Lake Okeechobee Storage Reservoir Section 203 Study

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

PROTECTOR OF THE EVERGLADES SINCE 1949

February 2024

Cover Sheet
NORTH OF LAKE OKEECHOBEE STORAGE RESERVOIR (LOCAR)
SECTION 203 FEASIBILITY STUDY AND REPORT
Highlands County, Florida

Non-federal Interest: South Florida Water Management District

Lead Federal Agency: U.S. Department of the Army
U.S. Army Corps of Engineers, Jacksonville District

Abstract:

The purpose and need of the Lake Okeechobee Storage Reservoir Section 203 Study (LOCAR, Project, or Section 203 Study) is to construct a 200,000-acre-foot (ac-ft) reservoir to store water during wet periods north of Lake Okeechobee for later use during dry periods and offer operational flexibility to draw and store water from the lake and basin to improve its littoral ecosystems. The Recommended Plan would achieve the Project goals and objectives by improving the quantity, timing, and distribution of water entering Lake Okeechobee; provide for better management of lake water levels; reduce high flows to the Caloosahatchee and St. Lucie Estuaries (Northern Estuaries) downstream of the lake; and improve systemwide operational flexibility. The Recommended Plan includes a 200,000 ac-ft aboveground storage reservoir north of Lake Okeechobee and Canal 41A, covering an area of approximately 12,316 acres and designed to have an average storage depth of 18 feet at its normal full-storage level.

The Recommended Plan creates additional water storage north of Lake Okeechobee to facilitate improved flexibility in the timing and distribution of water. Water can be drawn from Lake Okeechobee and stored during wet times to reduce damaging high lake stages and later be released back to the lake to reduce the impacts of low stages during dry times. The storage proposed by the Recommended Plan meets the Comprehensive Everglades Restoration Plan (CERP) goal for Component A. The Lake Weighted Index Score indicates a 26.9 percent improvement over the pre-CERP Baseline (PCB1), or 74.6 percent achievement of the Lake Index Score CERP goal when authorized projects are included in the future without condition. The first cost (2024 price level) of the Recommended Plan is $3,544,488,000.

For further information on this statement, please contact:
Drew Bartlett, Executive Director
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406
E-mail: LOCAR@sfwmd.gov

EXECUTIVE SUMMARY

This Final Feasibility Study (FS) is being prepared to document the effects of implementing an aboveground storage reservoir north of Lake Okeechobee, also known as the Lake Okeechobee Component A Storage Reservoir (LOCAR, Project, or Section 203 Study). The South Florida Water Management District (SFWMD) is preparing this FS pursuant to Section 203 of the Water Resources Development Act (WRDA) of 1986, as amended, for submission to the Assistant Secretary of the Army for Civil Works (ASA[CW]). The Jacksonville District, U.S. Army Corps of Engineers (Corps), is the federal agency acting on the District's behalf, and intends to prepare a National Environmental Policy Act (NEPA; Title 40 of the Code of Federal Regulations (CFR), Chapter V, Parts 1500 through 1508) assessment to support the ASA(CW) review of the FS. The SFWMD initiated the LOCAR FS in 2023 as the non-federal interest in response to Florida Governor's Executive Order 23-06. The goal of LOCAR is to construct Component A of the Comprehensive Everglades Restoration Plan (CERP), a storage reservoir north of Lake Okeechobee, to address Everglades-related water resource issues identified in the Corps' 1999 *Central and Southern Florida Project Comprehensive Review Study: Final Integrated Feasibility Report and Programmatic Environmental Impact Statement* (also known as the Yellow Book; Corps 1999) for the northern portion of the Lake Okeechobee Watershed (LOW), Lake Okeechobee, and Caloosahatchee and St. Lucie Estuaries (Northern Estuaries). Similar aboveground storage reservoirs are being constructed to the east, south, and west of Lake Okeechobee.

ES.1 Purpose and Need

The purpose of LOCAR is to construct a 200,000-acre-feet (ac-ft) reservoir to store water during wet periods north of Lake Okeechobee for later use during dry periods and offer operational flexibility to draw and store water from the lake and the basin to improve its littoral ecosystems. The LOCAR, or Component A in the Yellow Book, is included in CERP, which was approved by Congress as a framework for the restoration of the natural system under Section 601 of WRDA 2000. CERP, as documented in the Yellow Book, consists of 68 components. The need is to detain water during wet periods for release to Lake Okeechobee during dry periods using a storage goal of 200,000 ac-ft. Increased storage capacity north of Lake Okeechobee would improve flexibility in the timing and distribution of water to the lake, to the Northern Estuaries, and throughout the Lake Okeechobee Watershed. Water can be stored during wet periods to reduce the duration and frequency of both high and low water levels in Lake Okeechobee that are stressful to the lake's littoral ecosystems and cause large discharges from the lake that are damaging to the downstream estuary ecosystems.

LOCAR expands upon previously authorized projects to continue progress towards achievement of the level of restoration envisioned for CERP. LOCAR is focused on aboveground water storage north of Lake Okeechobee. Since the original CERP planning was completed in 1999, new studies, policy guidance, data collection, pilot projects, and improvements in hydrologic systems modeling capabilities have allowed for refining the knowledge base and approach in ecosystem restoration. This refined approach is used to maximize project benefits and reduce costs and risks to achieve the CERP goals.

ES.2 Study Area

The Study Area outlined in aqua below, covers a portion of the Lake Okeechobee Watershed in Florida. LOCAR builds off previous studies and includes Glades and Highlands Counties, along with the Seminole Tribe of Florida (STOF) Brighton Reservation**.** The Study Area includes Lake Okeechobee and the Caloosahatchee and St. Lucie Estuaries **(Figure ES-1)**.

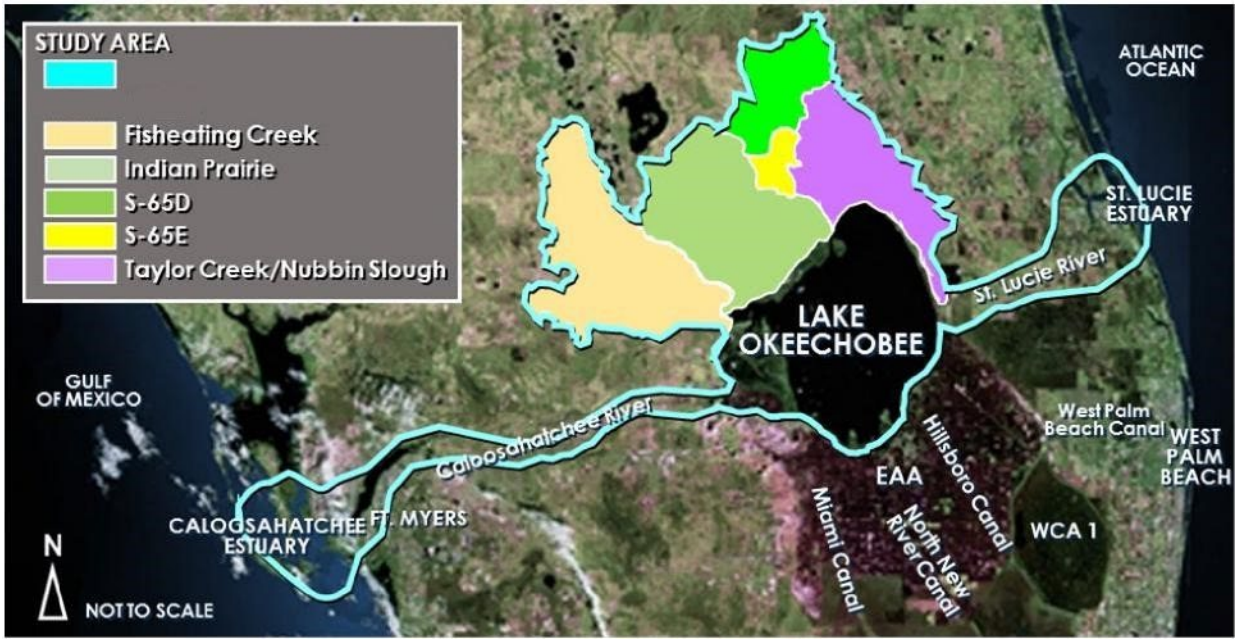


Figure ES-1. LOCAR Study Area Map.

ES.3 Authority

WRDA 2000 approved CERP as a framework for modifications to the Central and Southern Florida (C&SF) Project in Section 601(b)(1)(A). This LOCAR FS has been prepared by the SFWMD for submittal to the ASA(CW) for review, approval, and subsequent transmittal to Congress for authorization under Section 203 of WRDA 1986, as amended in accordance with Section 1152 of WRDA 2018.

ES.4 Project Goals and Objectives

In addition to Project purposes, the goals of LOCAR include:

1. Enhance ecological values in Lake Okeechobee and the St. Lucie and Caloosahatchee Estuaries ecosystems.
2. Enhance economic values and social well-being.
3. Maintain the rights of the STOF under the Compact among the Seminole Indian Tribe of Florida, the State of Florida, and the SFWMD (Savings Clause [Section 601 (h)(5)(C) of WRDA 2000]).

The objectives of the LOCAR include:

1. Improve quantity, timing, and distribution of flows into Lake Okeechobee to maintain ecologically desired lake stage ranges more often.

2. Improve the timing and volumes of freshwater flows from Lake Okeechobee to improve the salinity regime and the quality of habitats for oyster, submerged aquatic vegetation (SAV), and other estuarine communities in the Northern Estuaries.
3. Increase availability of the water supply to existing legal water users of Lake Okeechobee commensurate with improving Lake Okeechobee ecology.

The SFWMD used the most current, scientifically valid methodologies to conduct analysis of the proposed action in keeping with South Florida Water Management District practices and values, Congressional direction, and U.S. Army Corps of Engineers (USACE) planning guidance. The most current, and best available data and operational assumptions were employed. USACE planning methodology informed the plan analysis, selection, and assessment of positive and negative project impacts.

ES.5 Alternative Plans and Identification of the Tentatively Selected Plan

The LOCAR Project Team initiated plan formulation by reviewing previous studies and revisited opportunities to meet the goals of CERP Component A. Water conveyance to meet CERP Component A goals was a priority in plan formulation, along with lessons learned from work on Canal 43 (C-43), Canal 44 (C-44), and Everglades Agricultural Area (EAA) reservoirs. The focus of the Project Area for a deep storage aboveground reservoir became the area bounded by the C-38/Kissimmee River to the east, County Road 621 to the west, Canal 41A (C-41A) to the south, and the Istokpoga Canal and the CSX Railroad to the north. This area was ideal because of the ability to connect to C-41A and the ability to divert water to and from Lake Okeechobee.

The Project Team selected three possible configurations for an aboveground storage reservoir north of Lake Okeechobee. **Table ES-1** summarizes the features of each alternative. The operations for all three alternatives would be similar, allowing for a combination of methods to divert water from and return water to Lake Okeechobee.

Table ES-1. Array of Alternatives.

Feature	Alternative 1	Alternative 2	Alternative 3
Water storage capacity (ac-ft)	200,000	200,000	200,000
Land area of reservoir site (ac)	12,800	20,400	14,900
Land area of S-84+ spillway & PS-1 pump station site (ac)	1.5	1.5	1.5
Average ground elevation within each reservoir cell (ft NAVD88)	34 (east cell) 34 (west cell)	44 (north cell) 34 (southeast cell) 34 (southwest cell)	44 (north cell) 35 (south cell)
Average storage depth within each reservoir cell (ft)	17 (east cell) 17 (west cell)	11 (north cell) 11 (southeast cell) 11 (southwest cell)	15 (north cell) 15 (south cell)
Number of reservoir inflow pump stations (total number)	2	3	3
Total reservoir inflow capacity (cubic feet per second [cfs])	1,500	1,500	1,500
Total reservoir outflow capacity (cfs)	3,000	3,000	3,000

Note: Quantities for water-storage capacity, depth, and land area are approximate and are based on normal full-storage levels determined for the planning level design of the alternative.

ES.6 Description of the Recommended Plan

The Recommended Plan includes a 200,000-ac-ft aboveground storage reservoir north of the C-41A (**Figure ES-2**). The reservoir would cover an area of approximately 12,316 acres (ac) and be designed to have an average storage depth of 18 feet (ft) at its normal full-storage level. The reservoir would include two pump stations, two outflow culverts, an outflow canal, an interior divider dam with a gated control structure, and two ungated overflow spillways.

Construction. The reservoir would be constructed with a perimeter dam and an interior divider dam each having an average height of approximately 39 ft and 33 ft above the ground, respectively. The perimeter dam would be approximately 18 miles (mi) around, allowing for recreational opportunities. Material from the Project footprint and the surrounding seepage canal would be used to construct the dams. A gated outflow culvert would be constructed on the west side of the reservoir to discharge water into C-41A upstream of S-83, while another gated culvert would be constructed near the southeast side of the reservoir to discharge water into C-41A downstream of Structure-83 (S-83).

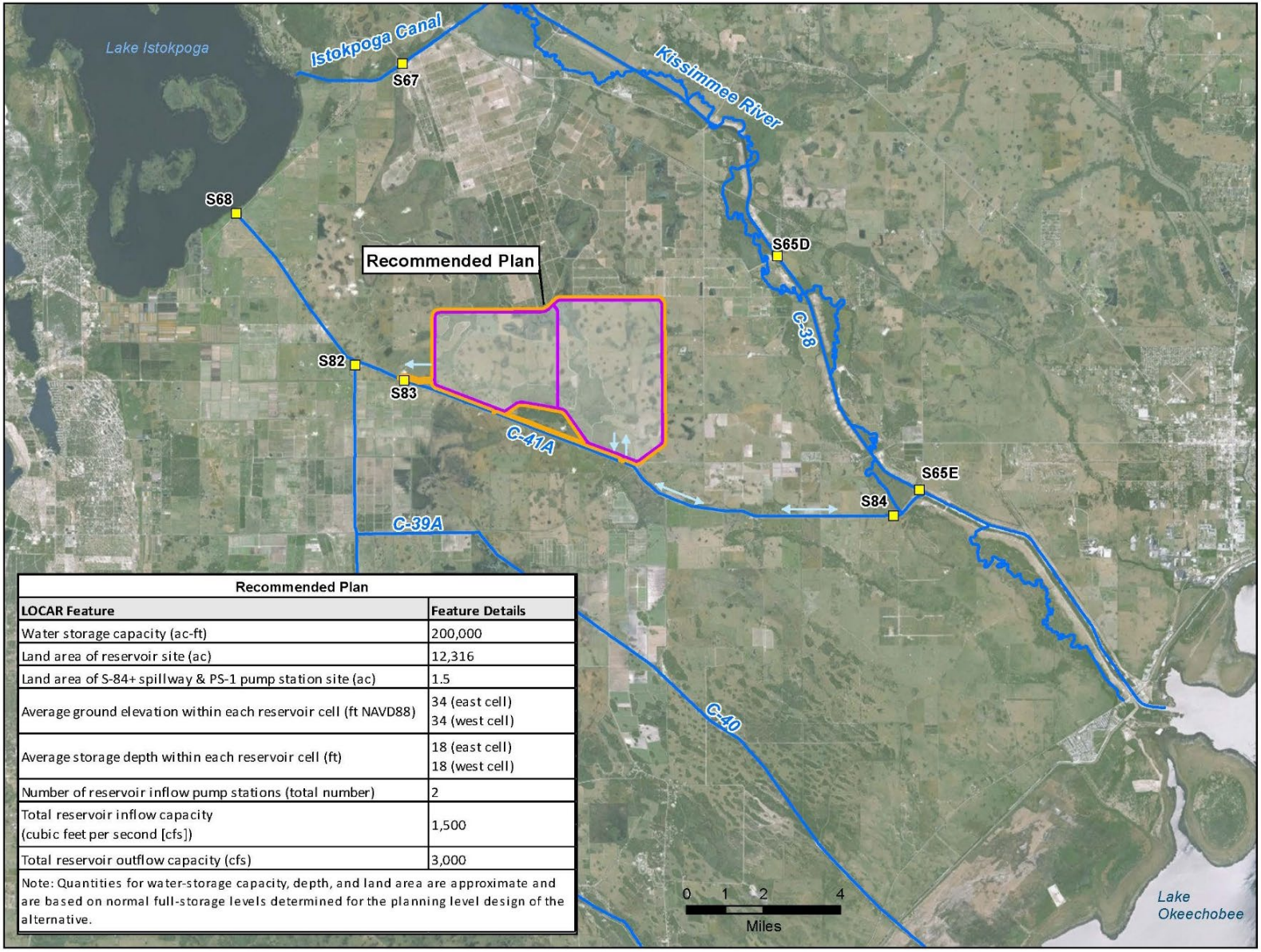
The reservoir would be constructed to have two storage cells (i.e., east and west) split by an interior divider dam to reduce wave runup. The interior divider dam would include a 1,500-cubic-feet-per-second (cfs), gated water-control structure to allow for controlled conveyance of water between the two cells. Each cell would include an ungated overflow spillway designed to discharge into C-41A.

A reservoir perimeter canal would be constructed outside the perimeter dam of the reservoir. Seepage from the reservoir would be collected in the canal and be returned to the reservoir via seepage pump stations. The seepage pump station would include two primary seepage pumps, an auxiliary seepage pump, and a back-up power generator to provide electrical power to operate the seepage pumps, in the event of an electrical service outage. If the seepage pump stations were not operational (e.g., the seepage pumps were out of service for maintenance, or the station's back-up power generator was not operating during an electrical service outage), the seepage collected in the perimeter canal would eventually overflow into the C-41A via overflow weir structures.

Operations.

The location of the two reservoir gated outflow culverts, Culvert (CU-) 1A and CU-2, would enable water to be released from the reservoir into the C-41A upstream and/or downstream of S-83, to convey water to the Indian Prairie Sub-basin, via C-41A, C-41, C-39A, C-40, and/or C-38, as well as to Lake Okeechobee. CU-1A and CU-2 would be designed to provide a maximum outflow rate of 1,500 cfs.

During times when water would be conveyed into the reservoir for storage, depending on the current and forecasted water management needs within the Study Area, the reservoir would be filled to a level not to exceed its normal full storage level (NFSL) of 51.7 ft North American Vertical Datum of 1988 (NAVD88) through one or a combination of three methods.



Recommended Plan	
LOCAR Feature	**Feature Details**
Water storage capacity (ac-ft)	200,000
Land area of reservoir site (ac)	12,316
Land area of S-84+ spillway & PS-1 pump station site (ac)	1.5
Average ground elevation within each reservoir cell (ft NAVD88)	34 (east cell) 34 (west cell)
Average storage depth within each reservoir cell (ft)	18 (east cell) 18 (west cell)
Number of reservoir inflow pump stations (total number)	2
Total reservoir inflow capacity (cubic feet per second [cfs])	1,500
Total reservoir outflow capacity (cfs)	3,000
Note: Quantities for water-storage capacity, depth, and land area are approximate and are based on normal full-storage levels determined for the planning level design of the alternative.	

Figure ES-2. LOCAR Recommended Plan features.

ES.6.1 Benefits to Lake Okeechobee Watershed

The Recommended Plan includes the creation of a 200,000-ac-ft reservoir in the watershed. The LOCAR Project Team anticipates that aquatic and wetland-dependent species will likely colonize this newly created habitat, despite potentially atypical water level fluctuations and seasonality of inundations. As predicted by the Trophic Hypothesis (RECOVER 2004), an influx of small fishes will directly benefit higher trophic level predators, such as wading birds.

ES.6.2 Benefits to Lake Okeechobee

The Recommended Plan would increase the amount of time Lake Okeechobee is within the ecologically preferred stage envelope, primarily through reductions in the frequency and duration of moderate and extreme high stages (i.e., greater than 16.0 ft National Geodetic Vertical Datum of 1929 [NGVD29] and greater than 17.0 ft NGVD29, respectively)[1] (**Table ES-2**). However, there are slight increases in the frequency of low stages and time spent below the envelope, though they are minimal compared to reductions of high stages. Extreme high stages lead to a loss of woody species (e.g., nesting substrate for wading birds) and expansion of invasive or nuisance vegetation at high elevations, loss of submerged plant beds at low elevations, and reduction in littoral extent. Stages above the preferred envelope, which would be reduced by 7 percent with the Recommended Plan, cause greater mixing of nutrients and sediment from the deep, open-water (i.e., limnetic) portion of the lake; reduce light penetration at the edge of the marsh; increase nutrient transport to the inner marsh; reduce the overall marsh size through loss of plants in deeper areas; and alter the plant community to one dominated by invasive or nuisance species. While low lake stages have similar impacts (e.g., temporary loss of nesting substrate for wading birds and aquatic habitat for fish and wildlife, expansion of invasive or nuisance vegetation at lower elevations, etc.), there are also some positive effects if such events are infrequent (e.g., oxidation/subsidence of organic soils, seed germination, SAV recovery, prey concentration for wading birds, etc.).

The Recommended Plan would improve conditions for fish in Lake Okeechobee by creating better conditions for the emergent and SAV habitat that fish use in the nearshore and littoral zones. Reductions in high stage would also improve nesting substrate for wading birds by restoring and maintaining historical colony locations in woody vegetation and would improve foraging by increasing prey density and availability of shallow marsh habitat during the breeding season.

[1] The Corps continues the usage of the NGVD29 system for elevation comparisons used with monitoring data, hydrologic modeling, and design for Florida. This allows the continuity of years of valuable data to be transitioned during Preconstruction, Engineering and Design (PED) to the more accurate North American Vertical Datum of 1988 (NAVD88). This Feasibility Study continues the use of NGVD29 and NAVD88, where appropriate, in hydrologic modeling and preliminary design of the Recommended Plan. In PED, the NGVD29 elevations will be converted to NAVD88 for design analyses and completion of construction documents (i.e., plans and specifications). In some prior instances, the local sponsor has requested both vertical datums to be referenced during PED. There are appropriate conversions based on spatial relevance to maintain design intent changing from NGVD29 to NAVD88.

Table ES-2. Lake Okeechobee Stage Effects with the Recommended Plan.

Lake Okeechobee Stage Levels	Future Without Project	Recommended Plan
Percent Time inside Ecologically Preferred Stage Envelope	22%	28%
Percent Time above Stage Envelope	48%	41%
Percent Time below Stage Envelope	30%	31%
Percent Time below Navigational Minimum Stage (<12.56 ft)	27.2%	30.1%
Percent Time above Extreme High Stage (Percent Time >17 ft)	2.1%	0.6%
Percent Time below Extreme Low Stage (Percent Time <10 ft)	3.1%	4.1%
Percent Time above Moderate High Stage (Percent Time >16 ft)	10.3%	5.8%
Percent Time below Moderate Low Stage (Percent Time <11 ft)	9.9%	10.3%

%–percent; ft–foot (feet)

ES.6.3 Benefits to Northern Estuaries

The restoration goal is to reestablish salinity regimes suitable for the maintenance of healthy, naturally diverse, and well-balanced estuarine ecosystems. Runoff from the watershed and freshwater flows from Lake Okeechobee both contribute to salinity fluctuations for the Northern Estuaries. Too much freshwater from watershed/basin runoff and freshwater flows from Lake Okeechobee can reduce salinity levels in the estuaries, and insufficient dry season flows can cause damaging high-salinity extremes.

Overall, there is marked improvement in all high and damaging flow metrics triggered by Lake Okeechobee regulatory releases when compared to the existing conditions baseline (ECB) and the Future Without Project (FWO) (**Table ES-3** and **Table ES-4**). Across all alternatives, low flows (i.e., St. Lucie River and Estuary [SLE] 14-day moving average (ma) flows of less than 150 cfs; and Caloosahatchee River and Estuary [CRE] 14-day ma flows of less than 750 cfs) perform worse than the ECB and the FWO, due to Lake Operations decisions. High and stressful flow events triggered by basin runoff, rather than Lake Okeechobee regulatory releases, improve across all alternatives compared to the ECB, but are worse than the FWO. Finally, across alternatives, extreme high flows in the estuaries (i.e., SLE 14-day ma flows of 1,700 to 4,000 cfs and greater than 4,000 cfs; and CRE 14-day ma flows of 2,600 to 4,500 cfs, 4,500 to 6,500 cfs, and greater than 6,500 cfs) show overall improvements, but degree of improvement depends on the estuary and on the flow category in question.

Table ES-3. Caloosahatchee Estuary Modeled Results for the Alternatives, Existing Conditions Baseline, and Future Without Condition.

Scenario	ECB	FWO	Alternative 1	Alternative 2	Alternative 3
Low Flow - # of 14-day periods <750 cfs	549	752	586	584	586
Optimal Flow - # of 14-day periods ≥750 cfs and <2,100 cfs	638	549	688	686	689
High Flow (Basin Runoff) - # of 14-day periods ≥2,100 cfs and <2,600 cfs	166	124	153	154	154
High Flow (LOK Regulatory) - # of 14-day periods ≥2,100 cfs and <2,600 cfs	77	66	42	42	41
Damaging Flow (Basin Runoff) - # of 14-day periods ≥2,600 cfs	230	160	179	178	179

Scenario	ECB	FWO	Alternative 1	Alternative 2	Alternative 3
Damaging Flow (LOK Regulatory) - # of 14-day periods ≥2,600 cfs	86	66	55	56	55
Damaging Flow (Total Flows) - # of 14-day periods ≥2,600 and ≤4,500 cfs	241	181	179	178	178
Damaging Flow (Total Flows) - # of 14-day periods ≥4,500 and ≤6,500 cfs	105	80	75	77	76
Damaging Flow (Total Flows) - # of 14-day periods ≥6,500 cfs	84	56	64	64	64

Notes: cfs–cubic feet per second; FWO–Future Without Project; LOK Regulatory–Lake Okeechobee regulatory releases

Table ES-4. St. Lucie Estuary Modeled Results for the Alternatives, Existing Conditions Baseline, and Future Without Condition.

Scenario	ECB	FWO	Alternative 1	Alternative 2	Alternative 3
Low Flow - # of 14-day periods <150 cfs	183	163	209	208	210
Optimal Flow - # of 14-day periods ≥150 cfs and <1,400 cfs	910	997	1,013	1,011	1,012
High Flow (Basin Runoff) - # of 14-day periods ≥1,400 cfs and <1,700 cfs	279	238	262	261	263
High Flow (LOK Regulatory) - # of 14-day periods ≥1,400 cfs and <1,700 cfs	30	49	20	20	20
Damaging Flow (Basin Runoff) - # of 14-day periods ≥1,700 cfs	452	344	350	350	351
Damaging Flow (LOK Regulatory) - # of 14-day periods ≥1,700 cfs	41	58	29	30	27
Damaging Flow (Total Flows) - # of 14-day periods ≥1,700 and ≤4,000 cfs	427	352	337	339	339
Damaging Flow (Total Flows) - # of 14-day periods ≥4,000 cfs	166	129	118	118	118

cfs–cubic feet per second; FWO–Future Without Project; LOK Regulatory–Lake Okeechobee regulatory releases

ES.6.4 Recreational Benefits

Recreational features have been added to LOCAR as an incidental Project benefit to enhance the existing opportunities for resource-based activities in the Project Area. These recreation benefits were not used in the justification of the plan. A summary of recreational costs and benefits is provided in **Table ES-5**. **Appendix F** contains the full recreational analysis.

LOCAR would accommodate public access and enhance the existing opportunities for resource-based recreation found in the Project Area. Due to the large public interest in outdoor recreation opportunities, the area would experience increased visitation rates because of its geographic proximity to Lake Okeechobee, the Kissimmee River, and several other water management areas, all of which currently experience visitors from all over the state and nation.

Recreational benefits were calculated using unit day value (UDV), a National Economic Development (NED) benefit evaluation procedure contained in Engineer Regulation (ER) 1105-2-100 (April 22, 2000), Appendix E, Section VII. See **Appendix F** for the full UDV analysis. The justification of incurring additional costs for recreation features is derived by using a benefit-to-cost ratio. The tangible economic justification

of the proposed ancillary recreation Project component can be determined by comparing the equivalent average annual charges (i.e., facility costs) against the estimate of the equivalent average annual benefits, which will be realized over the period of analysis (i.e., Project lifespan). **Table ES-5** displays recreational net annual benefits and a benefit-to-cost ratio of 2.7.

Table ES-5. Recreation Costs and Net Annual Benefits (Fiscal Year 2024 Dollars).

Category	Costs
Construction	$2,210,000
Lands and Damages	$0
Preconstruction Engineering and Design[1]	$552,000
Construction Management[2]	$203,000
Interest During Construction[3]	$30,000
Total Investment	$2,995,000
Amortized	$110,900
OMRR&R	$24,600
Average Annual Cost	$135,500
Unit Day Value	$10.23
Average Daily Users	97
Average Annual Users	35,405
Average Annual Benefits	$362,193
Benefit-to-cost Ratio	2.7
Net Annual Benefits	$226,656

OMRR&R–operation, maintenance, repair, replacement, and rehabilitation

1/ Recreation preconstruction, engineering, and design (PED) costs presented here constitute estimate external to Total Project Cost Sheet. The proportion of total Project recreation construction cost out of total Project construction cost is applied to total Project PED cost to estimate total Project recreation construction management (CM) cost. These costs differ from initial recreation costs used for alternative comparison due to a higher level of design detail to inform cost estimates.

2/ Recreation CM costs presented here constitute estimate external to Total Project Cost Sheet. The proportion of total Project recreation construction cost out of total Project construction cost is applied to total Project CM cost to estimate total Project recreation CM cost.

3/ Recreation interest during construction calculated by contract and summed. Contract-by-contract recreation CM and recreation PED costs estimated using the methodology described above, substituting total Project construction costs for contract-by-contract Project construction costs and total Project recreation construction costs for contract-by-contract Project recreation costs, as applicable.

ES.6.5 Other Benefits

Water supply is inextricably linked to restoration features of the Project because LOCAR would benefit both environmental and water supply objectives. Water supply benefits would come as a direct result of the additional storage provided by the reservoir. LOCAR would provide the ability to store water when lake levels rise above those desirable for lake ecology, enabling the lake to remain within the ecologically preferred band. Water stored would be recovered during dry periods to assist in keeping lake levels within the ecologically preferred band, which is above the water supply cutback trigger levels. Changes in cutbacks would be expected because of the timing of returning flows from LOCAR to Lake Okeechobee.

Water quality improvement was not a study objective; however, ancillary water quality improvements may result from implementation of the Recommended Plan. Results from a simple phosphorus load analysis showed slightly reduced phosphorus loading of less than 1 percent compared to the FWO condition. It is important to note that the P decrease identified by the model is predominantly attributed

to particulate settling and is therefore strongly dependent on the residence time of lake water in the reservoir. The overall phosphorus loads to the lake should not be increased in compliance with the adopted Lake Okeechobee Total Maximum Daily Load. Additionally, the current and proposed state actions, including the Lake Okeechobee Basin Management Action Plan, are anticipated to improve water quality to further meet hydrologic restoration objectives.

The Recommended Plan also boosts resiliency to potential climate change effects by increasing freshwater in the Lake Okeechobee and Northern Estuaries Watershed system and buffering natural system areas and the underlying aquifer.

ES.6.6 Compatibility of LOCAR with Recently Authorized CERP Projects

At the time of LOCAR formulation, including FWO modeling, other CERP and non-CERP projects that improve the condition of Lake Okeechobee that have been authorized, are under construction, or are completed, are assumed to be in place, including the EAA Storage Reservoir and stormwater treatment area (STA) authorized in 2018. At the time of LOCAR planning efforts, Lake Okeechobee System Operating Manual (LOSOM) was in the planning process waiting completion of NEPA and approval from the Corps' South Atlantic Division. Lake Okeechobee operations included the Lake Okeechobee Regulation Schedule (LORS) 2008 with Central Everglades Planning Project (CEPP) EAA Phase optimized release guidance. These placeholder operational changes, although not formally covered under the CEPP EAA NEPA, were critical to improve selected performance within LOW, Northern Estuaries, and Lake Okeechobee Service Area (LOSA), while meeting environmental targets in the Everglades. Consistent with plan formulation policy for development of FWO conditions, LOCAR planning conditions included projects that are authorized, under construction, or completed. A full discussion of the FWO condition is in **Section 2** of the main report.

However, as the LOCAR planning progressed, the Project Team anticipated that LOCAR would complement LOSOM to improve conditions in Lake Okeechobee and the Northern Estuaries. Additionally, it seemed reasonably foreseeable that LOSOM would be authorized. Although this Project was not included in the FWO condition, the Project Team decided to perform a sensitivity run of the potential compatibility of Project benefits provided by LOSOM. Results of the sensitivity analysis are detailed in **Appendix A, Annex A-2.4**.

The Yellow Book identified storage north and south of Lake Okeechobee as necessary individual components of CERP for restoration of the natural system. While both storage locations improve operational flexibility for Lake Okeechobee, they do so in different ways. Due to the unique purpose and function of storage in each location, the LOCAR Recommended Plan would complement other authorized CERP projects, including the EAA reservoir, to improve conditions in Lake Okeechobee and the Northern Estuaries.

ES.6.7 WRDA 2000 Savings Clause

The Project meets the requirements of the WRDA 2000 Savings Clause by maintaining current levels of service for flood protection and causing no elimination of existing legal sources of water supply within the areas affected by LOCAR.

The implementation of the Recommended Plan would not degrade the existing level of flood protection offered by various components of the C&SF Project for the area. Detailed assessments of the

Recommended Plan were conducted. The MODFLOW groundwater seepage model results are undergoing risk review by the Corps and SFWMD engineering teams to ensure the service area surrounding the reservoir maintains its existing level of service of flood protection. Additional assessments of potential effects from the Recommended Plan will be refined during the preconstruction engineering and design (PED).

With implementation of the Recommended Plan, sources of water to meet agricultural and urban demand in LOSA would continue to be met by their current sources, primarily Lake Okeechobee. Sources of water for the STOF and Miccosukee Tribe of Indians of Florida (MTI) are influenced by the regional water management system (i.e., C&SF Project, including Lake Okeechobee); these sources would not be negatively affected by the Project. Water sources for fish and wildlife located in Lake Okeechobee and the Northern Estuaries would also not be diminished.

ES.7 Environmental Considerations

The LOCAR has been identified to be environmentally preferable for meeting Project objectives within the Study Area. All practicable means to avoid or minimize adverse environmental effects have been incorporated into the Recommended Plan. An Adaptive Management and Monitoring Plan (**Annex D**) describes the methodology to monitor ecosystem restoration performance and provide options to improve restoration performance, if needed. The Invasive and Nuisance Species Management Plan **(Annex F)** describes actions associated with managing the spread of invasive species that will otherwise impact restoration performance. Adverse effects associated with implementing the Recommended Plan are expected to be negligible to major. Short-term impacts to air quality, the noise environment, aesthetic resources, and vegetation, and disturbances to and displacement of fish and wildlife resources to other nearby habitat, are expected from operation of construction equipment through lands designated for staging, access, and construction.

Major effects to vegetation in the Project Area would be expected under the Recommended Plan from the conversion of pastureland to an aboveground reservoir. The Project Area is dominated by improved pasture, accounting for 78 percent of the footprint. Other dominant vegetation communities include vegetated non-forested wetlands, accounting for 22 percent of the footprint. These pasturelands and wetlands would become an aboveground reservoir. Major effects to threatened and endangered (T&E) species would be expected from Alternative 1. A number of federally threatened, endangered, and candidate species may occur within the Study Area: the Florida panther, Florida manatee and its critical habitat, Florida bonneted bat, eastern black rail, Everglade snail kite and its critical habitat, Audubon's crested caracara, Florida grasshopper sparrow, wood stork, Eastern indigo snake, Okeechobee gourd, smalltooth sawfish and its critical habitat, green sea turtle, hawksbill sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, and loggerhead sea turtle. Details on the life history of each species and their effects determinations can be found in the Biological Assessment (BA) and Biological Opinion (BO) in **Annex A**. The Final BO will be included in **Annex A** upon receipt. If any of these species are encountered during the preconstruction surveys, the Corps would work closely with U.S. Fish and Wildlife Service (USFWS) to identify options to eliminate or minimize any potential effects. State listed threatened species also may occur in the Project Area and include the American oystercatcher, black skimmer, least tern, burrowing owl, Florida sandhill crane, little blue heron, roseate spoonbill, Southeastern American kestrel, tricolored heron, gopher tortoise, and Florida pine snake. If any of these species are found during the

preconstruction surveys, the Corps would coordinate with the Florida Fish and Wildlife Conservation Commission (FWC) on appropriate impact avoidance, minimization, and/or mitigation measures.

The Recommended Plan would not be expected to adversely affect historic properties and cultural resources, and Native American resources. In conjunction with the National Historic Preservation Act (NHPA), the Corps initiated formal consultation with the STOF's Tribal Historic Preservation Officer, the MTI Native American Graves Protection and Repatriation Act representative, and the Florida State Historic Preservation Office (SHPO). The SFWMD is currently conducting a cultural resource assessment survey to evaluate cultural resources and determine effects of the undertaking on historic properties within portions of Recommended Plan Project footprint prior to completion of the FS. Results from the survey have determined that the Recommended Plan would avoid historic properties. In a letter dated February 26, 2024, the Florida State Historic Preservation Officer that that "the proposed project will have no adverse effect on historic properties listed, or eligible for listing, in the NRHP, or otherwise of historical, archaeological, or architectural value within the surveyed APE." They found the report submitted to be "complete and sufficient in accordance with Chapter 1A-46*, Florida Administrative Code*." **Appendix C, Part 2**, contains a description of the full preliminary analysis, background information, and descriptions of terms.

ES.8 Cost Estimate and Implementation Plan

Table ES-6 presents the cost to implement LOCAR including the average annual costs for operation, maintenance, repair, replacement, and rehabilitation (OMRR&R). The total first cost of LOCAR, defined as the capital investment costs (2024 price level), is $3,544,488,000, including construction, non-construction items, and contingency (see **Section 6** and **Appendix B** for cost detail). Costs will be shared between the federal government and the non-federal sponsor under the CERP program as a whole. The non-federal sponsor will provide cash, perform work-in-kind during planning, engineering, and design, or manage a portion of construction as necessary to meet its 50 percent share of the total first cost of the Project, to be balanced according to Section 601(e) of WRDA 2000. **Section 6.6** contains additional information on cost sharing between the federal government and the non-federal sponsor.

Table ES-6. Project First Cost Estimates with Cost Share (2023 Price Level).

Item	Federal Cost	Non-federal Cost	Total[1]
Ecosystem Restoration			
Restoration Construction[2]	$1,361,590,000	$1,114,028,000	$2,475,618,000
PED	$309,453,000	$309,453,000	$618,905,000
Construction Management	$113,879,000	$113,879,000	$227,757,000
LER&R	$5,362,000	$213,881,000	$219,243,000
Ecosystem Restoration Subtotal	$1,790,284,000	$1,751,241,000	$3,541,523,000
Recreation			
Recreation Construction	$1,105,000	$1,105,000	$2,210,000
PED[2]	$276,000	$276,000	$552,000
Construction Management[3]	$102,000	$102,000	$203,000
Recreation Subtotal	$1,483,000	$1,483,000	$2,965,000
Total Project Cost	**$1,791,767,000**	**$1,752,724,000**	**$3,544,488,000**
Associated Average Annual Costs			
OMRR&R - LOCAR	$3,235,700	$3,235,700	$6,471,400
OMRR&R - Invasive Species	$55,957	$55,957	$111,914
OMRR&R- Monitoring (annual cost over 10- year cycle)	$520,330	$520,330	$1,040,660
OMRR&R - Monitoring (perpetual cost)	$1,058,198	$1,058,198	$2,116,396
OMRR&R - Recreation	$0	$24,600	$24,600

1/1/ Construction costs totals are FY23 First Costs Rounded to the nearest $1,000.
2/ Recreation preconstruction engineering and design (PED) costs presented here constitute estimate external to Total Project Cost Sheet. The proportion of total Project recreation construction cost out of total Project construction cost is applied to total project PED cost to estimate total Project recreation construction management (CM) cost.
3/ Recreation CM costs presented here constitute estimate external to Total Project Cost Sheet. The proportion of total Project recreation construction cost out of total Project construction cost is applied to total Project CM cost to estimate total Project recreation CM cost.
LER&R = lands, easements, rights-of-way, relocations, and disposal; LOCAR–Lake Okeechobee Storage Reservoir Section 203 Study; OMRR&R–operation, maintenance, repair, replacement, and rehabilitation; PED–preconstruction engineering and design Construction costs in this table include contingencies.

Implementation of LOCAR will occur over many years and include multiple phases by the Corps and SFWMD. Project Partnership Agreements (PPA) are legally binding agreements that describe the roles and responsibilities of the Corps and SFWMD for real estate acquisition, design, construction, and operations and maintenance. The PPA will include the construction of Project features that maximize benefits to the extent practicable consistent with Project dependencies. Development of sequencing for LOCAR components takes into consideration the desire for quick implementation of storage north of the lake and other influencing factors, such as funding availability and cost-share balance between the Corps and SFWMD.

Land acquisition will be included in the Master Agreement. However, land ownership was not considered as a screening criterion for LOCAR. All the land located within the Project footprint is owned by one private corporation. Uncertainties surrounding land acquisition include willingness of the landowner to sell; acquisition schedule risk to meet construction schedules; the potential for any unknown utility relocations not identified during the FS; the potential presence of minerals and mineral rights on lands to be acquired; and the potential for hazardous, toxic, and radioactive waste (HTRW) materials on the lands to be acquired. The real estate plan and associated acreages is tentative in nature. It is for planning purposes

only and both the final real property lines and real estate costs provided are subject to change even after approval of the Environmental Impact Statement (EIS). More details on land acquisition and landownership are provided in **Appendix D**.

ES.9 Coordination with Tribal Nations, Agencies, and the Public

The planning process for the LOCAR study involved coordination with the public and federal, Tribal, state, and local resource management and regulatory agencies. In accordance with 33 CFR Section 385.26(a), required consultation, as defined in 33 CFR Section 385.3, has occurred with all required agencies, including the U.S. Department of Commerce, and other federal, state, and local agencies as designated in 33 CFR Section 385.26(a). In accordance with 33 CFR Section 385.26(e)(3), required coordination, as defined in 33 CFR Section 385.3, has occurred with all appropriate agencies as required by applicable law.

At the beginning of the planning process, agencies and Tribes were asked to become cooperating agencies under NEPA. FWC, Florida Department of Environmental Protection, and Florida Department of Agriculture and Consumer Services agreed. Responses were not received from other agencies; however, the agencies were fully involved in all phases of the planning process. See **Appendix A of the EIS** for agency coordination letters.

A Notice of Intent (NOI) to prepare an EIS was published in the *Federal Register* (FR) on April 24, 2023 (88 FR 24777). The Corps, in coordination with the SFWMD, conducted two hybrid (i.e., in-person and virtual) public scoping meetings in Okeechobee, Florida, and via Zoom on Thursday, April 27, 2023. Materials developed for the public scoping meetings were also available online at https://www.sfwmd.gov/our-work/lake-okeechobee-component-reservoir-locar. The Corps mailed letters to 18 federal, state, local, and Tribal government representatives and agencies and issued press releases. Comments during the public scoping period were accepted through a variety of conduits, including U.S. mail, email, and as part of meeting transcripts. The scoping efforts resulted in 46 comments received from 18 interested parties. **Appendix A of the EIS** contains a copy of the scoping letter, NOI, scoping letters received, and comment-response matrix.

The Corps released a Notice of Availability (NOA) for the Draft EIS published in the *Federal Register*, which began the 45-day review period for the public and agencies. The Corps also sent letters to interested parties, and the SFWMD issued a press release. The Draft EIS is available online at https://www.saj.usace.army.mil/LOCAR/. The Draft EIS was also mailed to interested parties who requested copies and made available to the public at libraries in the region.

Public meetings are scheduled in Okeechobee. The dates, times, and locations are included in the *Federal Register*, press releases, and posted on the Corps and SFWMD Project websites at https://www.saj.usace.army.mil/LOCAR/ and https://www.sfwmd.gov/our-work/lake-okeechobee-component-reservoir-locar, respectively.

Pursuant to Executive Order 13175, and in consideration of the Corps' Trust Responsibilities, the Corps has engaged in government-to-government consultation to discuss Project formulation, benefits, and effects with two federally recognized Native American Tribes: the MTI and the STOF. Government-to-government meetings were held individually with representatives of MTI and STOF and are documented in **Appendix A of the EIS**. During government-to-government consultation, STOF representatives

expressed concern about flooding and seepage and interest in opportunities to improve their water supply reliability. Regularly occurring government-to-government meetings/teleconferences were and continue to be held with STOF and MTI during the planning phase.

ES.10 Environmental Justice

A robust environmental justice (EJ) analysis was undertaken with feedback from the U.S. Environmental Protection Agency (EPA). Special consideration was given to assessing intensity of impacts to the STOF Brighton Reservation, which is located approximately 5 mi south of the Project Area. According to the Council on Environmental Quality regulation (40 CFR Section 1508.27), unique characteristics of the geographic area could include proximity to distinctive features such as historic or cultural resources, prime farmlands, wetlands, or other ecologically critical areas. Impact categories considered included aesthetics, noise, light pollution, wetlands, cultural/historic resources, economic impacts (including displacement of listed species and potential compliance costs and restriction of economic activities, water supply, ranching impacts, drainage impacts to Brighton Reservation), health impacts (water supply wells, fish and wildlife (food) contamination, dam breach impacting property and safety), and cultural practices (access to sacred/ceremonial sites, hunting and fishing). The analysis concluded that LOCAR will provide benefits to quality of life by improving Lake Okeechobee ecology, improving the estuarine environment and contribute to hydrological improvements in the historic Everglades. Several EJ communities were identified in the Project Area as having a potential to be affected. Glades, Highlands, and Okeechobee Counties in the Study Area, including census tracts adjacent to the Project Area in Highlands County, have income levels notably lower than state and national averages, and poverty rates that are higher than the state and national averages. People of color communities in the Study Area that could be affected by the Project are the STOF Brighton Reservation in Glades County, which represents Tribal nation lands, and a community southwest of the reservoir site in Census Tract 9617.02 in Highlands County, where almost half of the population is of Hispanic or Latino origin. The communities have a higher percentage of people of color than the state average. However, the EJ analysis determined that the Project does not cause disproportionate impacts to the people of color and/or low-income communities. Any remaining minimal impacts will be further avoided, minimized, and/or mitigated. The full environmental justice analysis is located in **Appendix C.2**.

ES.11 Land Acquisition

Land ownership was not considered as a screening criterion for LOCAR. Privately owned lands would be used for LOCAR, as all the land located within the Project footprint is owned by one private corporation. Uncertainties surrounding land acquisition include willingness of the landowner to sell; acquisition schedule risk to meet construction schedules; the potential for any unknown utility relocations not identified during the FS; the potential presence of minerals and mineral rights on lands to be acquired; and the potential for HTRW materials on the lands to be acquired. Land acquisition will be the responsibility of the non-federal sponsor under CERP. More details on land acquisition and landownership are provided in **Appendix D**.

ES.12 Cultural Resources

The Recommended Plan would have no adverse effect to historic properties and cultural resources. Results from the survey determined that the Recommended Plan would avoid historic properties. In a letter dated February 26, 2024, the Florida State Historic Preservation Officer that that "the proposed project will have no adverse effect on historic properties listed, or eligible for listing, in the NRHP, or otherwise of historical, archaeological, or architectural value within the surveyed APE." They found the report submitted to be "complete and sufficient in accordance with Chapter 1A-46, *Florida Administrative Code*."

ES.13 Meeting Additional Regional Ecosystem Restoration Needs

The Yellow Book identified storage north and south of Lake Okeechobee as necessary individual components of CERP for restoration of the natural system. While both storage locations improve operational flexibility for Lake Okeechobee, they do so in different ways. Due to the unique purpose and function of storage in each location, the LOCAR Recommended Plan would complement other authorized CERP projects, including the EAA reservoir, to improve conditions in Lake Okeechobee and the Northern Estuaries.

The purpose of aboveground storage north of Lake Okeechobee, pursuant to the Yellow Book, is to store water during wet periods for later use during dry periods. Storage north of Lake Okeechobee provides water to the lake during dry times, benefitting lake ecology and downstream ecosystems, and also improves reliability of water supply for environmental and other water-related needs. Storage north of the lake also captures water during high flow periods, helping to reduce regulatory releases to the Northern Estuaries and moderate high lake stages. As envisioned in CERP, Lake Okeechobee is not intended to serve as a long-term storage reservoir, but, rather, to enable a healthy functioning lake with seasonally fluctuating stages. The increased storage capacity would reduce the frequency of large regulatory releases from the lake that are damaging to the downstream estuary ecosystems and would benefit the lake's littoral ecosystems by reducing both high and low lake stages. The distinction between the two purposes is important as neither is subsumed by the other.

ES.14 Water Supply

During previous planning efforts, agricultural, Tribal, and municipal/industrial water supply stakeholders expressed concerns about lack of progress on CERP projects intended to increase water supply and the loss of water supply experienced during the transition from the Water Supply and Environment schedule to implementation of the LORS. This additional storage volume provided north of Lake Okeechobee through implementation of the Recommended Plan benefits existing legal water users within LOSA by storing water that can be sent to Lake Okeechobee during dry periods. It would be expected that water would be released from the LOCAR reservoir to meet LOSA demands, and modeled results illustrate the Recommended Plan, when simulated with LOSOM, reduces the severity and frequency of water shortages and reduces the volume of water shortage cutbacks when compared to the Future Without Project and existing base condition. This and other future CERP increments that provide additional storage would increase water made available in the regional system for other water-related needs.

With implementation of the Recommended Plan, sources of water to meet agricultural and urban demand in LOSA would continue to be met by their current sources, primarily Lake Okeechobee. Sources of water for the STOF and MTI are influenced by the regional water management system (i.e., C&SF Project, including Lake Okeechobee); these sources would be supplemented by the additional storage provided by the Project. Water supplies for fish and wildlife located in Lake Okeechobee and the Northern Estuaries would be enhanced by the Project.

Project-specific Assurances ensure that the water needed for the natural system to achieve CERP restoration goals is identified and subsequently protected from other potentially competing uses. The Savings Clause protects existing legal sources of water supply, such as water for municipal and agricultural uses, and ensures that CERP implementation does not reduce the level of service for flood protection. Refer to **Annex B** for complete documentation of the Project Assurances and Savings Clause analysis for the Recommended Plan, responsive to the requirements of WRDA 2000.

ES.15 Water Quality

During previous planning efforts, stakeholders provided feedback on the importance of water quality both in the northern watersheds and in Lake Okeechobee. Although water quality improvement is not a study objective, water quality analysis demonstrates that the Project may provide minor improvements to water quality, primarily through reductions in high water levels in Lake Okeechobee. The Project would not be expected to adversely affect tributary or Lake Okeechobee water quality. The implementation of the Recommended Plan is not predicted to substantially affect phosphorus loadings to Lake Okeechobee. More detail on this analysis is available in **Annex I**. Additionally, the current and proposed state actions, including the adoption of Total Maximum Daily Loads and the Lake Okeechobee Basin Management Action Plan, are anticipated to improve water quality to further meet hydrologic restoration objectives.

ES.16 Effects on Threatened and Endangered Species

During previous planning efforts, both the STOF and local landowners have expressed concerns about the displacement of threatened and endangered species to Tribal and private lands. The Recommended Plan footprint is located outside of Tribal lands, 5 mi north of the STOF Brighton Reservation. To achieve restoration objectives, the Recommended Plan includes construction of infrastructure that floods lands potentially inhabited by threatened and endangered species, including the Audubon's crested caracara, eastern indigo snake, eastern black rail, wood stork, Florida panther, Everglade snail kite, Okeechobee gourd, and Florida bonneted bat. The USFWS provided recommendations in its BO, received on November 30, 2023, to avoid or minimize harmful effects on threatened and endangered species potentially affected by the Project. For more information, refer to **Annex A**.

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1.0 INTRODUCTION AND SIGNIFICANCE

This Final Feasibility Study (FS) is being prepared to document the effects of implementing an aboveground storage reservoir north of Lake Okeechobee, also known as the Lake Okeechobee Storage Reservoir Section 203 Study (LOCAR, Project, or Section 203 Study). The South Florida Water Management District (SFWMD) is preparing this FS pursuant to Section 203 of the Water Resources Development Act (WRDA) of 1986, as amended, for submission to the Assistant Secretary of the Army for Civil Works (ASA(CW)). The Jacksonville District, U.S. Army Corps of Engineers (Corps), as the lead federal agency, has prepared a National Environmental Policy Act (NEPA; Title 40 of the Code of Federal Regulations, Chapter V, Parts 1500 through 1508) Environmental Impact Statement (EIS) to evaluate potential effects on the human environment. The Corps' EIS has been prepared to support the ASA(CW) review of and decision on this Section 203 Study. The SFWMD initiated the LOCAR FS in 2023 as the non-federal interest in response to the Florida Governor's Executive Order 23-06. The goal of LOCAR is to construct Component A of the Comprehensive Everglades Restoration Plan (CERP), a storage reservoir north of Lake Okeechobee, to address Everglades-related water resource issues identified in the Corps' *Central and Southern Florida Project Comprehensive Review Study: Final Integrated Feasibility Report and Programmatic Environmental Impact Statement* (also known as the Yellow Book; Corps 1999) for the northern portion of the Lake Okeechobee Watershed, Lake Okeechobee, and Caloosahatchee and St. Lucie Estuaries (Northern Estuaries). Similar aboveground storage reservoirs are being constructed to the east, south, and west of Lake Okeechobee.

1.1 Project Purpose and Need

The purpose of LOCAR is to identify a 200,000-acre-foot (ac-ft) reservoir to store water during wet periods north of Lake Okeechobee for later use during dry periods and offer operational flexibility to draw and store water from the lake and the basin to improve its littoral ecosystems. The LOCAR is in line with Component A in the Yellow Book. The Yellow Book, or CERP, was approved by Congress as a framework for the restoration of the natural system under Section 601 of WRDA 2000. CERP, as documented in the 1999 Yellow Book, consists of 68 components. The need is to detain water during wet periods for release to Lake Okeechobee during dry periods using a storage goal of 200,000 ac-ft. Increased storage capacity north of Lake Okeechobee would improve flexibility in the timing and distribution of water to the lake, to the Northern Estuaries, and throughout the Lake Okeechobee Watershed. Water can be stored during wet periods to reduce the duration and frequency of both high and low water levels in Lake Okeechobee that are stressful to the lake's littoral ecosystems and that cause large releases from the lake that are damaging to the downstream estuary ecosystems.

Since 2000, much progress has been made toward CERP. Construction has begun on the first generation of CERP projects authorized by Congress. These include the Picayune Strand Restoration, Indian River Lagoon South, and Phase 1 of the Site 1 Impoundment projects. Congressional authorization has been received for the second generation of CERP projects, including Biscayne Bay Coastal Wetlands-Phase 1, Caloosahatchee River (C-43) West Basin Storage Reservoir, St. Lucie Canal (C-44) Reservoir and Stormwater Treatment Area (STA), and C-111 Spreader Canal Western Project, which are already under construction or are operational, and the Broward County Water Preserve Areas project, which is currently being designed. The Central Everglades Planning Project (CEPP) was authorized by WRDA (2016), Public

Law 114-322, and modified in WRDA 2020, Public Law 16-260, to include the project for ecosystem restoration, central and southern Florida, and Everglades Agricultural Area authorized by Section 1308 of WRDA 2018, Public Law 115-270. All these CERP projects contribute or will contribute significant ecological benefits to the system and specific regional habitats in which they are located. Although substantial progress has been made through the previously authorized projects, additional storage features north of Lake Okeechobee are needed to achieve CERP goals.

The Integrated Delivery Schedule (IDS) provides an overall strategy for project planning, design, and construction of federal projects that are cost shared with local sponsors as part of the South Florida Ecosystem Restoration Program. The IDS is based on ecosystem needs, benefits, costs, and available funding. It helps restoration planners, stakeholders, and public focus on priorities, opportunities, and challenges, and provides a path forward to complete construction on previously authorized projects while outlining the next projects to undergo planning and design. The current project planning and anticipated benefits for LOCAR are consistent with the sequencing of projects in the IDS and included in the next generation of CERP project features to provide restoration benefits.

Federal interest in LOCAR is clearly recognized by WRDA 2000, Section 601, the Project's authorizing language. It is the 200,000 ac-ft, Component A aboveground storage feature described in the Final Integrated Feasibility Report and Programmatic Environmental Impact Statement (Corps 1999). The Project is within the USACE ecosystem restoration mission area and appropriate for execution in cooperation with LOCAR's local sponsor. Federal interest is further confirmed by the nature of the environmental resource being restored and its scientific or technical value, scarcity, or value to the public, relevant institutions, and organizations.

Historically, south-central Florida's physiography was dominated by a low-gradient river and slough system intrinsically linked to Lake Okeechobee, the Everglades, and the Northern Estuaries. Following the national trend, anthropogenic changes have reduced regional wetlands by 40 percent; minimized Lake Okeechobee's surface area, its littoral zone and floodplain; and disrupted the hydrologic regime that benefited water-based ecosystems, including the Caloosahatchee and St. Lucie estuaries and the Everglades. The south-central Florida wetlands system is nationally and regionally significant because it is unique, scarce, and provides valuable environmental and economic functions.

LOCAR serves federal, State of Florida, and local interests by improving the ecosystem structure and function through re-establishment of wetlands functions. This is accomplished through increased water availability and prudent management, including increasing and stabilizing 1) habitat, 2) keystone species, and 3) surface water storage and hydrologic connectivity. The long-term adaptive management objective is a self-regulating system. It is well established that healthy wetlands communities provide ancillary, secondary benefits, including floodwater storage and routing, and resilience and recovery from coastal storms.

Areas potentially affected by LOCAR that are institutionally, publicly, and technically recognized as significant through legal designations include St. Lucie River, Significant Water of Florida (Smaller River); St. Lucie Inlet Preserve State Park; St. Lucie Estuary of National Significance; Caloosahatchee Estuary of National Significance; Caloosahatchee River National Wildlife Refuge; Caloosahatchee River-San Carlos Bay National Manatee Refuge; Caloosahatchee River, Significant Waterway of Florida (Larger River); Big Cypress National Preserve; Everglades National Park; Everglades United Nations Educational, Scientific,

and Cultural Organization (UNESCO) World Heritage Site; Everglades Wetland of National Importance; and Everglades International Biosphere Reserve.

Consistency with USACE Environmental Operating Principles was considered in LOCAR project planning and preliminary siting and design. Component A planning, siting, and design sought to minimize direct impacts to environmental resources in the Project area; cost-effectively balance ecosystem restoration and Project costs; invite and consider opinions of individuals and groups interested in ongoing ecosystem restoration in the area; and focus on solutions contributing to the long-term sustainability of freshwater wetland and estuarine ecosystems in central-south Florida. Risk to nearby communities and environmental and economic resources influenced the LOCAR approach.

1.2 Scope of Study

LOCAR expands upon previously authorized projects to continue progress towards achievement of the level of restoration envisioned for CERP. LOCAR is focused on aboveground water storage north of Lake Okeechobee. Since the original CERP planning was completed in 1999, new studies, policy guidance, data collection, pilot projects, and improvements in hydrologic systems modeling capabilities have allowed for refining the knowledge base and approach in ecosystem restoration.

Table 1-1 compares how the LOCAR scope is in line with Component A of the Yellow Book. Component A included water quality treatment. Features like STAs and reservoir-assisted stormwater treatment areas (RASTAs) have not been carried forward in the current effort. The state of Florida adopted a Total Maximum Daily Load (TMDL) for Lake Okeechobee and the Lake Okeechobee Watershed. To achieve the water quality improvements necessary to meet the TMDL in the lake and watershed, the Florida legislature established the Northern Everglades and Estuaries Protection Program, which directed the Florida Department of Environmental Protection (FDEP) to develop and implement water quality improvement plans called basin management action plans (BMAPs). BMAPs provide milestones and management measures to help meet the TMDL within a specified period of time. Other efforts in the region will be used to meet the intent of water quality improvements originally proposed by CERP Component A.

Table 1-1. Original Scope Envisioned in the CERP-authorized Plan Compared to the Current Section 203 Planning Effort.

	CERP Facility and Description	CERP Facility Purpose	Management Measures Carried Forward in the Section 203 Study
North of Lake Okeechobee Storage Reservoir (CERP Component A)	17,500-acre reservoir with total storage capacity of 200,000 acre-ft (average depth 11.5 feet) in Kissimmee River region and 2,500-acre STA (with a maximum depth of 4 ft)	Detain water during wet periods for later use during dry periods, reduce nutrient loads flowing to the lower Kissimmee River and Lake Okeechobee, and reduce the duration and frequency of high and low water levels in Lake Okeechobee that are stressful to the lake's littoral ecosystems and can lead to large freshwater flows to the downstream St. Lucie and Caloosahatchee Estuary ecosystems.	Various aboveground storage configurations; STAs are not a management measure in this effort.

CERP–Comprehensive Everglades Restoration Plan; ft–foot (feet); Yellow Book–Central and Southern Florida Project Comprehensive Review Study; Section 203 Study–Lake Okeechobee Storage Reservoir Section 203 Study; STA–stormwater treatment area

1.3 Study Area

The Study Area outlined in aqua below, covers a portion of the Lake Okeechobee Watershed in Florida. LOCAR builds off previous studies and includes Glades and Highlands Counties, along with the Seminole Tribe of Florida (STOF) Brighton Reservation (**Figure 1-1**)**.** The Study Area includes the Project Area, along with Lake Okeechobee and the Caloosahatchee and St. Lucie Estuaries. A description of the LOCAR Study Area is provided in **Table 1-2**.

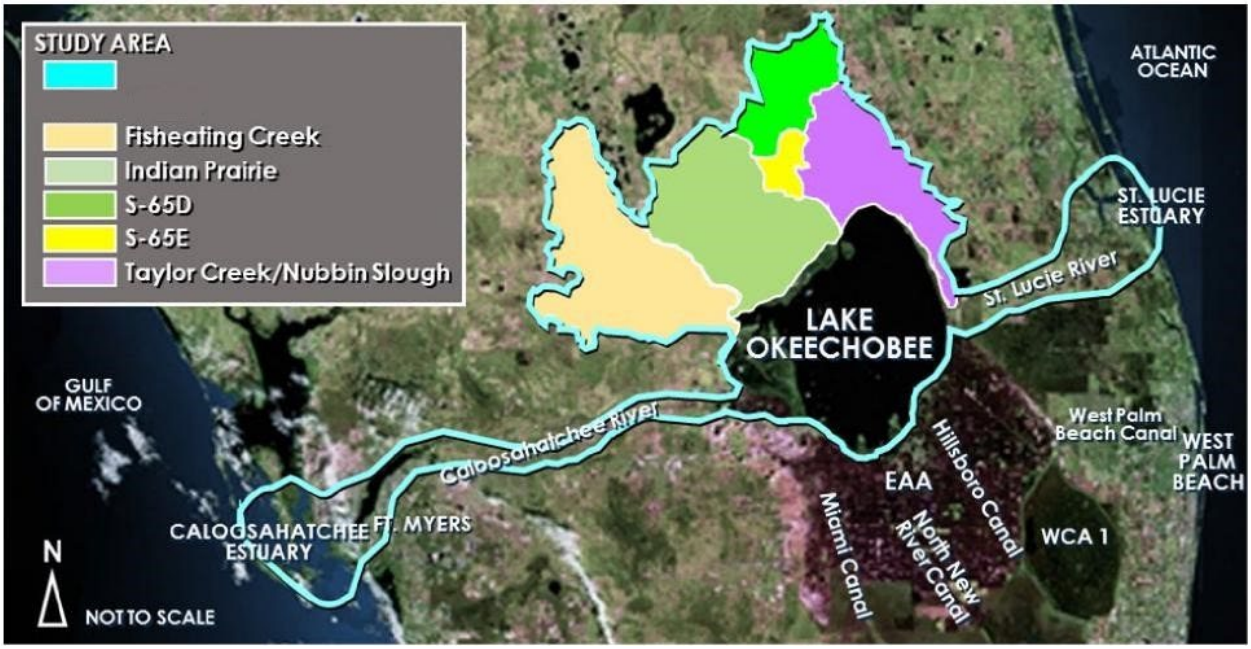


Figure 1-1. LOCAR Study Area Map.

Table 1-2. Description of the LOCAR Study Area.

LOCAR Study Area Region	Description of the Study Area Region
Lake Okeechobee Watershed	The combined Lower Kissimmee, Indian Prairie, Fisheating Creek, Taylor Creek, and Nubbin Slough sub-watersheds contribute 50 percent of the flow into Lake Okeechobee; 12 percent of that flow is from the Indian Prairie sub-watershed. The Lake Istokpoga sub-watershed contributes an additional 14 percent. Historically, approximately 40 percent of this area was comprised of wetland habitat, consisting of cypress and bay tree forests, inland swamps, freshwater marsh, wet prairie, and sawgrass marsh. Today, only 15 percent of the area is wetlands. The current major land uses include agriculture, urban, and natural/open lands and wetlands.
Lake Okeechobee	Lake Okeechobee is a large, shallow lake (surface area approximately 730-square mi) located 30 mi west of the Atlantic coast and 60 mi east of the Gulf of Mexico. The lake is impounded by a system of levees, with six outlets: St. Lucie Canal eastward to the Atlantic Ocean, Caloosahatchee Canal/River westward to the Gulf of Mexico, and four agricultural canals (i.e., West Palm Beach, Hillsboro, North New River, and Miami). The lake is mostly surrounded by the 143-mile-long Herbert Hoover Dike. The lake has many functions, including flood risk management, urban and agricultural water supply, navigation, recreation, fisheries, and

LOCAR Study Area Region	Description of the Study Area Region
	wildlife habitat. It is critical for flood control during wet seasons and water supply during dry seasons. Agriculture in the Lake Okeechobee Service Area, including the Everglades Agricultural Area immediately south of the lake, is the predominant user of lake water. The lake is a significant economic driver for both the surrounding areas' and central and south Florida's economy.
Northern Estuaries	In the current modified system, Lake Okeechobee flows into the two Northern Estuaries (i.e., Caloosahatchee and St. Lucie Estuaries). The St. Lucie Canal flows eastward into the St. Lucie Estuary, which is part of the larger Indian River Lagoon Estuary. The Caloosahatchee Canal/River flows westward into the Caloosahatchee Estuary and San Carlos Bay, which are part of the larger Charlotte Harbor Estuary. The St. Lucie and Caloosahatchee Estuaries are designated Estuaries of National Significance, and the larger Indian River Lagoon and Charlotte Harbor Estuaries are part of the National Estuary Program sponsored by the U.S. Environmental Protection Agency. The landscape includes pine flatwoods, wetlands, mangrove forests, submerged aquatic vegetation, estuarine benthic areas (mud and sand), and nearshore reefs.

LOCAR–Lake Okeechobee Storage Reservoir Section 203 Study; mi–miles; Study Area–Project Area plus Lake Okeechobee and the Northern Estuaries

The Kissimmee-Okeechobee-Northern Estuaries-Everglades ecosystem is an internationally recognized and valued aquatic ecosystem. Lake Okeechobee is a key component of central and south Florida's flood control and water supply and the primary water source for the southern Everglades and dry season deliveries to the Caloosahatchee Estuary. The lake supports a multibillion-dollar sports and commercial fishery industry along with other recreational opportunities.

Both the Caloosahatchee and St. Lucie Estuaries are within the Study Area, which is delineated in **Figure 1-1**. The Caloosahatchee Estuary is a large estuarine ecosystem where the waters of the Gulf of Mexico mix with the freshwater inflows from the Caloosahatchee River, sloughs, and overland sheet flow from the upstream basin. The estuary is an important nursery ground for many fish and shellfish species that are critical for commercial and recreational purposes. The estuary also provides foraging areas and wetland habitat for a large number of Florida's rare, endangered, and threatened species. The St. Lucie River and Estuary are part of the larger Indian River Lagoon system, the most diverse estuarine environment in North America, with more than 4,000 plant and animal species, including manatees, oysters, dolphins, sea turtles, and seahorses (SFWMD 2018). The Caloosahatchee and St. Lucie Estuaries support tourism, which provides substantial economic benefit to the surrounding counties.

The Study Area contains a rich cultural history. There are two federally recognized Tribes within Florida: the Miccosukee Tribe of Indians of Florida (MTI) and STOF. Both Tribes have a long history of living within the Study Area and maintain a strong connection to the region through continued use. They regard the Indigenous populations of Florida as their ancestors. The STOF Brighton Reservation, approximately 36,000 acres (ac) in size and located in Glades County, is within the Study Area. The STOF also owns approximately 3,685 ac of land located northeast of and adjacent to the Brighton Reservation, bounded by Kissimmee Branch Canal No. 1.

Ecosystems within the Study Area have been altered from 120 years of highly effective public and private efforts to drain water off the land, in part by a massive federal project known as the Central and Southern Florida Project (C&SF Project) for flood control and other purposes. The overall effect of the C&SF Project

on the hydrology of this ecosystem has been a disruption of the natural timing, quantity, and distribution of flows entering and leaving Lake Okeechobee; loss of overall water storage; increased stormwater runoff volumes and rates; flows of water from Lake Okeechobee to the Northern Estuaries that significantly alter conditions in the estuaries; and a lower quantity of water available for the Everglades, all affecting nationally significant areas. Water that once flowed from Lake Okeechobee south through the Everglades, down Shark River Slough, and to the southern estuaries has been impounded in Lake Okeechobee and now flows to the Northern Estuaries through Canals 43 and 44. Changes in the quantity, timing, and distribution of freshwater entering the Northern Estuaries often leads to fluctuations in salinity that cause subaquatic vegetation stress, loss of benthic organisms and habitat, and redistribution of salinity sensitive species, including commercially and recreationally important fish. The spatial extent of wetlands throughout the system has been significantly reduced due to development and farming of natural areas after drainage from the C&SF Project.

1.4 Problems and Opportunities

Current operations of the C&SF Project involve water supply and flood control releases to manage stage levels in Lake Okeechobee, Water Conservation Areas, and Everglades. Prolonged high-volume flows of water from Lake Okeechobee to the Northern Estuaries, combined with basin runoff from surrounding watersheds, have altered the natural salinity gradients in the estuaries, in turn altering the species diversity, ecological balance, and health of estuary communities. System changes have resulted in peak flows that are higher just prior to and/or following major rain events and flow rates that decline more abruptly during the end of the wet season. The impoundment of the natural system, construction of drainage canals and conveyance features, and current C&SF Project operations have disrupted the annual pattern of rising and falling water depths in the remaining wetlands. Additionally, the conversion of natural areas for urban and agricultural uses and network of C&SF Project canals have altered the natural system, causing complete shifts in vegetative communities and loss of fish and wildlife resources. The result is reduced water storage capacity in the remaining system and an unnatural mosaic of impounded, fragmented, over-inundated, and over-drained marshes.

1.4.1 Lake Okeechobee Watershed

Problem: A loss of wetland habitat has resulted in reduced water storage on the landscape, increased stormwater runoff, and flashier hydroperiods in the Lake Okeechobee Watershed.

Historically, the Project Area was approximately 40 percent wetlands, consisting of cypress and bay tree forests, inland swamps and lake floodplains, freshwater marsh, wet prairie, and sawgrass marsh (Davis 1943). Water storage in the watershed has been drastically reduced due to land use changes and drainage projects. The substantial reduction in the spatial extent of wetlands, which historically provided water storage in the basin, is exacerbated by a reduction in the functionality of remaining wetlands. Many remaining natural storage features have lost vital hydrologic and ecological connections to the greater aquatic system of the lake and the Everglades. The conversion of natural areas for urban and agricultural uses and the network of C&SF Project canals has caused complete shifts in vegetative communities and reduced water storage on the landscape.

Opportunity: Increasing water storage north of Lake Okeechobee is essential for achieving ecological restoration. Restoring portions of the Kissimmee River floodplain will return additional increments of the

channelized Kissimmee River to a more natural hydroperiod. The restoration in the region will improve hydrology that is crucial for Florida and the nation, given the significance of the ecosystems north of Lake Okeechobee.

1.4.2 Lake Okeechobee

Problem: Lake Okeechobee has experienced frequent and prolonged high and low water levels over the past few decades that have been detrimental to both lake ecology and downstream ecosystems.

At approximately 730-square mi (1,880-square kilometers), Lake Okeechobee is the second-largest freshwater lake entirely within the lower 48 states. The lake's vast surface area, shallow depth (averaging only 9 feet [ft] deep), and enormous habitat diversity make the ecosystem unique on the North American continent. As late as the 1860s, the Lake Okeechobee Watershed and the lake itself were part of a low-gradient natural river and slough system that was the heart and foundation of the Everglades and its associated estuaries. Water levels would seasonally fluctuate as the water flowed slowly through the creeks, sloughs, and rivers of the northern watersheds and into the lake. The lake was much larger than the current footprint, with an extensive wetland littoral zone and floodplain along the shoreline. Water levels fluctuated between 17 and 23 ft National Geodetic Vertical Datum of 1929 (NGVD29), and periodically flooded into low-gradient marshes, refreshing them with water and nutrients. Under both high and low conditions, there was abundant habitat for fish, birds, and other native wildlife. As the lake stage fluctuated higher, water would overtop the banks and flow south, feeding the Everglades and hydrologically connected ecosystems of south Florida, all the way to Florida Bay at the southern tip of the Florida peninsula.

