US Army Corps of Engineers®

AUGUSTA ROCKY CREEK GEORGIA
FLOOD RISK MANAGEMENT
SECTION 205 FEASIBILITY STUDY

Rocky Creek Flood Event in 1990

Revised
June 2017

FINAL

EXECUTIVE SUMMARY

Augusta-Richmond County asked the U.S. Army Corps of Engineers, Savannah District for assistance in reducing flood risks along Rocky Creek. Under the Section 205 Continuing Authority Program, the study team identified the best course of action to reduce flood risks.

The Savannah District and Augusta-Richmond County considered numerous ways to reduce flood risks to the residential, public, commercial and industrial properties along Rocky Creek and reduce the potential for loss of life. The team considered the following five alternatives in detail:

1. No Action
2. Rosedale Dam Detention Area Alone
3. Kissingbower Buyouts Alone
4. Kissingbower Buyouts with Recreation Park
5. Rosedale Dam Detention Area and Kissingbower Buyouts with Recreation Park

They then evaluated and compared the alternatives to determine the most economically efficient way of reducing flood risks. The report recommends Alternative 5 as the selected plan. It consists of constructing a detention area at Rosedale Dam, acquiring 5 residential parcels in the Kissingbower Road area, and converting those parcels into a recreational park. It improves the area's resiliency and sustainability for future flood events while complying with environmental laws and regulations. This plan builds on the previous actions of Augusta-Richmond County and substantially reduces flood risks to residents and businesses along Rocky Creek.

The selected plan would reduce flood risks and damages more than any of the other four alternatives evaluated. It would eliminate flood damages to 6 out of 14 structures for the 2-year event; 20 out of 52 structures for the 5-year event; 49 out of 114 structures for the 10-year event; 70 out of 162 structures for the 25-year event; 112 out of 233 structures for the 50-year event, 121 out of 279 structures for the 100-year event; 80 out of 326 structures for the 250-year event; and 64 out of 363 structures for the 500-year event.

The selected plan has the highest net benefits (average annual benefit minus average annual cost) of those alternatives that were considered in detail. It would produce $869,301 in average annual benefits with $192,448 in average annual costs over the 50-year period of analysis at the Fiscal Year (FY) 2016 price level. The resulting net benefit would be $676,853 each year. The benefit-to-cost ratio, a measurement of the investment, is $4.52 in benefits gained per $1.00 spent on the project.

The fully funded cost of the recommended plan is $4,962,000 at the FY 2018 price level. The Federal share is $3,137,000. Augusta-Richmond County's share of the project would be $1,825,000. The cost share split between the Federal Government and Augusta-Richmond County would be approximately 63 percent and 37 percent, respectively.

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SECTION 205 FEASIBILITY STUDY

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AUGUSTA ROCKY CREEK GEORGIA
FLOOD RISK MANAGEMENT
SECTION 205 FEASIBILITY STUDY

1.0 STUDY AUTHORITY

This study is authorized under Section 205, 1948 Flood Control Act (P.L. 80-858), as amended.

2.0 STUDY PURPOSE AND SCOPE

2.1 PURPOSE

The joint government of the City of Augusta and Richmond County (Augusta-Richmond County) has requested that the U.S. Army Corps of Engineers (USACE) study the flooding risks in the area drained by Rocky Creek, with particular attention to the populated areas within the Rocky Creek Basin.

The purpose of this study is to assess and recommend solutions to flooding risks along the Rocky Creek Basin. The problem is flood risks to residential, public, commercial, and industrial properties and the potential for loss of life. The opportunity is to reduce flood risks to properties and loss of life. The objective is to reduce flood risks within the Rocky Creek Basin downstream of the Rosedale Dam Detention Area. The constraint is avoiding induced flooding upstream.

2.2 SCOPE/DESCRIPTION OF STUDY AREA

The City of Augusta is located on the eastern edge of the State of Georgia and is 110 miles northwest of Savannah, Georgia (See Figure 1). The City of Augusta is the main population center in Richmond County and forms the center for the Augusta-Richmond County, Georgia-South Carolina Metropolitan Statistical Area (MSA). Other significant population centers in the area of concern are the towns of Hephzibah, Blythe, and Fort Gordon Military Reservation. Richmond County is located in Georgia's 12th Congressional District, which is represented by Honorable Rick Allen.

This report responds to Augusta-Richmond County's (the non-Federal sponsor's) request to reduce flooding risks within the Rocky Creek Basin, which is located in the central portion of the City of Augusta (See Figure 2). The majority of the stream is south of U.S. Route 78 (Gordon Highway) and north of Interstate 520 (Bobby Jones Expressway). Rocky Creek has numerous small tributaries flowing into it, and eventually empties into Phinizy Swamp, which is approximately 1.2 miles downstream of Georgia Highway 56 Spur (Doug Barnard Parkway). Rocky Creek's drainage area is approximately 11,024 acres (17.23 square miles). The Creek is 8.91 miles in length

from its headwaters located north of Gordon Highway to its mouth at Phinizy Swamp. Elevations within the Rocky Creek Basin range from a high of about 490 feet North American Vertical Datum 1988 (NAVD 88) to as low as 115 feet NAVD 88 at Phinizy Swamp. The channel has an average slope of 11 feet/mile downstream of Milledgeville Road. As Rocky Creek travels upstream of Milledgeville Road the channel quickly rises to an average slope of 63 feet/mile.

Engineering Regulation ER 1165-2-21 provides USACE guidance concerning flood damage reduction measures in urban areas. It establishes criteria to distinguish between improvements to be accomplished by the Corps under its flood risk management authorities and storm sewer systems to be accomplished by local interests. Urban water damage problems associated with a natural stream may be addressed under the flood risk management authority from the point where the flood discharge of such a stream within an urban area is greater than 800 cubic feet per second for the 10-percent flood (one chance in ten of being equaled or exceeded in any given year) under conditions expected to prevail during the period of analysis. On Rocky Creek, this point is just downstream of the North Leg Road approximately 1,100 feet downstream of the detention area (Figure 3). In general, USACE may perform work downstream of the 800 cubic feet per second (CFS) discharge point to reduce flooding or flood risks. However, it may perform work upstream of that location if that is the best site for an action that would reduce flood risks downstream of that 800 CFS location.

