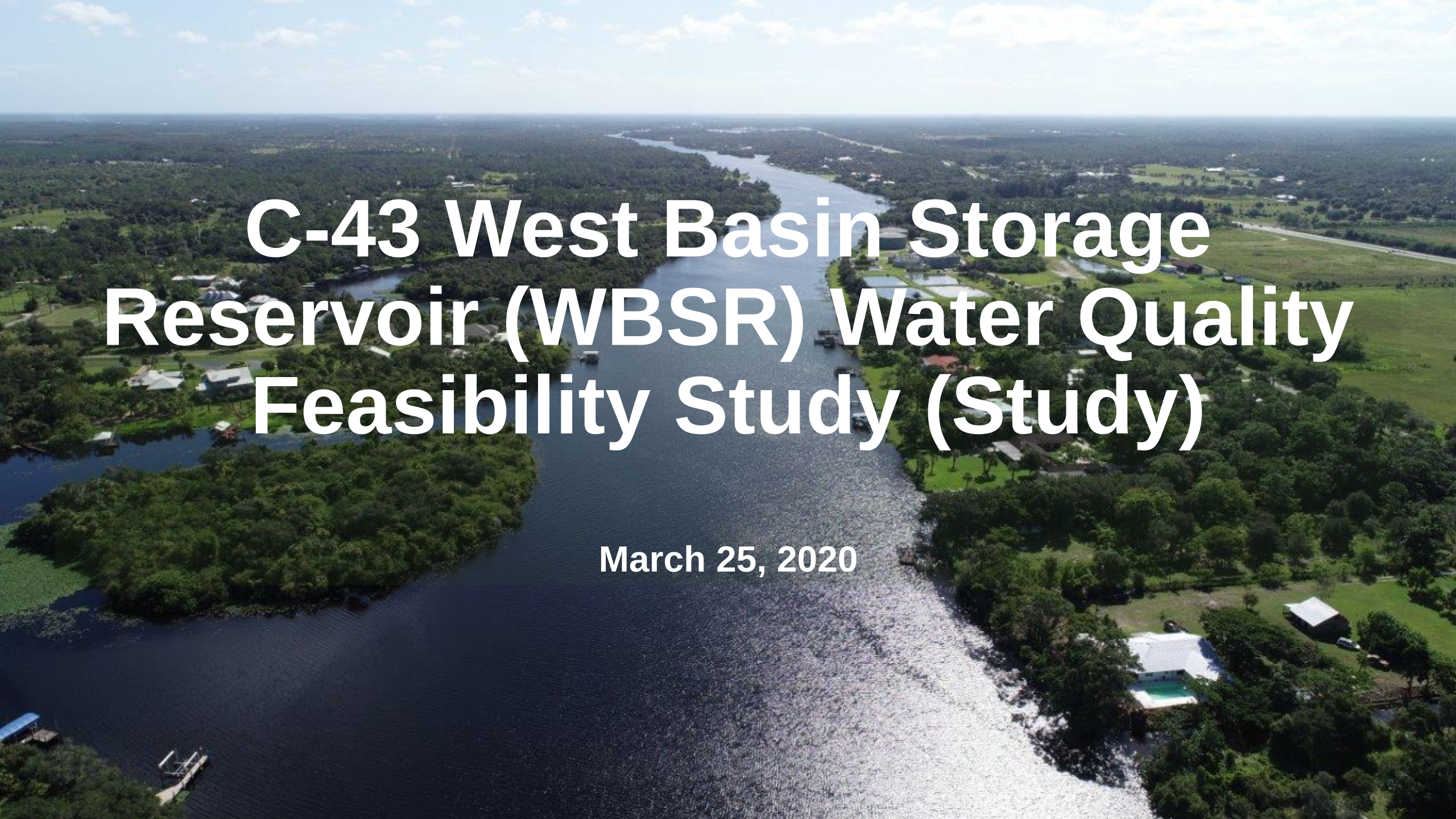


C-43 West Basin Storage Reservoir (WBSR) Water Quality Feasibility Study (Study)

March 25, 2020

Working Group Members

- South Florida Water Management District (SFWMD)
- Florida Department of Environmental Protection (DEP)
- Hendry County
- Lee County
- City of Cape Coral
- City of Sanibel
- Lehigh Acres Municipal Services Improvement District (LA-MSID)

C-43 WBSR Consultant Team

- J-Tech – A joint venture between Jacobs Engineering and Tetra Tech, Inc.
- Wetland Solutions, Inc (WSI)

Meeting Goals

1) Overview of Study Goals and Objectives

2) Update on Information Collection Report and Key Findings

3) Obtain Public Input for Study
   - ✓ Questions and Answers using “Menti” Interactive Tool


Understanding the Big Picture

Executive Order 19-12, January 10, 2019

- Greater protection of Florida's environment and water quality
- Harmful algal blooms
- Provide additional treatment and improve the quality of water leaving the C-43 WBSR

DEP is Leading the Following Regional Efforts

- Harmful Algal Bloom (Red Tide) Task Force
- Blue-Green Algae Task Force
- Caloosahatchee Basin Management Action Plan (BMAP)
- Agricultural Best Management Practices (BMPs) with the Florida Department of Agriculture and Consumer Services
- Working Group for the C-43 WBSR Water Quality Feasibility Study with SFWMD
- Technology Library
  http://fldeploc.dep.state.fl.us/tech_portal/tech_library_intro.asp