Construction began in the 1800s that modified the lake, northern watershed hydrology, and ultimately the hydrology of the entire Everglades system. The original flood control embankments around Lake Okeechobee were completed around 1915 and were rebuilt by the Corps between 1932 and 1938. The construction of Herbert Hoover Dike (HHD) and flood control drainage features of the C&SF Project in the 1960s significantly restricted Lake Okeechobee's size and affected water level fluctuations. The remaining littoral zone is now at an elevation between 12 and 16 ft NGVD29. Lake stage is currently managed by the 2008 Lake Okeechobee Regulation Schedule (2008 LORS), which determines the timing and quantity of water that flows from the lake to the Northern Estuaries when the stage exceeds levels defined in the regulation schedule. These flows from the lake flow through the primary outlets in the lake to the east through the St. Lucie Canal and to the west through the Caloosahatchee River. When combined with runoff captured in the surrounding basin flood control systems, these flows often cause unintended consequences to the ecology (e.g., salinity levels) of these environmentally sensitive ecosystems of national significance (refer to **Figure 1-1**). In addition, the water lost to tide is no longer available for aquatic ecosystems, including Lake Okeechobee and the greater Everglades system, during the dry season and extended dry periods. This results in widespread impacts to the natural systems as seen today.

Changes in water level, differences in plant community structural complexity, and water quality within vegetative communities exert the greatest effect on fish distribution in the littoral zone of Lake Okeechobee. Lake Okeechobee has experienced frequent and prolonged high-water levels over the past few decades that have been detrimental to both lake ecology and downstream ecosystems. Extreme high stage (i.e., above 17 ft NGVD29) allows wind-driven waves to directly impact the littoral emergent and

nearshore submerged plant communities, causing physical uprooting of plants. In addition, high stages cause suspended solids from the mid-lake region to be transported to the shoreline regions, reducing water clarity and light penetration, which in turn reduces the depth at which submerged aquatic vegetation (SAV) growth can occur (James and Havens 2005). High stage conditions also allow deposition of unconsolidated mud, which can cover the natural sand and peat sediment, reducing their suitability to sustain healthy and balanced vegetative communities. Overall, high lake stages result in extirpation or reduced growth of submerged plants, adverse impacts to germination of submerged plants, reductions in fish spawning and fish reproductive success, and shifts in species distribution, therein altering the balance and stability of the ecosystem.

Low water levels also impact lake ecology. Extreme low stage (i.e., below 10 ft NGVD29) can result in desiccation of the entire littoral zone, shoreline fringing bulrush zone, and nearly all the lake area that would otherwise support submerged plants. As a consequence, in-lake habitat for reptiles, amphibians, wading birds, apple snails, or fish that depend on aquatic plant-dominated regions for successful foraging and recruitment is severely compromised. Extreme low stage also encourages invasive exotic plants, such as torpedograss and melaleuca, to establish in areas of the littoral zone where they did not formerly occur, displacing native vegetation. Recovery from the impacts of prolonged low stage events (i.e., below 10 ft mean sea level) is slow, requiring multiple years of appropriate stage regime to recover, as documented by Havens et al. (2004) for submerged plants and by Havens and Gawlick (2005) for sport fish, such as largemouth bass.

Opportunity: Increased water storage north of Lake Okeechobee would make water available for controlled releases in support of lake and estuarine ecological health. Managed water releases can improve lake ecology by reducing dramatic fluctuations in water levels, improve marsh inundation patterns by reducing intra- and inter-annual variation tending to benefit invasive species, and reducing the littoral extent. By stabilizing lake stages, vegetation in the upper and lower marshes would improve due to the reduction of intra- and inter-annual variation that leads to encroachment of woody vegetation and exotic species at high elevations and loss of SAV beds to open water or emergent marsh at low elevations. There is an opportunity to improve conditions for fish in Lake Okeechobee by creating better conditions for the emergent and submerged aquatic vegetation habitat that fish use in the nearshore and littoral zones. An increase in invertebrate, plankton populations and diversity would also increase food sources for fish in the lake.

1.4.3 Northern Estuaries

Problem: The Caloosahatchee and St. Lucie Estuaries (Northern Estuaries) have been subject to watershed runoff and increased freshwater flows from Lake Okeechobee for decades, resulting in successive years of environmental and economic impacts to these regions.

The St. Lucie and Caloosahatchee Estuaries are designated Estuaries of National Significance, and the larger Indian River Lagoon and Charlotte Harbor Estuaries are part of the U.S. Environmental Protection Agency (EPA)-sponsored National Estuary Program. Extensive land use changes have altered the hydrology of the entire Lake Okeechobee Watershed. Current operations of the C&SF Project and drainage for urban and agricultural development increased the volume and altered the timing of local basin flows to the rivers and estuaries. As a result, heavy rainfall can bring large influxes of freshwater

into the estuaries from stormwater runoff within the basin, Lake Okeechobee flows, or both. Both stormwater runoff and releases from Lake Okeechobee have changed the quantity, timing, and distribution of freshwater entering the estuaries, which can cause atypical salinity fluctuations. SAV and oysters in these estuaries can become stressed, and in many cases have been reduced or eliminated by salinity fluctuations. As keystone species that provide forage and nursery habitat for a variety of species, a reduction in the size and health of SAV beds and oyster habitat affects the location, abundance, and species richness of all species in the estuary.

Low flows to the estuaries also affect the balance and stability of downstream communities. Flows less than 450 cubic ft per second (cfs) at Structure 79 (S-79) in the Caloosahatchee River Estuary allow saltwater to intrude, raising salinity above the tolerance limits for communities of submerged aquatic plants in the upper estuary. In the St. Lucie Estuary, flows less than 350 cfs at S-80 have this effect, as they result in higher salinities at which oysters are susceptible to increased predation and disease. Both SAV and oyster reefs are important habitats for fish and other organisms and contribute to ecological values.

Opportunity: Additional water stored north of Lake Okeechobee could be managed via controlled releases for flow quantity, timing, and distribution to the Northern Estuaries from Lake Okeechobee. These improvements would re-establish salinity regimes suitable for the maintenance of healthy, naturally diverse, and well-balanced estuarine ecosystems, creating more favorable habitat for juvenile marine fish, shellfish, oysters, and SAV in the Northern Estuaries.

1.4.4 Water Supply

Problem: Watershed low drainage and the associated loss in storage have impacted water supply for Lake Okeechobee Service Area water users.

The C&SF Project is a multi-purpose project that includes providing water supply to meet municipal, industrial, and agricultural uses. Drainage, water supply, and flood protection provided by the C&SF Project have allowed the growth of central and south Florida's population. Lake Okeechobee is an important source of water to both natural and developed areas, particularly during low rainfall years. Construction of HHD around Lake Okeechobee has changed the shoreline and littoral zone of the lake and disrupted the lake’s natural range of water levels, impacting both environmental and water supply uses.

Water restrictions primarily affect agricultural water users. Economic losses associated with water shortages depend not only on the number of water shortages, but also on the severity and duration of the water restrictions. The longer the restrictions are in place and the more severe the cutbacks, the more likely it is that crop yields will be reduced and the greater the expenses that are required by users to manage the water shortages. The growing demand for dependable water for agriculture, industry, and municipal water supply at a reasonable cost could exceed the limits of readily accessible sources during the 50-year planning horizon.

Opportunity: Additional water storage north of Lake Okeechobee is an opportunity to improve water supply for existing legal Lake Okeechobee Service Area (LOSA) users commensurate with ecosystem restoration opportunities. The additional storage stabilizes the water supply by holding water that could be lost to the system during high flow events.

1.4.5 Recreation

Problem: Degradation of the Everglades ecosystem reduces and restricts environmentally based recreation activities.

Tourism is a "critical industry," as identified by the Governor's Commission for a Sustainable South Florida Initial Report (1995). A healthy ecosystem and its attendant tourism are the mainstays of the regional economy, as reflected by the relative domination of economic activity in the services, retail trade, and fisheries industries. Many Americans and international tourists visit natural areas regularly to enjoy a variety of outdoor activities, including fishing, hunting, birding, and wildlife activities, such as outdoor photography and wildlife tours. The Lake Okeechobee Watershed, Lake Okeechobee, and Northern Estuaries are popular recreational destinations. The 2013 Florida Statewide Comprehensive Outdoor Recreation Plan (SCORP) divides the state into eight planning regions to assess the demand and need for outdoor recreation. Three of these regions are located within the Study Area, including the region identified to have the greatest need for outdoor recreation opportunities.

Lake Okeechobee is nationally recognized as supporting high-quality largemouth bass and black crappie fisheries. The lake also supports a commercial fishery dominated by catfish species. Freshwater fishing retail sales in the five counties surrounding Lake Okeechobee were estimated at more than $117 million during 2000 (FWC 2018). Biologically, Lake Okeechobee can successfully support recreational and commercial fishery interests. The ability to sustain the region's economy and quality of life depends to a great extent on the success of efforts to protect and better manage the region's water resources. A stable and healthy environment will directly benefit the local economy through increases in tourism and dollars generated by the residents who enjoy outdoor activities, while also benefiting the nation.

The Northern Estuaries are important nursery grounds for many fish and shellfish species that are vital for commercial and recreational purposes. The long-term loss of nursery habitat will result in population declines for many species of estuarine and marine fishes and macroinvertebrates, including those species whose young use fresher habitats. The Northern Estuaries provide substantial economic benefit to the surrounding counties that is likely measured in the hundreds of millions of dollars in annual value.

Opportunity: Additional water storage, such as a reservoir is an opportunity to provide or enhance multiple recreation and economic opportunities for the local areas in the form of hunting, fishing, boating, and other outdoor recreation.

1.5 Objectives and Constraints

Section 601(h) of WRDA 2000 states "[t]he overarching objective of the Plan is the restoration, preservation, and protection of the South Florida Ecosystem while providing for other water-related needs of the region, including water supply and flood protection."

1.5.1 Goals and Objectives

In addition to Project purposes, the goals of LOCAR include:

1. Enhance ecological values in Lake Okeechobee and the St. Lucie and Caloosahatchee Estuaries ecosystems.

2. Enhance economic values and social well-being.
3. Maintain the rights of the STOF under the Compact among the Seminole Indian Tribe of Florida, the State of Florida, and the SFWMD (Savings Clause [Section 601 (h)(5)(C) of WRDA 2000]).

The objectives of the LOCAR include:

1. Improve quantity, timing, and distribution of flows into Lake Okeechobee to maintain ecologically desired lake stage ranges more often.
2. Improve the timing and volumes of freshwater flows from Lake Okeechobee to improve the salinity regime and the quality of habitats for oyster, SAV, and other estuarine communities in the Northern Estuaries.
3. Increase availability of the water supply to existing legal water users of Lake Okeechobee commensurate with improving Lake Okeechobee ecology.

1.5.2 Constraints

Project constraints were recognized to ensure that the proposed Project would not reduce the level of service for flood protection and would protect existing legal water users. When a project is expected to result in an elimination or transfer of an existing legal source of water, the FS shall include an implementation plan that ensures a new source of water of comparable quantity and quality is available to replace the source that is being transferred or eliminated. Implementation of the Project would not reduce the levels of service for flood protection within the areas affected by the Project.

WRDA 2000 requires the inclusion of "Savings Clause" analyses for each CERP project. The Savings Clause protects existing legal sources of water supply, such as water for municipal and agricultural uses, and ensures that CERP implementation does not reduce the level of service for flood protection. The following are constraints for LOCAR implementation:

1. Comply with all applicable federal and state laws, regulations, and policies.
2. Maintain levels of service for flood protection to agricultural and urban lands (Savings Clause [Section 601 (h)(5)(B) of WRDA 2000]).
3. Maintain levels of water supply service for existing legal users (Savings Clause [Section 601 (h)(5)(A) of WRDA 2000]).
4. Maintain navigability to the lake, within the lake, and within the watershed.

1.6 Report Authority

WRDA 2000 approved CERP as a framework for modifications to the C&SF Project in Section 601(b)(1)(A). This LOCAR FS has been prepared by the SFWMD for submittal to the ASA(CW) for review, approval, and subsequent transmittal to Congress for authorization under Section 203 of WRDA 1986, as amended in accordance with Section 1152 of WRDA 2018.

2.0 EXISTING AND FUTURE WITHOUT CONDITIONS

This section describes the existing conditions baseline (ECB) and Future Without Project (FWO) conditions (i.e., the No Action Alternative) within the Study Area, as well as the definition of the FWO condition. For LOCAR, the ECB represents the system-wide infrastructure and operations based on the best available data. The FWO condition includes structural and operational features described in **Section 2.5**.

2.1 "With" and "Without" Comparisons

The U.S. Water Resources Council's *Principles and Guidelines* provide the instructions and rules for federal water resources planning. The *Principles and Guidelines* require the evaluation of the effects of alternative plans by comparing the most likely future conditions with (Future With Project [FWP] and FWO) those plans in place. The FWP condition describes the expected outcomes from implementing the alternatives, while the FWO condition represents what would be in place if none of the study's plans were implemented, similar to a no action alternative. The differences between the FWO condition and the FWP condition reflect the effects of the Project.

2.2 Planning Horizon

The planning horizon encompasses the planning study period, construction period, and the effective life of the Project. The timeframe used when forecasting the FWP and FWO conditions while considering impacts of alternative plans is called the "period of analysis." This period is distinct from the planning horizon, which is a longer and more encompassing concept. The period of analysis for LOCAR is 50 years beginning in 2033, when construction is expected to be complete, and ending in 2083, with a Project life expectancy of 100 years. Even if Project structures last more than 100 years, there is inherent uncertainty in forecasting conditions and impacts beyond 100 years.

Accounting for the beneficial and adverse effects of LOCAR through time is largely based on hydrologic modeling and the evaluation of performance measures. The operations projected in the absence of a Project would be similar to 2050 estimates, as would the non-LOCAR projects that are being implemented, as most of them are expected to be complete before 2050. The latest and best available data was used to project FWP. Based on the assumptions used for future forecasting, there is little reason to believe that hydrologic conditions in the Study Area would be substantially different between 2050 and 2083.

2.3 Existing and Forecasted Ecological Setting

This subsection summarizes the ECB and FWO conditions within the Study Area. ECB and FWO conditions are detailed in **Appendix C**.

2.3.1 Lake Okeechobee Watershed

The Study Area's watershed covers approximately 920,000 acres (ac) and includes the following sub-watersheds: Fisheating Creek, Indian Prairie, Lower Kissimmee, and Taylor Creek/Nubbin Slough (**Figure 1-3**). Over the last 5 water years (WY2018 to WY2022), these sub-watersheds contributed 9 percent, 10 percent, 15 percent, and 7 percent of the total inflows to Lake Okeechobee, or 41 percent (Jones et al. 2023). The largest contributor (42 percent) over the same period was the combined Kissimmee Basin

(Upper and Lower sub-watersheds, measured together at S-65E), which forms the headwaters of Lake Okeechobee and the Everglades; however, only the lower portion of the Kissimmee Basin is included in the Study Area.

Historically, the Study Area was approximately 40 percent wetlands, including cypress and bay tree forests, inland swamps, freshwater marshes, wet prairies, and sawgrass marshes (Davis 1943). Land use changes over the last 150 years have resulted in conversion to agriculture, primarily pasture. Only a small percentage of wetland habitat remains.

2.3.2 Lake Okeechobee

Lake Okeechobee is the largest lake in the southeastern U.S. and is a central part of the central and south Florida watershed. Lake Okeechobee receives water from a 5,400-square-mile (m^2) watershed that includes several sub-watersheds (**Figure 2-1**).

A new regulation schedule for Lake Okeechobee is expected to be finalized, known as the Lake Okeechobee System Operating Manual (LOSOM). The LOSOM manages water levels and releases based on four zones to limit high-volume releases and optimize releases for flood control, water supply, navigation, recreation, and enhancement of fish and wildlife. **Table 2-1** shows the ECB and FWO lake stage levels generated by the Regional Simulation Model for Basins (RSM-BN) hydrologic model using LOSOM for ECB and a FWO, including operation of the EAA Reservoir included in the lake regulation schedule. The ecological condition is measured by the lake stage level, which measures the percentage of time that lake levels remain within a scientifically based, ecologically preferred range, or stage envelope, between seasonal elevations of 11.5 to 15.5 feet (ft) National Geodetic Vertical Datum (NGVD29). The desired restoration condition avoids frequent or prolonged departures from this preferred envelope and extreme high (greater than 17 ft NGVD29) and extreme low (less than 10 ft NVGD29) lake stage events will be rare.

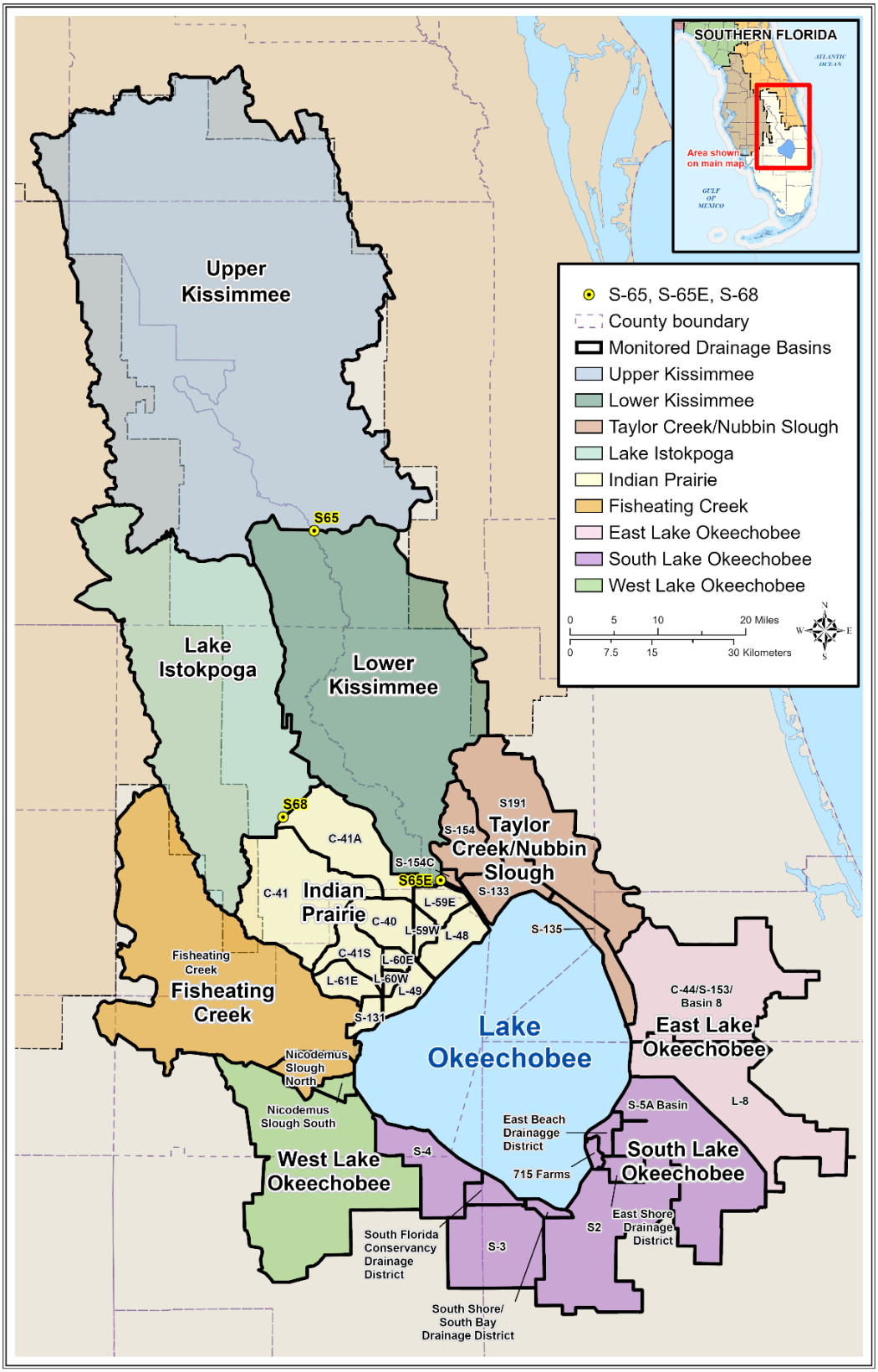


Figure 2-1. Lake Okeechobee system.

Table 2-1. ECB and FWO Conditions for Lake Okeechobee Stage Levels as Modeled in RSM-BN.

Lake Okeechobee Stage Levels	Existing Conditions	FWO Conditions
% TIME > 17 ft NGVD	1.4	2.1
% TIME > 16 ft NGVD	17.9	10.3
% TIME < 11 ft NGVD	11.9	9.9
% TIME < 10 ft NGVD	4.4	3.1
% Time Inside Ecologically Preferred Stage Envelope	19	22
% Time Above Ecologically Preferred Stage Envelope	49	48
% Time Below Ecologically Preferred Stage Envelope	32	30

ECB–existing conditions baseline; FWO– Future Without Project; ft–foot; NGVD–National Geodetic Vertical Datum; RSM-BN–Regional Simulation Model for Basins

The frequency and severity of water restrictions for the LOSA are expected to slightly decrease in the FWO condition, as compared to the ECB, due to the implementation of related projects. **Table 2-2** displays the total water supply cutback volumes, Restoration Coordination and Verification (RECOVER) severity scores, and the number of water years with at least one cutback, which are indications of water restrictions that affect existing legal users.

Table 2-2. RECOVER Performance Measure: Frequency and Severity of Water Restrictions for LOSA.[1]

Simulation	Cutback Total (ac-ft)	RECOVER Severity Score	Number of Water Years with at Least One Cutback
ECB	1,334,790	31	13
FWO	600,120	16	9

ac-ft–acre-foot; ECB–existing conditions baseline; FWO–Future Without Project; LOSA–Lake Okeechobee Service Area; RECOVER–Restoration Coordination and Verification

1/ RECOVER WS-1 Frequency and Severity of Water Restrictions for Lake Okeechobee Service Area Performance Measure. March 2005.

2.3.3 Northern Estuaries

The phrase "Northern Estuaries" (**Figure 2-2**) describes the estuaries that connect Lake Okeechobee to the Gulf of Mexico on the west coast of Florida (i.e., Caloosahatchee Estuary) and the Atlantic Ocean on the east coast of Florida (i.e., St. Lucie Estuary).

The Caloosahatchee River is the main source of freshwater for the Caloosahatchee Estuary (**Figure 2-3**), but alterations made to the river and watershed in the last century have significantly impacted freshwater inflow to the estuary. The Caloosahatchee River was originally a shallow, meandering river with headwaters in the proximity of Lake Hicpochee, near Lake Okeechobee. The Caloosahatchee River is now connected to Lake Okeechobee by Canal 43 (C-43) constructed in the early 1900s. Today, the river extends from Lake Okeechobee to San Carlos Bay. The river now functions as a primary canal (C-43) that conveys both runoff from the Caloosahatchee watershed and flows from Lake Okeechobee. The canal has undergone numerous alterations, including channel enlargement, bank stabilization, and a series of three lock-and-dam structures. The final downstream structure, W.P. Franklin Lock and Dam (S-79), demarcates the beginning of the estuary and acts as a barrier to salinity and tidal action, which historically extended farther east to near the LaBelle area.

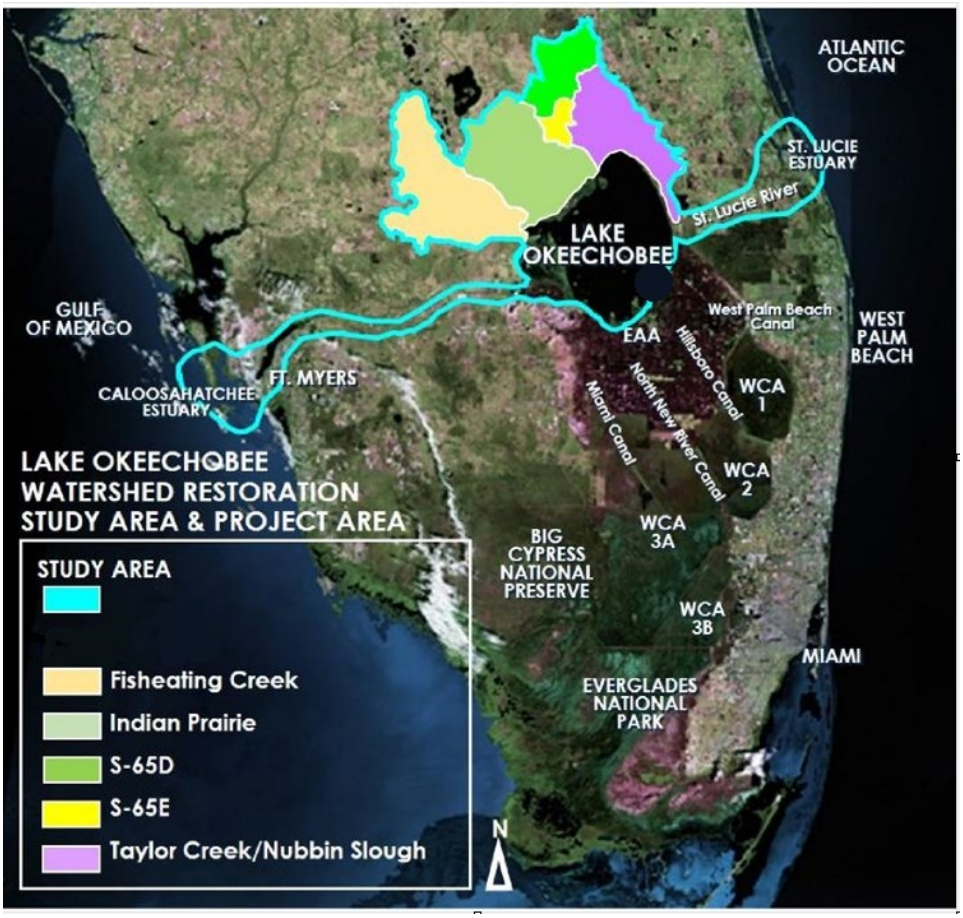


Figure 2-2. LOCAR Study Area Map.

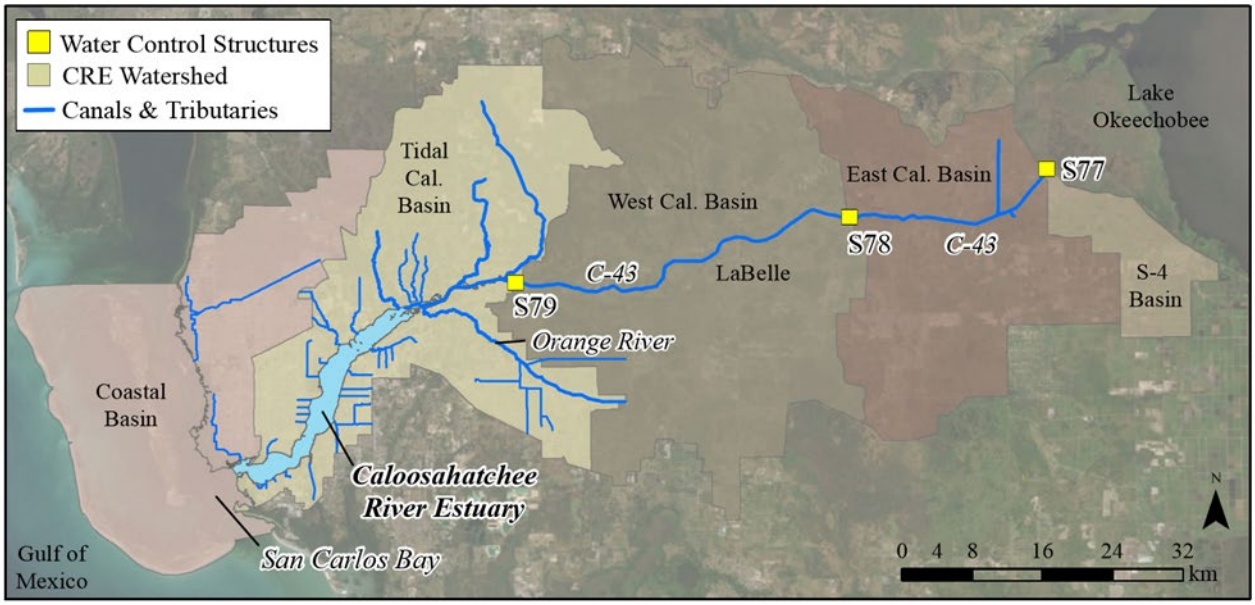


Figure 2-3. Map of the Caloosahatchee River and Estuary on the west coast of Florida, and its canals and tributary connections to the watershed and to Lake Okeechobee (RECOVER 2020).

The St. Lucie River is approximately 35 miles (mi) long and is part of the Indian River Lagoon ecosystem. It has two major forks, the North and the South, that flow together and then eastward to the Indian River Lagoon and Atlantic Ocean at the St. Lucie Inlet (**Figure 2-4).** Historically, the St. Lucie River system was a freshwater stream flowing into the Indian River Lagoon. An inlet was dug in the late 1800s to provide direct access from the Indian River Lagoon to the Atlantic Ocean, thus changing the St. Lucie from a river to an estuary. The St. Lucie Estuary is connected to Lake Okeechobee by Canal 44 (C-44) that was constructed in the early 1900s. The C-44 canal flows into the St. Lucie Estuary via the S-80 lock-and-flow control structure. Other major canals constructed in the watershed include the canals 23, 24, and 25.

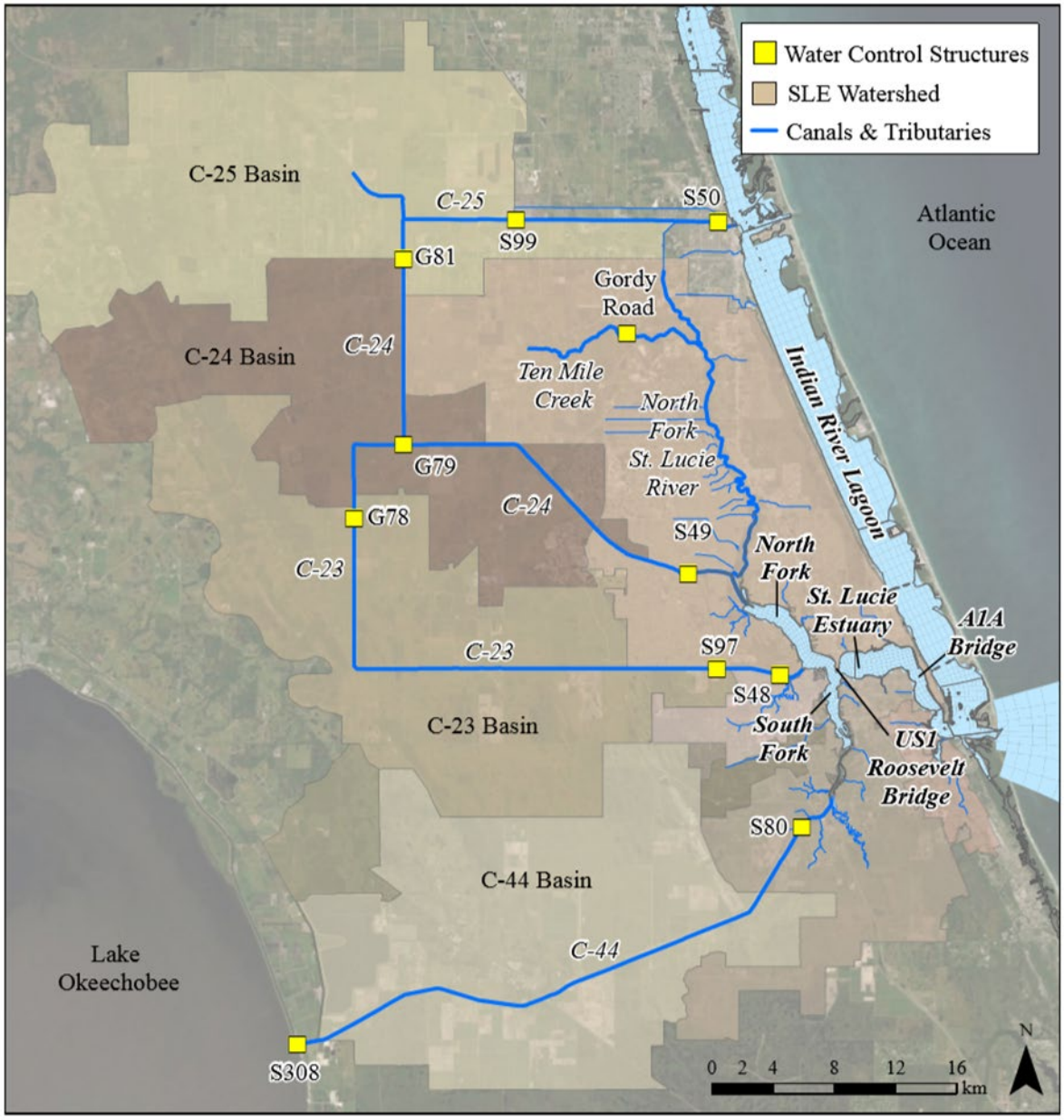


Figure 2-4. Map of the St. Lucie River and Estuary on the east coast of Florida, and its canals and tributary connections to the watershed and to Lake Okeechobee (RECOVER 2020).

As a result of channelization (C-43 and C-44) and operation of water control structures (S-79 and S-80), freshwater flows into the estuaries have been altered. Water flows from Lake Okeechobee, land use transformations, increased development, and dredging for navigation have also altered the quantity, timing, and distribution of freshwater entering the estuaries, causing adverse ecological impacts. These modifications tend to provide excessive flows during the wet season and insufficient flows during the dry season. The estuaries have lost large acreages of both submerged aquatic vegetation and oysters due to large fluctuations in salinity caused by excessive freshwater flows during wet times and a lack of freshwater flow during extremely dry years. In areas where salinity conditions are favorable, recolonization is also impacted by the lack of suitable substrate needed to support benthic fauna and flora. This substrate issue is due to large areas of thick organic mucky sediment as well as the lack of hard-bottom substrate needed for oyster colonization.

Stormwater runoff and regulatory flows from Lake Okeechobee have altered the quantity, timing, and distribution of freshwater entering the estuaries. Most inflows to the Northern Estuaries come from basin runoff and tidal flows; the remaining flows are from regulatory flows from Lake Okeechobee (**Table 2-3** and **Table 2-4**). Flows vary annually based on rainfall and evaporation. Regulatory releases from Lake Okeechobee to the estuaries depends on these factors. **Table 2-3** and **Table 2-4** represent the hydrologic conditions from water year 2022. The total contributions to the estuaries are also not the sum of the flows that occur throughout the basin to the tidal structures because regulatory releases are also made for water supply.

Table 2-3. Inflow Sources to the St. Lucie Estuary.

Inflow Source	Contributions to Basin Flow (Water Year 2022) (ac-ft)
Lake Okeechobee (via S-308)	115,000
C-44 Basin Runoff	10,000
Inflow from C-24, C-23, and Ten Mile Creek	255,000
Tidal Basin Flow[a]	158,000

Source: Cortez et al. 2023
ac-ft–acre-foot
a. Individual flows through each structure prior to the tidal structure represent contributions to the basin along the canal, not total flows into the estuary.

Table 2-4. Inflow Sources to the Caloosahatchee Estuary.

Inflow Source [a]	Contributions to Basin Flow (Water Year 2022) (ac-ft)
Lake Okeechobee (via S-77)	681,000
C-43 Basin Runoff	218,000
Tidal Basin Inflow (downstream of S-79)[b]	899,000

Source: Cortez et al. 2023
ac-ft–acre-foot
a. Flows out of S-77 represent inputs from the lake and the S-4 basin, flows from S-79 represent flows from the lake, S-4, and runoff from the C-43 basin into the canal.
b. Individual flows through each structure prior to the tidal structure represent contributions to the basin along the canal, not total flows into the estuary.

Large freshwater flows from Lake Okeechobee are still expected to occur in the FWO, although to a lesser degree. The FWO model results show that future optimization of Lake Okeechobee regulation schedules and implementation of related hydrologic improvement projects (i.e., C-43 reservoir, C-44 reservoir,

Kissimmee River Restoration Project, and CEPP, including the Everglades Agricultural Area [EAA] Reservoir, A-1 Flow Equalization Basin [FEB], A-2 STA, and A-2 Reservoir) reduce high, damaging flows from basin runoff to both the St. Lucie and Caloosahatchee Estuaries (**Table 2-5** and **Table 2-6**). Lake Okeechobee operations included the LORS 2008 with CEPP EAA Phase optimized release guidance. These are placeholder operational changes, although they are not formally covered under the CEPP EAA NEPA, they were critical to improve operational performance.

Table 2-5. ECB and FWO Conditions for Lake Okeechobee Regulatory Flows to the St. Lucie Estuary.

Scenario	Existing Conditions	FWO Conditions
Low Flow - # of 14-day periods <150 cfs	183	163
Optimal Flow - # of 14-day periods ≥150 cfs and <1,400 cfs	910	997
High Flow (Basin Runoff) - # of 14-day periods ≥1,400 cfs and <1,700 cfs	279	238
High Flow (LOK Regulatory) - # of 14-day periods ≥1,400 cfs and <1,700 cfs	30	49
Damaging Flow (Basin Runoff) - # of 14-day periods ≥1,700 cfs	452	344
Damaging Flow (LOK Regulatory) - # of 14-day periods ≥1,700 cfs	41	58

cfs–cubic foot per second; ECB–existing conditions baseline; FWO–Future Without Project; LOK – Lake Okeechobee

Table 2-6. ECB and FWO Conditions for Lake Okeechobee Regulatory Flows to the Caloosahatchee Estuary.

Scenario	Existing Conditions	FWO Conditions
Low Flow - # of 14-day periods <750 cfs	549	752
Optimal Flow - # of 14-day periods ≥750 cfs and <2,100 cfs	638	549
High Flow (Basin Runoff) - # of 14-day periods ≥2,100 cfs and <2,600 cfs	166	124
High Flow (LOK Regulatory) - # of 14-day periods ≥2,100 cfs and <2,600 cfs	77	66
Damaging Flow (Basin Runoff) - # of 14-day periods ≥2,600 cfs	230	160
Damaging Flow (LOK Regulatory) - # of 14-day periods ≥2,600 cfs	86	66

cfs–cubic foot per second; ECB–existing conditions baseline; FWO–Future Without Project; LOK–Lake Okeechobee

2.4 Comparison of Existing and Future Without Project Conditions

Table 2-7 provides a comparison of ECB and FWO conditions. Existing and FWO conditions are further documented in **Appendix C**.

Table 2-7. ECB and FWO Conditions.

Existing Conditions	Future Without Conditions
Climate Change	
The climate assessment for inland hydrology adheres to U.S. Army Corps of Engineers (Corps) guidance of Engineering and Construction Bulletin 2018-14, "Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Works Studies, Designs, and Projects," and Engineer Regulation (ER) 1105-2-101, "Risk Assessment for Flood Risk Management Studies." This policy requires consideration of climate change in all current and future studies to reduce vulnerabilities and enhance the resilience of communities. Observed temperature trends among five literature sources indicate an increase in temperature with a consensus in an increase in minimum and maximum temperatures. Observed precipitation shows no discernible trends in annual/seasonal precipitation, but shows an increase in the frequency and intensity of extreme precipitation events. No trend in observed stream flow was found. Sea level change has been a persistent trend for decades in the U.S. and globally. In most locations, global sea level rise results in local relative sea level rise. As a result, the nation's assets located at or near the ocean have already suffered impacts, such as flooding and coastal shoreline erosion, which will continue to grow in severity. To support data-driven and risk-informed decision-making, the Corps has developed two web-based sea level change tools—Sea Level Change Curve Calculator and the Sea Level Tracker—described in Annex H. These tools provide a consistent and repeatable method to visualize the dynamic nature and variability of coastal water levels at tide gauges, allow comparison to Corps-projected sea level change scenarios, and support simple exploration of how sea level change has intersected or will intersect with local elevation thresholds related to infrastructure. These trends will be evaluated following the Corps guidance of ER 1100-2-8162, "Incorporating Sea Level Change in Civil Works Programs," and Engineer Technical Letter (ETL) 1100-2-1, "Procedures to Evaluate Sea Level Change: Impacts, Responses, and Adaptation."	Projected precipitation shows no discernible trend in annual/seasonal precipitation, but does show an increase in the frequency and intensity of extreme precipitation events. There is no consensus on an increase or decrease in projected streamflow. The Corps used sea level change projections for the Project's life cycle of 2034 to 2134 for National Oceanic and Atmospheric Administration (NOAA) tidal gauges at Lake Worth Pier and Fort Myers, Florida, for historic, intermediate, and high rates of future sea level change. Flood protection from coastal structures may decline as a result of sea level rise because most coastal flood control structures are gravity driven and release capacity of these structures may be reduced. The regional hydrologic models used to simulate Future With Project (FWP) and Future Without Project (FWO) conditions require climatic and tidal data as boundary conditions. Given the uncertainty in future climatic conditions, the historic climate conditions used in the period of record are assumed to represent conditions likely to occur in the Study Area in the future. Modeled tidal boundary conditions that reflect future sea level rise were not available for the range of potential sea level rise expected. Modeled tidal boundary conditions used in the regional hydrologic model were developed using historic tidal data from two primary (i.e., Naples and Virginia Key) and five secondary (i.e., Flamingo, Everglades, Palm Beach, Delray Beach, and Hollywood Beach) NOAA stations. The impact of sea level changes on Project benefits was assessed for the FWO and FWP conditions per ER 1100-2-8162 and ETL 1100-2-1.

Existing Conditions	Future Without Conditions
Physical Landscape	
The surficial geology of the Study Area consists of Holocene freshwater peat and organic soils deposited within the Kissimmee River alluvial floodplain. The floodplain is over drained and stranded due to construction of the Canal 38 (C-38). The Paradise Run area is an example of a stranded, over-drained floodplain in which existing meanders and oxbow lakes are filling in with fine-grained sediments and vegetation. Organic soils (mucks) on the floodplain and depressional wetlands are still classified as hydric soils, as they remain saturated during high lake stages. Away from the floodplain on Indian Prairie, the surficial geology consists of Holocene soils developed on nearshore marine sands and silts that were deposited during the last high seas stand, approximately 120,000 years ago. The geomorphic setting of the Indian Prairie sub-basin is best described as a dry prairie with depressional wetlands that are saturated during the wet season.	Wetland soils would be drained and/or displaced with fill materials to support urban development in portions of the Project Area. Abandoned meanders and oxbow lakes on stranded portions of the Kissimmee River floodplain would continue to fill with fine-grained sediments and vegetation. Existing drainage structures would continue to maintain reduced hydroperiod in many locations, continuing peat soil loss by oxidation and lightning-induced fires. Additional erosion in the watershed would continue, contributing to soil loss.
Vegetative Communities	
The vegetative communities in the Project Area consist of mesic temperate hammock, pine flatwoods, hardwood forest, prairie hammock, dry prairie, wet prairie, freshwater marsh, forested wetlands, and open water habitats containing submerged aquatic vegetation (SAV).	Under FWO conditions, Glades and Highlands Counties are expected to retain their rural and agricultural characteristics, but some uplands and wetlands may deteriorate or be developed. High lake stages would continue to impact Lake Okeechobee vegetation. Continued regulatory flood control of freshwater flows from Lake Okeechobee to the Caloosahatchee and St. Lucie Estuaries (Northern Estuaries) would cause salinities to drop below preferred ranges for estuarine biota. High-level freshwater flows during the wet season would increase nutrient inflows and turbidity to the estuaries, negatively affecting seagrasses.
Threatened and Endangered Species	
A total of 28 federally protected species occur, or have the potential to occur, within the Project Area. Species include, but are not limited to, Audubon's crested caracara, Florida grasshopper sparrow, Florida scrub-jay, Eastern indigo snake, Everglade snail kite, Florida panther, Florida manatee, wood stork, and Florida bonneted bat. Many state listed species also occur throughout the Study Area.	Under FWO conditions, the Study Area's rural and agricultural nature is predicted to remain. The potential for future changes from improved pasture to other types of agriculture (e.g., sugar cane or other crops) may result in reduced foraging and nesting habitat for species like the Audubon's crested caracara. In the Northern Estuaries, altered hydroperiods would continue to negatively affect Florida manatees and smalltooth sawfish.

Existing Conditions	Future Without Conditions
Fish and Wildlife Resources	
A great diversity of fish and wildlife species occurs throughout the Lake Okeechobee Watershed and in Lake Okeechobee. Important fish and wildlife resources in the Project Area include aquatic macroinvertebrates, small freshwater marsh fishes, larger sport fishes, amphibians and reptiles, birds (including raptors and wading birds), and various mammals. Much of the native habitats in the watershed have been replaced by agricultural uses, resulting in a loss of historic prairie and wetland habitats. The creation of ditches, canals, and the flooding of fallow agricultural fields provides some lower quality habitat for fish and wildlife, particularly during the rainy season. The existing condition as modeled within Lake Okeechobee is stressed due to frequent and prolonged high-water levels. The overall littoral extent is reduced from historical highs as a result of shading and turbidity at low elevations and declining water quality associated with algal blooms. Upper marshes have less woody habitat due to increased hydroperiods, and nuisance species like cattail have replaced wet prairie and broadleaf marsh habitats at higher elevations. Important sportfish species are in decline due to poor condition of submerged aquatic vegetation within the lake. Fish, oyster, and submerged aquatic vegetation (SAV) in the Northern Estuaries are often impacted by high and damaging freshwater inflows, or insufficient low flows, that result in salinities outside of the salinity optima.	As modeled, improvements to habitat are possible. There are reduced durations at moderate high lake stage, which help to offset losses in littoral extent. However, lake levels are still above the ecological envelope twice as often as they are within it, resulting in continued stresses to submerged habitats and high elevation marsh communities. Continued moderate and extreme high water level events within the lake would reduce the availability of bedding habitat for fishes and continue to affect the extent and composition of the emergent and submerged vegetation communities. The extent and duration of extreme low water level events would be reduced, due to overall higher lake stages. Fish and wildlife inhabiting the Northern Estuaries would continue to be impacted by regulated flood control of freshwater flows from Lake Okeechobee. Annual variability in flow would lead to salinity extremes outside the tolerance ranges of many fish and wildlife species, resulting in decreased species diversity. Further declines in estuarine habitat in the St. Lucie and Caloosahatchee Rivers would continue to result in additional declines to oyster bed and SAV, such as seagrasses, during these high-volume freshwater release events.
Essential Fish Habitat	
EFH is designated within the St. Lucie River and Indian River Lagoon and the Caloosahatchee River and Estuary for numerous fish and invertebrate species. High-volume freshwater flows currently promote conditions unfavorable (I.e., salinities outside the tolerance ranges for fish during different stages of their life-cycle) to abundance and diversity of estuarine and coastal species.	The Florida Fish and Wildlife Conservation Commission (FWC) governs marine fisheries. The Magnuson-Stevens Fishery Conservation Management Act authorizes designation of Essential Fish Habitat (EFH). At least 70 percent of Florida's recreationally or commercially sought fishes depend on estuaries for part of their life histories. Flood control management actions release high volume freshwater flows reducing salinities in estuarine and coastal areas. Storing water can minimize freshwater flows into estuarine and coastal systems, promoting conditions likely to decrease species abundance and diversity within those habitats. Wet season, high-volume freshwater inflows negatively impact species utilizing essential fish habitat.
Hydrology	
The Study Area can be hydrologically divided into four sub-watersheds: Fisheating Creek, Indian Prairie, Taylor Creek/Nubbin Slough, and portions	The FWO condition assumes the construction and implementation of currently authorized Comprehensive Everglades Restoration Plan projects and other

Existing Conditions	Future Without Conditions
of the Lower Kissimmee (S-65D and S-65E). Each sub-watershed has a major tributary that historically drained south into Lake Okeechobee by meandering rivers and extensive floodplains. Through time, the construction of ditches, berms, and canals into this rain-driven system has disrupted the natural flow path of water leading to current restoration efforts. Hydrologic modeling simulations of the existing conditions baseline (ECB) were developed with the Regional Simulation Model Basin (RSM-BN) sub-regional modeling tool to provide baseline conditions. The ECB was developed to represent the system-wide infrastructure and operations that were in place or would be prior to construction of the recommended plan. Modeled conditions assumed use of the Lake Okeechobee System Operation Manual (LOSOM); Herbert Hoover Dike (HHD) features were operational; the Kissimmee River Restoration project was implemented; C-44 was complete; and the A-2 Stormwater Treatment Area (STA) and A-1 Flow Equalization Basin (FEB) were being used. The A-2 STA is assumed/modeled as operational under grow-in conditions only. As of 2023, SFWMD does not have 404/408 permits or an approved federal Water Control Plan (supported by NEPA) for flow-through operations.	federal, state, or local projects constructed or approved under existing governmental authorities that occur in the Study Area. Hydrologic modeling simulations of the FWO condition were developed with the RSM-BN sub-regional modeling tool assuming the Lake Okeechobee Regulation Schedule (LORS); HHD features were operational; the Kissimmee River Restoration project was implemented; the Ten Mile Creek Reservoir and STA were operating; and 370,000 acre-feet (ac-ft), which represents the increase in the quantity of freshwater flowing into the historic Everglades flow path on an average annual basis with the authorized CEPP EAA project. The FWO was developed to represent the system-wide infrastructure and operations that are authorized and would be expected in approximately year 2083. Lake Okeechobee operations included the LORS 2008 with CEPP EAA Phase optimized release guidance.
Regional Water Management – Operations	
Lake Okeechobee is managed by the Corps in accordance with LOSOM (pending completion of NEPA and approval by the Corps' South Atlantic Division) to ensure that the congressionally authorized Project purposes are met.	The FWO condition is based on Lake Okeechobee operations included in the LORS 2008 with CEPP EAA Phase optimized release guidance.
Groundwater Resources	
With exception of the Okeechobee Utility Authority, most communities in the Project Area rely on groundwater from the surficial aquifer system or Upper Floridan Aquifer (UFA) for drinking water supply. The Okeechobee Utility Authority uses surface water from Lake Okeechobee. A few permitted users rely on the UFA in the Indian Prairie sub-basin for livestock watering, agricultural irrigation, and freeze protection, because the groundwater is fresh or slightly brackish in this area. The UFA is artesian in the Project vicinity and produces larger volumes of water than the surficial aquifer system.	As communities develop within the Project Area, the drinking water supply would rely on groundwater from the surficial aquifer or UFA. Treated groundwater has a lower unit cost compared to treated surface water. Users must obtain a consumptive use permit to pump groundwater and/or surface water for water supply.

Existing Conditions	Future Without Conditions
Water Quality	
The Florida Department of Environmental Protection (FDEP) has determined that existing water quality conditions within most of the Study Area (Lake Okeechobee and Lake Okeechobee Watershed) to be impaired and in need of restoration. The primary pollutants of concern are nutrients. To address this issue, the FDEP develops Total Maximum Daily Load (TMDL) limits and implements water quality improvement plans called Basin Management Action Plans.	State adopted and U.S. Environmental Protection Agency (EPA)-approved TMDLs are in place for nutrients in Lake Okeechobee, and the FDEP is implementing TMDLs for nutrients in various waterbodies within the Kissimmee River Basin. The Project Team assumes that current and proposed state actions, including the adoption of nutrient TMDLs, would be implemented and improve water quality conditions in the Study Area.
Water Supply and Flood Control	
The Project is located adjacent to the Indian Prairie Canal System between Lake Istokpoga and the Lake Okeechobee Service Area (LOSA). Lake Istokpoga, the fifth largest lake in Florida, covers 27,692 acres (ac) and averages 4 to 6 feet (ft) in depth. It is fed by Arbuckle Creek and Josephine Creek and is connected to Lake Okeechobee through the Indian Prairie Canal System. The water level in Lake Istokpoga is regulated by the G-85 (replaced by S-67) and S-68 water control structures in accordance with the Lake Istokpoga Regulation Schedule adopted by the Corps and implemented by the South Florida Water Management District (SFWMD). A Restricted Allocation Area (RAA) for Lake Istokpoga/Indian Prairie Canal System was established in 1981, which prohibits additional surface water allocations from the lake and canal system above existing allocations and any increases in surface water pump capacity. The RAA reduces the potential for SFWMD-declared water shortages in the basin during dry periods and prevents new users from reducing the level of certainty for existing permitted users and Tribal entitlements. To protect water levels in Lake Istokpoga, a minimum flows and minimum water levels (MFLs) of 36.5 ft National Geodetic Vertical Datum of 1929 was adopted in 2006 (Subsection 40E-8.351, Florida Administrative Code). The LOSA, including Lake Okeechobee and connected systems, covers more than 1.8 million ac. The 2008 LORS lowered lake stages as compared to the Water Supply/Environmental previous regulation schedule. For surface water users in LOSA, the lowered lake stages have reduced the level of certainty and require additional sources, such as groundwater, to obtain the permitted 1-in-10-year drought level of certainty. In 2008, the SFWMD adopted an RAA rule limiting surface water allocations to base condition water uses that occurred from April 1, 2001, to January 1, 2008. The LOSA	The current LOSA RAA criteria apply to new projects, existing unpermitted projects, and modifications or renewals to existing projects located within LOSA. In the future, additional water from Lake Okeechobee resulting from operational changes or a revised regulation schedule is expected to return the lake to an MFL prevention strategy, enhance the level of certainty for existing permitted users now receiving less than a 1- in 10-year level of certainty, and support environmental objectives. Projects such as the Everglades Agricultural Area (EAA) Reservoir, LOCAR, and the ASR component of LOWRP are expected to provide additional storage to help return the Lake Okeechobee MFL to prevention status. The frequency and severity of water restrictions for the LOSA are anticipated to slightly decrease in the FWO condition as compared to the existing condition due to the implementation of other related projects. The current criteria for Lake Istokpoga and the Indian Prairie Canal System continue to apply to new projects, existing unpermitted projects, and modifications or renewals to existing projects using surface water. Flood risk management needs have increased since the original Central and Southern Florida Project was constructed and would be expected to continue to increase in the future. As agricultural and urban development continues, the volume, duration, and frequency of floodwaters may increase and the actual level of flood damage reduction may decline in some areas. Flood damage reduction may also decline as a result of sea level change. Most coastal flood control structures are gravity driven. Release capability of these structures with current headwater conditions may be reduced.

Existing Conditions	Future Without Conditions
RAA serves as a part of the MFL recovery strategy for Lake Okeechobee. Areas may become flooded during heavy rainfall events due to antecedent conditions, causing saturation and high runoff from developed areas.	
Air Quality	
Existing air quality in the affected environment is good to moderate. All areas of Florida are now attainment areas.	It is anticipated that population growth and economic expansion in southeast Florida would result in an increase in ozone (O_3) and other air quality pollutants.
Hazardous, Toxic, and Radioactive Waste (HTRW)	
Lands potentially used for this Project are very likely to have a past or present agricultural land use. Activities conducted over the past 100 years are likely to have resulted in the presence of HTRW materials on some of this land. State and federal databases include information on known HTRW contamination sites. Phase I and II environmental site assessments will be used to identify unknown HTRW sites and test cultivated areas for the presence of residual agricultural chemicals.	In the absence of the Project, potential Project lands would likely continue to be farmed. This would likely result in continued minor HTRW contamination associated with storing and applying agricultural chemicals as well as petroleum products. Cultivated soils would continue to have agricultural chemicals applied, which may accumulate in the soils, depending upon the properties of chemicals. Should the subsequent landowner(s) opt to change the land use to something other than agriculture, they would have to meet all applicable federal and state regulatory levels for that land use, which may require remediation for residual agricultural chemicals.
Noise	
Within natural areas, external sources of noise are limited mainly to recreational users, including airboats, off-road vehicles, swamp buggies, and motorboats. Existing sources of noise outside of the rural communities are limited to vehicular traffic, agricultural vehicles, etc. Within urban areas, existing sources of noise include sound associated with transportation arteries, construction and landscaping equipment, and commercial and industrial facilities.	Sources of noise associated with surrounding land use are expected to be similar to those described in existing conditions. Noise impacts would be expected in areas where land use is converted from agriculture to residential/commercial. Sound levels would be expected to be of greater intensity, frequency, and duration as areas are from agricultural to residential/commercial use.
Aesthetics	
Natural areas within central and south Florida are composed of a variety of flatwoods, dry prairies, wetlands, marshes, wet prairies, lakes, and estuaries. The land is very flat, with much of the visible topographic features resulting from human development, such as canals and levees. Most of the Project Area is private agricultural land. There are no public parks, conservation areas, or refuges in the Project footprint.	Urbanization is expected in the future, resulting in a potential loss of opportunity to aesthetically view open agricultural and natural areas.

Existing Conditions	Future Without Conditions
Land Use	
The existing land use within the Study Area varies from wetlands to upland hardwood forests and from agriculture to high-density residential land use. Most of the lands in the Study Area are pasture, wetlands, and agricultural crops, such as citrus and row crops.	Florida is expected to grow exponentially, exceeding the national expected growth rate; however, the growth rate is not as inflated for Glades, Highlands, and Okeechobee Counties. The region, including cities within the Study Area, is expected to grow slightly both in population and in development to meet population demands. Much of the land in the Study Area is currently zoned for agricultural use. As growth continues, rezoning of lands for commercial and industrial use is likely to occur. Development pertaining to increased population includes the demand for additional infrastructure (e.g., roads, fire districts, schools, recreation facilities, stormwater management, water and sewer systems, and other facilities the developer may require). Agriculture is expected to remain a strong economic driver within the Study Area. Based on future population projections, land use acreages are not expected to increase or decrease substantially.
Recreation	
Lands within the Project Area are predominantly private pasture lands not open to public recreation. SFWMD-completed water resource projects most often are cooperatively opened to the public as Florida Fish and Wildlife Conservation Commission Areas for hunting, fishing, and other outdoor recreation.	All of the areas throughout central and south Florida are expected to experience notably higher demand for selected recreation activities with a commensurate need to increase development of the region's recreational resources and facilities. Without this Project, these lands would not likely provide additional public outdoor recreational use.
Socioeconomics	
The primary economic activity throughout the Study Area is agriculture. A second major economic activity is recreation and tourism. Lake Okeechobee supports an active commercial and recreational fishing industry. Other than agriculture, recreation, tourism, commercial fishing, and navigation, secondary economic activities include services (e.g., banking, insurance, etc.), healthcare, education, and government activities. From 1950 to 2020, Florida underwent dynamic change in population. Florida's population grew by almost 700 percent (USCB 1950, 2023). This growth can be attributed to Florida's desirable climate and historically low property costs. With population expansion comes the challenges related to infrastructure, land use/pattern changes, water demand, environmental impacts, depletion of resources, and health and human safety issues.	Future economic growth in the Study Area would be expected to remain consistent with the population growth of the area, while maintaining a mix of agricultural, service, retail, and administrative jobs. The Study Area would be expected to continue to grow both in population and associated infrastructure and commercial development, although the growth rate is expected to be less than other areas of central and south Florida. Florida is expected to grow at a rate exceeding the national growth rate, but the rate is expected to diminish in the future.

Existing Conditions	Future Without Conditions
Environmental Justice	
Communities with low-income and people of color populations are near the Project Area, and within the larger Study Area. The nearest Native American Tribal population is the Seminole Tribe of Florida (STOF) Brighton Reservation, which is south of the Project Area. The STOF Brighton Reservation, which is in Glades County, is about 5 miles, at its closest point, south of the proposed Project Area, which is in Highlands County.	Future economic growth and development within the Study Area may change the distribution of populations that live within the Study Area.
Cultural Resources	
There is a high probability that a number of unrecorded archaeological sites are located throughout the Study Area, as most lands have not been surveyed for the presence of cultural resources.	Future development and expansion of infrastructure would be expected to adversely impact cultural resources during construction of roads, sewer systems, and other private facilities.
Invasive and Nuisance Species	
Seventy-four species of non-native plants have been documented to occur in the Project Area. Of the 74 species, 15 are classified as Florida Noxious Weeds, 44 are classified as Florida Exotic Pest Plant Council (FLEPPC) Category I, and 12 are classified as FLEPPC Category II plants. Fifty-one species of non-native animals have been documented to occur in the Project Area, two of which are invasive carnivorous reptiles.	Non-native invasive species would continue to thrive and negatively affect the ecology throughout the Project Area. New invasions and the expansion of existing invasive plant and animal species would continue in the future. Native nuisance species, such as cattail, would persist and expand in the Project Area.

Note: **Appendix C** includes a detailed description of the existing condition and Future Without Project condition.

2.5 Structural and Operational Assumptions

The FWO Project condition for the 50-year planning horizon assumes the construction and implementation of authorized CERP and non-CERP projects, operational assumptions, and other federal, state, and local projects constructed or approved under existing governmental authorities that occur in the Study Area (**Table 2-8**). **Table 2-9** presents additional data assumptions and an extension of the climate period of record to 52 years, from 1965 to 2016. **Table 2-10** presents the status of related projects and operational plans for ECB and FWO Assumptions.

Table 2-8. ECB and FWO Assumptions.

	Feature	ECB	FWO Relationship to LOCAR
Lake Okeechobee Operations	LOSOM.	Lake Okeechobee Regulation Schedule per CEPP/Everglades Agricultural Area Reservoir Operation.	Lake Okeechobee stage is influenced by a lake regulation schedule.
Herbert Hoover Dike	Complete with features operational.	Complete with features operational.	LOCAR would be expected to alleviate some risk associated with high lake levels during peak water years.
Kissimmee River Restoration	Construction complete with operations implemented.	Construction complete with operations implemented.	Kissimmee River Restoration will restore portions of the historic floodplain and oxbows, thereby slowing flows from the Kissimmee River into Lake Okeechobee, as well as restore timing and volume of flows.
Indian River Lagoon	C-44 complete.	Ten Mile Creek Reservoir and STA: 1,001 acres with 4.0 ft operating depth.	Provides alternate storage downstream from Lake Okeechobee, partially protecting the St. Lucie Estuary from freshwater flows from the C-44, C-23, C-24, and C-25 basins. The IRL-S C-44 reservoir may receive limited inflows from Lake Okeechobee if capacity is available.
C-43 West Basin Storage Reservoir	Under construction.	Complete; features operational.	Provides alternate storage downstream from Lake Okeechobee, partially protecting the Caloosahatchee Estuary from high-volume flows from the lake.

	Feature	ECB	FWO Relationship to LOCAR
CEPP Authorization	A-2 STA and A-1 FEB. The A-2 STA is assumed/modeled as operational under grow-in conditions only. As of 2023, SFWMD does not have 404/408 permits or an approved federal Water Control Plan (supported by NEPA) for flow-through operations.	370,000 ac-ft represents the increase in the quantity of freshwater flowing into the historic Everglades flow path on an average annual basis with the authorized CEPP EAA project.	CEPP components would allow approximately 370,000 ac-ft average annual of water to be delivered to the Everglades that would otherwise be retained within Lake Okeechobee or flow to the St. Lucie and Caloosahatchee Estuaries.

ac-ft–acre-foot; CEPP–Central Everglades Planning Project; EAA–Everglades Agricultural Area; ECB–existing conditions baseline; FEB–flow equalization basin; FWO–Future Without Project; LOCAR–Lake Okeechobee Storage Reservoir Section 203 Study; LOSOM–Lake Okeechobee Regulation Schedule; NEPA–National Environmental Policy Act; SFWMD–South Florida Water Management District; STA–stormwater treatment area.

Table 2-9. Data and Modeling Assumptions.

Data/Input	ECB	FWO
Climate period of record	1965–2016	1965–2016
Topography	2019	2019
Land use	2017	2017
Kissimmee River Inflows	UKOPS model	UKOPS model
Kissimmee River restoration	2019 reaches/pools (interim headwaters schedule)	2019 reaches/pools (entire headwaters schedule)
C-44 basin runoff backflow to lake	Lake stage below 14.5 ft Navigational Geodetic Vertical Datum	0.25 ft below low lake management sub-band pulse release
Everglades Agricultural Area simulated runoff and demand	1965–2016	1965–2016
STOF Brighton Reservation demands	52,938 ac-ft/year based on 2030 planted acreage	52,938 ac-ft/year based on 2030 planted acreage
Eastern flow way	Upper and Lower basins of the Indian Trail Improvement District, L8 FEB, and Grassy Waters Preserve are simulated	Upper and lower basins of the Indian Trail Improvement District, L8 FEB, and Grassy Waters Preserve are simulated

ac-ft–acre-foot; ECB–existing conditions baseline; FEB–Flow Equalization Basin; ft–foot; FWO–Future Without Project; STOF–Seminole Tribe of Florida

Table 2-10. Status of Related Projects and Operational Plans for ECB and FWO Assumptions.

ECB	FWO	Relationship to LOCAR
Natural Resource Conservation Service wetland restoration projects and wetland reserve programs; several projects complete within project footprint	All current projects complete; future acreage not projected	ACEP wetland restoration projects within the LOWRP footprint to consider in FWO conditions and when siting Lake Okeechobee Watershed Restoration Project wetland restoration sites. ACEP has approximately 40,000 acres of restored wetlands in the Lake Okeechobee Watershed.
U.S. Fish and Wildlife Service Refuge project; not currently constructed	Complete	Restoration project within the footprint would be considered in FWO conditions.
Florida Department of Protection Basin Management Action Plans; several projects operational	Complete	Necessary to satisfy state water quality requirements.
2008 Lake Okeechobee Regulation Schedule with CEPP refinements	Lake Okeechobee System Operating Manual and CEPP refinements	Lake Okeechobee stage influenced primarily by a lake regulation schedule.

ACEP–Agricultural Conservation Easement Program; CEPP–Comprehensive Everglades Planning Project; ECB–existing condition baseline; FWO–Future Without Project; LOCAR–Lake Okeechobee Storage Reservoir Section 203 Study

The LOCAR baselines and alternatives were modeled using the RSM-BN. A more detailed description on these assumptions used to simulate the ECB and FWO conditions is provided in **Appendix A**.

2.6 Native Americans

There are two federally recognized Tribes within Florida: the MTI and the STOF (**Figure 2-5**). Both Tribes have a long history of living within the Study Area and maintain a strong connection to the region through continued use. They regard the Indigenous populations of Florida as their ancestors.

Tribal members have lived in the heart of the Everglades since the 1830s, well before the first efforts to drain the land began in the 1880s. They witnessed firsthand the impact of those efforts on their homes and livelihoods. Today, Tribal members recall growing up on tree islands in the Everglades and living the lives their ancestors did 100 years before. Refer to the Native American sections in **Section 5** and **Appendix C** for more information.

The Seminoles inhabited camps scattered across Florida where the federal government started to bring services before the 1930s. Between 1935 and 1938, 35,279 ac of land was set aside to begin consolidating the Seminole camps into a reservation at Brighton. Some of the groups relocated and started to receive federal aid, while other groups resisted government intrusion into their lives and remained in various traditional areas that now include sites along Tamiami Trail (Weisman 1999). The 2020 Brighton Reservation population was 557 (USCB 2023). The Tribe continues to rely on the water from Lake Okeechobee as water supply and a secondary irrigation supply for water shortages on the reservation. The Tribe also has access to and uses the HHD and Lake Okeechobee for hunting, fishing, and recreational activities.

Members of the Seminole Tribe have six reservations in Florida, including the Brighton Reservation, which is approximately 36,000 ac in size and located in Glades County, northwest of Lake Okeechobee within the Study Area (**Appendix C**). The Tribe also owns an approximately 3,685-ac property located northeast of and adjacent to the Brighton Reservation, bounded by the Kissimmee Branch Canal No. 1. The Brighton Reservation on the northwest side of Lake Okeechobee would still exist under the FWO. It is expected that the Seminole Tribe would continue using the areas around the HHD for hunting and fishing.

The STOF has surface water entitlement rights pursuant to the 1987 Water Rights Compact with the State of Florida and the SFWMD. Additional documents addressing the Water Rights Compact entitlement provisions have since been executed. Two of the Tribe's reservations rely on Lake Okeechobee as a secondary irrigation supply source for their surface water entitlement, with specific volumes of water identified for this purpose for the Big Cypress Reservation and an operational plan addressing water shortage operations for the Brighton Reservation.

Members of the MTI administer approximately 270,818 ac, which includes federal reservations and leased lands. The MTI owns one property located within the Study Area: North Ranch (FKA Cherry Ranch), which covers approximately 3,000 ac in Highlands County and is located approximately 8 mi west of the STOF's Brighton Reservation. The property has no visible structures; it is predominantly pastureland used for cattle ranching but contains some wooded areas.

Further, members of both Tribes rely on areas off the reservations to support their cultural, medicinal, subsistence, and commercial activities. In addition to the two Tribes, the federally recognized Thlopthlocco Tribal Town of Oklahoma and the Seminole Nation of Oklahoma are regularly involved in the Section 106 consultation process as well.

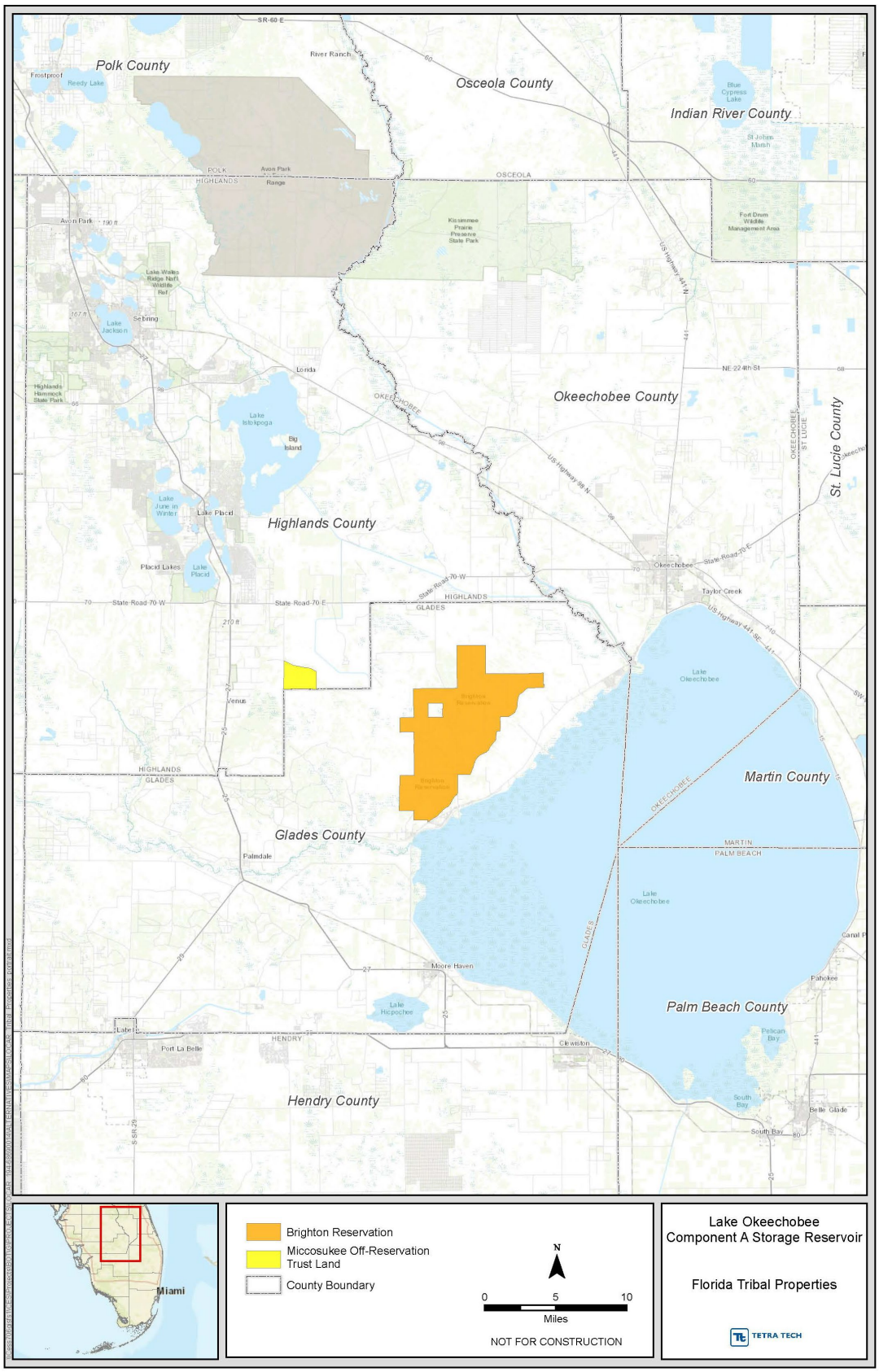


Figure 2-5. Florida Tribal properties.

3.0 FORMULATION OF ALTERNATIVE PLANS

The following sections present an overview of the strategy and development of alternatives evaluated during the LOCAR formulation process. Please see **Appendix E, Plan Formulation,** for a more detailed analysis of the alternative plan formulation.