Figure 1. Vicinity Map

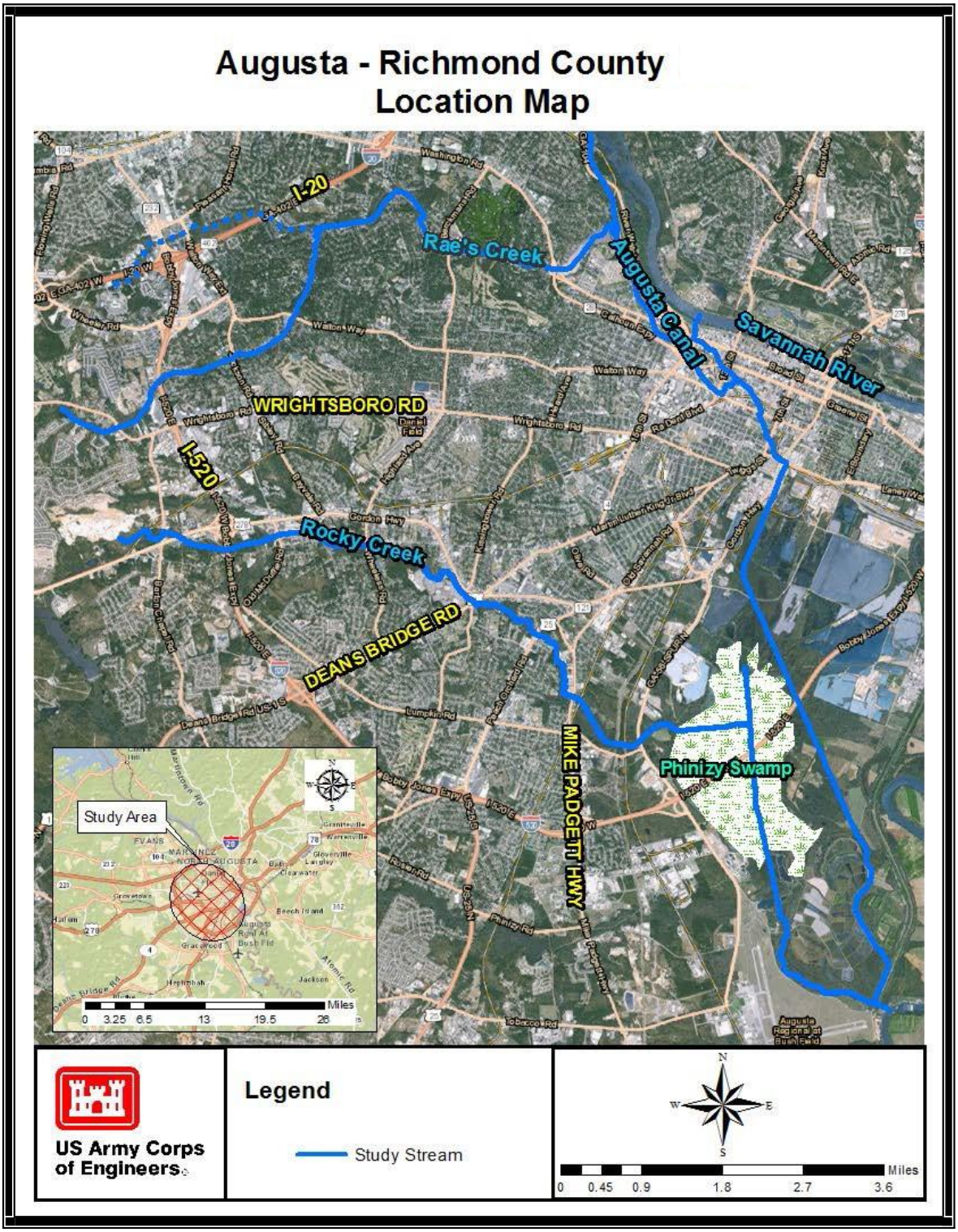

Figure 2. Location Map

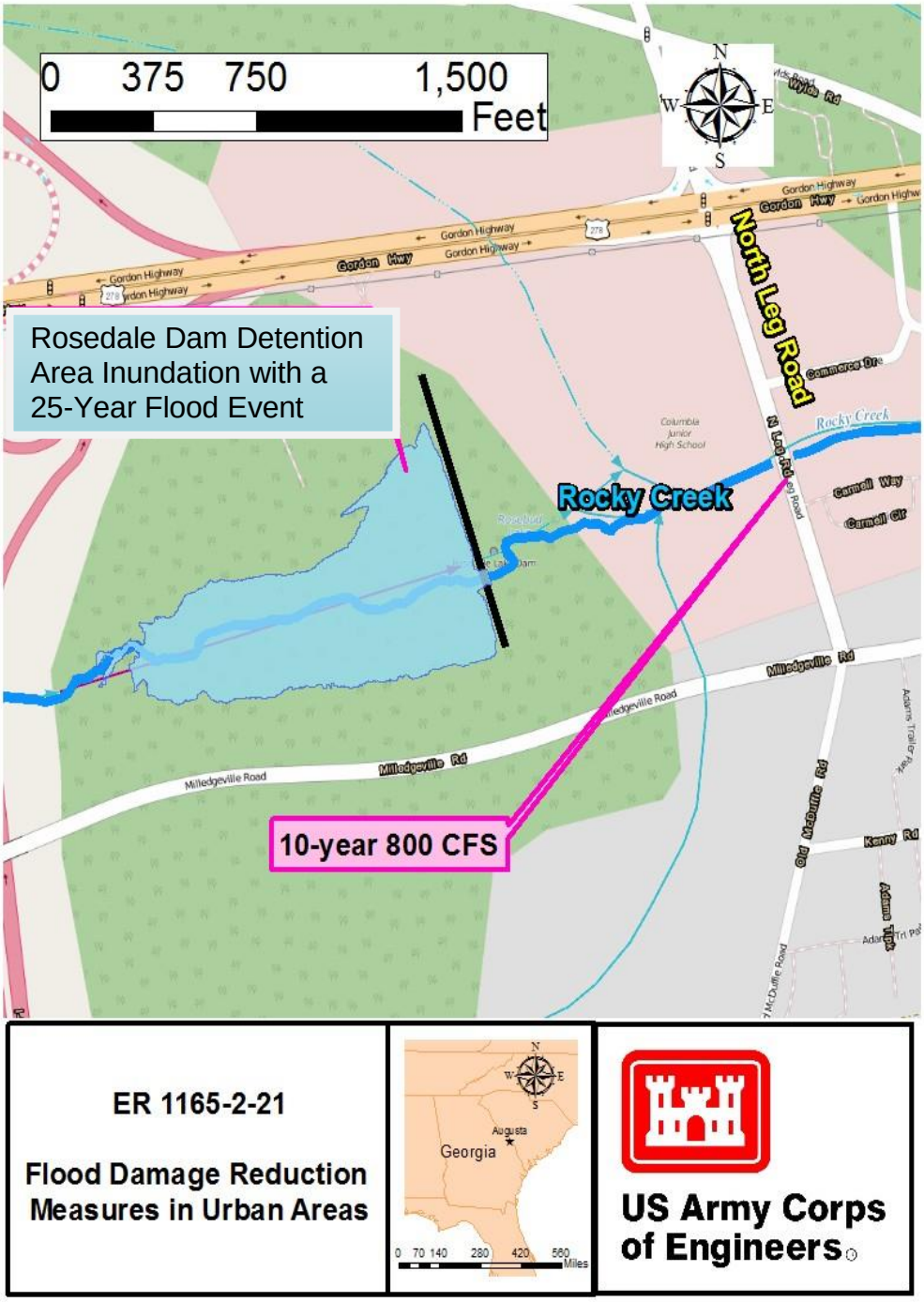

Figure 3: Flood Damage Reduction Measures in Urban Areas

3.0 PRIOR STUDIES, REPORTS AND EXISTING WATER PROJECTS

The Project Delivery Team (PDT) relied upon prior reports and studies such as the Flood Insurance Study (FIS) for Richmond County and project specific reports completed for drainage canals and creeks within the study area.

3.1 PRIOR STUDIES AND REPORTS IN THE AUGUSTA AREA

Augusta, Georgia Levee. The project was authorized by the 1936 Flood Control Act. The project provides flood protection to the City of Augusta from the Savannah River. The project was completed in 1941 and turned over to the Augusta-Richmond County for operation and maintenance.

Draft EA/FONSI for Augusta Flood Control Study. Savannah District USACE. April 2005. The Corps prepared a draft Environmental Assessment (EA) to analyze the alternatives presented in the Draft Feasibility Report for Augusta-Richmond County Regional Flood Control Draft Interim Feasibility Report. The EA was not finalized.

Draft Interim Feasibility Report, Flood Reduction Study, Augusta – Richmond County, Georgia. September 2005. Under the General Investigations (GI) program the Corps prepared a draft feasibility report to assess and recommend solutions to flooding problems in Richmond County, Georgia. The draft report addressed degraded ecosystem and recreation problems throughout the study area. The Rocky Creek Basin and the Augusta Canal Basin were included in the study. The study identified 17 structural and 2 non-structural measures for consideration to reduce flood damages along Rocky Creek. Of those 17 structural and 2 non-structural measures, only Rosedale Dam Detention Area Improvements and Kissingbower Buyouts with a recreation Park remained as viable opportunities to study in the feasibility phase. The study halted in 2006 and no further work was conducted due to liability issues and a lack of funding. Additional descriptions of alternatives studied during the 2005 draft report are contained in Appendix E. In 2013, South Atlantic Division (SAD) approved further study of the Rosedale Dam Detention Area Improvements and Kissingbower Buyouts and Recreation Park measures under the Continuing Authorities Program. Based on the 2013 approval, the Project Management Plan (PMP) scope of work, the approved Review Plan, and non-Federal project request letters included these two measures and the No Action alternative.

Federal Emergency Management Agency. Table 1 presents a listing of the Federal Emergency Management Agency flood insurance studies for Augusta-Richmond County, Georgia.

Final HTRW Site Investigation Report. Engineering Division, Savannah District USACE; October 2003. A historical database search was conducted in 2003 to determine whether the potential for contamination existed for the planned construction areas of the Augusta Flood Control Project. The database search showed no major historical factors, but several possible minor contamination issues in the areas

downstream of Regency Mall, which is 2.5 miles downstream from the subject site. Based on these issues, as well as a site visit, it was determined that extensive sampling along the five Rocky Creek detention areas that were analyzed in 2003 and the Nixon Street levee alternative should be conducted. Subsequent analytical results (including Rosedale Dam area) indicated that no contamination exists that would interfere with any future construction activities (USACE 2003) within this study.

J. Strom Thurmond Dam and Lake, Georgia and South Carolina. The project was built because of historical flooding, particularly in Richmond County and adjacent areas, and was authorized by the 1944 Flood Control Act. The completed project is located 22 miles north of Augusta, Georgia on the Savannah River.

Savannah River Basin Comprehensive (SRBC) Study. The SRBC study is evaluating the Corps' multi-purpose projects in the river basin. Actions potentially taken at those projects would not directly impact Rocky Creek. Similarly, any work conducted in Rocky Creek would not measurably impact flows in the Savannah River. The Corps is currently conducting a basin-wide water resources analysis of the Savannah River. The present interim study is focusing on alternate drought management scenarios. The Savannah River Basin Comprehensive study's focus is on current operational plans for three Federal reservoirs (Hartwell Lake and Dam, J. Strom Thurmond Lake and Dam and Richard B. Russell Lake and Dam). The study will determine if changes or reallocations are warranted to meet current and future needs for flood control, water supply, fish and wildlife enhancement, drought control, water quality, recreation, and other related purposes. The study is being jointly sponsored by the Georgia Department of Natural Resources, the South Carolina Department of Natural Resources, and The Nature Conservancy.

Additional Floodplain Reports. Additional reports prepared for FEMA, such as the 1995 Augusta-Richmond County Comprehensive Land Use Plan, are listed in the September 1998 Section 905(b) Analysis and included herein by reference (Table 1).

Table 1: Flood Insurance Studies for Augusta-Richmond County

Published	Title	Computations
September 25, 2009	Augusta-Richmond County GA – All Jurisdictions 13245CV000A (Countywide maps and FIS) The consolidated government of Augusta-Richmond County and including the Cities of Blythe and Hephzibah	Revisions and updated information on the existence and severity of flood hazards in the geographic area of Augusta-Richmond County, GA to include H&H Computations obtained from prior studies, some updates and additions. (Work completed by PBS&J in Jan 2006) Vertical datum converted from NGVD29 to NAVD88; UTM coordinates now referenced to NAD83. DFIRM and FIS produced in digital form. Prepared by FEMA.
March 23, 1999	City of Augusta (Prepared to include City of Augusta and Unincorporated Areas into one Flood Insurance Study)	H&H Computations for Oates Creek by USACE, Savannah District (work completed Aug 1994). Also included updated flood hazard data for Butler Creek and Rocky Creek, and revised backwater data for Rocky Creek Trib 2 and Trib 4, completed by GA DOT. Prepared by FEMA.
January 19, 1995	City of Augusta	Hydrology by USACE, Savannah District – Hydraulics by FEMA
January 19, 1995	Richmond County and Unincorporated Areas	Hydrology for the Savannah River by USACE, Savannah District – Hydraulics for the Savannah River by FEMA
January 3, 1994	FIS – Revisions to Oates Creek and Oates Creek Tributary following construction of Oates Creek Flood Reduction Project.	USACE, Savannah District
February 4, 1987	Richmond County and Unincorporated Areas	H&H by USACE, Savannah District (Work completed Sept 1984)
April 1, 1982	City of Augusta – FIS	H&H for the Savannah River by USACE, Savannah District (Work completed in March 1977)
January 1974	Special Flood Hazard Information Report, Raes Creek, Augusta and Richmond County, GA	USACE, Savannah District
August 1971	Special Flood Hazard Information Report, Savannah River at Augusta, GA.	USACE, Savannah District

4.0 PLAN FORMULATION

Plan formulation is the process of building solutions to ameliorate problems, meet planning objectives, and avoid planning constraints.

4.1 ASSESSMENT OF WATER AND RELATED LAND RESOURCES PROBLEMS AND OPPORTUNITIES

4.1.1 ROCKY CREEK FLOODING: HISTORIC AND EXISTING CONDITIONS

Historically, flooding in Richmond County has primarily been the result of severe thunderstorm activity. Flooding problems in Augusta have resulted in property damage and reduced public safety. The Augusta-Richmond County Hazard Mitigation Plan adopted in 1998 estimated that floods had caused over $150,000,000 in damages since October 1990, and that floods affected 30 percent of the county in this time frame.

The City of Augusta is largely an urban area which has experienced much growth over the last 40 years. Within this time frame, many residences and commercial structures have been built within the Floodplain. As a result of this growth, the rate of storm water runoff has increased, as have incidents of flooding. Channel dredging, bridge construction and other storm water control practices have not kept pace with the increased storm run-off.

Topography contributes to flooding of the area. Particularly, flooding is related to the sudden change in stream slope, and to the bowl-shaped area adjacent to the stream near Nixon Road.

Prompted by several devastating floods (Table 2), most recently in 1990 as a result from the convergence of Tropical Storms Marco and Klaus, Augusta-Richmond County has been working to implement flood risk management measures. Augusta-Richmond County, has constructed or is in the process of constructing several flood risk management projects in the Rocky Creek Basin. Rocky Creek is also included in the National Flood Insurance Program (NFIP). The Augusta-Richmond County Flood Reduction Program seeks to purchase repetitively-flooded structures. After the structures are purchased, Augusta-Richmond County demolishes the structures, and places the land in permanent conservation as green space/open space. In support of this effort, the local Flood Damage Prevention Ordinance requires new first floor elevation for new construction within the high hazard areas to be three feet above the Base Flood Elevation (BFE) based on the Flood Insurance Rate Maps (FIRM).

Pictures in Figure 4 illustrate the 1990 flood.

