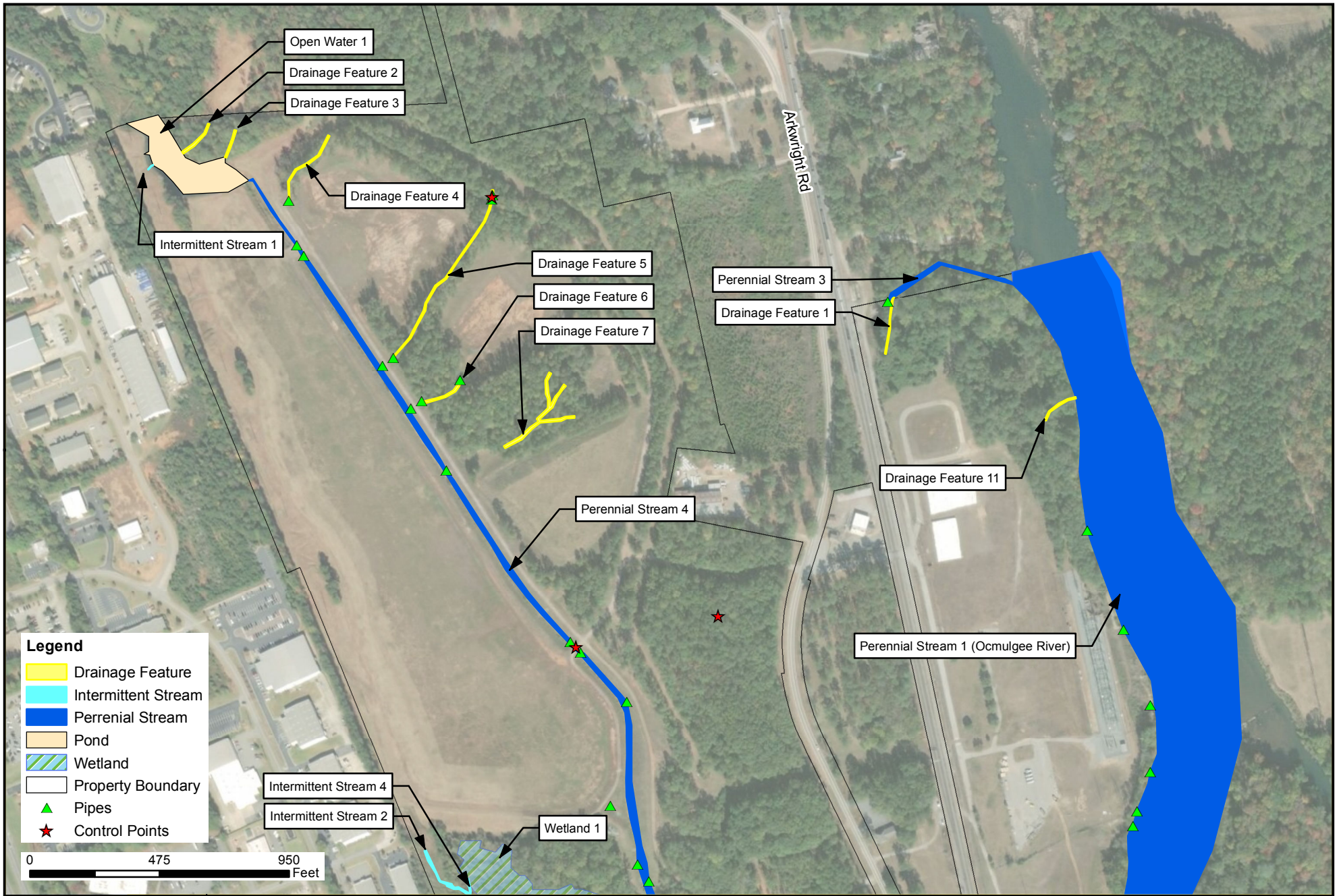


Plant Arkwright  
Bibb County, Georgia

Federal and State Waters Map

N  
Date: Oct. 2018  
Scale: 1" = 1,000'  
Figure 1 - Index



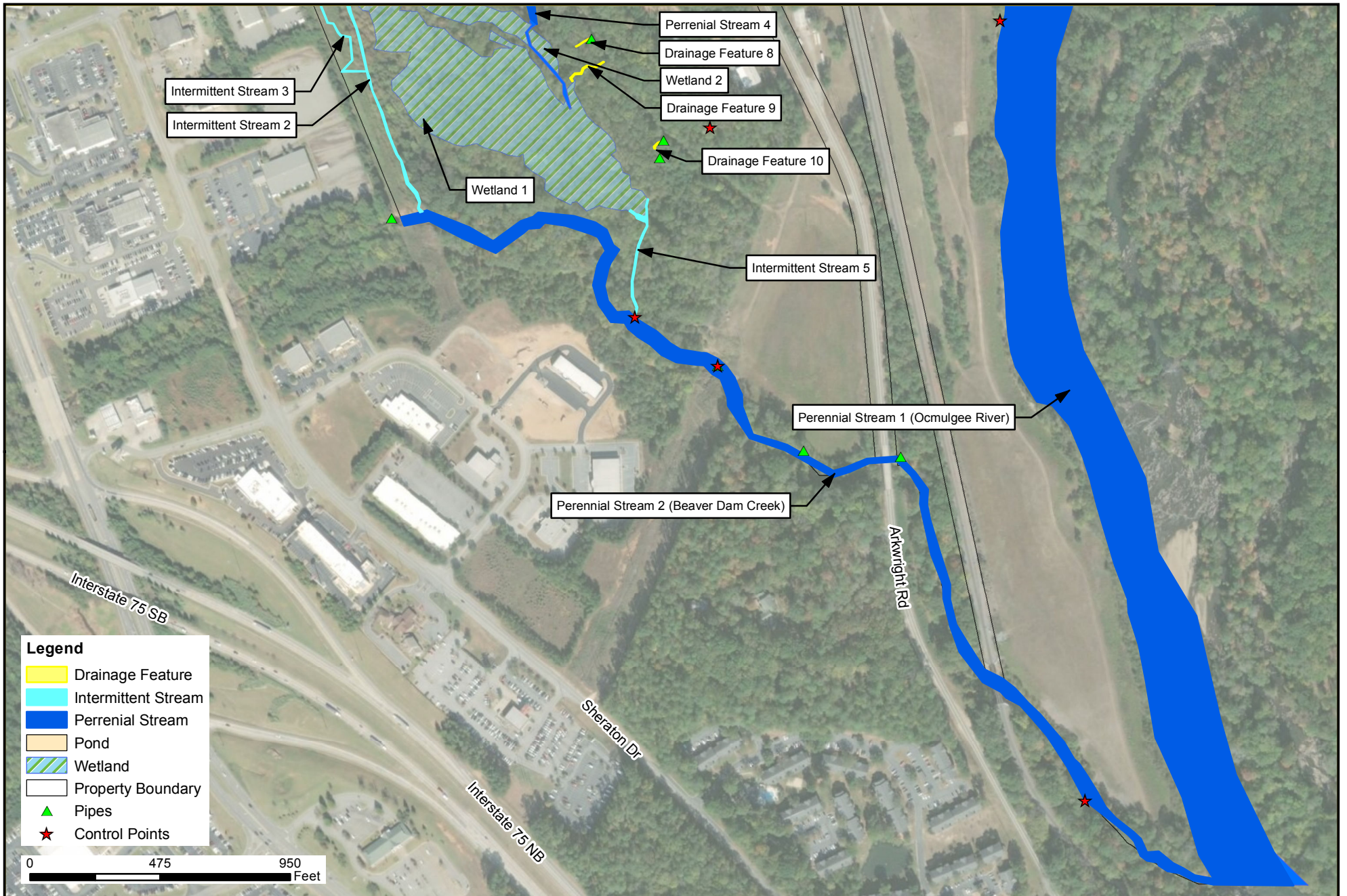


Plant Arkwright  
 Bibb County, Georgia

Federal and State Waters Map

N  
 Date: Oct. 2018  
 Scale: 1" = 475'  
 Figure 1A





Plant Arkwright  
 Bibb County, Georgia

Federal and State Waters Map

N  
 Date: Oct. 2018  
 Scale: 1" = 475'  
 Figure 1B



# Memorandum

Ecological Resource Survey

## Representative Photographs

Plant Arkwright  
Bibb County, GA





**Photograph 1. Open Water 1**



**Photograph 2. Wetland 1**



**Photograph 3. Intermittent Stream 1**



**Photograph 4. Intermittent Stream 2**

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Plant Arkwright  
Bibb County, GA