3.1 Plan Formulation

During the plan formulation process, the Project Team made qualitative and quantitative comparisons between the Future Without Project (FWO) condition and the Future With Project (FWP) condition to analyze the benefits (**Section 4**) and environmental effects (**Section 5**) of the Project alternatives. The FWO condition describes what is assumed to be in place if none of the study's alternative plans are implemented. The FWO and FWP conditions for LOCAR assume the construction and implementation of authorized CERP projects and other federal, state, or local projects that occur in the area as described in **Section 2**. The FWP condition describes what is expected to occur with implementation of each alternative plan being considered. The alternatives were formulated, evaluated, and justified based on their ability to (1) contribute to the goals and purposes of CERP Component A, and (2) provide benefits that justify costs on a next-added increment basis.

3.1.1 Project Feature Formulation

The alternative formulation strategy built upon the Corps' recent work on the Lake Okeechobee Watershed Restoration Project (LOWRP) to identify aboveground storage measures consistent with the intent of CERP Component A. Features were formulated and screened to meet the following Project objectives:

- Improve Lake Okeechobee stage levels;
- Reduce freshwater releases to the Northern Estuaries; and
- Increase water supply for existing LOSA users.

3.1.2 Project Operations Formulation

Alternatives formulation used the best available operational assumptions, as described in **Section 2.5**, including the Lake LORS 2008 with CEPP EAA Reservoir operations. Details of the proposed lake schedule modifications are within **Appendix A**. A model sensitivity run was performed to verify Project benefits. Results of this analysis are presented in **Section 6** and **Appendix A**.

3.1.3 Formulation of Aboveground Water Storage Measures

Management measures were compiled from LOWRP and new measures were identified consistent with study objectives. This section summarizes previous studies, the formulation process used to identify aboveground storage measures considered in this study, and the rationale used in carrying measures forward for evaluation. **Appendix E, Plan Formulation,** provides a more detailed analysis of alternative plans formulation.

3.1.3.1 Previous Studies

The Corps evaluated opportunities for aboveground reservoir storage as part of the LOWRP (Corps 2020). The LOWRP Project Delivery Team (PDT) conducted multiple levels of evaluation and screening of Project alternatives that are not included in the 2022 LOWRP Recommended Plan. Initial LOWRP screening in 2006 identified 15 potential sites for deep aboveground storage (**Figure 3-1**). These features were screened out for a variety of reasons, including opportunities to co-locate with proposed aquifer storage and recovery (ASR) wells and/or wetlands, costs, private land ownership, and dam safety. Five deep reservoirs (i.e., K-05 Large, K-05 North, K-05 South, I-01, and K-42) were carried forward in 2018 for initial modeling, preliminary cost estimates, and habitat unit calculations. Further analysis retained a deep reservoir with approximately 195,000 acre-feet of storage at the K-42 site. The other four reservoirs were not carried forward for further evaluation for deep storage based on the preliminary analyses and dam safety concerns to downstream communities.

The K-42 reservoir was combined with other proposed Project components (Alternative 2Cr) for further evaluation, but it was ultimately not selected as the LOWRP Recommended Plan. This alternative was found to be an efficient plan, but the reservoir could not be co-located with ASR wells due to existing users of the Floridan aquifer near the proposed Project footprint, and the deep reservoir storage option was not carried forward when compared with other alternatives. Instead, a shallow reservoir was selected at a location where a deep reservoir had been proposed. The August 2020 LOWRP Recommended Plan (Alternative 1BW) provided shallow storage referred to as a wetland attenuation feature and could be co-located with ASR wells to maintain high-quality wetlands, maximize the use of public lands, and avoid the endangered Florida grasshopper sparrow habitat.

LOCAR plan formulation was also informed by a 2012 proposed Highlands Ethanol, LLC, facility. The proposed facility was located north of Canal 41A (C-41A) near the site of the K-42 reservoir. Supporting studies included geotechnical borings and a biological assessment submitted to the U.S. Fish and Wildlife Service (USFWS). The USFWS' Biological Opinion (BO) concurred with a Corps' determination of "may affect, but not likely to adversely affect" for the Florida panther, Florida grasshopper sparrow, and eastern indigo snake. The BO focused on the effects to the crested caracara.

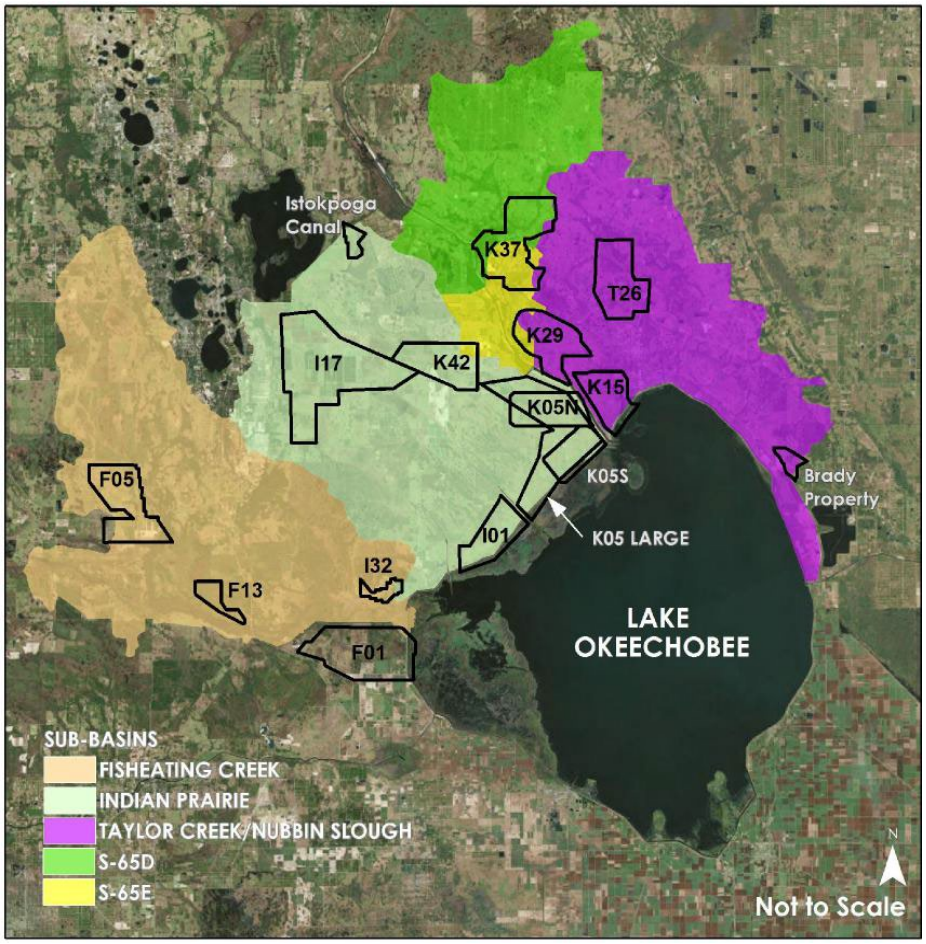


Figure 3-1. Deep aboveground storage sites considered during Corps LOWRP screening.

3.1.3.2 LOCAR Formulation

The LOCAR Project Team initiated plan formulation by reviewing previous studies and revisited opportunities to meet the goals in line with CERP Component A. The LOCAR Project Team initially evaluated four deep storage reservoirs carried forward in LOWRP: K-05 Large, K-05 South, I-01, and K-42. Three of these reservoirs were dismissed due to operational constraints and concerns for dam safety identified in previous studies.

Water conveyance consistent with CERP Component A was a priority in plan formulation along with lessons learned from work on the Canal 43 (C-43), Canal 44 (C-44), and EAA reservoirs. The area surrounding the K-42 site became the focus for a deep storage aboveground reservoir because of its location upstream of S-65E, allowing for a connection to C-41A and the ability to divert water to and from Lake Okeechobee. Reservoir siting opportunities were evaluated within a preliminary Project Area bounded by the C-38/Kissimmee River to the east, County Road 621 to the west, C-41A to the south, and the Istokpoga Canal and the CSX Railroad to the north.

Reservoir locations were identified to avoid known existing infrastructure, including public roads and residential developments. Residential areas in the southeast corner of the preliminary Project Area were avoided to further narrow sites for LOCAR.

Other environmental concerns were considered for siting in the remaining Project Area, including threatened and endangered species habitat and wetlands. Much of the area was identified as potential Florida grasshopper sparrow habitat with scattered isolated wetlands. Areas to the north and west have been in citrus and sugarcane production and would be expected to have limited habitat for protected species. The remaining land area is improved pasture, ideal habitat for the crested caracara. Presence of the crested caracara in the area was confirmed by the 2012 Highlands Ethanol, LLC, facility BO, as was the determination of "may affect, but not likely to adversely affect" for the Florida grasshopper sparrow. Many of the wetland features in the area were identified as designed infrastructure for farming operations.

Siting of a potential reservoir identified opportunities for operational flexibility, account for seepage, and reduce the potential for overtopping from waves generated within the reservoir's storage cells. Three reservoirs were laid out in the Project Area. Each was located adjacent to C-41A allowing for conveyance to and from Lake Okeechobee.

3.1.3.3 Measures Carried Forward

Initial conceptual reservoir designs for Alternatives 1, 2, and 3 varied by depth and operational flexibility. All three alternatives were designed to store 200,000 acre-feet of water from Lake Okeechobee. Alternatives 2 and 3 were initially designed with connections to the Istokpoga Canal to allow LOCAR to be used to influence Lake Istokpoga operations. Alternative 2 was also designed as two separate reservoirs connected by a canal to reduce the necessary depth of water stored from an average of 18 feet in Alternative 1 to an average of 12.0 feet in Alternative 2. Water from the southern reservoir would be pumped through the canal to the northern reservoir. The footprint and connection to C-41A for all three alternatives was carried forward. However, connections to Istokpoga Canal were screened out and not carried forward for further consideration, as described below.

The Lake Istokpoga Regulation Schedule was identified in Other Project Elements (OPE) of CERP. The intent of the feature was to enhance fish and wildlife benefits where a possible reduction in the annual fluctuation of the lake reduced quality habitat (Corps 1999). At this time, water levels in Lake Istokpoga remain relatively stable and performance metrics to quantify habitat conditions have not been defined. Developing performance metrics and consideration of a new regulation schedule for Lake Istokpoga are beyond the scope of this study. Therefore, measures to increase operational flexibility by connecting reservoir alternatives with Lake Istokpoga (via connection to the Istokpoga Canal) were not carried forward for further evaluation.

3.1.4 Consideration of CERP

LOCAR planning was performed consistent with CERP programmatic regulations. The CERP programmatic regulations require that the authorized CERP components be evaluated in the alternative evaluation process. The CERP Recommended Plan provides a framework of components needed to achieve a practicable level of restoration of the Everglades. This study was designed to address CERP Component A, which proposed a 200,000-acre-foot reservoir in the Kissimmee River region and a 2,500-acre STA.

Based on previous studies, timing and availability of the flows, and locations of communities within the Project Area, the LOCAR Project Team identified various reservoir configurations that could be cost effectively implemented to meet the original intent of CERP Component A by storing 200,000 ac-ft. All

three alternatives carried forward for evaluation include 200,000 ac-ft of aboveground storage. Modeling performed to evaluate the effects of LOCAR alternatives includes authorized CERP components; see **Section 2.5** and **Appendix A, Annex A-2.4**.

CERP also recommended a 2,500-acre STA to be located north of Lake Okeechobee. Water quality treatment features are not being pursued as discussed in **Section 1**. Instead, state water quality programs, such as BMAPs, are being used to meet the intent of water quality improvements originally proposed by CERP Component A.

3.2 Array of Alternatives

The Project Team selected three possible configurations for an aboveground storage reservoir north of Lake Okeechobee. **Table 3-1** summarizes the features of each alternative. The operations for all three alternatives would be similar, allowing for a combination of methods to divert water from and return water to Lake Okeechobee. Water would be conveyed to the reservoir in one of two ways: (1) full or partial diversion of flow in C-41A downstream of S-83, or (2) back-pumping water from Lake Okeechobee via pumping from C-41A downstream of S-84 into C-41A between S-83 and S-84. Water would be returned to Lake Okeechobee by discharging from the reservoir to C-41A upstream and/or downstream of S-83. The location of the reservoir outflow culverts would allow for water to be conveyed south to provide opportunities for storage in surrounding canals (e.g., C-41A, C-41, C-40, and C-39A). A full description of reservoir operations for the Recommended Plan is described in **Annex C**.

Table 3-1. Array of Alternatives.

Feature	Alternative 1	Alternative 2	Alternative 3
Water storage capacity (ac-ft)	200,000	200,000	200,000
Land area of reservoir site (ac)	12,800	20,400	14,900
Land area of S-84+ spillway & PS-1 pump station site (ac)	1.5	1.5	1.5
Average ground elevation within each reservoir cell (ft NAVD88)	34 (east cell) 34 (west cell)	44 (north cell) 34 (southeast cell) 34 (southwest cell)	44 (north cell) 35 (south cell)
Average storage depth within each reservoir cell (ft)	17 (east cell) 17 (west cell)	11 (north cell) 11 (southeast cell) 11 (southwest cell)	15 (north cell) 15 (south cell)
Number of reservoir inflow pump stations (total number)	2	3	3
Total reservoir inflow capacity (cfs)	1,500	1,500	1,500
Total reservoir outflow capacity (cfs)	3,000	3,000	3,000

*Note: Quantities for water-storage capacity, depth, and land area are approximate and are based on normal full-storage levels determined for the planning level design of the alternative.
ac-acre; ac-ft–acre-feet; cfs–cubic foot per second; ft–foot (feet)

3.2.1 Alternative 1

Alternative 1 includes a 200,000-ac-ft aboveground storage reservoir along the north side of C-41A (**Figure 3-2**). The reservoir and its external features, including its perimeter canal and perimeter maintenance road, would encompass an area of approximately 12,800 ac. At its NFSL of 50.60 ft-NAVD, the reservoir would have an average storage depth of approximately 17 ft within each of its two storage cells. The reservoir's major components include a perimeter dam and interior divider dam that form its two storage cells, a gated water control structure within the divider dam, an inflow pump station, a seepage return pump station, two gated outflow culverts, a perimeter canal (for the collection and conveyance of seepage and stormwater flows), an inflow-outflow canal, an outflow canal, and two ungated overflow spillways.

Construction. The reservoir would be constructed with a perimeter dam and an interior divider dam each having an average height of approximately 32 and 33 ft above the ground, respectively. The perimeter dam would be approximately 18 miles (mi) around, allowing for recreational opportunities. Material from the Project footprint and the surrounding perimeter canal would be used to construct the dams. A gated outflow culvert would be constructed on the west side of the reservoir to discharge water into C-41A upstream of S-83, while another gated culvert would be constructed near the southeast side of the reservoir to discharge water into C-41A downstream of S-83.

The reservoir would be constructed with two storage cells (i.e., east and west) split by an interior divider dam to reduce wave runup. The interior divider dam would include a gated water control structure with a 1,500 cubic feet per second (cfs) capacity to allow for controlled conveyance of water between the two cells. Each cell would include an ungated overflow spillway designed to discharge into C-41A.

A reservoir perimeter canal would be constructed outside the perimeter dam of the reservoir. Seepage from the reservoir would be collected in the canal and be returned to the reservoir via a seepage pump station. The seepage pump station would include two primary seepage pumps, an auxiliary seepage pump, and a back-up power generator to provide electrical power to operate the seepage pumps in the event of an electrical service outage. If the seepage pump station were to become nonoperational (e.g., the seepage pumps were out of service for maintenance, or the station's back-up power generator was not operating during an electrical service outage), the seepage collected in the perimeter canal would eventually overflow by gravity into the C-41A via overflow weir structures.

Operations. The location of the two reservoir gated-outflow-culverts, Culvert (CU) 1A and CU-2, would enable water to be released from the reservoir into the C-41A upstream and/or downstream of S-83, to convey water to the Indian Prairie Sub-basin, via C-41A, C-41, C-39A, C-40, and/or C-38, as well as to Lake Okeechobee. CU-1A and CU-2 would be designed to provide a maximum outflow rate of 1,500 cfs.

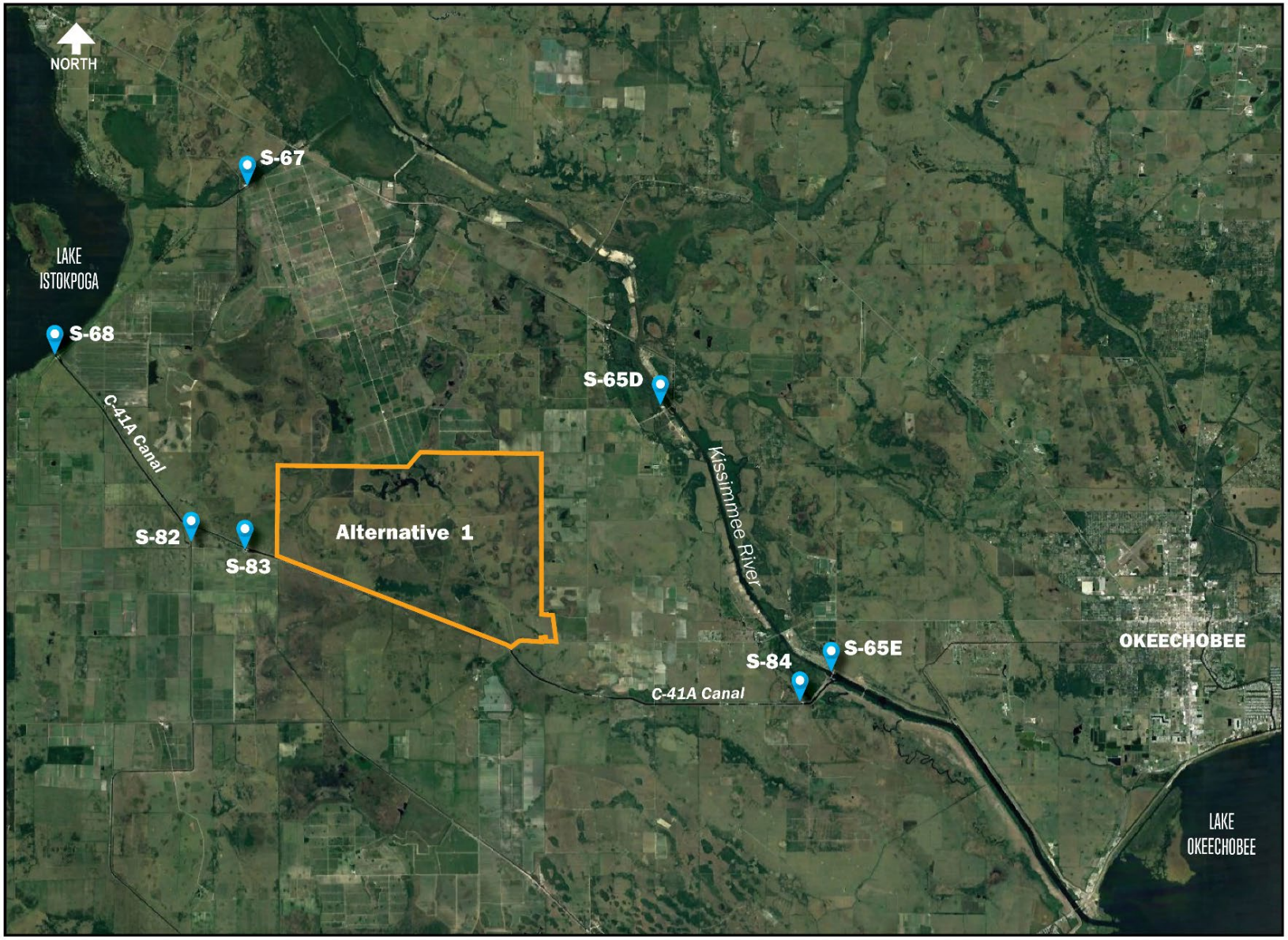


Figure 3-2. LOCAR Alternative 1.

During times when water would be conveyed into the reservoir for storage (depending on the current and forecasted water management needs within the Study Area), the reservoir would be filled to a level not to exceed its normal full storage level (NFSL) of 51.7 ft North American Vertical Datum of 1988 (NAVD88) through one or a combination of the following methods:

1. Full or partial diversion of flow in C-41A, downstream of S-83, into the reservoir at a maximum rate of 1,500 cfs by operating pump station PS-2.
2. Full or partial diversion of flow in C-41A, upstream of S-83, into the reservoir by gravity at a maximum rate of 1,500 cfs, through opening gated culvert CU-2. Unlike the other two methods, this method allows for only partial filling of the reservoir up to an elevation below the headwater stage at S-83, which normally ranges from 30.6 ft to 31.0 ft NAVD88. Water conveyed to the reservoir through this method would be stored mostly within the southern portion of each storage cell where the ground surface is the lowest. Stage-storage calculations for the Recommended Plan indicate that there is about 6,600 ac-ft of aboveground storage capacity in the reservoir at elevation 31.0 ft NAVD88 (3,800 ac-ft in the east cell and 2,800 ac-ft in the west cell), which is about 3 percent of the reservoir's total storage capacity of 200,000 ac-ft at its NFSL of 57.1 ft NAVD88.
3. Back-pumping water from Lake Okeechobee into the reservoir at a maximum rate of 1,500 cfs, by operating pump stations PS-1 and PS-2 concurrently. The first pump station, PS-1 (to be located at the existing S-84 site), will move water in C-41A from the downstream (tailwater) side of the existing S-84 site into C-41A on the upstream (headwater) side of the existing S-84 site. The second pump station, PS-2 (to be located between the reservoir's east cell and C-41A), will pump water from C-41A through the reservoir east inflow-outflow canal (CNL-2) directly into the reservoir's east cell.

Each of the reservoir's storage cells would include one ungated overflow spillway, designed to convey excess water in the storage cell (water within the storage cell above the NFSL of 51.7 ft NAVD88) to the reservoir perimeter canal (CNL-1), to then be discharged through the perimeter canal overflow structures into C-41A. Ungated Overflow Spillway (OS) 1, to be located along the south perimeter dam of the east cell, was designed to provide a maximum outflow rate of 750 cfs. Ungated overflow spillway OS-2, to be located along the south perimeter dam of the west cell, is designed to provide a maximum outflow rate of 750 cfs.

In the course of project development, Alternative 1 underwent strategic modifications in order to mitigate impacts on an environmentally sensitive upland area. This refinement included a reduced footprint in an effort to align with environmental considerations. These modifications would not result in any additional effects associated with the construction or operations of LOCAR. The refined Alternative 1 includes a 200,000 ac-ft aboveground storage reservoir along the north side of Canal 41A (C-41A), an. The reservoir and its external features, including its perimeter canal and perimeter maintenance road, would encompass an area of approximately 12,316 ac. The total area of the reservoir, bounded by the centerline of the perimeter dam, is approximately 11,352 ac (17.74 square miles [mi^2]), which includes approximately 6,561 ac (10.25 mi^2) for the east cell and 4,791 ac (7.49 mi^2) for the west cell. At its Normal Full Storage Level (NFSL) of 51.70 ft North American Vertical Datum (NAVD88), the reservoir would have an average storage depth of approximately 18 ft within each of its two storage cells since the average ground surface

elevation within the storage cells is about 33.9 ft NAVD88. **Section 6.1.1.** provides further detailed information on the modifications associated with Alternative 1.

3.2.2 Alternative 2

Alternative 2 has capacity, structures, and operations like Alternative 1, but covers a larger area, allowing for a shallower storage depth. Alternative 2 includes two reservoirs connected by a canal (**Figure 3-3**). The southern reservoir would include east and west cells in the same configuration and location as Alternative 1. The northern reservoir would be located south of the Istokpoga Canal at U.S. Highway 98 with an overflow spillway into the Istokpoga Canal. The two reservoirs would have a combined storage capacity of 200,000-ac-ft covering a total area of approximately 20,400-acres. Each reservoir would have an average storage depth of approximately 11 ft at its normal full storage level.

Construction. Each of the two reservoirs would be constructed with a perimeter dam having an average height of approximately 27 ft above the ground. The total length of the perimeter dams for both reservoirs would be approximately 30 mi, allowing for recreational opportunities. Material from the Project footprint, connector canal, and the surrounding perimeter canal would be used to construct the dams.

Two pump stations would be constructed similar to Alternative 1. A third pump station would also be constructed to pump water through a nearly 3.5-mile connector canal from the southern reservoir to the northern reservoir.

The southern reservoir would be constructed like Alternative 1 with two storage cells (i.e., east and west) split by an interior divider dam to reduce wave runup. The interior divider dam would include a 1,500-cfs, gated water-control structure to allow for controlled conveyance of water between the two cells. Each cell would include an ungated overflow spillway into C-41A. The second reservoir would be constructed to the north as illustrated in **Figure 3-3**.

Finally, like Alternative 1, a perimeter canal would also be constructed outside the perimeter dam of each reservoir. Seepage from each reservoir would collect in the canal and be returned to the reservoirs via seepage pump stations. If the seepage pump stations were not operational, the seepage collected in the canals would eventually overflow by gravity into the C-41A via overflow weir structures.

Operations. Operations would be similar to Alternative 1 with the following difference. In addition to the features in Alternative 1, a third pump station would pump water through a connector canal from the southern to northern reservoir to utilize the full storage capacity.

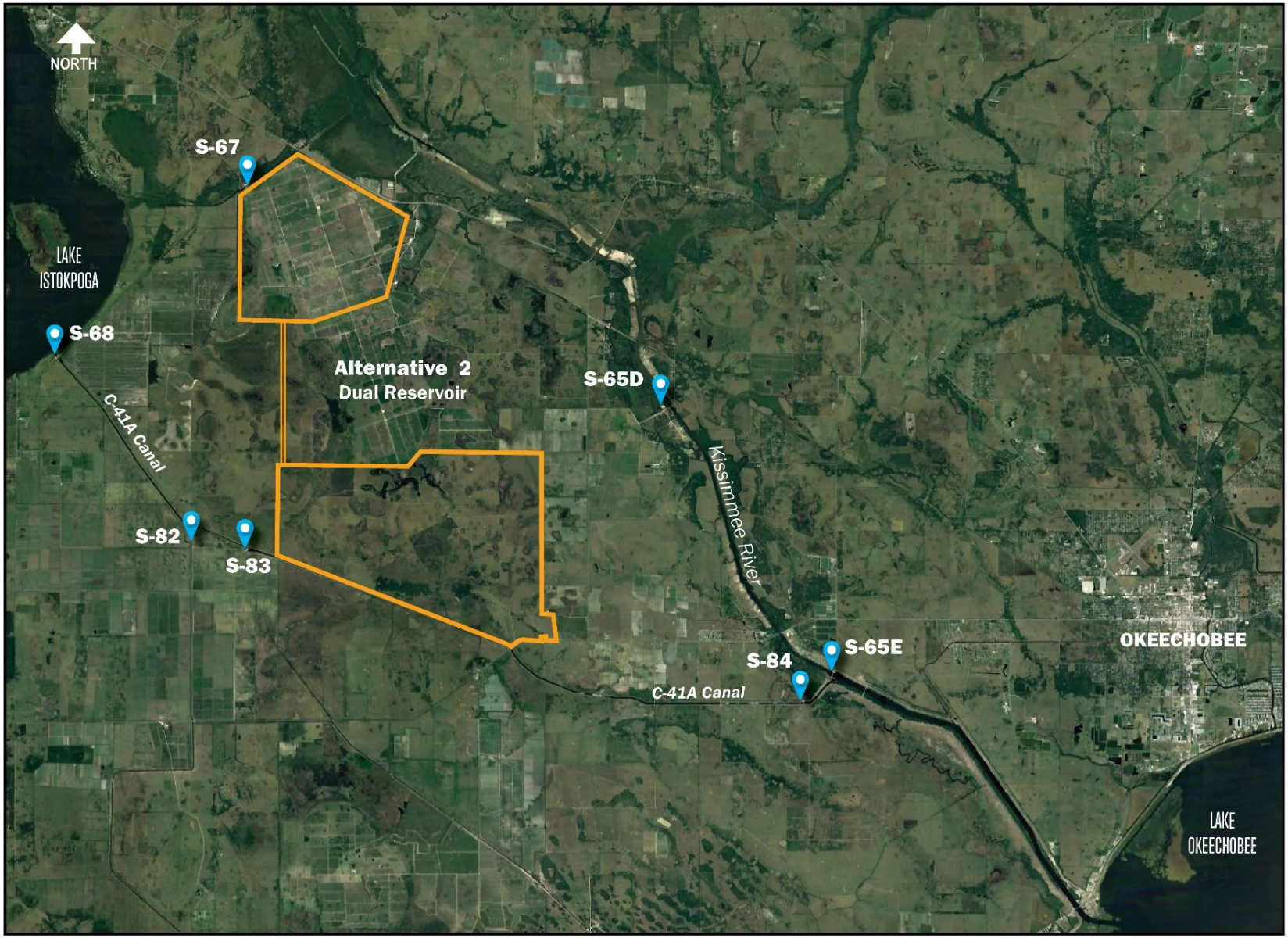


Figure 3-3. LOCAR Alternative 2.

3.2.3 Alternative 3

Alternative 3 has a capacity and operations similar to Alternative 1, but is configured north to south between the Istokpoga Canal and C-41A (**Figure 3-4**). The reservoir and its external features, including its perimeter canal and perimeter maintenance road, would encompass an area of approximately 14,900 ac. The reservoir's north and south storage cells would each have an average storage depth of approximately 15 ft at their normal full storage levels. The reservoir would include an interior divider dam with a 1,500-cfs, gated water-control structure and a 1,500-cfs pump station used to move water from the southern cell into the northern cell. A seepage canal would be constructed outside the perimeter dam.

Construction. The reservoir would be constructed with a perimeter dam having an average height of approximately 32 ft above the ground. The interior divider dam would have an average height of approximately 36 ft above the ground. The perimeter dam would be approximately 23 mi around, allowing for recreational opportunities. Three pump stations would be constructed and material from the Project footprint, connector canal, and the surrounding perimeter canal would be used to construct the dams.

Operations. Reservoir operations would be similar to Alternative 1, bringing water into and releasing water from the reservoir from/to C-41A. Unlike Alternative 2, this proposed configuration does not include a connector canal requiring pumping of water within the canal to utilize the full capacity of the reservoir.

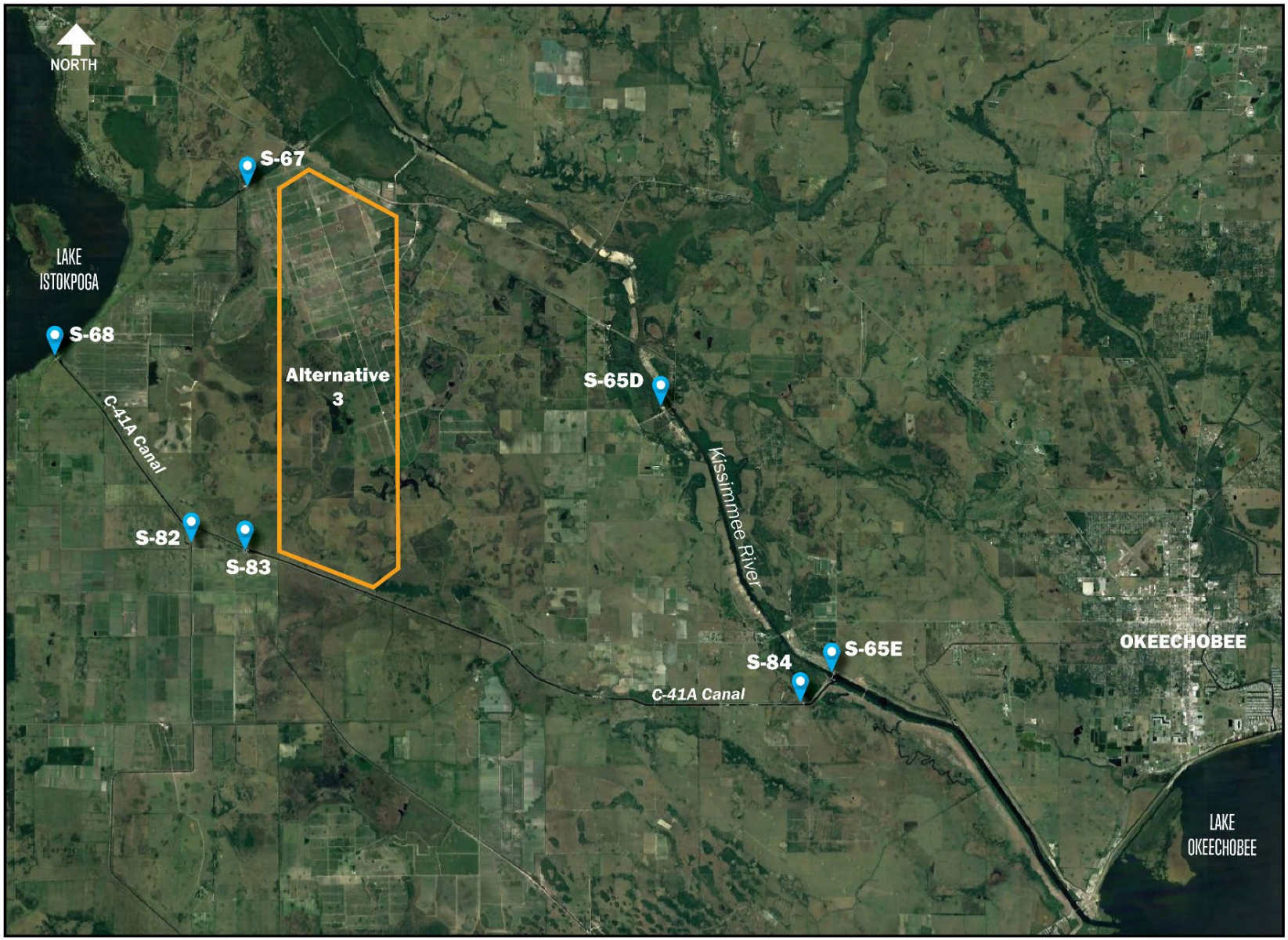


Figure 3-4. LOCAR Alternative 3.

3.2.4 Future Without Project

The FWO assumes CERP Component A would not be constructed, but includes other authorized CERP projects as well as other federal, state, and local projects constructed or approved under existing governmental authorities that occur in the Study Area. The FWO is consistent with the No Action Alternative described in the LOCAR EIS. It assumes the LORS is consistent with the CEPP EAA Reservoir Operation; completion of the Herbert Hoover Dike, Kissimmee River Restoration, Ten Mile Creek Reservoir, and STA; and 370,000 ac-ft of storage, which represents the increase in quantity of freshwater flowing into the historic Everglades flow path on an average annual basis with the authorized CEPP EAA project.

4.0 EVALUATION AND COMPARISON OF ALTERNATIVE PLANS

The evaluation and comparison of alternatives used the Principles and Guidelines criteria and the system of accounts (i.e., National Economic Development [NED], Environmental Quality [EQ], Regional Economic Development [RED], and Other Social Effects [OSE]). In accordance with the guidance provided in the 5 January 2021 Assistant Secretary of the Army (Civil Works) Policy Directive on Comprehensive Documentation of Benefits in Decision Document, alternatives are evaluated across a full array of benefits across these four accounts.

4.1 Principles and Guidelines Evaluation Criteria

The Principles and Guidelines criteria evaluated in this section include:

- **Effectiveness:** Extent to which an alternative plan contributes to achieving the planning objectives, alleviates specified problems, and achieves specified opportunities;
- **Acceptability:** Workability and viability of the alternative plan with respect to acceptance by state and local entities and the public and the extent to which the alternative plans are acceptable in terms of existing laws, regulations, and public policies;
- **Completeness:** Extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planning objectives and planned effects; and
- **Efficiency:** Extent to which an alternative plan is the most cost-effective means of achieving the objective, alleviating specified problems and realizing specified opportunities.

4.1.1 Effectiveness

An effective alternative achieves the specified objectives and alleviated problems where possible. The following sections summarize how each alternative carried forward (**Section 3.2**), and the FWO condition achieves the specified objectives defined in **Section 1.5.1.**

4.1.1.1 Objective 1: Improve Quantity, Timing, and Distribution of Flows into Lake Okeechobee to Maintain Ecologically Desired Lake Stage Ranges More Often

Frequent and prolonged high and low water levels in Lake Okeechobee impact lake ecology. High lake stages can cause extirpation or reduced growth of submerged plants, adverse impacts to germination of submerged plants, reductions in fish spawning and fish reproductive success, and shifts among species that comprise the macroinvertebrate community. Extreme high stage (i.e., above 17 ft National Geodetic Vertical Datum of 1929 [NGVD29]) can push turbid nutrient-laden water into the littoral zone, reducing littoral extent and changing vegetation communities in interior marshes. Low water levels impact both the lake ecosystem and water supply for existing legal users. Extreme low stage (i.e., below 10 ft NGVD29) can result in desiccation of the entire littoral zone, the shoreline fringing bulrush zone, and some of the lake area that would otherwise support submerged plants.

A variety of stage metrics are used to quantify the effectiveness for Lake Okeechobee stage improvements, including seasonal stage targets (i.e., an envelope of ecologically preferred stages),

moderate stage thresholds, extreme stage thresholds, and minimum flows and levels (MFL) exceedances. However, only stage envelope and extreme stage targets are quantified, relativized, and weighted to assess an overall ecological score. See **Appendix G** for additional information on performance metric calculation, weighting, and summary.

All the alternatives improve the duration of lake stages within the ecological envelope and reduce the frequency and duration of high stage exceedances (**Table 4-1**). There are slight increases in the frequency of low stages, though they are minimal compared to reductions of high stages. The combined, summary ecological scores are all approximately 12 points higher compared to the FWO, improvements of roughly 20 percent (**Table 4-2**). All alternatives effectively moderate or stabilize lake levels without comparative increases in low-stage events, demonstrating the utility of watershed storage.

Table 4-1. Lake Okeechobee Lake Stage Performance Metrics.

Lake Okeechobee Stage Levels (NVGD29)	FWO	Alternative 1	Alternative 2	Alternative 3
% Time inside Ecologically Preferred Stage Envelope (Seasonally Variable 11.5–15.5 ft)	22%	28%	28%	28%
% Time above Stage Envelope (Seasonally Variable >12.5–15.5 ft)	48%	41%	41%	41%
% Time below Stage Envelope (Seasonally Variable <11.5–14.5 ft)	30%	31%	31%	31%
% Time below Navigational Min. Stage (<12.56 ft)	27.2%	30.1%	29.6%	30.2%
% Time above Extreme High Stage (>17 ft)	2.1%	0.6%	0.6%	0.6%
% Time above Moderate High Stage (>16 ft)	10.3%	5.8%	5.8%	5.8%
% Time below Moderate Low Stage (<11 ft)	9.9%	10.3%	10.1%	10.3%
% Time below Extreme Low Stage (<10 ft)	3.05%	4.1%	4.0%	4.1%

Table 4-2. Lake Okeechobee Weighted Index Score.

Simulation	Lake Okeechobee Weighted Index Score (%)	% Improvement over FWO
FWO	60.9	N/A
Alternative 1	73.1	20.0
Alternative 2	73.4	20.5
Alternative 3	72.8	19.5

4.1.1.2 Objective 2: Improve Timing and Volume of Freshwater Flows from Lake Okeechobee to Improve the Salinity Regime and the Quality of Oyster, SAV, and Other Estuarine Community Habitats in the Northern Estuaries

High-volume and prolonged freshwater flows from Lake Okeechobee significantly alter salinity conditions in the Northern Estuaries. Sustained exposure to reduced salinity causes adverse effects on oyster reefs, juvenile marine fish, seagrass beds, and other submerged aquatic vegetation (SAV) in the Northern Estuaries, which all have unique salinity optima and tolerances (Haunert 1988; RECOVER 2020). Reducing the return frequency, timing, volume, and duration of Lake Okeechobee flows (and basin runoff) that are stressful or damaging to estuarine habitat will result in a more resilient ecological community.

Comparisons between the alternatives and Future Without Project (FWO) are listed for the St. Lucie Estuary (**Table 4-3**) and the Caloosahatchee Estuary (**Table 4-4**). Stressful (i.e., high) and damaging flows to the estuaries that result from Lake Okeechobee regulatory releases are improved and more evident when compared to the existing conditions baseline (see **Section 5**). Marginal differences in performance exist between alternatives for high and damaging flows from lake releases. As a result of this reduction in Lake Okeechobee Regulatory Releases, the tabulation of events by the RSM-basins model shows increases in the number of high and damaging flow events triggered by basin runoff. This is indicative of storage capacity because of the reservoir, but that during certain high precipitation or tropical storm events, basin runoff will still result in high and damaging freshwater inflow.

Compared to the FWO, low flow events in the St. Lucie Estuary and Caloosahatchee Estuary increase, as under certain scenarios during dry times water is held in the lake to reduce the percentage of time below the ecological stage envelope and the percentage of time below the extreme low stage. Low flows to the estuaries could have adverse impacts on a variety of estuarine species, including oysters and oligohaline-adapted organisms, if salinities exceed their optimal range.

Table 4-3. St. Lucie Estuary Alternative Performance.

Scenario	# of 14-day ma Low Flow Events <150 cfs	# of 14-day ma Optimal Flow Events ≥150 cfs and ≤1,400 cfs	# of 14-day ma Stressful (High) Flow Events ≥1,400 cfs and ≤1,700 cfs (from LOK)*	# of 14-day ma Stressful (High) Flow Events ≥1,400 cfs and ≤1,700 cfs (from Basin Runoff)*	# of 14-day ma Damaging Flow Events ≥1,700 cfs* (from LOK)*	# of 14-day ma Damaging Flow Events ≥1,700 cfs* (from Basin Runoff)*	# of 14-day ma Damaging Flow Events ≥1,700 cfs and ≤4,000 cfs	# of 14-day ma Damaging Flow Events ≥4,000 cfs
FWO	163	997	49	238	58	344	352	129
Alternative 1	209	1013	20	262	29	350	337	118
Alternative 2	208	1011	20	261	30	350	339	118
Alternative 3	210	1012	20	263	27	351	339	118

*Flow events triggered by either LOK (Lake Okeechobee Regulatory Releases) or basin runoff. Note: ma = moving average.

Table 4-4. Caloosahatchee Estuary Alternative Performance.

Scenario	# of 14-day ma Low Flow Events <750 cfs	# of 14-day ma Optimal Flow Events ≥750 cfs and ≤2,100 cfs	# of 14-day ma Stressful (High) Flow Events ≥2,100 cfs and ≤2,600 cfs (from LOK)*	# of 14-day ma Stressful (High) Flow Events ≥2,100 cfs and ≤2,600 cfs (from Basin Runoff)*	# of 14-day ma Damaging Flow Events ≥2,600 cfs* (from LOK)*	# of 14-day ma Damaging Flow Events ≥2,600 cfs* (from Basin Runoff)*	# of 14-day ma Damaging Flow Events ≥2,600 cfs and ≤4,500 cfs	# of 14-day ma Damaging Flow Events ≥4,500 cfs and ≤6,500 cfs	# of 14-day ma Damaging Flow Events ≥6,500 cfs
FWO	752	549	66	124	66	160	181	80	56
Alternative 1	586	688	42	153	55	179	179	75	64
Alternative 2	584	686	42	154	56	178	178	77	64
Alternative 3	586	689	41	154	55	179	178	76	64

*Flow events triggered by either LOK (Lake Okeechobee Regulatory Releases) or basin runoff. Note: ma = moving average.

4.1.1.3 Objective 3: Increase Availability of Water Supply to the Existing Legal Water Users of Lake Okeechobee

The overall objective of the CERP is to restore, preserve, and protect the central and south Florida ecosystem while providing for other water-related needs of the region. In the Lake Okeechobee Service Area (LOSA), water shortage restrictions primarily affect agricultural water users. Economic losses associated with water shortages depend not only on the number of shortages, but also on the severity and duration of the water use restrictions. The longer the restrictions are in place and the more severe the cutbacks, the more likely it is that crop yields will be reduced and the greater the expenses borne by users to manage the water shortages. Additionally, Lake Okeechobee is the back-up water supply to approximately 6 million people in the Lower East Coast Service Area.

The Lake Okeechobee Storage Reservoir Section 203 Study (LOCAR, Project, or Section 203 Study) provides the ability to store water when lake levels rise above those desirable for lake ecology. Water stored can be recovered during dry periods to assist in keeping lake levels within the ecologically preferred band, which is above water supply cutback trigger levels. Therefore, storage features that provide restoration benefits to the lake also improve water supply for existing legal users of Lake Okeechobee.

The Restoration Coordination and Verification (RECOVER) WS-1 Frequency and Severity of Water Restrictions for LOSA performance measure was used to calculate changes in water supply performance for each alternative. The severity score is developed based on the size of the largest monthly cutback during the water year. A score of “zero” means that the cutback is less than 18,000 ac-ft., and a score of “4” means that the cutback is greater than or equal to 150,000 ac-ft. The evaluation target for severity is that the cutback volumes during the worst month of the water restriction period in any year would be unlikely to cause economic losses. This is achieved when water shortage management cutback volumes in the worst month of a year with water restrictions are less than 18,000 ac-ft.

The water demand volume not met for the existing legal users in LOSA during the 8 years with the largest water shortage cutbacks is improved when comparing the Alternatives 1, 2, and 3 to the FWO condition, in 3 out of 8 water shortage years. However, water shortage cutback volumes are increased by the alternatives when compared to the FWO in 5 out of 8 years **(Figure 4-1)**.

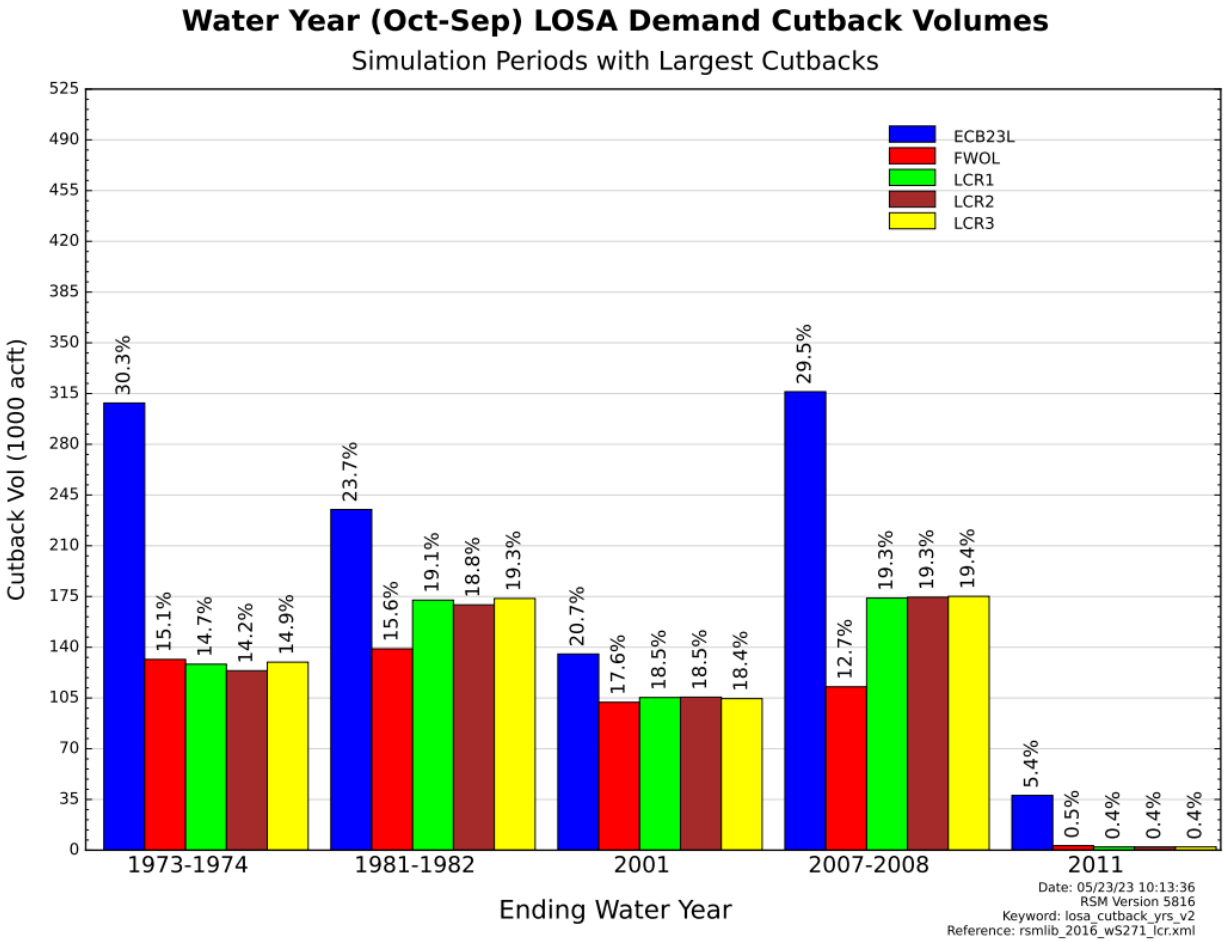


Figure 4-1. LOSA demand cutback volumes for the 5 years with the largest cutbacks.

The simulated Future Without Project condition (FWOL) assumes a LORS08-based schedule consistent with the current draft Project Operating Manual for the EAA Reservoir. However, recent project planning efforts have identified the LOSOM schedule as the successor to LORS08, and it is expected that future implementations of Lake Okeechobee regulation schedules will not return to LORS08-like protocols, but rather would continue to evolve the LOSOM-like operational mindset. To this end, a comparison set was developed and simulated to illustrate how the additional LOCAR storage features would help to improve a system using consistent LOSOM-like protocols. While the ECB23L and LCR1, LCR2, and LCR3 scenarios already used LOSOM protocols, the FWOL was updated for this exercise to a new scenario that incorporated LOSOM operations. This scenario is called FWOLL (Future Without LOCAR – LOSOM, released 7/25/23) and when compared to the ECB23L and LCR1 created a more consistent lake operational regime across the scenarios, thereby better illustrating the effects of LOCAR storage addition to the system. Due to the more intuitive nature of these comparisons and their better adherence to the latest operational mindsets, they were used extensively in the public engagement for LOCAR. Refer to the MDR report in **Appendix A, Annex A-2.4** for more information. When comparing Alternatives 1, 2, and 3 to the FWO condition updated to use LOSOM protocols (FWOLL), each alternative improves water supply and reduces water shortage cutbacks.

RECOVER's performance measure for water supply in LOSA (WS-1) quantifies the frequency and severity of water restrictions over the period of record (**Table 4-5**). Cutbacks are reduced by the three alternatives compared to the ECB condition. For example, a simulated cutback total of 1,335,000 ac-ft in the ECB condition is reduced to 734,000 ac-ft by Alternative 2, while the severity score is decreased from 31 to 17. Similar results were simulated for the other alternatives and therefore, the water supply improvements for the alternatives compared to the ECB condition, as quantified in RECOVER WS-1, satisfy Savings Clause requirements. The ECB can be used as a baseline performance in the Savings Clause analysis rather than the FWO, since LORS-08 is considered a non-CERP intervening project, as discussed further in **Annex B**. The severity, duration, and magnitude of water supply shortages (i.e., cutbacks) for existing legal users decrease with the Project when comparing alternatives to the ECB, which include LOSOM operations. Water supply is also improved when comparing each alternative to the FWO simulation using LOSOM (FWOLL), as discussed above and in the MDR report in **Appendix A, Annex A-2.4.**

Table 4-5. RECOVER WS-1 Frequency and Severity of Water Restrictions for LOCAR.

Simulation	Period of Record (POR)	Cutback Total (Thousand ac-ft, kaf)	Frequency	Severity Score	Number of Water Years with at Least One Cutback
ECB23L	1965–2016	1,335	13	31	13
FWOL	1965–2016	600	9	16	9
FWOLL	1965-2016	1,017	12	47	12
Alternative 1	1965–2016	753	10	18	10
Alternative 2	1965–2016	734	9	17	9
Alternative 3	1965–2016	755	10	18	10

4.1.2 Acceptability

Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, March 10, 1983, Section VI.1.6.2(c)(4)) and ER 1105-2-100, Planning Guidance Notebook, 22 April 2000, Section 2-3c.(2) define acceptability as the workability and viability of an alternative with respect to acceptance by federal, non-federal, state and local entities and the public and compatibility with existing laws, regulations, and public policies.

Two primary dimensions to acceptability are implementability and satisfaction. "Implementability" means that the alternative is feasible from a technical, environmental, economic, financial, political, legal, institutional, and social perspective. If it is not feasible due to any of these factors, then it cannot be implemented and, therefore, is not acceptable. Throughout the Project scoping and stakeholder outreach process, Project alternatives were discussed, and concerns were documented. All alternatives meet applicable laws, regulations, and public policies, and are considered acceptable. Modifications have been made throughout the planning process to increase acceptability. These modifications are documented in **Appendix E**.

The major categories considered for the acceptability criterion include:

- Tribal Acceptability: Effects and/or benefits to the two federally recognized Native American Tribes who have expressed interest in the Project, the Miccosukee Tribe of Indians of Florida (MTI) and Seminole Tribe of Florida (STOF), were considered during the evaluation of Project

alternatives. The Corps is engaging in government-to-government consultation with both Tribes. The following text summarizes acceptability considerations:

- MTI: No portion of the proposed action is located within or adjacent to known MTI-owned lands, reservation lands, or traditional cultural properties. Water quality is a major concern of the MTI.
- STOF: The STOF Brighton Reservation lands are south of LOCAR, so they are outside of the Project Area but within the larger Study Area. During government-to-government consultation, STOF representatives expressed concern about flooding and seepage and are interested in opportunities to improve their water supply reliability.

- Land ownership: SFWMD sought willing sellers, avoiding the need to implement eminent domain authority.

The acceptability considerations for each alternative were the same. The MTI and STOF support a northern reservoir to benefit Lake Okeechobee. However, mitigation may be required if there is any potential for flooding on their lands.

4.1.3 Completeness

A complete alternative provides and accounts for all necessary investments or other actions to ensure the realization of the benefits. Construction and operation of the Project would complete an essential component of CERP to benefit Lake Okeechobee. To maintain completeness and meet constraints during construction, an adaptive management plan will be required for any alternative suggested as the Recommended Plan.

Project benefits as described are based on assumptions of the completion of authorized CERP and related non-CERP projects, as described in the FWO condition defined in **Section 2.5**. As envisioned in CERP, LORS would be optimized to take advantage of the additional storage features, including the EAA Reservoir and LOCAR, to reduce high lake stages and improve optimal flows to the Northern Estuaries. Sensitivity analyses were performed to understand the effects of the Project with LOSOM operations, as described in **Appendix A, Annex A-2.4**.

The Project Team recognizes that LOCAR is not a mechanism for authorizing changes to LORS. Similar to CEPP, any proposed schedule optimizations would be recommendations to inform a future LORS study. Details of the modifications proposed by LOCAR are found in **Appendix A, Annex A-2.4**. All action alternatives are anticipated to provide environmental benefits with the current and future lake regulation schedules.

Based on the discussion above, all Project alternatives are considered complete, as they would implement an essential component of CERP and provide storage north of Lake Okeechobee. Storage options to the east, south, and west of the lake have already been authorized to provide benefits to the Northern Estuaries and Everglades. LOCAR would work in conjunction with authorized and future projects to benefit Lake Okeechobee.

4.1.4 Efficiency

A comparison of the benefits and costs of alternatives was conducted to ensure that the selected alternative would efficiently produce the desired environmental benefits. The measurement of efficiency is the extent to which an alternative is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the nation's environment.

The CE/ICA tool is used to evaluate and compare the production efficiency of alternatives. This identifies the plans that reasonably maximize ecosystem restoration, a key criterion to select the National Ecosystem Restoration (NER) plan. Cost-effectiveness analysis begins with a comparison of the costs and outputs of alternative plans to identify the least cost plan for every level of output considered. Alternative plans are compared to identify those that would produce greater levels of output at the same cost or lower cost than other alternative plans. Alternative plans identified through this comparison are the cost-effective alternative plans. Cost-effective plans are then compared by examining the additional (incremental) costs for the additional (incremental) amounts of output produced by successively larger cost-effective plans. The plans with the lowest incremental costs per unit of output for successively larger levels of output are the best buy plans. The results of these calculations and comparisons of costs and outputs between alternative plans provide a basis for addressing the decision question, "Are the additional outputs worth the costs incurred to achieve them?"

The CE/ICA analysis follows guidance from the Corps' Engineering ER 1105-2-100, Appendix E, Paragraph E-36. Costs are based initially on a planning-level estimate, and benefits are based on the habitat unit (HU) evaluation. As per this guidance, CE/ICA analysis compares the alternative plans' average annual costs against the appropriate average annual HU estimates. The average annual outputs are calculated as the difference between with-plan and without-plan conditions over the period of analysis.

4.1.4.1 Costs of Focused Array of Alternative Plans

Costs represent the difference between conditions without any plan (i.e., the "base condition" or "without project condition") and conditions with a plan or alternative. For purposes of this report and analysis, NED costs (as defined by federal and Corps policy) are expressed in FY2023 price levels. Costs of a plan represent the value of goods and services required to implement and operate/maintain the plan. The cost estimate for the alternatives includes construction; lands, easements; rights-of-way; relocation; preconstruction engineering and design (PED); construction management; and operation and maintenance, repair, replacement, and rehabilitation (OMRR&R). The cost estimate was developed through engineering design and cost estimation and real estate appraisal efforts. The costs listed in this section are planning level for comparison of alternatives. Costs will be refined on the selected plan as more design detail becomes available. For comparison to the action alternatives, the FWO condition cost is set to zero. However, the ecological improvements are associated with the completed projects described in **Section 2.5**. Each of these projects has an associated authorized project cost and costs that have already been incurred and cannot be recovered to obtain benefits in the FWO condition.

4.1.4.2 Overview of Real Estate Costs

An analysis of the real estate requirements was completed. Each parcel required for the Project was identified and a planning-level fee simple estimate was calculated. More detail on real estate is available in **Appendix D**.

4.1.4.3 Average Annual Costs

The timing of a plan's costs is important. Construction and other initial implementation costs cannot simply be added to periodically recurring costs for Project operation, maintenance, and monitoring if meaningful and direct comparisons of the costs of the different alternatives are to be made. A common practice of equating sums of money across time with their equivalent at an earlier point in time is the process known as "discounting." Through this mathematical process, which involves the use of an interest rate (or discount rate) officially prescribed by federal policy for use in water resource planning analysis (set at 4.75 percent at the time of the evaluation), the cost time streams for the alternatives were mathematically translated into an equivalent time basis value. There is some uncertainty as to how any of the alternatives would be implemented. It is recognized that any of the plans would likely be implemented over a considerable length of time. For purposes of this evaluation, construction costs are assumed to incur on an equal monthly basis during the implementation of the alternative plans and would be implemented with no fiscal appropriation constraints.

ER 1105-2-100 requires that interest during construction (IDC) be computed, which represents the opportunity cost of capital incurred during the construction period. IDC was computed for real estate, construction costs, and PED. IDC for construction and construction management assumed a 70-month, unconstrained construction timeline. IDC was computed for the total real estate cost starting from the month prior to construction commencing, amounting to a 121-month period. IDC for PED costs were calculated to reflect a 48-month period. These estimates are based on generalized construction schedules and assume that funding is readily available and land acquisition is completed before construction starts. The total first cost is the sum of construction and other capital costs, such as real estate and preconstruction. **Table 4-6** summarizes the total investment cost and average annual costs for the focused array of alternatives. Costs calculated below are planning level for the purposes of comparison of alternatives and will be refined for the Recommended Plan.

Table 4-6. Planning-level Total Project Costs (FY23 Price Level).

Item Description	Alternative 1	Alternative 2	Alternative 3
Cost Components			
Construction and Construction Management	$2,575,510,000	$3,832,450,000	$3,093,070,000
Lands	$131,642,000	$143,000,000	$163,900,000
Preconstruction Engineering and Design	$192,700,000	$286,740,000	$231,420,000
Total First Cost	$2,768,210,000	$4,119,190,000	$3,324,490,000
Interest During Construction Components			
Construction and Construction Management	$211,820,000	$315,200,000	$254,390,000
Lands	$7,250,000	$7,880,000	$9,030,000
Preconstruction Engineering and Design	$10,610,000	$15,790,000	$12,750,000
Total Interest During Construction	$229,680,000	$338,870,000	$276,170,000

Item Description	Alternative 1	Alternative 2	Alternative 3
Cost Components			
Total Project Investment (Total First Cost + Total Interest During Construction)	$3,129,532,000	$4,601,060,000	$3,764,560,000
Annualized Cost Components			
Interest and Amortization of Project Investment	$115,921,000	$170,427,000	$139,443,000
OMRR&R Storage Component	$6,471,400	$10,857,600	$9,058,400
Average Annual Cost	***$122,392,400***	***$181,284,600***	***$148,501,400***

4.1.4.4 Ecological Evaluation (Habitat Units)

The Project Team developed performance measures and a benefit model to evaluate alternatives. The primary areas evaluated included Lake Okeechobee and the Northern Estuaries. The Lake Okeechobee Stage Envelope and Extreme Stages performance measures and the Northern Estuaries Salinity Envelope performance measures used for the LOCAR planning effort were derived from those approved for use by RECOVER. A description of the performance measures used to quantify plan benefits is provided in **Appendix G, *Benefit Model*.**

Performance measure scores are displayed as a function of restoration potential or achievement of the target, with the minimum value of "zero" representing a fully degraded ecosystem and a maximum value of "100" representing the restoration target. Habitat suitability indices associated with each RECOVER performance measure were applied to the total spatial extent (acres) for each of the regions and summed to produce HUs. HU results are displayed in **Table 4-7.**

Table 4-7. Total HUs for Each Alternative Condition.

Project Region	ECB	FWO	Alternative 1	Alternative 2	Alternative 3
Total Lake Okeechobee	250,073	274,335	328,902	330,369	327,822
Caloosahatchee Estuary	35,817	53,884	57,217	57,195	57,129
St. Lucie Estuary	21,561	37,503	35,057	35,074	34,872
Total Northern Estuaries	57,378	91,387	92,274	92,269	92,001
Total HUs	307,451	365,722	421,176	422,638	419,823

Average Annual Habitat Units: The average annual HU outputs were calculated as the difference between the FWP and FWO conditions over the period of analysis (through year 2083). The base year for the period of economic analysis for LOCAR is the year 2033. The average annual HU lift is calculated by subtracting the FWO HUs from the FWP HUs for each year and averaging over the 50-year period of analysis. The anticipated time it will take to realize the benefits is necessary to calculate the average annual lift associated with each alternative. Since ecosystem restoration outputs are not monetary, they were not discounted.

Natural ecosystems are complex dynamic systems and the exact functional form of the relationship among variables is rarely, if ever, known. Central and south Florida ecosystems have been subject to extensive research and monitoring, and credible estimates of response times can be predicted based on how key ecosystem components have responded to varying hydrologic conditions. The rate at which

LOCAR benefits accrue over various time intervals, depending on the region, were estimated using these inferences. Linear interpolation was used as a simple method for inferring the rate at which benefits would accrue between those time intervals for two regions of the Study Area for both the FWP and FWO conditions.

Lake Okeechobee: Lake Okeechobee benefits are calculated using RECOVER-approved Lake Stage and Extreme Stage Performance Measures (PM). The Lake Stage PM looks at maintaining stages within a seasonally variable, ecologically preferred envelope of 11.5 to 15.5 ft NGVD29, and durations above and below the envelope are evaluated. The ecological envelope encompasses a range of stages that should result in increased spatial extent of bulrush along the western lakeshore; increased spatial extent of spikerush, beakrush, willow, and other native plants in the littoral zone; increased spatial extent of vascular submerged plants; a shift in taxonomic structure of zooplankton to better support fishery resources; increased diversity, distribution, and abundance of forage fish in the littoral and nearshore zones; and increased use of the littoral zone for wading bird foraging and nesting. The Extreme Stage PM considers durations of lake stages at extreme high (i.e., above 17 ft NGVD29) and extreme low stages (i.e., below 10 ft NGVD29).

Table 4-8 shows the Lake Okeechobee HUs for each alternative in the focused array. The two performance measures (four metrics) are relativized, weighted, and combined to calculate HUs for the lake. All three alternatives provide improvement over the FWO condition; however, Alternative 2 provides a slightly higher lift.

Table 4-8. Combined Lake Okeechobee HUs.

Condition	Total LOK HUs	Potential Lift (HUs)	% Increase from FWO
FWO	274,335	N/A	N/A
Alternative 1	328,902	54,568	19.9
Alternative 2	330,369	56,034	20.4
Alternative 3	327,822	53,487	19.5

The Lake Okeechobee AAHU lifts were calculated as the difference between the FWP and FWO conditions over the period of analysis (through year 2083). For the FWO condition, a straight trajectory between existing and FWO HUs was assumed to establish HU totals for each site and year.

The FWP HU trajectory was modeled to reflect the timeline of expected restoration effects. Lake Okeechobee HUs for each alternative are assumed to reach 25 percent potential 2 years following construction completion, 50 percent potential at 5 years, 60 percent potential at 10 years, and 100 percent potential 25 years following construction completion. At that point, the full potential of HUs will be realized for the remainder of the period of analysis. For the FWO, a straight HU trajectory was assumed between base year HUs and that at the end of the period of analysis. **Figure 4-2** and **Table 4-9** show the trajectory of Lake Okeechobee HUs for each alternative over the period of analysis, starting at an existing condition of 250,073 in 2033.

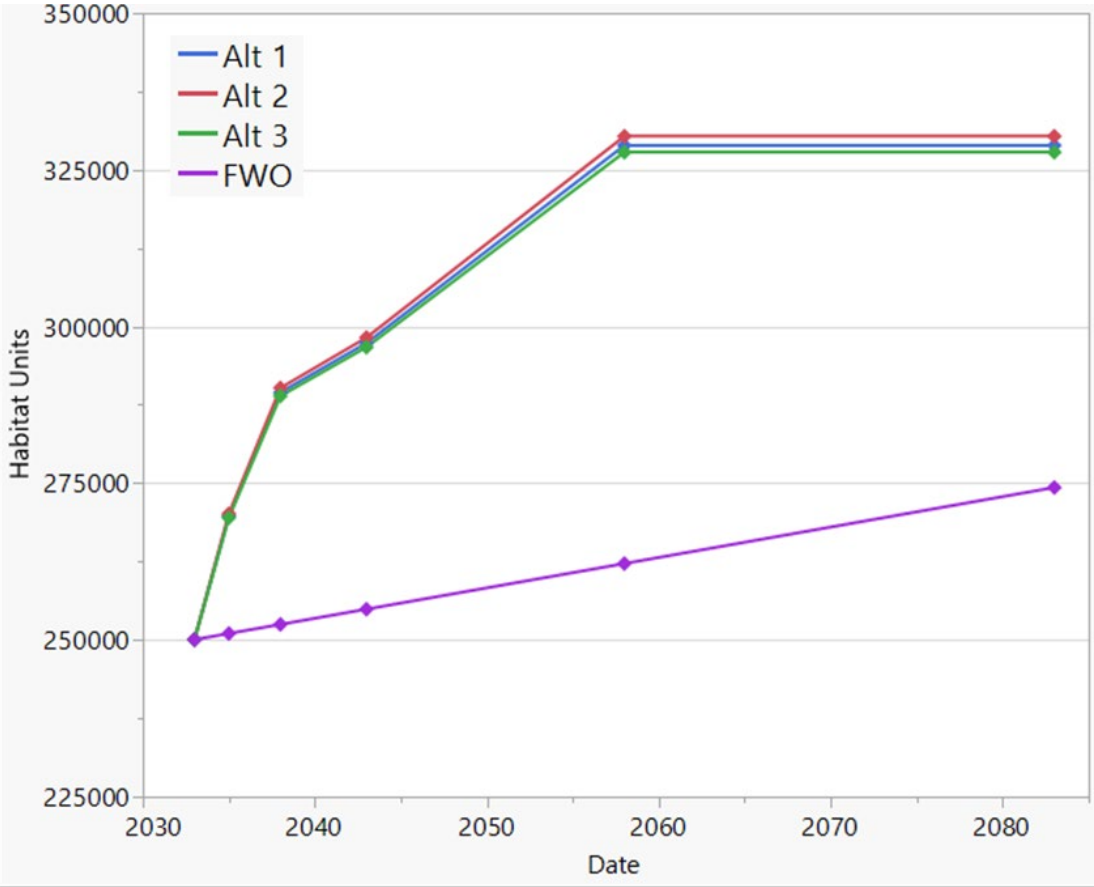


Figure 4-2. Lake Okeechobee HU trajectory.

Table 4-9. Summary of Lake Okeechobee HU Trajectory by Alternative.

Alternative	ECB LOK HUs (2033)	FWP LOK HUs (2035)	FWP LOK HUs (2038)	FWP LOK HUs (2043)	FWP LOK HUs (2058)	FWP LOK HUs (2083)	Average Annual LOK HU Lift (from ECB)
FWO	250,073	251,043	252,499	254,925	262,204	274,335	485
Alternative 1	250,073	269,780	289,488	297,370	328,902	328,902	1,577
Alternative 2	250,073	270,147	290,221	298,251	330,369	330,369	1,606
Alternative 3	250,073	269,510	288,948	296,722	327,822	327,822	1,555

The AAHUs for Lake Okeechobee are combined with the Northern Estuaries HUs for the storage CE/ICA. The CE/ICA is evaluated in **Subsection 4.1.4.6**.

Northern Estuaries: The primary areas evaluated in the Northern Estuaries are: 1) St. Lucie River and Indian River Lagoon (SLE) and 2) Caloosahatchee River and Estuary (CRE). Performance measures within the Northern Estuaries were used to evaluate salinity improvements over available Eastern oyster habitat from resulting flow volumes over water control structures. Within the CRE, evaluations were based on freshwater flows at the S-79 structure. Within the SLE, evaluations were based on freshwater flows at the S-80, S-48, S-49, and Gordy Road structures. RECOVER's Salinity Envelope Performance Measure (RECOVER 2020) provides Optimal Flow targets (in cubic feet per second [cfs]) for each of the estuaries: 14-day moving average (ma) flows 150 to 1,400 cfs for the SLE, and 14-day ma 750 to 2,100 cfs for the

CRE. It also includes flow bin(s) below the Optimal Flows (i.e., low flows), and above the Optimal. Those above Optimal are categorized as either stressful flows (in some figures referred to as "high flows"), or damaging flows. See RECOVER (2020) for detailed descriptions, definitions, and modeled salinity for each flow category, and **Section 4.1.1.2** and **Section 5** for LOCAR performance results. **Table 4-10** shows the combined Northern Estuaries HUs. See **Appendix G** for a detailed description of how the HUs are derived. Raw scores from the RSM-BN, which includes counts of 14-day ma flow events in Low, Optimal, Stress, and Damaging Flows (RECOVER 2020) modeled over the period of simulation, were normalized to scores from zero percent (worst performance) to 100 percent (best performance). The performance measures for each estuary were assumed of equal value and averaged, then multiplied by the extant oyster reef habitat (434 ac for SLE and 980 ac for CRE) to calculate HUs.

Table 4-10. Combined Northern Estuaries HUs for the Focused Array of Alternatives.

Region	ECB	FWO	Alternative 1	Alternative 2	Alternative 3
Caloosahatchee HUs	35,817	53,884	57,217	57,195	57,129
St. Lucie Estuary HUs	21,561	37,503	35,057	35,074	34,872
Overall Northern Estuaries HUs	57,378	91,387	92,274	92,269	92,001
Potential Lift from FWO	N/A	N/A	887	882	614
Potential Lift from ECB	N/A	34,009	34,896	34,891	34,623

The Northern Estuaries lifts were calculated as the difference between the FWP and FWO, and between FWP and ECB over the period of analysis.

The best performing LOCAR alternative is Alternative 1, but it is only marginally better than Alternative 2 (a difference of five HUs). Compared to the ECB, Alternative 1 has a potential lift of 34,896 HUs, and 887 HU lift compared to the FWO. The CE/ICA is evaluated in **Subsection 4.1.4.6.**

4.1.4.5 Summary of Alternative Performance

Lake and estuary HUs were assumed of equal value and summed. Alternative 2 provides the most total HUs (including Lake Okeechobee and Northern Estuaries), followed by Alternative 1, which were both best buy alternatives. Alternative 3 was found to be not cost effective. All alternatives provide a lift in HUs over the FWO. **Figure 4-3** provides AAHU when considering the ecological response times of both regions described above.