Table 2. Documented Flood and Declared Disasters 1990-2002

Date & Disaster (DR)	Nature of Event
October, 1990 (DR 880)	Flood: Flooding caused by convergence of Tropical Storms Klaus and Marco, causing two days of rain, with amounts as much as 15" measured in places. Estimates of damage exceeded $150 million.
October, 1990	Flood: Local rainfall exceeded 8.5 inches, producing flooding characterized as the 100-year flood.
August 1992	Flood: Intense rain caused rapid local flooding of homes and numerous roads, resulting in evacuations in the Hollywood Subdivision.
August, 1994	Flood: The Weather Bureau reported 4.2 inches in a 24-hour period.
September, 1995	Flood: 3.75 inches of rain, characterized as a 10-year storm, caused flooding, resulting in evacuations of 12 families in the Hollywood Subdivision and traffic accidents along Rocky Creek.
March, 1996	Flood: Thunderstorms in the Augusta area send several streams over their banks and into homes, including the Hollywood Subdivision. The flash flooding also closed several major highways, which were under water. Rainfall amounts of 2-4 inches occurred in a six to nine hour period over southern Columbia and northern Richmond counties.
December, 1997	Flood: Flash flooding along several creeks flooded several highways including Richmond Hill road.
March, 1998	Flood: Raes Creek flooded low lying areas and approached some homes but no flooding in homes was reported.
March, 1998 (DR 1209)	Flood and Winter Storm: More than 3-inches of rain fell on saturated ground, resulting in approximately 10-year flooding; residential and road flooding in the Rocky Creek area.
September, 1998	Flood: EPD reported 8.5 inches of rain from Tropical Storm Earl over a 14-hour period caused flash flooding along several streams. About five people were evacuated from two subdivisions, several streets were closed, and one shelter was opened to house 82 people.
June, 2000	Flood: After a prolonged dry period, more than 3-5 inches of rain fell over the area, flooding I-20 and other streets, forcing sewage backups; and inundating many homes along Rocky Creek and Raes Creek.
May, 2002	Flood: The Augusta Emergency Operations Center reported several streams flooding with water covering roadways and stranding cars.

Sources: NCDC Online (1950-2003; some data gaps and few descriptions); NWS Local Climatological Data; City's 1998 Mitigation Plan; FEMA records.

Figure 4. Pictures of Flooding Experienced in the Rocky Creek Basin During 1990 Storm Event

Augusta-Richmond County divides the Special Flood Hazard Area (SFHA) outside of the regulatory floodway into upper and lower floodway fringes and regulates the lower floodway fringe as floodway. Any property containing more than one acre of SFHA is regulated as floodway and requires an engineered No Rise Certification to make sure that proposed development does not affect the SFHA either upstream or downstream. Additionally, Augusta-Richmond County does not allow offsite fill material to be brought into the SFHA. Augusta-Richmond County allows grade changes of +/- two feet without a No Rise Certification. Augusta Richmond County has addressed flooding in their Comprehensive Zoning Ordinance, which contains a section to address Conservation Subdivisions. In short, if floodplain, wetlands or other similar sensitive areas are permanently protected, the developer is allowed to increase the density (units per acre) of structures constructed on the remaining buildable property, such that the overall yield is basically the same as if the developer constructed on the land this ordinance seeks to protect – namely, floodplain, wetlands, riparian buffers and other similar sensitive areas. Augusta-Richmond County's Stormwater Management Ordinance has additional storage requirements and design considerations in sensitive basins such as Rocky Creek and does not allow stormwater storage facilities (detention ponds) resulting from new development to be located in the SFHA. USACE considers the proposed Rosedale Detention Dam Area Alternative to comply with the ordinance because it is a stormwater enhancement that reduces flood risks and improves resiliency and sustainability. Augusta-Richmond County employs a Certified Floodplain Manager (CFM) on staff and has a full-time Floodplain manager as part of their Stormwater Utility program. Overall, Augusta-Richmond County's Flood Management Program is a comprehensive program focused on reducing the risk of flooding (particularly catastrophic flood events) in the community and is aimed at breaking the build-damage- rebuild cycle found elsewhere in the nation.

Figure 5 displays the 100-year floodplain on a street map of Rocky Creek.

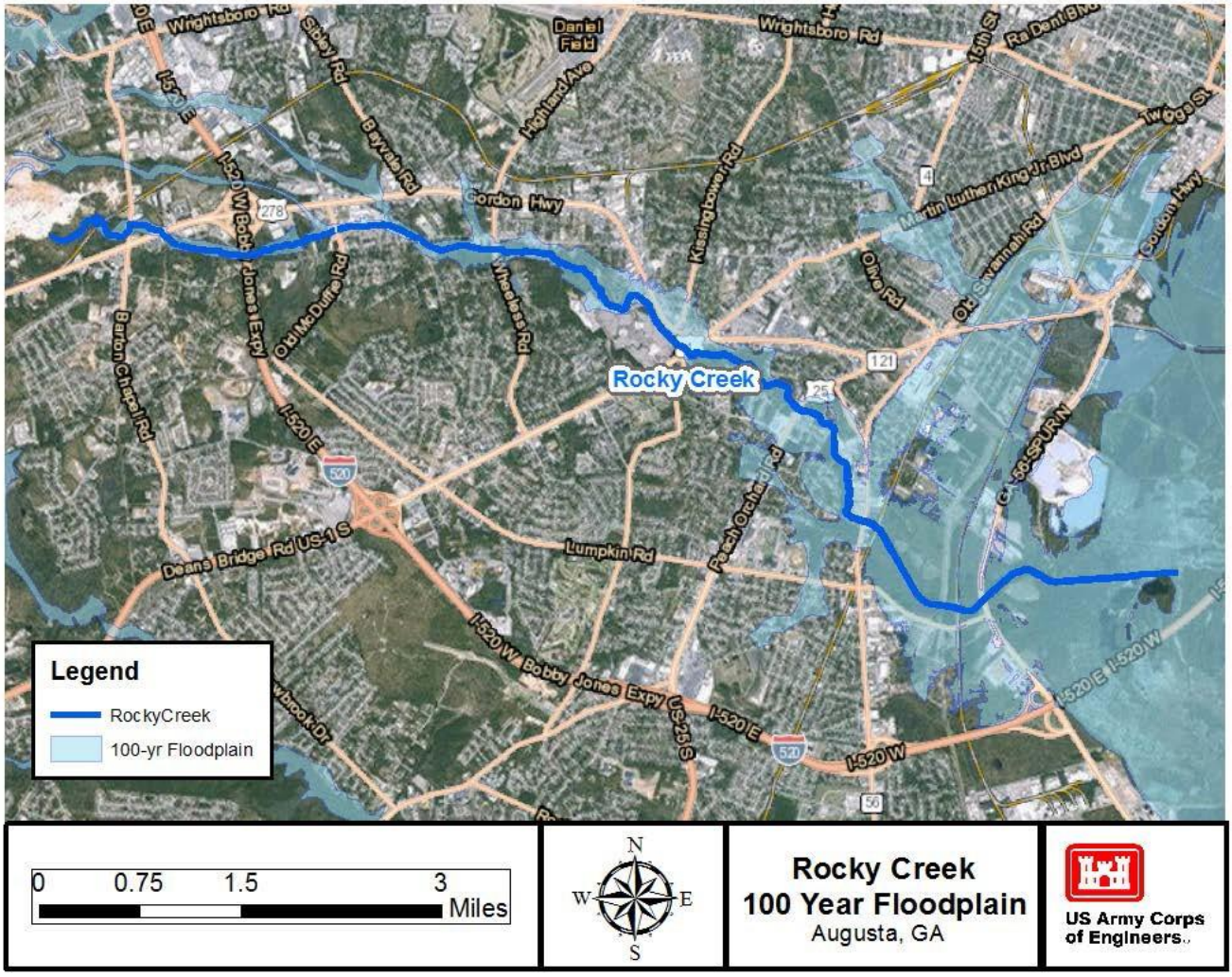

Figure 5. Rocky Creek 100-Year Floodplain

4.1.2 CLIMATE CHANGE

Analysis of the possible effects of climate change is included in the Engineering Appendix. That analysis concludes that this watershed as a whole is at low risk for climate change effects on flooding. Potential changes in future condition flows from increased rainfall as a result of climate changes were not included because they are not expected to change the study recommendations or the design of the recommended plan.

The analysis of future condition flows incorporated increased runoff due to land development expected through year 2030. Historic precipitation-frequency data used in this Section 205 Study were based on TP40 rainfall distributions. Since that time, new rainfall distributions have been published in TP14. The 2, 5, 10, 25, and 50-year rainfall estimates decreased from TP40 to TP14. The 100 and 500-year rainfall estimates increased from 8.00” to 8.18” and from 9.7” to 10.7”, respectively. All of the TP40 data used in this study’s analysis are within the 90% confidence intervals for the new TP14 estimates. There is no value in using the new rainfall distribution in the hydrologic analysis since it would result in no change in the study recommendations or the design of the recommended plan.

The USACE screening level climate change vulnerability assessment (VA) tool was utilized to assess the potential impacts and likelihood of climate change impacts to this region. The tool indicted that the Savannah-Ogeechee Basin was at relatively low risk for climate change to cause a substantial negative impact on flood risk reduction type projects. More information regarding climate change may be found in Appendix B Section C-2.5

4.1.3 FLOODING PROBLEMS IN THE ROCKY CREEK BASIN

The problem is that residential, public, commercial, and industrial structures are at risk of flooding and there is a potential for loss of life. The locations of affected structures inventoried are included in Figure 6 and listed below:

- The first area affected by risk of flooding is near the outfall at Phinizy Swamp, on the north bank of Rocky Creek between Old Savannah Road and Phinizy Swamp. Over 45 percent of the inventoried structures in the entire basin are located in this area. Flooding is caused by backwater from Rocky Creek entering into Phinizy Swamp.

- The second area affected by risk of flooding is immediately above Old Savannah Road. Flooding occurs on both sides of Chester Avenue in the vicinity of Smith Drive, Virginia Avenue, Higdon Street, and Piedmont Street. A combination of low terrain and flooding along a tributary of Rocky Creek can affect properties in this area. About 25 percent of the inventoried structures in the basin are located in this area.

- The third area affected by risk of flooding is north of the Regency Mall site which is located in the vicinity of Kissingbower Road. Single-family structures (less than 4 percent of basin flooding) are subject to flooding in this area. The mall itself is located on high ground, but the houses on the opposite side of Rocky Creek are susceptible to flood risks. The floodwaters overflow the north side of the bank since the south side (Regency Mall side) is high. Augusta-Richmond County has purchased and removed most of the subdivision located slightly upstream from the former Regency Mall.

- The fourth area affected by risk of flooding is located in the vicinity of Rozella Road. Approximately 7 percent of the inventoried structures in the basin are located in this area. Flooding occurs from the overflow from Rocky Creek.

4.1.4 Opportunities in the Rocky Creek Basin

There are opportunities in the Rocky Creek Basin to reduce flood risks and provide passive recreation experiences.

4.2 Planning Objectives and Constraints

The Federal objective of water and related land resources planning is to contribute to National Economic Development (NED) while protecting the Nation's environment. These contributions will be in accordance with national environmental statutes, applicable executive orders, and other Federal planning requirements. Project plans shall be formulated to alleviate the stated problems and will take advantage of opportunities that contribute to study planning objectives and, ultimately, the Federal objective.

4.2.1 Study Planning Objectives

The objective of this study is to reduce flood risks within the 500-year floodplain of the Rocky Creek Basin in an economically justified, environmentally sound, and technically feasible manner.

4.2.2 Study Planning Constraints

Unlike planning objectives that represent desired positive changes, planning constraints that represent restrictions should be avoided. The planning constraints identified in this study are as follows:

- Avoid or minimize environmental impacts from flood risk management measures.

- Minimize induced damages resulting from the implementation of flood risk reduction measures.