C-43 WBSR Study Objectives

- Primary Objective: Identify opportunities to provide additional treatment and improve water quality leaving the C-43 Reservoir
- Evaluate treatment options
- The goal of the Study is to identify at a minimum three alternatives

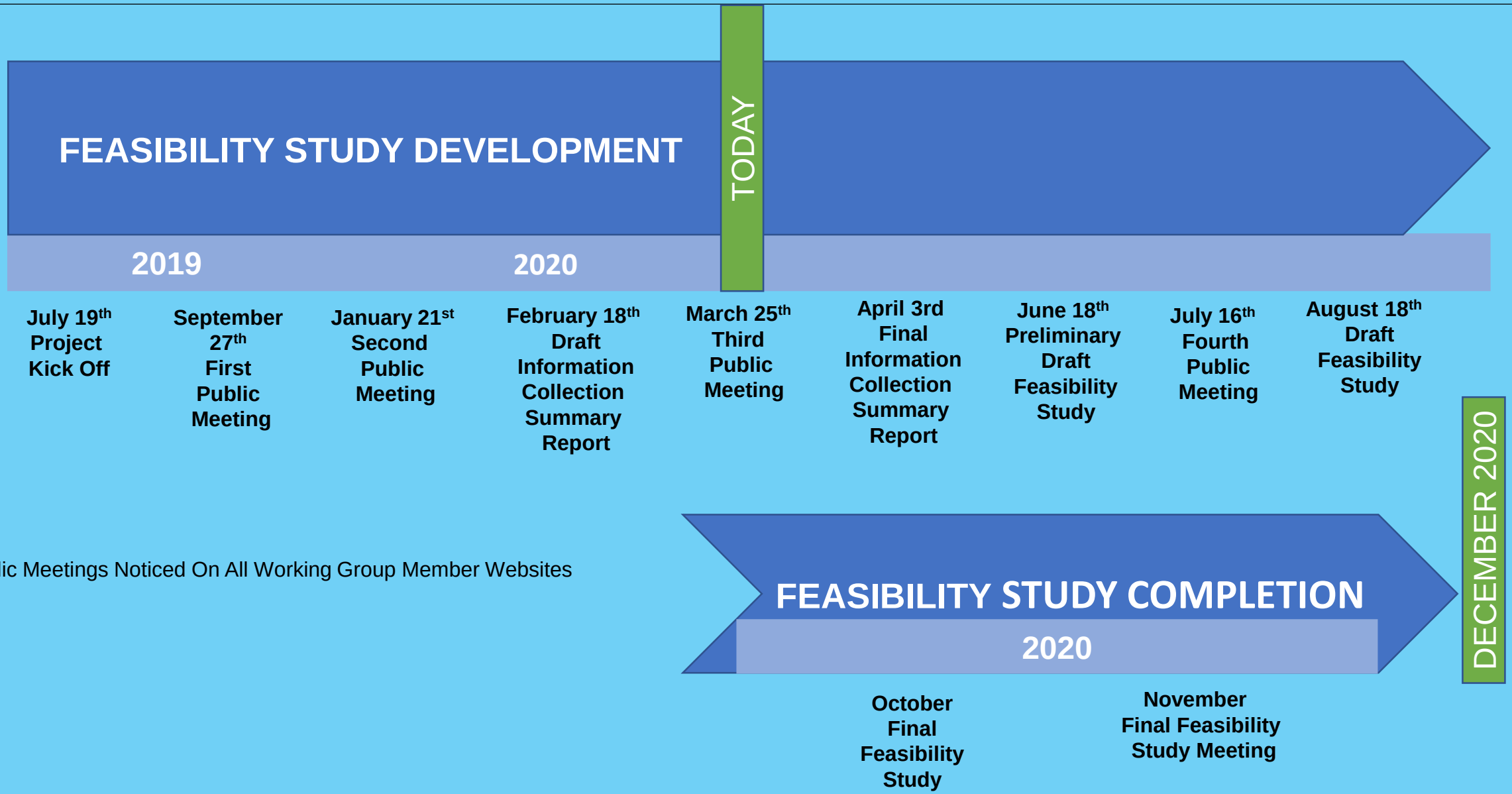
Study Will Evaluate

- Pre-treatment (prior to entering C-43 WBSR)
- In-reservoir treatment
- Post storage treatment
- Cost-effective and technically feasible technologies
- Conventional and/or innovative treatment technologies
- Biological, chemical and physical water quality treatment technologies
- Scalable and “available” for long-term technologies
- Compatibility with the objectives of the C-43 WBSR Project

Study Constraints

- Cannot affect the congressionally approved C-43 WBSR project purposes, benefits, infrastructure, construction schedule, or operation
- Available project lands have not been specifically identified for the Study.
- The C-43 WBSR and the selected treatment component(s) are not intended to achieve compliance with the Caloosahatchee River and Estuary Total Maximum Daily Loads (TMDLs)

Project Schedule



Public Meetings Noticed On All Working Group Member Websites

Questions?