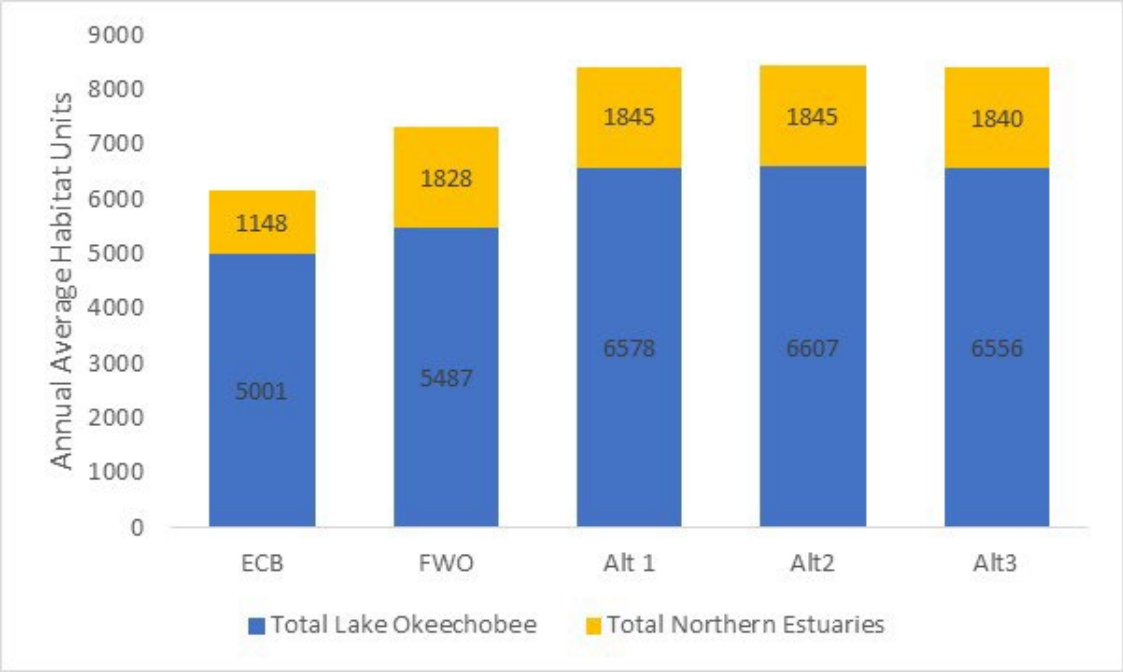


Figure 4-3. AAHU by alternative.

4.1.4.6 Cost-effectiveness and Incremental Cost Analysis

The Lake Okeechobee and Northern Estuaries benefits were calculated as the difference in AAHU between the FWP and FWO over the period of analysis (through year 2083). Each alternative's lift over the FWO was used to determine the best buy alternative.

For the incremental cost analysis, only the cost-effective plans are arrayed by increasing output to show changes in cost (i.e., marginal cost) and changes in output (i.e., marginal output) of each cost-effective alternative plan compared to the FWO condition cost, which is set to "zero." The IWR Planning Suite results are summarized in **Table 4-11**.

Table 4-11. IWR Planning Suite Summary.

	ECB	FWO	Alternative 1	Alternative 2	Alternative 3
Annual Average Habitat Units	6,149	7,314	8,424	8,453	8,396
Difference from FWO	-	-	**1,109 (+13%)**	**1,138 (+14%)**	**1,082 (+13%)**
Annual Average Cost*	-	-	**$122,392,400**	**$181,284,600**	**$148,501,400**
Cost per Habitat Unit	-	-	**$110,363**	**$159,301**	**$137,247**
Outputs	-	-	**Best Buy**	**Best Buy**	**Not Cost Effective**

*These costs are planning level for the purposes of comparison of alternatives.

Two best buy plans were identified because of higher benefits produced by Alternatives 1 and 2. However, the difference between Alternative 1 and Alternative 2 HUs was not significant enough to justify the cost increase between Alternatives 1 and 2. Alternative 1 is considered the NER plan because of the benefits to Lake Okeechobee and Northern Estuaries.

4.2 Sea Level Change Considerations

According to Corps' ER 1100-2-8162 dated December 31, 2013, potential relative sea level change (SLC) must be considered in every Corps coastal activity as far inland as the extent of estimated tidal influence. Research by climate science experts predicts continued or accelerated climate change for the twenty-first century and possibly beyond, which will cause a continued or accelerated rise in global mean sea level. In the case of LOCAR, alternatives have been formulated considering the entire range of possible future rates of SLC, represented by three scenarios of "low," "intermediate," and "high" SLC. The analysis of these three scenarios is provided in **Annex H**.

It is assumed that SLC will affect all alternatives. The three projected SLC trends range 0.26 to 1.29 ft by 2050 (FWO) and 1.02 to –10.06 ft by 2150 (100 years). SLC can cause a number of impacts in coastal and estuarine zones, including changes in shoreline erosion, inundation, or exposure of low-lying coastal areas, changes in storm and flood damages, shifts in the extent and distribution of wetlands and other coastal habitats, changes to groundwater levels, and alterations to salinity intrusion into estuaries and groundwater systems (Climate Change Science Program 2009). For the purposes of the LOCAR Project, the impact analysis was consistent with work performed for the LOWRP.

4.2.1 Estuary Impacts

SAV that are important in the South Indian River Lagoon (i.e., the portion of the Indian River Lagoon under the jurisdiction of the SFWMD) include Johnson's seagrass, paddle grass, star grass, shoal grass, Widgeon grass, manatee grass, and turtle grass. Tape grass is a freshwater and oligohaline SAV species in the upper Caloosahatchee Estuary and historically occurred as well-defined beds in shallow water (i.e., less than 1 m). Shoal grass, turtle grass, and manatee grass are the most common higher-salinity seagrasses in the Caloosahatchee Estuary.

Although there are species-specific variations, SAV distributions are generally limited by four environmental factors: light, salinity, temperature, and nutrients (Dennison et al. 1993; Kemp et al. 2004). The LOCAR Project SLC analysis focused on light and salinity factors, as it is assumed that increased water depths and associated reduced light, along with increased salinity, resulting from SLC would impact SAV distribution, health, and abundance throughout the Northern Estuaries. Changes in temperature and nutrient loading could certainly be affected by SLC, but uncertainty is much higher in these categories.

4.2.1.1 Light

Light has been recognized as the primary limiting factor controlling the lower depth limit of SAV. Light requirements are typically determined by evaluating the species-specific needs of individual plants coupled with the maximum depth distribution of a given species. SAV responses to the light regime include changes in areal extent, shoot density, blade length and width, carbon uptake, chlorophyll composition, and above- and belowground biomass. Freshwater flows from Lake Okeechobee, along with increased water depths associated with SLC, impact timing and duration of light quality and quantity.

The maximum water depths at which seagrasses will grow in the Northern Estuaries is 1.7 m (Virnstein and Morris 1996). Under various SLC scenarios, this depth would be surpassed (see **Annex H** for projected SLC trends). There is a potential for SAV to migrate farther upstream, but migration would be limited by

seawalls and other structures. Therefore, it is likely that SAV habitat will be reduced under all alternatives by limited light availability due to increased water depths from SLC.

4.2.1.2 Salinity

SLC will likely increase salinity in the Northern Estuaries. Salinity affects SAV growth, which may be seen in a phenotypic response by individual plants. For example, Montague and Ley (1993) found that SAV biomass was strongly correlated to the variance in salinity, with biomass decreasing as salinity variation increased. This is important as timing of freshwater flows from Lake Okeechobee may result in salinity fluctuations, which may, in turn, restrict SAV growth rates.

In the upper estuary, the naturally occurring grass species *Vallisneria americana* will not survive prolonged periods of elevated salinity. *Halodule wrightii* persists in areas with high variation in salinity. *Thalassia testudinum* and *Syringodium filiforme* will not tolerate prolonged periods of reduced salinity as a result of manipulated water flow and persist in areas with relatively low variation in salinity. Recent work in the Loxahatchee River has shown that low minimum daily salinity and high salinity fluctuation resulted in significant losses of *S. filiforme* (Ridler et al. 2006). Nonetheless, *H. wrightii* persisted throughout these same conditions.

For example, during drought conditions, the retention of freshwater in the upper Caloosahatchee River (i.e., above S-79) may result in salinities reaching a point that the extant populations of the freshwater SAV *V. americana* are extirpated from the lower river. Alternatively, the flow of additional freshwater during El Niño events may result in freshening the river to a point that downstream euryhaline SAV species are negatively impacted.

In some cases, increased salinity resulting from SLC may counteract some of the higher flows from Lake Okeechobee that reduce seagrasses in the estuaries. Under higher SLC projections, there may be a shift to salinity tolerant SAV species in the Northern Estuaries.

4.2.2 Inland Impacts

Although all the management measures proposed for the LOCAR Project are inland, far from the coastline, there could be indirect effects to the Project relative to tidally influenced Lake Okeechobee outlet structures S-79 in the west (Caloosahatchee River) and S-80 in the east (St. Lucie River). It is assumed that SLC will have limited impacts on Lake Okeechobee or the watershed due to these outlet structures that would limit saltwater intrusion to the center of the state, depending on the projected SLC trends (see **Annex H** for more detail). However, increased sea level is likely to cause increased saltwater intrusion into coastal freshwater supply well fields. In response, urban and agricultural water users may need to seek alternative water supplies to shift water supplies from the traditional groundwater sources or invest in new treatment systems. The degree to which Project water reservations will protect natural system water supplies has not been tested in this manner, so it presents a risk to Project benefits.

4.2.3 Sea Level Change Summary

Since no increase in surface water stages within the Caloosahatchee and St. Lucie Inlet were modeled with the implementation of any alternatives, habitat loss for FWO is assumed to be similar to the FWP condition for all alternatives. Saltwater intrusion would potentially affect water supply benefits of all alternatives. Flexibility in the design and operation of features for any alternative can be incorporated into the Project

during the planning phases to reduce impacts of SLC on Project benefits. For instance, during dry times, supplemental water could be released from Lake Okeechobee to the Northern Estuaries to maintain salinity levels optimum for estuary health. Any operational modifications to address SLC should be considered as part of any future updates to the Lake Okeechobee operations schedule.

It is important to note that scientific unknowns present a significant source of uncertainty in the effects and timing of impacts from SLC. It is unclear how quickly and successfully natural area habitat and species can transition or adapt to the range of potential future conditions anticipated due to ongoing and accelerating global climate change.

The most significant uncertainties associated with the SLC impacts on alterative benefits are: 1) the lag time between when estuaries become substantially impaired due to salinity impacts and when the transition estuarine habitat becomes fully productive, and 2) the degree to which Project-related water reservations will protect natural system water supplies, given SLC-related demand from the developed areas. That the Northern Estuaries are highly urbanized, with much of their shorelines hardened by seawalls or other structures, could exacerbate potential impacts related to SLC.

4.3 Summary of Comprehensive Benefits

Upon identification of the focused array of alternatives, each alternative plan and the FWO were evaluated to identify the expected effects on the environment, the economy, and society, and how well each plan met project objectives and avoided constraints.

These are the four accounts that were evaluated:

- NED: Net value of the national output of goods and services;
- RED: Regional economic activity;
- EQ: Non-monetary effects on significant natural and cultural resources; and
- OSE: Societal and individual health and human safety.

4.3.1 National Economic Development

NED benefits are defined as increases in the economic value of the goods and services that result directly from a project. These benefits are national in perspective. Benefit categories considered by the analysis include recreation, water supply, and flood control. These three categories represent important national considerations; however, the primary consideration of LOCAR is ecosystem restoration.

While selecting a plan is predicated on the degree and significance of environmental restoration efforts, the health of the environment has a correlation with economic and social wellbeing. The environmental restoration efforts of LOCAR are expected to improve conditions in the Study Area, which will lead to both direct and indirect economic benefits to commercial fisheries, property value, tax revenue, tourism, and other significant economic sectors. It is recognized that further actions are needed to achieve the restoration envisioned in CERP, which will have a direct correlation to the economic and social wellbeing of central and south Florida.

Recreation: The effect of the proposed alternatives on outdoor recreation has been evaluated in **Section 5**, as required under the federal Water Project Recreation Act of 1965, as amended. This Project

complies with the goals of the act. This Project would not adversely affect existing recreational opportunities; in fact, it would increase access for recreation by converting private lands to public for the purposes of water storage. The FWO condition assumes that, as private land, the Project Area reduces or restricts environmentally based recreation activities. There is a minimal expected difference in recreational benefits across alternatives.

Water Supply: Increasing water supply availability for existing legal users within LOSA is an objective of LOCAR. There is also a legal requirement to evaluate impacts on legal water users and provide replacement sources of water of comparable quantity and quality if any adverse impacts are identified. As the purpose of the CERP is to restore, preserve, and protect the central and south Florida ecosystem while providing for other water-related needs of the region, LOCAR is expected to improve water supply availability to existing legal users. All action alternatives slightly decrease total cutback volumes when compared to the ECB and FWO when the FWO condition is simulated using LOSOM, as described above. The alternatives also lower the frequency and severity of water restrictions, as described in **Subsection 4.1.1.**

Flood Control: Flood control is a constraint of the Project and, while no additional benefits are realized, all action alternatives and FWO condition would maintain the current level of service for flood protection.

Navigation: No impacts to Lake Okeechobee navigation would be realized with the implementation of any alternative or the FWO condition.

4.3.2 Regional Economic Development

All action alternatives are anticipated to provide RED benefits due to creation of additional jobs, although negative RED impacts include the loss of ad valorem tax revenue to county governments in Highlands County, where land acquisition will take place. The FWO is assumed to provide no additional RED benefits or negative impacts and is not included in the tables below. The construction of any recommended features would have a beneficial effect on employment and demand for local goods and services during the construction period. The Civil Works Regional Economic System (RECONS) Program was used to estimate direct and total job creation, as well as gross regional product (GRP) by locality. RECONS is a regional economic impact modeling tool that was developed to provide accurate and defendable estimates of regional economic impacts associated with Corps spending. While RECONS incorporates impact area data, as well as multipliers, direct ratios (e.g., jobs to sales, income to sales, etc.) and geographic capture rates were extracted from the economic models performed for different Corps projects. **Table 4-12**, **Table 4-13**, and **Table 4-14** display the expected increase in jobs stemming from construction, construction management, and PED for each alternative, as well as the consequent increase in GRP. Increase in GRP is set to a 50-year period of analysis. Annual O&M benefits are displayed in **Table** 4-15**, Table 4-16,** and **Table 4-17**. In addition, if recreational features are included, it is anticipated that some lasting benefits would accrue to the area as a result of additional recreational use and the associated economic activity.

Table 4-12. Alternative 1 RED Construction, Construction Management, and PED Benefits.

Region	Direct Jobs	Total Jobs	Total GRP
Local	23,535	31,453	$1,866,928,607
State	26,440	41,430	$3,075,157,764
National	27,618	51,049	$4,417,517,479

Table 4-13. Alternative 2 RED Construction, Construction Management, and PED Benefits.

Region	Direct Jobs	Total Jobs	Total GRP
Local	42,516	56,220	$3,444,513,489
State	47,247	70,908	$5,313,514,468
National	49,270	84,716	$6,949,482,059

Table 4-14. Alternative 3 RED Construction, Construction Management, and PED Benefits.

Region	Direct Jobs	Total Jobs	Total GRP
Local	34,314	45,374	$2,779,976,318
State	38,132	57,228	$4,141,510,475
National	39,764	68,372	$5,608,744,343

Table 4-15. Alternative 1 RED O&M Annual Benefits.

Region	Direct Jobs	Total Jobs	Total GRP
Local	27	42	$2,997,105
State	37	71	$6,572,319
National	37	89	$9,301,601

Table 4-16. Alternative 2 RED O&M Annual Benefits.

Region	Direct Jobs	Total Jobs	Total GRP
Local	45	70	$3,039,399
State	62	120	$11,026,920
National	63	149	$15,606,062

Table 4-17. Alternate 3 RED O&M Annual Benefits.

Region	Direct Jobs	Total Jobs	Total GRP
Local	38	58	$4,195,225
State	52	100	$9,199,662
National	52	124	$13,020,000

Negative RED impacts include the loss of ad valorem tax revenue to Highlands County government where land acquisition would take place. For the RED analysis, 2023 ad valorem tax data were used to assess initial impacts of land acquisition to the county. **Table 4-18** presents 2023 ad valorem tax data for property parcels in Highlands County that overlap proposed Project feature boundaries, where acquisition of land would occur.

Table 4-18. Maximum 2023 Forfeit Ad Valorem Tax Revenue for Highlands County for LOCAR Alternatives (Land Value Only).

Alternatives	Total Parcel Acres	Private Parcel Acres	2023 Ad Valorem Taxable Land Value
Alternative 1	13,000	13,000	$1,979,000
Alternative 2	21,000	21,000	$3,197,000
Alternative 3	16,000	16,000	$2,435,000

4.3.3 Environmental Quality

The EQ account is used to present non-monetary effects on ecological, cultural, and aesthetic resources, including the positive and adverse effects of ecosystem restoration plans. Lake Okeechobee and the Northern Estuaries benefits are described in **Subsection 4.1.1.** The environmental effects for the

alternatives compared to the FWO are displayed in **Section 5**. For the purposes of this section, three major environmental impact categories were considered in evaluating and comparing alternatives: effects to T&E species, effects to fisheries resources, and wetland impacts (**Table 4-19**). Impacts and benefits to these resources are discussed further in **Section 5** and **Appendix C**.

Regarding effects to T&E species, all three alternatives are similar. All three alternatives have critically endangered Florida grasshopper sparrow habitat within their footprint. All three alternatives would be expected to benefit fishery resources. Intake locations are considered high risk for fisheries. All three alternatives would also impact wetlands to varying amounts based on existing land uses.

Table 4-19. Summary of Environmental Quality Considerations.

Criterion	FWO	Alternative 1	Alternative 2	Alternative 3
Effects to Threatened and Endangered Species	Continued loss of habitat and population decline.	Alternative 1 may affect, but is not likely to adversely affect threatened and endangered (T&E) species. These effects would be expected from the conversion of crop and pastureland and other vegetation communities to an aboveground reservoir. A number of federally threatened, endangered, and candidate species may utilize or occur within the Study Area, including, but not limited to, the Florida panther, Florida manatee and its critical habitat, Florida bonneted bat, eastern black rail, Everglade snail kite and its critical habitat, Audubon's crested caracara, Florida grasshopper sparrow, wood stork, Eastern indigo snake, Okeechobee gourd, smalltooth sawfish and its critical habitat, green sea	Alternative 2 may affect, but is not likely to adversely affect some T&E species. These effects would be expected from the conversion of crop and pastureland and other vegetation communities to an aboveground reservoir. However, 30 percent of Alternative 2 land cover is tree crop, where T&E species habitat would not be expected to occur.	Alternative 3 may affect, but is not likely to adversely affect some T&E species. These effects would be expected from the conversion of crop and pastureland and other vegetation communities to an aboveground reservoir. However, 47 percent of Alternative 3 land cover is tree crop, where T&E species habitat would not be expected to occur.

Criterion	FWO	Alternative 1	Alternative 2	Alternative 3
		turtle, hawksbill sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, and loggerhead sea turtle.		
Effects to Fisheries Resources	Further reduction in fisheries habitat function is plausible, likely resulting in a decrease in the abundance and diversity of fisheries resources on non-protected lands.	Aboveground storage intake location considered to be high risk for fisheries.	Intake location considered to be high risk for fisheries.	Aboveground storage intake location considered to be low risk for fisheries.
Wetland Impacts	A portion of wetland soils located in the area could be altered as a result of future development. Wetland soils would be drained and/or displaced with fill materials to support the urban development.	A total wetland area is 2,920 acres (ac). 30 percent of wetland area is above ground impoundment (AGI) ponds.	A total wetland area is 3,904 ac. 60 percent of wetland area is AGI ponds.	A total wetland area is 2,592 ac. 50 percent of wetland area is AGI ponds

4.3.4 Other Social Effects

The primary purpose of LOCAR is to identify alternatives that will improve the ecologic conditions of Lake Okeechobee and the Northern Estuaries. There are also other social effects and benefits of this Project, including economic and recreational opportunities.

Life Safety: Life loss estimates are largely based on societal risk, which considers the loss of life to the overall number of people that are present in the flood zone, known as the downstream population at risk (PAR). The PAR comprises residents, local work force, and transient or recreational populations. Societal risk is used to represent society's general perception that probability of high life-loss consequences must be remediated. Planning-level breach assessments confirm that the probability of a breach is extremely low due to robust design criteria of modern design standards.

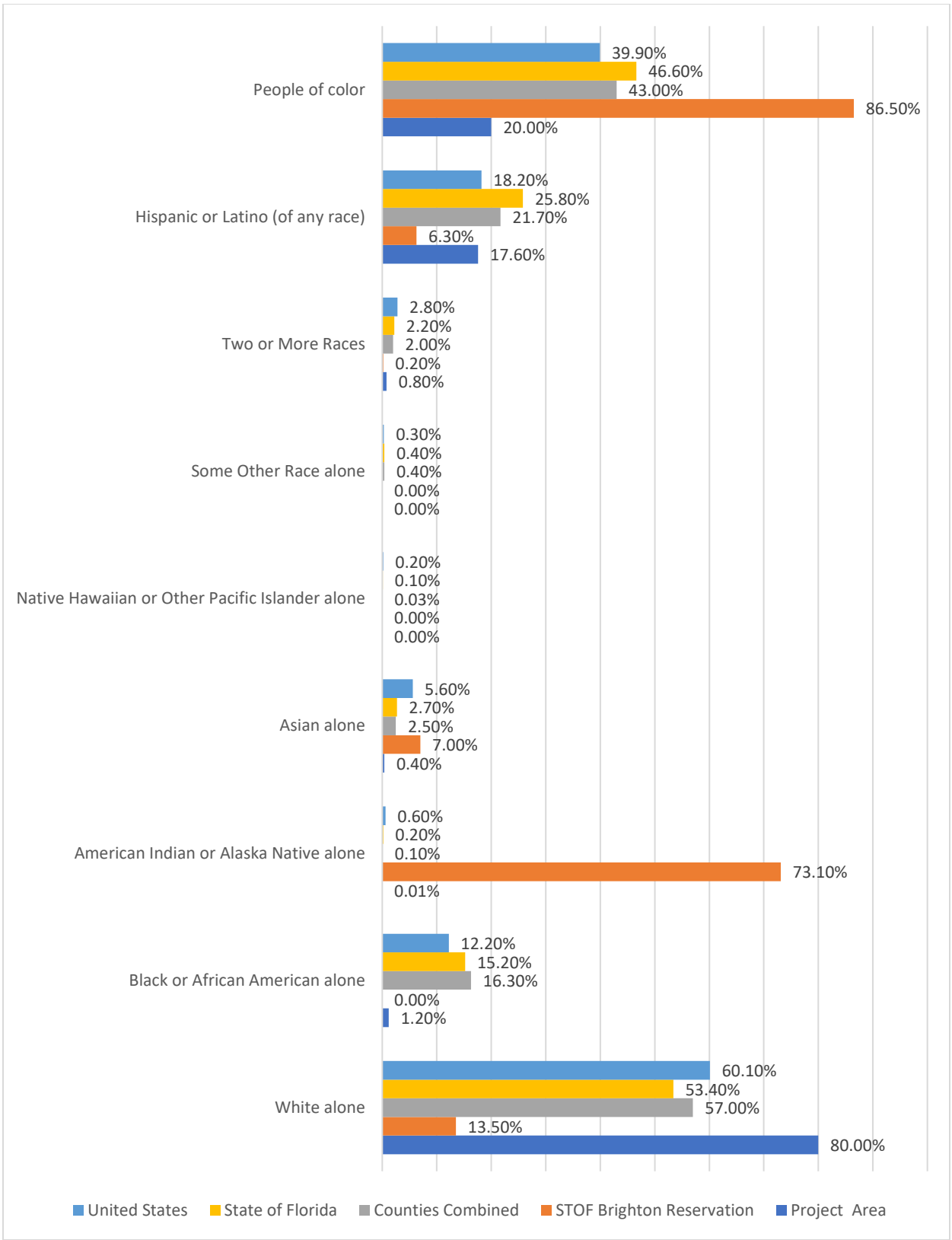
Prime and Unique Farmland: The Farmland Protection Policy Act, 7 U.S.C. Section 4201, finds that the nation's farmland is a unique natural resource and provides food and fiber necessary for the continued welfare of the people of the U.S. The act requires the Secretary of Agriculture to report the effects, if any, of federal programs, authorities, and administrative activities with respect to the protection of U.S. farmland. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Prime farmland is also used as cropland, pastureland, rangeland, forestland, or other land, but cannot be used as urban developed land. According to 7 CFR 657.5, unique farmland is land other than prime farmland that is used for the production of

specific high-value food and fiber crops. Most of the land in central and southern Florida used for agricultural production has been designated unique farmland. Coordination with NRCS during the PED phase will determine if additional analysis is needed. Refer to **Appendix C.4** for more information.

Environmental Justice: EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, and EO 14096, *Revitalizing Our Nation's Commitment to Environmental Justice for All,* requires the federal government to achieve environmental justice by identifying and addressing high, adverse, and disproportionate effects of its activities on communities with environmental justice concerns (which includes communities with a significant proportion of people in poverty, or with a significant proportion of people of color [referred to as "minority populations" in EO 12898]). It requires the analysis of information, such as the race, national origin, and income level, for people in areas expected to be impacted by environmental laws, regulations, and policies. It also requires federal agencies to identify the need to ensure the protection of populations relying on subsistence consumption of fish and wildlife, through analysis of information on such consumption patterns and the communication of associated risks to the public.

The communities surrounding Lake Okeechobee include a range of groups in terms of race and income. For the environmental justice demographic analysis, data from 2020 census tracts within a 2-mi radius of proposed LOCAR features in the focused array of alternatives are included. As displayed in **Figure 4** and listed in **Table 4-20** through **Table 4-24**, communities with people of color and low-income populations are in the Study Area. **Table 4-20** lists race and ethnicity data for the census tracts in or adjacent to the Project Area, and **Table 4-21** displays the racial demographic summary of STOF Brighton Reservation, the counties in the Study Area, Florida, and U.S.

Per CEQ's 2023 *Environmental Justice Guidance under the National Environmental Policy Act*, minority populations should be identified where either the minority population of the affected area exceeds 50 percent or the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. Following the guidance in the 2016 *Promising Practices for EJ Methodologies in NEPA Reviews* (Promising Practices) authored by the Federal Interagency Working Group on Environmental Justice and NEPA Committee, a 50-percent analysis and meaningfully greater analysis were conducted to identify minority populations. Under this methodology, percentages of minority populations within selected geographic areas are screened to determine where minority populations exceed 50 percent of the total. Percentages are then compared to those of a reference community. For this study, the percentage of minority populations of the State of Florida is used for comparison, which is a lower threshold than the 50 percent threshold (**Figure 4**). The Project Area or Study Area is determined to contain an environmental justice community if the minority percentage exceeds the state average. Additional comparisons are made at the county-level. It is noted here that the 2016 and earlier guidance and EOs used the term minority, but the more recent EO 14096 uses the terminology "people of color." People of color will be used going forward in this document.



Source: USCB 2023.

Figure 4-4. Racial composition.

Per CEQ guidance, poverty thresholds established by the U.S. Census Bureau are used to identify low-income populations. To identify low-income populations, the low-income threshold criteria from the Promising Practices document is used. The poverty rate for the State of Florida is used as the threshold. Similar to the analysis for people of color populations, additional comparisons are made at the county-level.

One census tract adjacent to the Project Area, Tract 9617.02 in Highlands County, has 48.3 percent of the population that is of Hispanic or Latino origin (**Table 4-20**). This is more than 20 percent higher compared to the counties, state, and nation (**Table 4-21**). Most people who live on the STOF Brighton Reservation are Native American or Alaska Natives (73.1 percent; **Table 4-21**). Income data is presented in **Table 4-22**, and poverty data is presented in Table 4-23 and Table 4-24. For the census tracts in and adjacent to the Project Area, the percent below poverty ranged from a low of 6.8 percent in Tract 9615 to a high of 25 percent in Tract 9101.02. All the tracts except Tract 9615, which covers the proposed reservoir site, had a considerably higher percent below poverty compared to the combined counties, state, nation, and STOF Brighton Reservation (**Table 4-24**). The low-income populations include those in the Census Tracts 9101.02, 9610, and 9617.02. Glades, Highlands, and Okeechobee counties all show poverty rates that are greater than the state-level.

An extensive public involvement effort has taken place throughout the LOCAR planning process to reach out to environmental justice communities. Government-to-government meetings were held individually with representatives of the MTI and STOF. The SFWMD hosted town halls and public workshops. **Appendix A of the EIS** also summarizes the Corps public involvement activities.

A summary of the major environmental justice assessment categories is provided below. The full environmental justice analysis is located in **Appendix C**. In general, LOCAR would provide benefits to quality of life by improving the estuarine environment and recreational opportunities and contributing to hydrologic improvements in Lake Okeechobee and the Northern Estuaries. LOCAR would translate into aesthetic and economic benefits for sport fishing and other recreational activities. LOCAR would also provide direct job opportunities for the local population in the construction and operation of the facility. SFWMD or its contractors could coordinate with local employment agencies, high schools, and post-secondary schools, including trade and vocational schools to target and train local residents. Additionally, LOCAR would indirectly create jobs from secondary business growth that may result from the creation of the reservoir, such as in the accommodation and food services, retail, recreational, and real estate industries.

Table 4-20. Racial Composition for Project Area and Adjacent Census Tracts.

County	Census Tract	Total Population	White Alone	Black or African American Alone	Native American or Alaska Native Alone	Asian Alone	Native Hawaiian or Other Pacific Islander Alone	Some Other Race Alone	Two or More Races	Hispanic or Latino (of Any Race)	People of Color
Highlands	9610	4,998	4,091	26	0	0	0	0	34	847	907
% of Census Tract	-	-	81.9%	0.5%	0.0%	0.0%	0.0%	0.0%	0.7%	16.9%	18.1%
Highlands	9615[1]	4,870	4,263	20	1	59	0	0	57	470	607
% of Census Tract	-	-	87.5%	0.4%	0.01%	1.2%	0.0%	0.0%	1.2%	9.7%	12.5%
Highlands	9617.02	1,473	762	0	0	0	0	0	0	711	711
% of Census Tract	-	-	51.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	48.3%	48.3%
Okeechobee	9101.02	3,153	2,472	122	0	0	0	0	32	527	681
% of Census Tract			78.4%	3.9%	0.0%	0.0%	0.0%	0.0%	1.0%	16.7%	21.6%
Total		14,494	11,588	168	1	59	0	0	123	2,555	2,906
Percent of Total			80.0%	1.2%	0.0%	0.4%	0.0%	0.0%	0.8%	17.6%	20.0%

Source: USCB 2023.

1/ Census Tract 9615 includes the proposed reservoir site.

Table 4-21. STOF Brighton Reservation, Counties, State, and National Racial Demographic Summary.

Population	STOF Brighton Reservation	Glades County	Highlands County	Martin County	Okeechobee County	Palm Beach County	Counties Combined (Study Area)	Florida	United States
Total Population	557	13,777	104,574	160,420	41,611	1,482,057	1,802,439	21,216,924	326,569,308
White Alone	75	8,255	69,153	125,077	26,036	799,163	1,027,684	11,331,222	196,251,375
White Alone (%)	13.5%	59.9%	66.1%	78.0%	62.6%	53.9%	57.0%	53.4%	60.1%
Black or African American Alone	0	1,793	9,677	8,405	3,373	269,684	292,932	3,231,108	39,994,653
Black or African American Alone (%)	0.0%	13.0%	9.3%	5.2%	8.1%	18.2%	16.3%	15.2%	12.2%
Native American or Alaska Native Alone	407	535	124	322	233	1,123	2,337	39,070	2,075,852
Native American or Alaska Native Alone (%)	73.1%	3.9%	0.1%	0.2%	0.6%	0.1%	0.1%	0.2%	0.6%
Asian Alone	39	91	1,527	2,320	393	40,532	44,863	579,476	18,184,182
Asian Alone (%)	7.0%	0.7%	1.5%	1.4%	0.9%	2.7%	2.5%	2.7%	5.6%
Native Hawaiian or Other Pacific Islander	0	0	0	128	74	270	472	10,889	550,080

Population	STOF Brighton Reservation	Glades County	Highlands County	Martin County	Okeechobee County	Palm Beach County	Counties Combined (Study Area)	Florida	United States
Alone									
Native Hawaiian or Other Pacific Islander Alone (%)	0.0%	0.0%	0.0%	0.1%	0.2%	0.02%	0.03%	0.1%	0.2%
Some Other Race Alone	0	47	456	329	109	6,775	7,716	90,892	1,017,604
Some Other Race Alone (%)	0.0%	0.3%	0.4%	0.2%	0.3%	0.5%	0.4%	0.4%	0.3%
Two or More Races	1	132	2,272	1,852	638	30,303	35,197	465,441	9,134,542
Two or More Races (%)	0.2%	1.0%	2.2%	1.2%	1.5%	2.0%	2.0%	2.2%	2.8%
Hispanic or Latino (of Any Race)	35	2,924	21,365	21,987	10,755	334,207	391,238	5,468,826	59,361,020
Hispanic or Latino (of Any Race) (%)	6.3%	21.2%	20.4%	13.7%	25.8%	22.6%	21.7%	25.8%	18.2%
People of Color	482	5,522	35,421	35,343	15,575	682,894	774,755	9,885,702	130,317,933
People of Color (%)	86.5%	40.1%	33.9%	22.0%	37.4%	46.1%	43.0%	46.6%	39.9%

Source: USCB 2023.

Table 4-22. Per Capita Income for Project Area, Surrounding Areas, STOF Brighton Reservation, Counties, State, and Nation (2020 Inflation-adjusted Dollars).

Area	Population	Per Capita Income
Project Area and Census Tracts Combined	14,494	$25,767
STOF Brighton Reservation	557	$47,070
Glades County	13,777	$22,128
Highlands County	104,574	$27,979
Martin County	160,420	$43,758
Okeechobee County	41,611	$23,133
Palm Beach County	1,482,057	$40,957
Counties Combined	-	$31,591
State of Florida	-	$32,848
United States	-	$35,384

Source: USCB 2023.

Table 4-23. Poverty for Project Area and Adjacent Census Tracts.

Category	Census Tract 9610	Census Tract 9615[2]	Census Tract 9617.02	Census Tract 9101.02
Eligible PSD Population[1]	4,998	4,870	1,447	4,591
Total below Poverty Threshold	910	329	308	1,146
Percent below Poverty Threshold	18.2%	6.8%	21.3%	25.0%

Source: USCB 2023.

[1/] Population eligible for poverty status classification under U.S. census guidelines.

[2/] Census Tract 9615 includes the proposed reservoir site.

Table 4-24. Poverty for Project Area, Surrounding Area, STOF Brighton Reservation, Counties, State, and Nation.

Area	Eligible PSD Population[1]	Total below Poverty Threshold	Percent below Poverty Threshold
Project Area and Census Tracts Combined	15,906	2,693	16.9%
STOF Brighton Reservation	541	61	11.3%
Glades County	12,452	2,127	17.1%
Highlands County	102,883	16,511	16.0%
Martin County	157,211	16,141	10.3%
Okeechobee County	38,243	6,818	17.8%
Palm Beach County	1,461,191	169,844	11.6%
Counties Combined	-	-	11.9%
State of Florida	-	-	13.3%
United States	-	-	12.8%

Source: USCB 2023.

[1/] Population eligible for poverty status classification under U.S. census guidelines.

The summary of environmental justice criteria and the determination if there is a potential disproportionate and adverse impact to an environmental justice community is discussed in **Table 4-25.** The full analysis is provided in **Appendix C**. Based on this analysis in compliance with EOs 12898 and 14096, none of the action alternatives result in disproportionate impacts upon one demographic over another.

Protection of Children: EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks,* requires each federal agency to "identify and assess environmental risks and safety risks [that] may disproportionately affect children" and ensure that its "policies, programs, activities, and standards address disproportionate risks to children that results from environmental health risks or safety risks." The proposed Project will not result in environmental health risks or safety risks that may have a disproportionate effect on children. Children would not be in the vicinity of any of the construction activities or reservoir operational areas, nor should these activities have an impact on children.

Safety/Health: All alternatives would be designed to dam safety requirements defined in ER 1110-2-1150, *Engineering and Design for Civil Works Projects*, and ER 1110-2-1156, *Engineering and Design Safety of Dams–Policy and Procedures* (**Sections 6.7 and 6.8**). Formal dam safety risk assessments are underway, and the results are not available at this stage of the planning process.

Community Cohesion: Land use in the Project Area is agricultural land (i.e., citrus and pasture). Private land acquisition is required for all alternatives. Societal and community impacts of land acquisition, while difficult to measure quantitatively, will vary by alternative depending on if landowners are willing or unwilling sellers. Only willing sellers are being sought in this action.

Table 4-25. Summary of Environmental Justice Criteria.

Major Criteria (Full list in Appendix C.2)	Concern	Potential Intensity of Impact	Avoidance/Minimization/Mitigation Measures	Disproportionate Adverse Impact to Environmental Justice (EJ) Community
Proximity of Project features to environmental justice (EJ) communities	Siting Project features near these communities may amplify Project impacts.	Reservoir proximity to Seminole Tribe of Florida (STOF) Brighton Reservation and Tribal lands is about 5 miles (mi) for all alternatives. Reservoir for all alternatives is less than 5 mi away from nearest EJ populations in the Study Area.	Modification of reservoirs to include buffer zones from local communities. Seepage canal to reduce off-site impacts. Vegetation cover to reduce visual impacts of Project levees.	Project features are not sited disproportionally close to EJ communities as compared to other communities within the Project Area. EJ communities would not be impacted by Project features more than any other community, including the STOF and Miccosukee Tribe of Indians of Florida.
Dam Breach Impacting Property and Life	Impact to life and property in the event of a dam breach in the aboveground storage features.	Extremely low due to the low probability of reservoir breach for any alternative and use of robust design criteria of modern design standards for high hazard dams.	Qualitative risk assessment during planning indicates extremely low risk of breach. Additional dam safety risk assessments throughout the Project will refine/inform reservoir design. Project features would be monitored throughout the life of the Project to ensure safety of local communities, and mitigation features would be constructed if needed.	The results of the risk assessment are in Appendix A. There is not a greater risk to an EJ community as compared to other nearby communities.
Aesthetics	Levees associated with reservoir may obstruct view of landscape (reservoir height 33 feet [ft]).	Most of the geographic area of the Lake Okeechobee Component A Storage Reservoir (LOCAR) is relatively flat with no significant change in topography, which magnifies the aesthetic impact in the surrounding area. However, the existing Herbert Hoover Dike levees with a height of 20 to 25 ft are located in the Study Area, which impacts the	Project levees will be visible on the rise but covered in grass to minimize the aesthetic impact.	There is not a greater aesthetic impact to an EJ community as compared to other communities.

Major Criteria (Full list in Appendix C.2)	Concern	Potential Intensity of Impact	Avoidance/Minimization/Mitigation Measures	Disproportionate Adverse Impact to Environmental Justice (EJ) Community
		continuity of the viewshed. The reservoir would be 5 mi from STOF Brighton Reservation and Tribal lands, and less than 5 mi from nearest EJ population, for all alternatives.		
Air Quality	Pollutants during Project construction.	Temporary short-term impacts during construction. Long-term adverse effects to air quality would not be expected from electric pump stations. There would be a reduction in farming equipment currently used on the proposed reservoir lands.	Best management practices would be implemented during construction, including measures to reduce dust. Pump stations would be electric.	There is not a greater air quality impact to an EJ community as compared to other communities.
Displacement of Endangered Species to Adjacent Private Lands	Displacement of listed species could increase Endangered Species Act compliance cost and limit the range of economic activities on private lands.	The U.S. Army Corps of Engineers (Corps) will conduct consultation with the U.S. Fish and Wildlife Service (USFWS) on the most likely species for dispersal due to LOCAR alternatives.	For all alternatives, species assessments on the Project footprint would be required to determine the abundance of threatened and endangered species. The Corps would coordinate with the Florida Fish and Wildlife Conservation Commission (FWC) on appropriate impact avoidance, minimization, and/or mitigation measures, as needed.	At the time of this feasibility level analysis, the Corps does not anticipate a disproportionate impact. There is not a higher risk of dispersing endangered species to an EJ community as compared to other communities.
Water Supply	Impact to existing Lake Okeechobee Service Area (LOSA) users to maintain existing legal water supply sources.	Negligible effects, as all alternatives would maintain pre-Project levels of service for water supply for existing legal users and would maintain the rights of the STOF.	All alternatives would maintain the pre-Project levels of service for water supply, consistent with the requirements of Section 601 (h)(5)(A) and Section 601 (h)(5)(C) of the WRDA 2000 for existing legal users and would maintain the rights of the STOF under the 1987 Water Rights Compact.	There is not a greater water supply impact to an EJ community as compared to other communities.
Ranching/	Seepage impacting	No impact anticipated due to	Seepage canal and groundwater	A seepage canal will limit off-

Major Criteria (Full list in Appendix C.2)	Concern	Potential Intensity of Impact	Avoidance/Minimization/Mitigation Measures	Disproportionate Adverse Impact to Environmental Justice (EJ) Community
Agricultural Impacts	crops and livestock.	construction of a seepage canal in all alternatives to limit seepage outside of the reservoir footprint.	monitoring.	site impacts to all nearby communities.
Private Land Acquisition	All alternatives require land acquisition from a single private corporation.	Converting private land to public would decrease ad valorem property tax contributions to the respective county government.	The Corps and South Florida Water Management District have performed extensive outreach to the public to inform them of the potential for land acquisition resulting from this Project. Landowners would be provided fair market compensation if their land is acquired.	There is no land acquisition planned at an EJ community.

4.4 Identification of the National Ecosystem Restoration Plan

The overarching goal of LOCAR is the environmental restoration of a northern Everglades ecosystem considered to be of both national and international significance. Selecting the NER Plan requires careful consideration of the plan that meets planning objectives and constraints and reasonably maximizes environmental benefits while passing tests of cost effectiveness and incremental cost analyses, significance of outputs, acceptability, completeness, efficiency, and effectiveness. In accordance with Corps guidance, the selected plan must be shown to be cost effective and justified to achieve the desired level of output (ER-1105-2-100 Appendix E, Paragraph E-41). Additionally, alternative risks and uncertainties were considered. **Table 4-26** summarizes the major selection criteria to identify the NER Plan.

Alternative 1 is recommended as the NER Plan for the following reasons:

- The FWO condition is not effective in meeting the goal of reducing high lake levels in Lake Okeechobee. The FWO is also not acceptable, or complete, in achieving the goal for Component A in the Yellow Book of 200,000-ac-ft of storage north of Lake Okeechobee.
- Alternative 1 reasonably maximizes ecosystem restoration benefits compared to costs. Alternatives 1 was identified as the best buy plan. The costs of Alternative 2 do not justify its minor increase in benefits. The overall benefits of the three alternatives were similar; however, the construction and operational cost of Alternative 1 is significantly less than the other two alternatives. The total number of pump stations and larger Project footprint of Alternatives 2 and 3 increased their costs when compared to the deeper reservoir, Alternative 1.

4.5 Modification of the NER Plan

Recreational features were added to the NER Plan as an incidental Project benefit to enhance the existing opportunities for resource-based activities in the Project Area. A major recreation attraction of LOCAR would be the approximately 21-mi multi-use trail atop the reservoir embankment and two paved parking areas, each with a boat ramp, dual-gender vault bathroom, standalone informational kiosk, large shelter with picnic benches, American Disabilities Act accessible parking, trailer parking, bicycle rack, pedestrian gate, and safety fencing. The full recreational analysis is located in **Appendix F**.

4.6 RECOVER Systemwide Evaluation

As required in the Programmatic Regulations, an interagency science coordination team called the "RECOVER team" will evaluate the ecological effects of the focused array of alternatives (i.e., Alternatives 1, 2, and 3). Areas evaluated include the Northern Estuaries, Lake Okeechobee (and associated watershed), and the LOSA (i.e., EAA and surrounding water use areas). The scope of the review covers all areas expected to be improved by CERP beyond the boundaries of the Project Area and includes performance measures and best professional judgment that reach beyond the tools and expertise of the traditional Corps planning process. The tools and professional backgrounds of the reviewers represent multiple agencies and experience studying and modeling the ecology of central and south Florida. The purpose of the review is threefold: to provide insight into whether some alternatives performed better ecologically than others, to indicate whether alternatives may lead to unintended ecological conditions, and to investigate unintended effects beyond LOCAR's boundaries that could potentially contradict CERP on a regional scale. The key findings will be presented in **Annex E** following their review. The RECOVER review occurred concurrently with public review of the Draft EIS and Draft Feasibility Study.

Table 4-26. Summary of NER Plan Major Selection Criteria.

Selection Criteria	Alternative 1	Alternative 2	Alternative 3
Reasonably Maximize Environmental Benefits in a Cost-effective Manner	Best buy alternative with lower costs and benefits than Alternative 2.	Best buy alternative with higher costs and benefits than Alternative 1. The average annual benefits are 3 percent higher than Alternative 1 in Lake Okeechobee.	Not a cost-effective alternative.
Acceptability	+ Meets all applicable laws, regulations, and public policies. + Greatest storage depth averaging 18 feet (ft).	+ Meets all applicable laws, regulations, and public policies. + Shallowest storage depth averaging 12 ft.	+ Meets all applicable laws, regulations, and public policies. + Storage depth averaging 16 ft.
Completeness	Completes an essential component of Comprehensive Everglades Restoration Plan to benefit Lake Okeechobee.	Completes an essential component of Comprehensive Everglades Restoration Plan to benefit Lake Okeechobee.	Completes an essential component of Comprehensive Everglades Restoration Plan to benefit Lake Okeechobee.
Efficiency	Cost-effective, best buy	Cost-effective, best buy	Not cost-effective
Effectiveness	Meets all four criteria. Would reduce moderate and extreme high lake stages and duration of stages above the preferred range (ecological envelope).	Meets all four criteria. Would reduce moderate and extreme high lake stages and duration of stages above the preferred range (ecological envelope).	Meets all four criteria. Would reduce moderate and extreme high lake stages and duration of stages above the preferred range (ecological envelope).
National Economic Development	Provides recreational opportunities greater than those expected with the Future Without Project (FWO) and similar flood control and navigation benefits as the FWO. Water supply would be impacted when compared to the FWO; however, expected changes to Lake Okeechobee operations would be expected to benefit the Lake Okeechobee Service Area.	Provides recreational opportunities greater than those expected with the Future Without Project (FWO) and similar flood control and navigation benefits as the FWO. Water supply would be impacted when compared to the FWO; however, expected changes to Lake Okeechobee operations would be expected to benefit the Lake Okeechobee Service Area.	Provides recreational opportunities greater than those expected with the Future Without Project (FWO) and similar flood control and navigation benefits as the FWO. Water supply would be impacted when compared to the FWO; however, expected changes to Lake Okeechobee operations would be expected to benefit the Lake Okeechobee Service Area
Regional Economic Development	Total jobs: 51,049 Total gross regional product (GRP): $4,417,517,479	Total jobs: 84,716 Total GRP: $6,949,744,059	Total jobs: 68,372 Total GRP: $5,608,744,343
Environmental Quality	+ The Project footprint is potential habitat for the critically endangered Florida grasshopper sparrow. + Minor beneficial effects to	+ The Project footprint is potential habitat for the critically endangered Florida grasshopper sparrow. + Minor beneficial effects to	+ The Project footprint is potential habitat for the critically endangered Florida grasshopper sparrow.

Selection Criteria	Alternative 1	Alternative 2	Alternative 3
	invertebrates, fish, wading birds, and mammals. + Total wetland area is 2,920 acres (ac). + 30 percent of wetland area is above ground impoundment (AGI) ponds.	invertebrates, fish, wading birds, and mammals. + Total wetland area is 3,904 ac. + 60 percent of wetland area is AGI ponds.	+ Minor beneficial effects to invertebrates, fish, wading birds, and mammals. + Total wetland area is 2,592 ac. + 50 percent of wetland area is AGI ponds.
Other Social Effects	+ Life/Safety: Robust design criteria and modern design standards improve the likelihood of a dam breach. + Prime and Unique Farmland: Coordination with Natural Resources Conservation Service would determine if additional analysis is required. + Environmental Justice: No disproportionate impacts to minority or low-income populations would be expected. + Only willing sellers would be sought.	+ Life/Safety: Robust design criteria and modern design standards improve the likelihood of a dam breach. + Prime and Unique Farmland: Coordination with Natural Resources Conservation Service would determine if additional analysis is required. + Environmental Justice: No disproportionate impacts to minority or low-income populations would be expected. + Only willing sellers would be sought.	+ Life/Safety: Robust design criteria and modern design standards improve the likelihood of a dam breach. + Prime and Unique Farmland: Coordination with Natural Resources Conservation Service would determine if additional analysis is required. + Environmental Justice: No disproportionate impacts to minority or low-income populations would be expected. + Only willing sellers would be sought.
Risk and Uncertainty Considerations	+ The risk of a dam breach, though unlikely, would be evaluated and steps would be taken to mitigate the effects on surrounding occupied structures. + Potential to find human remains or other significant cultural resources would be mitigated through ongoing consultation. + Potential to effect habitat of threatened and endangered species would be mitigated through coordination with the U.S. Fish and Wildlife Service.	+ The risk of a dam breach, though unlikely, would be evaluated and steps would be taken to mitigate the effects on surrounding occupied structures. + Potential to find human remains or other significant cultural resources would be mitigated through ongoing consultation. + Potential to effect habitat of threatened and endangered species would be mitigated through coordination with the U.S. Fish and Wildlife Service.	+ The risk of a dam breach, though unlikely, would be evaluated and steps would be taken to mitigate the effects on surrounding occupied structures. + Potential to find human remains or other significant cultural resources would be mitigated through ongoing consultation. + Potential to effect habitat of threatened and endangered species would be mitigated through coordination with the U.S. Fish and Wildlife Service.

Note: Regional Economic Development will be updated concurrently with South Florida Water Management District review.

4.7 Assuring Quality of Planning Models for Alternative Evaluation and Comparison

The LOCAR Project Team used PMs developed for previous CERP planning studies and will be reviewed by the RECOVER team concurrently with publication of the Draft EIS and Draft Feasibility Study. **Section 4.3** will detail the results of the RECOVER team's review.

LOCAR planning models were developed to evaluate Project alternatives within the Project domain (i.e., ecoregion and/or watershed) in central and south Florida and have been used to quantify ecological benefits and support plan evaluation, comparison, and selection, and has been developed by the Corps with support from multiple federal, state and local agencies. In addition, PMs and model output have been tested on prior planning projects and have been reviewed by RECOVER.

Although there is a degree of uncertainty using regional models to identify Project-specific benefits, the Project Team has determined that measures are appropriate to use as a tool to compare performance of alternatives to each other in the effectiveness and efficiency analysis (**Sections 4.1.1** and **4.1.4**) along with the NEPA evaluation. The Project benefits indicate that there is very little difference in HUs between alternatives. Therefore, Alternative 1 is the most cost-effective alternative.

5.0 SUMMARY OF ENVIRONMENTAL EFFECTS

This section summarizes the anticipated environmental effects of the alternative actions described in **Section 3.0** and **Section 4.0**.

Since the focused array of alternatives contained a No Action Alternative (the FWO), the three action alternatives were evaluated against the FWO to describe changes to existing conditions with implementation of each alternative. These potential effects are summarized within this section by alternative. See **Appendix C** for a detailed discussion.

For this analysis, intensity was rated as follows:

- Negligible—Effect to the resource or discipline is barely perceptible, not measurable, and confined to a small area.
- Minor—Effect to the resource or discipline is perceptible, measurable, and localized.
- Moderate—Effect is clearly detectable and could have appreciable effect on the resource or discipline; or the effect is perceptible and measurable throughout the Project Area.
- Major—Effect would have a substantial, highly noticeable influence on the resource or discipline on a regional scale.
- Beneficial—Effect of implementing the action would benefit the resource or discipline.

The duration of the effects in this analysis is defined as follows:

- Short-term—When effects last less than 1 year.
- Long-term—Effects that last longer than 1 year.
- No duration—No effect.

Section 6.3.3 presents reasonably foreseeable actions and cumulative effects in the Study Area. The 40 CFR defines cumulative effects as effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (i.e., federal or non-federal) or person undertakes such other actions (40 CFR §1508.1(g)(3)). Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time in the Study Area.

5.1 Climate

5.1.1 Alternative 1

Implementation of Alternative 1 would have a negligible effect on climate within the Study Area. Minor localized effects to microclimate may occur under the alternative because of redistribution of water and shifts in vegetation. Potential effects may include increases in evapotranspiration, increases in localized rainfall, and temperature changes. See **Annex H** for a detailed overview of the projected impact of climate change within the Study Area. Additional beneficial effects from capturing more frequent high flows caused by climate change are addressed in **Section 5.12**. The effects on GHG emissions are described in **Section 5.14**.

5.1.2 Alternative 2

The effects of Alternative 2 would be similar to Alternative 1 with the following difference; a negligible effect on climate within the Study Area would be expected.

5.1.3 Alternative 3

The effects of Alternative 3 would be similar to Alternatives 1 and 2 with the following difference; a negligible effect on climate within the Study Area would be expected.

5.2 Physical Landscape

5.2.1 Alternative 1

Minor and less-than-significant impacts to the physical landscape would be expected. Impacts would be expected from the excavation of soil within the Project footprint to obtain material for construction of levees, canals, and roads.

5.2.2 Alternative 2

The effects of Alternative 2 would be similar to those of Alternative 1 over a slightly larger footprint. Minor and less-than-significant impacts to the physical landscape would be expected.

5.2.3 Alternative 3

The effects of Alternative 3 would be similar to those of Alternatives 1 and 2 over a slightly larger footprint. Minor and less-than-significant impacts to the physical landscape would be expected.

5.3 Vegetative Communities

5.3.1 Lake Okeechobee Watershed

5.3.1.1 Alternative 1

Major effects to vegetation in the Project Area would be expected under Alternative 1 from the conversion of pastureland to an aboveground reservoir. **Table 5-1** shows the existing land use according to the Florida Land Use, Cover, and Forms Classification System (FLUCCS) codes. The Project Area is dominated by improved pasture, accounting for 78 percent of the Alternative 1 footprint (i.e., 10,133 acres [ac]). Other dominant vegetation communities include vegetated non-forested wetlands (i.e., 2,215 ac).

Table 5-1. Planning-level FLUCCS Land Use Acres in the Storage Footprint for Each Alternative.

FLUCCS Code Description	Alternative 1	Alternative 2	Alternative3
Cropland and Pastureland	10,132.8	10,220.5	4,394.6
Disturbed Lands	36.7	49.2	28.5
Herbaceous	189.8	352.3	955.6
Reservoirs	286.0	286.0	377.0
Shrub and Brushland	37.1	96.2	93.6
Streams and Waterways	10.0	13.7	14.7
Transportation	0	1.4	1.4
Tree Crops	0	6,204.2	7,145.5

FLUCCS Code Description	Alternative 1	Alternative 2	Alternative3
Upland Hardwood Forests	0	21.2	16.2
Upland Mixed Forests	0	0.9	0
Vegetated Non-Forested Wetlands	2,214.5	2,804.4	1,783.7
Wetland Hardwood Forests	137.0	467.2	236.1
Grand Total	**13,043.9**	**20,517.1**	**15,046.8**

FLUCCS–Florida Land Use, Cover, and Forms Classification System.

5.3.1.2 Alternative 2

Major effects to vegetation in the Project Area would be expected under Alternative 2 from the conversion of pastureland to an aboveground reservoir. The Project Area is dominated by improved pasture, accounting for 50 percent of the alternative footprint and tree crops accounting for 30 percent of the Alternative 2 footprint.

5.3.1.3 Alternative 3

Major effects to vegetation in the Project Area would be expected under Alternative 2 from the conversion of pastureland to an aboveground reservoir. The Alternative 3 footprint is dominated by tree crops (47 percent) and pasture accounts for 29 percent of the total area.

5.3.2 Lake Okeechobee

5.3.2.1 Alternative 1

Moderate, long-term beneficial effects to Lake Okeechobee's littoral vegetation would be anticipated from Alternative 1, relative to the FWO. The overall effect of the Project would be to stabilize water levels and reduce high lake stages, while maintaining lake stage within the ecologically preferred seasonal stage envelope (11.5 to 15.5 ft NGVD) more frequently than the FWO. Water levels were above the envelope 7 percent less time than the FWO–a critically important metric due to the severity and longevity of high-stage impacts to the littoral ecosystem (Havens 2002; Havens and Gawlik 2005). There were substantial improvements in exceedance rates of moderately high stages (greater than 16 ft National Geodetic Vertical Datum of 1929 [NGVD29]), with 4.5 percent reductions relative to the FWO. Importantly, these improvements to high stage durations only resulted in slight increases of time at moderate and extreme low stages, with just a 0.4 percent increase in duration of stages at less than 11 ft NGVD29 and a 1 percent increase in duration of stages at less than 10 ft NGVD29) (**Table 5-2**).

The overall effect of substantially lowering the duration and frequency of moderate and high lake stages with only minimal increases in low stage durations would improve vegetation throughout the littoral marshes relative to the FWO, primarily by reducing hydroperiods at the upper elevations and providing larger areas for SAV at low elevations. When lake stages are maintained nearer to the ecological envelope, the maximum practicable extent and diversity of littoral marsh is realized; the envelope represents a suite of seasonally variable stages that promote the largest extent of littoral marsh with the greatest diversity of vegetation communities, comprised of short-hydroperiod marshes at high elevations and large expanses of SAV habitat at low elevations. Alternative 1 would increase the frequency of time inside the envelope by reducing the time spent above it, resulting in increased vegetation diversity, increased coverage of short-hydroperiod communities, improvements to woody habitats that support wading bird nesting, and recovery of SAV beds relative to the FWO.

Refer to **Appendix C, Part 2**, for a detailed comparison of potential effects to vegetation.

Table 5-2. Stage Exceedance Durations and Time Spent Near and within the Ecological Envelope for the Alternatives. Lower Durations are Preferrable for All Metrics Except for Time Inside the Ecologically Preferred Stage Envelope.

Lake Okeechobee Stage Levels	Description of Stage Levels	Future Without Project	Alternative 1	Alternative 2	Alternative 3
% Time inside Ecologically Preferred Stage Envelope	Varies between 11.5 feet and 15.5 ft seasonally	22%	28%	28%	28%
%Time above Stage Envelope	Varies between 12.5 ft and 15.5 ft seasonally	48%	41%	41%	41%
%Time below Stage Envelope	Varies between 11.5 ft and 14.5 ft seasonally	30%	31%	31%	31%
% Time below Navigational Min. Stage	% TIME <12.5 ft	27.2%	30.1%	29.6%	30.2%
Extreme High Stage	% TIME >17 ft	2.1%	0.6%	0.6%	0.6%
Extreme Low Stage	% TIME <10 ft	3.1%	4.1%	4.0%	4.1%
Moderate High Stage	% TIME >16 ft	10.3%	5.8%	5.8%	5.8%
Moderate Low Stage	% TIME <11 ft	9.9%	10.3%	10.1%	10.30

5.3.2.2 Alternative 2

Moderate, long term beneficial effects to Lake Okeechobee's littoral vegetation would be anticipated from Alternative 2, relative to the FWO. The overall effect of LOCAR would be to stabilize water levels and reduce high lake stages, maintaining lake stage within the ecologically preferred seasonal stage envelope (i.e., 11.5 to 15.5 ft NGVD) more frequently than the FWO. Stages were above the envelope 7 percent less time than FWO–a critically important metric due to the severity and longevity of high-stage impacts to the littoral ecosystem (Havens 2002; Havens and Gawlik 2005). There were substantial improvements in exceedance rates of moderately high stages (greater than 16 ft NGVD29), with 4.5 percent reductions relative to the FWO. Importantly, these improvements to high stage durations only resulted in slight increases of time at moderate and extreme low stages, with just a 0.4 percent increase in duration of stages at less than 11 ft NGVD29 and a 0.9 percent increase in duration of stages at less than 10 ft NGVD29) (**Table 5-2**).

The overall effect of substantially lowering the duration and frequency of moderate and high lake stages with only minimal increases in low stage durations would improve vegetation throughout the littoral marshes relative to the FWO, primarily by reducing hydroperiods at the upper elevations and providing larger areas for SAV at low elevations. When lake stages are maintained nearer to the ecological envelope, the maximum practicable extent and diversity of littoral marsh is realized; the envelope represents a suite of seasonally variable stages that promote the largest extent of littoral marsh with the greatest diversity of vegetation communities, comprised of short-hydroperiod marshes at high elevations and large expanses of SAV habitat at low elevations. Alternative 2 would increase the frequency of time inside the envelope by reducing the time spent above it, resulting in increased vegetation diversity, increased coverage of short-hydroperiod communities, improvements to woody habitats that support wading bird nesting, and recovery of SAV beds relative to the FWO.

Refer to **Appendix C, Part 2**, for a detailed comparison of potential effects to vegetation.

5.3.2.3 Alternative 3

Moderate, long-term beneficial effects to Lake Okeechobee's littoral vegetation would be anticipated from Alternative 3, relative to the FWO. The overall effect of the Project would be to stabilize water levels and reduce high lake stages, while maintaining lake stage within the ecologically preferred seasonal stage envelope (11.5 to 15.5 ft NGVD) more frequently than the FWO. Stages were above the envelope 7 percent less time than FWO–a critically important metric due to the severity and longevity of high-stage impacts to the littoral ecosystem (Havens 2002; Havens and Gawlik 2005). There were substantial improvements in exceedance rates of moderately high stages (i.e., greater than 16 ft NGVD29), with 4.5 percent reductions relative to the FWO. Importantly, these improvements to high stage durations only resulted in slight increases of time at moderate and extreme low stages, with just a 0.4 percent increase in duration of stages at less than 11 ft NGVD29 and a 1 percent increase in duration of stages at less than 10 ft NGVD29) (**Table 5-2**).

The overall effect of substantially lowering the duration and frequency of moderate and high lake stages with only minimal increases in low stage durations would improve vegetation throughout the littoral marshes relative to the FWO, primarily by reducing hydroperiods at the upper elevations and providing larger areas for SAV at low elevations. When lake stages are maintained nearer to the ecological envelope, the maximum practicable extent and diversity of littoral marsh is realized; the envelope represents a suite of seasonally variable stages that promote the largest extent of littoral marsh with the greatest diversity of vegetation communities, comprised of short-hydroperiod marshes at high elevations and large expanses of SAV habitat at low elevations. Alternative 3 would increase the frequency of time inside the envelope by reducing the time spent above it, resulting in increased vegetation diversity, increased coverage of short-hydroperiod communities, improvements to woody habitats that support wading bird nesting, and recovery of SAV beds relative to the FWO.

Refer to **Appendix C, Part 2**, for a detailed comparison of potential effects to vegetation.

5.3.3 Northern Estuaries

5.3.3.1 Alternative 1

Benefits would be expected from the improvement in all high and damaging flow metrics triggered by Lake Okeechobee regulatory releases when Alternative 1 is compared to the FWO (**Table 5-3** and **Table 5-4**). Low flows (SLE 14-day flows less than 150 cfs; and CRE 14-day flows less than 750 cfs) perform worse than the FWO, due to lake operations decisions. High and stressful flow events triggered by basin runoff, rather than by Lake Okeechobee regulatory releases, improve compared to the existing conditions baseline (ECB), but are worse than the FWO. This is not representative of LOCAR adding more water to the watershed, which would result in increased basin runoff. Instead, this is an artifact of RSM-BN calculations that differentiate lake-triggered events from basin runoff-triggered events. When these high events occur, because there are fewer lake-triggered events , there still are enough high flows for RSM-BN to categorize this as a "basin-triggered" event. In short, the Project is not actually changing the volume of water from local basins.

Finally, extreme high flows in the estuaries (SLE 14-day flows of 1,700–4,000 cfs and greater than 4,000 cfs; and CRE 14-day flows of 2,600–4,500 cfs, 4,500–6,500 cfs, and greater than 6,500 cfs) show overall improvement, but the degree of improvement depends on the estuary and on the flow category in question.

Because the difference in performance between alternatives are marginal across all Caloosahatchee and St. Lucie Estuaries (Northern Estuaries) performance metrics, the below sections provide further analysis of Alternative 1 compared to the ECBs and FWO performance.

Table 5-3. Caloosahatchee Estuary Modeled Results for the Existing Conditions Baseline, Future Without Project Condition, and Each Alternative.

Scenario	ECB	Future Without Project	Alternative 1	Alternative 2	Alternative 3
Low Flow - # of 14-day periods <750 cfs	549	752	586	584	586
Optimal Flow - # of 14-day periods ≥750 cfs and <2,100 cfs	638	549	688	686	689
High Flow (Basin Runoff) - # of 14-day periods ≥2,100 cfs and <2,600 cfs	166	124	153	154	154
High Flow (Lake Okeechobee Regulatory) - # of 14-day periods ≥2,100 cfs and <2,600 cfs	77	66	42	42	41
Damaging Flow (Basin Runoff) - # of 14-day periods ≥2,600 cfs	230	160	179	178	179
Damaging Flow (Lake Okeechobee Regulatory) - # of 14-day periods ≥2,600 cfs	86	66	55	56	55
Damaging Flow (Total Flows) - # of 14-day periods ≥2,600 and ≤4,500 cfs	241	181	179	178	178
Damaging Flow (Total Flows) - # of 14-day periods ≥4,500 and ≤6,500 cfs	105	80	75	77	76
Damaging Flow (Total Flows) - # of 14-day periods ≥6500 cfs	84	56	64	64	64

Table 5-4. St. Lucie Estuary Modeled Results for the Existing Conditions Baseline, Future Without Project Condition, and Each Alternative.

Scenario	ECB	Future Without Project	Alternative 1	Alternative 2	Alternative 3
Low Flow - # of 14-day periods <150 cfs	183	163	209	208	210
Optimal Flow - # of 14-day periods ≥150 cfs and <1,400 cfs	910	997	1013	1011	1012
High Flow (Basin Runoff) - # of 14-day periods ≥1,400 cfs and <1,700 cfs	279	238	262	261	263
High Flow (Lake Okeechobee	30	49	20	20	20

Scenario	ECB	Future Without Project	Alternative 1	Alternative 2	Alternative 3
Regulatory) - # of 14-day periods ≥1,400 cfs and <1,700 cfs					
Damaging Flow (Basin Runoff) - # of 14-day periods ≥1,700 cfs	452	344	350	350	351
Damaging Flow (Lake Okeechobee Regulatory) - # of 14-day periods ≥1,700 cfs	41	58	29	30	27
Damaging Flow (Total Flows) - # of 14-day periods ≥1,700 and ≤4,000 cfs	427	352	337	339	339
Damaging Flow (Total Flows) - # of 14-day periods ≥4,000 cfs	166	129	118	118	118

Low Flows

In the CRE, low flows (i.e., 14-day flows less than 750 cfs) are improved compared to the FWO but worsen compared to the ECB. Meanwhile in the SLE, low flows (i.e., 14-day flows less than 150 cfs) worsen compared to the ECB and the FWO. Consider that the modeling assumptions for the FWO simulation include a version of the Lake Okeechobee Regulation Schedule (2008 LORS; LORS08+) rather than LOSOM, and the ECB and all alternative simulations use LOSOM. LOSOM ensured improvements in low flows compared to LORS08+, especially in the CRE where decreases in the frequency and duration of base flow would result in salinity optima needed for freshwater and oligohaline species of SAV, namely tape grass. While the combined measured low flows into the SLE do not impact the estuary proper, flows less than 150 cfs can result in salinity increases and potential detriment to juvenile fish and fish nursery habitat in the St. Lucie River upstream of the SLE north fork.

Alternative 1 is ranked the best performing overall for the estuaries. In the CRE, there are 37 more low flow events in the period of simulation than the ECB. In the SLE, there are 26 more low flow events in the period of simulation than the ECB. This can be explained due to lake operations in which, under certain conditions, water is held in Lake Okeechobee to prevent time below the stage envelope (i.e., 12 ft).

A sensitivity analysis was conducted to demonstrate Alternative 1 performance compared to an FWO scenario that is more representative of LOSOM operations (PA25_FWOLL) (**Table 5-5**). This analysis shows improvement for the CRE low flows in Alternative 1 compared to PA25_FWOLL, with 15 fewer low flow events over the period of simulation. For the SLE, 23 more low flow events in the PA25_FWOLL and Alternative 1 are observed compared to the ECB (**Table 5-6**) due to LOSOM operations that send supplemental baseflows to the CRE and restricting flows to the SLE.

Table 5-5. Caloosahatchee Estuary Modeled Results for the Sensitivity Run of LOSOM-like Operations of the Existing Conditions Baseline, Future Without Project, and Alternative 1.

Scenario	ECB	PA25_FWOLL	Alternative 1
Low Flow - # of 14-day periods <750 cfs	549	487	472
Optimal Flow - # of 14-day periods ≥750 cfs and <2,100 cfs	638	769	783

Scenario	ECB	PA25_FWOLL	Alternative 1
High Flow (Basin Runoff) - # of 14-day periods ≥2,100 cfs and <2,600 cfs	166	153	154
High Flow (Lake Okeechobee Regulatory) - # of 14-day periods ≥2,100 cfs and <2,600 cfs	77	55	52
Damaging Flow (Basin Runoff) - # of 14-day periods ≥2,600 cfs	230	179	184
Damaging Flow (Lake Okeechobee Regulatory) - # of 14-day periods ≥2,600 cfs	86	59	57

Table 5-6. St. Lucie Estuary Modeled Results for the Sensitivity Run of LOSOM-like Operations of the Existing Conditions Baseline, Future Without Project and Alternative 1.

Scenario	ECB	PA25_FWOLL	Alternative 1
Low Flow - # of 14-day periods <150 cfs	183	206	206
Optimal Flow - # of 14-day periods ≥150 cfs and <1,400 cfs	910	1018	1018
High Flow (Basin Runoff) - # of 14-day periods ≥1,400 cfs and <1,700 cfs	279	269	265
High Flow (Lake Okeechobee Regulatory) - # of 14-day periods ≥1,400 cfs and <1,700 cfs	30	16	17
Damaging Flow (Basin Runoff) - # of 14-day periods ≥1,700 cfs	452	354	350
Damaging Flow (Lake Okeechobee Regulatory) - # of 14-day periods ≥1,700 cfs	41	21	19

Optimal Flows

Overall, the number of times in the period of simulation in which optimal flows are met in both estuaries (CRE 14-day flows 750–2,100 cfs; and SLE 14-day flows 150–1,400 cfs) increases. Benefit is more evident in the SLE, where there are 110 more optimal events in the period of simulation for Alternative 1 than the ECB (**Table 5-4**). There are 50 more optimal events in the period of simulation in the CRE in Alternative 1 compared to the ECB (**Table 5-3**).

Optimal flows, as defined by RECOVER (2020), would result in a suitable salinity gradient throughout the estuary to support the range of indicator species in the estuaries. In the SLE, salinities are optimal for oysters in the north fork, south fork, and middle estuary, and suitable for marine SAV in the lower estuary. In the CRE, salinities remain less than 10 parts per thousand (ppt) in the upper estuary to support tape grass, with a salinity gradient moving downstream that is optimal for both oysters in mid and lower estuary, and marine SAV in the lower estuary and San Carlos Bay.

Stress (High) Flows

In the CRE, there are 35 fewer events of 14-day stress (high) flows (i.e., 2,100–2,600 cfs) that are triggered by Lake Okeechobee regulatory releases, and 13 fewer triggered by basin runoff, over the period of simulation than the ECB (**Table 5-3**). In the SLE, there are 10 fewer events of 14-day stress (high) flows (i.e., 1,400–1,700 cfs) that are triggered by Lake Okeechobee regulatory releases, and 17 fewer triggered by basin runoff, over the period of simulation than the ECB (**Table 5-4**).

Stress (high) flows in the CRE (i.e.,14-dayflows of 2,100–2,600 cfs) are characterized by salinities falling below the optima for oysters at their most upstream extent of the estuary, while tape grass in the upper estuary and oysters and marine SAV in the lower estuary and San Carlos Bay are unaffected. This stress flow range was defined by RECOVER (2020) as a conservative measure of impact to the estuary outside the optimal flows. In the SLE, stress (high) flows (i.e., 14-day flows of 1,400–1,700 cfs) result in lower salinities in the north fork and south fork, falling outside of the salinity optima for oysters and marine SAV. Typically, oyster reefs in the forks are less dense (oysters per square meter), with a lower proportion of live-to-dead individual oysters compared to the middle estuary, where salinities are higher. Similarly, these stress flows were defined by RECOVER (2020) as a conservative measure of impact in the estuary outside of optimal flows.

Damaging Flows

In the CRE, there are 31 fewer events of 14-day stress (high) flows (i.e., greater than 2,800 cfs) that are triggered by Lake Okeechobee regulatory releases, and 51 fewer triggered by basin runoff, over the period of simulation than the ECB (**Table 5-3**). In the SLE, there are 11 fewer events of 14-day stress (high) flows (i.e., greater than 1,700 cfs) that are triggered by Lake Okeechobee regulatory releases, and 102 fewer triggered by basin runoff, over the period of simulation than the ECB (**Table 5-4**).

To understand the improvements in extreme damaging flows between the ECB, FWO, and alternatives, additional flow bins above the damaging flow ranges for the CRE (i.e., greater than 2,800 cfs) and SLE (i.e., greater than 1,700 cfs) were modeled (**Table 5-3** and **Table 5-4**). In the CRE, these include14-day flows of 2,800–4,500 cfs, 4,500–6,500 cfs, and 6,500 cfs, which would result in progressive decreases in salinity throughout the entire estuary and, therefore, adverse impacts to mesohaline and euryhaline species. The number of events of 2,800–4,500 cfs over the period of simulation in the CRE decreases by 62, by 30 events for flows of 4,500–6,500 cfs, and by 20 events for 14-day flows greater than 6,500 cfs with Alternative 1 compared to the ECB, respectively (**Table 5-3**).