- USACE may address urban flooding problems with a natural stream under the flood risk management authority from the point where the flood discharge is greater than 800 cubic feet per second for the 10-percent flood (one chance in ten of being equaled or exceeded in any given year) under conditions expected to prevail during the period of analysis. On Rocky Creek, this point is just downstream of the North Leg Road approximately 1,100 feet downstream of the Rosedale Dam Detention Area (Figure 3). In general, USACE may perform work downstream of the 800 CFS discharge point to reduce flooding or flood risks. However, it may perform work upstream of that location if that is the best site for an action that would reduce flood risks downstream of that 800 CFS location.

Rocky Creek Basin
Damage Centers

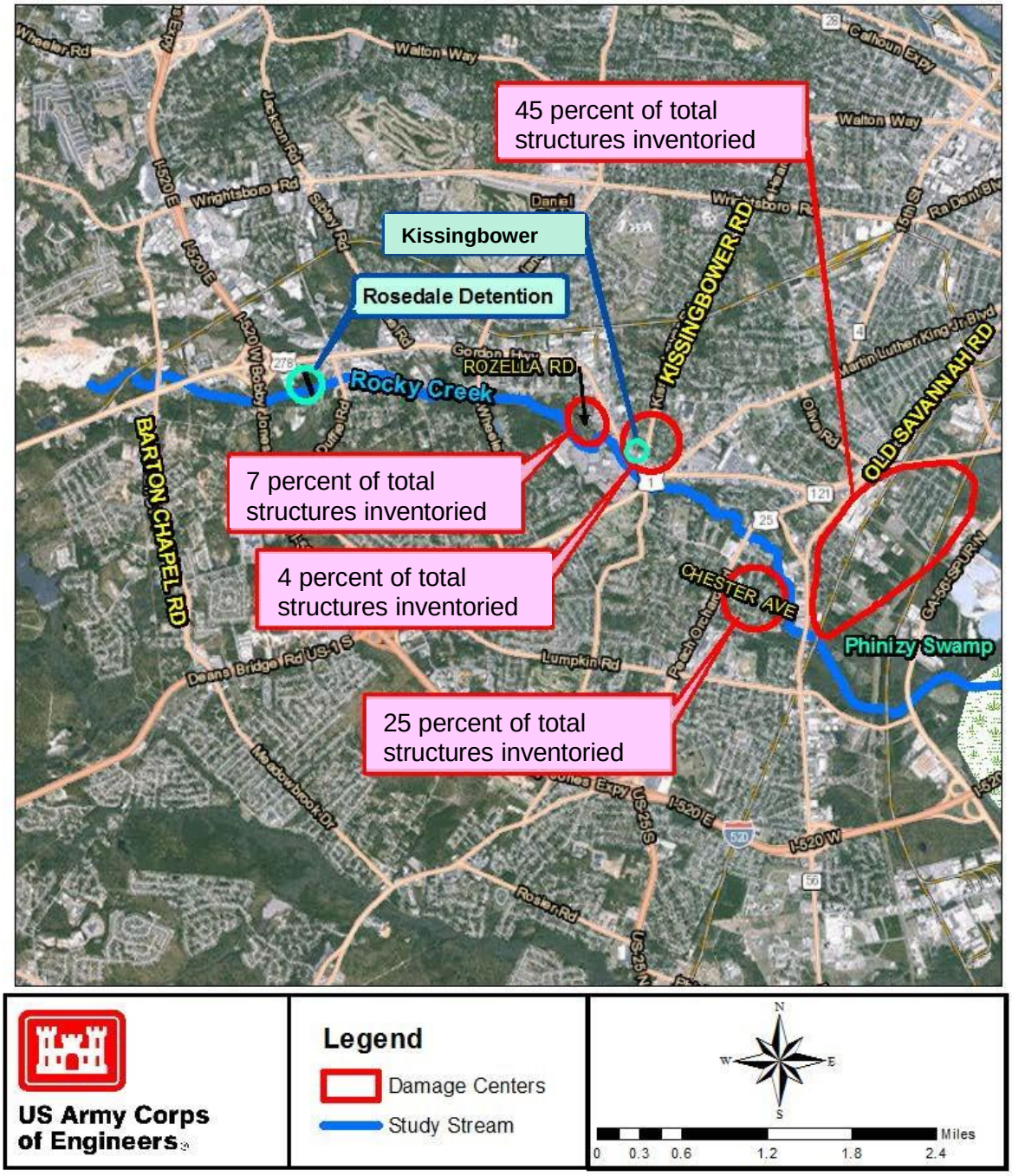

Figure 6. Damage Centers

4.3 FORMULATION OF ALTERNATIVE PLANS FOR ROCKY CREEK FLOODING PROBLEMS

Solutions to the problem are achieved by way of formulating management measures and alternatives that meet the planning objective and avoid the constraints. A management measure is a feature or activity that can be implemented at a specific site that addresses the planning objective. An alternative can be one management measure or a combination of management measures that address the planning objective.

Flood risk management measures are categorized as either structural or nonstructural. Structural measures are physical modifications designed to reduce the frequency of damaging levels of flood inundation. Non-structural measures reduce flood damages without significantly altering the nature or extent of flooding. Damage reduction from nonstructural measures is accomplished by changing the use made of floodplains, or by accommodating existing uses to the flood hazard. Section 73 of the Water Resources Development Act of 1974 mandates consideration of nonstructural alternatives in flood damage reduction studies.

This study evaluates two management measures for flood risks in the Rocky Creek Basin: one structural and one non-structural. The non-structural management measure could include a path dependent measure for recreation which can only occur after the buyouts. The structural management measure is the Rosedale Dam Detention Area improvement. The non-structural management measures are the Kissingbower Buyouts Alone and the Kissingbower Buyouts with a recreation park. The location of the management measures can be seen on Figure 7.

4.3.1 ALTERNATIVES

Based on these two management measures, the following alternatives were formulated:

1. No Action
2. Rosedale Dam Detention Area Alone
3. Kissingbower Buyouts Alone
4. Kissingbower Buyouts with Recreation Park
5. Rosedale Dam Detention Area and Kissingbower Buyouts with Recreation Park

4.3.1.1 NO ACTION ALTERNATIVE

The Council on Environmental Quality (CEQ) regulations prescribe inclusion of the No Action Alternative as the benchmark against which proposed Federal actions are evaluated. Without any action, the Rocky Creek drainage basin would continue to be subjected to frequent flooding resulting in substantial losses to properties. Subsequently, property values would be expected to decrease in the vicinity. Additional information quantifying property losses are in the economic analysis (Appendix A) of the Feasibility Report.

Properties on Kissingbower Road that have been subjected to past damage from flooding would continue to deteriorate with future storm events. These structures located within the floodplain would continue to occupy the floodplain resulting in an incompatible land use.

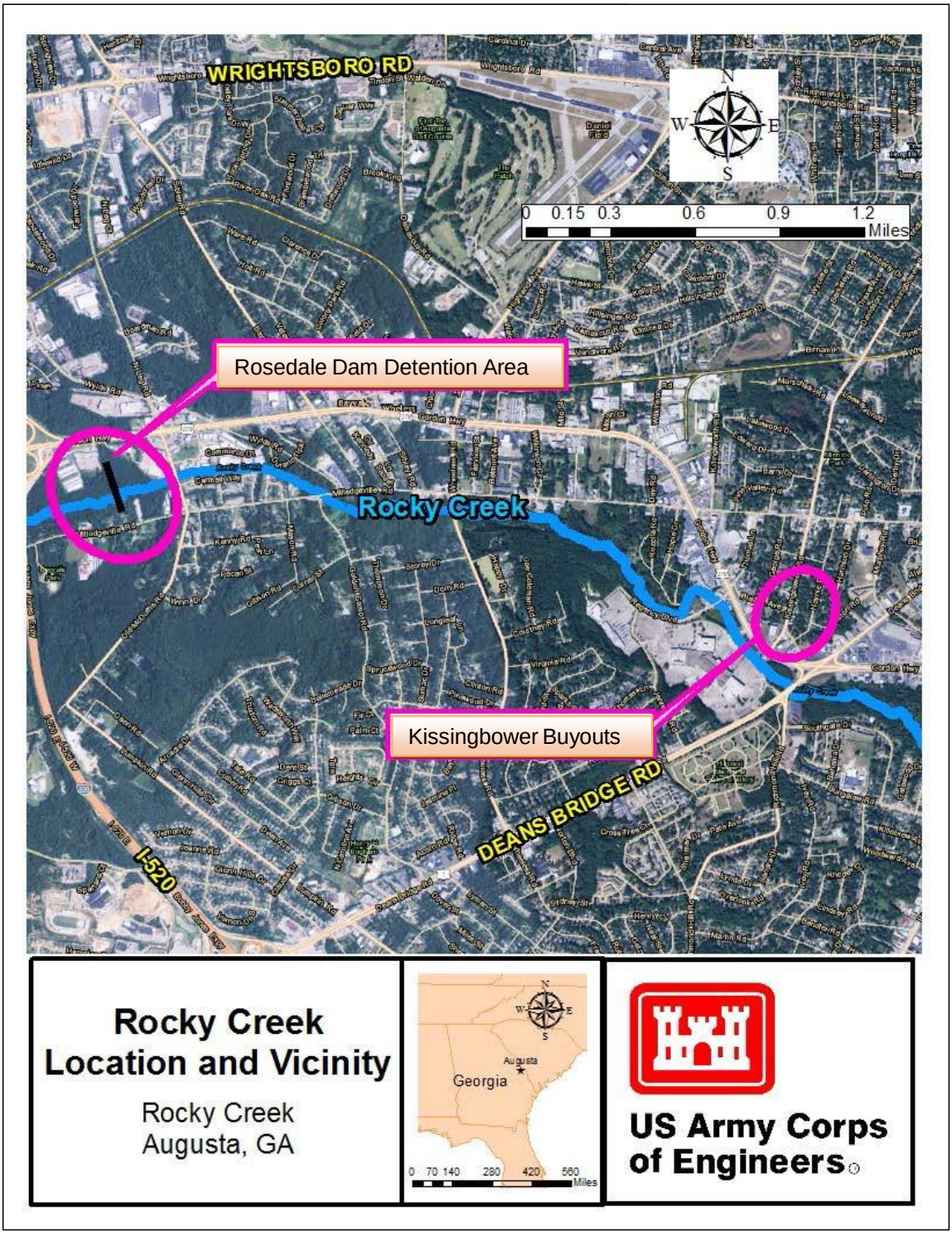

Figure 7. Location of Management Measures Analyzed

The future without-project condition (which is the No Action Alternative) is the most likely condition expected to exist in the future in the absence of a flood risk management project or program. The future without-project condition constitutes the benchmark against which flood reduction alternatives are evaluated. Forecasts of future without-project conditions consider all other practicable actions, plans and programs that could be implemented in the future to address the problems and opportunities in the study area.

Rocky Creek is included in the flood insurance program. In support of this effort, the local ordinance requires the lowest floor elevation of new construction within the high hazard areas to be three feet above the base flood elevation on the Flood Insurance Rate Map. In addition, Augusta-Richmond County has an ongoing Flood Hazard Mitigation Program that includes the purchase of structures in high hazard areas. Additionally, no residential structures shall be constructed within a dam break flood zone. These measures will aid in reducing future flood risks.