Please “raise your hand” in the Zoom meeting to ask a question regarding the information presented in this section.

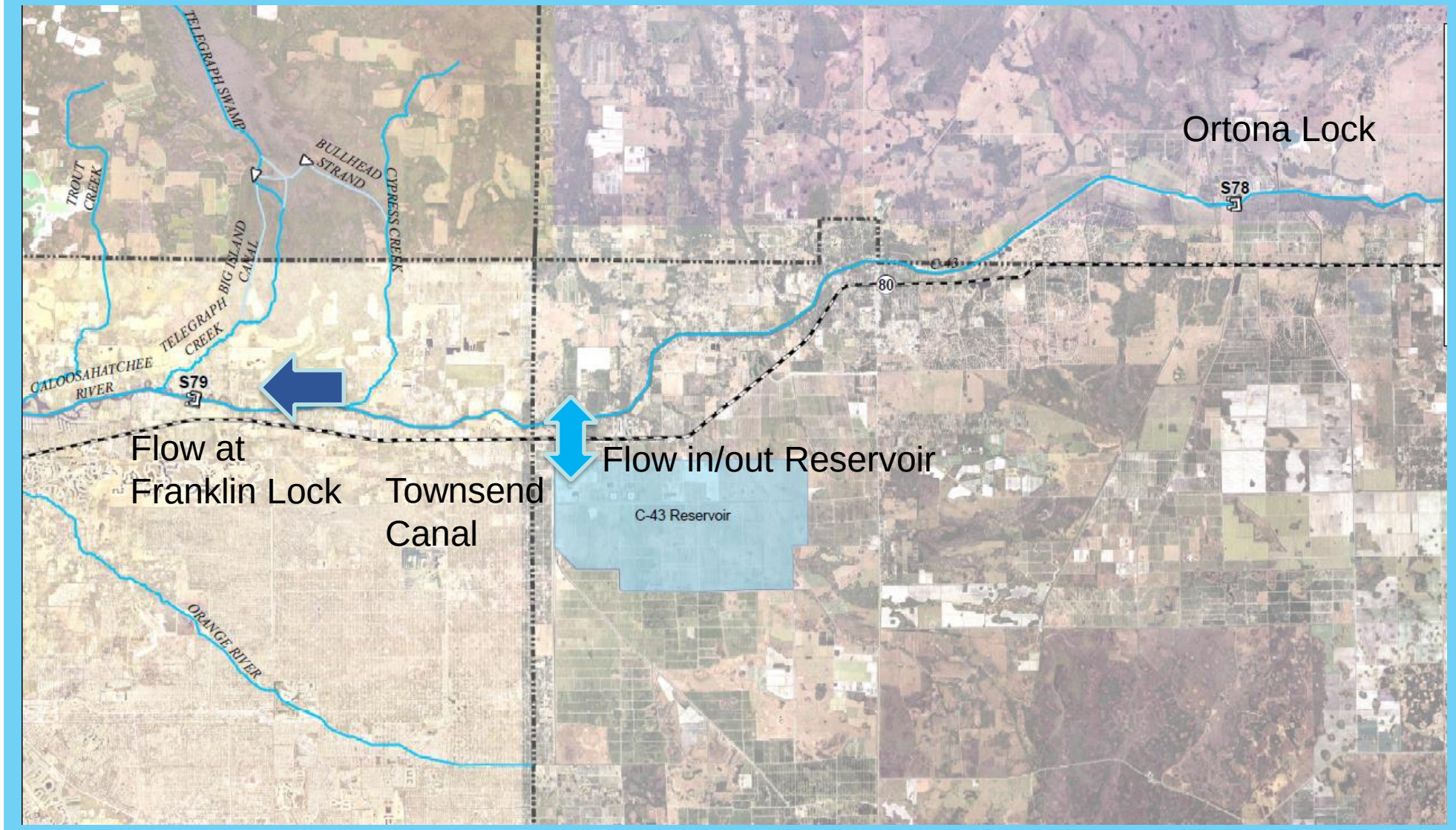
You will also have an opportunity to type in questions at the end of the presentation using the Menti interactive tool.


