PROGRAMS AND PROJECTS AFFECTING THE SAVANNAH RIVER BASIN

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Topics of Discussion

- Hartwell Lake Water Supply Reallocation Study
- Savannah Harbor Expansion Program
- Dissolved Oxygen Mitigation
- Savannah River Below Augusta

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Hartwell Lake
Water Supply Reallocation Study

Study Area

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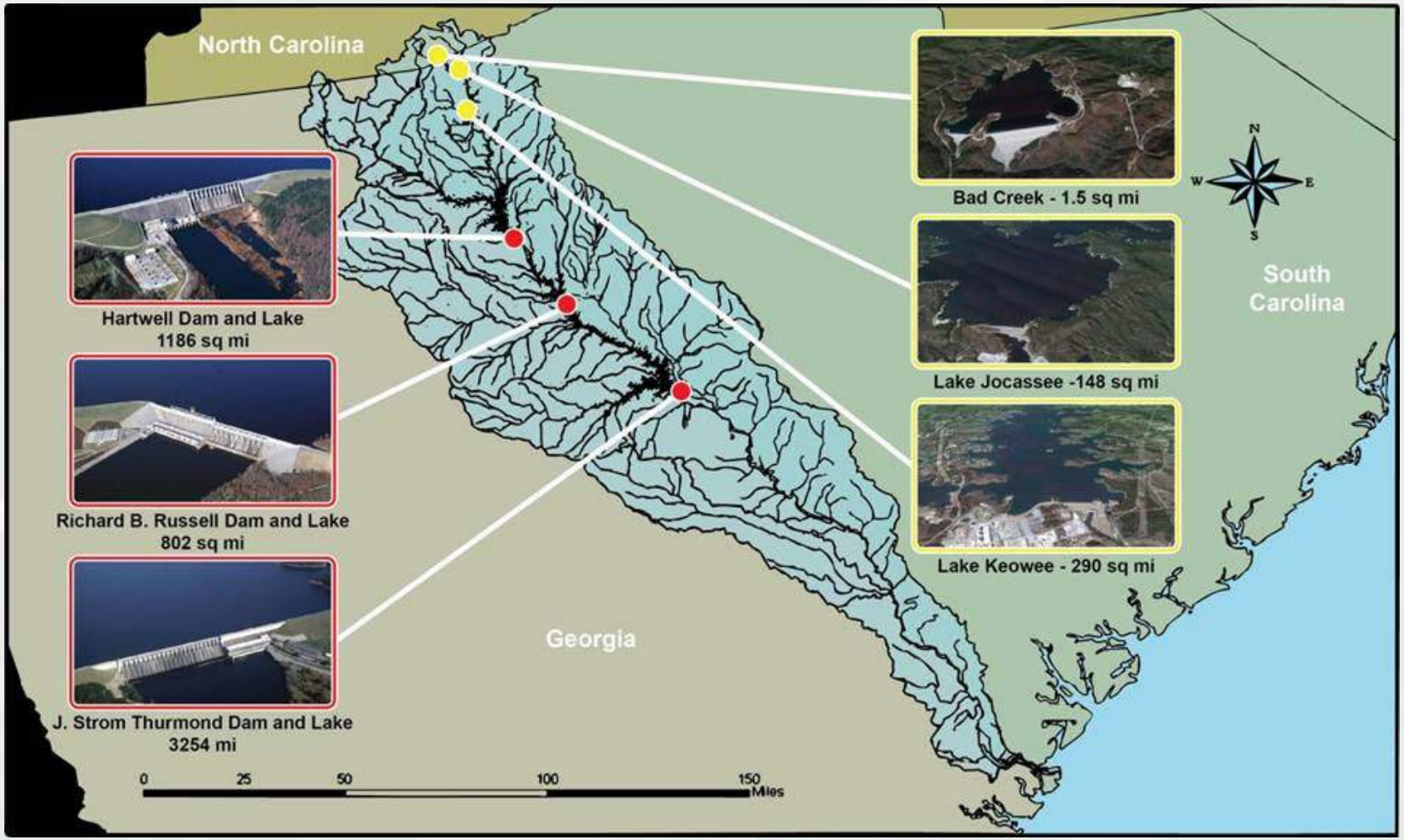

Project Purpose

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Evaluate the feasibility of reallocating existing authorized water storage in Hartwell Lake to water supply for four water supply storage reallocation requests

Timeline

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Task Name	ACTUAL	Start Date	Completion	Status
Project Initiated	4 non-federal requestors	1-Apr-14	NA	ACTUAL
AMM	Additional economic analysis required	8-Sep-16	8-Sep-16	ACTUAL
1-YR Hold on Study	Suspended Clemson Lower Diversion Dam Saddle Dike DSAC Rating downgrade	12-Mar-18	20-Mar-19	ACTUAL
IRRP Approved	Interim Risk Reduction Plan for Clemson Lower Diversion Dam Saddle Dike	NA	6-Dec-18	ACTUAL
HQ/SAD Approved Waiver	Waiver to Continue Study (3x3x3 NA)	NA	20-Mar-19	ACTUAL
Prepare Integrated Draft Report/EA	H&H Analysis, HAC Analysis, Economic Analysis, & EA completed Apr 19-Apr 20	14-Feb-20	10 Oct 2020	ACTUAL
TSP	SAD IPR Pre-TSP- completed 8 May 2020	29-May-20	29-May-20	ACTUAL
Awaiting Funds	FY21 Work Plan funding of $185K approved and funds received	29-May-20	19-Apr-21	ACTUAL
Complete Draft Report	Update Draft Report/EA/FONSI (includes Supervisory Review)	19-Apr-21	17-Mar-22	ACTUAL
DQC Review	DQC Review of Integrated Draft Report	21-Mar-22	NA	NA
***RFC**	***PDT developed Return Flow Credit Alternative***	***1-Apr-22***	***30-Oct-23***	***ACTUAL***
2nd DQC Review	DQC Review of Integrated Draft Report	15-Nov-23	7-Feb-24	ACTUAL
Public and Agency Technical Review	ATR Review of Draft Report	12-Feb-24	5-May-24	Ongoing

Existing Storage Contracts

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USACE Project	Recipient	Acre Feet of Storage	Reallocated From	Date of Approval
Hartwell (GA & SC)	*Anderson Co. Joint Municipal Water System (mod)	24,620	Conservation	1967
	*City of Lavonia	127	Conservation	1990
	Hart County	1,827	Conservation	1998
J Strom Thurmond (GA & SC)	City of Lincolnton	92	Conservation	1964
	City of Washington	632	Conservation	1975
	Savannah Valley Auth.	92	Conservation	1989
	Columbia County	1,056	Conservation	1989
	Town of McCormick	506	Conservation	1999
	City of Lincolnton	83	Conservation	1990
	City of Thompson	1,056	Conservation	1990
	Town of McCormick	316	Conservation	2001
Richard B Russell (GA & SC)	SC Public Service Auth.	491	Flood Control	2001
	City of Elberton	381	Conservation	1990
	Total	31,279		

Existing Requestors with new request:

- ARJWS
- City of Lavonia

New Requestors:

- Pioneer Rural Water District
- Currahee Club

Problems & Opportunities

Problems:

- Increased water demands
- Limited cost-efficient water sources
- Limited existing and potential drought resilient water sources

Opportunities:

- Reallocate existing storage in Hartwell Lake to water supply storage for use by requestors

Objectives & Constraints

Objectives:

- Identify the most effective and efficient water supply source to meet water demands of requestors over a 50-year period of analysis from 2021-2070.

Constraints:

- Avoid serious affects on authorized project purposes.
- Avoid substantial changes to the structure or operations.
- Avoid negative environmental effects.
- Avoid over-allocation of storage reallocation.

Array of Alternatives

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Alternative #	Type	Description
1	FWOP/NAA Condition	No water supply storage reallocation from Hartwell Lake would result in existing Plan of Regulation and requestors identifying other water supply sources.
2	FWP Condition/Federal Action	Hartwell Lake Reallocation from Conservation Storage
3	FWP Condition/Federal Action	Hartwell Lake Reallocation from Inactive Storage
4*	FWP Condition/Federal Action	Hartwell Lake Reallocation from Flood Storage

*Flood storage from a project classified DSAC 1,2, or 3 cannot be considered as an alternative source of water supply storage.

Hartwell Storage Breakdown

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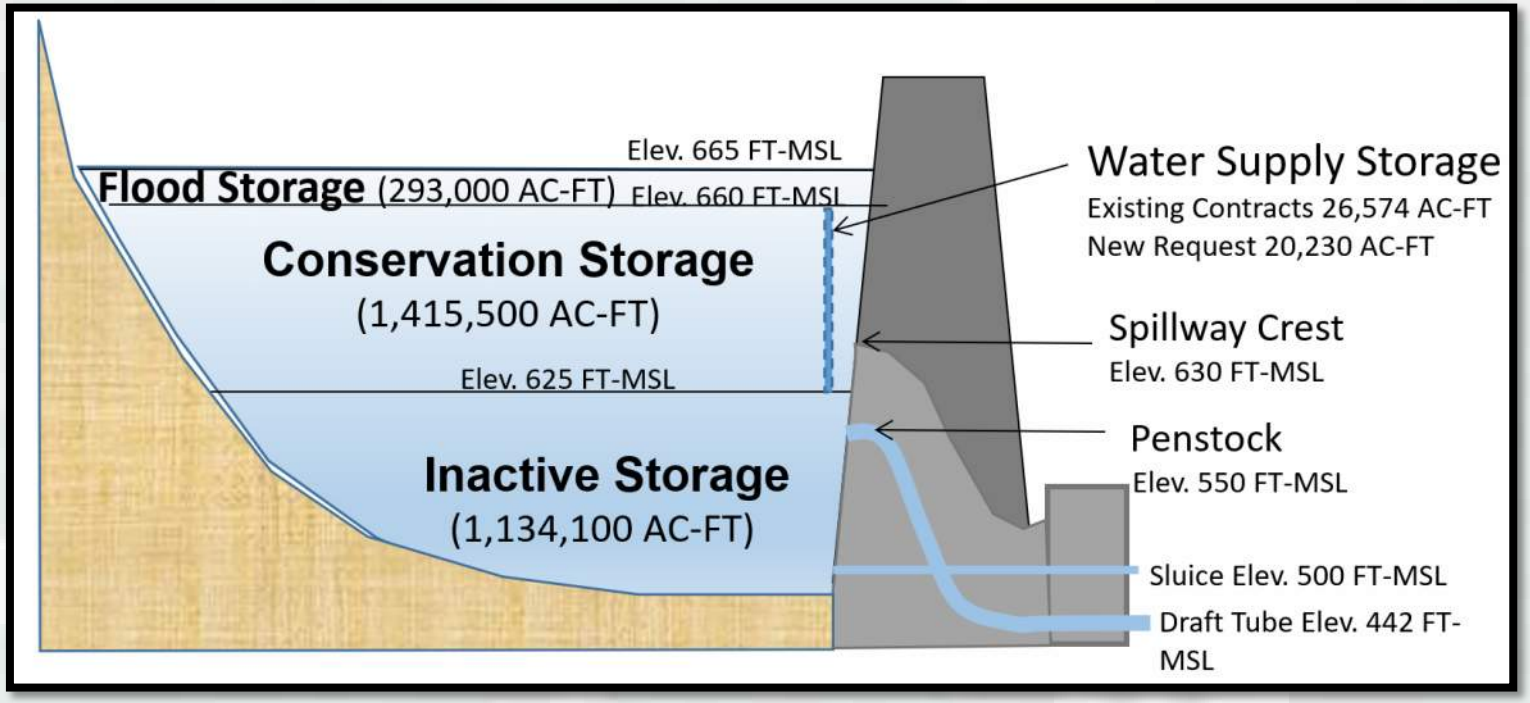

General Information: Flood Pool

- Hartwell Lake supports 293,000 acre-feet of flood storage while the entire Savanah River multi-purpose project system has 823,000 acre-feet of total flood storage.
- No previous reallocation from Flood Storage Pool in Hartwell Lake.

Tentatively Selected Plan

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- **Alternative 2**
  - PDT selected Hartwell Lake conservation pool storage as the most cost-effective and efficient water supply source
  - SAD approved TSP on 8 May 2020

Return Flow Credit

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- On 20 Aug 2021, Vertical Team (VT) met to discuss requestor's (AJRWS) request for direct storage credit for return flows
  - The VT recommended proceeding without RFC
- SC introduced pending legislation to require RFC
- On 30 Mar 2022, VT met and recommended the PDT hold the draft report and revise ResSim to develop RFC alternative prior to draft release
  - Added $100k for scripting/modeling and edits before ADM
  - Need to identify additional funding source

2023 Tentatively Selected Plan

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- **Alternative 5**
  - Conservation Pool w/ RFC

Conservation Pool Withdrawal Conversion—Alternative 2				
	MGD Requested	CFS Requested	CFS Credited	Contract Storage sans RFC Mitigation
Anderson	16.05	24.83		13,140
Pioneer	5.00	7.74		3,985
Lavonia	3.00	4.64		2,437
Currahee	0.50	0.77		411
Hart County				0
Total	24.55	38.0		19,973 AC-FT

RFC Withdrawal Conversion –Alternative 5				
	MGD Requested	CFS Requested	CFS Credited	Contract Storage w/ RFC Mitigation
Anderson	16.05	24.8	10.8	4,571
Pioneer	5.00	7.7	1.1	3,123
Lavonia	3.00	4.6	0.2	2,308
Currahee	0.50	0.8	0.0	412
			0.0	0
Total	24.55	38.0	12.2	10,414 AC-FT

Path Forward and Finish Dates

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- 14 May 2024 – Public, Legal, and Technical Review
  - Stakeholder Letters
  - Agency Technical Review
  - Public Comment Period
  - Policy and Legal Compliance
- 27 June 2024 – Agency Decision Milestone
- 18 October 2024 – Final Draft Report Review
- 6 January 2025 – Final Report Command Approval
- 12 May 2025 – ASA(CW) Approval
- TBD – SAS coordinates new water supply agreement with requestors

Savannah Harbor Expansion Project

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Unique Authorization – SHEP

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PUBLIC LAW 106–53—AUG. 17, 1999.