Since the floodplain is close to being fully developed, no changes in property density or location are anticipated. For purposes of this analysis, the Flood Damage Analysis (FDA) modeling focuses on the floodplain structures within the .002 exceedance probability (500-year) event. Expected annual damages for each year in the analysis period were computed, discounted back to present value, and annualized at the Fiscal Year (FY) 2017 Federal discount rate of 2.875 percent to determine equivalent annual damages over the 50-year period of analysis (2020-2069). It is estimated that the Rocky Creek study area will incur $1,547,024 in average annual damages in the future without-project condition.

4.3.1.2 ROSEDALE DAM DETENTION AREA

The structural alternative, Rosedale Dam Detention Area Improvement, would convert the former earthen dam to a detention structure. The renovations proposed at this location include placing a reinforced concrete box culvert through the existing breached embankment in the creek bed for normal creek flow. This would consist of a culvert for low flow which consists of a 5 feet wide x 6 feet high culvert outlet, approximately 150 linear feet in length, set to a culvert invert elevation of 215.7 feet NAVD 88. See Figure 8. There will be 1’ of fill and a controlling invert elevation of 216.7 feet NAVD 88. Because this is an inline detention structure, the outlet is set equal to the existing channel invert (1 foot below channel surface) so that there is no impoundment of water during normal low flow, and no barrier to movement of aquatic life during normal flow. The embankment will then be reconstructed to form the new embankment with an overflow weir. At flows of the 10-year flood event and greater, the overflow weir will be engaged and pass water in addition to culvert flow. The detention structure will reduce downstream peak flows and water surface elevations at flows greater than the 10-year event, but the incremental reduction in water surface elevation will decrease as flow increases.

The spillway crest elevation (notch) would be set to elevation 232 feet NAVD 88. The top of the detention structure would be set to elevation 240 feet NAVD 88, and protected against overtopping with a hardened structure. The bottom width of the overflow notch will be 50 feet, and the top width will be 82 feet. The side slopes will be at 2H:1V. The crest and downstream slope at the weir will be protected from erosion with about 7,000 square feet of articulated concrete block (ACB) slope protection or cast in place concrete. Both the inlet and the outfall of the culvert and weir will be protected from flow erosion. The downstream side contains a stilling basin made of rock riprap to dissipate energy when returning the flow into the creek bed. For outfall protection, approximately 150 CY (250 tons) of GADOT Type 1 riprap will be placed downstream of the reinforced concrete box culvert.

The entire structure will require clearing/grubbing and reconstruction of the embankment. Earthwork operations will require the use of an off-site borrow source for the newly constructed embankment and an off-site disposal area for soils excavated from the existing embankment which are not suitable for re-use in the new embankment. The construction contractor will be responsible for ensuring the borrow material is obtained from a source that is free of hazardous materials, cultural resources and wetlands. The proposed renovations will also include installation of riprap outfall protection, and establishment of grass cover for approximately 3 acres. The suggested plan will require acquisition of real estate in the impoundment area, but there will be no other real estate impacts upstream of the impoundment area.

A box culvert would be sunk 1 foot below grade to allow development of a natural stream channel through the culvert and facilitate passage of wildlife. The box culvert has been designed to approximate the existing channel width, to allow normal low flow and bed load sediment to pass unimpeded. This design would allow the upstream detention area to remain dry under normal weather conditions, with only normal creek flows passing through it.

This detention area does not involve excavation and is designed to utilize the natural existing flood storage capacity of the existing floodplain/wetland areas for floodwater detention. The detention area as designed is expected to hold water 3-4 hours during an average summer rain event; approximately 12 hours during typical flood events; and approximately 21 hours (no more than 36 hours) during the 25-year flood event (over an approximate area of 21 acres). The detention of water for longer periods in the detention area may create or enhance some wetland functions and values like the filtering of excessive nutrients and other pollutants from runoff, decreasing sedimentation/erosion, and enhancing wetland vegetation.

As designed, the Rosedale Dam Detention Area would limit downstream scour and loss of aquatic habitat by reducing the peak flow rate and energy of storm water discharges

to the receiving stream (USEPA 1999). Subsequent to this reduction to downstream erosion, benefits may occur to wetlands, floodplains, riparian vegetation, and bottomland hardwoods.

The sunken box culvert at the Rosedale Dam would prevent the potential for scouring of the channel bottom along the edge of the culvert, which would create a barrier to wildlife passage through the culvert. This barrier would have created hazards by forcing wildlife to go around the culvert instead of utilizing the safety of the creek for movement/migration through this area. In addition to improving the conditions for wildlife passage along the canal greenway, this culvert modification would provide a more suitable substrate for wildlife that may inhabit or pass through the culvert.

A plan view of the existing dam and proposed modifications and a profile of the dam are shown in Figures 8 and 9. Additional details are also located in the Engineering Appendix, which is Appendix B.

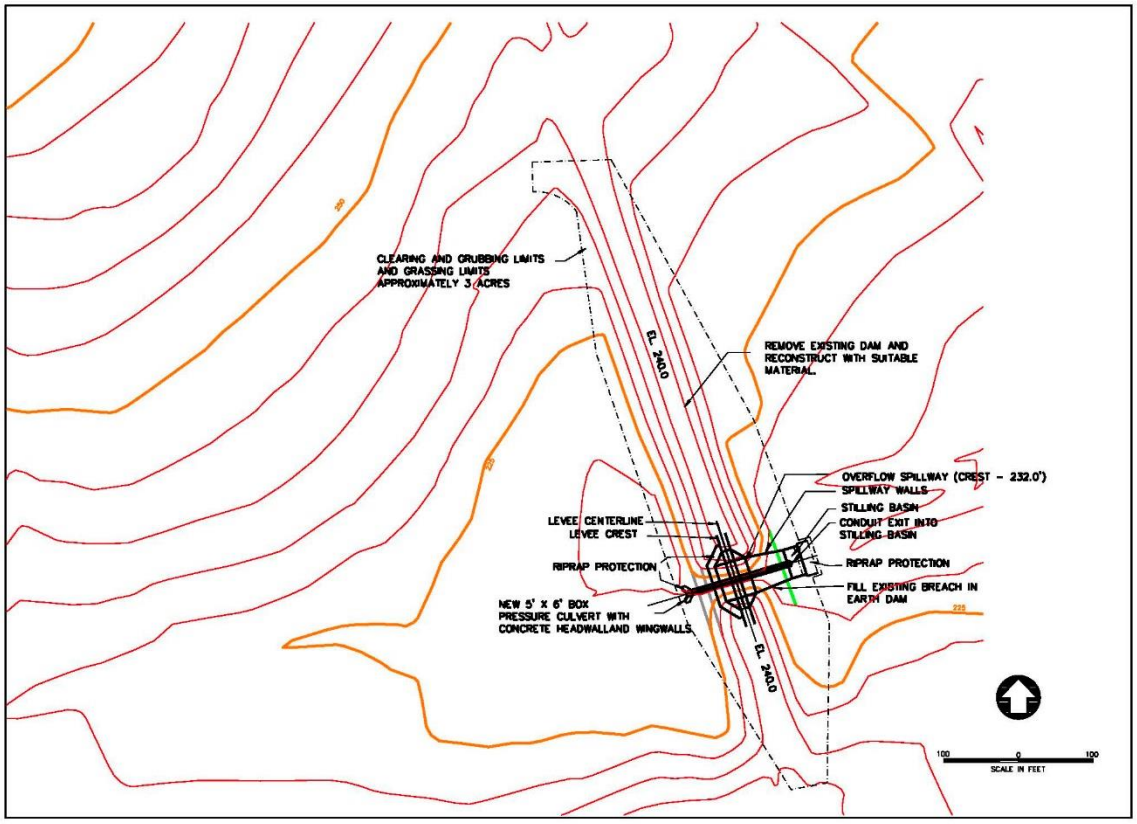

Figure 8: Plan View of the Existing Breached Dam and Proposed Modifications

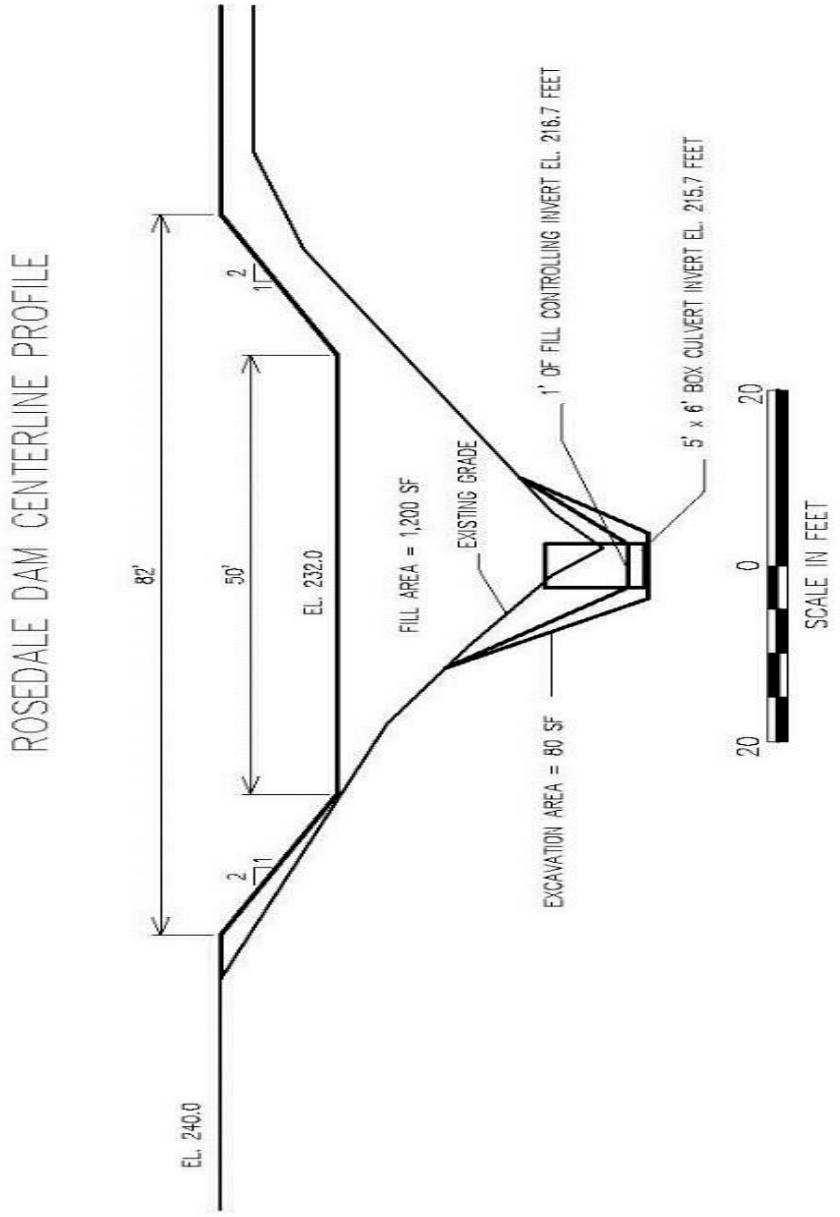

Figure 9: Profile Rosedale Dam Centerline

4.3.1.3 KISSINGBOWER BUYOUTS

This non-structural measure would require mandatory acquisitions of five properties; two are vacant and three each have a structure on them (refer to Section 5.4 "Real Estate Requirements" for more detail). By demolishing these structures, they will be eliminated from the floodplain. The remaining land would be, in perpetuity, converted to greenspace. PL 91-646 (Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970) requires that displaced residents be provided benefits for moving and resettlement.