C-43 WBSR

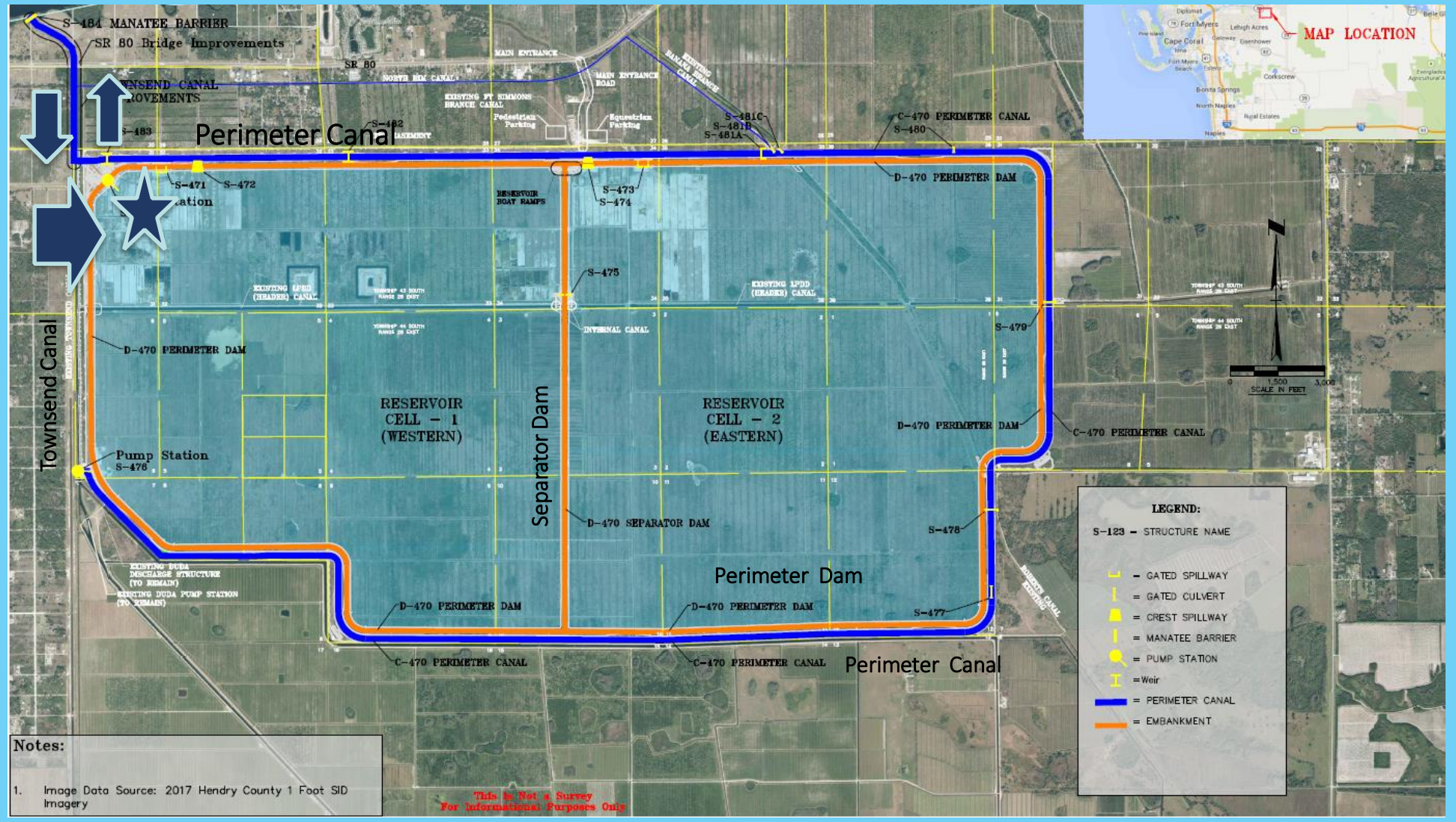
C-43 WBSR

- C-43 Reservoir project is a component of the Comprehensive Everglades Restoration Plan (CERP)
- Funded by annual State of Florida legislative appropriations and USACE will credit all eligible project costs
- Capture excess basin runoff and Lake Okeechobee releases
- Improve quantity, timing, and distribution of freshwater flows to the Caloosahatchee Estuary, to help maintain proper salinity levels
- Maintain water supply for existing legal users

C-43 WBSR Operations



C-43 WBSR Inflow/Outflow



General Operational Notes

- Major Constraints:
  - Lake Okeechobee operation schedule
  - Caloosahatchee Estuary minimum flows and levels (MFLs) of 457 cubic feet per second (cfs)
- Operated to store excess local basin runoff and regulatory releases from Lake Okeechobee and the local basin and to deliver water to the Caloosahatchee River based on maintaining desirable salinity levels in the estuary as measured by flows at S-79
- Fill during the wet season and discharge during the dry season:
  - Based on flows at S-79 and reservoir water elevations
- Inflow capacity = 1,500 cfs and >2,500 cfs emergency discharge capacity