- (b) PROJECTS SUBJECT TO A FINAL REPORT.—The following projects for water resources development and conservation and other purposes are authorized to be carried out by the Secretary substantially in accordance with the plans, and subject to the conditions, recommended in a final report of the Chief of Engineers if a favorable report of the Chief is completed not later than December 31, 1999:

(9) SAVANNAH HARBOR EXPANSION, GEORGIA.—

(A) IN GENERAL.—Subject to subparagraph (B), the project for navigation, Savannah Harbor expansion, Georgia, including implementation of the mitigation plan, with such modifications as the Secretary considers appropriate, at a total cost of $230,174,000 (of which amount a portion is authorized for implementation of the mitigation plan), with an estimated Federal cost of $145,160,000 and an estimated non-Federal cost of $85,014,000.

(B) CONDITIONS.—The project authorized by subparagraph (A) **may be carried out only after**—

(i) **the Secretary, in consultation with affected Federal, State of Georgia, State of South Carolina, regional, and local entities, reviews and approves an environmental impact statement** for the project that includes—

(I) an analysis of the impacts of project depth alternatives ranging from 42 feet through 48 feet; and

(II) a selected plan for navigation and an associated mitigation plan as required under section 906(a) of the Water Resources Development Act of 1986 (33 U.S.C. 2283(a)); and

(ii) **the Secretary of the Interior, the Secretary of Commerce, the Administrator of the Environmental Protection Agency, and the Secretary approve the selected plan and determine that the associated mitigation plan adequately addresses the potential environmental impacts of the project.**

(C) MITIGATION REQUIREMENTS.—The mitigation plan shall be implemented before or concurrently with construction of the project.

SHEP BOTTOM LINE

- **Deepen Channel 5 feet:** from -42 to -47 feet
- **Lengthen Channel 7 miles:** from 33 to 40 miles
- **Estimated New Work Material:** 24 MCY
- **Annual Net Benefits:** $291M
- **Authorized Cost:** $1.019B
- **Benefit/Cost Ratio:** 7.7 to 1

SHEP MITIGATION FEATURES

Based on the provisions of the unique authorization, approval of the selected plan for SHEP included very specific mitigation requirements:

1. Fish Passage construction IVO New Savannah Lock & Dam – **Revised by WRDA 2016 to in-river not around NSBLD**
2. Flow Re-routing in the estuary to include a freshwater diversion structure, cut closures, removal of a tidegate structure, and construction of a rock sill and submerged sediment berm
3. Fresh Water Wetlands acquisition and preservation of 2,245 acres of freshwater wetlands
4. Marsh Restoration of approximately 29 acres of tidal brackish marsh
5. Oxygen Injection System (DO Plant) installation
6. Water Supply Impoundment facility for the City of Savannah to provide industrial and domestic water treatment
7. Boat Ramp construction
8. Striped Bass Stocking program one-time funding for the Georgia Department of Natural Resources (GADNR)
9. CSS Georgia Removal & recovery of the remains of a Civil War ironclad
10. Monitoring and Adaptive Management for up to ten (10) years post construction for monitoring of the function of project features and to allow for modification of those features to improve operation as intended

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Mitigation accounts for approximately 50% of SHEP costs, compared with similar projects which average 10% of costs for mitigation

SHEP PROGRESS

(AS OF 8 SEPTEMBER 2023)

Project Feature	Progress	Start Date
CSS Georgia Recovery	100%	Recovery completed Aug 2017; Conservation completed in December 2021
Striped Bass Stocking Payment	100%	Completed March 2015
Freshwater Wetlands Acquisition	100%	Completed July 2017
First Dike Raising	100%	Completed July 2017
Sediment Basin Tidegate Removal (Flow Re-Routing)	100%	Completed December 2017
Entrance Channel Dredging	100%	Channel accepted May 2018
Raw Water Impoundment	100%	Completed June 2018
Dissolved Oxygen Injection System	100%	Completed November 2019
McCoy's Cut Area Work (Flow Re-Routing)	100%	Completed May 2020
Inner Harbor Dredging	100%	Completed March 2022
Marsh Restoration	100%	Completed August 2022
Sediment Basin Rock Weir & Fill (Flow Re-Routing)	0%	Design Phase / Working Alternative Plan with Agencies
Boat Ramp on Hutchinson Island	0%	Design Phase
Fish Passage	0%	Design Phase / On-going litigation

Environmental Navigation Cultural Resources

CSS *GEORGIA* RECOVERY

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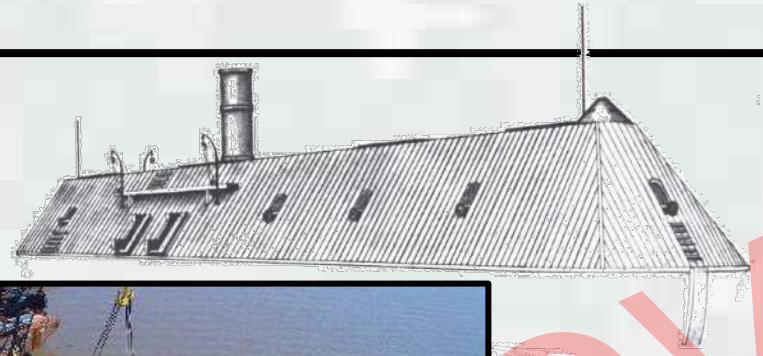

RECOVERY COMPLETED

Recovery Effort Completed – Aug 2017

- 2 Casemate sections (East/West)
- 248 pieces of ordnance recovered
- 5 cannons recovered
- 2 Steam Cylinders (Engines)
- Nearly 30,000 artifacts collected
- Texas A&M executing conservation; multi-year effort concluded in December 2021

Work completed by Army, Navy, Marines, Coast Guard, Corps of Engineers, Contractors, Conservation Research Laboratory at Texas A&M

FRESHWATER WETLANDS ACQUISITION

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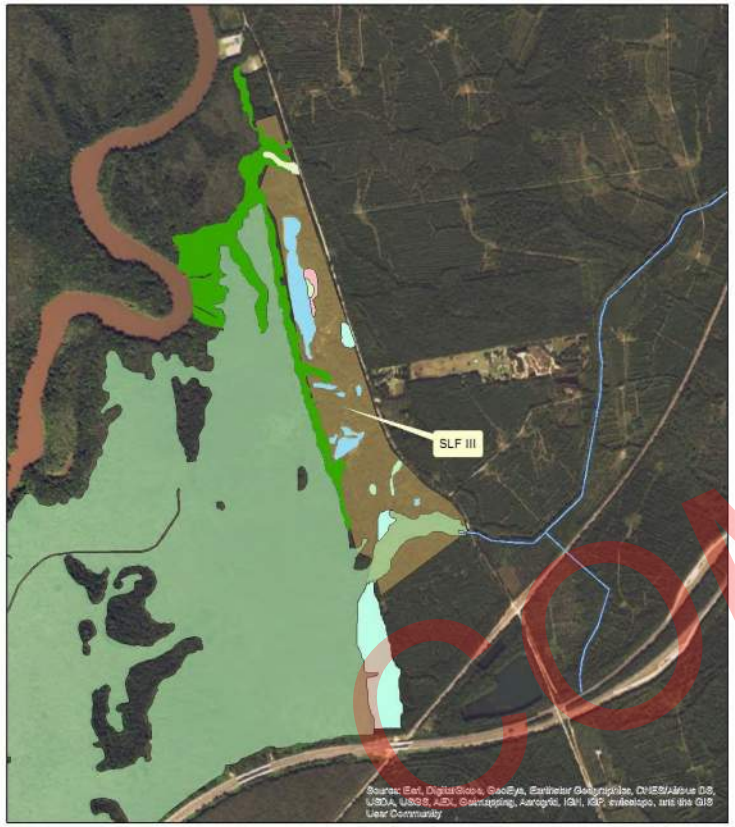

SLF III Mitigation Site

COMPLETED

The SHEP requirement to purchase 2,245 acres of mitigation lands was completed in July 2017 with the recordation of the deed to turnover of the final tract to the US Fish & Wildlife Service

DMCA 14A DIKE RAISING

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Completed Weir Structure (1 of 3)


Completed Counterweight & Back Dike

COMPLETED

Requirement: Construct the first dike raising (5-feet) of the back dike at Dredged Material Containment Area 14A in order to prepare for the start of Inner Harbor Dredging.

Construction was completed in July 2017.

SEDIMENT BASIN TIDEGATE & EMBANKMENT REMOVAL

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COMPLETED

Requirement: Remove Tidegate Structure, Abutments and Embankments to return the Back River to its original width as part of flow re-routing plan to protect the freshwater wetlands of the Savannah National Wildlife Refuge (SNWR).

Construction was completed in December 2017.

ENTRANCE CHANNEL DREDGING

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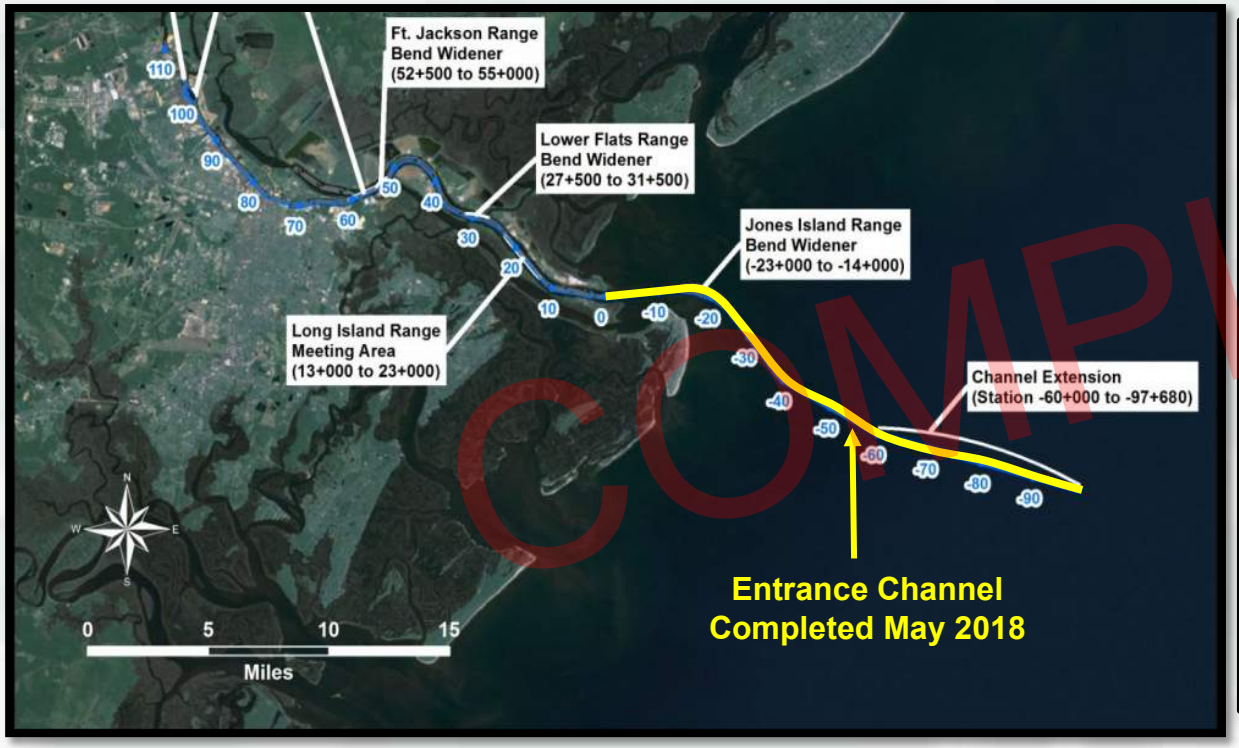

COMPLETED

Requirement: Deepen the Entrance Channel from -44' MLLW to -49' MLLW and extend the channel 7.1 miles seaward; removing approximately 11 million cubic yards of new work material.

Dredging was completed May 2018.

RAW WATER STORAGE IMPOUNDMENT

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Aerial Photo – 30 Nov 2016

Aerial Photo (Full at 36') – 7 Mar 2018

COMPLETED

Requirement: Construct a 97MG raw water storage impoundment for the City of Savannah

Construction completed and the facility turned over to the City of Savannah for operation in June 2018

DISSOLVED OXYGEN INJECTION SYSTEM

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Downriver Site on Hutchinson Island; Upriver Site near Plant McIntosh, Effingham County

Requirement: Construct a Dissolved Oxygen Injection System to deliver 40,000lbs of O_2 into the river daily to mitigate for deepening impacts.