4.3.1.4 KISSINGBOWER BUYOUTS WITH RECREATIONAL PARK

This alternative includes the non-structural Kissingbower buyouts with the added feature of a recreation park that would provide passive recreation benefits to the area. The proposed recreational park would require acquisition of five residential properties; two are vacant and three that have structures. Two of the houses were inundated with 4 to 5 ½ feet of water during the 100-year flood; the third house received 2.5 feet of flooding above the first floor elevation. By eliminating these structures from the floodplain and converting the remaining open property to a passive recreation facility, future flood damages would be eliminated and local residents would benefit from the recreational facility.

This recreation facility would consist of approximately 1.32 acres within the floodplain from the acquisition of these 5 parcels, which includes the bottom vacant triangular lot (0.3 of an acre) on Haynie Street. The purchase of this lot also provides more protection to the root system of the large existing Red Oak to be preserved for the recreational park. The site's mature trees would be left for the park. The properties would be purchased by the Non-Federal sponsor in fee.

The concept design includes the following items; 2 playgrounds, 2 swing sets, 4 benches, 1 picnic shelter (provided by the city) with 4 picnic tables, one trash container, and a bike rack (Appendix A; Figure A-8). A picnic area is provided with 16 picnic tables, each set on a concrete pad, with a grill and trash container. Landscaping would consist of preserving the existing trees on site and adding where needed shade trees, ornamental trees, a shrub hedge along the fence to screen and buffer the park from the neighbors. Fencing would be provided around the park for the children's safety.

At the onset of this study, the non-Federal sponsor expressed interest in converting evacuated lands into recreational facilities. Current recreational facilities in the Augusta-Richmond County area do not fulfill the recreation demand for day use activities. Consequently, consideration of a day use park in conjunction with evacuation/demolition of some of the structures subjected to moderate flooding would meet the objective of supplying some of the demands of the recreation shortages. ER-1105-2-100, section E-17 (2), acknowledges USACE's support that most of the benefits for the non-structural project will be associated with new uses of the vacated land. Recreational use is one of the most common post-project uses. The benefits from

future use of the vacated floodplain for recreation will generally be the dominant NED benefit for the non-structural alternative. The benefits of the recreation area are explained in detail in the Appendix A (Economics Analysis), in Section 5.5. In conclusion, by adding a recreational park area, the land use changes for that flood prone area from residential use to recreational use.

4.3.1.5 ROSEDALE DAM DETENTION AREA AND KISSINGBOWER BUYOUTS WITH PARK

This alternative would consist of a combination of both the structural improvements at Rosedale Dam and the non-structural improvements in Kissingbower Park. Impacts would be a combination of those for the detention area and the buyouts.

4.3.2 FORMULATION CRITERIA

The final array of alternative plans is compared using four formulation criteria required by the U.S. Water Resources Council. This criteria was released by the CEQ and is the "Principles and Requirements for Federal Investment in Water Resources," which was established pursuant to the Water Resources Planning Act of 1965 (Pub. Law 89-81), as amended by 42 U.S.C. 1962a-2 and consistent with section 2031 of the 2007 WEDA (Pub. Law 110-114). These criteria are completeness, effectiveness, efficiency and acceptability.

(1) Completeness

Completeness is a determination of whether or not the plan includes all elements necessary to achieve the objectives of the plan. It is an indication of the degree that the outputs of the plan are dependent upon the actions of others.

(2) Effectiveness

All of the plans in the final array provide some contribution to the planning objectives. Effectiveness is a measure of the extent to which a plan achieves its objectives.

(3) Efficiency

All of the plans in the final array provide net benefits. Efficiency is a measure of the cost effectiveness of the plan expressed in net benefits.

(4) Acceptability

Acceptability is the extent to which the alternative plans are implementable in terms of feasibility from technical, environmental, economic, financial, legal, institutional, and social perspectives. If it is not feasible due to any of these factors, then it cannot be implemented, and therefore is not acceptable. However, just because a plan is not the preferred plan of a non-Federal sponsor, it does not make it infeasible or unacceptable. The other dimension of acceptability is the satisfaction that a particular plan brings to government entities and the public. The degree of support can help planners evaluate whether to carry the plan forward or screen it out.

4.3.3 HYDROLOGIC AND HYDRAULIC ANALYSIS

As part of the evaluation of measures and alternatives, flood risk reduction is a major factor. Flood risk reduction is evaluated through the use of hydrologic and hydraulic models for the Rocky Creek Basin. The Hydrologic Modeling System (HMS) and River Analysis System (RAS) models were developed for the Augusta-Richmond County Study. The models were updated based on the latest hydrologic and survey information available, as well as modifying for the specific alternatives that would be utilized in the current study. A full suite of runs was utilized to capture the hydrologic loading condition of the basin from the 2-year to the 500-year recurrence intervals. The results of these model runs were utilized to evaluate the flood risk reduction effectiveness of the measures and alternatives for screening and final plan selection. Specific information and input/output of the HMS/RAS models are contained in Appendix B (Engineering Appendix). It should be noted that none of these measures, or combinations of measures, provide complete protection from flood risks nor provide a uniform level of flood protection throughout the basin.

4.3.4 ANTICIPATED ENVIRONMENTAL IMPACTS

Land use throughout this portion of the Rocky Creek Basin is typical of urban streams and has been developed primarily for residential subdivisions; while some is occupied by commercial and industrial property. This development involved much fill material that destroyed most of the natural flood storage of the original floodplain and wetland ecosystems. The combination of the Rosedale Dam Detention Area with the Kissingbower Buyouts and Recreation Park would restore some of this lost natural flood storage capacity and reduce economic damages from flooding in some of the developed areas of the drainage basin.

The Corps has assessed the environmental impacts of the all alternatives in the attached EA. Appendix A includes a detailed demographic and economic assessment of the existing condition in the study area. Environmental justice communities are present. However, USACE has not identified any significant adverse environmental impacts to any such community. All alternatives would comply with all applicable laws and regulations and would be expected to result in beneficial impacts and not have any significant adverse impacts. More detail regarding environmental impacts from alternatives in this study may be found in the EA, which is incorporated by reference.

Substantial coordination with the USFWS and GADNR has already occurred and is referenced in the EA. The GADNR issued a Water Quality Certification when the Corps considered this same project design in 2005. The USFWS has reviewed this proposed action and has been supportive both formally (Appendix D, Fish and Wildlife Coordination Act Report) and informally (phone and email). This coordination is described in more detail and is referenced throughout the EA.

A summary of the overall impacts of the all alternatives are contained in Table 2 of the attached EA and summarized in the table below. Since no significant adverse impacts have been identified in this study, environmental mitigation would not be required.

Table 3: Summary of Impacts of Alternatives

	FACTORS	NO ACTION	DETENTION AREA	BUYOUTS	BUYOUTS/ PARK	DETENTION AREA AND BUYOUTS/ PARK
1.	Economics/Social	A	B	b	b	B
2.	Recreation	--	--	--	b	b
3.	Historical/Archaeological/ Architectural	--	a	U	U	U
4.	Land Use	--	b	b	B	B
5.	HTRW	--	--	--	--	--
6.	Soil Conservation	--	B	--	--	B
7.	Stream/Wetlands Ecosystem	--	b	--	--	b
8.	Water Quality	--	b	--	--	b
9.	Air Quality	--	--	--	--	--
10.	Noise Levels	--	--	--	--	--
11.	Public Safety/Health	--	b	b	b	b
12.	Floodplain	--	b	b	b	b
13.	Flora/Fauna	--	b	--	--	b
14.	Threatened & Endangered Species	--	--	--	--	--
15.	Environmental Justice	--	b	b	b	b
16.	Cumulative Impacts	a	b	--	--	b

(A – Significant adverse impact) (a – Minor adverse impact)*
(B – Significant beneficial impact) (b – Minor beneficial impact)
(--- None or negligible) (U - Undetermined)
*a - Reference EA section 4.15

4.3.5 CULTURAL RESOURCES

No National Register of Historic Places (NRHP)-listed or eligible properties are located within or near the 100-year floodplain. Cultural resources surveys were conducted of selected areas along Rocky Creek in 2005. Six cultural resources sites were identified during the survey. One of the historic sites, Rosedale Dam (9RI1099), is located within the area of potential effect. The dam was constructed between 1928 and 1933 and consists of the earthen dam and concrete and metal water control features. Consultation with the Georgia State Historic Preservation Office (SHPO) in 2016 determined the site is not eligible for the National Register of Historic Places.

The structures that would be affected by the Kissingbower Buyouts non-structural alternative have not been recorded or formally evaluated for the NRHP. Based on an initial review of tax records, all are over 50 years old. A historic building inventory would be conducted during the next phase to record and evaluate the structures. Should the structures be determined eligible for the National Register, a Memorandum of Agreement would be executed with the GA SHPO to mitigate adverse effects. If the structures are determined not eligible, no further cultural resources investigations or agreements would be required. Based on the information obtained from the database search, there would be minimal risk to project cost and schedule in delaying the field assessment for the Kissingbower buildings until the next phase as the buildings will most likely be determined not eligible for the NHRP due to extensive modifications.

4.3.6 ECONOMIC COMPARISON

Table 4 presents the investment costs associated with each alternative at the FY18 price level. In compliance with ER 1105-2-100, which mandates that all costs and benefits be analyzed at a consistent price level, those costs are converted to the FY16 price level using Amendment 9 of EM 1110-2-1304. Deflation factors are derived from the appropriate feature code of the Civil Works Cost Construction Index System (CWCCIS). Further detail regarding this analysis is available in Appendix A.

Table 4. Costs by Alternative
2.875 Percent Discount Rate

	Investment Cost FY18 Price Level	CWCCIS Deflation Factor	Investment Cost FY16 Price Level
Rosedale Detention Basin Alone	$ 3,679,000	0.966	$ 3,554,447
Kissingbower Buyout Alone	$ 433,000	0.954	$ 412,984
Kissingbower Buyout with Park	$ 1,061,000	0.940	$ 997,025
Rosedale Detention Basin and Kissingbower Buyout with Park	$ 4,710,000	0.966	$ 4,550,542

The final economic comparison of the alternatives is illustrated in Table 5, which summarizes the costs and benefits for each alternative at the FY 16 price level. Both flood damage reduction and recreation benefits are included, as is the ratio of average annual benefits to average annual costs (BCR) for each plan. The NED Plan is the alternative that maximizes average annual net benefits.

Table 5. Net Benefit Analysis by Alternative
FY16 Price Level and 2.875 Percent Discount Rate

	Investment Cost	IDC*	Total Investment Cost	AAE Investment Cost	Annual O&M Cost	AAE Cost	AAE Benefits **	AAE Net Benefit	BCR
Rosedale Detention Basin Alone	$3,554,447	$46,598	$3,601,044	$136,653	$15,000	$151,653	$766,536	$614,883	5.05
Kissingbower Buyout Alone	$412,984	$2,449	$415,433	$15,765	$0	$15,765	$1,524	-$14,241	0.10
Kissingbower Buyout with Park	$997,025	$13,071	$1,010,096	$38,331	$2,500	$40,831	$102,765	$61,934	2.52
Rosedale Detention Basin and Kissingbower Buyout with Park	$4,550,542	$59,656	$4,610,198	$174,948	$17,500	$192,448	$869,301	$676,853	4.52

***Interest during Construction**
****Note: An overview of the average annual benefit calculation procedure can be found in Appendix A**

The alternative that maximizes net benefits, the NED plan, is the combination of the Rosedale Dam Detention Area Improvements with the Kissingbower Buyouts and Recreation Park. This plan produces $869,301 in average annual benefits and $192,448 in average annual costs over the life of the project equaling average annual net benefits of $676,853. This yields a BCR of 4.52. The NED plan eliminates flood damages for 6 out of 14 structures for the 2-year event; 20 out of 52 structures for the 5-year event; 49 out of 114 structures for the 10-year event; 70 out of 162 structures for the 25-year event; 112 out of 233 structures for the 50-year event, 121 out of 279 structures for the 100-year event; 80 out of 326 structures for the 250-year event; and 64 out of 363 structures for the 500-year event.