Representative Photographs

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Photograph 5. Intermittent Stream 3



Photograph 6. Intermittent Stream 4



Photograph 7. Intermittent Stream 5



Photograph 8. Perennial Stream 1 (Ocmulgee River)

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Plant Arkwright  
Bibb County, GA

Representative Photographs

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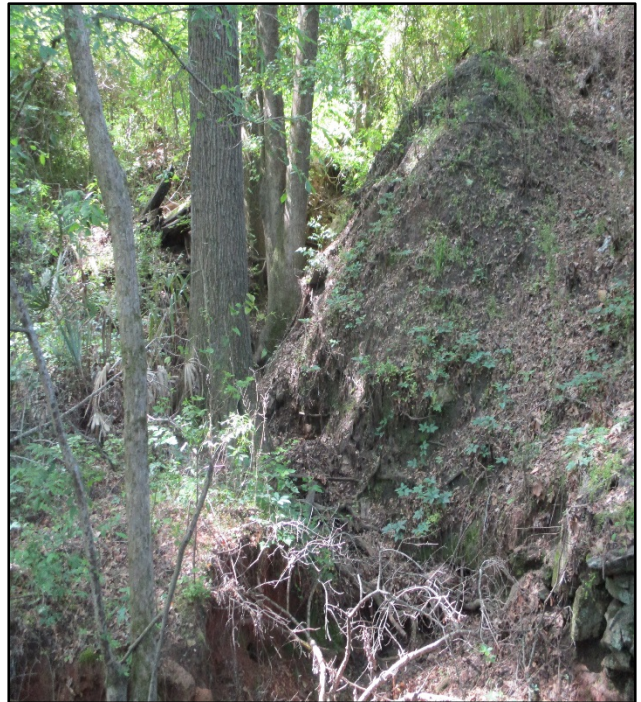
Photograph 9. Perennial Stream 2 (Beaver Dam Creek)



Photograph 10. Perennial Stream 3



Photograph 11. Perennial Stream 4



Photograph 12. Drainage Feature 1

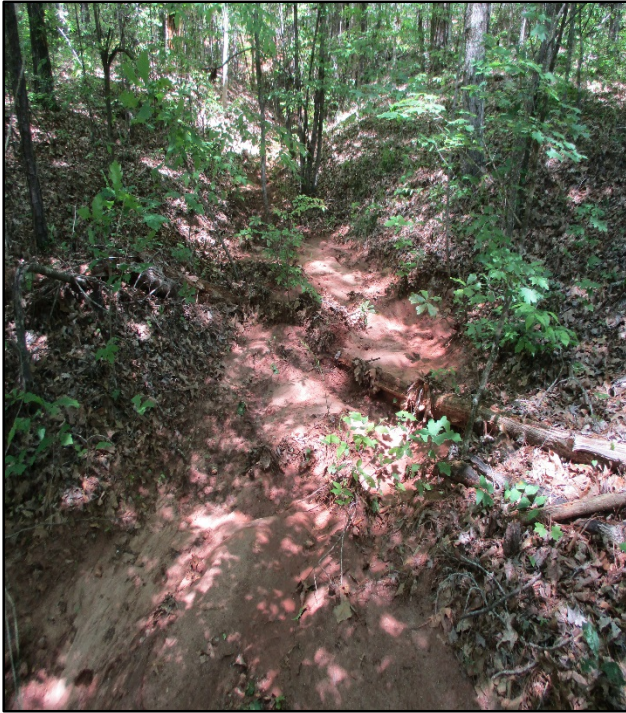
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Bibb County, GA

Representative Habitat Photographs

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Photograph 13. Drainage Feature 2



Photograph 14. Drainage Feature 3



Photograph 15. Drainage Feature 4



Photograph 16. Drainage Feature 5

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Bibb County, GA

Representative Photographs

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Photograph 17. Drainage Feature 6



Photograph 18. Drainage Feature 7



Photograph 19. Drainage Feature 8



Photograph 20. Drainage Feature 9

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Representative Photographs

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**Photograph 21. Drainage Feature 10**



**Photograph 22. Drainage Feature 11**