Downriver Plant:
4 Pumps; 4 Speece Cones
12,000 lbs dissolved O_2 per day

Upriver Plant:
3 Pumps; 8 Speece Cones
28,000 lbs dissolved O_2 per day

Construction was completed in November 2019

DO SYSTEM CONCERNS

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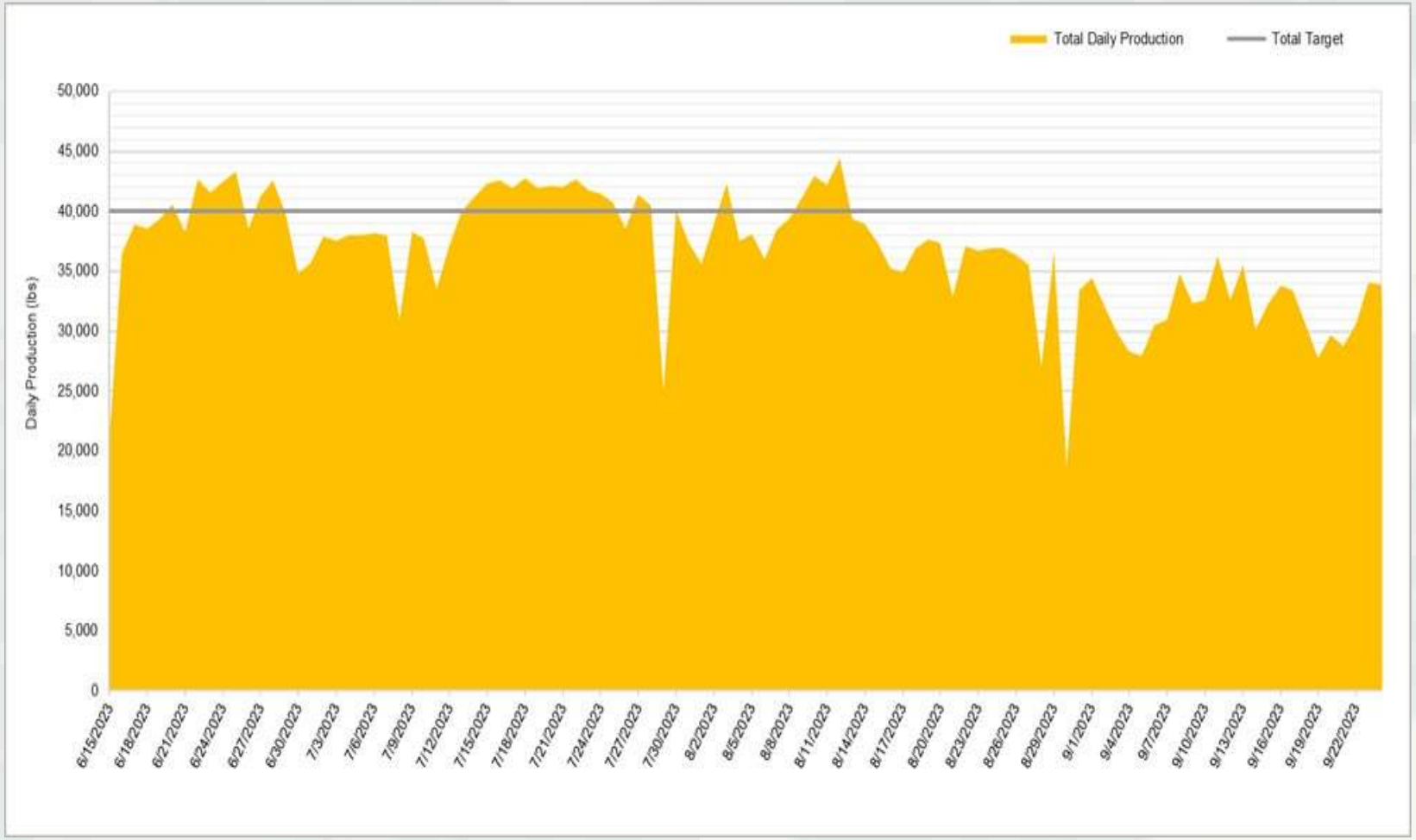
- Performance Targets
  - ~91.5 %
- Equipment Failures
  - Blowers
  - Outpacing repair lead time
- Spare Parts
- Fiscal Law Boundaries
  - O&M Funding



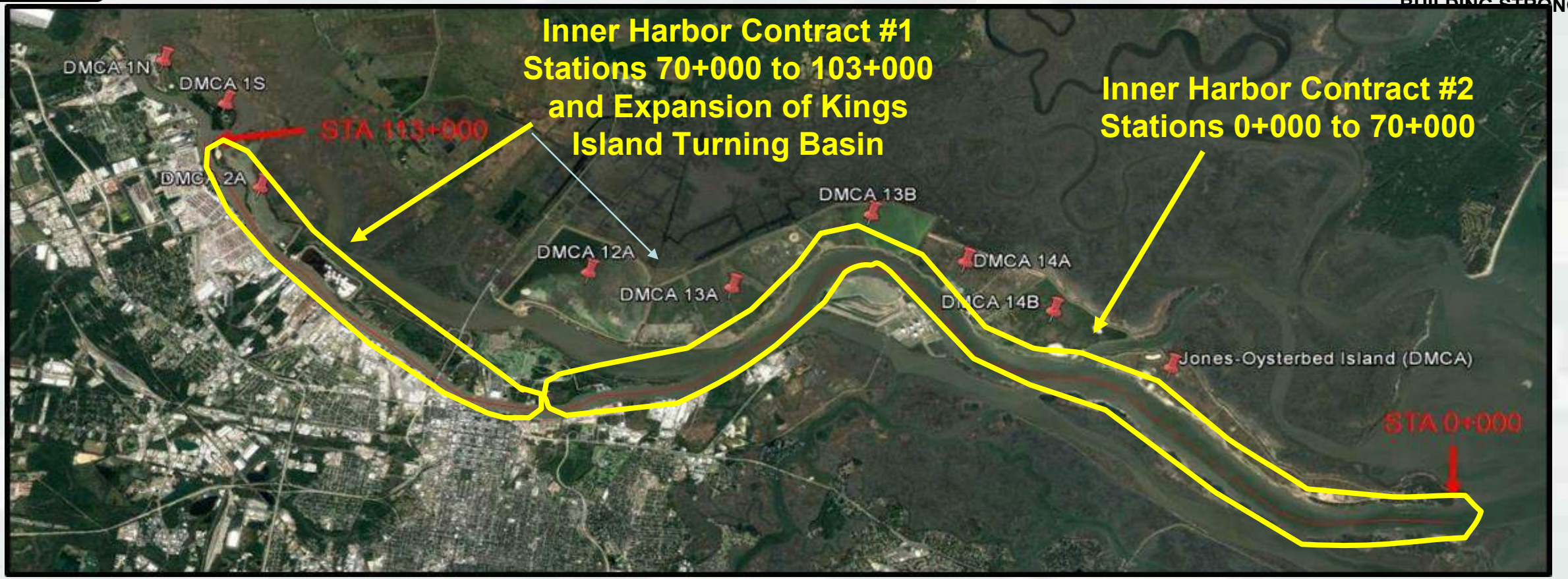
FLOW RE-ROUTING - MCCOY'S CUT AREA WORK

COMPLETED

Requirement: Construction of a freshwater diversion structure, deepening of the Back and Middle Rivers, closure of Rifle and McCoombs Cuts as part of flow re-routing plan to protect the freshwater wetlands of the Savannah National Wildlife Refuge (SNWR).

Construction of the feature was completed in May 2020.

INNER HARBOR DREDGING



Requirement: Deepen the Inner Harbor from -42' MLLW to -47' MLLW; removing approximately 13 million cubic yards of new work material with upland disposal in DMCAs. Work includes the handling of naturally occurring cadmium in sediments requiring special handling.

Dredging was completed in March 2022.

CULTURAL DISCOVERIES

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In February 2021, while work on the deepening was being completed in the vicinity of Old Fort Jackson, the Corps' contractor found three (3) cannon, two (2) anchors / fragments, and multiple wooden and metal artifacts. Dredging in the area was suspended until an investigation was completed.

In December 2021, work on the investigation and recovery of artifacts concluded. The work yielded 19 cannon in total, all appear to be 6-pound and two (2) different types of cannon. These cannon were determined to be from the Revolutionary War era. The cannon are likely attributed to armed British troop transport vessels that were scuttled during the Battle or Siege of Savannah in September 1779.

Work on the conservation of some of the artifacts is pending and the Corps is working on an execution of an agreement with the Coastal Heritage Society for the long-term curation of the artifacts.

MARSH RESTORATION – DREDGED MATERIAL CONTAINMENT AREA 1S (DMCA 1S)

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Requirement: Restoration of approximately 29 acres of tidal brackish marsh to mitigate for impacted brackish marsh due to the deepening.

Construction was completed in August 2022.

NEXT STEPS - COMPLETE SHEP MITIGATION

Remaining Mitigation Projects:

- Sediment Basin Weir & Fill – continued discussion with the agencies regarding decision on alternative to construction
- Hutchison Island Boat Ramp – design underway
- Final Dike Raisings – Restoration of capacity in the Savannah Harbor DMCAs consumed by SHEP
- Fish Passage at New Savannah Bluff Lock & Dam

SEDIMENT BASIN ROCK WEIR & FILL

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Requirement: Construction of a submerged rock weir and placement of fill in the Sediment Basin as part of flow re-routing plan to protect the freshwater wetlands of the Savannah National Wildlife Refuge (SNWR)

Due to significant cost concerns identified in the 95% Design cost estimate, coupled with sheer stresses and potential mobilization of material from behind the weir, the Corps is proposing alternatives to construction of the feature. Coordination and discussion with the agencies continues on the way ahead.

DIKE RAISINGS AFTER DREDGING

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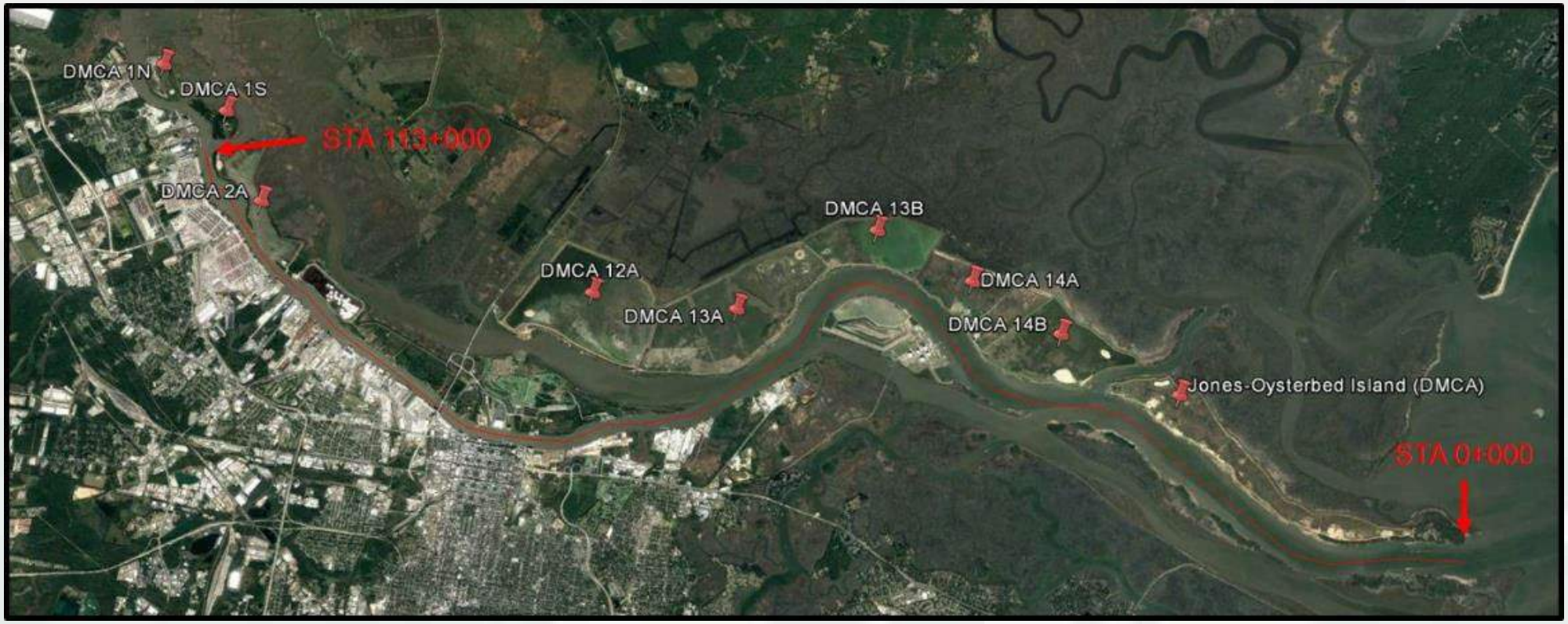

Requirement: Construction of final dike raisings for applicable DMCAs to restore capacity utilized by the SHEP deepening activities.

Construction at Jones-Oysterbed Island is underway and the final dike raising at DMCA 14A is in design phase.