In the SLE, extreme high flows of 1,700 to 4,000 cfs and greater than 4,000 cfs were modeled (**Table 5-4**), the latter of which could result in salinities decreasing below 5 ppt in the whole SLE. Compared to the ECB, Alternative 1 results in 90 fewer flow events of 1,700–4,000 cfs, and 48 fewer 14-day flow events greater than 4,000 cfs of the period of simulation.

There is less improvement in the highest of the flow bins modeled likely due to flood protection and flood control measures made prior to or following extreme precipitation with lower capacity to move water south, and the need to lower Lake Okeechobee levels below the high stage line (i.e., 17 ft).

5.3.3.2 Alternative 2

The effects of Alternative 2 would be similar to those of Alternative 1, as illustrated in **Table 5-3** and **Table 5-4**.

5.3.3.3 Alternative 3

The effects of Alternative 3 would be similar to those of Alternative 1, as illustrated in **Table 5-3** and **Table 5-4**.

5.4 Threatened and Endangered Species

Details on the life history of each species and their effects determinations can be found in the Biological Assessment (BA) in **Annex A**. The Final Biological Opinion (BO) was received on November 30, 2023, and is located in **Annex A**.

5.4.1 Alternative 1

Alternative 1 may affect, but is not likely to adversely affect threatened and endangered (T&E) species. These effects would be expected from the conversion of crop and pastureland and other vegetation communities to an aboveground reservoir. Prior to construction, surveys of T&E species would be conducted on the Project Area. A number of federally threatened, endangered, and candidate species may utilize or occur within the Study Area, including, but not limited to, the Florida panther, Florida manatee and its critical habitat, tricolored bat, Florida bonneted bat, eastern black rail, Everglade snail kite and its critical habitat, Audubon's crested caracara, Florida grasshopper sparrow, wood stork, Eastern indigo snake, Okeechobee gourd, smalltooth sawfish and its critical habitat, green sea turtle, hawksbill sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, and loggerhead sea turtle.

5.4.2 Alternative 2

The effects of Alternative 2 would be similar to those of Alternative 1. Alternative 2 may affect, but is not likely to adversely affect some T&E species. These effects would be expected from the conversion of crop and pastureland and other vegetation communities to an aboveground reservoir. However, 30 percent of Alternative 2 land cover is tree crop, where T&E species habitat would not be expected to occur.

5.4.3 Alternative 3

The effects of Alternative 3 would be similar to those of Alternative 1. Alternative 3 may affect, but is not likely to adversely affect some T&E species. These effects would be expected from the conversion of crop and pastureland and other vegetation communities to an aboveground reservoir. However, 47 percent of Alternative 3 land cover is tree crop, where T&E species habitat would not be expected to occur.

5.5 State-listed Species

5.5.1 Alternative 1

Major effects to state species would be expected from conversion of uplands to an aboveground reservoir. Prior to construction, surveys of species would be conducted on the Project Area. Habitat suitable for the presence, nesting, and/or foraging of the state-listed threatened species may occur in the Project Area. T&E animal species include the American oystercatcher, black skimmer, least tern, burrowing owl, Florida sandhill crane, little blue heron, roseate spoonbill, Southeastern American kestrel, tricolored heron, gopher tortoise, and Florida pine snake.

5.5.2 Alternative 2

Major effects to state species would be expected from conversion of uplands to an aboveground reservoir, similar to Alternative 1.

5.5.3 Alternative 3

Major effects to state species would be expected from conversion of uplands to an aboveground reservoir, similar to Alternative 1.

5.6 Fish and Wildlife

5.6.1 Alternative 1

Moderate beneficial effects would be expected for fish and wildlife for Alternative 1 within Lake Okeechobee. In the watershed, beneficial effects would be offset by negative effects from the conversion of pastureland and wetlands to an aboveground reservoir. The potential effects of Alternative 1 on fish and wildlife are summarized in the subsections to follow. Changes in hydrology have the potential to affect prey forage base by altering hydroperiods and associated vegetation composition or structure. Changes in dominant vegetation structure have potential to affect the prey forage base. Hydrology would continue to be monitored.

5.6.1.1 Invertebrates

Within the Lake Okeechobee Watershed (LOW), wetland and aquatic invertebrates would colonize newly created aquatic habitats in the reservoir footprint, but there would be losses from any existing wetlands within the reservoir footprint, providing negligible effects overall in the watershed.

Minor beneficial effects to the aquatic invertebrate community within Lake Okeechobee are anticipated under Alternative 1, which maintains lake stages within the ecologically preferred envelope more frequently than the FWO (**Table 5-2**). Reduced durations at high lake stages would increase the range of hydroperiods across the littoral marsh and its overall lakeward extent, improving diversity and acreage of habitats, benefiting a wider variety of invertebrate communities.

5.6.1.2 Fish

Within the LOW, Alternative 1 would provide minor beneficial effects to fish through the creation of a reservoir. Fish would be expected to benefit from the reservoir as water would be conveyed to the Project Area by canals, which also act as conduits for the introduction of many aquatic organisms, including fish. Due to the operation of the pumps, however, entrainment and impingement of fish and other aquatic organisms would be expected, negating most beneficial effects of LOCAR on fish in the reservoir footprint.

Species that would likely inhabit LOCAR include largemouth bass, black crappie, gar, red ear sunfish, bluegill, and mosquitofish, as well as exotic species, such as armored catfish and cichlids. The design of the seepage canal includes littoral areas for fish and wildlife use.

Alternative 1 may have a potentially major effect on the entrainment and impingement of fish and aquatic invertebrates. The Florida Fish and Wildlife Conservation Commission (FWC) considers intakes and pump stations high risk for fisheries because of the potential for entrainment and impingement. Intakes would be designed to limit impingement and entrainment by using intake screens that are set at appropriate depths and include slot-size openings to reduce intake velocities, and/or a multi-stage, filter fabric-type system.

Alternative 1 would have moderate beneficial effects for fish in Lake Okeechobee by increasing the amount of time that water levels are in the beneficial stage envelope. Alternative 1 increases this time by 6 percent (to 28 percent) when compared to the FWO (**Table 5-2**), which would help to increase both the emergent aquatic vegetation and SAV habitat that the fish use in the nearshore and littoral zones. An increase in invertebrate and plankton populations and diversity would also benefit fish in the lake as an increased food source.

5.6.1.3 Amphibians and Reptiles

Alternative 1 would have negligible effects to amphibians and reptiles in Lake Okeechobee, benefiting shorter hydroperiod species in the upper marshes, but potentially reducing habitat for truly aquatic species. Within the LOW, Alternative 1 may provide additional aquatic habitat for some amphibians and reptiles, including frogs, turtles, snakes, and alligators, which is a major beneficial effect, unless the hydrology is too dynamic for sustained use. The reservoir shoreline, despite having a steep gradient and widely varying water levels, would likely increase the spatial extent of suitable habitat for aquatic amphibian species. Increase in forage prey availability (e.g., crayfish and other invertebrates, fish) would also directly benefit amphibian and reptile species, although it is unclear whether the deep reservoir would provide additional availability relative to existing wetlands in the footprint. There would be a loss of habitat for upland reptiles and amphibians (e.g., toads, certain snakes, and box turtle).

5.6.1.4 Birds

Moderate beneficial effects would be expected for birds in Lake Okeechobee from Alternative 1. Having lake stages within the ecological envelope more frequently would increase availability of foraging habitat within the lake littoral zone and improve coverage of woody nesting substrates. Within the watershed, Alternative 1 would create foraging habitat for wading birds along the reservoir shoreline, although gradients would be steep and minimally vegetated. Changes in hydrology have the potential to affect birds through alteration of vegetation composition or structure or impacts to their forage base. Hydrology would continue to be monitored, with potential increases in forage base expected. If emergent vegetation was established within the reservoir, it would increase the habitat value, especially for ducks. Forested or upland bird species (e.g., wild turkey, northern bobwhite quail, and songbirds) may lose habitat within the Project footprint.

5.6.1.5 Mammals

As compared with the FWO, potential minor beneficial effects to mammals are anticipated with implementation of Alternative 1. In the watershed, due to loss of upland and wetland habitat within the reservoir footprint, there may be major and adverse effects on mammals dependent upon upland habitat (e.g., deer, armadillos, opossum, skunks, woodrats, and raccoons). There would be a loss of 227 ac of uplands with Alternative 1.

Some small mammals, like river otters, may benefit from increased aquatic habitat in areas of the reservoir footprint, depending on habitat and water depths. However, improvements to lake hydrology would provide benefits to wetland dependent species within the higher elevations of lake marshes. Changes in hydrology also have the potential to affect prey forage base through altering vegetation

composition or structure. Hydrology would continue to be monitored; potential effects to prey forage base and vegetation composition or structure are expected to be better with LOCAR.

5.6.1.6 Aircraft Wildlife Strikes

There would be negligible effects to airspace and the potential for aircraft wildlife strikes because of the distance from proposed LOCAR alternatives and nearby airports.

5.6.2 Alternative 2

Within Lake Okeechobee, moderate beneficial effects would be expected for fish and wildlife for Alternative 2, similar to Alternative 1. In the LOW, Alternative 2 would be expected to have negligible benefits to fish and wildlife. The beneficial effects would be offset by negative effects from the conversion of pastureland to an aboveground reservoir.

5.6.3 Alternative 3

Moderate beneficial effects would be expected for fish and wildlife for Alternative 3 within Lake Okeechobee, similar to Alternative 1. In the watershed, the beneficial effects would be offset by negative effects from the conversion of pastureland to an aboveground reservoir.

5.7 Essential Fish Habitat

5.7.1 Alternative 1

Alternative 1 effects to EFH would be negligible when compared to the No Action Alternative. Overall, Alternative 1 would be expected to improve conditions for estuarine and marine resources throughout the Northern Estuaries by restoring more natural timing, volume, and duration of freshwater flows to the Caloosahatchee and St. Lucie Estuaries. The exception would be in instances of low flows. Increases in the number of low-flow events in the St. Lucie Estuary could increase the frequency of periods when the lower St. Lucie River experiences salinities higher than 10 ppt, which would impact hot spots of larval fish (e.g., common snook or red drum).

5.7.2 Alternative 2

Alternative 2 effects are similar to those of Alternative 1 (see **Figures 5-3** and **5-4**), with only one event difference modeled over the period of simulation.

5.7.3 Alternative 3

Alternative 3 effects are similar to those of Alternative 1 (see **Figures 5-3** and **5-4**), with only one event difference modeled over the period of simulation.

5.8 Hydrology

5.8.1 Alternative 1

Beneficial effects to hydrology would be expected from Alternative 1 as illustrated in **Figure 5-1** through **Figure 5-4**. The hydrologic effects to Lake Okeechobee would be beneficial during high stages, but approximately the same as the FWO during low flow conditions as illustrated in **Figure 5-1**. High flows at S-79 on the Caloosahatchee River are slightly higher than, or equal to, FWO conditions (**Figure 5-2**) The

effects to the Northern Estuaries can be evaluated by combining the modeled results when Lake Okeechobee releases with basin runoff flows. **Figure 5-3** illustrates that Alternative 1 performs nearly the same as the FWO condition in the Caloosahatchee Estuary and that conditions in the St. Lucie Estuary illustrate reduced damaging high flows compared to the FWO.

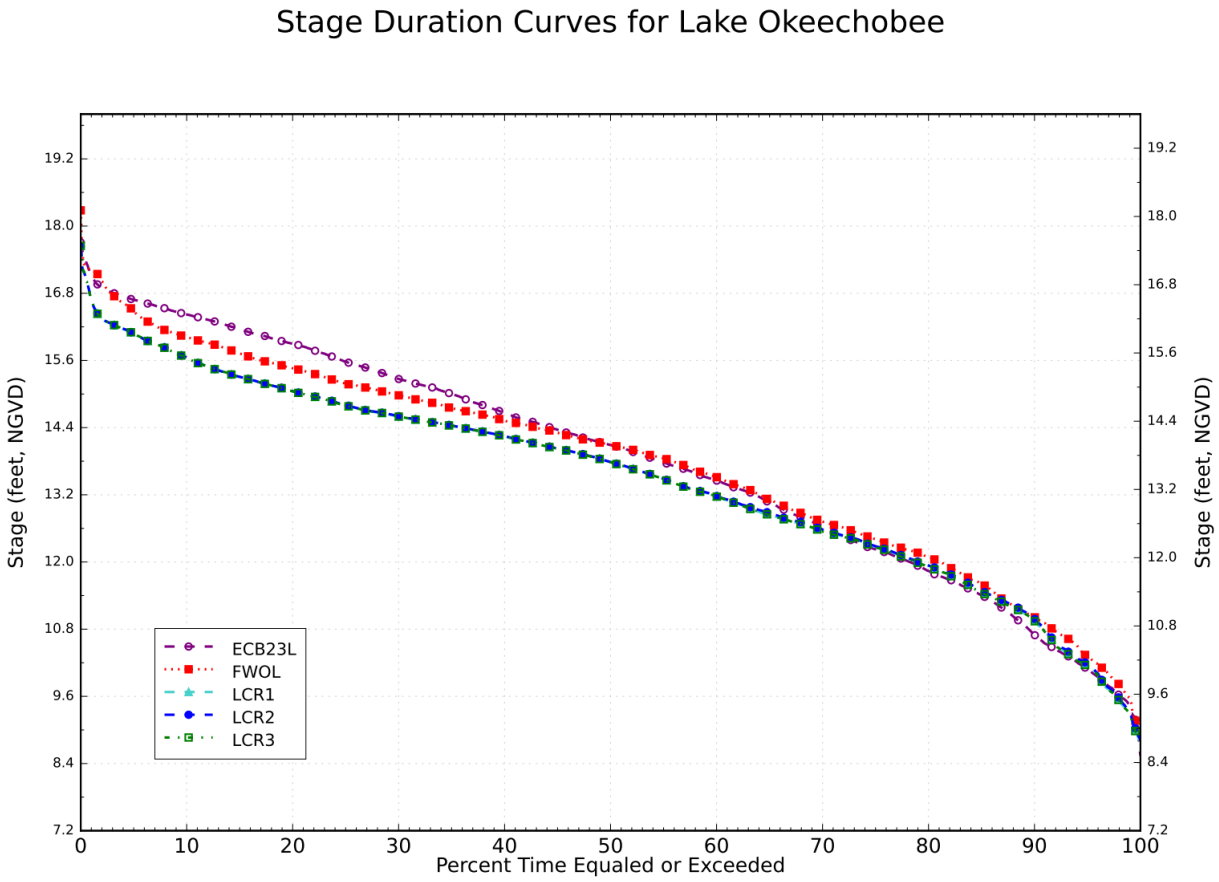


Figure 5-1. Lake Okeechobee stage duration curve: LOCAR RSM-BN simulations (1965–2016).

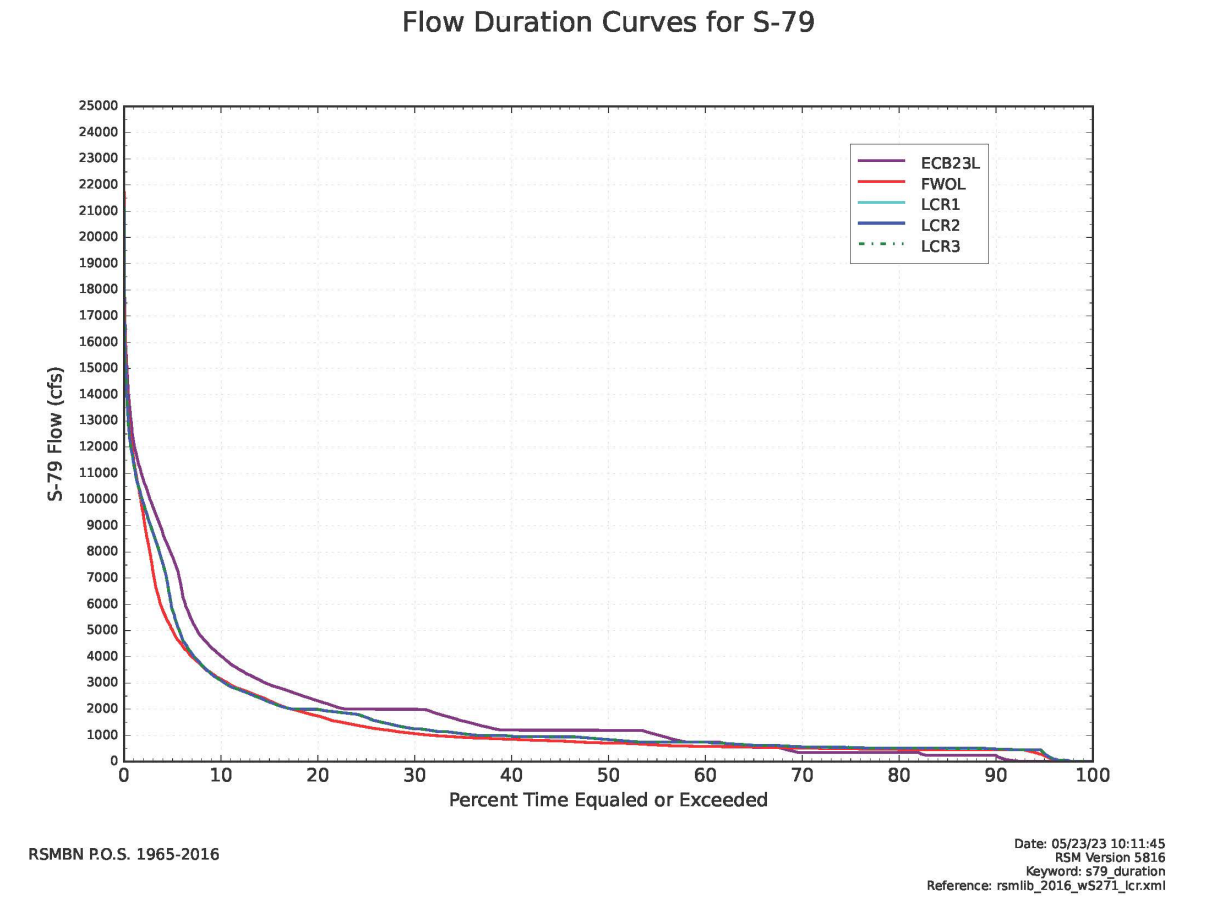


Figure 5-2. Stage duration at S-79: LOCAR RSM-BN simulations (1965–2016).

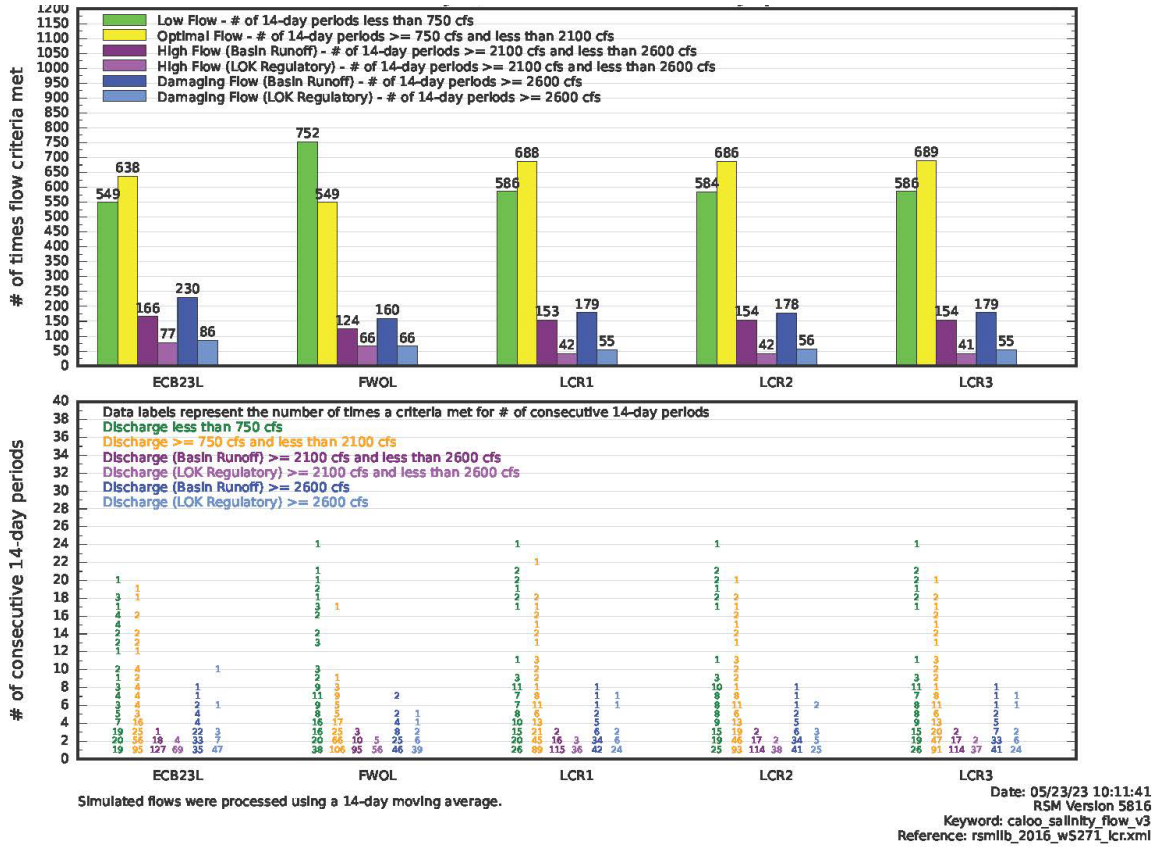


Figure 5-3. Number of events for each of the salinity envelope flow categories for the Caloosahatchee Estuary (number of 14-day periods 1965–2016).

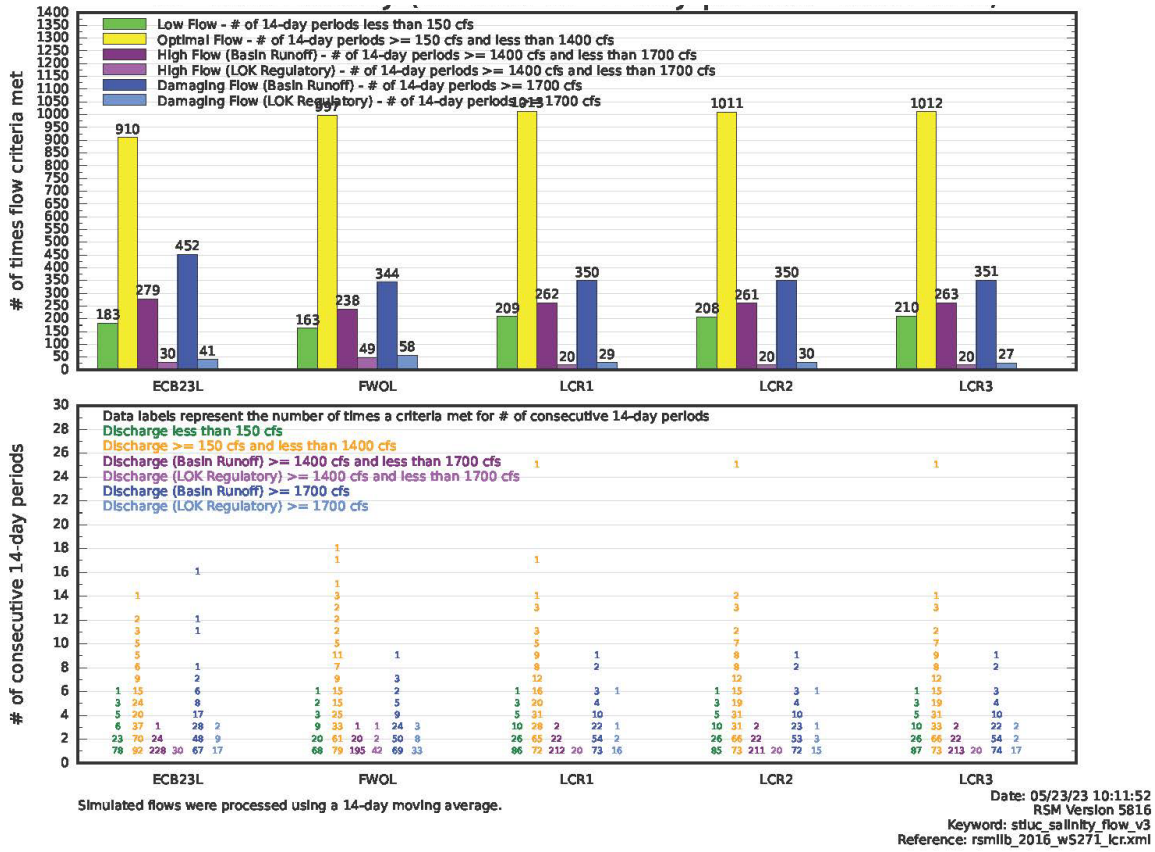


Figure 5-4. Number of events for each of the salinity envelope flow categories for the St. Lucie Estuary (number of 14-day periods 1965–2016).

5.8.2 Alternative 2

The hydrologic benefits of Alternative 2, when compared to the FWO, would be similar to Alternative 1; overall beneficial effects would be expected.

5.8.3 Alternative 3

The hydrologic benefits of Alternative 3, when compared to the FWO, would be similar to Alternative 1; overall beneficial effects would be expected.

5.9 Regional Water Management (Operations)

5.9.1 Alternative 1

Major beneficial effects to operations would be expected from implementation of Alternative 1; however, those benefits would not be realized without changes to LORS, as illustrated in sensitivity runs performed for this Feasibility Study.

5.9.2 Alternative 2

The effects to operations from Alternative 2 would be similar to Alternative 1.

5.9.3 Alternative 3

The effects to operations from Alternative 3 would be similar to Alternative 1.

5.10 Groundwater Resources

Negligible effects on groundwater resources would be expected from each of the alternatives. **Table 5-7** describes the groundwater resources for each alternative.

Table 5-7. Effects of the Alternatives on Groundwater Resources.

Alternative	Surficial Aquifer System (SAS)	Upper Floridan Aquifer (UFA)	Avon Park Permeable Zone (APPZ)
Future Without Project	Total water demand is expected to increase by 15% by 2035, mostly due to agricultural demands. Surficial aquifer would meet part of those demands. Extensive pumping of the SAS could potentially affect regional water levels in this unconfined aquifer.	Estimated future demands on UFA groundwater may be limited near the Lake Wales Ridge to maintain minimum flows and levels in adjacent lakes. However, sufficient confinement separates Lake Istokpoga and Lake Okeechobee from the UFA, so increased demands are unlikely to affect water levels in these lakes.	The APPZ is not a water supply source due to greater salinity compared to the UFA, as well as greater depth. It is unlikely that the APPZ will provide drinking water or agricultural irrigation supplies in the future.
Alternative 1	Seepage from the Lake Okeechobee Storage Reservoir Section 203 Study (LOCAR or Project) would be managed by a seepage canal and discharge to C-41A. The Project would benefit the unconfined SAS by providing recharge to the aquifer from unrecovered seepage.	No effect on the UFA would be expected from LOCAR.	No effect on the APPZ would be expected from LOCAR.
Alternative 2	Seepage from LOCAR would be managed by a seepage canal and discharge to C-41A. The Project would benefit the unconfined SAS by providing recharge to the aquifer from unrecovered seepage.	No effect on the UFA would be expected from LOCAR.	No effect on the APPZ would be expected from LOCAR.
Alternative 3	Seepage from LOCAR would be managed by a seepage canal and discharge to C-41A. The Project would benefit the unconfined SAS by providing recharge to the aquifer from unrecovered seepage.	No effect on the UFA would be expected from LOCAR.	No effect on the APPZ would be expected from LOCAR.

5.11 Water Quality

Table 5-8 and **Table 5-9** summarize the assessment of Project impacts to water quality in the Lake Okeechobee Watershed and in the lake itself, respectively. For detailed analyses, see **Appendix C, Part 2**. The reservoir components would provide increased watershed runoff retention at times and would result in direct conversion of pasture and upland to a reservoir. Inflows to Lake Okeechobee may contain nutrients such as nitrogen and phosphorus from surrounding uplands. If this upland flow is diverted to a reservoir prior to entering Lake Okeechobee, such as when water in C-41A (from the Indian Prairie Sub-basin and/or Lake Istokpoga runoff) that would otherwise flow to Lake Okeechobee is diverted into the reservoir, there would be greater opportunity for retention and storage of nutrients within these systems. While the reservoir compartments may be too deep to support plant growth, water may remain there long enough so that particulates and associated nutrients settle within the reservoir, providing minor improvement to water quality before it is returned to the watershed canals.

Table 5-8. Effects of the Alternatives on Lake Okeechobee Watershed Water Quality.

Alternative	Water Quality
Future Without Project	Water quality is expected to improve relative to present conditions as the result of establishment of Total Maximum Daily Loads and implementing the associated basin management action plans for the basins discharging to the lake.
Alternative 1	Ancillary water quality benefits would be expected from the alternative from the retention of watershed runoff.
Alternative 2	Ancillary water quality benefits would be expected from the alternative from the retention of watershed runoff.
Alternative 3	Ancillary water quality benefits would be expected from the alternative from the retention of watershed runoff.

Table 5-9. Effects of the Alternatives on Lake Okeechobee Water Quality.

Alternative	Water Quality
Future Without Project	Water quality is expected to improve relative to present conditions as the result of establishment of Total Maximum Daily Loads and implementation of the associated basin management action plan for the basins discharging to the lake.
Alternative 1	Projected water quality improvements for the FWO are not expected to be negatively affected by the alternatives. Results from a simple P-loading spreadsheet model showed slight (<1 percent) reductions in phosphorus loading compared to FWO. This would equate to a load reduction of less than 1 metric ton/yr. .
Alternative 2	Projected water quality improvements for the FWO are not expected to be negatively affected by the alternatives. Results from a simple P-loading spreadsheet model showed slight (<1 percent) reductions in phosphorus loading compared to FWO. This would equate to a load reduction of less than 1 metric ton/yr.
Alternative 3	Projected water quality improvements for the FWO are not expected to be negatively affected by the alternatives. Results from a simple P-loading spreadsheet model showed slight (<1 percent) reductions in phosphorus loading compared to FWO. This would equate to a load reduction of less than 1 metric ton/yr.

yr–year

5.12 Flood Protection for Savings Clause Analysis and Flood Risk Management

Updates to demonstrate Savings Clause compliance for flood protection, as described in CERP Guidance Memorandum 3 (CGM-3), are still being coordinated.

Other alternatives considered for retaining water for water management and supply were determined impractical due to negative resources impacts, technical challenges, expense, or being ineffectual. Other alternative actions considered include dredging Lake Okeechobee, deep injection wells, dispersed water management, wetland attenuation features, and aquifer storage/recovery wells. The project's impacts and performance when compared to other options led to its selection as the recommended plan.

The proposed action conforms with federal, State of Florida and local floodplain protection standards. The floodplain determination sourcing is the November 18, 2015, Federal Emergency Management Agency Flood Insurance Rate Maps. The current freeboard value of 2-feet plus 1-percent-annual-chance-floodplain is assumed until the project Planning, Engineering and Design (PED) phase, when the Federal Flood Risk Management Standard (FFRMS) flood elevations will be evaluated using the Guidelines for Implementing E.O. 11988, Floodplain Management, and E.O. 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input, October 8, 2015 or more current guidance.

Construction and operation of the project is unlikely to affect the natural or beneficial values of the existing floodplain. Precipitation normally falling within the project footprint will be captured by the project. The surrounding floodplain is managed to capture and store precipitation in agricultural impoundments. The water is used in agriculture and livestock production or passively recharges the groundwater. High flows, generally associated with precipitation and storms, is captured in local canals, and transferred to the Kissimmee River and Lake Okeechobee. The project has been designed to capitalize on existing infrastructure, minimize new infrastructure outside of the reservoir footprint, and minimize impacts to water management operations within the study area.

The project was subject to public scoping, public meetings sharing the proposed alternatives, and coordination with local, state, and federal agencies and tribes in keeping with National Environmental Policy Act requirements. Scoping is described in Appendix A, Pertinent Correspondence of the Draft Environmental Impact Statement for North of Lake Okeechobee Storage Reservoir Section 203 Study, October 2023. The public was given a second opportunity for review announced by a Notice of Availability published in the Federal Register on 26 October 2023 and through public meetings. The reservoir concept was also coordinated as part of the Central and Southern Florida Project Comprehensive Review Study, Final Integrated Feasibility Report and Programmatic Environmental Impact Statement, April 1999, and Lake Okeechobee Watershed Restoration Project, June 2022.

5.12.1 Alternative 1

The level of flood protection of Alternative 1 would be similar to the FWO; negligible effects would be expected within the Study Area. Beneficial effects would be expected during some flood events where LOCAR would store stormwater that would have otherwise caused flooding in the Study Area. LOCAR would also maintain the existing level of service of flood protection of the area through engineering design and construction following state-of-the-practice methods for design and construction of pertinent features of the plan.

5.12.2 Alternative 2

The effects of Alternative 2 would be similar to Alternative 1.

5.12.3 Alternative 3

The effects of Alternative 3 would be similar to Alternatives 1 and 2.

5.13 Water Supply

5.13.1 Alternative 1

Table 5-10 and **Table 5-11** summarize that the volume of water available for water supply would be greater in Alternative 1 than the FWO. However, water shortage frequencies and durations would occur more frequently than in the FWO. These results are based on the RSM-BN LOCAR modeling representations. The period of simulation (i.e., 1965 to 2016) used for the LOCAR hydrologic modeling encompasses a wide range of historical climatologic and meteorologic conditions that are representative of central and south Florida hydrology. The effects from both increased volumes of water available and water shortages are influenced by the timing and routing of other projects.

Modeling was performed for various scenarios based on known Lake Okeechobee operational changes and federally authorized projects. Theses modeled changes are described in **Appendix A, Annex A-2.4**. In particular, Section 3.1 of the **Appendix A, Annex A-2.4** describes the as-authorized LORS-based EAA reservoir FWO, Section 3.2 describes the LOCAR LOSOM-based proposed operations and the Appendix B of **Appendix A, Annex A-2.4** describes a LOSOM-based version of the EAA reservoir FWO which is the cleanest way of showing the LOCAR storage benefits independent of Lake Okeechobee regulation schedule changes.

Analysis indicates that Alternative 1 maintains the pre-Project levels of service for water supply, consistent with the requirements of Section 601 (h)(5)(A) and Section 601 (h)(5)(C) of the WRDA 2000 for existing legal users and maintains the rights of the STOF under the 1987 Water Rights Compact (Compact) among the STOF, State of Florida, and SFWMD.

Table 5-10. Effects of the Alternatives on Lake Okeechobee Service Area Water Supply.

Alternative	Water Supply for Existing Legal Users (ka-feet/year)
Future Without Project	386
Alternative 1	411
Alternative 2	410
Alternative 3	410

Table 5-11. Effects of the Alternatives on Seminole Tribe of Florida Brighton Reservation Water Supply.

Alternative	Water Supply for Existing Legal Users (ka-feet/year)
Future Without Project	83
Alternative 1	83
Alternative 2	83
Alternative 3	83

5.13.2 Alternative 2

Analysis indicates that Alternative 2 maintains the pre-Project levels of service for water supply, consistent with the requirements of Section 601 (h)(5)(A) and Section 601 (h)(5)(C) of WRDA 2000 for existing legal users and maintains the rights of the STOF under the Compact among the STOF, State of Florida, and SFWMD.

5.13.3 Alternative 3

Analysis indicates that Alternative 3 maintains the pre-Project levels of service for water supply, consistent with the requirements of Section 601 (h)(5)(A) and Section 601 (h)(5)(C) of WRDA 2000 for existing legal users and maintains the rights of the STOF under the Compact among the STOF, State of Florida, and SFWMD.

5.14 Air Quality

5.14.1 Alternative 1

Short-term, major adverse effects and long-term negligible effects to air quality would be expected from the construction and operation of Alternative 1. Short-term, major adverse effects to air quality would be expected during construction activities from Particulate Matter 10 (PM_{10}—dust). Assumptions during construction would expect to exceed allowable emissions for PM_{10}. Exceedances of PM10 would not be expected if less than 2 million square feet of soil was left bare for less than 3 consecutive months. Reasonable precautions should be taken to prevent dust from becoming airborne. Reasonable precautions might include using water to control dust from building construction and demolition, road grading, or land clearing. Cleared or graded land would be stabilized by mechanical controls, seeded and/or vegetated in a timely manner to reduce fugitive dust. Additional analysis would be performed during PED to update emissions and determine permitting needs. Long-term negligible effects to air quality would be expected from the operation of electric-powered pump stations and propane powered backup generators that are categorically exempt from air permitting.

Using CO_2e as a surrogate for CO_2 emissions, the highest annual emissions would be expected during construction at more than 38,000 tons (roughly 35,000 metric tons); more than 60 percent of these emissions are from hauling material to the Project. For perspective, this would be 0.02 percent of the annual CO_2 emissions in Florida in 2021 (USEIA 2023). The annual operational emissions would be 8 tons; two times the global annual average use of an individual (4.7 tons per year) and a fraction (15 percent) of the annual use by the wealthiest people (the top 10 percent) living in the United States (55 tons per year).

Over the 50-year project life cycle, the social cost of carbon (SCC) of operations (beginning in 2034) of Alternative 1 was estimated to be roughly $38,552 (Friedlinstein et al. 2022; IWG 2021).

5.14.2 Alternative 2

Short-term moderate and long-term negligible effects to air quality would be expected from the construction and operation of Alternative 2, similar to Alternative 1.

5.14.3 Alternative 3

Short-term moderate and long-term negligible effects to air quality would be expected from the construction and operation of Alternative 3, similar to Alternative 1.

5.15 Hazardous, Toxic, and Radioactive Waste

5.15.1 Alternative 1

Negligible effects from hazardous, toxic, and radioactive waste (HTRW) contamination would be expected because the SFWMD, the non-federal sponsor, would be required to remediate these sites at its sole expense. Agricultural lands in the Project footprint would be remediated, and further application and release of petroleum and pesticides would not occur.

5.15.2 Alternative 2

Negligible effects from HTRW contamination would be expected from Alternative 2 because the SFWMD would be required to remediate sites.

5.15.3 Alternative 3

Similar to Alternatives 1 and 2, negligible effects from HTRW contamination would be expected from Alternative 3.

5.16 Noise

5.16.1 Alternative 1

Short- and long-term minor noise increases would be expected from Alternative 1 during construction and operation. Short-term noise during construction would be caused by construction equipment including an on-site concrete batch plant. Long-term noise would be localized to areas around pump stations.

5.16.2 Alternative 2

Similar to Alternative 1, short- and long-term effects would be expected from noise. More noise would be generated by Alternative 2 over the larger footprint and increased number of pump stations.

5.16.3 Alternative 3

Similar to Alternative 2, minor short- and long-term effects would be expected from noise generated by Alternative 3.

5.17 Aesthetics

5.17.1 Alternative 1

Aesthetic effects refer generally to impacts on the visual qualities of the environment. People value viewing wildlife, open water, and open, relatively pristine spaces, as supported by tourism statistics for

central and south Florida. There would be a short-term, major negative effect to aesthetic value during construction. Long-term negative effects during operation of Alternative 1 would be moderate.

There would be some small improvements in the aesthetics of Lake Okeechobee and the Northern Estuaries from more frequent ideal water levels in the lake and optimal flows to the estuaries. Moderating water levels and flows would be expected to improve growing conditions for SAV and emergent aquatic vegetation, which can themselves have positive effects on water quality and clarity. These benefits could lead to an increase in wildlife viewing opportunities (Orth et al. 2006).

5.17.2 Alternative 2

The effects of Alternative 2 would be similar to Alternative 1.

5.17.3 Alternative 3

The effects of Alternative 3 would be similar to Alternative 1.

5.18 Land Use

5.18.1 Alternative 1

Converting privately owned pastureland to aboveground storage accessible to the public would be expected to provide negligible effects to local land use when compared to the FWO. Construction of LOCAR would maintain the natural landscape and create recreational opportunities. Coordination with the U.S. Department of Agriculture and Natural Resources Conservation Service to meet the requirements of the Farmland Protection Policy Act is ongoing. When detailed design is completed, the impact to unique farmland would be defined and mitigated if needed.

5.18.2 Alternative 2

Alternative 2 effects on land use would be negligible. Private pastureland would be maintained or considered for other uses and citrus crop land what would be expected to remain as such. Implementation of Alternative 2 would allow the public access to the land for recreational opportunities that did not previously exist.

5.18.3 Alternative 3

The effects to land use would be negligible from Alternative 3, similar to Alternative 2.

5.19 Recreation

5.19.1 Alternative 1

Alternative 1 would be expected to provide a minor effect on recreational opportunities in the Study Area compared to the FWO condition. Measurable positive impacts are likely limited to those created within the LOCAR Project footprint as described in **Appendix F**. While LOCAR would offer additional opportunities for fishing, hunting, and frogging, with hiking and biking opportunities, the value of annual FWO recreational benefits within the broader Study Area is likely in the hundreds of millions of dollars.. LOCAR

would improve ecological conditions in Lake Okeechobee and the Northern Estuaries, but the economic effects to areas outside of the LOCAR Project footprint would be difficult to measure.

5.19.2 Alternative 2

Alternative 2 would be expected to cause minor effects to recreational opportunities in the Study Area compared to the FWO condition. Effects would be similar to those of Alternative 1.

5.19.3 Alternative 3

Alternative 3 would be expected to cause minor effects to recreational opportunities in the Study Area compared to the FWO condition. Effects would be similar to those of Alternative 1.

5.20 Socioeconomics

5.20.1 Alternative 1

Implementation of Alternative 1 would be expected to have minor beneficial effects on socioeconomics within the Study Area. Beneficial economic effects would be expected from construction and operation of the reservoir.

No effects would be expected on population. Population projections are not anticipated to be affected by Alternative 1 and would be expected to be consistent with existing projections. The Study Area consists of a predominantly agricultural and sparsely populated area in Glades, Highlands, Martin, Okeechobee, and Palm Beach Counties. The University of Florida Bureau of Economic and Business Research medium population projections anticipate that the residential populations of these counties in total would grow by 287,800 people, from 1,892,400 people in 2025 to 2,180,200 people in 2050, an increase of 15.2 percent. This increase is consistent with that projected previously in CERP planning efforts. **Table 5-12** displays the University of Florida's total and percent population increase by county projected between 2025 and 2050 and represents the FWO and Alternative 1 as well. Population projections are not anticipated to differ between the FWO and Alternative 1, as population projections would not be expected to be affected by the proposed Project.

Table 5-12. Projected Net and Percent Population Increase by County (2025–2050).

County	Projected Population Increase (2025–2050)	Percent Change
Glades	700	5.6
Highlands	8,100	7.8
Martin	20,100	12.2
Okeechobee	1,700	4.3
Palm Beach	257,200	16.4
Total, Study Area Counties Combined	287,800	15.2

Source: BEBR 2022.

The infusion of construction funds into the regional economy would generate beneficial economic effects, such as increased sales, additional jobs, increased labor income, and increased gross regional product during the construction period. Operations, maintenance, repair, rehabilitation, and replacement funds would have the same beneficial effects throughout the life of the Project. Primary industries affected would be construction, food and drink services, and engineering services. Operation of the reservoir would see beneficial economic effects from new recreational features added to LOCAR, and improved recreational opportunities at Lake Okeechobee. This would be expected to result in increased spending from residents and tourists in accommodation and food services, real estate rentals, recreation, and retail trade industries, and an increase in state and local sales tax revenue.

For all private-sector relocations, a private landowner would be monetarily compensated for the economic value of their property based on a fair market value appraisal, and the non-federal sponsor would provide relocation assistance for affected businesses per the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Therefore, it is expected that business owners would be monetarily compensated and may have the opportunity to relocate to a suitable location in the region, resulting in less-than-significant socioeconomic impacts. Agricultural jobs displaced by property acquisition may be transferred elsewhere in the regional economy. All private land acquisition would result in a decrease in ad valorem property tax revenue for the counties in which the property is located.

5.20.2 Alternative 2

The effects of Alternative 2 would be similar to those of Alternative 1; minor beneficial and adverse economic effects on the Study Area would be expected.

5.20.3 Alternative 3

The effects of Alternative 3 would be similar to those of Alternative 1; minor beneficial and adverse economic effects on the Study Area would be expected.

5.21 Environmental Justice

5.21.1 Alternative 1

No disproportionate and adverse effects on communities with environmental justice (EJ) concerns would be expected under Alternative 1. EJ analysis involves identifying and addressing, as appropriate, disproportionate and adverse human health or environmental effects of federal programs, policies, and activities on communities with EJ concerns (which include communities with a significant proportion of people in poverty, or with a significant proportion of people of color). Executive Orders 12898, 14008, and 14096 require an analysis of environmental effects, including human health, economic, social, and climate effects, of federal actions on communities with EJ concerns, when such analysis is required by NEPA. Several communities were identified in the Study Area as having a potential to be affected. Glades, Highlands, and Okeechobee Counties in the Study Area, including census tracts adjacent to the Project Area, have income levels notably lower than the state average and poverty rates that are higher than the state average. Communities of people of color in the Study Area that could be affected by the Project are the STOF Brighton Reservation in Glades County, which represents Tribal nation lands, and a community

southwest of the reservoir site in Census Tract 9617.02 in Highlands County, where almost half of the population is of Hispanic or Latino origin.

Alternative 1 would provide benefits to quality of life by improving Lake Okeechobee ecology, improving the estuarine environment, and contributing to hydrologic improvements in the historical Everglades. The reservoir would benefit the abundance of fish and wildlife species and recreation and subsistence fishing/hunting, as the reservoir itself would provide habitat for fish and wildlife as well as aesthetic value and recreational opportunities.

The reservoir would have short-term, major adverse impacts to aesthetic values in the Project Area during construction and long-term, major adverse impacts in the Project Area resulting from the addition of the human-made features of the levee in the line of sight. An earthen dam will be visible on the rise but covered with grass to minimize the aesthetic impact. The proposed reservoir site would be about 5 miles north of the STOF Brighton Reservation and about 9 miles northeast of the MTI North Ranch (formerly known as Cherry Ranch) Tribal-owned lands. The alternative also shows an increase in aesthetic value over the No Action Alternative from the creation of a reservoir, as people value viewing wildlife, open water, and open, relatively pristine spaces, as supported by tourism statistics for central and south Florida.

Alternative 1 would have short-term adverse effects to air quality from construction activity, but long-term negligible effects to air quality from the operation of electric pumps, and would not substantially increase climate change risks, greenhouse gas emissions, or result in a substantial SCC (**Section 5.14**).

Alternative 1 would have a short-term, minor increase in noise during construction activities and long-term, localized increases in noise from the pump stations. Long-term, minor effects at night from pump station lights would be minimized by light type, number, direction of orientation, and location relative to residential areas. For cultural and Tribal resources, the Project would be subject to separate consultation and consideration of effects through ongoing consultation with the State Historic Preservation Officer (SHPO) and the appropriate federally recognized Native American Tribes. Results from the CRAS have determined that Alternatives 1, 2, and 3 would adversely affect historic properties but the Recommended Plan would avoid historic properties. In a letter dated February 26, 2024, the Florida State Historic Preservation Officer that that “the proposed project will have no adverse effect on historic properties listed, or eligible for listing, in the NRHP, or otherwise of historical, archaeological, or architectural value within the surveyed APE.” They found the report submitted to be “complete and sufficient in accordance with Chapter 1A-46, Florida Administrative Code“ (**Section 4.23**).

Existing drainage patterns outside of reservoir footprints would be maintained. The probability of a breach of the proposed reservoir would be extremely low because of robust design criteria of modern design standards.

Negligible effects to water supply would be expected, as the volume of water available for water supply would be greater under Alternative 1 than for the No Action Alternative. The pre-Project levels of service for water supply would be maintained, consistent with the requirements of Section 601 (h)(5)(A) and Section 601 (h)(5)(C) of the WRDA 2000 for existing legal users, and the water rights of the STOF would be maintained under the 1987 Compact.

Based on the full analysis provided in **Appendix C, Part 2**, Alternative 1 would not result in disproportionate and adverse impacts upon the communities with EJ concerns in the Study Area.

5.21.2 Alternative 2

The effects of Alternative 2 would be similar to those of Alternative 1; no disproportionate and adverse effects on communities with EJ concerns would be expected.

5.21.3 Alternative 3

The effects of Alternative 3 would be similar to those of Alternative 1; no disproportionate and adverse effects on communities with EJ concerns would be expected.

5.22 Cultural Resources

The use of the term "cultural resources" includes historical properties and culturally significant sites that are eligible or potentially eligible for National Register of Historic Places listing. For definitions of terms, see **Section 10.0**. In conjunction with the National Historic Preservation Act (NHPA), the Corps initiated formal consultation with the STOF's Tribal Historic Preservation Officer, the MTI's Native American Graves Protection and Repatriation Act representative, and the Florida State Historic Preservation Officer (SHPO). Results from the CRAS have determined that Alternatives 1, 2, and 3 would adversely affect historic properties but the Recommended Plan would avoid historic properties. In a letter dated February 26, 2024, the Florida State Historic Preservation Officer that that "the proposed project will have no adverse effect on historic properties listed, or eligible for listing, in the NRHP, or otherwise of historical, archaeological, or architectural value within the surveyed APE." They found the report submitted to be "complete and sufficient in accordance with Chapter 1A-46, *Florida Administrative Code*. "

5.22.1 Alternative 1

Alternative 1 would adversely affect historic properties and cultural resources. **Section 4.0** lists criteria used for the evaluation. **Appendix C, Part 2**, contains a description of the full preliminary analysis, background information, and descriptions of terms. Ongoing CRAS have identified historic properties within the Alternative 1 footprint. Alternative 1 would adversely affect these historic properties. Therefore, potential mitigation measures would be developed in consultation with the SHPO, federally recognized Tribes, and other interested parties as established in implementing regulations for Section 106 of the NHPA.

5.22.2 Alternative 2

Alternative 2 would adversely affect historic properties and cultural resources. Similar to Alternative 1, mitigation of those effects on cultural resources would be developed in consultation with the SHPO, federally recognized Tribes, and other interested parties as established in implementing regulations for Section 106 of the NHPA.

5.22.3 Alternative 3

Alternative 3 would adversely affect historic properties and cultural resources. Similar to Alternative 1, mitigation of those effects on cultural resources would be developed in consultation with the SHPO, federally recognized Tribes, and other interested parties as established in implementing regulations for Section 106 of the NHPA.

5.23 Invasive and Exotic Species

5.23.1 Alternative 1

Alternative 1 would be expected to have long-term major effects on the establishment and spread of non-native invasive and native nuisance species. Several ecosystem drivers that would directly or indirectly influence the spread of non-native species would be expected from construction and operation of LOCAR. These factors may affect invasive species positively or negatively, depending on the unique characteristics of individual species, the environmental conditions for a given biological invasion, and the mitigation measures implemented to reduce the effects of Alternative 1 (Doren et al. 2009). Disturbed areas resulting from construction are likely to become established with non-native invasive and native nuisance species. New flows created by operations of Alternative 1 may serve as a vector to spread invasive and non-native nuisance species into new areas. The large number of existing and potential invasive plant and animal species and the often-incomplete knowledge of invasive mechanisms for each species create moderate-to-high uncertainty in this evaluation. Long-term monitoring in an adaptive management framework is critical to ensure efficient management of the most threatening, non-native invasive species in the Project Area. **Annex F** contains proposed management activities to address invasive species.

5.23.2 Alternative 2

The effects of Alternative 2 would be similar to Alternative 1. Long-term major effects would be expected from creating new vectors for the spread of invasive and non-native species to new areas.

5.23.3 Alternative 3

Alternative 3 would be expected to have long-term major effects on the spread of invasive and non-native species to new areas.

5.24 Effects on Native Americans

The MTI and STOF rely upon the Everglades to support their cultural, subsistence, and commercial activities. Subsistence activities for members of the both the STOF and MTI include gathering of materials, hunting, trapping, frogging, and fishing. The STOF's Brighton Reservation lands are situated approximately 5 miles (mi) south of the Project Area. As part of the development of this Project, consultation has occurred between the SFWMD, Corps, MTI, STOF, and other interested, federally recognized Tribes with ancestral ties to the region.

The following alternative evaluations evaluate potential impacts to Native Americans as indicated by the Tribes through government-to-government consultation. Native American concerns extend beyond physical impacts to their lands. Such considerations, while not always explicit, have been taken into account during discussions and consultations that have occurred with federally recognized Tribes.

5.24.1 Alternative 1

5.24.1.1 Miccosukee Tribe of Indians of Florida

No portion of Alternative 1 is located within or adjacent to known MTI-owned lands, reservation lands, or traditional cultural properties. Pursuant to Section 106 of the NHPA (Title 54 of the United States Code

[U.S.C.] Section 306101 *et seq*.), obligations regarding Corps trust responsibilities to federally recognized Native American Tribes, the Corps consulted with the MTI.

5.24.1.2 Seminole Tribe of Florida

The STOF Brighton Reservation and Tribe-owned lands are situated approximately 5 mi (to the nearest point) to Alternative 1. The STOF is concerned about flooding and seepage and is interested in opportunities to improve its water supply reliability.

The short- and long-term effects to the STOF have the potential to be negligible to major adverse. Ongoing consultation would determine whether Alternative 1 has a probability to contain additional historical properties and cultural resources within the Project footprint. Cultural resource surveys are currently underway. These impacts would be avoided, minimized, or mitigated, as appropriate, during the PED phase of this Project.

5.24.2 Alternative 2

Alternative 2 offers the lowest reservoir storage depth; however, it would still be expected to have long-term negligible to major adverse effects to the STOF, similar to Alternative 1.

5.24.3 Alternative 3

Alternative 3 offers the lowest reservoir storage depth; however, it would still be expected to have long-term negligible to major adverse effects to the STOF, similar to Alternative 1.

6.0 RECOMMENDED PLAN

The LOCAR Recommended Plan is the most cost-effective (Alternative 1), with refinements for a reduced footprint to avoid environmentally sensitive uplands (**Figure 6-1**). The environmental effects of the Recommended Plan are essentially the same as the effects of Alternative 1 described in **Section 5.0**, but the reduced footprint (a change of 484 ac—compare **Figure 3-2** to **Figure 6-1**) would avoid effects on an environmentally sensitive upland area. Further, the Recommended Plan would have the same effects as Alternative 1 associated with constructing and operating LOCAR.

The Recommended Plan would improve the quantity, timing, and distribution of water entering Lake Okeechobee, thus providing opportunities for better management of lake water levels for ecological and water supply purposes. The Recommended Plan reduces the frequency and duration of high-volume regulatory lake flows to the Caloosahatchee and St. Lucie Estuaries (Northern Estuaries) and improves systemwide operational flexibility. Recreational features included in the Recommended Plan would enhance the existing opportunities for resource-based recreation in the Lake Okeechobee Watershed (LOW).

6.1 Plan Description

This subsection describes plan features, lands and interests in lands, Project operations, adaptive management and monitoring plans (AMMP), invasive and nuisance species management plan, and recreational features.

6.1.1 Plan Features

The Recommended Plan includes a 200,000 ac-ft aboveground storage reservoir along the north side of Canal 41A (C-41A), and various recreational features. The reservoir and its external features, including its perimeter canal and perimeter maintenance road, would encompass an area of approximately 12,316 ac. The total area of the reservoir, bounded by the centerline of the perimeter dam, is approximately 11,352 ac (17.74 square miles [mi^2]), which includes approximately 6,561 ac (10.25 mi^2) for the east cell and 4,791 ac (7.49 mi^2) for the west cell. At its Normal Full Storage Level (NFSL) of 51.70 ft North American Vertical Datum (NAVD88), the reservoir would have an average storage depth of approximately 18 ft within each of its two storage cells since the average ground surface elevation within the storage cells is about 33.9 ft NAVD88. The reservoir's major components include a perimeter dam and interior divider dam that form its two storage cells, a gated water control structure within the divider dam, an inflow pump station, a seepage return pump station, two gated outflow culverts, a perimeter canal (for the collection and conveyance of seepage and stormwater flows), an inflow-outflow canal, an outflow canal, and two ungated overflow spillways. Features would be operated in conjunction with the existing C&SF Project features for the purpose of filling and emptying the storage reservoir.

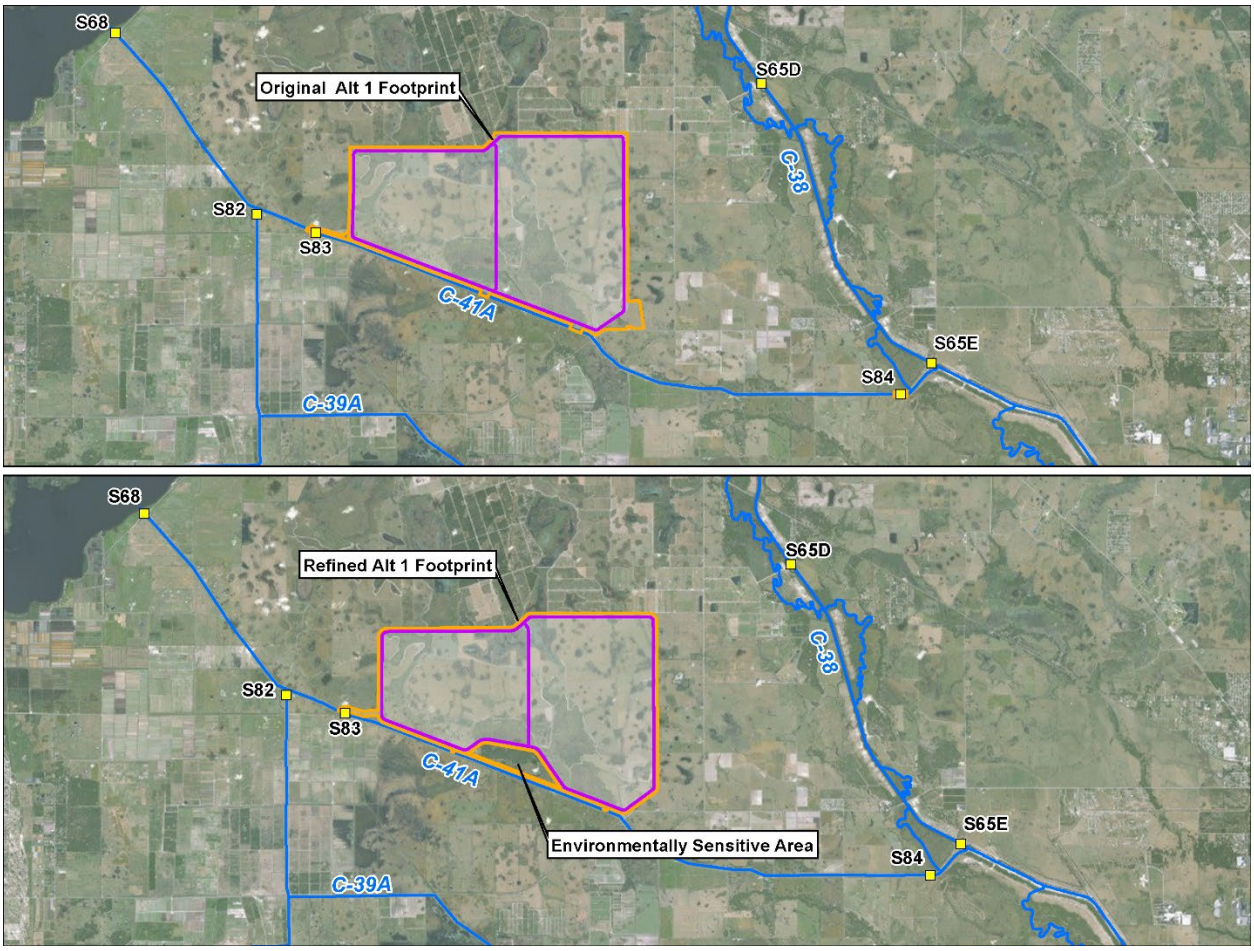


Figure 6-1. Original Alternative 1 footprint vs. Refined Alternative 1 footprint and environmentally sensitive area.

Construction. The reservoir would be constructed with a perimeter dam and an interior divider dam, with each having an average height of approximately 39 ft and 33 ft above the ground, respectively. The perimeter dam would be approximately 18 mi around, allowing for recreational opportunities. Material from the Project footprint and the surrounding perimeter canal would be used to construct the dams. A gated outflow culvert would be constructed on the west side of the reservoir to discharge water into C-41A upstream of Structure 83 (S-83), while another gated culvert would be constructed near the southeast side of the reservoir to discharge water into C-41A downstream of S-83.

The reservoir would be constructed to have two storage cells (i.e., east and west) split by an interior divider dam to reduce wave runup. The interior divider dam would include a 1,500 cfs capacity, gated water-control structure to allow for controlled conveyance of water between the two cells. Each cell would include an ungated overflow spillway designed to discharge into C-41A.

A reservoir perimeter canal would be constructed outside the perimeter dam of the reservoir. Seepage from the reservoir would be collected in the canal and be returned to the reservoir via a seepage pump station. The seepage pump station would include two primary seepage pumps, an auxiliary seepage pump, and a back-up power generator to provide electrical power to operate the seepage pumps, in the event

of an electrical service outage. If the seepage pump station became non-operational (e.g., the seepage pumps were out of service for maintenance, or the station's back-up power generator was not operating during an electrical service outage), the seepage collected in the perimeter canal would eventually overflow by gravity into the C-41A via overflow weir structures.

Operations. The location of the two reservoir gated outflow culverts, CU-1A and CU-2, would enable water to be released from the reservoir into the C-41A upstream and/or downstream of S-83, to convey water to the Indian Prairie Sub-basin, via C-41A, C-41, C-39A, C-40, and/or C-38, as well as to Lake Okeechobee. CU-1A and CU-2 would be designed to provide a maximum outflow rate of 1,500 cfs.

During times when water would be conveyed into the reservoir for storage, depending on the current and forecasted water management needs within the Study Area, the reservoir would be filled to a level not to exceed its normal full storage level (NFSL) of 51.7 ft NAVD88 through one or a combination of the following methods:

1. Full or partial diversion of flow in C-41A, downstream of S-83, into the reservoir at a maximum rate of 1,500 cfs by operating Pump Station 2 (PS-2).
2. Full or partial diversion of flow in C-41A, upstream of S-83, into the reservoir by gravity at a maximum rate of 1,500 cfs, through opening gated culvert CU-2. Unlike the other two methods, this method allows for only partial filling of the reservoir up to an elevation below the headwater stage at S-83, which normally ranges from 30.6 ft to 31.0 ft NAVD88. Water conveyed to the reservoir through this method would be stored mostly within the southern portion of each storage cell where the ground surface is the lowest. Stage-storage calculations indicate that there is about 6,600 ac-ft of aboveground storage capacity in the reservoir at elevation 31.0 ft NAVD88 (3,800 ac-ft in the east cell and 2,800 ac-ft in the west cell), which is about 3 percent of the reservoir's total storage capacity of 200,000 ac-ft at its NFSL of 57.1 ft NAVD88.
3. Back-pumping water from Lake Okeechobee into the reservoir at a maximum rate of 1,500 cfs, by operating pump stations PS-1 and PS-2 concurrently. The first pump station, PS-1, to be located at the existing S-84 site, would move water in C-41A from the downstream (tailwater) side of the existing S-84 site into C-41A on the upstream (headwater) side of the existing S-84 site. The second pump station, PS-2, to be located between the reservoir's east cell and C-41A, would pump water from C-41A via the reservoir east inflow-outflow canal (CNL-2), directly into the reservoir's east cell.

Each of the reservoir's storage cells would include one ungated overflow spillway, designed to convey excess water in the storage cell (water within the storage cell above the NFSL of 51.7 ft NAVD88) to the reservoir perimeter canal (CNL-1), to then be discharged through the perimeter canal overflow structures into C-41A. Ungated Overflow Spillway (OS-) 1, which would be located along the south perimeter dam of the east cell, was designed to provide a maximum outflow rate of 750 cfs. Ungated overflow spillway OS-2, which would be located along the south perimeter dam of the west cell, was designed to provide a maximum outflow rate of 750 cfs.

Recreation Features. The dam embankment will offer approximately 18 mi of trails. Typical activities expected in the Project Area include bicycle riding, nature study, wildlife viewing, hiking, boating,

canoeing/kayaking, fishing, and hunting. These are all well suited to the environmental purposes of the Project. See **Figure 6-2** for the recreation features, including proposed locations for public access sites.

Facilities could include features such as gravel parking with a boat ramp, trailheads, shelters, and small boat portages. Other recreational amenities include signage, vehicle and pedestrian gates, picnic tables, and restroom facilities. These features and costs are described in detail in **Appendix F**.

The proposed features of the recreation plan will not require additional real estate to be purchased. All features will be compatible with the environmental purposes of the Project. Program activities can be adjusted over time to better fit Project purposes.

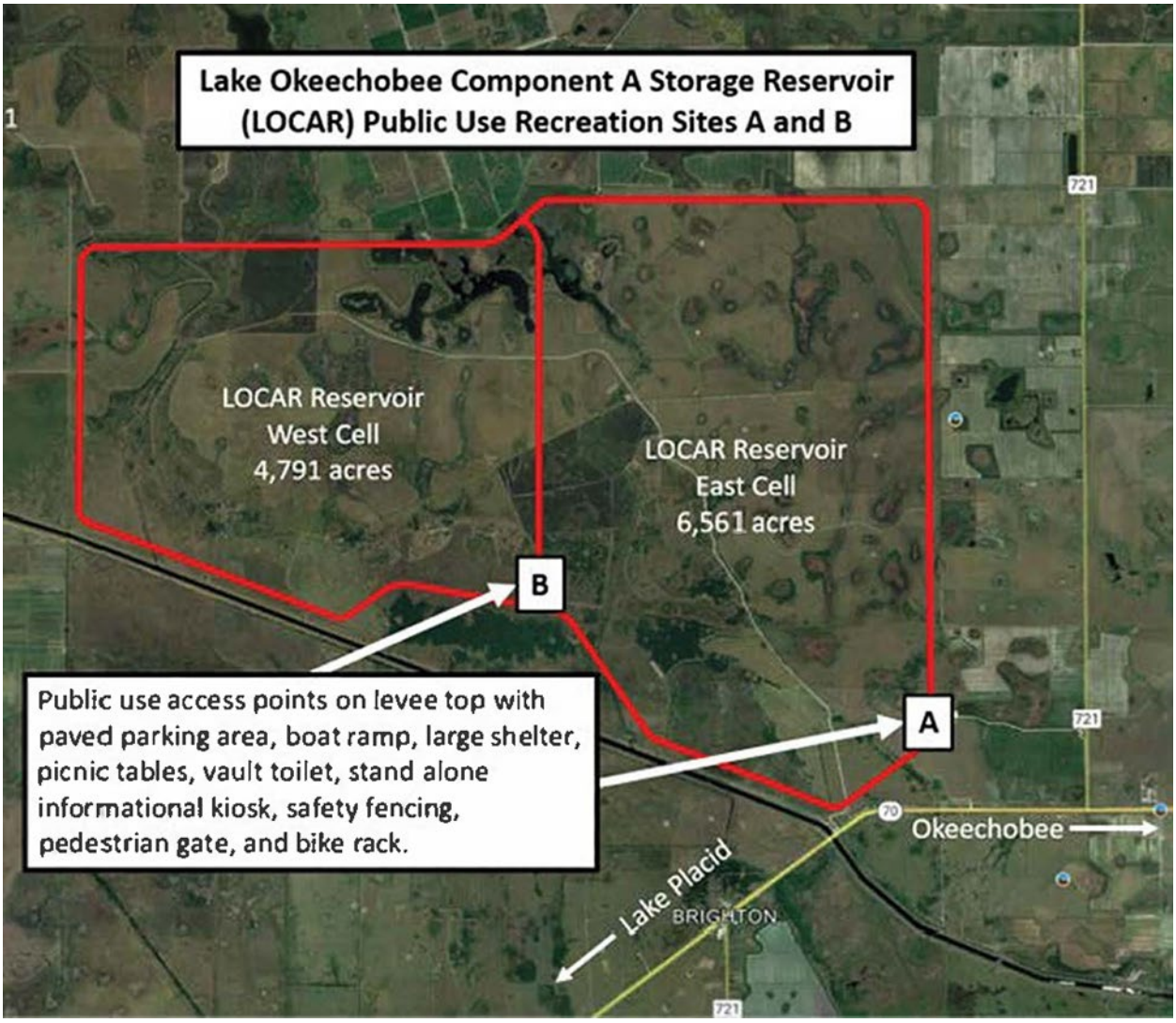


Figure 6-2. Conceptual locations of the boat ramp, portages, and trail shelters at the spillway sites.

6.1.1.1 Lake Okeechobee Operational Considerations

Hydrologic modeling was conducted for the Recommended Plan to optimize system-wide performance. The FWO incorporated the current regulation schedule management bands within the 2008 LORS with

the CEPP EAA Phase optimized release guidance. Because the Project Team incorporated LORS modifications as described, benefits gained are derived in part from operational refinements.

It is important to note that the LORS revisions and environmental water supply deliveries to the Northern Estuaries identified in LOCAR are intended to inform future system-wide operational updates, including the LOSOM. This FS will not be the mechanism to propose or conduct the required NEPA evaluation of LORS or systemwide operational modifications. These actions will be conducted under other authority consistent with CERP regulations. The SFWMD anticipates reservation of water that is intercepted for storage aboveground. Water returned to Lake Okeechobee after storage would be available to meet C&SF Project purposes and overarching objectives. Stored water, upon return to Lake Okeechobee, would be accessible to both the lake ecology and water users in accordance with SFWMD's water supply program and the lake regulation schedule.

The U.S. Army Corps of Engineers (Corps) expects to operate under the 2008 LORS until completion of the LOSOM effort. The change to the Lake Okeechobee schedule due to the LOSOM effort is anticipated, but remains pending. Depending on the ultimate outcome of these future lake schedule revisions, including the level of inherent operational flexibility provided with these revisions, LOCAR implementation may still require further lake schedule revisions. A sensitivity analysis was performed to consider what effects would be expected if the FWO LOCAR modeled scenario was based on LOSOM. **Appendix A, Annex A-2.4,** describes the sensitivity analysis.

6.1.1.2 Potential Relocation of Structure 83

The Recommended Plan may also include the relocation of Structure 83 (S-83) to a new location within C-41A, about 1.2 miles downstream of S-83's current location. Relocating S-83 would eliminate some construction and land acquisition costs, including constructing a reservoir inflow-outflow canal with a culvert connection to C-41A, and purchasing about 85 acres of pasture land. However, the relocation of S-83 would include the additional cost of demolishing project culvert PC20N and structures S-83, S-83X, and S-83W. Finally, it would include the additional cost to construct a new three-gated S-83 spillway in C-41A, about 1.2 miles downstream of S-83's current location.

The potential relocation of S-83 may include the following operational benefits:

- Existing S-83X has a maximum permissible head difference (i.e., maximum permissible headwater-tailwater stage difference) of 11 ft. Under normal operations of C-41A, the head difference across S-83/S-83X can range from 6.6 to 7.9 ft. A new S-83 could be designed to have a greater maximum permissible head difference, to allow for more operational flexibility within C-41A, which could benefit the Indian Prairie Sub-basin, especially during extreme events.
- Existing S-83 and S-83X have a combined design flow capacity of 4,830 cfs. The new S-83 could be designed to have a greater design flow capacity, with less restrictive maximum allowable gate opening (MAGO) curves, to allow for more operational flexibility within C-41A, which could benefit the Indian Prairie Sub-basin, especially during extreme events.

The relocation of S-83 will be further evaluated during the PED phase of the project.

6.1.2 Lands and Interests in Lands

Real estate interests and lands were preliminarily identified for the Recommended Plan as required to ensure the construction and OMRR&R for LOCAR implementation. See **Appendix D** for more details. The real estate plan and associated acreages are tentative in nature. It is for planning purposes only, and both the final real property lines and real estate costs provided are subject to change even after approval of the FS.

6.1.2.1 Staging and Access

Staging areas identified during the PED phase will be within the Project footprint. Access to the Project and the staging areas will be via public roads and SFWMD-owned lands situated within the Project Area. Additional access areas will be identified during the PED phase, as required.

6.1.2.2 Utilities and Facility Relocations

Preliminary aerial and ground inspections have revealed no major transmission lines within the Project Area. However, the Glades Electric Cooperative Morris Substation is to the southeast corner of the Project (**Figure 6-1)**. Service lines for occupied structures are also expected within the Project Area. Since the area is to be acquired, no facility or utility relocations are expected.