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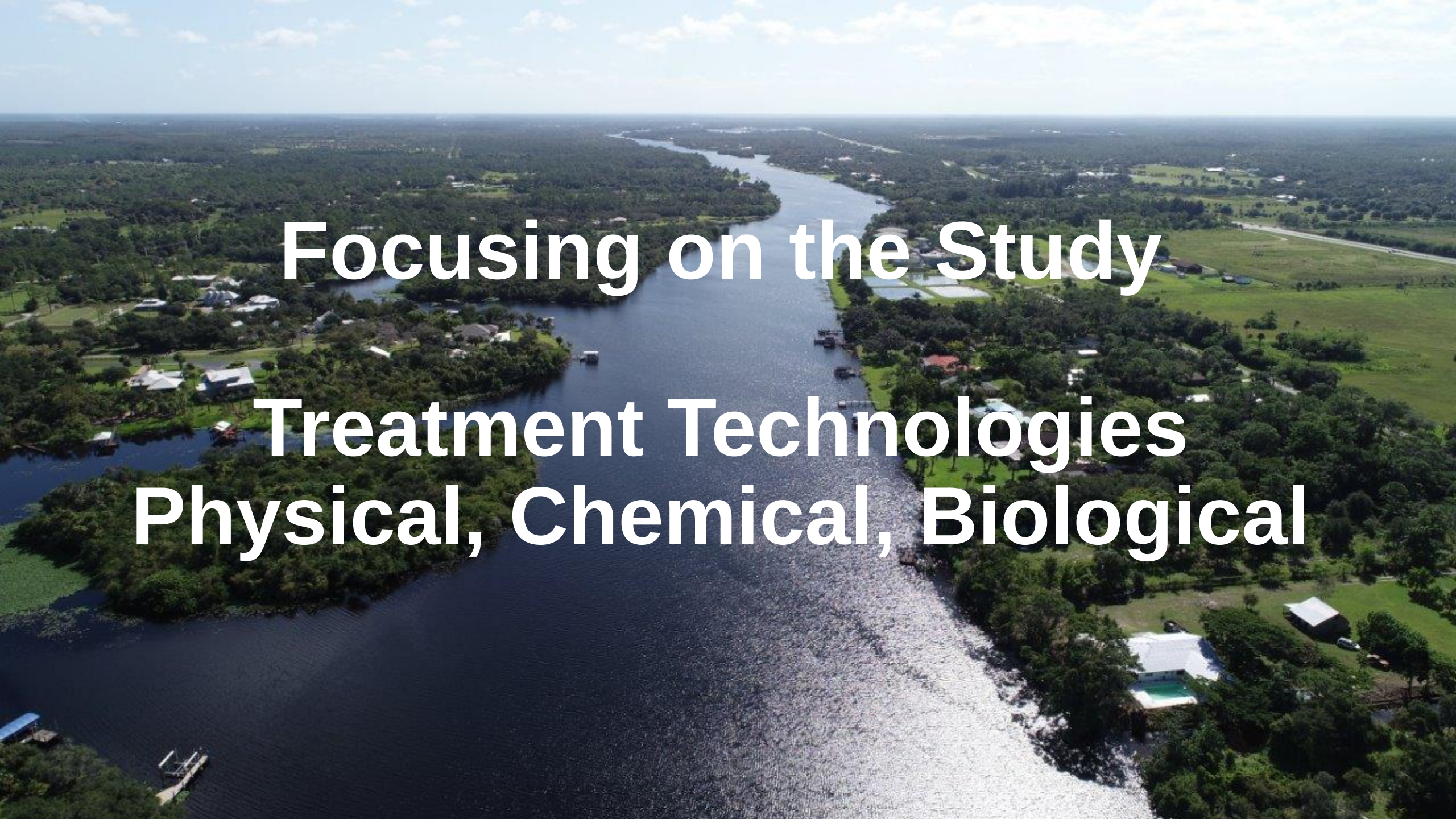

Focusing on the Study
Treatment Technologies
Physical, Chemical, Biological

Treatment Technology Focus

Nitrogen

- Dissolved Organic Nitrogen
- Dissolved Bio-available Organic Nitrogen
- Dissolved Inorganic Nitrogen (Ammonia, Nitrate, Nitrite)
- Total Nitrogen (TN)

Phosphorus

- Particulate Phosphorus
- Soluble Reactive Phosphorus
- Total Phosphorus (TP)

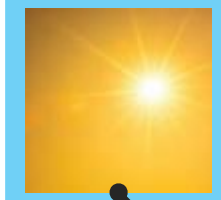
Total Suspended Solids (TSS, Algae, Particulates)

How to Treat?

Natural and Conventional Treatment Approaches

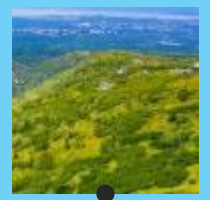
Natural Systems

Sun



Gravity

Land

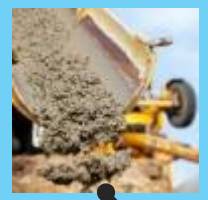


Biomas

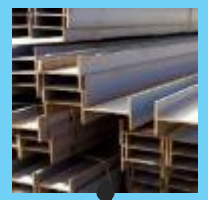
Water Treatment $

Conventional Systems

Concrete



Steel



Electrical

Chemical

Water Treatment $ $ $

Information Collection Summary Report

Performed literature review and assessed available technology based upon information sources:

- DEP Technology Library (http://fldeploc.dep.state.fl.us/tech_portal/tech_library_intro.asp)
  - ✓ 33 accepted water technologies (as of 01/16/2020)
  - ✓ Includes chemical, physical, and biological technologies
- Working Group experience and case studies
- Other professionals with similar project experience
- Technology vendor submittals
- Public input
- Final Report will be available April 3, 2020

Technology Evaluation Criteria

- Florida Case Study & Data Quality
- Nutrient Reduction
  - ✓ Scalable
- General Land Area
  - ✓ Compatible with C-43 WBSR system
- Treatment Residuals
- Energy Requirements
- Schedule for Implementation
- O&M Requirements
- Costs: Capital, O&M, and Cost-benefit
- Regulatory Constraints
  - ✓ Cannot cause harm

Treatment Technology Highlights

Constructed Treatment Wetlands

- Nutrient uptake, transformation, burial
- Many Florida applications
- Well-studied, good performance data
- 20-40% TN, 75-90% TP, >90% algae
- Large land area required
- Large capital cost
- Lower O&M cost
- Long-term residual accumulation
- Power for pump stations
- Pre-and post-storage