FISH PASSAGE AT NEW SAVANNAH BLUFF LOCK & DAM

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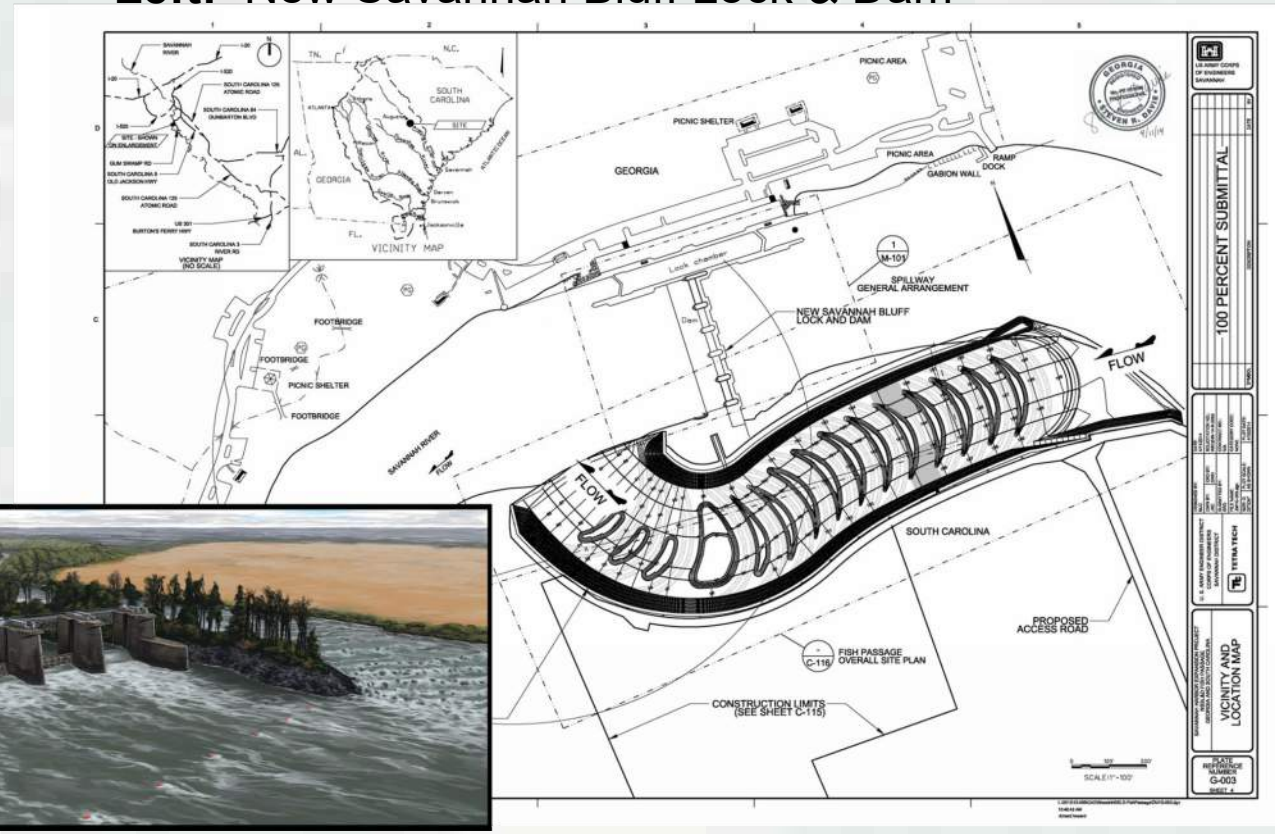
Left: New Savannah Bluff Lock & Dam



Right: Original Plan based on the approved SHEP GRR (2012)

The district completed a Post-Authorization Change Report based on changes required by the passage of the Water Infrastructure Improvements for the Nation (WIIN) Act of 2016 in October 2019; design was completed in September 2020.
The project is currently amid litigation with the State of South Carolina and the City of Augusta, Georgia.

APPROVED PLAN FOR DESIGN – FISH PASSAGE @ NSBLD

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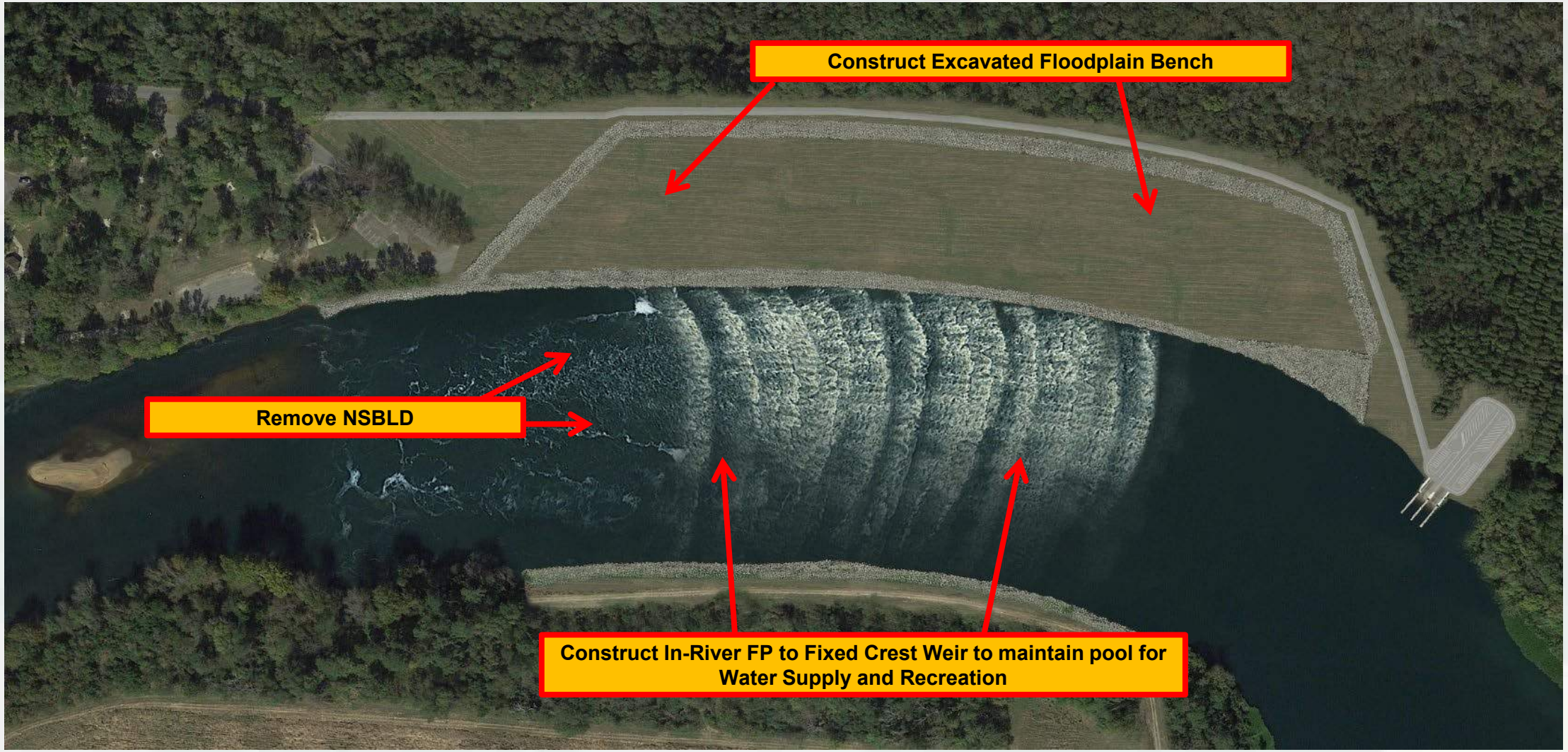

NEXT STEPS – SHEP POST-CONSTRUCTION

Element	Pre	During	Post										
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Post Year 10
Establish Baseline Data Bank	X												
Installation of Continuous Water Quality Data Recorders (5 new, 3 upgrade)	X												
Update Hydrodynamic and WQ Models (If Necessary)	X												
Bathymetric Surveys of Sediment Basin		X											
D.O. Transfer Efficiency Study		X											
D.O. Levels near Dredge during Summer Months		X											
Cadmium Sediment Sampling in 14A/14B		X											
CDF Effluent		X	X	X									
Monitoring of 8 Continuous Water Quality Data Recorders	X	X	X	X	X	X	X	X	X	X	X	X	4 Recorders
2 Intensive Water Quality/Hydrologic Monitoring Events	X		X				X						
2 Bathymetric Surveys in Unique Areas	X		X				X						
Hydrodynamic/Water Quality Model Assessment		X		X				X					
Freshwater Interface Determination					X					X			
Chloride Monitoring at Abercorn Creek Intake	X	X	X	X	X	X	X						
Groundwater Chloride Monitoring	X	X	X	X	X	X	X	X	X	X	X	X	8 Wells
Monitoring of 12 Marsh Sites (Chloride/Hydrologic/Vegetation)	X	X	X	X	X	X	X	X	X	X	X	X	
Monitoring of Marsh Restoration Site (1S)			X	X	X	X	X	X	X				
Shortnose Sturgeon Distribution in Estuary	X	X	X	X	X	X	X				X		
Shortnose Sturgeon Distribution at NSBL&D	X		X	X	X	X	X				X		
Fish Distribution Along Marshes			X		X		X				X		
Impact Assessment Review (Comprehensive Physical Data/Model Comparison and Review)			X	X	X	X	X	X	X	X	X	X	
Wildlife Use in 14A/14B (Avian/Terrestrial Field Counts)		X	X	X	X								
14A/14B Inflow/Effluent (Georgia)		X	X										
14A/14B Bird Tissue Analysis		X	X	X	X								
Sampling Exposed Miocene for Cadmium			X	X									
Shortnose Sturgeon and Striped Bass Habitat Monitoring				X		X					X		

Savannah River Below Augusta (SRBA) Ecosystem Restoration Project


Mosquito Camp Point @ RM 88.8


Wildcat Cut @ RM 78.6

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Study Area

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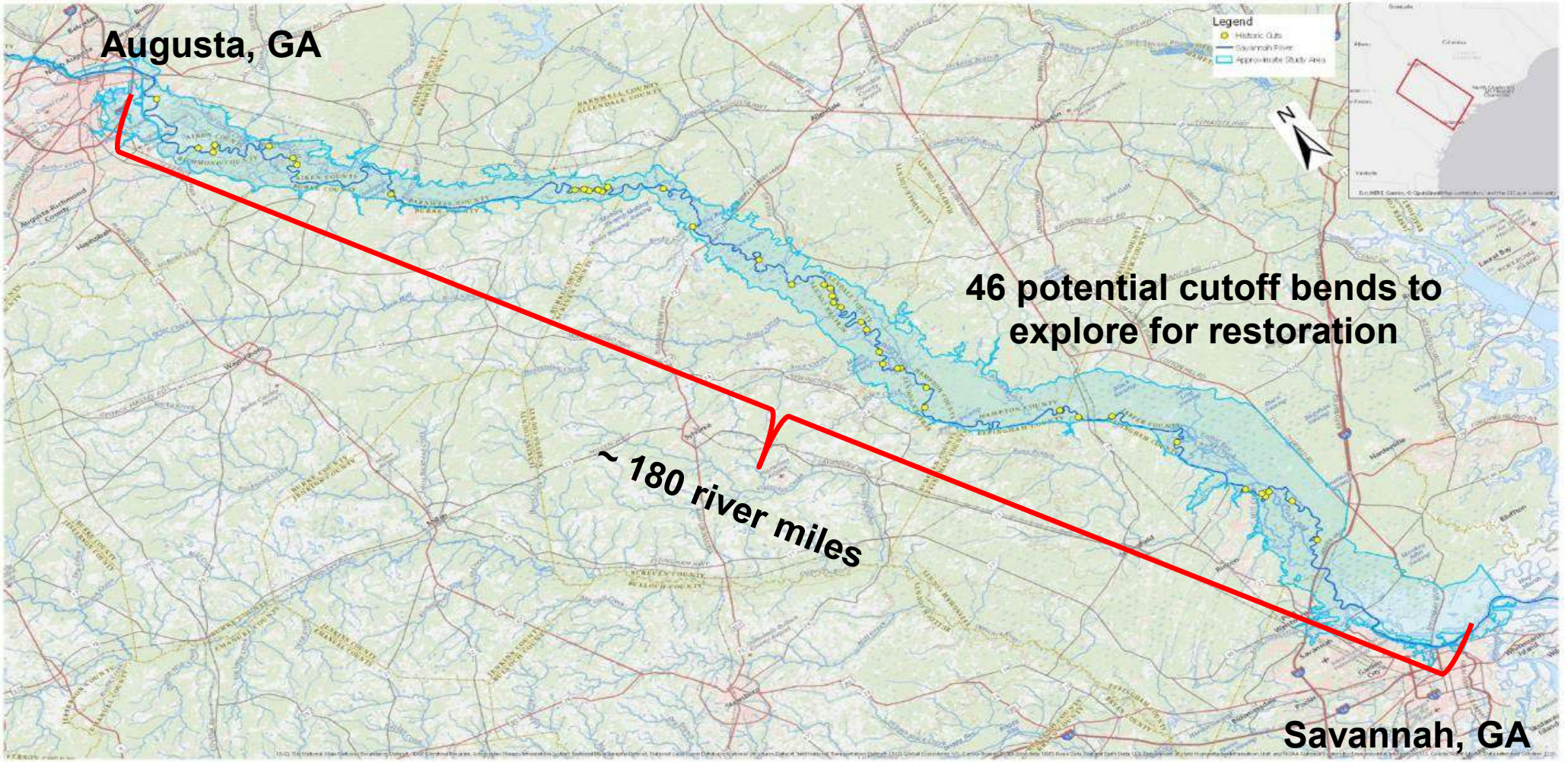

STUDY SCOPE

The study will focus on the restoration of form, function, and dynamic process of the Savannah River cutoff bends for the benefit of fish & wildlife habitat, wetlands, and the associated hydrology and hydrodynamic processes to develop environmental lift in the system.

PROBLEM STATEMENT:

Environmental modifications have occurred to the Savannah River due to the navigation project. As a result, the following problems have occurred:

- Cutoff bends were disconnected from the main river leading to decreased interaction between surface water and ground water, conversion of wetland type, and seasonal reduction of fish and wildlife habitat.

- Straightening of the river has reduced water quality (nutrient uptake), residence time of overbank flooding, and the quality and quantity of spawning and foraging habitat.

DECREASED QUANITITY OF AQUATIC HABITAT

- ~ 800 acres of aquatic habitat is seasonally disconnected from the Savannah River;
- River reduced by 27.3 miles;
- Loss or disconnection of ~ 990 acres of bottomland hardwood forest.

Boil Makers Cut @ RM 51.4

Wildcat Point @ RM 102.2

DECREASED WATER QUALITY & SEDIMENT DYNAMICS

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- Disconnection from the Savannah River creates stagnant water conditions increasing temperatures and decreasing dissolved oxygen in the bends.