6.1.3 Project Operations

The Draft Project Operating Manual (DPOM) in **Annex C** includes operational criteria based on the LOCAR hydrologic modeling assumptions and generally discusses the transitions to operations during the construction phase, the operational testing and monitoring period (OTMP), and the long-term OMRR&R phase. The LOCAR Project Team recognizes that multiple revisions of the manual and operational fine-tuning will occur over the life of the Project. The operations discussed herein represent the startup operational strategy, recognizing that constraints in the system may be removed over time due to the completion of other CERP and non-CERP projects. The DPOM assumes completion of both cells of LOCAR. Modifications and/or revisions to the DPOM would occur during subsequent implementation phases, such that a preliminary Project Operating Manual (POM) would be completed after detailed design is complete, and a final POM would be established after the OTMP. The POM is a living document that would continue to evolve throughout the life of the Project (**Figure 6-3**). The POM would be updated at periodic intervals during the detailed design, construction, and OTMP of the Project. Refinements to the operating criteria in the POM would be made as more Project design details, data, operational experience, and general information are gained during these Project phases. It is also anticipated that when the POM is completed and the long-term O&M phase is underway, it may be necessary to revise the POM periodically based on additional scientific information and implementation of other CERP or non-CERP activities.

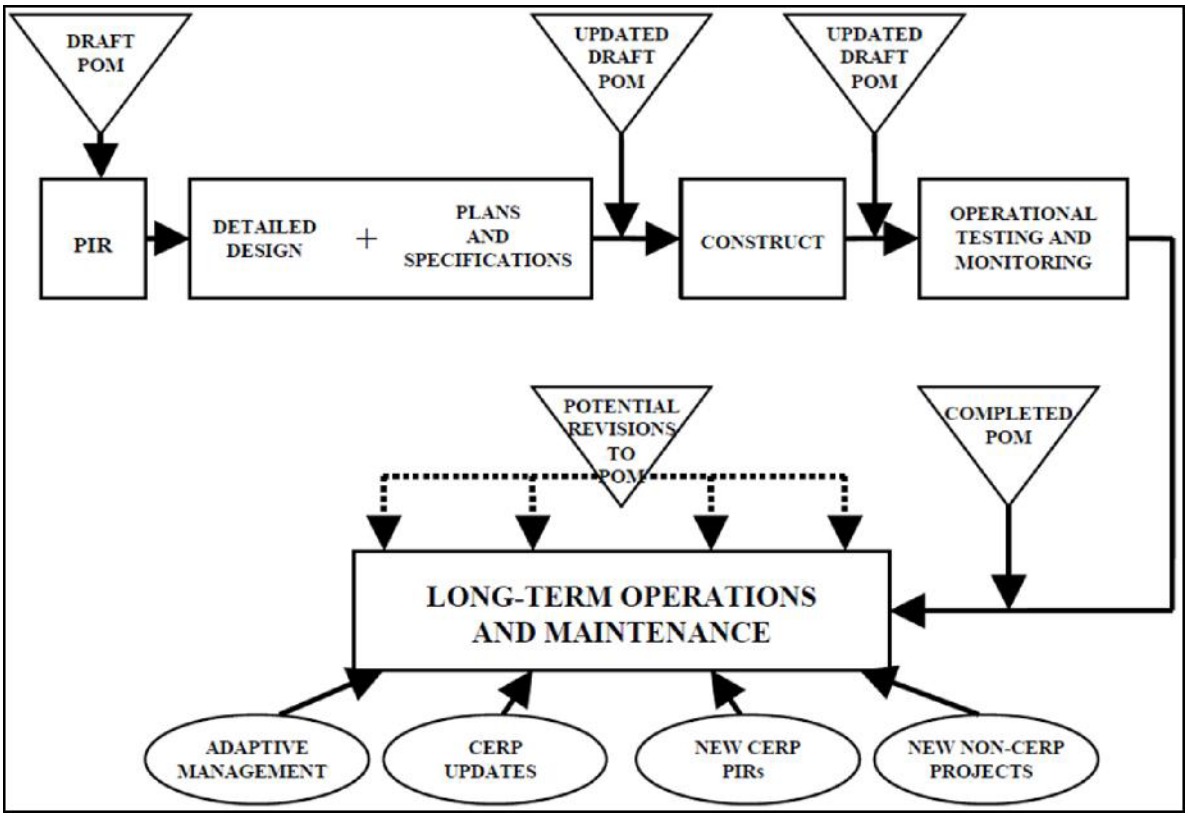


Figure 6-3. Evolution of the Project operating manual.

6.1.3.1 System Operating Manual Updates

Implementation of CERP envisioned the need to create a System Operating Manual (the Master Water Control Manual has been the primary governing document). This System Operating Manual would ensure that the operations of all projects, both CERP and non-CERP, are integrated within C&SF system operations to achieve the authorized purposes of the C&SF Project and the individual CERP and non-CERP projects. The plan acknowledges that a revision to the existing lake regulation schedule, as well as the associated Volume 3 of the *Master Water Control Manual–Lake Okeechobee and Everglades Agricultural Area (EAA)*, would be needed to integrate LOCAR, as well as the HHD remediation, the Kissimmee River Restoration Project, and other CERP projects that are connected or adjacent to Lake Okeechobee. Therefore, it is anticipated that modifications to lake operations would be triggered by actions other than LOCAR implementation and the FS would not be the mechanism to propose or conduct the required NEPA evaluation of modifications to the 2008 LORS or LOSOM, which is pending completion of NEPA and approval by the Corps' South Atlantic Division.

6.1.4 Adaptive Management and Monitoring Plans

The LOCAR AMMP (**Annex D**) identifies the monitoring information needed to inform implementation and to document restoration progress to agencies, the public, and Congress. The overall objective of the adaptive management (AM) plan is to focus resources on refinement of the Project to fine-tune performance due to inevitable uncertainties based on existing knowledge and knowledge that will be gained through monitoring and assessment. Consistent with the implementation guidance for Section

1161 of WRDA 2016, monitoring will continue until the success criteria identified in the monitoring plans are determined to have been met, even though federal cost-sharing is limited to 10 years.

The AMMP contains descriptions of monitoring that should address specific uncertainties identified during planning, required parameters, such as water quality and hydrology, and ecological features that track progress toward achieving the LOCAR objectives. The monitoring data will also be used to ensure compliance with applicable legal requirements. The monitoring descriptions are detailed in **Annex D**. For each objective, the monitoring parameters, their value to the Project, timeframe needed to see changes, measurement frequencies, decision criteria for triggering adaptive management options, and suggested AM options are provided in the AMMP text. The information is also summarized per Project objective. Monitoring durations, which are specified in **Annex D**, are dependent on the intended use of the monitoring. Regulatory monitoring will be continued as long as required by applicable regulations. The adaptive management and ecological success monitoring would continue up to 10 years, in coordination with the phases of construction. See **Annex D** for a description of the rolling implementation of the monitoring and the feedback that the data will provide to inform management decisions.

Part 1 of the AMMP is the AM and ecological monitoring. A fundamental principle of AM is that a project can be adjusted to achieve higher performance toward the project's goals and objectives and to remain within its constraints. In AM, the adjustments are based on a scientifically efficient and sound process of learning from data. These adjustments should be viewed as intelligently fine-tuning the project, the need for which is almost inevitable in large-scale, long-term restoration projects like CERP. Given this fundamental principle of AM, the LOCAR AMMP provides suggestions for potential improvements and refinements, called Adaptive Management Options (AM Options). The suggestions are based on current experience and knowledge and are not required actions, nor are they meant to limit agencies from considering other options. The AM Options are considered part of the Recommended Plan for authorization, although some will require more information about Project footprint and performance to perform a full NEPA analysis, permitting, and agency coordination before they could be initiated. The AM Options are included in the cost estimates and described here per Section 1161 of WRDA 2016 implementation guidance (October 2017). Below is a list of uncertainties and recommended monitoring actions to reduce these uncertainties:

Lake Okeechobee Uncertainties–AM Options

- Adjust water level operations as appropriate for the ecological indicators, including, but not limited to, recessions, low water, reduced highs, etc.
- Perform additional habitat management and/or species operations (e.g., exotic/nuisance vegetation removal, prescribed burning, vegetation plantings, harvest regulations, etc.).
- Implement additional faunal monitoring or analyses as needed.
- Contribute monitoring data to the refinement of invasive risk assessment tools used by invasive species management practitioners.
- Use practices per Invasive and Nuisance Species Management Plan to control or eradicate invasive plants.
- Adjust water management related decisions in addition to informing the invasive and nuisance species management team about actions taken.

Estuary Uncertainties–AM Options

- Optimize flows to get the correct salinity in the correct locations for SAV and oysters.
- Adjust timing and duration of flows to minimize impacts to ecological indicators during key life history stage events, such as spawning.

Water Supply Uncertainties–AM Options

- Optimize quantity, quality, timing, and distribution of freshwater flow.

In addition to the AM and Ecological Monitoring Plans, **Annex D** contains the Water Quality Monitoring Plan (Part 2) and Hydrometeorological Monitoring Plan (Part 3). These include regulatory monitoring associated with water quality and the USFWS BO, as well as hydrometeorological monitoring, to inform system operations and ecological success monitoring directly related to Project objectives.

6.1.5 Invasive and Nuisance Species Management Plan

The Invasive and Nuisance Species Management Plan (INSMP), located in **Annex F**, has been developed in accordance with EO 13112, *Invasive Species*, signed (February 3, 1999); the Corps Invasive Species Policy (June 3, 2009); and CERP Guidance Memorandum 062.00, *Invasive and Native Nuisance Species Management* (July 11, 2012). The purpose of this plan is to outline measures for preventing, controlling, reducing, and monitoring invasive species within the LOCAR footprint to achieve restoration benefits. To achieve these goals, the plan proposes to perform both initial and long-term invasive species management within the reservoir. The INSMP is a living document and will be updated throughout design, construction, and OMRR&R.

6.2 Recommended Plan Benefits

The Recommended Plan includes water storage in the reservoir. Benefit categories include environmental restoration, recreation, water supply, resiliency to climate change, and other benefits. Lake Okeechobee, Northern Estuaries, and water supply benefits have been evaluated by hydrologic performance via the RSM-BN.

6.2.1 Environmental Restoration Benefits

The LOCAR Recommended Plan would improve the quantity, timing, and distribution of water entering Lake Okeechobee; provide for better management of lake water levels; reduce freshwater flows to the Northern Estuaries; and improve systemwide water management operational flexibility. Maintaining Lake Okeechobee stage levels within the ecologically preferred stage envelope would benefit plant and animal communities by providing appropriate depths and seasonality of flooding, concentrating prey resources in the marsh for wading birds, improving nesting and foraging habitat for endangered Everglade snail kites, increasing spawning habitat for sport fish, increasing light penetration for submerged and emergent plants at the edge of the marsh, and creating a diverse littoral vegetation community. Reducing the return frequency, volume, and duration of freshwater flows to the Northern Estuaries would improve salinity and turbidity conditions, benefiting seagrass beds and the animals that inhabit them.

6.2.1.1 Lake Okeechobee Watershed

The Recommended Plan includes the creation of a 200,000 ac-ft reservoir in the watershed. The LOCAR Project Team anticipates that aquatic and wetland-dependent species will likely colonize this newly created habitat, especially since water levels could remain low for multiple years during extended dry periods. As predicted by the Trophic Hypothesis (RECOVER 2004), an influx of small fishes will directly benefit higher trophic level predators, such as wading birds. However, rapid changes in depth between wet and dry conditions will ultimately limit long-term habitat quality in this storage feature.

6.2.1.2 Lake Okeechobee

The Recommended Plan would increase the amount of time Lake Okeechobee is within the ecologically preferred stage envelope, primarily through reductions in the frequency and duration of moderate and extreme high stages (i.e., greater than 16.0 ft NGVD29 and greater than 17.0 ft NGVD29, respectively) (**Table 6-1**). Extreme high stages lead to a loss of woody species (e.g., nesting substrate for wading birds) and expansion of invasive or nuisance vegetation at high elevations, loss of submerged plant beds at low elevations, and reduction in littoral extent. Stages above the preferred envelope, which would be reduced by 7 percent with the Recommended Plan, cause greater mixing of nutrients and sediment from the deep, open-water (i.e., limnetic) portion of the lake; reduce light penetration at the edge of the marsh; increase nutrient transport to the inner marsh; reduce the overall marsh size through loss of plants in deeper areas; and alter the plant community to one dominated by invasive or nuisance species.

The Recommended Plan would improve conditions for fish in Lake Okeechobee by creating better conditions for the emergent and SAV habitat that fish use in the nearshore and littoral zones. Reductions in high stage would also improve nesting substrate for wading birds by restoring and maintaining historical colony locations in woody vegetation and will improve foraging by increasing prey density and availability of shallow marsh habitat during the breeding season.

Table 6-1. Lake Okeechobee Stage Envelope Improvements with the Recommended Plan.

Lake Okeechobee Stage Levels	Future Without Project	Recommended Plan
Percent Time inside Ecologically Preferred Stage Envelope	22%	28%
Percent Time above Stage Envelope	48%	41%
Percent Time below Stage Envelope	30%	31%
Percent Time below Navigational Min. Stage (<12.56 ft)	27.2%	30.1%
Percent Time above Extreme High Stage (Percent Time >17 ft)	2.1%	0.6%
Percent Time below Extreme Low Stage (Percent Time <10 ft)	3.1%	4.1%
Percent Time above Moderate High Stage (Percent Time >16 ft)	10.3%	5.8%
Percent Time below Moderate Low Stage (Percent Time <11 ft)	9.9%	10.3%

ft–foot

The effectiveness of the Recommended Plan for Lake Okeechobee was assessed with an index score composed of two lake PMs. The scores were weighted as follows: 67 percent high stage criteria (i.e., above ecological envelope and duration at greater than 17 ft NGVD29) and 33 percent low stage criteria (i.e., below the ecological envelope and duration at less than 10 ft NGVD29, methodology further documented in **Appendix G**). **Table 6-2** shows the resulting score for the Recommended Plan and comparison scenarios. The Lake Weighted Index Score indicates a 26.9 percent improvement over the pre-CERP Baseline (PCB1),

or 74.6 percent achievement of the lake index score CERP goal when including authorized projects in the FWO condition.

Table 6-2. Lake Okeechobee Performance of the Recommended Plan Relative to CERP Goals.[1]

Scenario	Description	Lake Weighted Index Score %	Percent Improvement Relative to Pre-CERP Baseline	Percent of CERP Goal Achieved
PCB1	Pre-CERP Conditions	57.9	0.0	0
Existing Conditions	Current	57.6	0.0	0
Future Without Project	Authorized Projects	59.4	2.6	7.2
Alternative 1	LOCAR Recommended Plan	73.5	26.9	74.6
CERPA	CERP Goal	78.8	36.1	100

1/ These are based on a 36-year period of record (1965–2000) instead of a 52-year period of record (1965–2016) for comparison to earlier calculated metrics (PCB1, CERPA [full CERP build out]).
CERP–Comprehensive Everglades Planning Project; LOCAR–Lake Okeechobee Storage Reservoir Section 203 Study

Table 6-3 shows the Lake Okeechobee HUs for the Recommended Plan relative to baselines. The combined, weighted index scores are multiplied by the acreage of the lake to provide HUs for each. The Recommended Plan (Alternative 1) provides an HU lift of 54,568. **Table 6-4** shows the trajectory of Lake Okeechobee HUs for the Recommended Plan from 2034 through 2084, as well as the average annual Lake Okeechobee HU lift. The average annual Lake Okeechobee HU lift for the Recommended Plan is 1,091 from FWO, or 1,577 from ECB. See **Appendix G** for the full HU analysis.

Table 6-3. Combined Lake Okeechobee Habitat Units for the Recommended Plan.

Condition	Habitat Units	Potential Lift
ECB HUs	250,073	-
Future Without Project HUs	274,335	-
Recommended Plan (Alternative 1) HUs	328,902	54,568

ECB–existing conditions baseline; HU–habitat unit

Table 6-4. Summary of Recommended Plan Lake Okeechobee Habitat Unit Trajectory.

Condition	ECB Lake O HUs (2034)	FWP Lake O HUs (2036)	FWP Lake O HUs (2039)	FWP Lake O HUs (2044)	FWP Lake O HUs (2059)	FWP Lake O HUs (2084)	Average Annual Lake O HU Lift
Future Without Project	250,073	251,044	252,498	254,923	262,198	274,323	485
Recommended Plan (Alternative 1)	250,073	294,042	313,749	321,632	328,902	328,902	1,577

ECB–existing conditions baseline; HU–habitat unit; FWP–Future With Project; Lake O–Lake Okeechobee

6.2.1.3 Northern Estuaries

The restoration goal is to reestablish salinity regimes suitable for the maintenance of healthy, naturally diverse, and well-balanced estuarine ecosystems. Runoff from the watershed and freshwater flows from Lake Okeechobee both contribute to salinity fluctuations for the Northern Estuaries. Too much freshwater

from watershed/basin runoff and freshwater flows from Lake Okeechobee can reduce salinity levels in the estuaries, and insufficient dry-season flows can cause damaging high salinity extremes.

Overall, there is marked improvement in all high and damaging flow metrics triggered by Lake Okeechobee regulatory releases when compared to the ECB and the FWO **(Table 6-5** and **Table 6-6)**. Across all alternatives, low flows (i.e., SLE 14-day moving average (ma) flows of less than 150 cfs; and CRE 14-day ma flows of less than 750 cfs) perform worse than the ECB and the FWO, due to Lake Operations decisions. High and stressful flow events triggered by basin runoff, rather than Lake Okeechobee regulatory releases, improve across all alternatives compared to the ECB, but are worse than the FWO. Finally, across alternatives, extreme high flows in the estuaries (i.e., SLE 14-day ma flows of 1,700 to 4,000 cfs and greater than 4,000 cfs; and CRE 14-day ma flows of 2,600 to 4,500 cfs, 4,500 to 6,500 cfs, and greater than 6,500 cfs) show overall improvements, but degree of improvement depends on the estuary and on the flow category in question.

Table 6-5. Caloosahatchee Estuary Modeled Results for the Existing Conditions Baseline, Future Without Project Condition, and Each Alternative.

Scenario	ECB	FWO	Alternative 1	Alternative 2	Alternative 3
Low Flow - # of 14-day periods <750 cfs	549	752	586	584	586
Optimal Flow - # of 14-day periods ≥750 cfs and <2,100 cfs	638	549	688	686	689
High Flow (Basin Runoff) - # of 14-day periods ≥2,100 cfs and <2,600 cfs	166	124	153	154	154
High Flow (LOK Regulatory) - # of 14-day periods ≥2,100 cfs and <2,600 cfs	77	66	42	42	41
Damaging Flow (Basin Runoff) - # of 14-day periods ≥2,600 cfs	230	160	179	178	179
Damaging Flow (LOK Regulatory) - # of 14-day periods ≥2,600 cfs	86	66	55	56	55
Damaging Flow (Total Flows) - # of 14-day periods ≥2,600 and ≤4,500 cfs	241	181	179	178	178
Damaging Flow (Total Flows) - # of 14-day periods ≥4,500 and ≤6,500 cfs	105	80	75	77	76
Damaging Flow (Total Flows) - # of 14-day periods ≥6,500 cfs	84	56	64	64	64

cfs–cubic foot per second; FWO–Future Without Project; LOK–Lake Okeechobee regulatory releases

Table 6-6. St. Lucie Estuary Modeled Results for the Existing Conditions Baseline, Future Without Project Condition, and Each Alternative.

Scenario	ECB	FWO	Alternative 1	Alternative 2	Alternative 3
Low Flow - # of 14-day periods <150 cfs	183	163	209	208	210
Optimal Flow - # of 14-day periods ≥150 cfs and <1,400 cfs	910	997	1,013	1,011	1,012
High Flow (Basin Runoff) - # of 14-day periods ≥1,400 cfs and <1,700 cfs	279	238	262	261	263
High Flow (LOK Regulatory) - # of 14-day periods ≥1,400 cfs and <1,700 cfs	30	49	20	20	20

Scenario	ECB	FWO	Alternative 1	Alternative 2	Alternative 3
Damaging Flow (Basin Runoff) - # of 14-day periods ≥1,700 cfs	452	344	350	350	351
Damaging Flow (LOK Regulatory) - # of 14-day periods ≥1,700 cfs	41	58	29	30	27
Damaging Flow (Total Flows) - # of 14-day periods ≥1,700 and ≤4,000 cfs	427	352	337	339	339
Damaging Flow (Total Flows) - # of 14-day periods ≥4,000 cfs	166	129	118	118	118

cfs–cubic foot per second; FWO–Future Without Project; LOK–Lake Okeechobee regulatory releases

Low Flows

In the CRE, low flows (i.e., 14-day ma flows of less than 750 cfs) are improved across alternatives compared to the FWO but worsen compared to the ECB. Meanwhile, in the SLE, low flows (i.e., 14-day ma flows of less than 150 cfs) worsen across all alternatives compared to the ECB and the FWO,considering that the modeling assumptions for the FWO simulation include a version of the LORS 2008 (LORS08+) schedule rather than LOSOM, and the ECB and all alternative simulations use LOSOM (see **Appendix A, Annex A-2.4,** for details on model assumptions). LOSOM ensured improvements in low flows compared to LORS08+, especially in the CRE, where decreases in the frequency and duration of base flow will result in salinity optima needed for freshwater and oligohaline species of SAV, namely tape grass. While the combined measured low flows into the SLE do not impact the estuary proper, flows less than 150 cfs can result in salinity increases and potential detriment to juvenile fish and fish nursery habitat in the St. Lucie River upstream of the SLE North Fork.

Alternative 1 is ranked the best performing overall for the estuaries. In the CRE, there are 37 more low flow events in the period of simulation than the ECB. In the SLE, there are 26 more low flow events in the period of simulation than the ECB. This can be explained due to lake operations in which, under certain conditions, water is held in Lake Okeechobee to prevent time below the stage envelope (i.e., 12 ft).

A sensitivity analysis was conducted to demonstrate Alternative 1 performance compared to a FWO scenario that is more representative of LOSOM operations (FWOLL) (**Table 6-7**). This shows improvement for the CRE low flows in Alternative 1 compared to FWOLL, with 15 fewer low flow events of the period of simulation. For the SLE, 23 more low flow events are observed in the FWOLL and Alternative 1 compared to the ECB (**Table 6-8**) due to LOSOM operations that send supplemental baseflows to the CRE and restrict flows to the SLE.

Table 6-7. Caloosahatchee Estuary Modeled Results for the Sensitivity Run of LOSOM-like Operations of the FWO and Alternative 1.

Scenario	ECB	FWOLL	Alternative 1
Low Flow - # of 14-day periods <750 cfs	549	487	472
Optimal Flow - # of 14-day periods ≥750 cfs and <2,100 cfs	638	769	783
High Flow (Basin Runoff) - # of 14-day periods ≥2,100 cfs and <2,600 cfs	166	153	154
High Flow (LOK Regulatory) - # of 14-day periods ≥2,100 cfs and <2,600 cfs	77	55	52
Damaging Flow (Basin Runoff) - # of 14-day periods ≥2,600 cfs	230	179	184
Damaging Flow (LOK Regulatory) - # of 14-day periods ≥2,600 cfs	86	59	57

cfs–cubic foot per second; EBC23–-existing conditions baseline; FWOLL–Future Without Project; LOK–Lake Okeechobee regulatory releases; LOSOM–Lake Okeechobee System Operating Manual

Table 6-8. St. Lucie Estuary Modeled Results for the Sensitivity Run of LOSOM-like Operations of the FWO and Alternative 1.

Scenario	ECB	FWOLL	Alternative 1
Low Flow - # of 14-day periods <150 cfs	183	206	206
Optimal Flow - # of 14-day periods ≥150 cfs and <1,400 cfs	910	1,018	1,018
High Flow (Basin Runoff) - # of 14-day periods ≥1,400 cfs and <1,700 cfs	279	269	265
High Flow (LOK Regulatory) - # of 14-day periods ≥1,400 cfs and <1,700 cfs	30	16	17
Damaging Flow (Basin Runoff) - # of 14-day periods ≥1,700 cfs	452	354	350
Damaging Flow (LOK Regulatory) - # of 14-day periods ≥1,700 cfs	41	21	19

cfs–cubic foot per second; EBC23L–existing conditions baseline; FWOLL–Future Without Project; LOK–Lake Okeechobee regulatory releases; LOSOM–Lake Okeechobee System Operating Manual

Optimal Flows

Overall, the number of times in the period of simulation in which Optimal Flows are met in both estuaries (i.e., CRE 14-day ma 750 to 2,100 cfs; and SLE 14-day ma 150 to 1,400 cfs) increases. Benefit is more evident in the SLE, where there are 110 more Optimal events in the period of simulation for Alternative 1 than the ECB (**Table 6-6**). There are 50 more Optimal Flow events in the period of simulation in the CRE in Alternative 1 compared to the ECB (**Table 6-5**).

Optimal Flows as defined by RECOVER (2020) would result in a suitable salinity gradient throughout the estuary to support the range of indicator species in the estuaries. In the SLE, salinities are optimal for oysters in the North Fork, South Fork, and middle estuary, and suitable for marine SAV in the lower estuary. In the CRE, salinities remain less than 10 parts per thousand in the upper estuary to support tape grass, with a salinity gradient moving downstream that is optimal for both oysters in mid and lower estuary and marine SAV in the lower estuary and San Carlos Bay.

Stress (High) Flows

In the CRE, there are 35 fewer events of 14-day ma Stress (High) Flows (i.e., 2,100 to 2,600 cfs) that are triggered by Lake Okeechobee regulatory releases, and 13 fewer triggered by basin runoff, over the period of simulation than the ECB (**Table 6-5**). In the SLE, there are 10 fewer events of 14-day ma Stress (High) Flows (i.e., 1,400 to 1,700 cfs) that are triggered by Lake Okeechobee regulatory releases, and 17 fewer triggered by basin runoff over the period of simulation than the ECB (**Table 6-6**).

Stress (High) Flows in the CRE (i.e., 14-day ma flows of 2,100 to 2,600 cfs) are characterized by salinities falling below the optima for oysters at their most upstream extent of the estuary, while tape grass in the upper estuary and oysters and marine SAV in the lower estuary and San Carlos Bay are unaffected. This Stress Flow range was defined by RECOVER (2020) as a conservative measure of impact to the estuary outside the Optimal Flows. In the SLE, Stress (High) Flows (i.e., 14-day ma flows of 1,400 to 1,700 cfs) result in lower salinities in the North Fork and South Fork, falling outside of the salinity optima for oysters and marine SAV. Typically, oyster reefs in the forks are less dense (oysters per square meter), with a lower proportion of live-to-dead individual oysters compared to the middle estuary, where salinities are higher.

Similarly, these Stress Flows were defined by RECOVER (2020) as a conservative measure of impact in the estuary outside of Optimal Flows.

Damaging Flows

In the CRE, there are 31 fewer events of 14-day ma Stress (High) Flows (i.e., greater than 2,800 cfs) that are triggered by Lake Okeechobee regulatory releases, and 51 fewer triggered by Basin Runoff, over the period of simulation than the ECB (**Table 6-5**). In the SLE, there are 11 fewer events of 14-day ma Stress (High) Flows (i.e., greater than 1,700 cfs) that are triggered by Lake Okeechobee regulatory releases, and 102 fewer triggered by basin runoff, over the period of simulation than the ECB (**Table 6-6**).

To understand the improvements in extremely damaging flows between the ECB, FWO, and alternatives, additional flow bins above the Damaging Flow ranges for the CRE (i.e., greater than 2,800 cfs) and SLE (i.e., greater than 1,700 cfs) were modeled (**Table 6-5** and **Table 6-6**). In the CRE, these include 14-day ma flows of 2,800 to 4,500 cfs, 4,500 to 6,500 cfs, and 6,500 cfs, which would result in progressive decreases in salinity throughout the entire estuary and, therefore, adverse impacts to mesohaline and euryhaline species. The number of 14-day ma events of 2,800 to 4,500 cfs over the period of simulation in the CRE decrease by 62, by 30 events for 14-day ma flows of 4,500 to 6,500 cfs, and by 20 events for 14-day ma flows greater than 6,500 cfs with Alternative 1 compared to the ECB, respectively (**Table 6-5**).

In the SLE, extreme high 14-day ma flows of 1,700 to 4,000 cfs and greater than 4,000 cfs were modeled (**Table 6-6**). The latter of which could result in salinities decreasing below 5 parts per thousand in the whole SLE. Compared to the ECB, Alternative 1 results in 90 fewer 14-day ma flow events of 1,700 to 4,000 cfs and 48 fewer 14-day ma flow events greater than 4,000 cfs over the period of simulation.

There is less improvement in the highest of the flow bins modeled likely due to flood protection and flood control measures made prior to or following extreme precipitation with lower capacity to move water south and the need to lower Lake Okeechobee levels below the high stage line (i.e., 17 ft).

Total Volume of Flows

Authorized CERP projects included in the FWO condition (i.e., C-43 West Basin Storage Reservoir, Indian River Lagoon South Project, and CEPP) reduce freshwater flows to the Northern Estuaries. Implementation of the LOCAR Recommended Plan will provide an additional increment of the benefits envisioned in CERP and will build upon those achieved in the Northern Estuaries with implementation of other CERP projects.

The additional storage and flow attenuation provided by the LOCAR Recommended Plan will allow for a reduction in freshwater flows that the previously authorized projects did not address. The freshwater flows that the plan will capture, store, and redirect are of much longer duration and higher in volume than those managed by previous projects. After the benefits claimed in the previously authorized projects, the remaining CERP systemwide goals must address more extreme conditions. Projects like LOCAR must deal with larger magnitude events that present a significant design challenge and usually cost more per incremental lift. Another challenge is a reduced sensitivity in performance measures (e.g., capture 10 larger events rather than 30 smaller events, so the improved “event count” is not as dramatic mathematically, but is of significance within the ecosystem).

The LOCAR Project will reduce the moderately high freshwater flows from Lake Okeechobee to the Northern Estuaries and manage some of the extremely high and longer duration lake inflows by diverting larger flows to storage. Holding and diverting larger freshwater flows becomes more expensive, but the ecological significance of doing so cannot be overstated. The capacity for the estuaries to withstand, and recover from, these continued perturbations in volume and duration of high-flow events is being tested repeatedly. LOCAR reduces flows to the SLE by an additional 17 percent and to the CRE by an additional 36 percent for a total of a 30 percent reduction when compared to the FWO condition (**Table 6-9**).

Table 6-9. Total Estuary Flow Reduction with the Implementation of LOCAR.

Category	ECB Flows (cfs)	Future Without Project Flows (cfs)	LOCAR Flows (cfs)
St. Lucie Estuary Average Annual Flow	165,000	129,501	107,116
Caloosahatchee Estuary Average Annual Flow	416,071	235,824	149,810
Total Flow	581,071	365,326	256,926
LOCAR Total Flow Reduction over Future Without Project	Not applicable	Not applicable	30%

cfs–cubic foot per second; ECB–existing conditions baseline; LOCAR–Lake Okeechobee Storage Reservoir Section 203 Study

Reducing the duration and return frequency of freshwater flows allows more time for the estuaries to recover and establish resiliency. The implementation of LOCAR may increase the acres of SAV, oyster, and healthy benthic habitat. The improvement of estuarine conditions will ultimately have a beneficial effect to essential fish habitat resources. SAV and algal communities are also common foraging areas for the green sea turtle and manatee. Reductions in freshwater flows within the Northern Estuaries reduce stress on SAV and promote increases in seagrass shoots, potentially increasing foraging opportunities for green sea turtles in this region.

Oysters improve overall water clarity by acting as natural water filters, as well as providing habitat for juvenile fish and other species. The estuaries are currently showing signs of vulnerability to state change. The reproductive capability of the oysters is extremely stressed. In the spring of 2018, following Hurricane Irma, oyster monitoring showed the lowest number of oyster spat in the entire period of record of the RECOVER monitoring program (i.e., 14 years).

6.2.2 Recreational Benefits

Recreational features have been added to LOCAR as an incidental Project benefit to enhance the existing opportunities for resource-based activities in the Project Area. These recreation benefits were not used in the justification of the plan. A summary of recreational costs and benefits is provided in **Table 6-10**. **Appendix F** contains the full recreational analysis.

LOCAR would accommodate public access and enhance the existing opportunities for resource-based recreation found in the Project Area. Due to the large public interest in outdoor recreation opportunities, the area would experience increased visitation rates because of its geographic proximity to Lake Okeechobee, the Kissimmee River, and several other water management areas, all of which currently experience visitors from all over the state and nation.

Recreational benefits were calculated using unit day value (UDV), an NED benefit evaluation procedure contained in ER 1105-2-100 (April 22, 2000), Appendix E, Section VII. See **Appendix F** for the full UDV

analysis. The justification of incurring additional costs for recreation features is derived by using a benefit-to-cost ratio. The tangible economic justification of the proposed ancillary recreation Project component can be determined by comparing the equivalent average annual charges (i.e., facility costs) against the estimate of the equivalent average annual benefits, which will be realized over the period of analysis (i.e., Project lifespan). **Table 6-10** displays recreational net annual benefits and a benefit-to-cost ratio of 2.7.

Table 6-10. Recreation Costs and Net Annual Benefits (FY23 Dollars).

Category	Costs
Construction	$2,210,000
Lands and Damages	$0
Preconstruction Engineering and Design[1]	$552,000
Construction Management[2]	$203,000
Interest During Construction[3]	$30,000
Total Investment	$2,995,000
Amortized	$110,938
OMRR&R	$24,600
Average Annual Cost	$135,538
Unit Day Value	$10.23
Average Daily Users	97
Average Annual Users	35,405
Average Annual Benefits	$362,193
Benefit to Cost Ratio	2.7
Net Annual Benefits	$226,656

1/ Recreation Planning, Engineering, and Design (PED) costs presented here constitute estimate external to Total Project Cost Sheet. The proportion of total Project recreation construction cost out of total Project construction cost is applied to total Project PED cost to estimate total Project recreation construction management (CM) cost. These costs differ from initial recreation costs used for alternative comparison due to a higher level of design detail to inform cost estimates.

2/ Recreation construction management (CM) costs presented here constitute estimate external to Total Project Cost Sheet. The proportion of total Project recreation construction cost out of total Project construction cost is applied to total Project CM cost to estimate total Project recreation CM cost.

3/ Recreation interest during construction calculated by contract and summed. Contract-by-contract recreation CM and recreation PED costs estimated using the methodology described above, substituting total Project construction costs for contract-by-contract Project construction costs and total Project recreation construction costs for contract-by-contract Project recreation costs as applicable.

OMRR&R–operation, maintenance, repair, replacement, and rehabilitation

This analysis concludes that the Recommended Plan (Alternative 1) incidental NED total Project recreation features (Total Project Cost Summary [TPCS] contracts 6, 7, 8a) benefit-to-cost ratio is 2.7. FY24 average annual recreation NED benefits of $362,193 and average annual costs of $135,538 amount to net annual benefits of $226,656 over a 50-year period of analysis.

6.2.3 Other Benefits

Water supply is inextricably linked to restoration features of the Project because LOCAR would benefit both environmental and water supply objectives. Water supply benefits would come as a direct result of the additional storage provided by the reservoir. LOCAR would provide the ability to store water when lake levels rise above those desirable for lake ecology, enabling the lake to remain within the ecologically preferred band. Water stored would be recovered during dry periods to assist in keeping lake levels within

the ecologically preferred band, which is above the water supply cutback trigger levels. Changes in cutbacks would be expected because of the timing of returning flows from LOCAR to Lake Okeechobee (**Table 6-11**).

Table 6-11. Water Restrictions for Lake Okeechobee Service Area (POR 1965–2016).

Simulation	Cutback Total (1,000 ac-ft)	Cutbacks Compared to ECB
ECB	1,335	Not applicable
Future Without Project	600	45%
Recommended Plan (Alternative 1)	753	56%
Alternative 2	734	55%
Alternative 3	755	57%

ac-ft–acre-foot; ECB–existing conditions baseline; POR–period of record

Ancillary water quality improvements may result from implementation of the Recommended Plan. The average load reductions for Alternatives 1, 2, and 3 compared to the FWO condition were all less than 1 percent. This minor decrease is attributed to the settling of particulate matter as water is recycled from Lake Okeechobee through the reservoir and back to Lake Okeechobee. These results indicate that the LOCAR Project will not negatively affect phosphorus loads to the lake.

The Recommended Plan also boosts resiliency to potential climate change effects by increasing freshwater in the Lake Okeechobee and Northern Estuaries Watershed system and buffering natural system areas and the underlying aquifer.

6.2.4 Contribution to Achievement of Interim Goals and Interim Targets

Section 601(h)(3)(C)(III) of WRDA 2000 (Public Law. 106-541) required that CERP promulgate Programmatic Regulations that will include the "establishment of interim goals to provide a means by which the restoration success of the Plan may be evaluated throughout the implementation process." Section 385.38 of the Programmatic Regulations (33 CFR Part 385) describes the intent and the underlying principles for establishing interim goals and a process for their development (33 CFR Section 385.38). Recommendations for interim goals and interim targets were developed by RECOVER in 2005. An intergovernmental agreement signed in 2007 among the Corps, U.S. Department of the Interior (USDOI), and SFWMD established interim goals for CERP. Section 385.38 also established the requirement to develop interim targets to measure progress toward meeting other water-related needs of the South Florida region, and described the intent, underlying principles, and the process for establishing interim targets. An agreement between the Corps and SFWMD, signed in 2007, established interim targets.

The Programmatic Regulations also required that each Project Implementation Report (PIR) describe how the Project contributes to the achievement of interim goals and interim targets (33 CFR Section 385.26(a)(3)(xv)). Quantitative and qualitative predictions based on results from the RECOVER-approved PMs, information gained from additional ecological planning tools, and best professional judgment were used to evaluate the progress toward the interim goals.

6.2.5 Ecosystem Services

Ecosystem services can be defined as the benefits human beings receive from resources and processes supplied by ecosystems (Murray et al. 2013). Some ecosystem services are material resources that can be used by people, such as food, timber, water, and medicine. Other ecosystem services come from ecological processes, such as carbon sequestration that results from the formation of peat soils. Describing ecosystem services helps capture a fundamental value of ecosystems: that they support human life on Earth.

LOCAR would improve the ecological condition of Lake Okeechobee, the watershed, and the associated estuaries and, therefore, should boost several ecosystem services including aesthetics; biodiversity and species composition; atmospheric carbon sequestration; commercial fishing; frogging; recreation in the forms of biking, hiking, estuary fishing, some kinds of hunting, and non-motor boating; ecological connectivity of landscapes; educational opportunities; water supply to existing legal uses in LOSA; and wildlife-associated activities, such as wildlife photography, tours, and viewing.

6.2.6 Socioeconomic Impacts

The following sections describe socioeconomic impacts to the LOW, Lake Okeechobee, and Northern Estuaries.

6.2.6.1 Lake Okeechobee Watershed

Increased recreational opportunities may result in increased visitation and ecotourism to local counties, thus providing regional tourism economic benefits.

6.2.6.2 Lake Okeechobee

Freshwater fishing within Lake Okeechobee and the broader Everglades region is world renowned and an integral part of the local and regional economy. There are no known recent studies that estimate the economic impact of recreation and other ecosystem services provided by a healthy Lake Okeechobee system and the specific benefits resulting from LOCAR. However, one study prepared for the Bonefish and Tarpon Trust (Fedler 2009) provides insights into the economic impact of the recreational fishing in Lake Okeechobee by disaggregating the $3.9 billion expenditures by 2.8 million anglers in Florida during the 2006 calendar year (USFWS and USCB 2007). The study estimated that retail expenditures by anglers targeting freshwater species within the Everglades region, including Lake Okeechobee, exceeded $205 million in 2006, generating approximately $353 million in total economic activity. The expenditures also directly supported 3,495 local jobs and provided approximately $45 million in federal, state, and local taxes in 2006. These estimates can be adjusted to 2023 values by applying consumer price inflation statistics published by the U.S. Department of Labor's Bureau of Labor Statistics (BLS 2023). Freshwater fishing in the Everglades region currently generates approximately $309 million in expenditures, $533 million in total economic activity, and $68 million in taxes each year. Use of the Lake Okeechobee fishery and the ecosystem of which it is a part contributes most of these economic benefits. Improvements in the lake from the Recommended Plan may benefit the local economy.

6.2.6.3 Northern Estuaries

There are limited analyses that attempt to quantify the economic impacts of specific high rainfall events leading to Lake Okeechobee regulatory releases. Most recently, the high rainfall and resulting freshwater

flows to the Northern Estuaries during late 2015 and 2016 had a clear effect on tourism and recreation. Black Hills State University and the University of Florida's Tourism Crisis Management Initiative conducted a survey in the summer of 2016. They found that more than 70 percent of those who planned to visit Martin, St. Lucie, Lee, and Palm Beach Counties during the time of the freshwater flows decided to avoid travel to their original destinations. Of the approximately 70 percent who indicated that they would change their plans, half postponed their travel plans and 32 percent opted to travel to alternative destinations (UF News 2016). The results of this survey were supported by data on hotel occupancy rates in Martin County. Total rooms booked in the county in 2016 were 3.3 percent less than they were in 2015. The downturn in occupancy rates in Martin County occurred during a period (i.e., 2015 to 2016) when room demand across the state grew approximately 1.2 percent (Martin County 2017). In another study, Florida TaxWatch estimated that Lee County lost out on up to $185 million in tourist spending during the summer of 2016 due to the freshwater flows (Florida TaxWatch 2017).

There are numerous opportunities to enhance recreational features throughout the Project Area. Enhancing use of the estuaries by fish will improve related recreational opportunities, such as fishing, boating, and kayaking. The economic output attributed to the use of the St. Lucie Estuary and other connected inshore areas in Martin and St. Lucie Counties has been estimated to be $873 million per year from the Indian River Lagoon Economic Update (ECFRPC and TCRPC 2016). The industry groups included are: 1) living resources; 2) marine industries; 3) recreation and visitor related; and 4) resource management. Notably, the economic activity generated through the recreation and visitor related industry group accounts for almost half of the $873 million per year valuation. This $873 million annual contribution is substantial but may be much less than the total value of the ecosystem services provided. A broad-based economic analysis comparable to the Indian River Lagoon Economic Update (ECFRPC and TCRPC 2016) has not been published for the CRE. However, some studies have examined the economic activity attributable to the CRE through individual industry groups, again using input-output models. One study by Hodges et al. (2015) concluded that the marine-related industries in Lee County that are dependent on the health of the estuary and ecosystem services contributed $1.27 billion to the economy in 2013. Another study reported the tourism industry group employed one out of every five people in Lee County, generating approximately $4 billion in economic impact each year (Lee County VCB 2023). Like the Indian River Lagoon Economic Update, both Hodges et al. (2015) and Aitchison et al. (2017) considered only the economic activity generated from select industry groups. The total value the ecosystem services provided by the CRE could be much greater than the combined $5.27 billion suggested by these two studies.

6.3 Environmental Considerations

The following subsections describe environmental considerations of the Recommended Plan.

6.3.1 Water Quality

Table 6-12 summarizes the assessment of Project impacts to water quality. The water quality analysis demonstrates that the Project may provide minor improvements to water quality, primarily through reductions in high water levels in Lake Okeechobee. The Project would not be expected to adversely affect tributary or Lake Okeechobee water quality. For detailed analyses, see **Appendix C, Part 2.**

Table 6-12. Recommended Plan Water Quality Improvements.

Geographic Region	Water Quality Improvements
Lake Okeechobee	The Recommended Plan would not be expected to adversely affect water quality. Results from a simple phosphorus load analysis showed a reduction of phosphorus loads of less than 1 percent over the Future Without Project condition. This is predominantly due to settling of particulate matter while water from the lake is held in the reservoir and then returned to the lake. Additionally, other activities in the area, including the Lake Okeechobee BMAP, are anticipated to improve water quality to further meet hydrologic restoration objectives.
Northern Estuaries	The Recommended Plan would be expected to reduce high-flow events, which may result in some improvement in Northern Estuaries water quality and in improved salinity conditions. Improved nutrient and dissolved oxygen conditions are expected to result from reduced high-flow events from Lake Okeechobee, improved Lake Okeechobee nutrient levels, and improved estuary basin runoff quality due to implementation of basin management action plan projects.

Northern Estuaries–Caloosahatchee and St. Lucie Estuaries

6.3.2 Past, Present, and Reasonably Foreseeable Actions Affecting Resources within the Project Area

Cumulative effects are defined in 40 CFR Section 1508.7 as those effects that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (i.e., federal or non-federal) or person undertakes such other actions (**Table 6-13**). Cumulative impacts can result from individually minor but collectively significant actions that take place over a period of time. **Table 6-13**Table summarizes past, present, and projected Corps efforts that cumulatively affect the regional environment of south Florida.

Table 6-13. Past, Present, and Reasonably Foreseeable Future Actions and Plan Affecting the Project Area.

Component	Past Actions/Authorized Plans	Current Actions and Operating Plans	Reasonably Foreseeable Future Actions and Plans
Status of Non-Comprehensive Everglades Restoration Plan (CERP) Projects	• Central and Southern Florida (C&SF) Project (1948) • Everglades National Park (ENP) Protection and Expansion Act (1989) • Modified Waters Delivery (MWD) General Design Memorandum and Final Environmental Impact Statement (1992) • C-111 South Dade General Reevaluation Report (GRR) (1994)	• MWD 8.5 Square Mile Area GRR (2000) • MWD Tamiami Trail Modifications Limited Reevaluation Report (2008) • C&SF C-51 West End Flood Control Project • Kissimmee River Restoration Project • Seepage Barrier near the L-31 N Levee (Miami-Dade Limestone Products Association) • Tamiami Trail Modifications Next Steps Project • South Florida Water Management District (SFWMD) Florida Bay Initiatives	• The State of Florida has water quality programs like basin management action plans that are intended to improve water quality. • MWD Closeout • Natural Resources Conservation Service (NRCS) Wetland Reserve Projects • State Dispersed Water Projects

Component	Past Actions/Authorized Plans	Current Actions and Operating Plans	Reasonably Foreseeable Future Actions and Plans
		• C-111 South Dade Project (Contracts 8, 8A, and 9)	
Operations Plan for Lake Okeechobee, Water Conservation Area 3A, ENP and the SDCS	• Water Supply and Environment (WSE) Lake Okeechobee Regulation Schedule (LORS; 2000) • Interim Operational Plan 2002 to Present	• Lake Okeechobee Regulation Schedule (2008 LORS) • SFWMD Lower East Coast (LEC) Regional Water Supply Plan • Everglades Restoration Transition Plan (ERTP) October 2012 to present; deviation includes Increment 1 and Increment 1.1 and 1.2 and 2.0 Operational Strategies • Herbert Hoover Dike Dam Safety Modification Study (HHD DSMS) risk reduction measures (2011 through 2025)	• The 2008 LORS to be replaced by Lake Okeechobee System Operating Manual (LOSOM) of HHD rehabilitation. • SFWMD periodically revises the LEC Regional Water Supply Interim Plan. • ERTP to be replaced by Combined Operating Plan (anticipated 2020) that will include MWD and C-111 components.
CERP Projects	-	*Congressional Authorization Received:* • Broward County Water Preserve Areas Project C-9 Impoundment and Seepage Management Area • Caloosahatchee River (C-43) West Basin Storage Reservoir • Central Everglades Planning Project (CEPP) Partnership Agreement (PPA) North and PPA New Water • Everglades Agricultural Area Storage Reservoir and Stormwater Treatment Area *Congressional Authorization Received and Construction in Progress:* • Indian River Lagoon-South Project • Picayune Strand Restoration Project • Site 1 Impoundment Project • Biscayne Bay Coastal Wetlands Project • C-111 Spreader Canal Western Project (operated by SFWMD) • Broward County Water Preserve Areas Project C-11 Impoundment • CEPP PPA South, including U.S. Department of the Interior removal of portions of the old	• Future CERP Projects (LOCAR, Western Everglades Restoration Project, Lake Okeechobee Watershed Restoration Project) • CERP LORS (Component F) upon completion of north and south of lake storage features

Component	Past Actions/Authorized Plans	Current Actions and Operating Plans	Reasonably Foreseeable Future Actions and Plans
		Tamiami Trail roadway and SFWMD construction of the increased S-333 structure	

SDCS–South Dade Conveyance System

For the LOCAR FWO condition, other CERP and non-CERP projects that improve the condition of Lake Okeechobee that have been authorized, are under construction, or are completed, are assumed to be in place including the EAA Storage Reservoir and STA authorized in 2018. At the time of LOCAR planning efforts, LOSOM was in the planning process waiting completion of NEPA and approval from the Corps' South Atlantic Division. Lake Okeechobee operations included the LORS 2008 with CEPP EAA Phase optimized release guidance. These placeholder operational changes, although not formally covered under the CEPP EAA NEPA, were critical to improve selected performance within LOW, Northern Estuaries, and LOSA while meeting environmental targets in the Everglades. Consistent with plan formulation policy for development of FWO conditions, LOCAR planning conditions included projects that are authorized, under construction, or completed. A full discussion of the FWO condition is located in **Section 2.0** of the main report.

However, as the LOCAR planning progressed, the Project Team anticipated that LOCAR would complement LOSOM to improve conditions in Lake Okeechobee and the Northern Estuaries. Additionally, it seemed reasonably foreseeable that LOSOM would be authorized. Although this Project was not included in the FWO condition, the Project Team decided to perform a sensitivity run of the potential compatibility of Project benefits provided by LOSOM. Results of the sensitivity analysis are detailed in **Appendix A, Annex A-2.4**.

The Yellow Book identified storage north and south of Lake Okeechobee as necessary individual components of CERP for restoration of the natural system. While both storage locations improve operational flexibility for Lake Okeechobee, they do so in different ways. Due to the unique purpose and function of storage in each location, the LOCAR Recommended Plan would complement other authorized CERP projects, including the EAA reservoir, to improve conditions in Lake Okeechobee and the Northern Estuaries.

- **South of Lake Okeechobee Storage:** Per the 1999 Yellow Book description, the purpose of aboveground storage south of the lake is to improve the timing of environmental deliveries to the Water Conservation Areas, including reducing damaging flood releases from the EAA to the Water Conservation Areas, reducing Lake Okeechobee regulatory releases to the estuaries, meeting EAA irrigation and Everglades water demands, and increasing flood protection in the EAA. Storage south of Lake Okeechobee provides additional capacity to send lake water south when lake stages are high and regulatory releases are required, thus decreasing the need to send water to the east and west coasts. Storage south of the lake also provides water supply for the Everglades during the dry season months, providing needed flows benefitting the natural ecosystem and, in addition, supplements deliveries to the regional canal system, which is beneficial to agricultural, municipal, and industrial water users. However, storage south of the lake does not provide water to the lake or to the Northern Estuaries during dry periods. Storage south of Lake Okeechobee is focused on capturing water during the wet season to improve deliveries to the southern

Everglades system during dry times while enhancing the operational flexibility of Lake Okeechobee.

- **North of Lake Okeechobee Storage:** The purpose of aboveground storage north of the lake, pursuant to the 1999 Yellow Book, is to store water during wet periods for later use during dry periods. Storage north of Lake Okeechobee provides water to the lake during dry times, benefitting lake ecology and downstream ecosystems, and also improves reliability of water supply for environmental and other water-related needs. Storage north of the lake also captures water during high flow periods, helping to reduce regulatory releases to the Northern Estuaries and moderate high lake stages. As envisioned in CERP, Lake Okeechobee is not intended to serve as a long-term storage reservoir but, rather, to enable a healthy functioning lake with seasonally fluctuating stages. The increased storage capacity would reduce the frequency of large regulatory releases from the lake that are damaging to the downstream estuary ecosystems and would benefit the lake's littoral ecosystems by reducing both high and low lake stages. The distinction between the two purposes is important as neither subsumed by the other.

6.3.3 Cumulative Effects

Cumulative environmental effects for the proposed action were assessed in accordance with guidance provided by the President's Council on Environmental Quality. The primary goal of cumulative effects analysis is to determine the magnitude and significance of the environmental consequences of the proposed action in the context of the cumulative effects of other past, present, and future actions. **Table 6-14** shows the net cumulative effects of the various resources that are directly or indirectly impacted. LOCAR is expected to have a net beneficial cumulative impact on the regional ecosystem. Further information on cumulative effects can be found in **Appendix C, Part 2**.

Table 6-14. Summary of Cumulative Effects.

Condition	Cumulative Effects Hydrology
Past Actions	Flood and water control projects have greatly altered the natural hydrology.
Present Actions	Federal and state agencies are coordinating on and implementing projects to improve hydrology.
Proposed Action	Implement Recommended Plan to realize additional reductions in high flow events from Lake Okeechobee to the Caloosahatchee and St. Lucie Estuaries (Northern Estuaries). Improvement in the timing and distributions of flows into Lake Okeechobee. Reductions in high flow events from Lake Okeechobee to the Northern Estuaries. Rehydrate previously drained areas. Significant beneficial hydrologic effects are anticipated within the Lake Okeechobee watershed through storing water north of Lake Okeechobee.
Future Actions	Additional Comprehensive Everglades Restoration Plan (CERP) projects propose to restore hydrology to more natural conditions (e.g., Western Everglades Restoration Project and Loxahatchee River Watershed Restoration Project). Future refinements to water control manuals, such as the Combined Operational Plan, Kissimmee River Headwaters, and future updates to the Lake Okeechobee Regulation Schedule (LORS), would further improve hydrology within the Northern Estuaries and Greater Everglades.
Cumulative Effect	Although it is unlikely that natural hydrologic conditions would be fully restored to pre-drainage conditions, hydrology would improve. CERP is expected to improve the quantity, quality, timing, and distribution of freshwater flow.

	Cumulative Effects
Threatened and Endangered Species	
Past Actions	Water management practices and urbanization resulted in the degradation of existing habitat function and direct habitat loss, leading to negative population trends of threatened and endangered (T&E) species.
Present Actions	Ongoing efforts have been made by federal and state agencies to implement projects to improve hydrology within the Study Area, thus improving habitat for some T&E species.
Proposed Action	Implement Recommended Plan to provide more habitat and foraging opportunities.
Future Actions	Projects would be implemented to maintain T&E species within the Study Area.
Cumulative Effect	Habitat improvement, monitoring, and management of T&E species are anticipated to allow populations to be maintained. Improvement of degraded populations is expected to be facilitated by the restoration and enhancement of suitable habitat through efforts to restore more natural hydrologic conditions within the Study Area.
Fish and Wildlife Resources	
Past Actions	Water management practices resulted in aquatic vegetation community changes and a resultant disruption of aquatic productivity and function that has had repercussions throughout the food web, including effects on wading birds, large predatory fishes, reptiles, and mammals.
Present Actions	Ongoing efforts are being made by federal and state agencies to implement projects to improve hydrology within the Study Area to restore habitat conditions for fish and wildlife resources.
Proposed Action	The effects of converting pasture to an aboveground reservoir would be negligible to fish and wildlife resources. A reservoir would increase the spatial extent of suitable habitat for several fish and wildlife resources at the expense of upland species. Increases in forage prey availability (e.g., crayfish, other invertebrates, and fish) would directly benefit aquatic amphibian, reptile, small mammal, and wading bird species. Nesting and foraging activities of resident wading bird species are anticipated to improve. Although upland species occurring within the Project Area are adapted to the naturally fluctuating water levels, there is an increased potential that species currently using upland habitat may be negatively affected. There are expected beneficial effects to fish and wildlife resources within Lake Okeechobee due to increased time within the preferred stage envelope. Reductions in the number of freshwater flows to the Northern Estuaries are anticipated to improve suitable habitat for key indicator species, such as oysters.
Future Actions	Some level of improvement to fish and wildlife resources would be expected to occur as a result of implementation of projects with the capability of improving the timing, quantity, quality, and distribution of freshwater flow to the Study Area. Hydrologic restoration planned as part of CERP will further improve fish and wildlife habitat.
Cumulative Effect	Habitat improvement efforts are anticipated to benefit fish and wildlife resources.
Vegetation and Wildlife	
Past Actions	Drainage of Florida's interior wetlands, conversion of wetlands to agriculture, and urban development reduced the spatial extent and quality of wetland resources.
Present Actions	State and federal regulatory agencies are taking steps to reduce wetland losses.
Proposed Action	Moderate beneficial effects to vegetation within Lake Okeechobee are anticipated by reductions in frequency and duration of high lake stages. Reductions in the number of high flow events to the Northern Estuaries are anticipated to improve conditions for estuarine submerged aquatic vegetation.

	Cumulative Effects
Future Actions	While the spatial extent of natural plant communities in the Lake Okeechobee Storage Reservoir Section 203 Study (Project) footprint will be devoid of vegetation, other projects to restore the Kissimmee River and create wetland habitat in areas surrounding the river will provide quality vegetative communities where they currently do not exist.
Cumulative Effect	While the spatial extent of natural plant communities in the Project footprint will be devoid of vegetation, other projects to restore the Kissimmee River and create wetland habitat in areas surrounding the river will provide quality vegetative communities where they currently do not exist.
Cultural Resources	
Past Actions	Flood and water control projects, conversion of wetlands into agriculture, and urban development had adverse unmitigated effects to cultural resources, either directly or indirectly.
Present Actions	State and federal agencies are making efforts to conduct cultural resource investigations near the Project Area, thereby avoiding or minimizing adverse effects to cultural resources.
Proposed Action	No adverse effects to cultural resources, or historic properties, would be expected from the Recommended Plan. Results from the survey determined that the Recommended Plan would avoid historic properties. In a letter dated February 26, 2024, the Florida State Historic Preservation Officer that that “the proposed project will have no adverse effect on historic properties listed, or eligible for listing, in the NRHP, or otherwise of historical, archaeological, or architectural value within the surveyed APE.” They found the report submitted to be “complete and sufficient in accordance with Chapter 1A-46, Florida Administrative Code. “
Future Actions	Continued improvement to hydroperiods and extreme water level events in Lake Okeechobee could stabilize the environment and prevent impacts to cultural resources surrounding Lake Okeechobee. Transferring significant cultural sites within the Project Area from private ownership into public ownership may assist in protecting sites from impacts from agriculture and other anthropogenic activities.
Cumulative Effect	Cumulative effects to cultural resources are not anticipated based on the placement of features north of Lake Okeechobee and as features are operationally distinct from other CERP features.
Water Quality	
Past Actions	Water quality has been degraded by urban, suburban, commercial, industrial, recreational, and agricultural development in addition to channelization (such as Kissimmee River) and drainage within the Study Area and upstream.
Present Actions	Efforts to improve water quality are ongoing. The State of Florida has adopted a Total Maximum Daily Load (TMDL) for Lake Okeechobee and the Lake Okeechobee Watershed. To achieve the water quality improvements necessary to meet the TMDL in the lake and watershed, the Florida legislature established the Northern Everglades and Estuaries Protection Program, which directed the Florida Department of Environmental Protection to develop and implement water quality improvement plans called basin management action plans that provide milestones and management measures to help meet the TMDL within a measured period.
Proposed Action	The Recommended Plan would not be expected to adversely affect water quality. Results from a simple phosphorus load analysis showed negligible load reduction compared to the Future Without Project condition. This is caused by changes in watershed flows surrounding the Project footprint. Lake Okeechobee flows would be unchanged.
Future Actions	Actions by the State of Florida would decrease nutrient concentration and loadings to the Project Area.
Cumulative Effect	While anthropogenic effects on water quality are unlikely to be eliminated, water quality would be expected to slowly improve over existing and recent past conditions. During detailed planning and design, the Corps and South Florida Water Management District (SFWMD) are committed to ensuring that the Project implementation would not result in water quality degradation.
Water Supply/Flood Control	

	Cumulative Effects
Past Actions	Water supply and flood control for agricultural and urban users have benefited from construction and operation of the Central and Southern Florida Project.
Present Actions	Availability of water from Lake Okeechobee for agricultural users was diminished through implementation of 2008 LORS. The SFWMD has implemented Restricted Allocation Area Rules to cap allocations to existing legal users within the Lake Okeechobee Service Area (LOSA) and Indian Prairie Basin.
Proposed Action	Implementation of the Project would be expected to benefit existing legal users of water supplies within the LOSA.
Future Actions	Future supplies would not change unless additional CERP storage features were implemented to increase water availability.
Cumulative Effect	While effects on water supplies are unlikely to fully restore the level of service experienced prior to implementation of 2008 LORS, water supply availability would improve as additional storage is constructed.

6.3.4 Recommended Plan with CERP Storage

CERP identifies storage features north, south, east, and west of Lake Okeechobee that work together to achieve beneficial ecological effects. The combination of these storage features with other CERP components provides synergy in achieving Everglades restoration. These complete storage components are critical to the overall success of CERP. The previously authorized projects are components that were identified in CERP and are being implemented incrementally over time, consistent with IDS, reducing the risks and uncertainties associated with Project planning and implementation.

6.3.5 CERP Components Comparison

The LOCAR components are in agreement with Component A of CERP. Since CERP began, years of updated science, new information, improved hydrologic modeling tools, and varying water treatment assumptions have led to the differences between CERP components and the Recommended Plan. Water quality treatment features, like STAs and reservoir-assisted STAs, although proposed in CERP Component A, have not been carried forward in the current effort. The state of Florida adopted a TMDL for Lake Okeechobee and the LOW. To meet the TMDL in the lake and watershed, the Florida legislature established the Northern Everglades and Estuaries Protection Program, which directed the FDEP to develop and implement water quality improvement plans, called BMAPs, that provide milestones and management measures to help meet the TMDL within a specified period of time. Other efforts in the region will be used to meet the intent of water quality improvements originally proposed by CERP Component A.

CERP Component A included a 17,500 ac reservoir with total storage capacity of 200,000 ac-ft in Kissimmee River Region and a 2,500 ac STA. The purpose of this FS is to identify 200,000-ac-ft aboveground storage north of Lake Okeechobee, in agreement with Component A of the Yellow Book. Releases from Lake Okeechobee would be made during wet periods for later use during dry periods and offer operational flexibility to draw and store water from the lake and the basin to improve its littoral ecosystems.

The Recommended Plan proposed in this FS does not preclude future increments of CERP planning for additional storage north of Lake Okeechobee to provide additional water storage and peak flow attenuation. It also recognizes that improvements in water supply for existing legal users in LOSA could be considered in future increments of CERP to provide additional storage for capturing water currently

being sent to tide from Lake Okeechobee or capturing water from other sources. Future CERP increments that provide this additional storage will increase water made available in the regional system for other water-related needs.

6.3.5.1 Future Operational Opportunities

The LOCAR plan formulation effort evaluated optimized Lake Okeechobee operations to best use the infrastructure proposed in each alternative. Independent of benefits provided to the Northern Estuaries, additional operational flexibility is possible via targeted, supplemental environmental deliveries from Lake Okeechobee to optimize flows within preferred flow regimes. There are future opportunities to address these CERP components: Environmental Water Supply Deliveries to the Caloosahatchee Estuary (Component E) and Environmental Water Supply Deliveries to the St. Lucie Estuary (Component C). This FS is not recommending changing the existing operational manual schedule, only providing recommendations to inform a future regulation schedule study.

This opportunity for operational flexibility provided by LOCAR would improve salinity conditions to the Northern Estuaries. By their nature, these operations should maintain or slightly improve the extreme flows (both high and low flows) but are more targeted at optimizing the flow regime closer to targets. Additional benefit from LOCAR storage may be realized if Components E and C are implemented in operations.

6.3.6 Incomplete or Unavailable Information

The analyses provided in this document are based upon current knowledge of the physical and biological conditions in the Project Area and on projections of the most probable future conditions, as indicated by hydrologic models. The LOCAR Project Team recognizes that there is uncertainty in the predictions derived from these models that stems from input variability, measurement errors, parameter uncertainty, model structure uncertainty, and algorithmic (i.e., numerical) uncertainty as outlined in CERP Model Uncertainty Workshop Report (RECOVER 2002). As a result, there is uncertainty as to whether the specific performance indicators and measures used to characterize the overall system performance capture that overall performance. The likelihood of capturing all the processes occurring in a system as complex as the Everglades within simulation models is low. There will always be some uncertainty present in predicting environmental benefits associated with any CERP project because of the size and complexity of the Everglades ecosystem as well as the difficulty in fully understanding its physical and biological processes. However, the outputs of the subregional hydrologic models used to assess projected hydrologic changes and to quantify ecosystem benefits for LOCAR were the best data available to predict the most likely hydrologic changes as a result of the Project. Even though uncertainty is recognized, ecological benefits derived from PM metrics are useful in making planning-level decisions. These values provide a quantitative means for comparing alternatives to identify the best performing alternative.

New technical information or models may be developed as the Recommended Plan is implemented, and the observed results may differ from predicted results. Considering this, it may be necessary to adjust operations to address the new information or observed results to achieve better performance for environmental restoration and protection, and to ensure the health, safety, and wellbeing of the general public and affected individuals. Using an AM approach during implementation of LOCAR, as documented

in **Annex D**, would provide new information to address uncertainties and risks over time, decrease the potential for costly mistakes, and ultimately support fulfillment of the restoration goals and objectives.

6.3.7 Unavoidable Adverse Environmental Effects

As discussed under each resource in **Section 5,** adverse effects associated with implementing the Recommended Plan are expected to be negligible to major. Unavoidable potentially adverse impacts that would result from implementation of the LOCAR include effects to native upland species including the threatened Eastern indigo snake, threatened crested caracara, endangered Florida panther, endangered Florida bonneted bat, and proposed endangered tricolored bat that may be displaced by the conversion of uplands to a reservoir; effects to larval fish impingement and entrapment with the pumps; and temporary short-term impacts to air quality, the noise environment, and aesthetic resources from operation of construction equipment through lands designated for staging, access, and construction. Temporary disturbances to and displacement of fish and wildlife resources to other nearby habitat would occur during construction. Vegetation may be lost during construction where land would be flooded. Hydrologic conditions and vegetation would continue to be monitored.

Significant beneficial effects to fish and wildlife resources are anticipated from LOCAR. Changes in hydrology have the potential to affect prey forage base through alteration of vegetation composition or structure. However, adverse effects to some upland species would occur due to construction and operation of a reservoir. These effects would be expected to be short-term as upland species could expand into other areas of suitable habitat created because of the implementation of other CERP projects including the LOWRP.

Non-native and invasive plant infestations in the Project Area may be exacerbated by soil disturbance during construction and hydrological modification and may require active management as described in the Invasive and Species Nuisance Species Management Plan (**Annex F**). Many non-native and invasive species are flourishing in a variety of habitats and are negatively affecting the ecology throughout the Everglades.

Privately owned lands would be used for the LOCAR. Negative impacts include the loss of ad valorem tax revenue to county governments after land acquisition. The Regional Economic Development analysis in **Section 4** documents the ad valorem tax data for Highlands County, where land would be acquired.

Potential adverse impacts on prime and unique farmland and wetlands would be assessed during detailed design. Above ground impoundment ponds make up 30 percent of the Project footprint.

With regards to sites containing human remains, the Jacksonville District and STOF entered into a Burial Resources Agreement pursuant to the Corps Trust Responsibility as outlined in the November 1, 2012, Chief of Engineers Memorandum, *Tribal Consultation Policy.* The Burial Resources Agreement establishes a framework that will serve as the basis for consultation regarding the presence of burial resources within the Jacksonville District's area of action and jurisdiction for the Civil Works and Regulatory Programs, respectively. It sets forth procedures that will ensure culturally sensitive treatment of burial resources. This agreement is not intended to clarify or interpret the responsibilities of the Jacksonville District pursuant to NHPA Section 106, nor does it guide investigations required by NHPA Section 106. Rather it is intended to set forth procedures that will ensure meaningful consultation with respect to burial resources.

Although they are not signatories of the Burial Resources Agreement, the presence of burial resources will also require consultation with the MTI and other appropriate, federally recognized Tribes pursuant to NHPA Section 106, the Corps Trust Responsibility, and other federal regulations, EOs, and departmental policies.

6.3.8 Irreversible and Irretrievable Commitment of Resources

An irreversible commitment of resources is one in which the ability to use and/or enjoy the resource is lost forever. An irretrievable commitment of resources is one in which, due to decisions to manage the resource for another purpose, opportunities to use or enjoy the resource as they presently exist are lost for a period of time. Construction of the proposed Project would include permanent features. Such construction and structural modifications are proposed on such a large scale that represents an irreversible and irretrievable commitment of resources. Resources to be committed if the Project is approved include expenditure of state and federal funding, labor, energy, and project materials to build, operate, and maintain the Recommended Plan.

6.4 Engineering Considerations

The following subsections of **Section 6.4**, provide an overview of the planning level engineering design of the Recommended Plan for the LOCAR FS, as documented in **Appendix A, *Engineering***.

6.4.1 Introduction

Appendix A of the LOCAR FS report provides a comprehensive record of the technical information and engineering analyses prepared by SFWMD to support the conceptual design of the Recommended Plan. **Appendix A** is organized by technical discipline and includes, but is not limited to, the following: an overview of the Recommended Plan features, status of engineering design activities and analyses, general construction procedures, and planning level design information for the civil-site, hydrologic, hydraulic, geotechnical, hydrogeologic, structural, architectural, mechanical, electrical, and instrumentation-and-control aspects of the Recommended Plan. For the summary of costs, cost considerations, and assumptions, refer to **Appendix B**, ***Cost Engineering***.

During the preconstruction engineering and design (PED) phase of the Project, the location and design of each feature will be refined and optimized as the design of the Project is finalized. This optimization may include adjustments to the size and layout of the reservoir, as well as the relocation, addition, removal, and/or combination of some water control structures and conveyance features.

6.4.2 Status of Engineering Design

6.4.2.1 Level of Design Efforts

Engineer Regulation (ER) 1110-2-1150, *Engineering and Design for Civil Works Projects,* provides guidance for feasibility-level design to accompany decision documents. ER 1110-2-1302, *Engineering and Design for Civil Works Cost Engineering*, and CECW-EC Memorandum for Record (MFR) – Guidance on Cost Engineering Products Update for Civil Works Projects in Accordance with ER 1110-2-1302, dated June 5, 2023, provide guidance for preparing cost estimates for feasibility studies, based on the level of design maturity achieved and risk identified at the conclusion of a feasibility study. The CECW-EC MFR, dated June 5, 2023, states:

"At a minimum, the District Chief of Engineering Division, utilizing the project's Risk Register, must address three basic areas in determining the level of design:

a. Geotechnical data quality, likely unknowns, and risks associated with using the available data, including the risks where there is little to no data. Scope changes from unknown foundation conditions have been known to cause significant increases.

b. Hydrology and Hydraulics (H&H) model type (e.g., 1d, 2d, 3d), if a model has been run, quality of data, and risks associated with these models.

c. Survey data quality and risks associated with this data."

During the preparation of the LOCAR FS, the planning level engineering design for the Recommended Plan was completed in accordance with ER 1110-2-1150. Based on the scope of the engineering analyses completed and the level of design maturity achieved for the Recommended Plan's major features (or Project components) documented in **Appendix A** including but not limited to the level of design maturity of: the geotechnical data and subsurface investigations (**Sections A.7, A.8, A.9**), hydrology and hydraulics modeling (**Sections A.5, A.6, A.12**), and survey data (**Section A.4.2**), it was determined that the aggregate level of engineering design maturity of the Recommended Plan completed for the FS is twenty percent. In addition, during the FS Project, risks were identified. The risks are presented in a Project risk register, included in **Appendix B**. Risks to be addressed by the engineering design of the Recommended Plan from the risk register include:

- TD1: Internal water conveyance
- TD2: Seepage
- TD3: Flood control operations
- TD4: Pump station designs
- TD5: Global geotechnical assumptions
- TD6: On-site disposal of excess material
- TD7: System not performing as intended
- TD8: Wave wall designs (currently not a risk because the perimeter dam no longer includes a wave wall. Could become a risk during PED if the perimeter dam is redesigned to include a wave wall.)

These risks will be further evaluated and addressed during the PED phase of the Project.

6.4.2.2 Recommendation for Design Completion

Features of the Recommended Plan have been designed based on available data, historic information, and preliminary engineering analyses and calculations. The design of these features (or Project components) will be optimized during the PED phase for cost efficiency and performance, incorporating updated data and information as it becomes available. Specific recommendations concerning the optimization of Project components and additional analyses to be completed during the PED phase are included throughout the **Appendix A** sections and annexes. During the PED phase, an economic analysis will be conducted on the components of each proposed pump station to ensure compliance with Engineering Manual (EM) 1110-2-3102.

6.4.3 Planning Level Engineering Overview

The following is a summary of the types of planning level engineering considerations, design, and analyses completed for the Recommended Plan, as part of the LOCAR FS, listed in the order presented in **Appendix A**. Details concerning the planning level engineering completed for each category listed below are provided in the **Appendix A** sections identified for each category, and in the **Appendix A** annexes associated with these sections.