Stormwater Treatment Area

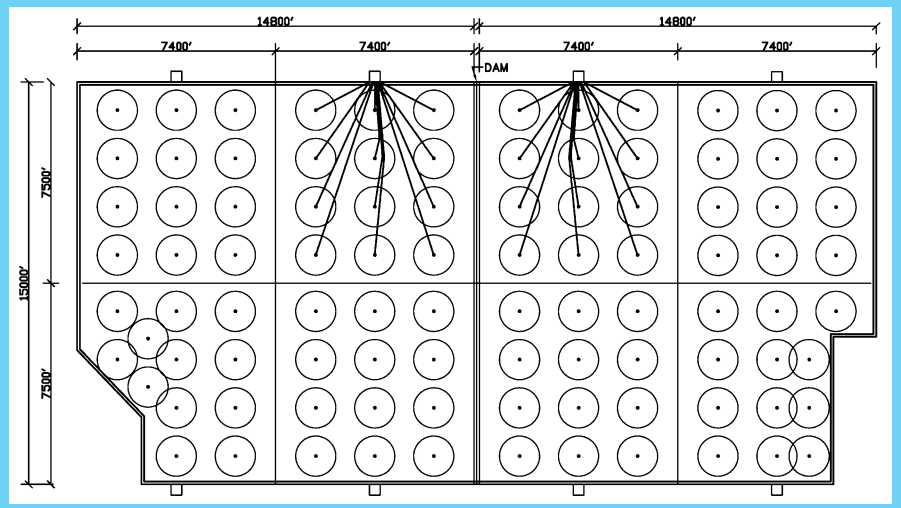
Sand Filtration

- Gravity separation of solids
- Several Florida applications
- Well-studied, good performance data
- 20-40% TN, 25-50% TP, >90% algae
- Large land area required
- Large capital cost
- Lower O&M cost
- Upper sand layer replacement (3-5 years)
- Power for pump stations
- Pre- and post-storage application

Aquifer restoration and recovery project, Mosaic

Aeration (Air Diffusion Systems)

- Reduce algal populations through mixing, reduces internal nutrient loading
- Several Florida applications
- Well-studied, good performance data
- 50-75% TN and TP
- Small land area (blowers, power)
- No residuals
- Moderate capital cost
- Moderate O&M cost
- Compressor and diffuser maintenance (annual)
- Power for blowers
- Treatment during storage



Hybrid Wetlands Treatment Technology

- Coagulation of nutrients, solids separation, wetland uptake and sedimentation
- Several Florida applications
- Well-studied, good performance data
- 50-60% TN, 80-90% TP, >90% algae
- Reduced land area required
- Reduced capital cost
- Greater O&M cost than wetlands
- Residual (floc) removal and disposal
- Power for pumps, dosing, mixing
- Pre- and post-storage application

Hybrid Wetlands Treatment Technology, Nubbin Slough

Questions?

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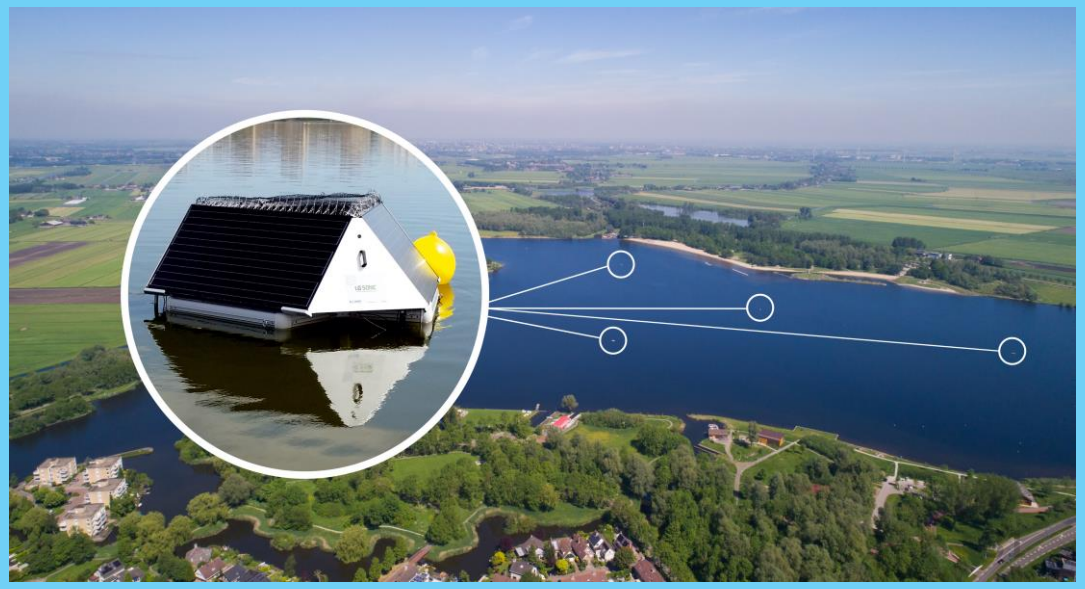
Coagulant Treatment