Little Hell Landing @ RM 134.5

Blanket Point @ RM 81.0

OPPORTUNITIES

- Improve fish and wildlife habitat to benefit: shortnose and Atlantic sturgeon, Savannah lilliput mussel, Altamaha arc mussel, barrel floater mussel, as well as the robust red horse, American shad striped bass, largemouth bass, etc. – *approximately 800 acres of habitat seasonally disconnected*

- Improve ground water and surface water connections by restoring the cutoff bends – *length of river reduced by 27.3 miles*

- Reconnect overbank flooding – benefitting bottom land hardwoods and cypress tupelo swamp – *approximately 992 acres of bottomland hardwood less*

- Improve Water Quality & sediment dynamics in cutoff bends (Dissolved Oxygen, Total Suspended Solids, water temperature, etc)

OBJECTIVES

- Increase the quality and/or quantity of availability of fish (397 acres) and wildlife (496 acres) habitat by up to 50% of what was lost since 1959.
- Increase the acreage of potential adult foraging habitat (397 acres) for sturgeon species and robust redhorse by up to 50% of what was lost since 1959.
- Increase connection between surface water and ground water by increasing river mile stream banks (14 miles) by up to 50% of what was lost since 1959.
- Enhance wetlands (496 acres) by increasing frequency and duration of wetting of the adjacent wetlands by up to 50% of what was lost since 1959.

Environmental Benefits Evaluation

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Objective	Evaluation Tool	Metric
Increase the quality and/or quantity of availability of fish and wildlife habitat.	Habitat Suitability Index (HSI) Models for largemouth bass, snapping turtle, shortnose sturgeon	Habitat Units (AAHUs)
Increase the acreage of potential adult foraging habitat for sturgeon species and robust redhorse.		
Increase connection between surface water and ground water by increasing river mile stream banks.	Wetland Value Assessment Bottomland Hardwoods Community Model for Civil Works	Habitat Units (AAHUs)
Enhance wetlands by increasing frequency and duration of wetting of the adjacent wetlands		
Increase the quality and/or quantity of availability of wildlife habitat.		

CONSTRAINTS

- No adverse modifications to Atlantic sturgeon critical habitat
- No impact to water intakes to the Savannah River Site or Vogtle Electric generating plant
- Flow regime is controlled by upstream dams
- No net loss of wetlands

INVENTORY AND FORECAST

- Significant negative impacts to the ecosystem occurred when the navigational cuts were made since 1959:
  - River shortened by ~ 27 miles
  - ~ 1000 acres of bottomland hardwoods with less water
  - ~ 800 acres of aquatic habitat disconnected
- No significant additional impacts will occur during the 50-year period of analysis

RANKING OF CUTOFF BENDS

- Bends were evaluated for restoration potential and ranked based on seven criteria:
  - Benefit Criteria
    - River Miles Restored
    - Adjacent Wetlands
    - Sturgeon Habitat
    - Water Fund Priority
  - Negative Criteria
    - Percentage of Siltation
    - Wetland Habitat Disturbed
    - Threat of Urbanization
- Each cutoff received a normalized score for each weighted criteria and then added for benefits and subtracted for negative impacts

BENEFIT CRITERIA: RIVER MILES RESTORED

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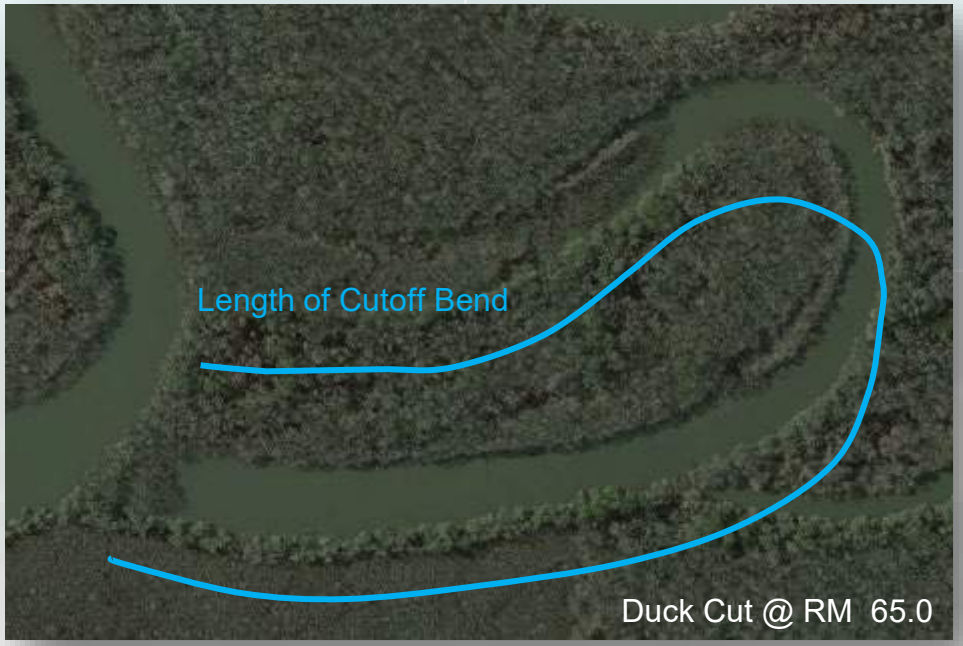
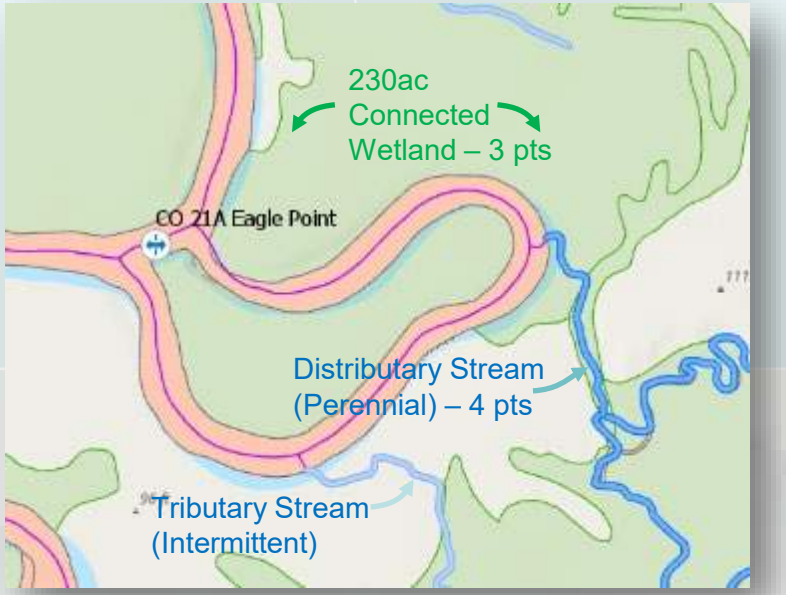
Metric	Scoring	Weight	Rationale
Length of cutoff bend standardized to 0-10	10 = longest 2 = 20% the length of the longest	Bends disconnected from the river at both or either end received 100% score. Bends connected to the river at both ends received 50% score.	Length of river restored is primary driver for increasing surface/ground water connectivity, increasing residence time, enhancement of riverine habitat



BENEFIT CRITERIA: ADJACENT WETLANDS/DISTRIBUTARIES

BUILDING STRONG

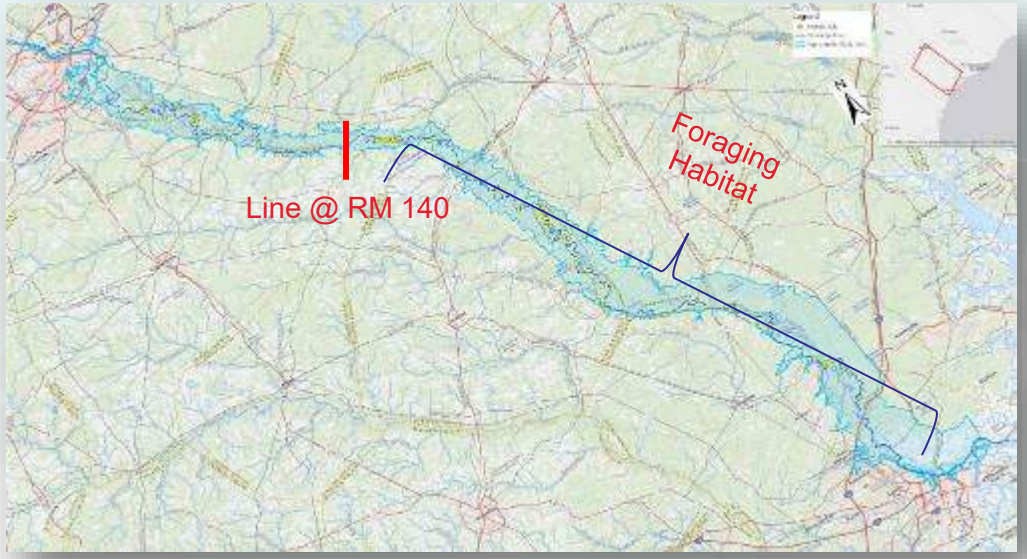
Metric	Scoring	Weight	Rationale
Area of wetland adjacent to cutoff bend, connected distributaries, scored 0-10	10 = highest score based on acres of wetlands, connected distributaries	Received 100% score	The area immediately adjacent the cutoff bend may receive benefits from increased connectivity through the enhancement of existing wetlands, increased groundwater replenishment through infiltration, flow through distributaries



BENEFIT CRITERIA: STURGEON HABITAT

BUILDING STRONG

Metric	Scoring	Weight	Rationale
Location on river	10 = in foraging habitat 0 = not in foraging habitat area	Received 100% score	Per NMFS, approximately lower ¾ of river suitable for adult sturgeon foraging habitat and restoration may providing increased quantity of foraging habitat



BENEFIT CRITERIA: WATER FUND PRIORITY

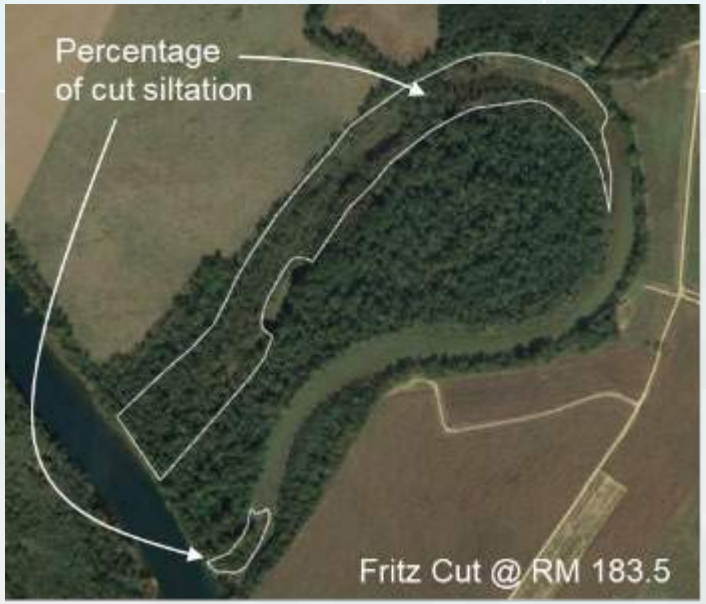
BUILDING STRONG

Metric	Scoring	Weight	Rationale
The Nature Conservancy priority areas for the Savannah Clean Water Fund	10 = within the footprint of the Priority 1 lands 6.25 = ¾ bend in Priority 2, ¼ Priority 1 (weighted average)	Received 80% score (not as directly related to objectives as other criteria)	The TNC evaluated the priority lands that have the greatest impact on water quality. Restoration efforts in these areas would have the greatest affect on water quality.

NEGATIVE CRITERIA: PERCENTAGE OF SILTATION

BUILDING STRONG

Metric	Scoring	Weight	Rationale
The percentage of the cutoff bend silted in.	10 = highest percentage of siltation 5 = ½ the percentage of the highest	Received 50% score (1/2 of a full picture of habitat conversion)	Proxy for habitat conversion that has taken place as the riverine habitat has been replaced with wetlands



NEGATIVE CRITERIA: WETLAND HABITAT

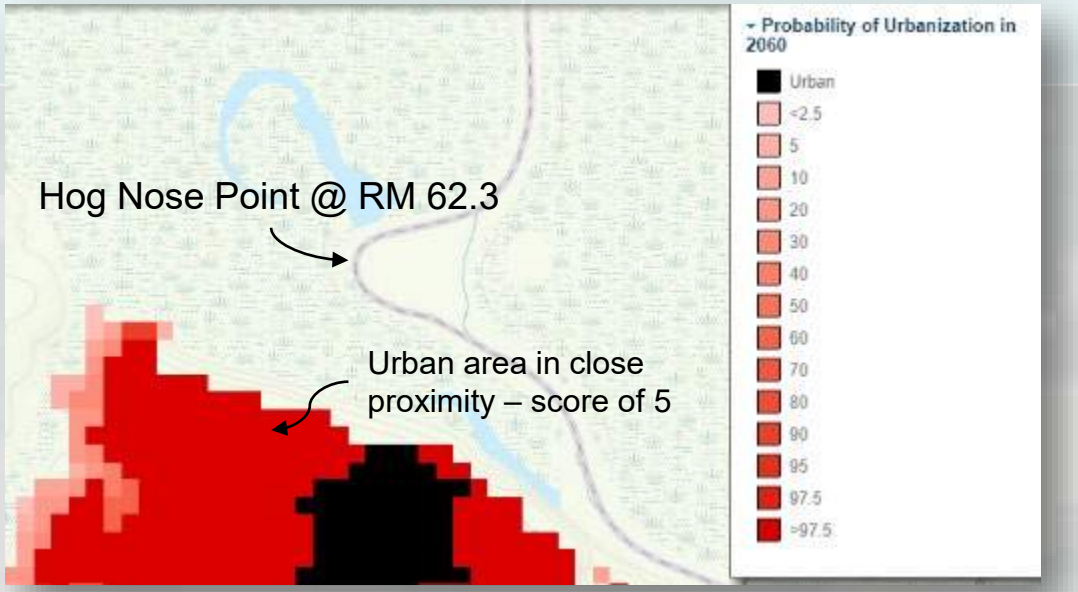
BUILDING STRONG

Metric	Scoring	Weight	Rationale
Area of the cutoff bend in the original channel that has become wetland	10 = largest area of wetlands 2 = 20% the amount of wetland area in the cutoff bend	Received 50% score (the other 1/2 of the habitat conversion picture)	An additional proxy for the amount of habitat conversion that has taken place in the cutoff bend