When combining the Rosedale Detention Basin Alone Alternative with the Kissingbower Buyout with Park Alternative, the BCR decreases from 5.05 to 4.52. However, including the Kissingbower Buyout with Park reduces average annual damages by $1,524. It has the additional impact of providing $101,241 in average annual recreation benefits. This decrease in average annual damages increases the average annual net benefits for the combined alternative above that of the Kissingbower Buyout with Park Alternative. The additional investment is worth the additional cost from a NED perspective and is policy compliant.

4.3.7 NED PLAN

The NED plan maximizes net benefits. The combination of the Rosedale Dam Detention Area with the Kissingbower Buyouts and Recreation Park is the NED plan and; hence, the Selected Plan.

The uncertainty surrounding the economic and engineering input proves to have a greater than 75 percent probability of the annual benefits exceeding the annual cost and being economically justified. The details of the uncertainty analyses can be found in the economic and engineering appendices.

5.0 DESCRIPTION OF THE SELECTED PLAN

The selected plan is alternative 5, consisting of the Rosedale Dam Detention Area and Kissingbower Buyouts with the Recreation Park.

5.1 ROCKY CREEK PLAN COMPONENTS AND CONSTRUCTION CONSIDERATIONS

The main components of the selected plan include the following elements:

- Structural Component
- Non-Structural Component

5.1.1 STRUCTURAL COMPONENT – ROSEDALE DAM DETENTION AREA

The structural component would include the following:

- Conversion of the existing breached Rosedale dam to a storm water detention structure (Figures 8 and 9).
- A low-level 5 feet wide x 6 feet high culvert outlet set to 1 foot below the controlling invert elevation of 216.7 feet NAVD 88.
- A spillway crest set (notch) at elevation 232 feet NAVD 88.
- A detention structure set at elevation 240 feet NAVD 88.
- Installation of riprap inlet and outfall protection.

The structural plan includes placing a reinforced concrete box culvert approximately 150 feet in length through the breach in the dam for normal creek flow. The dam will be reconstructed to an elevation of 240.0 feet NAVD 88 with a hardened weir with a crest (notch) elevation of 232.0 feet NAVD 88. The culvert will pass all flows up to the 10-year flood event. At flows larger than the 10-year flood event, the overflow weir would engage and pass water in addition to the culvert flow. The detention structure would still

provide a reduction in peak flows and water surface elevations downstream at flows greater than the 25-year event. However, the incremental water surface elevation reduction would decrease as flow increases. At no time should the entire structure be overtopped. The crest and downstream slope at the notch would be covered with articulated concrete blocks (ACB) or a cast-in-place reinforced concrete apron for slope protection.

The Engineering Appendix includes more detailed descriptions of the dam. The impoundment area would not change the highest and best use of the lands upstream since they are currently subject to periodic flooding.

5.1.2 NON-STRUCTURAL COMPONENT – KISSINGBOWER BUYOUTS AND RECREATIONAL PARK

The non-structural portion of the recommended plan is located north of Gordon Highway on Kissingbower Road and Haynie Street, across from the Regency Mall. There are three structures presently located on five parcels (refer to section 5.4 "Real Estate Requirements" for more detail regarding real estate issues). Two of the structures were inundated with 4 to 5 ½ feet of water while the third house received 2.5 feet of flooding during the 100-year flood. Those occupying the houses would be relocated and the structure would be demolished. The properties would be purchased by the local sponsor in fee. All 5 parcels would be acquired, which includes the bottom vacant triangular lot (0.3 of an acre) on Haynie Drive. The proposed recreational park would use the vacated lands of these five parcels. The park would consist of approximately 1.32 acres within the floodplain. The purchase of these parcels also provides more protection to the root system of the large existing Red Oak that would be preserved for the recreational park. The site's other mature trees would also be left for the park also (Appendix B, Engineering Appendix; Figure 24).

The concept design for the recreational park includes the following items: swing sets, benches, a picnic shelter (provided by the city) with picnic tables, a trash container, multi-use trail, and a bike rack. Two concept designs can be found in Appendix A. Concept 3B was chosen.

A picnic area is provided with 16 picnic tables, each set on a concrete pad, with a grill and trash container. Landscaping would consist of preserving the existing trees on site and adding where needed shade trees, ornamental trees, a shrub hedge along the fence to screen and buffer the park from the neighbors. Fencing would be provided around the park for public safety.

The annual recreation benefits are calculated by multiplying the unit day value ($7.42) by 13,648 annual activity occasions for a total of $101,268. Additionally, the average annual NED flood damage reduction that results from buying out five properties is $1,524. This results in $102,792 in total benefits at the FY16 price level. The cost to build this park includes the average annual cost (AAC) of buying out five properties ($16,396), AAC of constructing the park ($23,831), annual operation and maintenance ($2,500), and interest during construction ($528) for a total AAC of $43,255 at the FY18 price level. Using the Civil Works

Breakdown Structure (CWBS) feature code for Recreation Facilities Amendment 9 of EM 1110-2-1304 to index these costs to the FY16 price level yields average annual costs of $40,831. The net benefits are $61,934. For additional information, see section 5.5 of the Economics Appendix A.

5.2 Operation and Maintenance

Based on implementation of the recommended plan and current policy and guidance, operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) is the responsibility of the non-Federal sponsor. Maintenance of the evacuated residential sites would be minimal and consist of periodic mowing and landscaping. Operation and Maintenance of the recreational park is estimated to cost $2,500 per year. Operation and Maintenance (O&M) cost of the Rosedale Dam Detention Area is estimated at $15,000 per year.

5.3 Plan Accomplishments

The Rosedale Dam Detention Area would primarily provide temporary storage for small (2-year) to medium (10-year) size flood events. Once constructed, the area would provide additional attenuation time for rainfall runoff (primarily for less than 25-year flows), and the peak downstream flow would be reduced by 200-250 CFS. Flood elevations would be reduced immediately downstream. The Rosedale Dam Detention Area would reduce the peak flow downstream for all rain events. The structure design is targeted to have the largest flood reduction impact up to the 25-year flood event. At flows larger than the 10-year flood event, the overflow weir would be engaged and pass water in addition to culvert flow. The detention structure would still provide a reduction in peak flows and water surface elevations downstream at flows greater than the 10-year event. However, the incremental water surface elevation reduction will decrease as flow increases.

The following flood reductions result from the Rosedale Dam Detention Area, and not the non-structural plan. The area between Wheeless Road and Regency Mall has flooding risks reduced by about 0.25 feet for the 25-year event and 0.21 feet for the 10-year event. The area between Peach Orchard Road and Mike Padgett Highway has flooding reduced by about 0.7 feet for the 25-year event and 0.85 feet for the 10-year event. The area between Peach Orchard and Deans Bridge shows approximately a 1.5 feet Water Surface Elevation (WSE) reduction.

The Kissingbower property buyouts would include the purchase of five parcels that include three structures in the floodplain. The Kissingbower properties sustain water damage on a fairly frequent interval due to their proximity to Rocky Creek and experience up to 5 feet of flooding with the 100-year flood event. The property buyouts and demolition of the structures would eliminate the potential for future flood damages on these properties. Converting the use of these lands to a recreational park would provide unmet recreational demands in the Kissingbower Road area. More importantly, owners of purchased properties would have the opportunity to relocate to an area less prone to flooding. In addition, the floodplain would be restored on these properties in perpetuity.

The selected plan which includes the Rosedale Dam Detention Area and the Kissingbower Buyouts with the Recreation Park reduces flood damages for 258 structures within the 500-year floodplain. Three of these structures would be completely removed from the floodplain in the non-structural alternative. The non-structural alternative eliminates 100 percent of the average annual damages to the structures and contents while the structural alternative would reduce average annual damages by approximately 50 percent. The residual damages would be approximately 50 percent.

The USACE screening level climate change vulnerability assessment (VA) tool was utilized to assess the potential impacts and likelihood of climate change impacts to this region. The tool indicated that the Savannah-Ogeechee Basin was at relatively low risk for climate change to cause a substantial negative impact on flood risk reduction type projects. More information regarding climate change may be found in Appendix B Section C-2.5.

There are no significant adverse environmental impacts caused by the project. The description of water detention periods is located in the EA under project description: "This detention area does not involve excavation and is designed to utilize the natural existing flood storage capacity of the existing floodplain/wetland areas for floodwater detention. The detention area as designated is expected to hold water 3-4 hours during an average summer rain event; approximately 12 hours during typical flood events; and approximately 21 hours (no more than 36 hours) during the 25-year flood event (over an approximate area of 21 acres)…"

The EA includes a discussion of stream impacts using the "waters of the US" criteria and discusses jurisdictional wetland impacts (0.4 acre of wetland within project impact area) using the definition for wetlands. The 55 cubic yards of fill for renovating the Rosedale Dam is within the stream channel, which are waters of the US (but are not jurisdictional wetlands). The 55 cubic yards of fill for renovating Rosedale Dam is located a significant distance from the 0.4 acre wetland (as illustrated in EA Figure 4; Appendix A) and therefore would not impact the wetland.

5.4 Real Estate Requirements

The requirements for lands, easements, rights-of-way and relocations, and disposal/borrow areas (LERRD) would include the right to construct, maintain, repair, operate, patrol and replace a flood protection levee and weir, including all appurtenances, and for the location, construction, operation, maintenance, and alteration/ replacement of a road and appurtenances. Five parcels that lie within the floodplain in the Kissingbower area would be purchased in fee estate. A Real Estate Plan is included as Appendix C.

The Flowage Easement for Occasional Flooding (approximately 17.19 acres) would be used for the detention area and the Flood Protection Levee Easement (approximately 1.80 acres) will be used for the berm/levee. The Temporary Work Area Easement (approximately 2.20 acres) would be used for staging area and a Perpetual Road Easement (approximately 0.3 acres) would be used for the access road to the levee.

The five privately owned parcels (approximately 1.32 acres) located on Kissingbower Road and Haynie Drive in the area of Gordon Highway and Kissingbower Road would be bought out. Two of the parcels are vacant and three of the properties have structures. Of those, one appears to be owner occupied and the other two are assumed to be tenant occupied. Relocation assistance would be available for eligible displaced persons. After acquisition of the property and relocation of the owner/tenants, the parcels would be cleared and would be used to construct a public recreation park.

Nine landowners and ten parcels would be impacted by construction of the two features of the project. It is estimated that real estate could be acquired within 12 months. Real estate cost including land value, administrative cost and relocation assistance is estimated at $613,200. It is noted that the real estate costs in the following cost tables reflect the fully funded Total Project Cost (TPC), and do not match the estimated real estate costs provided for inclusion in the TPC.

5.5 Cost Sharing

Federal and non-Federal cost-share apportionments are based on the fully-funded total project cost unlike the NED analysis which is based on the first cost. The fully-funded costs are the current estimate of the costs at current price levels and inflated through the estimated mid-point of construction.