- General Construction Procedures and Considerations (**Section A.3**)
- General Technical Design Requirements and Criteria (**Section A.4**)
- Hydrologic Design and Modeling (**Section A.5**)
    - Probable Maximum Precipitation Determination for Reservoir
    - Design Flood Routing for Reservoir (i.e. 10-yr design flood, 100-yr design flood, and probable maximum flood)
    - Wind, Wave, and Overtopping Analyses for Reservoir
- Hydraulic Design and Modeling (**Section A.6**)
    - Hydraulic Design for Gravity Conveyance Structures
    - Hydraulic Design for Pump Stations
    - Hydraulic Design and Modeling of Canals
- Geotechnical Data, Subsurface Investigations, and Considerations for Construction (**Section A.7**)
- Geotechnical Dam Embankment Design and Modeling (**Section A.8**)
- Three-Dimensional Seepage Modeling of Reservoir and Surrounding Area (**Section A.9**)
- Structural Design Criteria and Considerations for Pump Stations, Gated Water Control Structures, and Associated Control Buildings (**Section A.10**)
- Site Civil Design Criteria and Considerations for Reservoir Site and Sites Associated with Pump Stations and Gated Water Control Structures (**Section A.11**)
- Mechanical Design Criteria and Considerations for Pump Stations and Gated Water Control Structures (**Section A.12**)
- Electrical Design Criteria and Considerations for Pump Stations and Gated Water Control Structures (**Section A.13**)
- Instrumentation and Controls Design Criteria and Considerations for Pump Stations and Gated Water Control Structures (**Section A.14**)
- Architectural Design Criteria and Considerations for Control Buildings Associated with Pump Stations and Gated Water Control Structures (**Section A.15**)

- Heating, Ventilation, Air Conditioning (HVAC), Plumbing, and Fire Suppression Systems Design Criteria and Considerations for Control Buildings Associated with Pump Stations and Gated Water Control Structures (**Section A.16**)

- Access and Security Design Criteria and Considerations for the Reservoir Site, Pump Stations and Gated Water Control Structures (**Section A.17**)

- Operations and Maintenance Criteria and Considerations for the Project Features (**Section A.18**)

- Dam Safety Considerations, Dam Breach Modeling Overview, and Reservoir Emergency Action Plan Criteria and Considerations (**Section A.19**). See additional information in **Section 6.4.4**.

6.4.4 Dam Safety

To evaluate the extent of flooding from a potential breach in the LOCAR dam, a two-dimensional hydrodynamic breach model of the Recommended Plan was developed using Corps Hydrologic Engineering Center's River Analysis System (HEC-RAS) v6.3.1. Four breach locations were evaluated to focus on the impacts to transportation, residential, and agricultural lands near the reservoir:

- Location 1: From LOCAR towards the Kissimmee River to the residential properties and County Road 721

- Location 2: From LOCAR towards C-41A, residential properties, and State Road 70

- Location 3: From LOCAR away from C-41A towards State Road 70 and C-40

- Location 4: From LOCAR away from C-41A towards the Brighton Valley Impoundment

For each breach location, three dam breach conditions were evaluated: Sunny Day; 100-year, 72-hour rain event; and Probable Maximum Precipitation (PMP). Two non-breach conditions were also evaluated for the 100-year, 72-hour rain event and PMP. The dam breach modeling indicates that State Road 70 and the farmland surrounding the Project site will likely be significantly impacted in the event of a breach of the reservoir's perimeter dam. A breach could lead to life-threatening conditions for nearby farm personnel and motorists along State Road 70 and impede emergency evacuation routes along State Road 70 and other roads within Highlands and Glades counties.

Figure 6-4 shows the extent of flooding simulated by the LOCAR dam breach model for the sunny day dam breach at Location 4. Note, **Figure 6-4** is from the dam breach modeling technical memorandum in **Annex A-2.7**. The term Alternative 1 in **Figure 6-4** refers to the Recommended Plan. This simulation shows flooding within the Brighton Valley Impoundment with a portion of flooding extending south of State Road 70. Maximum flood depths are estimated to reach portions of the Brighton Valley Impoundment within 0 to 2 days, and most of the area immediately north of State Road 70 and south of State Road 70 but north of C-41A in 0.6 to 1 day. The residential communities along State Road 70 and the community immediately south of Lake Istokpoga are estimated to have maximum flood depths in 1.1 to 1.5 days.

Additional details about the dam breach modeling and results for the other breach locations/simulations are included in **Appendix A, Section A.19 and Annex A-2.7**.

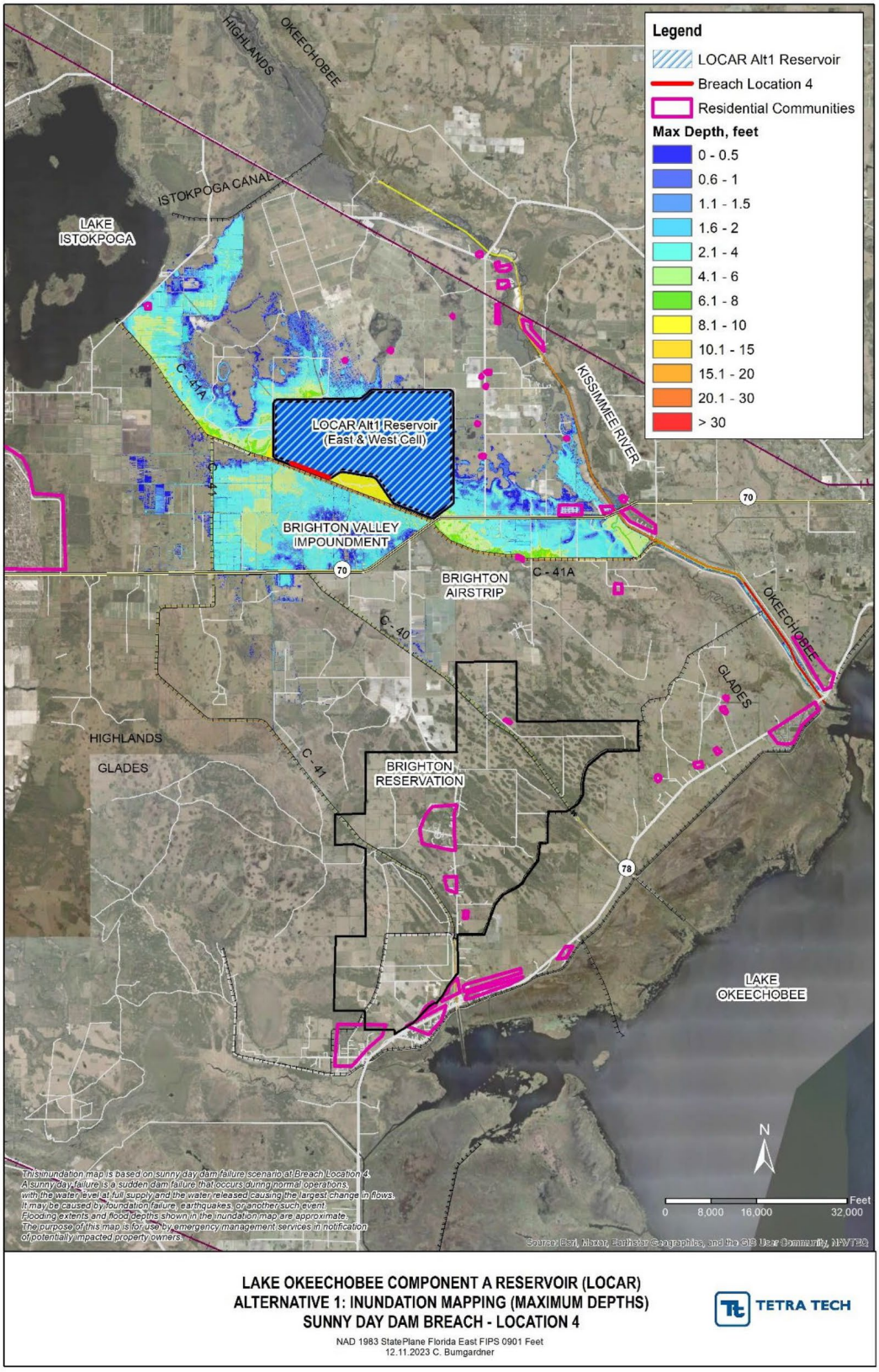


Figure 6-4. Sunny Day Flooding Extent from a Breach at Location 4.

6.5 Cost Estimates of Restoration Elements

LOCAR cost estimates are intended to present a Total Project Cost (i.e., construction and non-construction costs) at the current price level to be used for Project justification or authorization. The costing efforts are also intended to produce a final product (i.e., cost estimate) that is reliable and accurate.

The cost estimate was prepared in Micro-computer Aided Cost Estimating System (MCACES) second generation (MII) tool. This estimate is supported by the preferred labor, equipment, materials, and crew/production breakdown. The Project Team performed a preliminary risk analysis to addresses Project uncertainties and set contingencies for the Recommended Plan. Guidance for estimating costs, the fully funded (escalated for inflation through Project completion) cost estimate, and the TPCS, including the preliminary risk analysis, are provided in **Appendix B**.

The Recommended Plan has a more detailed level of engineering design than did the final array of alternatives. The LOCAR Project Team has performed a cost schedule risk analysis to reevaluate the risk-based contingency (i.e., 55 percent) used during plan formulation to account for uncertainties.

Table 6-15 includes a breakdown of the estimated construction and non-construction costs for ecosystem restoration activities. Recreation costs are not included in the table below but are included in the cost share. This is because ecosystem restoration costs are for HU benefits and recreation costs are for NED benefits. Total Project costs, including cost share, are provided in **Table 6-15** below. Non-construction costs generally include lands, easements, rights-of-way, and relocations (LERR), Engineering During Construction, PED, and Supervision and Administration costs. Costs were estimated at Fiscal Year 2024 price levels and rounded to the nearest $1,000. The 2.75 percent federal discount rate and a 50-year economic period of analysis were used to amortize costs and determine the Project investment costs. Based on preliminary engineering and design of the Recommended Plan, the total investment cost without recreation and average annual cost are $3,541,523,000and $151,786,400, respectively (**Table 6-16** and **Table 6-17**).

Table 6-15. Total Ecosystem Restoration First Costs (2024 Price Level) without Recreation Costs.

Construction Phase Items	Cost[1]
Construction Features Subtotal	$$2,475,618,000
Preconstruction Engineering and Design	$618,905,000
Construction Management (Supervision and Administration)	$$227,757,000
Lands and Damages	$219,243,000
Total First Cost	$3,541,523,000

1/ Construction costs in this table include contingencies

Table 6-16. Ecosystem Restoration Investment Costs without Recreation Costs.

Category	Cost
Total Ecosystem Restoration First Cost	$3,541,523,000
Interest During Construction[1]	$381,580,000
Total Investment Cost	$3,923,103,000

1/ Interest During Construction was calculated over the following rough order of magnitude schedule estimates by feature site and Civil Works Sub-feature Description: construction and construction management, Preconstruction Engineering and Design, and Lands and Damages.

Table 6-17. Ecosystem Restoration Average Annual Costs without Recreation Costs.

Category	Cost
Interest and Amortization	$145,315,000
Operations, Maintenance, Repair, Replacement, and Rehabilitation	$6,471,400
Total Average Annual Costs	**$151,786,400**

6.5.1 Real Estate

The non-federal sponsor will acquire and estimated 12,392 ac in fee simple title and any needed easements that may be identified from one landowner.

6.5.2 Operations, Maintenance, Repair, Replacement, and Rehabilitation for Project Features

OMRR&R begins after physical Project construction and OTMP is complete, and generally includes all operation activities and maintenance needed to keep the Project features functioning as intended. OMRR&R for LOCAR would occur following construction of the reservoir.

The O&M Costs Methodology Report Database developed by the SFWMD was used to calculate OMRR&R costs. This tool is useful in calculating basic operations, maintenance, and repair costs. It is based on historical accruals for similar operations, maintenance, and repair activities. Rehabilitation and replacement costs include those costs required to keep the pump station operable for the period of analysis, and in perpetuity. Repair and rehabilitation costs on items, such as pumps, drivers, and switchgear, are assumed to be rehabilitated or replaced once during the 50-year lifecycle. Rehabilitation costs are typically 35 to 45 percent of replacement costs; to provide a conservative estimate for LOCAR, major equipment replacement is considered in the estimate. Replacement is estimated to occur 30 years after placing the station into operation. The replacement cost includes engineering and structural modification costs as well as the equipment costs. **Table 6-18** lists the expected average annual OMRR&R costs for LOCAR.

Table 6-18. Annual OMRR&R Costs for New LOCAR Facilities without Recreation Facilities.

Structure	OMRR&R Costs
Total Annual OMRR&R Costs New Facilities	$6,471,400

LOCAR–Lake Okeechobee Storage Reservoir Section 203 Study; OMRR&R–operations, maintenance, repair, replacement, and rehabilitation

6.5.3 Invasive Species Management

Invasive species management costs accrue during all phases of the Project, as shown in **Table 6-19**. Preconstruction management activities, construction phase activities, and OTMP activities are all construction-based activities and are included in the PED account of the TPCS. Management of invasive species, including surveillance, control, etc., will occur throughout the OMRR&R phase.

Table 6-19. Summary of Cost Estimates for Invasive Species Management.

Category	Cost
1-year Preconstruction	$153,875
Construction Phase	$93,050

Category	Cost
Operational Testing & Monitoring Phase	$93,050
1-year OMRR&R Phase	$99,050
50-year OMRR&R Phase[1]	$5,249,650
Total Cost	**$5,595,625**
Average Annual Cost	**$111,913**

1/ Includes Year 1 OMRR&R Phase
OMRR&R–operation, maintenance, repair, replacement, and rehabilitation

6.5.4 Monitoring and Adaptive Management

The methods, locations, timing, and funding requirements for conducting adaptive management and monitoring are included in **Annex D**. The LOCAR monitoring plan was designed to provide the monitoring required to address LOCAR-specific needs while being integrated with other Everglades monitoring to take advantage of existing monitoring efforts, knowledge, and information. The AMMP leverages several existing programs to avoid redundancies and ensure cost effectiveness. Since LOCAR relies on existing physical instrumentation, stations, locations, servicing, and analysis efforts funded by RECOVER, CERP sponsors, and partner agencies, the monitoring requirements described in the LOCAR plan are limited to the additional increase in monitoring resources and analysis efforts necessary for LOCAR-specific questions. The LOCAR monitoring plan assumes these other monitoring efforts would continue into the future at least for the period required by the Project. AM and monitoring costs accrue during different phases of the Project, as shown in **Table 6-20**. These costs (i.e., 1 percent of total first costs for monitoring and 3 percent for AM) would be updated as the Recommended Plan is optimized. Post-construction monitoring would occur either during 10-year cycles or in perpetuity, including the period of analysis; this is part of OMRR&R costs.

Table 6-20. Summary of Cost Estimates for Monitoring and Adaptive Management.

Part	Annual (1-year) Construction	2- to 5-year Post-construction	10-year[1] Post-construction	6- to 50-year Post-construction
AMMP	$1,040,660.00	$5,203,300.00	$10,406,600.00	
WQ	$753,720.88	$1,470,085.36	$0.00	$13,147,122.60
Hydro	$1,615,158.00	$8,075,790.00	$0.00	$80,757,900.00
BO	-	-	-	-
Total	$3,714,539	$16,274,175	$10,406,600	$93,905,023

1/ Adaptive Management and Monitoring (Ecosystem Restoration Success) plan costs are construction funded up to 10 years post construction, per Corps Headquarters implementation guidance on Section 1161 of 2016 Water Resources Development Act.
AMMP–Adaptive Management and Monitoring Plan; BO–Biological Opinion; Hydro–hydrology; WQ–water quality

6.5.5 Operational Testing and Monitoring Period Costs

As defined in the CERP Master Agreement, the OTMP means a reasonable, limited period of time within the period of construction, after physical construction has been completed, during which the authorized CERP project, or a functional portion of the authorized CERP project, is operated, tested, and monitored. The constructed features will be tested to ensure that they operate as designed, and to allow for any adjustments to such features as may be necessary so that they perform as designed. The OTMP costs for project features are included in the PED/EDC construction costs and accrue for interim operation of

project features during OTMP. The total amount for operations and testing is equivalent to one year of OMRR&R.

6.5.6 Cultural Resources Preservation Costs

Pursuant to ER 1105-2-100, Appendix C, Paragraph C-4.d(6)(c), federal responsibility for data recovery costs is capped at 1 percent of the total federal amount authorized for appropriation. Anything above the 1 percent cap will be cost-shared between the federal government and the non-federal sponsor, as identified in ER 1105-2-100, Appendix C, Paragraph C-4.h(3).

The cost of Phase I cultural resources surveys would be $251,880 wherein the goal of the survey is to locate, identify, and evaluate cultural resources within the area of potential effects. If Phase II evaluation studies were needed wherein archaeological test excavation are undertaken to determine site integrity and NRHP eligibility, the costs would be around $150,000. The original desktop analysis was $18,856. Phase III data recoveries, wherein an archaeological site is scientifically excavated as a mitigation of an adverse effect, would be cost if needed.

6.6 Cost-sharing

The total first cost of the restoration features of LOCAR (**Table 6-21**), including the value of LERR and PED costs, will be shared between the federal government and the non-federal sponsor under the CERP program as a whole. The non-federal sponsor will provide cash, perform work-in-kind during planning, engineering, and design, or manage a portion of construction as necessary to meet its 50 percent share of the total first cost of the Project, to be balanced according to Section 601(e) of WRDA 2000.

Table 6-21. Cost Share for the LOCAR Recommended Plan (FY24 Dollars).

Item	Federal Cost	Non-federal Cost	Total[1]
Ecosystem Restoration			
Restoration Construction[2]	$1,361,590,000	$1,114,028,000	$2,475,618,000
PED	$309,453,000	$309,453,000	$618,905,000
Construction Management	$113,879,000	$113,879,000	$227,757,000
LER&R	$5,362,000	$213,881,000	$219,243,000
Ecosystem Restoration Subtotal	$1,790,284,000	$1,751,241,000	$3,541,523,000
Recreation			
Recreation Construction	$1,105,000	$1,105,000	$2,210,000
PED[2]	$276,000	$276,000	$552,000
Construction Management[3]	$102,000	$102,000	$203,000
Recreation Subtotal	$1,483,000	$1,483,000	$2,965,000
Total Project Cost	**$1,791,767,000**	**$1,752,724,000**	**$3,544,488,000**
Associated Average Annual Costs			
OMRR&R - LOCAR	$3,235,700	$3,235,700	$6,471,400
OMRR&R - Invasive Species	$55,957	$55,957	$111,914
OMRR&R- Monitoring (annual cost over 10- year cycle)	$520,330	$520,330	$1,040,660
OMRR&R - Monitoring (perpetual cost)	$1,058,198	$1,058,198	$2,116,396
OMRR&R - Recreation	$0	$24,600	$24,600

1/ Construction costs totals are FY24 First Costs Rounded to the nearest $1,000.

2/ Recreation preconstruction engineering and design (PED) costs presented here constitute estimate external to Total Project Cost Sheet. The proportion of total Project recreation construction cost out of total Project construction cost is applied to total project PED cost to estimate total Project recreation construction management (CM) cost.
3/ Recreation CM costs presented here constitute estimate external to Total Project Cost Sheet. The proportion of total Project recreation construction cost out of total Project construction cost is applied to total Project CM cost to estimate total Project recreation CM cost.
LER&R = lands, easements, rights-of-way, relocations, and disposal; LOCAR–Lake Okeechobee Storage Reservoir Section 203 Study; OMRR&R–operation, maintenance, repair, replacement, and rehabilitation; PED–preconstruction engineering and design

6.6.1 Cost-sharing of Real Estate

The total estimated cost for real estate is $219,243,000 (rounded). The non-federal interest is responsible for the acquisition of LERR at an estimated cost of $213,881,000. The federal portion of the cost share is estimated to be $5,362,000, which includes administrative review costs and a 40 percent contingency. The remainder will be creditable to the non-federal sponsor share of the Project cost under the CERP program as a whole, pursuant to Section 601 (e)(5) of WRDA 2000. The non-federal portion includes a 30 percent contingency to avoid condemnation.

6.6.2 Cost-sharing of Operations, Maintenance, Repair, Replacement, and Rehabilitation

Section 601(e)(4) of WRDA 2000 specifies that the OMRR&R of authorized projects of CERP is cost-shared equally by the federal government and the non-federal sponsor. The federal and non-federal sponsors' obligations to provide OMRR&R will continue indefinitely unless the Project is deauthorized by Congress. OMRR&R costs associated with recreation features of the plan will be funded 100 percent by the non-federal sponsor.

6.6.3 Cost-sharing of Monitoring

Generally, CERP post-construction project monitoring is cost-shared for a maximum period of 10 years for performance-based ecological monitoring, and monitoring required for operations may continue longer. Monitoring would be cost-shared during the construction phase of the Project in accordance with Section 601(b)(2) of WRDA 2000. The post-construction costs become part of the Project's OMRR&R plan, which would be cost-shared as described in the recommendations section of this report.

RECOVER will perform systemwide monitoring as part of the CERP Monitoring Assessment Program. Data collected as part of this monitoring program is critical to the overall success of CERP projects. Systemwide monitoring funds are provided by and for RECOVER and are independent from Project-level funding. Project operations follow water management rules developed in the DPOM (**Annex C**). Operational monitoring is cost-shared during the OMRR&R phase of the Project.

6.6.4 Cost-sharing of Cultural Resources Preservation

Data recovery for cultural resources is a 100 percent federal responsibility until the cost of data recovery reaches 1 percent of the total amount authorized for appropriation. Data recovery caps are identified in ER 1105-2-100, Appendix C, Paragraph C-4.d.(5)(f).

6.6.5 Non-federal Sponsor Work-in-kind

The non-federal sponsor may be provided in-kind credit for Project-related work, including in-kind work completed prior to execution of a Project Partnership Agreement (PPA), as described in Section 601(e)(5)(B) of WRDA 2000, as amended by Section 6004 of WRDA 2007. In-kind credit for CERP is defined programmatically in the CERP Master Agreement and, for PED, in the CERP Design Agreement. The Secretary of the Army may provide credit, including in-kind credit, toward construction that is necessary for the implementation of the plan if these conditions are met:

1. The work is defined in a PPA between the Secretary and the non-federal sponsor providing for such credit.
2. The agreement prescribes the terms and conditions of the credit.
3. The Project is ultimately being authorized by Congress as a federal project.
4. The Secretary of the Army determines that the work performed by the non-federal sponsor is integral to the Project.

Should the non-federal sponsor construct portions of LOCAR prior to execution of a PPA, this work must be covered by a Pre-partnership Credit Agreement (PPCA). The non-federal sponsor may receive credit for such construction costs upon execution of the PPA for LOCAR. Such credit would be applied toward the non-federal sponsor's share of the costs associated with the implementation of the Project under the CERP program as a whole, as authorized by Section 601(e)(5)(C) of WRDA 2000, shall not include cash reimbursements, and shall be subject to these terms:

1. The authorization of LOCAR by law;
2. A determination by the Secretary of the Army that the construction work completed under the PPCA is integral to the authorized CERP project;
3. A certification by the District Engineer that the costs are reasonable, allowable, necessary, auditable, and allocable;
4. A certification by the District Engineer that the activities have been implemented in accordance with Corps design and construction standards and applicable federal and state laws; and
5. Per Section 601(e)(5)(E) of WRDA 2000, in-kind credit is subject to audit by the Secretary of the Army.

6.7 Plan Implementation

Implementation of LOCAR would occur over many years and include many actions by the Corps and SFWMD. This subsection discusses the major implementation phases that are expected to occur after Congressional authorization, making LOCAR an authorized CERP project, and appropriation of funding for Project construction. The Corps and the SFWMD would likely execute a single PPA prior to construction.

6.7.1 Implementation and Construction

Several basic principles were considered in development of an implementation plan for LOCAR:

1. Construction of the Project cannot proceed until it is determined that construction and operation of the feature:

a) Will not cause or contribute to a violation of state water quality standards;

b) Will not cause or contribute to a violation of other water quality standards; and

c) Reasonable assurances exist that demonstrate adverse impacts will not occur to flora and fauna in the area influenced by the Project features.

2. Recreation features will be constructed in conjunction with corresponding Project features.

Other factors may influence implementation, such as funding availability, maintaining cost-share balance, and the integration of projects that may be constructed by other agencies. The Corps and SFWMD will, through a robust public process, undertake integration of the Recommended Plan and the other CERP projects authorized or awaiting authorization into the CERP program's IDS, which contains the Master Implementation Sequencing Plan (MISP) (33 CFR Part 385.30).

A potential implementation scenario with unconstrained resources and funding is provided to demonstrate the duration of full design and construction of all Project features, without considering construction dependencies, funding appropriation, outside factors, such as changing priorities or litigation, and physical limitations, such as staging and access. The best-case implementation timeframe for construction will achieve realization of the full LOCAR benefits within 8 years. The two longest activities that must occur in series are real estate acquisition and construction. Real estate acquisition completion is assumed to be 5 years (i.e., 60 months). Construction of LOCAR is estimated to be 8 years (i.e., 72 months), similar to the estimated duration of the CEPP EAA reservoir. This assumes all design activities would be performed in parallel during real estate acquisition. Uncertainty surrounding the timing of LOCAR construction, funding, resources, and stakeholder input, as well as potential conflicting priorities, may lead to a longer implementation period. The implementing agencies are committed to engaging in a public process to integrate LOCAR into the IDS, which defines the order in which CERP projects will be planned, designed, and constructed.

Other viable options for the implementation of construction phases may be considered in the future. This flexibility is essential to successful implementation, given the uncertainties associated with the lengthy implementation period and the inevitable improvement in scientific knowledge about the functioning of the greater Everglades that will occur as planned CERP and non-CERP projects are completed. Features not included in the Recommended Plan shall not be implemented phases without proper coordination, or NEPA analysis, if necessary.

Federal laws and regulations applicable to implementing CERP require PIRs to address certain assurances as part of the Project recommendation for approval and subsequent implementation. For the LOCAR FS, the analyses associated with Section 601(h)(4) and 601 (h)(5) of WRDA 2000 and the Programmatic Regulations for CERP (33 CFR Part 385) for Project-specific Assurances and Savings Clause were conducted for the Recommended Plan. The Corps and SFWMD will undertake updated Project assurances and Savings Clause analyses for the implementation phases that are selected to be included in the PPA. The Corps' District Engineer and SFWMD will ensure that Project-specific Assurances and Savings Clause requirements are met per construction phase, per applicable policies and laws. NEPA documentation would be updated, if appropriate, as revisions are made to Water Control Plans and/or POMs associated with each feature. Compliance with the requirements of the Savings Clause will be maintained throughout the entirety of the implementation period.

6.7.2 Preconstruction Engineering and Design

Appendix A represents a limited level of design but includes documentation of all engineering assumptions and conceptual designs. PED for Recommended Plan features could begin after Congressional authorization and upon the SFWMD's concurrence, consistent with the implementation phases. The Corps or SFWMD will prepare a Detailed Design Report updating the conceptual design and prepare initial, intermediate, and final plans and specifications for each phase of construction. All work will be coordinated and reviewed between the Corps and SFWMD and approved by the Corps and SFWMD prior to construction, to ensure that the work meets Corps standards and regulations and incorporates SFWMD design guidance, as applicable. PED will include site-specific surveys and geotechnical investigations. During the design phase, detailed analyses, subsurface investigations, and site investigations will be conducted to prepare construction documents. During PED, Project assurances, Savings Clause analysis, and operating manuals will be updated consistent with the implementation phases, if necessary. The lead construction agency (i.e., Corps or SFWMD) will prepare and submit a Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) permit application (Florida Statutes [F.S.] 373.1502) to FDEP. FDEP will review the application material to determine if it offers reasonable assurance that:

1. The project component will achieve the design objectives set forth in the detailed design documents submitted as part of the application.
2. State water quality standards, including water quality criteria and moderating provisions, will be met. Under no circumstances shall the project component cause or contribute to violation of state water quality standards.
3. Discharges from the project component will not pose a serious danger to public health, safety, or welfare.
4. Any impacts to wetlands or threatened or endangered species resulting from implementation of the project component will be avoided, minimized, and mitigated, as appropriate.

The Corps continues the usage of the NGVD29 system for elevation comparisons used with monitoring data, hydrologic modeling, and design for Florida. This allows the continuity of years of valuable data to be transitioned during PED to the more accurate North American Vertical Datum of 1988 (NAVD88). This FS continues of the usage of NGVD29 and NAVD88, where appropriate, in hydrologic modeling and preliminary design of the Recommended Plan. In PED, the NGVD29 elevations will be converted to NAVD88 for design analyses and completion of construction documents (i.e., plans and specifications). In some prior instances, the local sponsor has requested both vertical datums to be referenced during PED. There are appropriate conversions based on spatial relevance to maintain design intent changing from NGVD29 to NAVD88.

6.7.3 Construction

The Project would be constructed using conventional means and methods. Multiple contracts will be awarded in a sequenced and phased approach. Construction contracts for Project would not be awarded by the Corps or SFWMD prior to obtaining CERPRA permit authorization or other water quality certification, as applicable. AM would help with future development of implementation and sequencing.

6.7.4 Operational Testing and Monitoring Period

Prior to initiating OTMP, each major operational component will undergo a short period of testing and commissioning. This includes functional performance tests on all features to verify all modes of operation and to verify other relevant contract requirements. Following the testing and commissioning, operational testing and monitoring will be conducted for one full wet season (i.e., June 1 to November 30). If the OTMP begins after the start of a wet season, the OTMP should be extended as needed to encompass a full wet season. Contractor services to be provided during the OTMP will include, but will not be limited to, vegetation management (including control of exotics); answering questions on equipment operation; contacting the appropriate vendor/manufacture for response or site visits; arranging and officiating supplemental owner training sessions; and assisting in resolution of functionality issues. The OTMP activities of the construction contractor will be separate from, and supplemental to, the warranty requirements of the contract. The Corps and SFWMD will share in the responsibilities for conducting water management operations during OTMP.

During OTMP, the Corps and SFWMD will work together closely to identify any features that are not operating as designed. Any such features will be identified in writing to the Corps' District Engineer and SFWMD. At the conclusion of the OTMP, the Corps' District Engineer and SFWMD will decide as to whether the Project is "operational," as defined in the CERP Master Agreement. When the feature, or a functional portion of the feature, is determined to be operational, the feature(s) will be transferred to the SFWMD for OMRR&R.

6.7.5 Floodplain Management and Flood Insurance Programs Compliance

As LOCAR is part of the multipurpose C&SF Program, the SFWMD agrees to participate in and comply with applicable federal floodplain management and flood insurance programs consistent with its statutory authority. Not less than once each year, the non-federal sponsor shall inform affected interests of the extent of protection afforded by the authorized CERP project.

The SFWMD shall publicize floodplain information in the area concerned. It shall provide this information to zoning and other regulatory agencies for its use in preventing unwise future development in the floodplain and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with protection levels provided by the CERP project.

The SFWMD shall comply with Section 402 of WRDA 1986, as amended (33 United States Code [U.S. C.] 701b-12), which requires a non-federal interest to have prepared a floodplain management plan, within 1 year after the date of signing a PPA for the authorized CERP project. The plan shall be designed to reduce the impacts of future flood events in the Project Area, including, but not limited to, addressing those measures to be undertaken by non-federal interests to preserve the level of flood protection provided by the authorized CERP project. As required by Section 402, as amended, the non-federal sponsor shall implement such plan not later than 1 year after completion of construction of the authorized CERP project. The non-federal sponsor shall provide an information copy of the plan to the government upon its preparation.

The SFWMD shall prescribe and enforce regulations to prevent obstruction of, or encroachment on, the authorized CERP project or on the LERR determined by the government to be required for the construction and OMRR&R of the authorized CERP project that could reduce the level of protection the authorized

CERP project affords; hinder O&M of the authorized CERP project; or interfere with the authorized CERP project's proper function.

6.7.6 Environmental Commitments

The following commitments would be included in Corps and SFWMD contract specifications to avoid, minimize, or mitigate adverse effects during construction activities:

1. The contractor would be required to keep construction activities under surveillance, management, and control to avoid pollution of surface waters, groundwaters, and wetlands. The contract specifications would require the contractor to employ best management practices (BMP) with regard to erosion and turbidity control.
2. The contractor would be required to prevent oil, fuel, or other hazardous substances from entering the air, ground, drainage, local bodies of water, or wetlands. The contract specifications would require that the contractor adopt safe and sanitary measures for the disposal of solid wastes and would require a spill prevention plan. The contractor would also be required to transport and dispose of any construction and demolition debris in accordance with applicable requirements.
3. The contractor would be required to keep construction activities under surveillance and control to minimize damage to the environment by noise and air pollution.
4. The contractor would be required to keep construction activities under surveillance, management, and control to minimize interference with, disturbance to, and damage to fish and wildlife. The contractor would be required to inform the construction team of the potential presence of threatened and endangered species in the work area, the need for construction conservation measures, and any requirements resulting from Endangered Species Act Section 7 consultation. **Annex A** addresses these requirements.
5. The contractor would be required to take appropriate measures to protect historic, archeological, and cultural resources within the work area.
6. The contractor would be required to keep construction activities under surveillance, management, and control to prevent the transfer and spread of invasive species due to construction activities. The contract specifications would require the contractor to employ BMPs and measures designed to prevent the transfer and spread of invasive species.

In addition, as required under WRDA 2000, CERP Programmatic Regulations, and current Corps policy, the LOCAR Project Team has taken the following actions:

1. The LOCAR Project Team has identified water to be reserved or allocated for the natural system. **Annex B** addresses this requirement.
2. The Recommended Plan has been evaluated in light of its potential effects on existing legal sources of water and the level of service for flood protection. **Annex B** addresses this requirement.
3. The Recommended Plan includes adaptive management, water quality, hydrometeorological, and ecological monitoring activities to ensure that the intended purposes of the Project would be achieved through long-term operations. **Annex D** addresses this requirement.
4. In addition to the Project-level monitoring plan, the LOCAR Project Team has developed a nuisance and exotic vegetation control plan, which strives to either prevent or reduce the

establishment of invasive and non-native species within the Project Area. **Annex F** addresses this requirement.

5. AM is a formal process for continually improving management policies and practices by learning from their outcomes. In the context of LOCAR, the AM plan provides an approach for addressing Project uncertainties by testing hypotheses, linking science to decision-making, and adjusting implementation of the Project, as necessary, to improve the probability of restoration success. **Annex D** addresses this requirement.
6. The Recommended Plan has been evaluated in light of its potential effects on fish and wildlife resources, including effects to federally listed species. Consultation was initiated with the USFWS in June 2023 with completion of a Biological Assessment on August 16, 2023 on the Recommended Plan. ESA requirements are provided by the USFWS in the BO received on November 30, 2023. Additional information can be found in **Annex A**.

6.8 Project Assurances and Savings Clause

WRDA 2000 requires the inclusion of Project-specific Assurances and the Savings Clause analyses within each CERP PIR, or FS. LOCAR planning was completed consistent with CERP programmatic regulations; CERP designation would be given upon Congressional Authorization.

Project-specific Assurances ensure that the water needed for the natural system to achieve CERP restoration goals is identified and subsequently protected from other potentially competing uses. The Savings Clause protects existing legal sources of water supply, such as water for municipal and agricultural uses, and ensures that CERP implementation does not reduce the level of service for flood protection. The ECB can be used as a baseline performance in the Savings Clause analysis since LORS-08 is considered a non-CERP intervening project, as discussed further in Annex B. Refer to **Annex B** for complete documentation of the Project Assurances and Savings Clause analysis for the Recommended Plan, responsive to the requirements of WRDA 2000.

Based on the analysis, a simulated cutback total of 1,335,000 ac-ft in the ECB condition is reduced to 753,000 ac-ft by the Recommended Plan. Similarly, the severity score is decreased from 31 to 18. The water supply improvements for the Recommended Plan compared to the ECB condition, as quantified in RECOVER WS-1, satisfy Savings Clause requirements.

The following subsections summarize the results of the Savings Clause Analysis.

6.8.1 Project Assurances: Identification of Water Made Available for the Natural System and Water for Other Water-related Needs

Section 601(h)(4) of WRDA 2000, *Project-specific Assurances*, requires CERP PIRs to:

- Identify the appropriate quantity, timing, and distribution of water dedicated and managed for the natural system; and
- Identify the amount of water to be reserved or allocated for the natural system necessary to implement under state law.

The 2003 Programmatic Regulations for CERP (33 CFR Part 385), which were developed in response to statutory requirements in WRDA 2000, further established the processes and procedures to guide the

Corps in the implementation of CERP. Section 385.35(b) of the Programmatic Regulations requires that each PIR identify the quantity, timing, and distribution of water to be dedicated and managed for the natural system necessary to meet the restoration goals of CERP. This evaluation considers the availability of the pre-CERP baseline water and previously reserved water, and whether improvements in water quality are necessary. Section 385.35(b) of the Programmatic Regulations also requires that procedures be developed for identifying water generated by CERP for use in the human environment and specifies that the quantity, timing, and distribution of water for other water-related needs be identified in CERP PIRs.

6.8.1.1 Project Assurances: Identifying Water for the Natural System

Identification of water for the natural system is quantified from reservoir releases from the reservoir to Lake Okeechobee in the Recommended Plan. This location represents inflows to the basins where ecosystem benefits (HUs) would be expected as a result of implementation of the Recommended Plan. Water returned to Lake Okeechobee or delivered to the reservoir was quantified. The volumes of water at the tenth, fiftieth, and ninetieth percentiles are identified for the Recommended Plan (i.e., FWO) condition only (**Table 6-22**). Because the LOCAR storage features do not exist in the pre-Project condition, water is not quantified for the FWO condition. Benefits projected for the Northern Estuaries are the result of reduced flows from Lake Okeechobee and, therefore, water for the natural system is not identified.

Table 6-22. Water Made Available for the Natural System by LOCAR (Difference between Recommended Plan and FWO).

Location	Water Available Equaled or Exceeded 10% of Water Years (1,000 ac-ft)	Water Available Equaled or Exceeded 50% of Water Years (1,000 ac-ft)	Water Available Equaled or Exceeded 90% of Water Years (1,000 ac-ft)
Lake Okeechobee	175.8	31.5	0

ac-ft–acre-foot; FWO–Future Without Project; LOCAR–Lake Okeechobee Storage Reservoir Section 203 Study

6.8.1.2 Water to be Reserved or Allocated for the Natural System

The Recommended Plan provides additional water for the natural system. As required by Section 601(h)(4)(A) of the of the WRDA 2000 and Section 385.35 of the Programmatic Regulations for the Implementation of CERP, the water made available by the Project would be protected using the State of Florida's reservation or allocation authority under state law. The SFWMD would protect the water made available by the Project using its reservation or allocation authority as required by F.S. 373.470. Protection of water made available by Project features is required for the SFWMD and the Department of the Army to enter into a PPA to construct the Project features.

6.8.1.3 Project Assurances: Identifying Water Made Available for Other Water-related Needs

The ability of the LOCAR to provide water to meet other water-related needs in LOSA was analyzed for the Recommended Plan. Based on the analysis, the water supply level of service for existing legal users in LOSA is improved over the ECB. Increased water supply does not enable new or expanded allocations in LOSA.

6.8.2 Savings Clause Summary

The Savings Clause analyses, described in Section 601(h)(5) of WRDA 2000, is a means to protect users of legal sources of water supply and flood protection that were in place at the time of enactment of WRDA

2000. Section 385.36 of the Programmatic Regulations requires that CERP PIRs determine if existing legal sources of water would be eliminated or transferred as a result of project implementation. If a project is expected to result in an elimination or transfer of an existing legal source of water, the PIR shall include an implementation plan that ensures a new source of water of comparable quantity and quality is available to replace the source that is being transferred or eliminated. Section 385.37 of the Programmatic Regulations requires that CERP PIRs include analyses to ensure the level of service for flood protection would not be reduced by implementation of CERP project features.

6.8.2.1 Savings Clause: Water Supply from Existing Legal Sources

During high lake stage events, the Recommended Plan would draw water from Lake Okeechobee into LOCAR until Lake Okeechobee stage falls. LOCAR would provide storage capacity and attenuation of high flows, prior to delivery back to Lake Okeechobee. The cumulative water storage capacity of the Recommended Plan would decrease high-volume freshwater flows from Lake Okeechobee that are currently conveyed to the Northern Estuaries.

With implementation of the Recommended Plan, sources of water to meet agricultural and urban demand in LOSA would continue to be met by their current sources, primarily Lake Okeechobee. Sources of water for the STOF and MTI are influenced by the regional water management system (C&SF Project, including Lake Okeechobee); these sources would not be negatively affected by the Project. Water sources for fish and wildlife located in Lake Okeechobee and the Northern Estuaries would not be diminished. Therefore, as a result of the Recommended Plan, there would be no elimination or transfer of existing legal sources of water supply for the following:

- Agricultural or urban water supply in LOSA;
- Allocation or entitlement to the STOF under Section 7 of the Seminole Indian Land Claims Settlement Act of 1987 (25 U.S.C. 1772e); and
- Water supply for fish and wildlife in Lake Okeechobee or the Northern Estuaries.

6.8.2.2 Savings Clause: Flood Protection

The implementation of the Recommended Plan would not degrade the existing level of flood protection offered by various components of the C&SF Project for the HDD. LOCAR does not contribute to an increased Lake Okeechobee stage. While LOCAR recommends changes to LORS, this study is not the mechanism to implement those changes. A separate effort with associated NEPA assessment would be required for any future LORS changes.

Detailed assessments of the Recommended Plan were conducted. The MODFLOW groundwater seepage model results, presented in **Section A.9** of **Appendix A**, have undergone risk review by the Corps and SFWMD engineering teams to ensure the service area surrounding the reservoir maintains its existing level of service of flood protection. Furthermore, the Recommended Plan would ensure flood protection of the service area surrounding the reservoir through engineering design and construction following state-of-the-practice methods for design and construction of pertinent features of the plan. Corps ER 1110-2-1150, *Engineering and Design for Civil Works Projects*, and ER 1110-2-1156, *Engineering and Design Safety of Dams–Policy and Procedures,* along with various other site/structure-specific regulations, would be adhered to prior to and during the PED phase.

6.9 Project Concerns and Controversies

The planning of LOCAR and selection of the Recommended Plan relied on previous studies that underwent extensive public scoping as well as extensive existing scientific and local knowledge of Lake Okeechobee, the surrounding watershed, and associated waterbodies and estuaries. While the Recommended Plan is based on this wealth of knowledge, concerns and controversies were documented during the planning process. The LOCAR AM Plan (**Annex D**) addresses the concerns and uncertainties identified over decades of planning to fill information gaps. The AM Plan provides site- and question-specific methods to inform ongoing Project adjustments intended to address uncertainties and continually improve Project performance. Uncertainties exist in every natural resource management and restoration effort, and it is not unexpected to have controversies associated with construction of a reservoir. The AM Plan helps to promote the role of science in restoration and in the management of concerns and controversies.

6.9.1 LOCAR Proximity to the STOF Brighton Reservation, Tribal Lands, and Local Communities

Local communities, including the STOF, have expressed concern regarding potential impacts of siting aboveground storage features near their lands. Throughout previous planning efforts, features were modified based on Tribal and stakeholder feedback to reconfigure the surface storage footprint to avoid direct northern proximity to the Brighton Reservation. Similar efforts were made in this FS to locate the aboveground storage reservoir north of C-41A to reduce the potential for flooding on the Brighton Reservation. The Recommended Plan footprint is located 5 mi north of the Brighton Reservation.

Extensive dam safety and seepage analyses have been performed during the Project planning phase and would be continued during later Project phases. The Corps has a legal obligation to avoid degradation of existing levels of flood protection to areas outside the Project footprint. A primary Project constraint is to maintain flood protection as per the Assurances Provisions in WRDA 2000 Section 601(h). Additional modeled results do not illustrate significant decreases in water supply cutback volumes detailed modeling during PED and monitoring during construction would be performed to ensure that current levels of flood protection are maintained. The Project would be designed so it does not cause changes to flood protection.

Dam breach modeling at four locations on the reservoir was completed to explore potential life safety concerns from breach of the Project. The likelihood of a breach will be extremely low due to the use of modern design standards for water impoundment features and modern state-of-practice construction methods for dams.

Flooding from all breach scenarios would be limited from impacting the currently developed areas of the Brighton Reservation because the Indian Prairie Canal, adjacent levees (also known as C-40), and the C-41A act as a hydraulic barrier and would intercept some of the water. Potential flooding from breach would mostly impact undeveloped land around the reservoir.

A major rain event that increases the reservoir by feet would significantly overwhelm the existing drainage infrastructure causing flooding of the Project Area. Additional recommendations produced by the risk assessment to reduce the risks in the vicinity would be incorporated into the reservoir design. Environmental risk from a breach would be relatively low with no major industrial facilities or sensitive preservation areas in the predicted inundation area. For more information on this analysis, see **Appendix A.**

Seepage and effects on groundwater in surrounding properties, effects on existing local drainage infrastructure, and dam safety evaluation and design criteria would be further refined during the Project PED phase. Prior to construction, groundwater levels would be monitored to establish a baseline condition. Groundwater levels would continue to be monitored to ensure there are no off-site impacts during construction and Project operations.

6.9.2 Incremental Restoration and Future Opportunities

The National Academy of Sciences (NRC 2007) has recommended the implementation of CERP through an incremental adaptive restoration process. This Section 203 Study has formulated a solution for an increment of overall restoration of the central and south Florida ecosystem. Although the Recommended Plan provides a significant increase in water storage north of Lake Okeechobee, additional actions outside the scope of the current LOCAR effort may be needed to achieve the restoration envisioned in CERP. The actions may include:

- Additional storage throughout the LOW to move closer to a more natural timing and distribution of flows coming into the lake.
- Implementation of LOSOM to further reduce regulatory flows from Lake Okeechobee to the Northern Estuaries to improve habitat for indicator species oysters and SAV.
- Lake Okeechobee schedule optimizations to meet lake stage requirements within the preferred ecological band and reduce excursions into extreme high and low lake stages.
- Systemwide operational optimization to increase storage within the system and provide improved overall quantity, timing, and distribution of flows.

6.9.3 Water for Other Water-related Needs

During previous planning efforts, agricultural, Tribal, and municipal/industrial water supply stakeholders expressed concerns about lack of progress on CERP projects intended to increase water supply and the loss of water supply experienced during the transition from the Water Supply and Environment schedule to implementation of the LORS.

This additional storage volume provided north of Lake Okeechobee through implementation of the Recommended Plan benefits existing legal water users within LOSA by storing water that can be sent to Lake Okeechobee during dry periods. Though modeled results do illustrate increases in water supply cutback volumes over the FWO condition, it would be expected that water would be released from the LOCAR reservoir to meet LOSA demands. This and other future CERP increments that provide additional storage would increase water made available in the regional system for other water-related needs.

6.9.4 Water Quality

Water quality improvement was not a study objective, and the implementation of the Recommended Plan is not predicted to substantially affect phosphorus loadings to the lake . Results from a simple phosphorus load analysis showed a phosphorus loading reduction of less than 1 percent compared to the FWO condition. This reduction is predominantly attributed to the settling of particulate matter as water from the lake is held in the reservoir and then returned to the lake. More detail on this analysis is available in

Annex I. Additionally, other activities in the area, including the Lake Okeechobee BMAP, are anticipated to improve water quality to further meet hydrologic restoration objectives.

6.9.5 Effects on Threatened and Endangered Species

To achieve restoration objectives, the Recommended Plan includes construction of infrastructure that floods lands potentially inhabited by threatened and endangered species, including the Audubon's crested caracara, eastern indigo snake, eastern black rail, wood stork, Florida panther, Everglade snail kite, Okeechobee gourd, and Florida bonneted bat. The USFWS provided recommendations in its BO, received November 30, 2023, to avoid or minimize harmful effects on threatened and endangered species potentially affected by the Project. For more information, refer to the BO located in **Annex A**.

6.9.6 Effects of Invasive Species on the South Florida Ecosystem

South Florida contains numerous harmful invasive plant and animal species that have the potential to significantly alter ecological communities throughout the region. Concerns have been expressed that hydrologic restoration efforts to improve the greater Everglades may be ineffectual if invasive plant and animal species continue to spread and overtake natural communities of plants and animals. Scientists generally agree that restoring natural system processes and managing those areas provide greater resilience to threats posed by invasive species; refer to **Annex F**.

6.9.7 Climate Change

The magnitude of the effects of climate change, including rising sea levels, temperature changes, and changing rainfall patterns, is uncertain. However, it is generally acknowledged that climate change would affect both natural system and human environmental conditions in central and south Florida during the next century. The effects of sea level change on the benefits predicted for the Recommended Plan is described further in **Subsection 6.9.1.4** and **Annex H**.

6.9.8 Land Acquisition

Land ownership was not considered as a screening criterion for LOCAR. All the land located within the Project footprint is owned by one private corporation. More details on land acquisition and landownership are provided in **Appendix D**.

6.10 Risk and Uncertainty

Issues of risk and uncertainty are inherent in the planning, design, and implementation of the Recommended Plan. This subsection contains an overview of feasibility, forecasting, and implementation issues. This subsection also contains a discussion of the role of LOCAR's AM strategies in addressing risk and uncertainty; the LOCAR AM Plan in **Annex D** provides more detail. Monitoring and AM strategies will continue to evaluate and address issues pertaining to construction sequencing, ecosystem connectivity, and potential for early restoration benefits, thus continuing to reduce uncertainties and increase the likelihood for overall Project success.

6.10.1 Planning

Simulation model confidence and Project performance are two primary areas of focus for this risk and uncertainty evaluation. This analysis addresses the reliability and accuracy of the assumptions and tools used to forecast FWP and FWO conditions.

6.10.1.1 Hydrologic Simulation Tools

The RSM-BN regional model was approved for use through the current Corps engineering software validation process. Qualified senior Corps engineers conducted the validation reviews with support from technical experts. Corps approval indicates that the software is technically/theoretically sound and approved for use by knowledgeable and trained staff for purposes consistent with the software's purposes and limitations. The modeling tool was used to evaluate the effects of the final array of alternatives.

Model building and generic software tools (i.e., STELLA, Microsoft Excel, etc.) are generally allowed for use under the validation process, but these tools are not pre-validated and additional Agency Technical Review (ATR) of the inner workings of the model is required. ATR is conducted by a qualified senior team not involved in the Project. All other modeling tools were reviewed through the ATR process.

The modeling strategy identified these tools as the best models available for assessment of the hydrologic effects of LOCAR. **Appendix A** provides additional information on the model review process and the LOCAR modeling strategy.

6.10.1.2 Uncertainty of Project Benefits: Predicting Ecosystem Response to Hydrologic Change

There is no standardized methodology for predicting ecosystem benefits that result from habitat restoration projects. For the Corps planning process, the most apparent adverse risks of employing a given benefit estimation methodology are: (1) the most effective Project alternative is not selected for implementation, (2) the selected Project provides significantly fewer benefits than estimated, or (3) the selected Project significantly harms the resource. An uncertainty analysis is typically used to reduce the likelihood of these adverse outcomes. SFWMD resource experts reviewed the planning model to document qualitative and, where possible, quantitative assessments of how well the planning model represents the anticipated ecosystem benefits of the alternatives. The team performed this review to ensure that decisionmakers are informed about uncertainties that affect interpretation of planning model outputs. The LOCAR AMMP (**Annex D**) was developed to address uncertainty.

For LOCAR, the two most apparent sources of uncertainty in the overall benefits quantification arise from (1) the use of regional hydrologic models for the prediction of changes in hydrology, and (2) the use of performance measures to represent the ecological significance of the predicted change in hydrologic conditions.

6.10.1.3 Lake Okeechobee Regulation Schedule

The LOCAR Modeling Team incorporated LOSOM modifications into the formulation process by modifying the lake schedule in the ECB to evaluate the potential benefits of proposed infrastructure. Therefore, LOCAR benefits compared with ECB gained from reducing freshwater flows to the Northern Estuaries are derived in part from operational refinements that can take place within the existing, inherent flexibility of lake operations and, in part, with refinements that are beyond the schedule's current flexibility. The Corps has authority to perform a study to revise LORS, when needed, and implement it after compliance with

NEPA and other rules and regulations; therefore, there is a high likelihood that the LORS would be modified following authorization of LOCAR.

6.10.1.4 Sensitivity of Project Benefits to Climate Change

LOCAR is vulnerable to climate change and at risk over the Project lifecycle (i.e., 2034 to 2134) due to the following climate factors: increasing air temperatures, increases in extreme storm frequency and intensity, increasing streamflow, and rising sea level. This section focuses on the uncertainty regarding estuary benefits in light of climate change scenarios. Two main metrics are used to measure the sensitivity of estuary benefits to climate change: water depths and salinity levels. Project benefits within the northern LOW and the lake itself are not likely to be significantly reduced within the Project planning period and are not included in this analysis.

Increased Water Depths due to Climate Change

Assumptions have been made regarding the sensitivity of LOCAR benefits to SLC based on system-recognized ecosystem responses to hydrology changes. The Corps uses three SLC scenarios: (1) baseline (or "low") estimate, which is based on historical sea level rise and represents the minimum expected SLC; (2) intermediate estimate; and (3) high estimate, representing the maximum expected SLC. The LOCAR analysis is detailed in **Annex H**.

Caloosahatchee Estuary

The total area of the Caloosahatchee Estuary used for benefit calculations was 70,979 ac, although during LOWRP planning, 14,814 ac of current bathymetry data were available for the SLC sensitivity analysis. The Fort Myers, Florida, gage was used to estimate relative SLC predictions for the Caloosahatchee Estuary. Suitable depths for seagrass habitat are projected under the three Corps SLC scenarios (**Figure 6-** and **Table 6-23**).

Table 6-24 displays the year that each projected SLC scenario would exceed suitable depths for seagrass habitat. Under the high SLC projection, suitable habitat for seagrasses would be available in the Caloosahatchee Estuary until the year 2115. This projection assumes no operational or structural changes in the Caloosahatchee River. **Subsection 6.9.1.4** provides a discussion on potential future actions that could be considered to maintain estuary health.

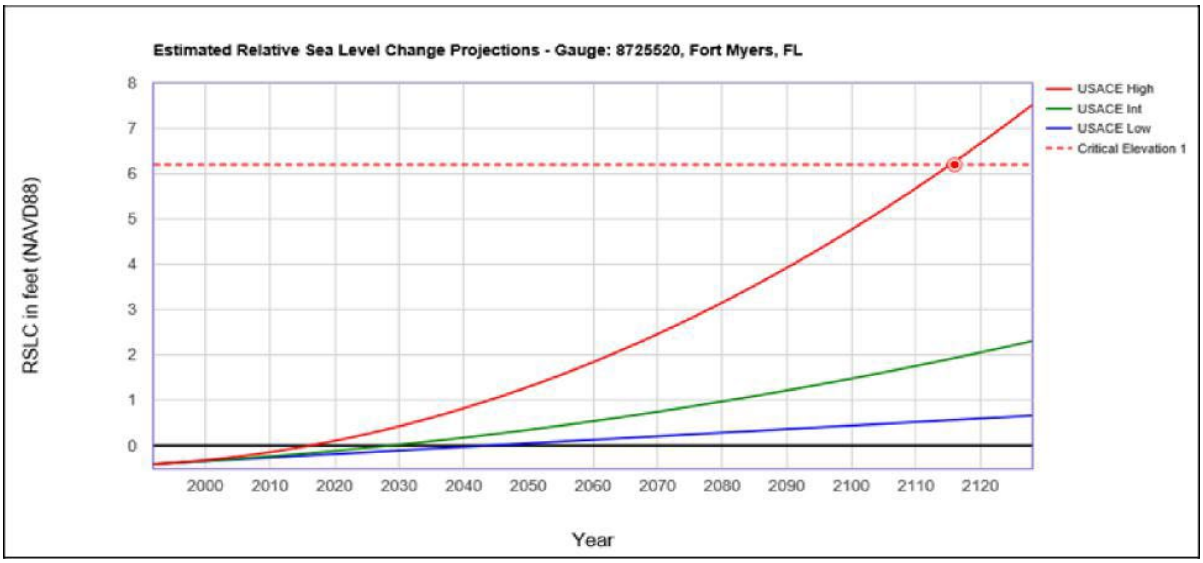


Figure 6-5. Caloosahatchee Estuary estimated relative SLC projections.

Table 6-23. Fort Myers Baseline, 50-year, and 100-year SLC Projections.[1]

Year	Low SLC Projection	Intermediate SLC Projection	High SLC Projection
2028	-0.13	-0.1	0.35
2078	0.27	0.93	3.01
2128	0.66	2.31	7.52

1/ Values expressed in feet relative to North American Vertical Datum of 1988.
SLC–sea level change

Table 6-24. Fort Myers Curve Intersections for Corps High, Intermediate, and Low SLC Projections.

Curve Intersections	Critical Elevation #1 (Year)
High SLC Projection	2115
Intermediate SLC Projection	2223
Low SLC Projection	2831

Corps–U.S. Army Corps of Engineers; SLC–sea level change

St. Lucie Estuary

The total area of the SLE used for benefit calculations was 14,994 ac, although during LOWRP planning, current bathymetry data were available for 6,500 ac. The Daytona Beach Shores, Florida, gage was used to estimate relative SLC predictions for the St. Lucie Estuary. With the exception of the 100-year high SLC projection, suitable depths for seagrass habitat are projected under the remaining scenarios (**Table 6-25**). **Table 6-26** displays the year that each projected SLC scenario would exceed suitable depths for seagrass habitat. Under the high SLC projection, suitable habitat for seagrasses would be available in the SLE until the year 2119. This projection assumes no operational or structural changes in the St. Lucie River. **Subsection 6.9.1.4** provides a discussion on potential future actions that could be considered to maintain estuary health.

Table 6-25. Daytona Beach Shores Baseline, 50-year, and 100-year SLC Projections.[1]

Year	Corps Low SLC Projection	Corps Intermediate SLC Projection	Corps High SLC Projection
2028	-0.52	-0.40	-0.04
2078	-0.14	0.52	2.61
2128	0.25	1.89	7.10

1 Values expressed in feet relative to North American Vertical Datum of 1988.
Corps–U.S. Army Corps of Engineers; SLC–sea level change

Table 6-26. Daytona Beach Shores Curve Intersections for Corps High, Intermediate, and Low SLC Projections.

Curve Intersections	Critical Elevation #1 (Year)
High SLC Projection	2119
Intermediate SLC Projection	2232
Low SLC Projection	2910

Corps–U.S. Army Corps of Engineers; SLC–sea level change

Increased Salinity Levels due to Climate Change

Under natural conditions, estuarine environments may experience substantial variation in salinity due to storm events, changes in season, and decadal cycles in regional weather patterns. On geologic time scales, plants and animals have adapted to estuarine variability to the extent that many species rely upon estuaries for habitat, complex reproductive cycling, sanctuary from predation, and sustenance of key elements of an expanded food web, including birds, marine fish and mammals. The manner in which freshwater inputs are balanced via tidal exchange with the open ocean defines the salinity envelope, which may differ among estuaries as a consequence of unique morphology, degree of connection with the sea, tidal height, and so forth. Salinity patterns directly influence productivity, population distribution, community composition, predator-prey relationships, and food web structure in the inshore marine habitat (Myers and Ewel 1990; Kennish 1990).

The RSM-BN model is not capable of simulating tidal boundaries; therefore, the LOCAR Project Team has made qualitative assumptions for the effects of salinity change on the estuary ecosystem, similar to previous studies, including LOWRP. Havens (2015) has documented the effects on salinity in Florida's estuaries and responses of oysters, seagrass, and other animal and plant life. Climate change in the Northern Estuaries is expected to lead to long periods of higher estuarine salinity interrupted for short periods with a flush of freshwater (Havens 2015). Higher sea level will exacerbate the high salinity conditions during low-flow periods. A future in which SLC causes saltier ocean water moving into estuaries and longer-lasting droughts cause periods of reduced freshwater input could stress estuarine organisms (Havens 2015). The shifts in magnitude and timing of precipitation and flows will affect the salinity distributions in estuaries and, therefore, the habitat, growth, and vulnerability of oyster populations and associated species. While estuarine oysters can tolerate freshwater during the winter, very low salinities cause high degrees of physiological stress under spring and summer temperature conditions (Schumway 1996). In general, increased salinity will provide some improvement for oyster habitat and increase oyster growth rates, although it may allow for increased predation of oyster spat and higher susceptibility to diseases.

Discussion

Although coastal Florida is susceptible to climate change, Project benefits would be preserved due to existing structures in the Caloosahatchee River and St. Lucie River to manage water levels and tidal inflows, including the Structure 79 lock and dam and Structure 80 lock and dam (**Figure 6-**), and due to flexibility in the design and operation of features incorporated into the Project during the planning phases. By creating additional storage north of Lake Okeechobee, the Recommended Plan would provide additional operational flexibility within the LOW. For instance, during dry times, water from LOCAR could be released back into Lake Okeechobee and be released to the Northern Estuaries to maintain salinity levels optimum for estuary health. Any operational modifications to address climate change would be considered in a future Lake Okeechobee schedule update, as LOCAR is not the mechanism to propose these modifications. Climate change has been incorporated into the Project risks, design, and cost contingency. Resiliency and adaptive management, however, should be revisited during PED.

SLC projections would likely not lead the LOCAR Project Team to select a plan other than the Recommended Plan. Since no increase in surface water stages within the Caloosahatchee Estuary and St. Lucie Inlet are expected with the implementation of LOCAR, habitat loss for the FWO condition is assumed to be similar to the FWP conditions. This means that the proportional habitat loss due to sea level rise affects both the FWP and FWO conditions equally.

Figure 6-6. Lake Okeechobee outlet structures in the Caloosahatchee and St. Lucie Rivers.

6.10.2 Design and Implementation

The FS included evaluations of design and construction issues, such as Project scheduling, technology, construction cost estimate contingencies, land availability, and hazardous or toxic waste. AM is included in the implementation schedule to reduce uncertainties during implementation using on-the-ground data. The AMMP (**Annex D**) incorporates the monitoring and AM strategies that will be used to address the uncertainties described below.

Lake Okeechobee

- Will ecological indicators respond to lake changes as expected? (ID#25; LOCAR Objective 1)
- Will fish and wildlife communities benefit from the Project's effect on lake stages or will additional habitat management be needed? (ID#26; LOCAR Objective 1)
- Will new hydrologic regimes affect the occurrence of invasive (native and/or non-native) or undesirable vegetation species in Lake Okeechobee? (ID#17; LOCAR Objective 1)

Estuaries

- When flows from Lake Okeechobee are reduced and salinity regimes for SAV are improved, what changes to SAV, extent, and species composition/diversity will occur in the estuaries? (ID#12; LOCAR Objective 2)
- When flows from Lake Okeechobee are altered and salinity regimes for oysters are improved, what changes to oyster abundance, density, extent, and recruitment will occur in the estuaries? (ID#16; LOCAR Objective 2)

6.10.2.1 Cultural Resources

Due to a lack of prior cultural resource surveys, the SFWMD completed the Cultural Resources Assessment Survey on the Project footprint lands to reduce the uncertainties about the presence/absence of cultural resources for as many of the alternatives as possible. The survey was designed to identify cultural resources within three of the alternatives and provide additional information about the potential of these alternatives to contain historic properties. The survey area was generally representative of the type of environmental conditions that are present within the Project Area.

Results from the survey determined that the Recommended Plan would avoid historic properties. In a letter dated February 26, 2024, the Florida State Historic Preservation Officer that that "the proposed project will have no adverse effect on historic properties listed, or eligible for listing, in the NRHP, or otherwise of historical, archaeological, or architectural value within the surveyed APE." They found the report submitted to be "complete and sufficient in accordance with Chapter 1A-46, *Florida Administrative Code*. "

6.10.2.2 Project Schedules

Implementation of LOCAR would occur over many years and include many actions by the Corps and SFWMD. There is extensive uncertainty regarding when construction would begin and end, influenced by funding, legal requirements, permitting, and authorization, among other factors.

6.10.2.3 Construction Cost Estimate Contingencies

A preliminary cost schedule risk analysis was performed during plan formulation to develop approximate order of magnitude contingencies. See **Appendix B** for additional detail.

6.10.2.4 Land Availability and Acquisition Issues

Uncertainties surrounding land acquisition include willingness of the landowner to sell; acquisition schedule risk to meet construction schedules; the potential for any unknown utility relocations not identified during the FS; the potential presence of minerals and mineral rights on lands to be acquired; and the potential for HTRW materials on the lands to be acquired.

6.10.2.5 Residual Agricultural Chemicals and Hazardous or Toxic Waste

Consistent with the September 14, 2011, memorandum from Jo-Ellen Darcy, ASA-CW, unless addressed as part of normal engineering and construction activities, the SFWMD, the non-federal sponsor, will be 100 percent responsible for the costs of all actions taken due to the presence of residual agricultural chemicals, at no expense to the federal government. Any future costs associated with the presence of residual agricultural chemicals at the federal Project site will be a 100 percent SFWMD responsibility. As stated in the memorandum, normal Project engineering and construction activities will remain part of total Project cost, provided that these are the same activities required to implement the Project features absent the presence of residual agricultural chemicals. More specifically:

- The SFWMD will ensure the development, planning, and execution of federal, state, and/or locally required response actions to address residual agricultural chemicals, including any soil management activities, at 100 percent SFWMD cost.
- The SFWMD is 100 percent responsible for costs of characterization of the Project lands necessary to determine an appropriate response action for the residual agricultural chemicals.
- Removal of soils that are Resource Conservation and Recovery Act hazardous waste is a 100 percent SFWMD responsibility.
- The SFWMD is 100 percent responsible for the costs of characterizing the Project lands in preparation for conducting a response action for removal of soils that are identified as hazardous waste.
- The SFWMD will regularly update the District Commander regarding its progress in developing and ensuring execution of the required response actions.
- The SFWMD agrees that any future costs associated with the presence of residual agricultural chemicals remaining on federal Project lands are 100 percent SFWMD responsibilities, including any potential liability related to its presence. This includes future responsibility for any disposal units.
- The SFWMD acknowledges that the Jacksonville District will not conduct actions to address residual agricultural chemicals during the OMRR&R phase of the Project.
- Based upon coordination with resource agencies, if the Corps determines in the future that Project soils containing residual agricultural chemicals will need to be removed or isolated, and the SFWMD requests incorporation of impacted soils into Project features or requests that the materials remain on-site in a disposal unit, the SFWMD will demonstrate compliance with the September 14, 2011, memorandum from Jo-Ellen Darcy, ASA-CW, and the Corps will demonstrate compliance to Corps Headquarters prior to execution of the work.

Appendix C contains a discussion of the CERP Residual Agricultural Chemical policy requirements as they apply to this Project. **Annex G** contains LOWRP HTRW reports, sampling protocol, and correspondence.

7.0 ENVIRONMENTAL COMPLIANCE

This section documents public involvement, agency coordination, and compliance with various state and federal laws, statutes, and EOs. NEPA requirements for public participation and agency coordination are documented in detail in the Corps' EIS.

7.1 Public Involvement

Public outreach efforts for LOCAR began early in the planning process. The Corps also conducted public outreach in compliance with 33 CFR Section 385.18. Due to intense public, political, and media interest in restoration of the central and south Florida ecosystem, public participation is a critical component of this FS development. The Corps, in coordination with the SFWMD, held two NEPA public scoping meetings in Okeechobee, Florida, on April 27, 2023. The SFWMD also held two community meetings. The first was held during the formal public scoping process to answer questions from the public and the second before a public meeting to present the Recommended Plan. The SFWMD presented the Recommended Plan to the public at a virtual meeting in August 2023.

7.1.1 Public Scoping

The Corps began its scoping period with the publication of the Notice of Intent (NOI) to publish the EIS in the *Federal Register* (FR) on April 24, 2023 (88 FR 24777). Interested parties were invited to provide their comments by May 24, 2023, to ensure adequate time for analysis and inclusion in the draft EIS preparation.

Multiple methods of scoping outreach were used. The Corps, in coordination with the SFWMD, conducted two hybrid (i.e., in-person and virtual) public scoping meetings in Okeechobee, Florida, and via Zoom on Thursday, April 27, 2023. The meetings began as an open house with formal presentations 1 hour past the meeting start time. Materials developed for the public scoping meetings were also available online at https://www.sfwmd.gov/our-work/lake-okeechobee-component-reservoir-locar. The Corps mailed letters to 18 federal, state, local, and Tribal government representatives and agencies and issued press releases. Comments during the public scoping period were accepted through a variety of conduits, including U.S. mail, email, and as part of meeting transcripts.

The scoping efforts resulted in 43 comments received from 17 interested parties. The comments were broadly grouped as follows: (1) general support for the proposed action; (2) proposed action or alternatives; and (3) other environmental resource considerations, including recreation, socioeconomics, water management, and water quality. **Appendix A of the EIS** contains a copy of the scoping letter, NOI, scoping letters received, and comment-response matrix.

7.1.2 Draft Environmental Impact Statement Review

The Corps released a Notice of Availability (NOA) for the Draft EIS published in the *Federal Register*, which began the 45-day review period for the public and agencies. The Corps also sent letters to interested parties, and SFWMD issued a press release. The Draft EIS is available online at https://www.saj.usace.army.mil/LOCAR/. The Draft EIS was also mailed to interested parties who requested copies and made available to the public at libraries in the region.

Public meetings are scheduled in Okeechobee. The dates, times, and locations are included in the *Federal Register*, press releases, and posted on the Corps and SFWMD Project websites at https://www.saj.usace.army.mil/LOCAR/ and https://www.sfwmd.gov/our-work/lake-okeechobee-component-reservoir-locar, respectively.

7.1.3 Agency Coordination and Public Involvement

In accordance with 33 CFR Section 385.26(a), required consultation, as defined in 33 CFR Section 385.3, has occurred with all required agencies, including:

- USDOI;
- EPA;
- U.S. Department of Commerce (DOC);
- STOF;
- MTI;
- FDEP; and
- Other federal, state, and local agencies as designated in 33 CFR Section 385.26(a).

In accordance with 33 CFR Section 385.26(e)(3), required coordination, as defined in 33 CFR Section 385.3, has occurred with all required agencies, including:

- USFWS;
- FWC; and
- Other appropriate agencies as required by applicable law.

At the beginning of the planning process, agencies and Tribes were asked to become cooperating agencies under NEPA. FWC, FDEP, and Florida Department of Agriculture and Consumer Services (FDACS) agreed. Responses were not received from other agencies; however, the agencies listed above were fully involved in all phases of the planning process. See **Appendix A of the EIS** for agency coordination letters.

Government-to-government meetings were held individually with representatives of MTI and STOF and are documented in **Appendix A of the EIS**. Regularly occurring government-to-government meetings/teleconferences were and continue to be held with STOF and MTI during the planning phase.

7.2 Compliance with Environmental Laws, Statutes, and Executive Orders

Table 7-1 provides a summary of environmental compliance with each federal Act, EO, or applicable law.

Table 7-1. Compliance with Environmental Laws, Regulations, and Executive Orders.

Law, Policy, and Regulations	Status	Comments
Anadromous Fish Conservation Act	Complies with this Act.	Recommended Plan would not adversely affect anadromous fish species.
Archaeological and Historic Preservation Act (ACHP)	This Act is not applicable.	This Act applies to federally owned lands. The Recommended Plan does not occur on federally owned lands.
Bald and Golden Eagle Protection Act	Complies with this Act.	Potentially suitable nesting and foraging habitat for bald eagles occur within the Project Area; however, the closest nest is located approximately 2.13 miles to the east. The Recommended Plan would not adversely affect the bald eagle. No take permits are required.
Clean Air Act of 1963	The Project would comply with this Act as applicable based on detailed design; would obtain any required permits.	Potential for permanent sources of air emissions would not be expected from the use of electric pump stations. However, operations staff would determine if stations would be exempt from air permitting or if an air general permit would be required.
Clean Water Act of 1972	The Project would be implemented in compliance with this act. Water Quality Certification (WQC) would be obtained from the State of Florida as would any required National Pollutant Discharge Elimination System (NPDES) permits needed for construction. The 404(b)1 analysis would be updated as needed with submission of the WQC application.	All required permits would l be obtained prior to construction activities. **Appendix C, Part 3** includes the 404(b)1 analysis.
Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990	These Acts are not applicable to this Project.	No designated coastal barrier resources are in the Project Area that would be affected.
Coastal Zone Management Act of 1972	This Project would be implemented in compliance with this Act and obtaining concurrence by the State of Florida.	A Florida Coastal Zone Consistency Determination was prepared in accordance with the provisions of 15 CFR Part 930 and is located in **Appendix C, Part 3**.

Law, Policy, and Regulations	Status	Comments
Endangered Species Act of 1973	The Project would be implemented in compliance with this Act. Consultation with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) was conducted as appropriate.	Formal consultation was initiated with USFWS in July 2023, with completion of Biological Assessment (BA). The Final BA was delivered to the USFWS on August 16, 2023, and is included in **Annex A**. The USFWS Biological Opinion (BO) was received from the USFWS on November 30, 2023, and is located in **Annex A**. The Corps determined there would be no effect on species under NMFS purview, therefore no further NMFS consultation is required.
Estuary Protection Act of 1968	Complies with this Act.	The objectives of the Recommended Plan are focused on environmental protection, providing opportunities to redirect large freshwater flows from Lake Okeechobee and increasing the number of days optimal flow reaches the Caloosahatchee and St. Lucie Estuaries (Northern Estuaries).
Farmland Protection Policy Act of 1981	Complies with this Act.	Coordination with U.S. Department of Agriculture/Natural Resources Conservation Service to meet the requirements of the Farmland Policy Protection Act was completed.
Federal Water Project Recreation Act of 1965/Land and Water Conservation Fund Act	Complies with this Act.	The effects on outdoor recreation are described in Section 5.0. Existing recreational opportunities are not adversely affected; in addition, new recreational opportunities could be created as described in **Appendix F**.
Fish and Wildlife Coordination Act of 1958, as amended	Complies with this Act.	The Final Fish and Wildlife Coordination Act Report was received on November 17, 2023.
Magnuson-Stevens Fishery Conservation and Management Act	Complies with this Act.	An essential fish habitat assessment was prepared and coordination with NMFS was initiated.
Marine Mammal Protection Act of 1972	Complies with this Act.	The Study Area is accessible to the Florida manatee, a subspecies of the West Indian manatee. All construction is inland, however, and interaction between construction activities and manatees is not expected. Applicable listed species guidelines and conservation measures would be followed and coordinated with the USFWS and NMFS.
Marine Protection, Research, and Sanctuaries Act	This Act is not applicable.	Ocean disposal is not a component of this Project; therefore, this Act is not applicable.