NEGATIVE CRITERIA: THREAT OF URBANIZATION

BUILDING STRONG

Metric	Scoring	Weight	Rationale
Adjacency to areas of potential urbanization as available at the South Atlantic Conservation Planning Atlas	10 = directly adjacent 5 = close proximity 0 = no near threat	Received 50% score (not directly related to objectives)	The threat of future urban development could adversely affect benefits gained through restoration



Ranking Criteria

BUILDING STRONG

			Environmental Benefit Metrics				Environmental Negatives Metrics			Total Weighted Equal
Weight -------->			1	1	1	0.8	0.5	0.5	0.5	
			(0-10)	(0-10)	(0/10)	(0-10)	(0-10)	(0-10)	(0-10)	
#	River Mile	Cut Name	River Miles Restored	Adjacent Wetlands	Sturgeon Habitat	Water Fund Priority	Percentage Siltation	Wetland Habitat Disturbed	Threat of Urbanization	∑weighted benefits
11	88.8	Mosquito Camp Point	3.0	9	10	7.5	5.8	2.0	0	24.12
8B	78.6	Wildcat Cut	4.5	5	10	7.5	4.2	2.3	0	22.28
7	51.4	Bowl Maker Point	2.4	7	10	7.5	5.3	1.0	0	22.27
1	31.4	Moody cut	1.6	3	10	10.0	2.6	0.0	0	21.31
17	107.0	Dick's Lookout Point	2.0	5	10	7.5	3.2	0.6	0	21.07
9	85.2	Ware Creek Cut	1.4	7	10	7.5	6.8	0.6	0	20.63
9A	85.4	Poor Robin Lower Cut	1.3	6	10	7.5	5.3	0.6	0	20.42
12	92.8	Thompsons Cow Fold Point	3.0	6	10	5.0	4.2	1.4	0	20.16
4	41.3	Flat Ditch Point	3.1	5	10	6.3	5.3	0.7	0	20.14
8C	81.0	Blanket Point	3.6	2	10	7.5	2.1	1.3	0	19.90
14A	100.2	Miller's Old Lake	1.9	5	10	5.0	1.6	0.3	0	19.90
10	87.1	Poor Robin Upper Cut	1.2	6	10	6.7	4.7	0.5	0	19.87
15A	102.2	Wildcat Point	2.8	5	10	5.0	3.7	1.0	0	19.43
18C	134.5	Little Hell Landing	2.6	3	10	5.0	1.6	0.3	0	18.65
5	41.6	Bay Bush Point	0.4	4	10	5.0	0.0	0.0	0	18.36
13	93.8	Pfeiffers Landing	2.6	5	10	5.0	5.3	1.6	0	18.14
2	37.2	Pine Tree Camp Point	1.5	2	10	10.0	6.3	0.8	0	17.87
18	112.4	Green Log Point	1.5	3	10	7.5	4.7	0.7	0	17.76
8A	65.0	Duck Cut	3.7	2	10	7.5	3.7	1.3	5	16.68
18B	128.5	Little Randall Point	3.0	2	10	5.0	4.2	1.7	0	16.02
14	99.9	Whirligig Point	1.9	3	10	5.0	4.7	1.1	0	15.96
16	102.8	Cook's Field Point	2.1	5	10	5.0	8.4	2.1	0	15.82
15	101.1	Seven-day Baptist Point	0.9	5	10	5.0	8.9	0.7	0	15.07
19B	136.0	Catfish Hole Point	2.0	3	10	2.5	3.7	0.9	0	14.74
19A	135.5	Devil's Elbow	2.0	2	10	2.5	2.6	0.5	0	14.44
21A	168.0	Eagle Point	4.2	6	0	7.5	2.6	1.3	0	14.23
8	62.3	Hog Nose Point	1.3	2	10	7.5	5.3	0.3	5	14.04

NO NET LOSS OF WETLANDS

BUILDING STRONG

Measured avg. distance from riverbank to delineation between wetland categories

Used avg. distance to determine conservative potential wetland enhancement area

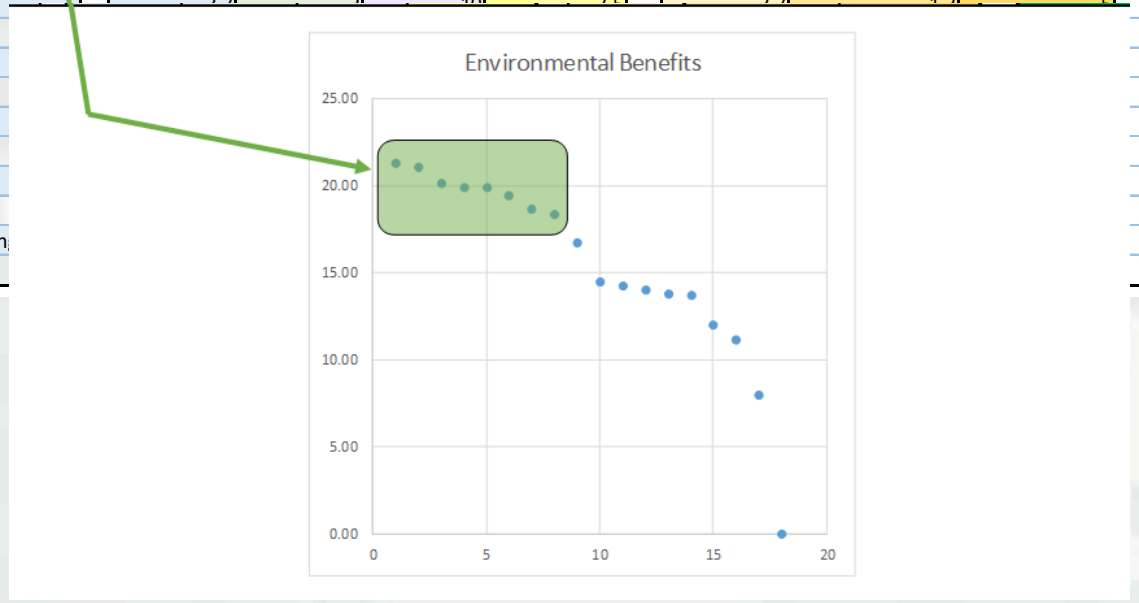
Assuming wetland acres could be enhanced by 0.25 Habitat Sustainability Index and impacted wetlands acres are 1 HSI, potential enhancement acres must be 4 times greater than wetland acres impacted for no net negative impacts.

#	River Mile	Cut Name	∑weighted benefits	Enhancement>Impact (150ft)
11	88.8	Mosquito Camp Point	24.12	NO
8B	78.6	Wildcat Cut	22.28	NO
7	51.4	Bowl Maker Point	22.27	NO
1	31.4	Moody cut	21.31	YES
17	107.0	Dick's Lookout Point	21.07	YES
9	85.2	Ware Creek Cut	20.63	NO
9A	85.4	Poor Robin Lower Cut	20.42	NO
12	92.8	Thompsons Cow Fold Point	20.16	NO
4	41.3	Flat Ditch Point	20.14	YES
8C	81.0	Blanket Point	19.90	YES
14A	100.2	Miller's Old Lake	19.90	YES
10	87.1	Poor Robin Upper Cut	19.87	NO
15A	102.2	Wildcat Point	19.43	YES
18C	134.5	Little Hell Landing	18.65	YES
5	41.6	Bay Bush Point	18.36	YES
13	93.8	Pfeiffers Landing	18.14	NO
2	37.2	Pine Tree Camp Point	17.87	NO
18	112.4	Green Log Point	17.76	NO
8A	65.0	Duck Cut	16.68	YES
18B	128.5	Little Randall Point	16.02	NO
14	99.9	Whirligig Point	15.96	NO
16	102.8	Cook's Field Point	15.82	NO
15	101.1	Seven-day Baptist Point	15.07	NO
19B	136.0	Catfish Hole Point	14.74	NO
19A	135.5	Devil's Elbow	14.44	YES
21A	168.0	Eagle Point	14.23	YES
8	62.3	Hog Nose Point	14.04	YES
7A	59.7	McKenzie's Camp	13.78	YES
7.1	59.0	Sister's Cut	13.70	YES
E	183.5	Fritz Cut	13.23	NO
18.1	118.0	Beaufort Island	13.05	NO
19	135.3	Swift Cut	12.83	NO
6	43.2	Big Keiffer Point	12.01	YES
18A	120.8	Fat Meat Point	11.49	NO
20	137.5	Cunningham Point	11.14	YES
19C	136.5	Sweetwater Creek Cut	11.13	NO
24	181.5	Beckum's Cut	9.79	NO
22.1	170.0	Holme's Cut	8.61	NO
23	173.3	Lower Silver Bluff Landing	7.98	YES
D	181.9	Bailey's Cut	6.69	NO
21	153.2	Cox Point	4.54	NO
23.1	179.0	Barney's Cut	3.85	NO
22	169.5	Gray's Landing	3.72	NO
27	193.0	Beech Island	2.82	NO
21.1	157.0	Haynes' Cut	2.41	NO
3	40.9	Hickory Bend	0.00	YES

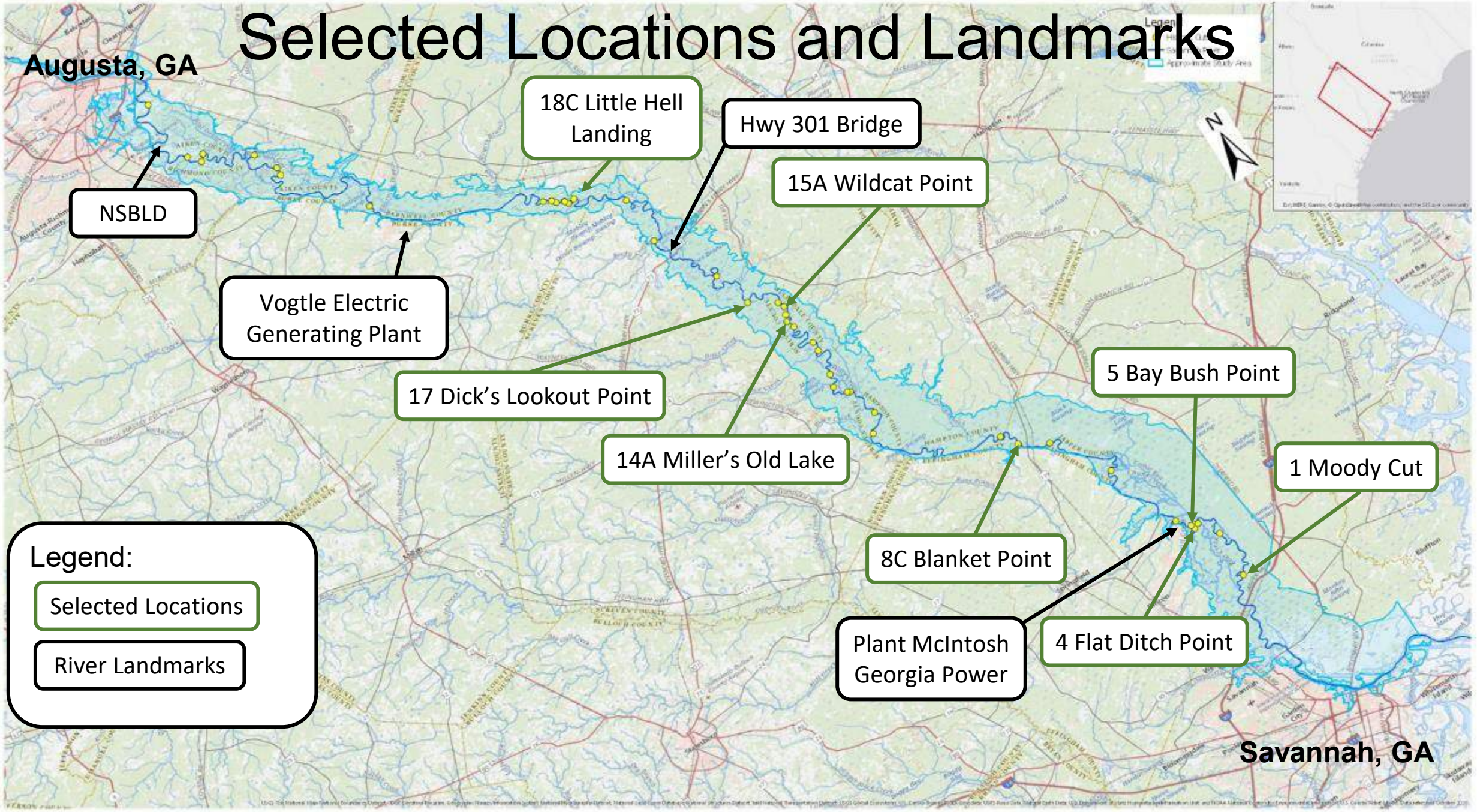
Cutoff Bends Selection

BUILDING STRONG

			Environmental Benefit Metrics				Environmental Detriments Metrics				Total Weighted Equal
Weight -------->			1	1	1	0.8	0.5	0.5	0.5		
			(0-10)	(0-10)	(0/10)	(0-10)	(0-10)	(0-10)	(0-10)		
#	River Mile	Cut Name	River Miles Restored	Adjacent Wetlands	Sturgeon Habitat	Water Fund Priority	Percentage Siltation	Wetland Habitat Disturbed	Threat of Urbanization	Enhancement>Impact (150ft)	∑weighted benefits
1	31.4	Moody cut	1.6	3	10	10.0	2.6	0.0	0	YES	21.31
17	107.0	Dick's Lookout Point	2.0	5	10	7.5	3.2	0.6	0	YES	21.07
4	41.3	Flat Ditch Point	3.1	5	10	6.3	5.3	0.7	0	YES	20.14
8C	81.0	Blanket Point	3.6	2	10	7.5	2.1	1.3	0	YES	19.90
14A	100.2	Miller's Old Lake	1.9	5	10	5.0	1.6	0.3	0	YES	19.90
15A	102.2	Wildcat Point	2.8	5	10	5.0	3.7	1.0	0	YES	19.43
18C	134.5	Little Hell Landing	2.6	3	10	5.0	1.6	0.3	0	YES	18.65
5	41.6	Bay Bush Point	0.4	4	10	5.0	0.0	0.0	0	YES	18.36
8A	65.0	Duck Cut								YES	16.68
19A	135.5	Devil's Elbow								YES	14.44
21A	168.0	Eagle Point								YES	14.23
8	62.3	Hog Nose Point								YES	14.04
7A	59.7	McKenzie's Camp								YES	13.78
7.1	59.0	Sister's Cut								YES	13.70
6	43.2	Big Keiffer Point								YES	12.01
20	137.5	Cunningham Point								YES	11.14
23	173.3	Lower Silver Bluff Landin								YES	7.98
3	40.9	Hickory Bend								YES	0.00