- Coagulation of nutrients by particle charge neutralization and solids sedimentation in offline lagoons or within reservoir
- Multiple Florida applications
- Well-studied, good performance data
- 50-70% TN, 50-90% TP, >90% algae
- Reduced land area required
- Reduced capital cost
- Greater O&M cost
- Residual (floc) removal and disposal
- Power for pumps, dosing, mixing
- Pre- and post-storage; in-storage

Nutrient Reduction Facility
Lake County FL

MPC-Buoy

- Reduce algal populations through sonic interference with cell flotation; may impact zooplankton
- Case studies are beginning
- Limited performance data in the US; extensive data from Europe
- Up to 90% algae removal
- No additional land area
- No residuals
- Low capital cost
- Moderate O&M cost
- Transducer and buoy maintenance
- Treatment during storage



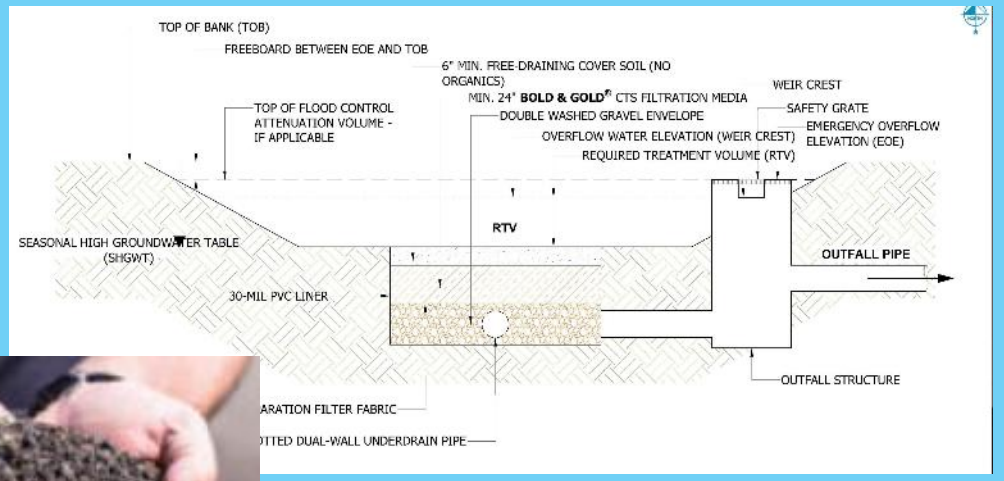
ElectroCoagulation

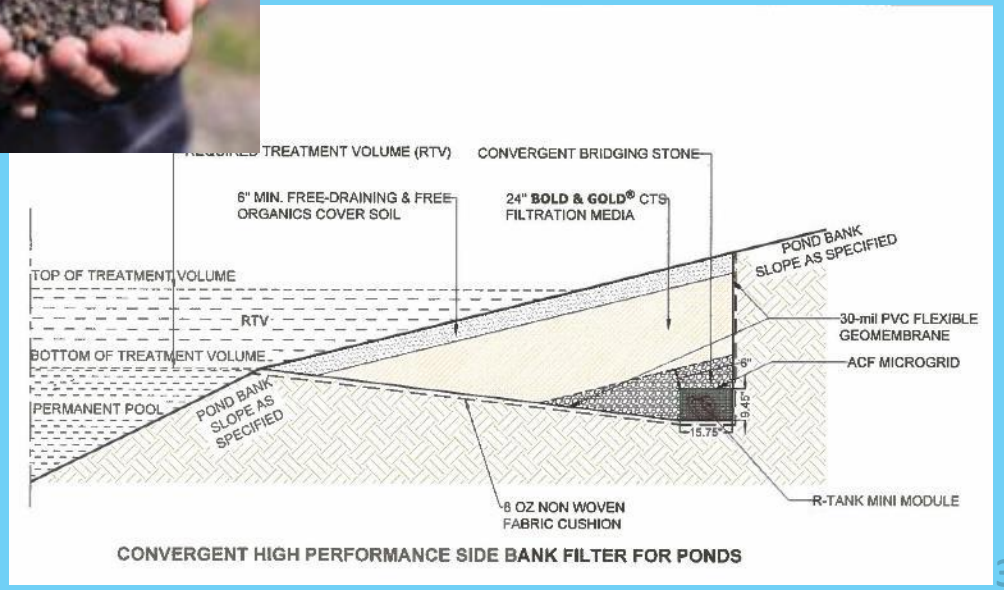
- Coagulation of nutrients by electrode particle charge neutralization and solids sedimentation
- Limited Florida case studies
- Limited performance data
- 60-90% TN, >90% TP, >90% algae
- Low land area required
- High capital cost
- High O&M cost
- Lower residual amount but still require disposal
- Power for electrodes, pumps, dosing, air
- Pre- and post-storage application

Powell Water Systems

Bold & Gold

- Sorption of nutrients to engineered media and filtration of solids in basin or basin side walls
- Many Florida application
- Good performance data
- 75-95% TN, 50-90% TP
- Low land area required
- Moderate capital cost
- High O&M cost
- Spent media must be replaced (15 years)
- Pre- and post-storage application





Nutrigone BAM (Media Sorption)