Law, Policy, and Regulations	Status	Comments
Memorandum on Government-to-Government Regulations with Native American Tribal Governments	Complies with this memorandum.	The Corps consulted with the Miccosukee Tribe of Indians of Florida (MTI), Seminole Tribe of Florida (STOF), Seminole Nation of Oklahoma, and Thlopthlocco Tribal Town. Consultation is ongoing and would continue throughout final design.
Migratory Bird Treaty Act of 1918	Complies with this Act and would continue to comply with the Act at the time of construction.	Migratory bird surveys would be conducted prior to and during construction and buffers would be implemented as necessary
National Environmental Policy Act of 1969	Public and agency review of this document are compliant with this Act. Complies with this Act and will continue to be in compliance through completion of the Final EIS and signing of the Record of Decision.	Compliance with NEPA is documented in a separate EIS prepared by the Corps.
National Historic Preservation Act	Compliance Pending.	Consultation has been initiated. Section 106 of the NHPA allows compliance with this act using a phased approach. Results from the survey determined that the Recommended Plan would avoid historic properties. In a letter dated February 26, 2024, the Florida State Historic Preservation Officer that that "the proposed project will have no adverse effect on historic properties listed, or eligible for listing, in the NRHP, or otherwise of historical, archaeological, or architectural value within the surveyed APE." They found the report submitted to be "complete and sufficient in accordance with Chapter 1A-46, *Florida Administrative Code*."
Native American Graves Protection and Repatriation Act, as amended	This Act is not applicable.	This Act applies to federally owned lands, including reservation lands. The Project Area does not occur on federally owned lands or reservation lands.
Noise Control Act	Would comply with this Act.	The effects of noise from the operation of pump stations would be localized and measures would be put in place to reduce the effects of noise from pump stations operating at Lake Okeechobee Component A Storage Reservoir (LOCAR).

Law, Policy, and Regulations	Status	Comments
Resource Conservation and Recovery Act, as amended by the Hazardous and Solid Waste Amendments of 1984; Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act of 1986; Toxic Substances Control Act of 1976	Complies with this Act.	The SFWMD completed a desktop survey of available information. Historical environmental assessments indicate that other properties in the area have been identified cattle dip vat sites that required further investigation. Compliance with this Act would be achieved prior to construction. If any items regulated under these laws are discovered, the SFWMD would comply with applicable requirements. to ensure removal of materials of concern.
Rivers and Harbors Act of 1899 and 1953	Complies with this Act.	The Recommended Plan would not obstruct navigable waters of the United States.
Safe Drinking Water Act	Complies with this Act.	The Recommended Plan would comply with this Act because the proposed Project does not affect water quality for drinking water such as the surficial aquifer system and the Upper Floridan aquifer.
Seminole Indian Claims Settlement Act of 1987	Complies with this Act.	This Act also involves an agreement known as the Water Rights Compact, which specifically defines Tribal water rights. The analysis contained in the Feasibility Study demonstrates that the number and severity of water shortages and water shortage cutbacks increase when compared with the Future Without Project. The modeled sensitivity run indicates that cutbacks would be reduced based on proposed operational changes to Lake Okeechobee. The STOF's Big Cypress and Brighton Reservations lie within the SFWMD Section 203 Feasibility Study Area. Water supply deliveries to these reservations are not affected by the proposed Project and may actually improve.
Submerged Lands Act of 1953	This Act is not applicable.	The Recommended Plan improves optimal flows to the Northern Estuaries that would ultimately benefit the ecological habitats that occur on submerged estuarine lands of the State of Florida. The Project does not occur on submerged lands, and no construction is expected on submerged lands.

Law, Policy, and Regulations	Status	Comments
Wild and Scenic River Act of 1968, As Amended	This Act is not applicable.	No designated wild and scenic rivers are located within Project Area.
Executive Order (EO) 11514, Protection and Enhancement of Environmental Quality	Complies with this EO.	The objectives of the Recommended Plan are focused on environmental protection by providing storage for water that would otherwise increase water levels in Lake Okeechobee and increasing the number of optimal flows to the Northern Estuaries. The Recommended Plan changes the timing and distribution of flows into Lake Okeechobee per the Comprehensive Everglades Restoration Plan (CERP) goals.
EO 11593, Protection and Enhancement of the Cultural Environment	Complies with this EO.	The proposed Project takes into consideration the preservation of non-federally owned cultural resources of significance.
EO 11988, Floodplain Management	Complies with this EO.	The purpose of this EO is to discourage federally induced development of floodplains. Commitment of lands to restoration precludes such development.
EO 11990, Protection of Wetlands	Complies with this EO.	Portions of the Project Area are existing wetlands, which would be mitigated if impacts are unavoidable.
EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	Complies with this EO.	A full environmental justice analysis was completed (**Appendix C, Part 2**). The analysis demonstrates that the alternatives would not disproportionately adversely affect minority or low-income populations.
EO 12962, Recreational Fisheries	Complies with this EO.	The Recommended Plan is expected to improve recreational fisheries in Lake Okeechobee by expanding and improving habitat through reductions in the duration and frequency of high water level events.
EO 13007, Indian Sacred Sites	This EO is not applicable	This EO directs federal land managing agencies to accommodate and facilitate the accessibility and ceremonial utilization of Indian sacred sites by Indian religious practitioners while ensuring that sites are not adversely physically impacted. The Recommended Plan would have no adverse effect to historic properties and cultural resources. This EO is not applicable.

Law, Policy, and Regulations	Status	Comments
EO 13045, Protection of Children from Environmental Health Risks and Safety Risks	Complies with this EO.	The alternatives would not be expected to have environmental or safety risks that may disproportionately affect children. Children would not be in the vicinity of any of the construction activities or reservoir operational areas.
EO 13089, Coral Reef Protection	This EO is not applicable	Coral reefs are not affected.
EO 13122, Invasive Species	Complies with this EO.	A nuisance and exotic vegetation control plan was prepared to prevent or reduce establishment of invasive and non-native species within the Project Area. The vegetation control plan is located in **Annex G**. The Invasive & Nuisance Species Management Plan (INSMP) is in **Annex F.**
EO 13175, Consultation and Coordination with Indian Tribal Governments	Complies with this EO.	The Corps would continue to consult with members and representatives of the STOF, MTI, Seminole Nation of Oklahoma, and Thlopthlocco Tribal Town.
EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	Complies with this EO.	The Recommended Plan would not adversely affect migratory bird species.
EO 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis	Complies with this EO.	Greenhouse gas emissions from construction and operation of the Recommended Plan are discussed in **Appendix C, Part 2.**
EO 14008, Tackling the Climate Crisis at Home and Abroad	Complies with this EO and would continue to comply with the EO at the time of construction.	Construction and operation of the Recommended Plan would be consistent with the DoD's Climate Action Plan. A full environmental justice analysis was completed (**Appendix C, Part 2**). The analysis demonstrates that the alternatives would not have disproportionately adverse climate-related effects on disadvantaged communities.
EO 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All	Complies with this EO and would continue to comply with the EO at the time of construction.	A full EJ analysis was completed (**Appendix C, Part 2**). The analysis demonstrates that the alternatives would not disproportionately adversely affect communities with environmental justice concerns.

7.3 Compliance with Corps CERP Agricultural Chemical Policy

The Corps HTRW policy (ER 1165-2-132) directs that construction of Civil Works projects in HTRW-contaminated areas should be avoided where practicable. In September 2011, the ASA-CW provided clarification to this HTRW policy for CERP Projects (Memorandum for Deputy Commanding General for Civil and Emergency Operations, Subject: *Comprehensive Everglades Restoration Plan [CERP]–Residual Agricultural Chemicals*, dated September 14, 2011). If specific criteria are met, this policy memorandum authorizes residual agrichemicals to remain on Project lands and allows the Corps to integrate response actions directly into the construction plan.

7.4 Compliance with Florida Statutes

The State of Florida enacted several laws pertaining to implementation of CERP projects. Section 373.470(3)(c), Florida Statutes, requires the SFWMD, in cooperation with the Corps, to submit a complete a Project implementation report to address the Project component's economic and environmental benefits, engineering feasibility, and other factors in Section 373.1501, Florida Statutes, sufficient to allow the district to obtain approval under Section 373.026, Florida Statutes. Section 373.026(8), Florida Statutes, then requires FDEP to review and approve the report before it is formally submitted to Congress for authorization and before state appropriation for construction and other implementation activities can be received (except the purchase of lands from willing sellers). Section 373.1501, Florida Statutes, sets forth the SFWMD's responsibilities regarding CERP and the analysis procedures to be followed by the SFWMD. Section 373.1502, Florida Statutes, establishes the permitting process and requirements for issuance of certain regulatory permits for CERP projects. Sections 373.470, Florida Statutes, and 373.472, Florida Statutes, establish the "Save Our Everglades Trust Fund," funding and reporting requirements and procedures for distributions from the trust fund.

The SFWMD's State Compliance Report, which analyzes the topics listed in Section 373.1501, Florida Statutes, is included in **Annex B**. In addition to the above-described statutory requirements, other sections of Chapters 373, Florida Statutes, (*Water Resources*) and 403, Florida Statutes, (*Environmental Control*) include requirements that may apply to various aspects of CERP project planning and implementation. Chapter 403, Florida Statutes, and the implementing rules govern "facilities that discharge, or potentially discharge, pollutants to surface and groundwaters, and the discharge of air pollutants." These facilities that may also be regulated under the federal Clean Water and Safe Drinking Water Acts and the federal Clean Air Act. Based on the information contained in this Feasibility Study, the Recommended Plan complies with the applicable statutory provisions. **Annex B and Appendix C** contains a detailed explanation of how the Project complies with the applicable requirements for CERP projects contained in the Florida Statutes.

7.4.1 Permits, Entitlements, and Certifications

The SFWMD, as the local sponsor, would obtain the needed State CERPRA Permit from FDEP under Section 373.1502 and a Federal Section 404 permit prior to construction of the project. Section 402 (NPDES) permits required under the CWA may be necessary for the construction (non-point source runoff) of Project features, depending on means and methods of construction. The EPA delegated this program to the State of Florida's FDEP for implementation. At this time, an NPDES permit is not be required for the

operation of LOCAR, as the Project does not involve the discharge of pollutants. All required permits and/or modifications to existing permits would be acquired prior to construction activities.

7.4.2 Compliance with Applicable Water Quality Standards and Permitting Requirements

LOCAR is not expected to significantly affect Lake Okeechobee's and the Northern Estuaries' compliance with applicable water quality criteria. In general, any short-term impacts to water quality associated with construction of the Recommended Plan would be ameliorated by construction sequencing, BMPs for erosion and sedimentation control, and monitoring during construction. If potentially adverse effects are observed or predicted, longer-term impacts to water quality associated with the operation of Project features would be addressed through operational monitoring and adaptive management actions.

7.4.3 Coastal Zone Management Act of 1972

A Federal Consistency determination was prepared in accordance with the provisions of 15 CFR Part 930, and is located in **Subsection C.3.5**. The Corps considered the enforceable policies of the State of Florida's coastal management program. The proposed Project is consistent with the enforceable policies of Florida's approved Coastal Zone Management program to the maximum extent practicable. The Florida State Clearinghouse responded via letter dated December 4, 2023 stating the Department supports the project in achieving progress toward meeting the state's objectives for the restoration of the greater south Florida ecosystems.

8.0 SOUTH FLORIDA WATER MANAGEMENT DISTRICT RECOMMENDATIONS

LOCAR is integral to achieving restoration in Lake Okeechobee. An aboveground storage reservoir north of Lake Okeechobee plays an important role in meeting CERP systemwide ecosystem objectives. The Project will improve the quantity, timing, and distribution of water entering Lake Okeechobee; provide for better management of lake water levels; reduce high flows to the Northern Estuaries downstream of the lake; and improve systemwide operational flexibility. Better management of Lake Okeechobee stage levels within the ecologically preferred stage envelope will benefit plant and animal communities in the lake by concentrating prey resources in the littoral zone where wading birds forage. This will provide optimal light levels for photosynthesis in the summer months to benefit bulrushes and submerged plants and favor development of a diverse emergent plant community. Reducing high flows to the Northern Estuaries will improve salinity and turbidity conditions and benefit seagrass beds and the organisms that inhabit and use them.

The Recommended Plan includes a 200,000-ac-ft aboveground storage reservoir north of Canal 41A(C-41A) (**Figure 3-1**). The reservoir would cover an area of approximately 13,000 ac and be designed to have an average storage depth of 18 ft at its normal full storage level. Two pump stations, two outflow culverts, an outflow canal, an interior divider dam with a gated control structure, and two ungated overflow spillways would be constructed. The perimeter dam would be approximately 33 ft above the ground and 18 mi around to allow for recreational opportunities. Material from the Project footprint and the surrounding seepage canal would be used to construct the dams. The interior divider dam would include a 1,500-cfs, gated water control structure to allow for controlled conveyance of water between the two cells. Seepage from the reservoir would collect in a canal outside the perimeter dam and be returned to the reservoir via seepage pump stations. If the seepage pump stations were not operational, the seepage collected in the canal would eventually overflow into the C-41A via overflow weir structures.

Two pump stations would be used to fill the reservoir at 1,500 cfs. One pump station would be located downstream of Structure 84 (S-84) and move water from Canal 38 (C-38) into C-41A, upstream of S-84. The second pump would be located on the C-41A Canal, upstream of State Highway 70, to pump water from C-41A directly into the reservoir. Water would be conveyed to the reservoir in one of two ways: (1) full or partial diversion of flow in C-41A downstream of Structure 83 (S-83), or (2) back pumping water from Lake Okeechobee via pumping from C-41A, downstream of S-84, into C-41A between S-83 and S-84. Water would be returned to Lake Okeechobee by discharging from the reservoir to C-41A upstream and/or downstream of S-83. The location of the reservoir outflow culverts would allow for water to be conveyed south to provide opportunities for storage in surrounding canals (e.g., C-41A, C-41, C-40, and C-39A).

Therefore, LOCAR is recommended as described in the section of the report entitled "The Recommended Plan," with such modifications that may be deemed advisable at the discretion of the Chief of Engineers, be authorized for construction. The total estimated first cost for LOCAR is $3,544,488,000 (Fiscal Year 2024 price level), with an estimated federal cost of $1,791,767,000 and an estimated non-federal cost of $1,752,724,000. The total first cost of the recreation features is $2,965,000. The estimated total annual cost of OMRR&R of features (not including recreation) is $6,471,400, with an estimated federal annual OMRR&R cost of $3,235,700 and an estimated non-federal OMRR&R cost of $3,235,700. The average annual monitoring cost, which includes both 10-year cycle costs amortized over the period of analysis and

the annual cost of longer-term monitoring requirements, is $1,040,660, with an estimated federal cost of $520,330 and a non-federal cost of $520,330. The estimated cost for OMRR&R of the recreation elements, a 100 percent non-federal sponsor responsibility, is $24,600.

8.1 Items of Local Cooperation

The above recommendations are made with the provision that the non-federal sponsor and the ASA-CW enter into binding Project partnership agreements defining the terms and conditions of cooperation for implementing the Project, and that the non-federal sponsor agrees to perform the following items of local cooperation:

a. *Provide 50 percent of total Project costs consistent with Section 601(e) of the Water Resources Development Act (WRDA) of 2000, as amended, including authority to perform design and construction of Project features consistent with federal law and regulation.*

b. *Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or ensure the performance of all relocations that the federal government and the non-federal sponsor jointly determine to be necessary for the construction and OMRR&R of the Project and valuation in accordance with the Master Agreement.*

c. *Shall not use the ecosystem restoration features or lands, easements, and rights-of way required for such features as a wetlands bank or mitigation credit for any other non-CERP projects.*

d. *Give the federal government a right to enter, at reasonable times and in a reasonable manner, upon land that the non-federal sponsor owns or controls for access to the Project for the purpose of inspection and, if necessary, for the purpose of constructing, completing, operating, maintaining, repairing, replacing, or rehabilitating the Project.*

e. *Assume responsibility for Project OMRR&R or completed functional portions of the Project, including mitigation features, in a manner compatible with the Project's authorized purposes and in accordance with applicable federal and state laws and specific directions prescribed in the OMRR&R manuals and any subsequent amendments thereto. Cost-sharing for OMRR&R will be in accordance with Section 601(e) of WRDA 2000, as amended. Notwithstanding Section 528(e)(3) of WRDA 1996 (110 Statute 3770), the non-federal sponsor shall be responsible for 50 percent of the cost of OMRR&R activities authorized under this section.*

f. *Provide OMRR&R for the Project recreational features. The non-federal sponsor is responsible for 100 percent of the cost.*

g. *Keep the recreation features, and access roads, parking areas, and other associated public use facilities, open and available to all on equal terms.*

h. *Unless otherwise provided for in the statutory authorization for this Project, comply with Section 221 of the Flood Control Act of 1970 (Public Law 91-611), as amended, and Section 103 of the WRDA of 1986 (Public Law 99-662), as amended, which provides that the ASA-CW shall not commence the construction of any water resources project or separable element thereof until the non-federal sponsor has entered into a written agreement to furnish its required cooperation for the Project or separable element.*

i. Hold and save the federal government free from all damages arising from construction and OMRR&R of the Project and any Project-related betterments, except for damages due to the fault or negligence of the federal government or the federal government's contractors.

j. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the Project to the extent and in such detail as will properly reflect total Project costs in accordance with the Master Agreement between the Department of the Army and the non-federal sponsor dated August 13, 2009, including Article XI, Maintenance of Records and Audit.

k. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. Chapter 103, that may exist in, on, or under lands, easements, or rights-of-way necessary for the construction, operation, and maintenance of the Project; except that the non-federal sponsor shall not perform such investigations without prior specific written direction by the Federal government on lands, easements, or rights-of-way that the federal government determines to be subject to the navigation servitude without prior written specific direction from the government.

l. Assume complete financial responsibility for all necessary cleanup and response costs of any CERCLA-regulated materials located in, on, or under lands, easements, or rights-of-ways that the federal government determines necessary for construction and OMRR&R of the Project.

m. Consider the non-federal sponsor the operator of the Project for purposes of CERCLA liability. To the maximum extent practicable, the non-federal sponsor shall provide OMRR&R for the Project in a manner that will not cause liability to arise under CERCLA.

n. Prevent obstruction of or encroachments on the Project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on Project lands, easements, and rights-of-way or the addition of facilities which might reduce the outputs produced by the ecosystem restoration features, hinder O&M of the Project, or interfere with the Project's proper function.

o. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646 [42 U.S.C. Chapter 61]), as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, and performing relocations for construction, operation, and maintenance of the Project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

p. Comply with all applicable federal and state laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964 (Public Law 88-352 [42 U.S.C. Section 2000d]) and DoD Directive 5500.11 issued pursuant thereto; Army Regulation (AR) 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable federal labor standards requirements including, but not limited to, 40

U.S.C. Sections 3141–3148 and 40 U.S.C. Sections 3701–3708 (revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act [formerly 40 U.S.C. Section 276a et seq.], the Contract Work Hours and Safety Standards Act [formerly 40 U.S.C. Section 327 et seq.], and the Copeland Anti-Kickback Act [formerly 40 U.S.C. Section 276c]).

q. *Provide 50 percent of that portion of total data recovery activities associated with historic preservation that exceed 1 percent of the amount authorized to be appropriated; data recovery costs under 1 percent of the authorized cost will be funded in their entirety by the federal government. Any costs of data recovery that exceed 1 percent of the amount authorized to be appropriated shall not be included in Project construction costs or Project OMRR&R costs (as defined by the Master Agreement); therefore, credit shall not be afforded to the non-federal sponsor for costs or work-in-kind associated with data recovery activities that exceed 1 percent of the amount authorized to be appropriated for the Project.*

r. *Do not use federal funds to meet the non-federal sponsor's share of total Project costs unless the federal granting agency verifies in writing that the expenditure of such funds is expressly authorized and in accordance with Section 601 (e)(3) of the WRDA of 2000, as amended, and in accordance with the Master Agreement.*

s. *The non-federal sponsor agrees to participate in and comply with applicable federal floodplain management and flood insurance programs consistent with its statutory authority:*

    1. *The non-federal sponsor shall not less than once each year inform affected interests of the extent of protection afforded by the Project.*

    2. *The non-federal sponsor shall publicize floodplain information in the area of concern and shall provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the floodplain, and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with protection levels provided by the Project.*

    3. *The non-federal sponsor shall comply with Section 402 of WRDA 1986, as amended (33 U.S.C. Section 701b-12), which requires a non-federal interest to have prepared, within 1 year after the date of signing a Project partnership agreement, a floodplain management plan. The plan shall be designed to reduce the impacts of future flood events in the Project Area including, but not limited to, addressing those measures to be undertaken by non-federal interests to preserve the level of flood protection provided by the Project. As required by Section 402, as amended, the non-federal sponsor shall implement such plan no later than 1 year after completion of Project construction. The non-federal sponsor shall provide the federal government an information copy of the plan upon its preparation.*

    4. *The non-federal sponsor shall prescribe and enforce regulations to prevent obstruction of or encroachment on the Project, or on the lands, easements, and rights-of-way determined by the federal government to be required for the construction and OMRR&R of the Project, that could reduce the level of protection the Project affords, hinder operation or maintenance of the Project, or interfere with the Project's proper function.*

t. Execute, or certify that the Florida Department of Environmental Protection (FDEP) executed under state law, the reservation or allocation of water for the natural system as identified in the FS for this authorized CERP project was reserved or allocated under state law as required by Section 601(h)(4)(B)(ii) of WRDA 2000 and the non-federal sponsor shall provide information to the federal government regarding such execution. In compliance with 33 CFR Part 385, the District Engineer will verify such reservation or allocation in writing. Any change to such reservation or allocation of water shall require an amendment to the Project partnership agreement after the District Engineer verifies in writing, in compliance with 33 CFR Part 385, that the revised reservation or allocation continues to provide for an appropriate quantity, timing, and distribution of water dedicated and managed for the natural system after considering any changed circumstances or new information since completion of the FS for the authorized CERP Project.

u. Consistent with the September 14, 2011, memorandum from Jo-Ellen Darcy, ASA-CW, the non-federal sponsor shall be 100 percent responsible for the cost of all actions taken due to the presence of residual agricultural chemicals, at no expense to the federal government, and any future costs associated with the presence of residual agricultural chemicals at the federal Project site are 100 percent a non-Federal sponsor cost and responsibility. As stated in the September 14, 2011, memorandum, normal Project engineering and construction activities will remain part of the total Project cost, provided that these are the same activities required to implement the Project features absent the presence of residual agricultural chemicals.

v. The determination of applicable water quality standards for the water associated with this Project and any necessary treatment or remediation of this water shall be made by regulatory agencies with jurisdiction over any laws or regulations that apply to this Project. Cost-share for water quality treatment is as follows:

1. If source water violates applicable surface water quality standards, the non-federal sponsor shall be responsible for treatment costs necessary to prevent the violation of those surface water standards prior to well recharge. Additional treatment costs necessary to further reduce the concentration of pollutants in source water to meet Underground Injection Control (UIC) and/or applicable groundwater standards prior to well recharge shall be cost-shared as a Project cost.

2. In cases where the source water violates applicable surface water standards but there is no applicable UIC or groundwater standard for the constituent causing the violation, and there is no increase in contamination resulting from those factors identified in paragraphs (2) and (4), the non-federal sponsor shall be responsible for treatment costs to prevent violation of applicable water quality standards prior to release of retrieved water back into the source waterbody.

3. If the water in the affected aquifer violates applicable groundwater quality standards, the non-federal sponsor shall report this to the appropriate regulatory authorities for a determination of the party or parties responsible for causing this contamination. If the federal project is to proceed at that site, the non-federal sponsor shall certify to the federal sponsor that any necessary measures to prevent violations of groundwater quality standards prior to surface release from the Project at that site have been accomplished by the party or parties determined to be

responsible for remediating the aquifer contamination. Costs of such measures shall not be a federal responsibility and shall not be included in the total Project costs. Where there is an increase in contamination in the groundwater resulting from natural occurrence, or due to the subsurface interaction between stored and native aquifer water, additional treatment costs necessary to bring groundwater into compliance with applicable surface water quality standards necessary for release shall be cost shared as a Project cost where it is determined to be economically feasible and within the scope of the original Project.

8.2 Feature Recommendations

The SFWMD selected Alternative 1 as the Recommended Plan. The SFWMD recognizes that geotechnical exploration results showed high seepage rates in the Project Area and a seepage canal would be constructed. LOCAR is also considered a high-hazard dam (see ER 1110-2-1156 and Design Criteria Memorandum 1 [DCM-1], *Hazard Potential Classification*) due to the potential consequences if the embankment were to fail. The Corps' Potential Failure Mode Analysis and Qualitative Risk Assessment concluded that a dam breach would likely be below the societal tolerable risk guidelines, assuming further design refinements and it is constructed using current dam safety industry standards. The SFWMD reviewed the qualitative dam safety risks and support the feasibility level study and the determination that deep storage is needed as proposed to benefit Lake Okeechobee and fulfill the goals of CERP.

8.3 Incremental Restoration and Future Opportunities

The National Research Council (NRC) has recommended the implementation of CERP through an incremental adaptive restoration (IAR) process. LOCAR has adopted that recommendation to meet the storage targets of CERP north of Lake Okeechobee. Providing this storage has great benefit to Lake Okeechobee, as illustrated in modeled results. Although the Recommended Plan provides a significant increase in storage north of Lake Okeechobee, additional projects outside the scope of LOCAR may be needed to achieve the restoration envisioned in CERP. The actions may include:

- Systemwide operational optimization and adaptive management to provide for better overall quantity, timing, and distribution of flows.
- Additional storage throughout the LOW to move closer to a more natural timing and distribution of flows coming into the lake.
- Further reduction of freshwater from Lake Okeechobee to the Northern Estuaries through additional storage throughout the system and optimized Lake Okeechobee operations to improve estuary habitat for indicator species oysters and SAV.
- Lake Okeechobee schedule optimizations to meet lake stage requirements within the preferred ecological band and reduce excursions into extreme high and low lake stages.
- Canal 41A widening and deepening to increase the amount of water that can flow to and from the reservoir.

8.4 Request for Congressional Authorization

The recommendations contained herein reflect the information available at this time and current departmental policies governing development of individual projects. They do not reflect program and

budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the sponsor, the state, interested federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

9.0 LIST OF REPORT PREPARERS

This section provides a list of persons involved in the preparation (**Table 9-1**) and review (**Table 9-2**) of this document. Refer to **Appendix H** for detailed IEPR and ATR documentation.

Table 9-1. List of LOCAR Project Implementation Report Preparers.

Name	Organization	Discipline/Expertise	Role in Document Preparation
Akintunde Owosina	SFWMD	Hydrology	Hydrologic Modeling/Reviewer
Alexa Menashe	SFWMD	Legal	Environmental Justice
Amanda Kahn	SFWMD	Monitoring	Monitoring Plan
Armando Ramirez	SFWMD	Tribal Liaison	Cultural Resources
Beverly Hayes	J Tech	Planning	Plan Formulation
Bob Mrykalo	SFWMD	Environmental Scientist	Vegetation Communities
Bob Verrastro	SFWMD	Geologist	Hydrogeology Analyses/Engineering Appendix
Brandon Russakis	J Tech	Mechanical Engineer	HVAC, Plumbing, Fire Suppression Systems
Bruce Chesser	SFWMD	Okeechobee FS Superintendent	Noise, Aesthetics
Chad Brcka	SFWMD	Water Supply Planning	Water Supply
Chris Keller	Wetland Solutions, Inc.	Environmental Engineer	Quality Control/Assurance Reviewer
Clay Brown	SFWMD	Civil Engineer/ Modeling	Hydrologic Modeling
Courtney Deal	SFWMD	Environmental Analyst	Threatened and Endangered Species, Fish and Wildlife Resources, Essential Fish Habitat, State Listed Species
Daniel Rutland	J Tech	Agricultural Engineer	Civil Engineering Design Reviewer
David Paiko	J Tech	Geotechnical Engineer	Geotechnical Engineering Design and Reviewer
David Scott	J Tech	Agricultural Engineer	Civil Engineering Design Reviewer
Don Kingery	J Tech	Coastal Engineer	Wind and Wave Modeling Reviewer
Duane McClelland	J Tech	Coastal Engineer	Wind and Wave Modeling Oversight
Eduardo Gutierrez-Pacheco	J Tech	Geotechnical Engineer	Geotechnical Modeling
Elizabeth Caneja	SFWMD	Project Management	Project Management Team
Emily McBryan	Collective Water Resources, LLC.	Civil Engineer	Groundwater Modeling Reviewer
Georgia Vince	J Tech	Project Management	Project Management Team
Hannah Guyer	Collective Water Resources, LLC.	Hydrologic/ Hydraulic Modeler	Groundwater Modeling
Heather Darrow	J Tech	Biologist	Threatened and Endangered Species
Hongsheng Gao	SFWMD	Engineer	Geological Resources/Engineering Reviewer
Jacob Thayer	J Tech	Invasive Species	Invasive Species
Jamie Childers	J Tech	Water Resources Planner	Project Management Team
Jeff Smith	SFWMD	Air Quality	Reviewer
Jenifer Barnes	SFWMD	Modeling	Modeling
Jennifer Chastant	SFWMD	Biologist	RECOVER

Name	Organization	Discipline/Expertise	Role in Document Preparation
Jennifer Leeds	SFWMD	Project Management	Project Management Team
Jess Ryan-Slinger	J Tech	Coastal Engineer	Wind and Wave Modeling
Jose Guardiario	SFWMD	Civil Engineer/ Geotechnical	Civil Engineer/ Geotechnical
Julianne LaRock	SFWMD	Water Quality	Monitoring
Justin Nolte	SFWMD	Land Stewardship	Physical Landscape, Land Use
LeRoy Rodgers	SFWMD	Biologist	Invasive Species
Leslye Waugh	SFWMD	Policy	Project Management Team
Libby Pigman	SFWMD	Project Office	Public Engagement
Luce Bassetti	J Tech	Coastal Engineer	Wind and Wave Modeling
Lucine Dadrian	SFWMD	Engineering	Engineering Management
Luis Colon	SFWMD	Scientist	State Compliance Report/Review
Marcy Frick	J Tech	Planning/Modeling	Project Management Team
Marcy Zehnder	SFWMD	Real Estate	Reviewer
Maria Loinaz	Collective Water Resources, LLC.	Civil Engineer and Hydrologic/ Hydraulic Modeler	Groundwater Modeling
Mark Barton	SFWMD	Environmental Scientist	Reviewer
Matt Alexander	SFWMD	Civil Engineer	Engineering Evaluation
Matt Stahley	SFWMD	Water Use Compliance	Groundwater Resources
Melanie Parker	SFWMD	Northern Coastal	Habitat Analysis
Melinda Parrott	SFWMD	Policy Analyst	Reviewer
Michael Cheek	SFWMD	Environmental Scientist	Recreation
Michael Brown	SFWMD	Engineer	Hydrologic Modeling
Michelle Cannella	J Tech	Economist	Socioeconomics, Environmental Justice
Nicole Cortez	SFWMD	Environmental Data	Environmental Data
Nirmala Jeyakumar	SFWMD	Permitting	Environmental Compliance
Patrick Kirby	Mock-Roos & Associates, Inc.	Civil Engineer and Hydrologic/ Hydraulic Modeler	Hydraulic Modeling and Engineering Design
Paul Jones	SFWMD	Lakes and Rivers	Water Quality
Phyllis Klarmann	SFWMD	Environmental Scientist	Northern Estuaries Habitat Assessment
Ray Palmer	SFWMD	Real Estate	Real Estate
Raymond Sciortino	J Tech	Civil Engineer	Project Management Team, Civil Engineering Design & Reviewer
Rita Martins	J Tech	Coastal Engineer	Wind and Wave Modeling
Rusty Childers	J Tech	Editor	Technical Editor
Scott Dunn	J Tech	Coastal Engineer	Wind and Wave Modeling Reviewer
Scott Vose	J Tech	Economist	Cost Engineering
Shawn Hillers	Hillers Electrical Engineering, Inc.	Electrical Engineer	Electrical and I&C Engineering Design
Shawn Waldeck	J Tech	Civil Engineer	Engineering Oversight and Reviewer
Stacey Ollis	SFWMD	Water Quality	Water Quality
Stuart McGahee	J Tech	Engineer	Cost Engineering
Suelynn Kirkland	SFWMD	Water Management Operations	Reviewer

Name	Organization	Discipline/Expertise	Role in Document Preparation
Therese East	SFWMD	Environmental Scientist	RECOVER
Terrence Horan	SFWMD	Environmental Scientist	Air Quality, HTRW
Tom James	SFWMD	Water Quality	Water Quality Monitoring Plan
Victor Steck	J Tech	Geotechnical Engineer	Geotechnical Exploration and Testing
Walter Wilcox	SFWMD	Modeler	Hydrologic Modeling/Review
Zachariah Welch	SFWMD	Biologist	Adaptive Management/Biological Resources/Monitoring Plan

FS–Feasibility Study; HTRW–hazardous, toxic, and radioactive waste; SFWMD–South Florida Water Management District; USFWS–U.S. Fish and Wildlife Service

Table 9-2. List of Project Implementation Report Technical and Quality Control Reviewers.

Name	Organization	Discipline/Expertise
Adnan Mirza	SFWMD	Water Managers
Alexa Menashe	SFWMD	Legal
Alexis San Miguel	SFWMD	E&C
Angela Chelette	FDACS	Water Supply
Anthony Betts	SFWMD	Everglades & Estuaries Protection
Holly Andreotta	SFWMD	Wildlife
Jack Ismalon	SFWMD	Cost Estimator
Jennifer Chastant	SFWMD	Lakes & Rivers
Jennifer Thera	FDACS	Water Supply
Jose Guardiario	SFWMD	Engineering Design
Joseph Martin	SFWMD	Real Estate
Julia Lomonico	SFWMD	Legal
Kevin Snell	SFWMD	Engineering & Construction
Kristin Larson	SFWMD	Everglades & Estuaries Protection
Lori Miller	USFWS	Hydrology, Climate, Water Quality
Luis Colon	SFWMD	Biologist
Madeline Hart	FDACS	Water Supply
Mark Barton	SFWMD	Lakes & Rivers
Matahel ANsar	SFWMD	H&H
MD Josan	SFWMD	WQ Monitoring
Melanie Parker	SFWMD	Lakes & Rivers
Mindy Parrott	SFWMD	Policy Principal Scientist
Neha Pandya	SFWMD	E&C
Nenad Iricanin	SFWMD	WQ
Nimmy Jeyakumar	SFWMD	Permitting
Northon Jocelyn	SFWMD	Engineering Design

Name	Organization	Discipline/Expertise
Patricia Burke	SFWMD	WQ Monitoring
Pete Kwiatkowski	SFWMD	Hydro & Water Supply
Rebecca Elliot	FDACS	Water Supply
Sandy Smith	SFWMD	Engineering Design
Stanley Ganthier	FDEP	Engineering
Stephen Brown	SFWMD	Air Quality
Steve Krupa	SFWMD	Hydro & Water Supply
Suelynn Kirkland	SFWMD	Water Managers
Tracey Woods	FDEP	Hydrology
Yesenia Escribano	FDACS	Water Supply
Zhongwei Li	SFWMD	H&H

DQC–U.S. Army Corps of Engineers Jacksonville District Quality Control Review; TRB–South Florida Water Management District Technical Review Board

SECTION 10

10.0 GLOSSARY OF ACRONYMS, ABBREVIATIONS, AND TERMS 10-1

10.1 List of Acronyms and Abbreviations 10-1

10.2 Glossary of Terms 10-4

10.0 GLOSSARY OF ACRONYMS, ABBREVIATIONS, AND TERMS

10.1 List of Acronyms and Abbreviations

A

ac	acre(s)
ac-ft	acre-foot (feet)
AAHU	Average Annual Habitat Unit
AGI	above-ground impoundment
AM	adaptive management
AMMP	adaptive management and monitoring plan
AM Options	Adaptive Management Options
APE	area of potential effects
APPZ	Avon Park Permeable Zone
AR	Army Regulation
ASA(CW)	Assistant Secretary of the Army for Civil Works
ASR	aquifer storage and recovery
ATR	Agency Technical Review

B

BA	Biological Assessment
BMAP	basin management action plan
BMP	best management practice
BO	Biological Opinion

C

C&SF	Central and Southern Florida
CE/ICA	Cost Evaluation/Incremental Cost Analysis
CEPP	Central Everglades Planning Project
CERP	Comprehensive Everglades Restoration Plan
CERPRA	Comprehensive Everglades Restoration Plan Regulation Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic foot (feet) per second
Compact	1987 Water Rights Compact
Corps	U.S. Army Corps of Engineers
CRE	Caloosahatchee River and Estuary
CWA	Clean Water Act

D

DOC	U.S. Department of Commerce
DoD	U.S. Department of Defense
DPOM	Draft Project Operating Manual

E

EAA	Everglades Agricultural Area
ECB	existing conditions baseline
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EJ	environmental justice
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EQ	Environmental Quality
ER	Engineering Regulation

F

FAC	Florida Administrative Code
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FEB	flow equalization basin
FLUCCS	Florida land use, cover, and form classification system
FR	*Federal Register*
F.S.	Florida Statutes
FS	Feasibility Study
FWC	Florida Fish and Wildlife Conservation Commission
FWO	Future Without Project (or the No Action Alternative under NEPA)
FWP	Future With Project
ft	foot

G

GRP	gross regional product

H

Hg	Mercury
HHD	Herbert Hoover Dike
HTRW	hazardous, toxic, and radioactive waste
HU	Habitat Unit

I

IAR	incremental adaptive restoration
IDC	interest during construction
IDS	Integrated Delivery Schedule
INSMP	Invasive and Nuisance Species Management Plan

J

K

L

LERR	lands, easements, rights-of-way and relocations
LOCAR	Lake Okeechobee Storage Reservoir Section 203 Study
LORS	Lake Okeechobee Regulation Schedule
LOSA	Lake Okeechobee Service Area
LOSOM	Lake Okeechobee System Operating Manual
LOW	Lake Okeechobee Watershed
LOWRP	Lake Okeechobee Watershed Restoration Project

M

m	meter(s)
MCACES	Micro-Computer Aided Cost Estimating System
MFL	minimum flow and level
mi	mile(s)
mi^2	square miles
MISP	Master Implementation Sequencing Plan
MTIF	Miccosukee Tribe of Indians of Florida

N

NAVD	North American Vertical Datum
NAVD88	North American Vertical Datum of 1988
NED	national economic development
NEPA	National Environmental Policy Act
NER	national ecosystem restoration
NFSL	normal full storage level
NGVD	National Geodetic Vertical Datum
NGVD29	National Geodetic Vertical Datum of 1929
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOI	Notice of Intent
Northern Estuaries	Caloosahatchee and St. Lucie Estuaries
NPDES	National Pollutant Discharge Elimination System
NRC	National Research Council
NRCS	Natural Resources Conservation Service

O

O&M	operations and maintenance
OMRR&R	operations, maintenance, repair, rehabilitation, and replacement
OPE	other Project elements
OSE	other social effects
OTMP	operations testing and monitoring period

P

P&G	Principles and Guidelines for Federal Investments in Water Resources
PAR	population at risk
PDT	Project Delivery Team
PED	PED,
PIR	Project Implementation Report
PM	performance measure
POM	Project Operating Manual
POR	Period of Record
PPA	Project Partnership Agreement
PPCA	Pre-partnership Credit Agreement

Project	Lake Okeechobee Storage Reservoir Section 203 Study
Project Area	Fisheating Creek, Indian Prairie, Lower Kissimmee, and Taylor Creek/Nubbin Slough sub-watersheds
PWS	public water supply

Q

R

RASTA	reservoir-assisted stormwater treatment area
RECONS	Regional Economic System
RECOVER	Restoration Coordination and Verification
RED	Regional Economic Development
ROD	Record of Decision
RSM	Regional Simulation Model
RSM-BN	Regional Simulation Model for Basins

S

SAV	submerged aquatic vegetation
SCC	social cost of carbon
SCORP	Statewide Comprehensive Outdoor Recreation Plan
Section 203 Study	Lake Okeechobee Storage Reservoir Section 203 Study
SFWMD	South Florida Water Management District
SHPO	State Historic Preservation Officer
SLC	sea level change
SLE	St. Lucie River and Indian River Lagoon
STA	stormwater treatment area
STOF	Seminole Tribe of Florida
Study Area	Project Area plus Lake Okeechobee and the Northern Estuaries

T

T&E	threatened and endangered
TMDL	Total Maximum Daily Load
TPCS	Total Project Cost Summary

U

UDV	unit day value
UIC	underground injection control
UNESCO	United Nations Educational, Scientific, and Cultural Organization
U.S.C.	United States Code
USDOI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service

V

W

WQC	water quality certification
WRDA	Water Resources Development Act
WY	water year

X

Y

Yellow Book	Central and Southern Florida Project Comprehensive Review Study

Z

10.2 Glossary of Terms

A

Acre — Area of land equal to 43,560 square feet. In the S.I. metric system, 1 acre is equal to 4,046.9 square meters or 2.471 hectares.

Acre-foot — The quantity of water required to cover 1 acre to a depth of 1 foot. Equal to 43,560 cubic feet (1,233.5 cubic meters).

Activity — A specific project task that requires resources and time to complete.

Adaptive Management — A process for learning and incorporating new information into the planning and evaluation phases of the restoration program. This process ensures that the scientific information produced for this effort is converted into products that are continuously used in management decision-making.

Adverse Effect — In relation to historic properties, an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places in a manner that will diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

Adverse Impact — The detrimental effect of an environmental change relative to desired or baseline conditions.

Affected Environment — Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as a result of a proposed human action.

Air Quality — Measure of the health-related and visual characteristics of the air, often derived from quantitative measurements of the concentrations of specific injurious or contaminating substances.

Anthropogenic — Of, relating to, or resulting from the influence of human beings on nature.

Aquatic — Consisting of, relating to, or being in water; living or growing in, on, or near the water; or taking place in or on the water.

Aquifer — An underground geologic formation, a bed or layer of earth, gravel or porous stone, which yields water or in which water can be stored.

Authorization — An act by the Congress of the United States that authorizes use of public funds to carry out a prescribed action.

B

Baseline — The initial approved plan for schedule, cost, or performance management, plus or minus approved changes, to which deviations will be compared as the project proceeds.

Benthic — Bottom of rivers, lakes, or oceans; organisms that live on the bottom of waterbodies.

Best Management Practices — The best available land, industrial, and waste management techniques or processes that reduce pollutant loading from land use or industry, or which optimize water use.

Biological Opinion — Document issued under the authority of the Endangered Species Act stating the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Services finding as to whether a federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction or adverse modification of critical habitat.

Borrow Canal — Canal or ditch where material excavated is used for earthen construction nearby. Also, typically denotes a canal with no conveyance or water routing purpose.

C

Canal — A humanmade waterway that is used for draining or irrigating land or for navigation by boat.

Candidate Species — Plant or animal species not yet officially listed as threatened or endangered, but which is undergoing status review by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service.

Central and Southern Florida Project — A multi-purpose project, first authorized by Congress in 1948, which provides flood control, water supply protection, water quality protection, and natural resource protection.

Channel — Natural or artificial watercourse, with a definite bed and banks to confine and conduct continuously or periodically flowing water.

Coastal Ridge — Area of land bordering the coast whose topography is elevated higher than land further inland.

Comprehensive Everglades Restoration Plan — The plan for the restoration of the greater Everglades and to meet water supply and flood protection needs in the urban and agricultural regions of South Florida.

Control Structure — A humanmade structure that regulates the flow of waters or the level of waters.

Conveyance Capacity — The rate at which water can be transported by a canal, aqueduct, or ditch. In this document, conveyance capacity is generally measured in cubic feet per second.

Cost-Benefit Analysis — An analysis, often stated as a ratio, used to evaluate a proposed course of action.

Critical Habitat — A description, which may be contained in a Biological Opinion, of the specific areas with physical or biological features essential to the conservation of a listed species and which may require special management considerations or protection; these areas have been legally designated via *Federal Register* notices.

Cubic feet per second — A measure of the volume rate of water movement. As a rate of stream flow, a cubic foot of water passing a reference section in 1 second of time. One cubic foot per second equals 0.0283 meters per second (7.48 gallons per minute). One cubic foot per second flowing for 24 hours produces approximately 2 acre-feet of water.

Culture — The National Park Service defines culture as “a system of behaviors, values, ideologies, and social arrangements. These features, in addition to tools and expressive elements such as graphic arts, help humans interpret their universe as well as deal with features of their environments, natural and social. Culture is learned, transmitted in a social context, and modifiable. Synonyms for culture include life ways, customs, traditions, social practices, and folkways. The terms ‘folk culture’ and ‘folk life’ might be used to describe aspects of the system that are unwritten, learned without formal instruction, and deal with expressive elements such as dance, song, music and graphic arts as well as storytelling."

Cultural Resources — Encompasses both culturally significant sites and historic properties.

Culturally Significant Site — Geographically defined areas supporting current or past

human use, such as a community meeting area, spiritual sites, places of worship, medicinal plant gathering areas, or cemeteries and burial sites.

Culvert — A concrete, metal, or plastic pipe that transports water.

D

Data — (cultural resources) Per Engineering Regulation 1105-2-100(b)(10), the U.S. Department of the Interior defines "data" as "evidence about historic and prehistoric periods, which are buried in the ground and recovered as evidence...when construction projects pose threats that would result in their irreparable loss or destruction."

Data Recovery — (cultural resources) Also known as Mitigative Excavations; is a way to remedy or offset an adverse effect or a change in qualifying characteristics within an archaeological site. Through mitigative excavations, important information that makes the site eligible for National Register of Historic Places listing is retrieved from the site before the site's integrity is compromised or destroyed.

Discharge — The flow of water exiting a pump, culvert, or other hydraulic structure.

Dry Downs — Refers to marsh water levels going below ground in the Everglades. Dry downs occur naturally in the pre-drainage Everglades, but were not as frequent, nor as long in duration as occurs in the current system.

Dry Season — Hydrologically, for South Florida, the months associated with a lower incident of rainfall, typically November through May.

Duration — The period of time over which a task occurs, in contrast to effort, which is the amount of labor hours a task requires; duration establishes the schedule for a project, and effort establishes the labor costs.

E

Ecology — The science of the relationships between organisms and their environments, also called "bionomics"; or the relationship between organisms and their environment.

Ecosystem — A functional group of animal and plant species that operate in a unique setting that is mostly self-contained.

Effectiveness — A measure of the quality of attainment in meeting objectives; this is distinguished from efficiency, which is measured by the volume of output achieved for the input used.

Endangered Species — Any species or subspecies of bird, mammal, fish, amphibian, reptile, or plant, which is in serious danger of becoming extinct throughout all, or a significant portion of, its range. Federally endangered species are officially designated by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service and published in the *Federal Register.*

Enhancement — Measures that develop or improve the quality or quantity of existing conditions or resources beyond a condition or level that would have occurred without an action; i.e., beyond compensation.

Environmental Consequences — The impacts to the Affected Environment that are expected from implementation of a given alternative.

Environmental Impact Statement — An analysis required by the National Environmental Policy Act for all major federal actions, which evaluates the environmental risks of alternative actions.

Estuary — A water passage where the tide meets a river current; an arm of the sea at the lower end of a river.

Evaluate — To appraise or determine the value of information, options, or resources being provided to a project.

Evaporation — The change of a substance from the solid or liquid phase to the gaseous (i.e., vapor) phase.

Evapotranspiration — Part of the hydrologic cycle that is a combination of evaporation and transpiration. Solar energy induces evaporation, causing water vapor to condense and fall as precipitation. A portion of the precipitation seeps into the ground and is consumed by plants. It is then recycled back into the atmosphere in the form of transpiration.

Exotic species — Introduced species not native to the place where they are found.

F

Fallowed Land — Cultivated land that lies idle during a growing season.

Feasibility Study — The second phase of a project. The purpose is to describe and evaluate alternative plans and fully describe the recommended project.

Federally Endangered Species — An endangered species, which is officially designated by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service and published in the *Federal Register*.

Flow — The volume of water passing a given point per unit of time.

> ***Instream Flow Requirements —*** Amount of water flowing through a stream course needed to sustain instream values.
>
> ***Minimum Flow —*** Lowest flow in a specified period of time.
>
> ***Peak Flow —*** Maximum instantaneous flow in a specified period of time.

G

Geospatial Data — Information, which includes, but is not limited to, surveys, maps, aerial photography, aerial imagery, and biological, ecological, and hydrological modeling coverages.

Goal — Something to be achieved. Goals can be established for outcomes (results) or outputs (efforts).

Groundwater — Water stored underground in pore spaces between rocks and in other alluvial materials and in fractures of hard rock occurring in the saturated zone.

Groundwater Level — Refers to the water level in a well and is defined as a measure of the hydraulic head in the aquifer system.

Groundwater Pumping — Quantity of water extracted from groundwater storage.

Groundwater Seepage — Groundwater flow in response to a hydraulic gradient.

Groundwater Table — The upper surface of the zone of saturation, except where the surface is formed by an impermeable body.

H

Habitat — Area where a plant or animal lives.

Hammock — Localized, thick stands of trees that can grow on natural rises of only a few inches in the land.

HistoricProperties – Encompasses archaeological, traditional, and built environment resources, including, but not

limited to, buildings, structures, objects, districts, and sites over 50 years of age.

Hydraulic Gradient — Denotes slope of watercourse, above or below ground water level. Typically, defines energy loss or consumption in the conveyance process.

Hydraulic Head (Lift) — Denotes relative comparison of water stages for gravity flow. Pump stations generally provide lift or increase water level elevations.

Hydric — Characterized by, relating to, or requiring an abundance of moisture.

Hydrologic Condition — The state of an area pertaining to the amount and form of water present. For example, saturated ground (water table at surface), lake stage, and river flow rate.

Hydrologic Response — An observed decrease or increase of water in a particular area.

Hydrology — The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Hydropattern — Refers to depth as well as hydroperiod. Hydropatterns are best understood by a graphic depiction of water level (above as well as below the ground) through annual cycles.

Hydroperiod — For non-tidal wetlands, the average annual duration of flooding is called the "hydroperiod," which is based only on the presence of surface water and not its depth.

I

Impoundment — An aboveground reservoir used to store water.

Independent Technical Review Team — A group autonomous of the Project Team established to conduct reviews to ensure that design products are consistent with established criteria, guidance, procedures and policies.

Indicator Species — Organism, species, or community that indicates presence of certain environmental conditions.

Invertebrate — A small animal that does not have a backbone. Examples include crayfish, insects, and mollusks, which can be indicators of ecosystem status.

J

K

L

Lag — The amount of time after one task is started or completed before the next task can be started or completed.

Land Classification — An economic classification of variations in land reflecting its ability to sustain long-term agricultural production.

Levee — A humanmade embankment that controls or confines water.

Littoral Zone — The shore of land surrounding a waterbody that is characterized by periodic inundation or partial saturation by water level. Typically defined by species of vegetation found.

Local Sponsor — The South Florida Water Management District.

M

Macrophytes — Visible plants found in aquatic environments, including sawgrass, sedges, and lilies.

Marl — Soils comprised of clays, carbonates, and shell remains.

Marsh — An area of low-lying wetland.

Master Program Management Plan — A document that describes the framework and processes to be used by the U.S. Army Corps of Engineers and South Florida Water Management District for managing and monitoring implementation of the Comprehensive Everglades Restoration Plan.

Mercury — Heavy metal that is toxic to most organisms when concerted into a byproduct of inorganic-organic reaction. Distributed into the environment mostly as residual particles from industrial processes.

Mitigation — To make less severe; to alleviate, diminish, or lessen; one or all of the following may comprise mitigation: (1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating an impact over time by preservation and maintenance operations during the life of an action; and (5) compensating for an impact by replacing or providing substitute resources or environments.

Model — A tool used to mathematically represent a process that could be based upon empirical or mathematical functions. Models can be computer programs, spreadsheets, or statistical analyses.

Monitoring — The capture, analysis, and reporting of project performance, usually as compared to plan.

Muck — Soil type consisting of 25 percent to 65 percent plant material mixed with sand, silt, and clay.

N

National Economic Development — The U.S. Army Corps of Engineers benefit evaluation process used to justify Recreation expenditures.

No Action Alternative — The planning process by which the action agency decides to not carry forth any planned action to alter existing conditions. In this report, the No Action Alternative is the same as the Future Without Project (FWO) Condition and is referred to throughout the document as “FWO.”

Northern Estuaries – Refers to the Caloosahatchee Estuary on the west coast of Florida and the St. Lucie Estuary on the east coast of Florida.

O

Objective — A goal expressed in specific, directly measurable terms.

Off-peak — Less than peak design flow rate during storm runoff-producing events.

Operation, Maintenance, Repair, Rehabilitation, Replacement — 100 percent local sponsor responsibility for operation, maintenance, repair, rehabilitation, and replacement of recreation facilities and amenities.

Outreach — Proactive communication and productive involvement with the public to best meet the water resource needs of South Florida.

Oxygen Demand — The biological or chemical demand of dissolved oxygen in water.

Required by biological processes for respiration.

P

Peat — Soil type consisting of 65 percent or more plant material with relatively little mineral matter. Everglades peat is formed mostly from partially decayed sawgrass. The upper 12 inches is a nearly black, finely fibrous peat, which contains approximately 10 percent mineral soil. The subsoil is brown fibrous peat, which rests on the underlying rock, sand, or marl.

Performance Measure — A desired result stated in quantifiable terms to allow for an assessment of how well the desired result has been achieved.

Periphyton — The biological community of microscopic plants and animals attached to surfaces in aquatic environments; for example, algae.

Phosphorus — Element or nutrient required for energy production in living organisms. Distributed into the environment mostly as phosphates by agricultural runoff (fertilizer) and lifecycles. Frequently the limiting factor for growth of microbes and plants in South Florida.

Programmatic Regulations — Section 601(h) of Water Resourced Development Act 2000 states that the overarching purpose of the Comprehensive Everglades Restoration Plan is the restoration, preservation, and protection of the South Florida ecosystem while providing for the other water related needs of the region, including water supply and flood protection. The purpose of the regulations is to ensure that the goals and objectives of the Comprehensive Everglades Restoration Plan are achieved. The regulations will contain: (1) processes for the development of Project Implementation Reports, Project Cooperation Agreements, and operating manuals that ensure the goals and objectives of the plan are achieved; (2) processes that ensure new scientific, technical, or other information, such as that developed through adaptive management, is integrated into the implementation of the plan; and (3) processes to establish interim goals to provide a means by which the restoration success of the plan may be evaluated throughout the implementation process.

Project — A sequence of tasks with a beginning and an end that uses time and resources to produce specific results. Each project has a specific desired outcome, a deadline or target completion date, and a budget that limits the number of resources that can be used to complete the project.

Project Delivery Team — An interdisciplinary group formed from the resources of the implementing agencies, which develops the products necessary to deliver the project.

Project Duration — The time it takes to complete an entire project from starting the first task to finishing the last task.

Project Implementation Report — A decision document that will bridge the gap between the conceptual design contained in the Comprehensive Everglades Restoration Plan and the detailed design necessary to proceed to construction.

Project Partnership Agreement — A document that describes the roles and responsibilities of the U.S. Army Corps of Engineers and South Florida Water Management District for real estate acquisition, construction, construction management, and operations and maintenance.

Proposed Action — Plan that a federal agency intends to implement or undertake and which is the subject of an environmental analysis. Usually, but not always, the proposed action is the agency's preferred alternative for a project. The proposed action and all reasonable alternatives are evaluated against the no action alternative.

Public Involvement — Process of obtaining citizen input into each stage of the development of planning documents. Required as a major input into any environmental impact statement.

Public Outreach — A program-level activity with the objectives of keeping the public informed of the status of the overall program and key issues associated with restoration implementation and providing effective mechanisms for public participation in the restoration plan development.

Pump Station — A human-constructed structure that uses pumps to transfer water from one location to another.

Q

Quality Assurance — The process of evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards.

Quality Control — The process of monitoring specific project results to determine if they comply with relevant quality standards and identifying means of eliminating causes of unsatisfactory performance.

R

Recharge — The processes of water filling the voids in an aquifer, which causes the piezometric head or water table to rise in elevation.

Record of Decision — Concise, public, legal document that identifies and publicly and officially discloses the responsible official's decision on the alternative selected for implementation. It is prepared following completion of an environmental impact statement.

Reservoir — Artificially impounded body of water.

Restoration — The recovery of a natural system’s vitality and biological and hydrological integrity to the extent that the health and ecological functions are self-sustaining over time.

Restoration Coordination and Verification — A program-level activity whose role is to organize and apply scientific and technical information in ways that are most effective in supporting the objectives of the Comprehensive Everglades Restoration Plan.

Restudy — The Central and Southern Florida Project Comprehensive Review Study, authorized by the Water Resources Development Act of 1992, which examined the Central and Southern Project to determine the feasibility of modifying the project to restore the South Florida ecosystem and provide for other water-related needs of the region, and which resulted in the Final Integrated Feasibility Report and Programmatic Environmental Impact Statement, which was transmitted to Congress on July 1, 1999.

Risk Analysis — An evaluation of the feasibility or probability that the outcome of a project or policy will be the desired one; usually conducted to compare alternative scenarios, action plans, or policies.

S

Scoping — The process of defining the scope of a study, primarily with respect to the issues, geographic area, and alternatives to be considered. The term is typically used in association with environmental documents prepared under the National Environmental Policy Act.

Scrub — A community dominated by pinewoods with a thick understory of oaks and saw palmetto, and which occupies well-drained, nutrient-poor sandy soils.

Seepage — Water that escapes control through levees, canals, or other holding or conveyance systems.

Sheet Flow — Water movement as a broad front with shallow uniform depth.

Slough — A depression associated with swamps and marshlands as part of a bayou, inlet, or backwater; contains areas of slightly deeper water and a slow current; can be thought of as the broad shallow rivers of the Everglades.

South Florida Ecosystem — An area consisting of the lands and waters within the boundary of the South Florida Water Management District, including the Everglades, Florida Keys, and contiguous nearshore coastal waters of South Florida.

Spatial Extent — Area that is continuous without non-integrating internal barriers or land usage.

Spillway — Overflow structure of a dam.

Stakeholders — People or organizations having a personal or enterprise interest in the results of a project, who may or may not be involved in completing the actual work on that project.

Stormwater — Surface water resulting from rainfall that does not percolate into the ground or evaporate.

Subsidence — A local mass movement that principally involves the gradual downward settling or sinking of the earth's surface with little or no horizontal motion. It may be due to natural geologic processes or mass activity, such as removal of subsurface solids, liquids, or gases, groundwater extraction, and wetting of some types of moisture-deficient loose or porous deposits.

Surficial Aquifer — An aquifer that is closest to the surface and is unconfined; the water level of a surficial aquifer is typically associated with the groundwater table of an area.

Sustainability — The state of having met the needs of the present without endangering the ability of future generations to be able to meet their own needs.

Swamp — A generally wet, wooded area where standing water occurs for at least part of the year.

T

Threatened Species — Legal status afforded to plant or animal species that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range, as determined by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service.

Trade-off — Allowing one aspect of a project to change, usually for the worse, in return for another aspect of the project getting better.

Traditional Cultural Property – The National Park Service defines "traditional" in this context as referring "to those beliefs, customs, and practices of a living community of people that have been passed down through the

generations, usually orally or through practice. The traditional cultural significance of a historic property, then, is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices."

Tributary — A stream feeding into a larger stream, canal, or waterbody.

U

V

W

Water Budget — An account of all water inflows, outflows, and change in storage for a pre-specified period of time.

Watershed — A region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water.

Wetlands — Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wet Season — Hydrologically, for South Florida, the months associated with a higher than average incident of rainfall, June through October.

Wildlife Corridor — A relatively wide pathway used by animals to transverse from one habitat arena to another.

Wildlife Habitat — An area that provides a water supply and vegetative habitat for wildlife.

X

Y

Z

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X

Y

Z

SECTION 11

11.0 REFERENCES 11-1

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BEBR (Bureau of Economic and Business Research). 2022. Projections of Florida Population by County, 2025–2050, with Estimates for 2021. *BEBR* (55) 192. February. Available online at: https://www.bebr.ufl.edu/wp-content/uploads/2022/02/projections_2022.pdf (accessed April 2023).

BLS (Bureau of Labor Statistics). 2023. CPI Inflation Calculator. Available online at: https://www.bls.gov/data/inflation_calculator.htm (accessed June 2023).

Climate Change Science Program and Subcommittee on Global Change Research. 2009. Our Changing Planet: The U.S. Climate Change Science Program for Fiscal Year 2009. A Supplement to the President's Budget for Fiscal Year 2009.

Corps (U.S. Army Corps of Engineers). 1999. Central and Southern Florida Project Comprehensive Review Study: Final Integrated Feasibility Report and Programmatic Environmental Impact Statement. Jacksonville District, Jacksonville, Florida. October. Available online at: https://usace.contentdm.oclc.org/digital/collection/p16021coll7/id/11299.

Corps. 2020. Comprehensive Everglades Restoration Plan Lake Okeechobee Watershed Restoration Project Final Integrated Project Implementation Report and Environmental Impact Statement. Jacksonville District, Jacksonville, Florida.

Cortez, N.A., L. Baldwin, C. Mo, C. Qiu, and S. Xue. 2023. Appendix 2A-4: Monthly Flows for Water Year 2022, Water Year 2021, and Historical Averages. In: *2023 South Florida Environmental Report*. South Florida Water Management District, West Palm Beach, Florida. March 1. Available online at: https://apps.sfwmd.gov/sfwmd/SFER/2023_sfer_final/v1/appendices/v1_app2a-4.pdf.

Davis, J.H. 1943. The Natural Features of Southern Florida. *The Florida Geological Survey*, Bulletin No. 25.

Dennison, W.C., R.J. Orth, K.A. Moore, J.C. Stevenson, V. Carter, S. Kollar, P.W. Bergstrom, and R.A. Batiuk. 1993. Assessing Water Quality with Submersed Aquatic Vegetation. *Bioscience* 43:86–94.

Doren, R.F., J.C. Volin, and J.H. Richards. 2009. Invasive Exotic Plant Indicators for Ecosystem Restoration: An Example from the Everglades Restoration Program. *Ecological Indicators* 9S:S29–S36.

ECFRPC (East Central Florida Regional Planning Council) and TCRPC (Treasure Coast Regional Planning Council). 2016. Indian River Lagoon Economic Update.

Fedler, T. 2009. The Economic Impact of Recreational Fishing in the Everglades Region. Prepared for The Everglades Foundation, The Bonefish and Tarpon Trust. December. Available online at: https://www.bonefishtarpontrust.org/downloads/research-reports/stories/everglades-economics-report.pdf.

Florida TaxWatch. 2017. Recent TaxWatch Reports. Available online at: https://floridataxwatch.org/.

Friedlingstein, P., O'Sullivan, M., Jones, M. W., Andrew, R. M., Gregor, L., Hauck, J., Le Quéré, C., Luijkx, I. T., Olsen, A., Peters, G. P., Peters, W., Pongratz, J., Schwingshackl, C., Sitch, S., Canadell, J. G., Ciais, P., Jackson, R. B., Alin, S. R., Alkama, R., Arneth, A., Arora, V. K., Bates, N. R., Becker, M., Bellouin, N., Bittig, H. C., Bopp, L., Chevallier, F., Chini, L. P., Cronin, M., Evans, W., Falk, S., Feely, R. A., Gasser, T., Gehlen, M., Gkritzalis, T., Gloege, L., Grassi, G., Gruber, N., Gürses, Ö., Harris, I., Hefner, M., Houghton, R. A., Hurtt, G. C., Iida, Y., Ilyina, T., Jain, A. K., Jersild, A., Kadono, K., Kato, E.,

Kennedy, D., Klein Goldewijk, K., Knauer, J., Korsbakken, J. I., Landschützer, P., Lefèvre, N., Lindsay, K., Liu, J., Liu, Z., Marland, G., Mayot, N., McGrath, M. J., Metzl, N., Monacci, N. M., Munro, D. R., Nakaoka, S.-I., Niwa, Y., O'Brien, K., Ono, T., Palmer, P. I., Pan, N., Pierrot, D., Pocock, K., Poulter, B., Resplandy, L., Robertson, E., Rödenbeck, C., Rodriguez, C., Rosan, T. M., Schwinger, J., Séférian, R., Shutler, J. D., Skjelvan, I., Steinhoff, T., Sun, Q., Sutton, A. J., Sweeney, C., Takao, S., Tanhua, T., Tans, P. P., Tian, X., Tian, H., Tilbrook, B., Tsujino, H., Tubiello, F., van der Werf, G. R., Walker, A. P., Wanninkhof, R., Whitehead, C., Willstrand Wranne, A., Wright, R., Yuan, W., Yue, C., Yue, X., Zaehle, S., Zeng, J., and Zheng, B. 2022. Global Carbon Budget 2022, Earth Syst. Sci. Data, 14, 4811-4900, https://doi.org/10.5194/essd-14-4811-2022.

Governor's Commission for a Sustainable South Florida Initial Report. 1995. 1550 Madruga Avenue, Suite 412, Coral Gables, Florida, 33146.

Haunert, D.E. 1988. Sediment Characteristics and Toxic Substances in the St. Lucie Estuary, Florida. Technical Publication DRE-259. South Florida Water Management District, West Palm Beach, Florida.

Havens, K.E. 2002. Development and Application of Hydrologic Restoration Goals for a Large Subtropical. *Lake and Reservoir Management* 18(4):285–292.

Havens, K.E. 2015. Climate Change: Effects on Salinity in Florida's Estuaries and Responses of Oysters, Seagrass, and Other Animal and Plant Life. Florida Sea Grant College Program, UF/IFAS Extension. Available online at: https://edis.ifas.ufl.edu/pdffiles/SG/SG13800.pdf.

Havens, K.E., B. Sharfstein, M.A. Brady, T.L. East, M.C. Harwell, R.P. Maki, and A.J. Rodusky. 2004. Recovery of Submerged Plants from High Water Stress in a Large Subtropical Lake in Florida, USA. *Aquatic Botany* 78:67–82.

Havens, K.E., and D.E. Gawlick. 2005. Lake Okeechobee Conceptual Model. *Wetlands* 25(4):908-925.

Hodges, A., M. Rahmani, and C.D. Court. 2015. Economic Contributions of Agriculture, Natural Resources, and Food Industries in Florida in 2013. FE969. University of Florida, Gainesville, Florida. 119 pp.

IWG (Interagency Working Group on Social Cost of Greenhouse Gases, United States Government). 2021. Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990.

James, R.T., and K.E. Havens. 2005. Outcomes of Extreme Water Levels on Water Quality of Offshore and Nearshore Regions in a Large Shallow Subtropical Lake. *Archiv für Hydrobiologie* 163:225–239.

Jones, P., Z. Welch, A. Betts, and J. Zhang. 2023. Chapter 8B: Lake Okeechobee Watershed Protection Plan Annual Progress Report. In: *2023 South Florida Environmental Report,* Vol. I. South Florida Water Management District, West Palm Beach, Florida.

Kemp, W.M., R. Batleson, P. Bergstrom, V. Carter, C.L. Gallegos, W. Hunley, L. Karrh, E.W. Koch, J.M. Landwehr, K.A. Moore, L. Murray, M. Naylor, N.B. Rybicki, J.C. Stevenson, and D.J. Wilcox. 2004. Habitat Requirements for Submerged Aquatic Vegetation in Chesapeake Bay: Water Quality, Light Regime, and Physical-chemical Factors. *Estuaries* 27:363–377.

Kennish, M.J. 1990. *Ecology of Estuaries: Anthropogenic Effects.* Boca Raton: CRC Press, Inc.

Lee County VCB (Visitor and Convention Bureau). 2023. Value of Tourism. Available online at: https://www.visitfortmyers.com/lee-vcb/education-and-resources/statistics/value-of-tourism (accessed July 2023).

Martin County. 2017. The Impact of the 2016 Algae Booms in Martin County, Florida: Losses Suffered by the Tourism Sector and Overall Economy.

Montague, C.L., and J.A. Ley. 1993. A Possible Effect of Salinity Fluctuation on Abundance of Benthic Vegetation and Associated Fauna in Northeastern Florida Bay. *Estuaries* 16:703–717.

Meyers, R.L., and J.J. Ewel. 1990. *Ecosystems of Florida*. Gainesville: University Press of Florida.

Murray, E.O., J.A. Cushing, L.A. Wainger, and D.J. Tazik. 2013. Incorporating Ecosystem Goods and Services in Environmental Planning—Definitions, Classification, and Operational Approaches. ERDC TN-EMRRP-ER-18. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

NRC (National Resource Council). 2007. Progress Toward Restoring the Everglades: The First Biennial Review, 2006. Committee on Independent Scientific Review of Everglades Restoration Progress (CISRERP). Washington, D.C.: National Academies Press.

Orth, R.J., T.B. Carruthers, W.C. Dennison, C.M. Duarte, J.W. Fourqurean, K.L. Heck, Jr., A.R. Hughes, G.A. Kendrick, W.J. Kenworthy, S Olyarnik, F.T. Short, M. Waycott, and S.L. Williams. 2006. A Global Crisis for Seagrass Ecosystems. *BioScience* 56:12:987–996.

RECOVER (Restoration Coordination and Verification). 2002. Model Uncertainty Workshop Report: Quantifying and Communicating Model Uncertainty for Decision Making in the Everglades, Restoration Coordination and Verification Program (RECOVER), U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, Florida, and South Florida Water Management District, West Palm Beach, Florida. Available online at: https://www.researchgate.net/publication/222798820_Quantifying_and_Communicating_Model_Uncertainty_for_Decision_Making_in_the_Everglades.

RECOVER. 2004. CERP Monitoring and Assessment Plan: Part 1. Monitoring and Supporting Research. Comprehensive Everglades Restoration Plan, Restoration, Coordination, and Verification. U.S. Army Corps of Engineers Jacksonville District, Jacksonville, Florida, and South Florida Water Management District, West Palm Beach, Florida. January.

RECOVER. 2020. RECOVER Northern Estuaries Performance Measure: Salinity Envelope. CERP Systemwide Performance Measure Documentation Sheet.

Ridler, M.S., R.C. Dent, and D.A. Arrington. 2006. Effects of Two Hurricanes on *Syringodium filiforme*, Manatee Grass, within the Loxahatchee River Estuary, Southeast Florida. *Estuaries and Coasts* 29:1019–1025.

Schumway, S.E. 1996. Natural Environmental Factors. In: *The Eastern Oyster (Crassostrea virginic),* edited by V.S. Kennedy, R.I.E. Newell, and A.E. Eble, pp. 467–513. College Park, MD: Maryland Sea Grant.

SFWMD (South Florida Water Management District). 2018. South Florida Environmental Report. South Florida Water Management District, West Palm Beach, Florida. Available online at: https://apps.sfwmd.gov/sfwmd/SFER/2018_sfer_final/v1/sfer_toc_v1.pdf.

USCB (U.S. Census Bureau). 1950. 1950 Census of Population, Preliminary Counts, Population of Florida, By Counties. Available online at: https://www2.census.gov/library/publications/decennial/1950/pc-02/pc-2-09.pdf (accessed April 2023).

USCB. 2023. 2020 American Community Survey (ACS) 5-year Estimates. Available online at: https://data.census.gov (accessed May 2023).

USEIA (U.S. Energy Information Administration). 2023. 2021 Energy-Related CO_2 Emissions Data Tables. Accessible at State Carbon Dioxide Emissions Data - U.S. Energy Information Administration (EIA) (accessed September 2023).

USFWS (U.S. Fish and Wildlife Service) and USCB. 2007. 2006 National Survey of Fishing, Hunting, and Wildlife-associated Recreation: Florida. Available online at: https://www2.census.gov/programs-surveys/fhwar/publications/2006/fhw06-fl_rev.pdf (accessed July 2023).

Virnstein, R.W., and L.J. Morris. 1996. Seagrass Preservation and Restoration: A Diagnostic Plan for the Indian River Lagoon. Technical Memorandum No. 14. St. Johns River Water Management District, Palatka, Florida.

Weisman, B.R. 1999. Unconquered People: Florida's Seminole and Miccosukee Indians. Gainesville: University Press of Florida.

3301 Gun Club Road
West Palm Beach, FL 33406
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