Selected Locations and Landmarks



MANAGEMENT MEASURES CONSIDERED AND ELIMINATED

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- Remove of derelict boats
- Remove of house boats without sewer holding tanks
- Require sewage packet plants rather than septic tanks along the shoreline
- Require buffer zones around all farmland
- Remove invasive vegetation to improve habitat
- Excavate to restore wetland hydrology
- Restore native riparian cover by seeding and planting hydrophytic vegetation
- Reduce pollutants in the river
- Rezoning
- Buyouts and relocations
- Riparian buffer restoration
- Inter-basin water transfer
- Modified reservoir operations at Thurmond Dam
- Stormwater impoundment
- Off-channel constructed wetlands
- Bank stabilization
- Bank setbacks
- Channel realignment
- Channel straightening
- Aquifer storage and recovery (ASR)
- Invasive species removal
- Hardwood plantings
- Dissolved oxygen injection
- Combined sewer overflow improvements
- Point source pollution control

STRUCTURAL Management Measures Applied

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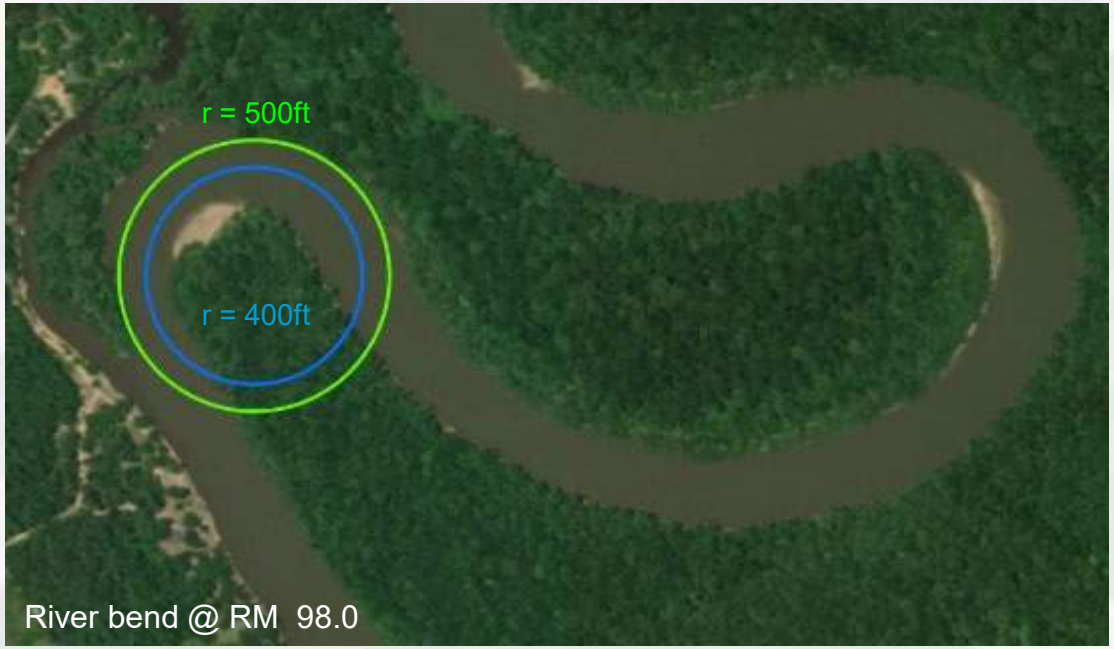
Measure #	Structural Management Measures	Objectives Met	Constraints Avoided
1	**Closure Options**	1,2,3, & 4	All
	a) Full Cut closure (Cutoff Plug)		
	b) Diversion structure- Construct plug to partially close cut		
	c) Diversion structure - Construct plug with boat bay		
2	Remove existing training structures including existing rock closures	Must be combined with other stand-alone measures	All
3	Add new training structures	Must be combined with other stand-alone measures	All
4	Excavate pilot channel to upper disconnected end to cutoff bend	2,3	All
5	Excavate pilot channel to lower disconnected end to cutoff bend	2,3	All
6	Cutoff bends dredging/channel creation	3	All
7	Realign tributary stream	4	All
8	Construct gravel bar spawning habitat	1	All
9	Construct D.O. riffles	1	All
10	Construct sand bar for foraging habitat	1	All
11	Controlled flow channel (limit flow for recreational navigation)	1,2	All
12	Remove trees and roots in pilot channel and place approx. 1/3 adjacent to the bank line in the water to act as both shoreline protection and wood habitat structure as large woody debris.	Must be combined with other stand-alone measures	All

MITIGATION IMPACTS TO NAVIGATION

BUILDING STRONG

Authorized commercial navigation channel has not been maintained since 1979.
Additional limiting factor to commercial navigation is the turning radius.



Evaluated radius of the tightest navigable river bend

Applied at each cutoff bends to determine post-restoration navigability

Planning Guidance Criteria (Sample)

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Cut #	Name	Management Measures	Alternatives Per Location	Evaluation Criteria				Costs (TBD)	Benefits (TBD)
				C	E1	E2	A		
1	Moody Cut RM 31.4	Diversion Structure, training structures, full closure	NAA						
			Alt 1 – both Diversion str and training str						
			Alt 2 – Diversion Structure						
			Alt 3 – Full closure						
4	Flat ditch Point RM 41.3	Diversion Structure, pilot channel, removal of trees and roots in channel	NAA						
			Alt 1 – Diversion Structure and pilot channel						
			Alt 2 – Diversion Structure and tree removal						
5	Bay bush Point RM 41.6	Full closure of cut (force water into distributary), or nothing	NAA						
			Alt 1 – Full Closure						

*The four evaluation criteria from the Planning Guidance Notebook are: completeness (C), effectiveness (E1), efficiency, (E2), and acceptability (A).

MOODY CUT ALTERNATIVES PROPOSED

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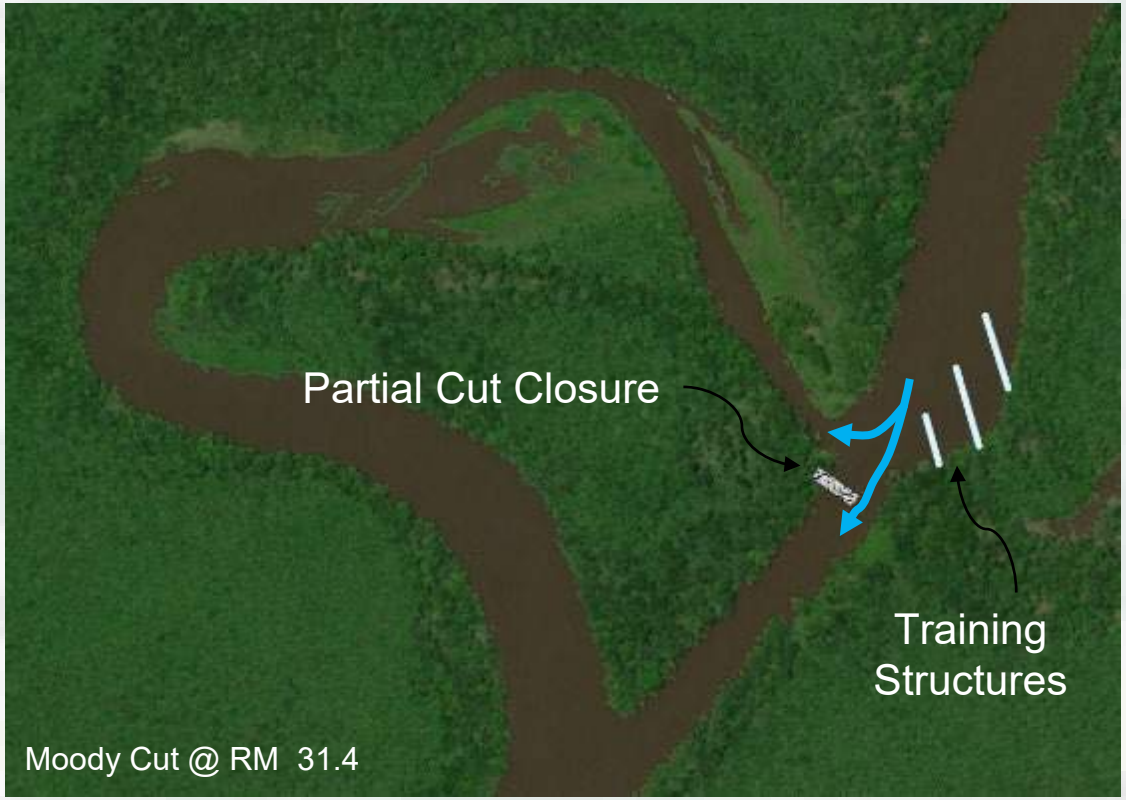
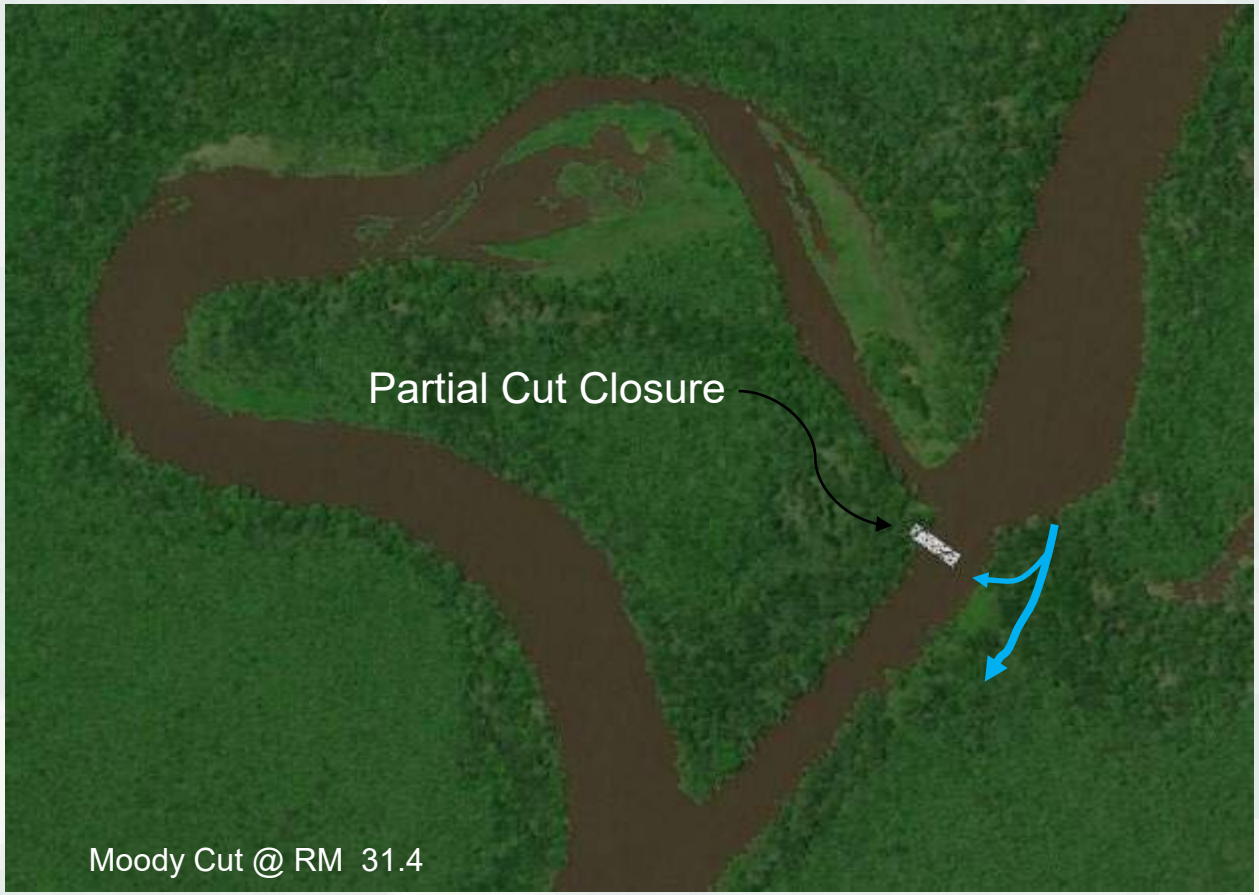