5.5.1 Cost Sharing by Project Purpose

Cost sharing percentages are shown in Table 5 by project purpose. However, additional considerations affecting the distribution include lands, easements, rights-of-way, relocations, and disposal areas (LERRDs) paid by the non-Federal sponsor, limits on cost increases on certain purposes such as recreation, and minimum cash contribution requirements by the non-Federal sponsor.

Table 6. Cost Sharing Distribution by Purpose

Purpose	Federal	Non-Federal
Flood Risk Management[1]	65%	35%
Recreation	50%	50%

[1]65/35 is the minimum cost-share percentage. It could be as high as 50/50 depending on LERRDs, but this does not influence this study since LERRDs will not exceed 35 percent of the total project cost.

5.5.2 Cost Sharing of Structural Measure

1. Total Project Cost (TPC) for structural management measures is $3,786,000 and includes Design and Implementation (D/I); construction management; Lands, Easements, Rights-of-way, Relocations, and Disposal Areas (LERRDs); and construction features.

2. 35 percent of structural TPC

.35 x $3,786,000 = $1,325,100

3. LERRDs for structural:

$208,000 Total
$196,000 non-Federal (NF)

4. Minimum of five percent cash contribution for structural Flood risk management measures of TPC by non-Federal sponsor:

.05 x $3,786,000 = $189,300

5. LERRDs (NF) plus five percent cash contribution by non-Federal sponsor:

$196,000+ $189,300 = $385,300

6. Since LERRDs plus five percent, or $385,300 is less than 35 percent of structural TPC of $1,362,200, the non-Federal sponsor must provide an additional $939,800 in cash required for the structural flood risk management measure.

7. A summary of the NED structural flood risk management cost-share allocation is contained in Table 7.

Table 7. Cost Sharing
of Structural Flood Risk Management Measure
FY18 Price Level

Item	Non-Federal Cost	Federal Cost	Total Cost
D/I[1]	$239,050	$443,950	$683,000
Construction Mgmt[1]	$37,100	$68,900	$106,000
LERRDs	$196,000	$12,000	$208,000
Construction Features[2]	$852,950	$1,936,050	$2,789,000
Total	**$1,325,100**	**$2,460,900**	**$3,786,000**
(Percent)	***35%***	***65%***	
Min 5% Cash Rqmnt[3]	$189,300		
LERRD Cost	$196,000		
Additional Non-Fed Cash for 35%	$939,800		

[1] D/I and Construction Management costs are 65/35 percent Federal/non-Federal.
[2] Adjustment to limit non-Federal sponsor to 35 percent maximum.
[3] Five percent Cash Contribution by non-Federal sponsor.

5.5.3 COST SHARING OF NON-STRUCTURAL MEASURE

1. TPC for non-structural management measures is $584,000, and includes D/I, construction management, and LERRDs.

2. 35 percent of non-structural TPC

    0.35 x $584,000 = $204,400

3. LERRDs for non-structural:

    $558,000 Total
    $533,950 Non-Federal (NF)

4. Since sponsor non-structural cost are greater than 35 percent of TPC, Federal reimbursement of difference is required, amounting to $338,650.

$543,050 - $204,400 = $338,650

5. A summary of the NED non-structural flood risk management cost-share allocation is contained in Table 8.

Table 8. Cost Sharing of Non-Structural Flood Risk Management Measure FY18 Price Level

Item	Non-Federal Cost	Federal Cost	Total Cost
D/I[1]	$7,000	$13,000	$20,000
Construction Mgmt	$2,100	$3,900	$6,000
LERRDs	$533,950	$24,050	$558,000
Construction Features	-	-	-
Total without Reimbursement	$543,050	$40,950	$584,000
(Percent)	*93%*	*7%*	
35% Maximum NF Contribution	$204,400		
Reimbursement Amount:		$338,650	
Total	**$204,400**	**$379,600**	**$584,000**
(Percent)	***35%***	***65%***	

5.5.4 COST SHARING OF RECREATION

1. Total project cost (TPC) for recreation is $591,000 and includes preconstruction engineering and design (PED), construction management, and construction features.

2. 50 percent of recreation TPC is $295,500

0.50 x $591,000 = $295,500

3. A summary of the NED recreation cost-share allocation is contained in Table 9.

Table 9. Cost Sharing of Recreation Measure FY18 Price Level

Item	Non-Federal Cost	Federal Cost	Total Cost
D/I	$70,500	$70,500	$141,000
Construction Mgmt	$17,500	$17,500	$35,000
LERRDs	-	-	-
Construction Features	$207,500	$207,500	$415,000
Total	**$295,500**	**$295,500**	**$591,000**
(Percent)	***50%***	***50%***	

5.5.5 NED Plan Cost Sharing

1. Total project cost (TPC) for the NED plan include all costs pertaining to structural management measures, non-structural management measures, and recreation (see sections 5.5.2 through 5.5.4) TPC is $4,962,000 and includes preconstruction engineering and design (PED), construction management, and LERRDs ("Lands & Damages") and construction features.

2. 35 percent of structural TPC

0.35 x $3,786,000 = $1,325,100

3. Minimum of five percent cash contribution for structural flood risk management measures of TPC by non-Federal sponsor:

0.05 x $3,786,000 = $189,300

4. Structural LERRDs (NF) plus five percent cash contribution by non-Federal sponsor (see Section 5.5.2):

$196,000+ $189,300 = $385,300

5. Since LERRDs plus five percent, or $385,300 is less than 35 percent of structural TPC of $1,325,100 the non-Federal sponsor must provide an additional $939,800 in cash required for the structural flood risk management measure.

6. Since sponsor non-structural cost are greater than 35 percent of non-structural TPC, Federal reimbursement of difference is required, amounting to $338,650 (see section 5.5.3).

$543,050 - $204,400 = $338,650

7. A summary of the NED structural flood risk management cost-share allocation is contained in Table 10.

Table 10. Cost Sharing of NED Plan FY18 Price Level

Item	Non-Federal Cost	Federal Cost	Total Cost
D/I	$316,550	$527,450	$844,000
Construction Mgmt	$56,700	$90,300	$147,000
LERRDs	$729,950	$37,050	$767,000
Construction Features	$1,060,450	$2,143,550	$3,204,000
Total Costs before Federal Reimbursement	$2,163,650	$2,798,350	$4,962,000
(Percent)	*44%*	*56%*	*100%*
Non-Structural Cost Federal Reimbursement to Sponsor	*-($338,650)*	$338,650	
Total Project Costs:	**$1,825,000**	**$3,137,000**	**$4,962,000**
(Percent)	***37%***	***63%***	
Min 5% Cash Rqmnt[2] (Structural)	$189,300		
Additional Non-Fed Cash for 35% (Structural)	$939,800		

6.0 PLAN IMPLEMENTATION

6.1 PROJECT PARTNERSHIP AGREEMENT

The description of Federal and non-Federal responsibilities would be legally defined in the Project Partnership Agreement (PPA). The PPA would not be executed nor will construction be initiated on this project until the National Environmental Policy Act, the Clean Water Act, the Endangered Species Act, the Fish and Wildlife Coordination Act and the National Historic Preservation Act planning phase requirements are met.

These requirements are met for the Augusta-Richmond County project once the draft EA has been coordinated, responses to comments prepared, and a Final Environmental Assessment and Finding of No Significant Impact (FONSI) is signed.

PPA negotiations with the non-Federal project sponsor would be conducted, and the draft PPA package submitted to higher authority for review and approval once the feasibility report is approved and the project is budgeted for construction. In accordance with CAP policies, an initial allocation of $100K in D/I phase funds would be made available to negotiate and execute the PPA.

6.2 FINANCIAL ASSESSMENT

Augusta-Richmond County has been a non-Federal sponsor with the Corps of Engineers on several projects and studies since the early 1990's. The City of Augusta (now consolidated city and county and referred to Augusta-Richmond County) was the non-Federal sponsor on the Oates Creek Flood Control Project that was constructed in 1992. The total cost was around $14,000,000 of which the non-Federal share was about $4,000,000. They have performed the operation and maintenance of the project since construction. Also, Augusta-Richmond County has contributed 50% as their share of the feasibility phase of this Section 205 flood risk management study.

Most of the funding for this project is expected to come from a Special Purpose Local Option Sales Tax (SPLOST) funding. This is a one-cent sales tax on goods in the county. SPLOST proceeds may be used for capital improvement projects that would otherwise be paid for with general fund and property tax revenues. Since 1985, Richmond County residents have voted seven times to approve or extend the SPLOST on seven different referendums. Some of these capital investment funds have been used for drainage projects on Rocky Creek, Raes Creek, the Wheeless Road area on Rocky Creek, and East Augusta drainage improvements. Table 11 shows the funds generated.

Table 11. Historical SPLOST Funding

Referendum	Years	Amount of Funds Generated
SPLOST I	1986-1990	$82,380,000
SPLOST II	1991-1995	$100,995,000
SPLOST III	1996-2000	$138,044,000
SPLOST IV	2001-2005	$120,233,000
SPLOST V	2006-2010	$160,000,000
SPLOST VI	2011-2015	$184,724,000
SPLOST VII	2016-2021	$215,550,000

SPLOST VII project list was approved by the Augusta Commission on August 18, 2015. Augusta has an A+ bond rating if it should choose this option.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

This report assesses the feasibility of providing flood risk management for the Rocky Creek Basin through a combined structural and non-structural plan. The structural plan includes constructing a flood reduction feature along Rocky Creek. The non-structural plan includes purchasing properties in a portion of the basin prone to repetitive flooding.

Structural Alternative: The entire existing embankment would be cleared of all vegetation and de-constructed. A new embankment would then be reconstructed back to a crest elevation of 240 feet. A new 150 foot long reinforced concrete box culvert would be placed in the creek bed and the area that was previously breached would be filled to an elevation of 232.0 feet to form a weir for all flows in excess of the 10-year event. The bottom width of the overflow weir would be 50 feet, and the top width would be 82 feet. The side slopes would be at 2H:1V. The crest and downstream slope at the weir would be protected from erosion with about 7,000 square feet of Articulated Concrete Block (ACB) slope protection or cast in place concrete. For outfall protection, approximately 150 CY (250 tons) of GADOT Type 1 riprap would be placed downstream of the reinforced concrete box culvert.

Non-Structural Alternative: The proposed non-structural plan would require acquisition of five residential properties. The acquired properties would be converted into a recreational park.

Selected Plan: Based on the results found in this feasibility report, the selected plan includes both the structural and non-structural alternatives. Alternative 5, Rosedale Dam Detention Area and Kissingbower Buyouts with Recreation Park, produces the highest average annual net benefits of all the alternatives while sustaining environmental resources.

The conclusions contained herein reflect the information available at this time and current Department of Army policies governing formulation of individual projects. The selected plan is in accordance with current Department of the Army budgetary policy.

7.2 RECOMMENDATIONS

I recommend that the selected plan for the management of flood risks along Rocky Creek in Augusta-Richmond County, Georgia as described in Section 5.0 be authorized for implementation as a Federal project. The selected plan includes the construction of the Rosedale Dam Detention Area, the acquisition of five properties in the Kissingbower Road Area, and the construction of a recreational park in the Kissingbower Road Area.

Date: 25 Apr 2017

Marvin L. Griffin, P.E.
Colonel, US Army
Commanding