- Sorption of phosphorus and denitrification of nitrogen on natural media
- Limited Florida applications
- Limited performance data
- 90% TN, >90% TP
- Moderate land area required
- High capital cost
- High O&M cost
- Spent media must be replaced (1-5 years) and residuals disposed; can be used for soil amendments
- Pre- and post-storage application

Aqua-Lutions®™

- Coagulation with chemicals and dissolved air flotation with micro-bubbles for solids separation
- Several Florida pilot studies
- Good performance data
- 65% TN, 90% TP, 80% algae
- Low land area required
- High capital cost
- High O&M cost
- High residual production requires removal and disposal; can be converted to fertilizer pellets
- Power for pumps, air, dosing, and flotation
- Pre- and post-storage application

Lake - *Pre-treatment*

AquaLutions™® - *Post-treatment*

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Next Steps

Project Milestones

April 3, 2020	FINAL C-43 WBSR Technology Data Collection Summary Report
June, 2020	*Preliminary Draft* C-43 WBSR Water Quality Feasibility Study
July 16, 2020	Final Public Meeting SW Florida Collaboratory – 2pm to 4pm
August, 2020	*Draft* C-43 WBSR Water Quality Feasibility Study
October 2020	FINAL C-43 WBSR Water Quality Feasibility Study
November 2020	Final Presentation of Study Results

Frequently Asked Questions (FAQ)

Question	Answer
How much land is available?	Available land specific to the project has not been identified as part of this phase of the Study.
Is there a goal to be achieved for the water quality treatment project?	The focus of the Study is to ensure improved water quality leaving the reservoir. The C-43 WBSR operational permit will set water quality requirements for water discharged from the reservoir.
Are all treatments environmentally friendly?	Technologies included in the study cannot cause environmental harm.

FAQ

Question	Answer
How was nitrogen and phosphorus sequestered in the C-43 WBSR project test cells?	The C-43 test cell data showed a **decrease** in both phosphorus and nitrogen over time during storage.
Why wasn't a stormwater treatment area (STA) always part of the plan?	The C-43 WBSR congressionally approved project purpose is storage to maintain the appropriate range of salinity concentrations for the estuary.
When is this project due for completion?	Substantial completion of construction of the C-43 WBSR is scheduled for 2023. The Study is to be completed in November 2020.

FAQ

Question	Answer
You mentioned the TMDL requires the basin stakeholders to reduce Total Nitrogen (TN) by 23%. Will the C-43 WBSR be required to reduce TN by 23%?	The TN TMDL load reduction was set for the entire Caloosahatchee River and Estuary Watershed. Any reduction in TN from water stored in the reservoir or an associated water quality feature will be included as part of the overall reduction for the watershed.
How large an area is needed for an STA to treat the volume of water released from the C-43 reservoir?	Approximately 5,000 acres of land.
Will C-43 WBSR be lined?	No the reservoir is not lined, the bottom of the reservoir will remain native soils.

Public Input and Project Website

C43waterquality@sfwmd.gov

https://www.sfwmd.gov/content/c43waterqualitystudy

Menti.com - Instructions

Step 1. Open a new internet browser on your computer or smart phone

Such as: Internet Explorer, Safari, Google etc.

(To view all public input, leave the Zoom meeting window open)

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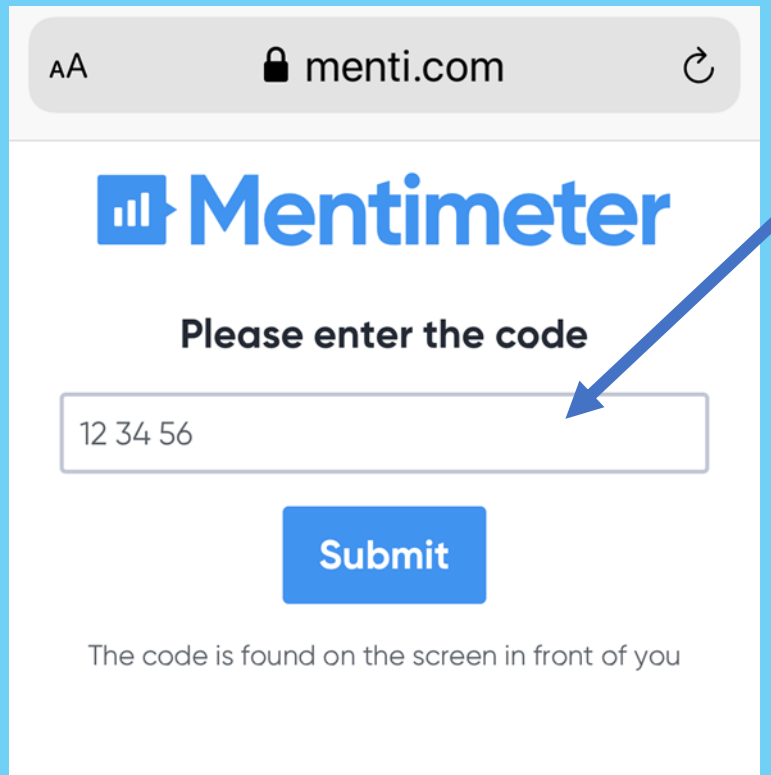

Step 3. Enter the Menti Code in the box on your screen and click “Submit”

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Answer the questions in Menti screen

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