Moody Cut Alt. 1



Moody Cut Alt. 2

Full Closure Alternative

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Moody Cut Alt. 3

Moody Cut @ RM 31.4

ALTERNATIVES: Flat Ditch

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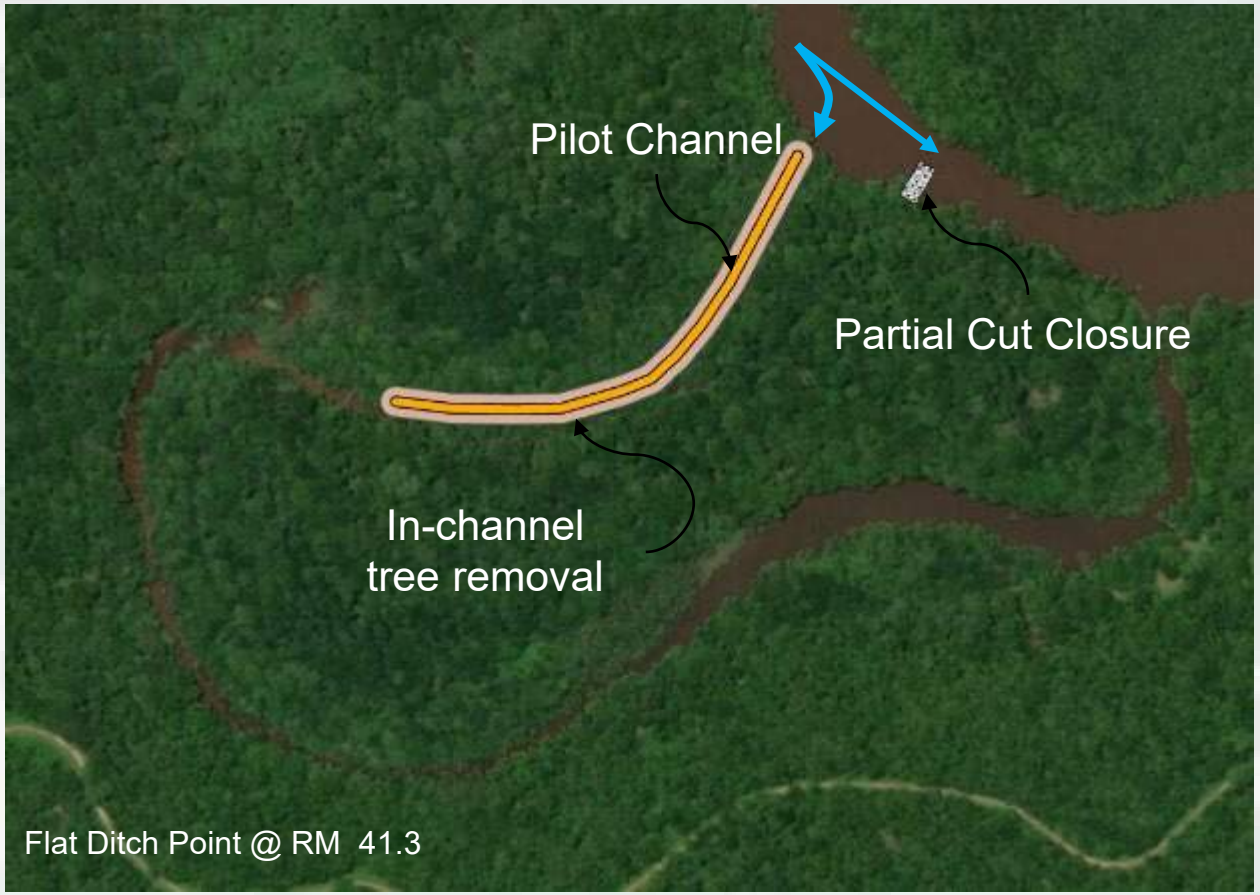
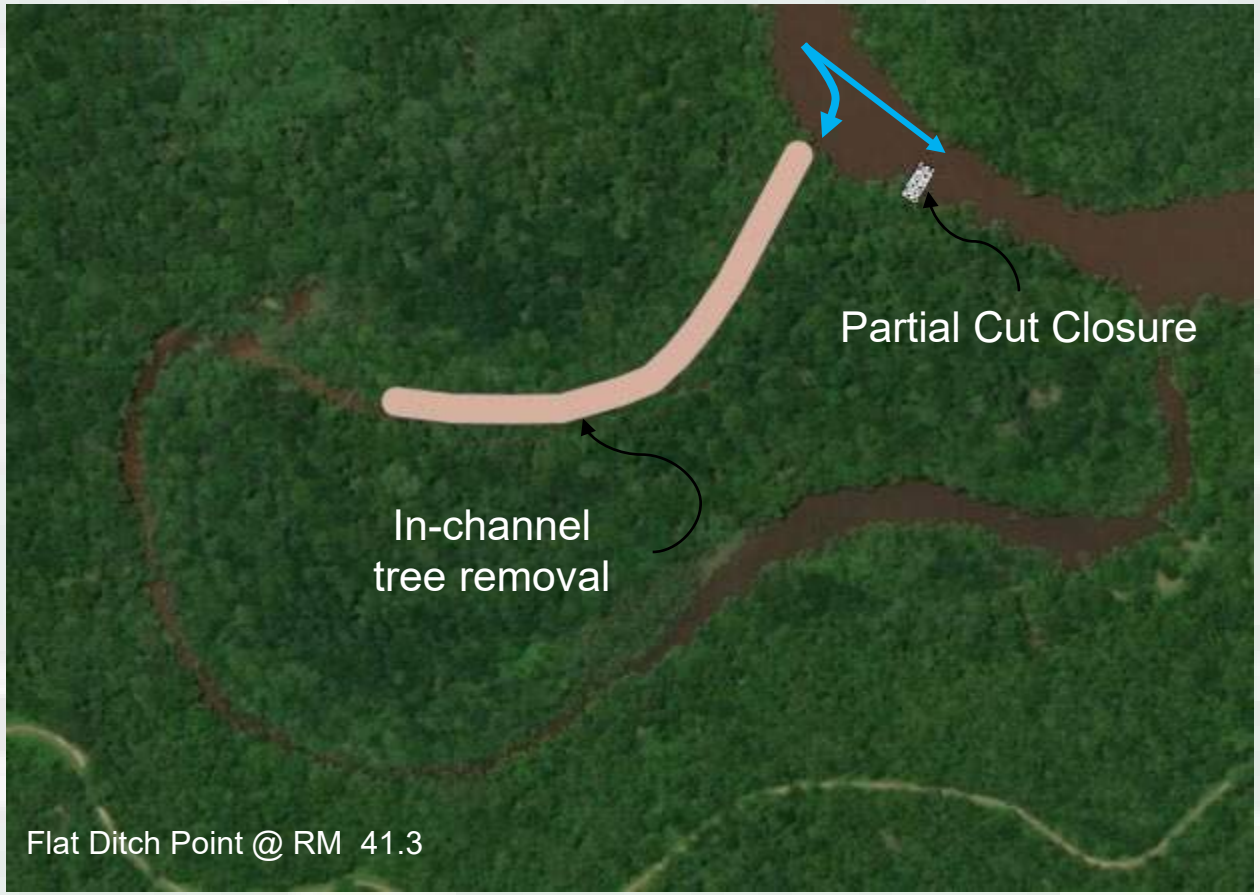


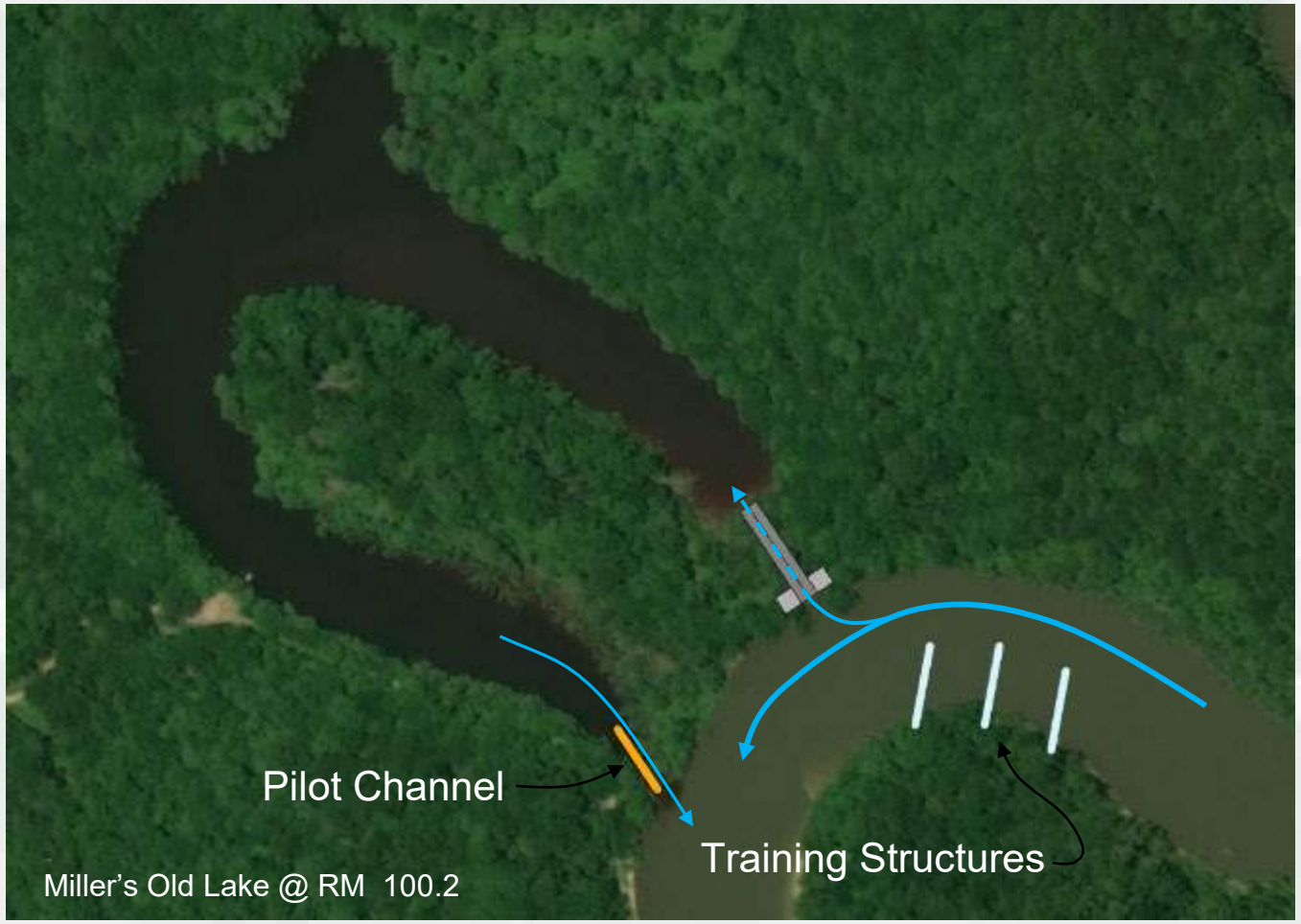
Flat Ditch Alt. 1



Flat Ditch Alt. 2

ALTERNATIVES: Miller's Old Lake

BUILDING STRONG



Initially in the proposed cutoff bends alternatives

- Removed from further planning due to concerns from USFWS and recreational users
- Concern was velocity of water flow into the lake would lead to unsafe boating and fishing for the public
- Cultural resources were an additional concern

Next Steps (pending support and funding)…

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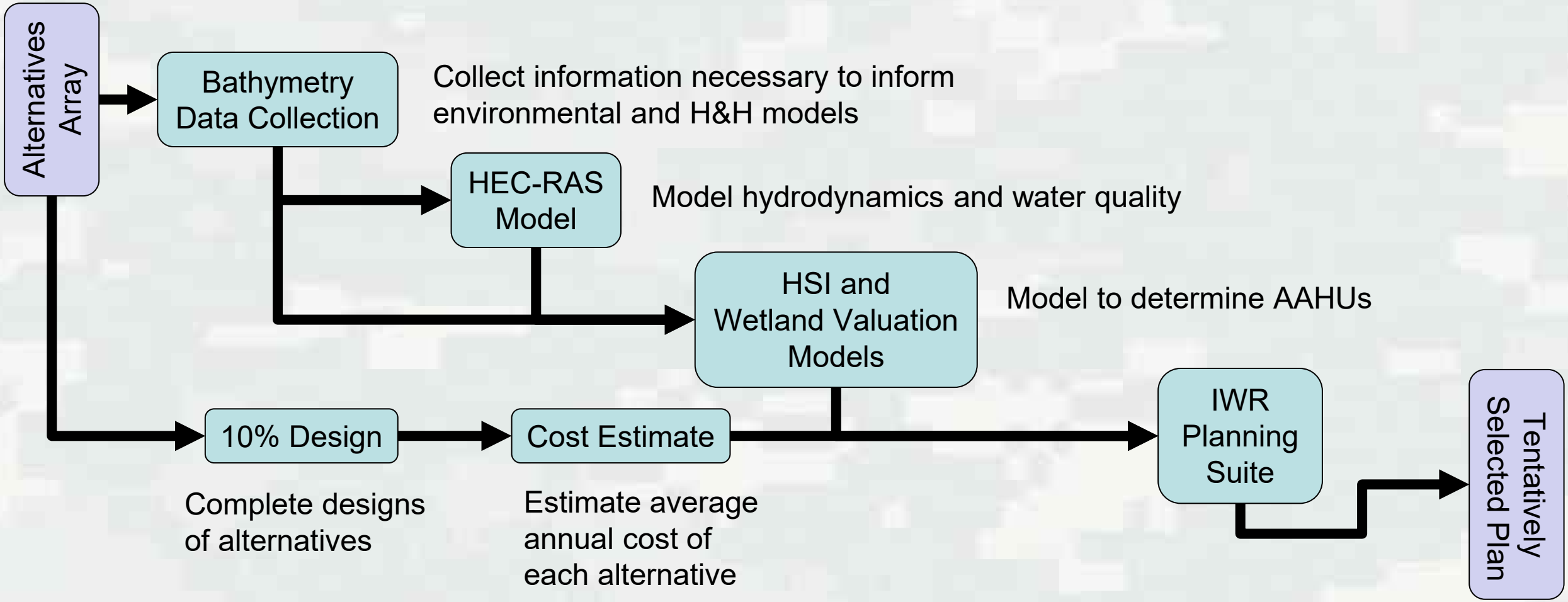
ALTERNATIVE MODELING



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DISCUSSION/QUESTIONS