C-43 West Basin Storage Reservoir (WBSR)

Water Quality Component (WQC) Plan Selection Update

September 13, 2021

Meeting Format

Zoom Meeting Functions

I. Question and Answer (Q&A) – Type in Questions

II. Raise Your Hand for Comments at end of Q&A session

Note: If you call in only (not on the internet) press *9 to raise and lower hand and *6 to mute or unmute.


Jennifer Reynolds,
SFWMD

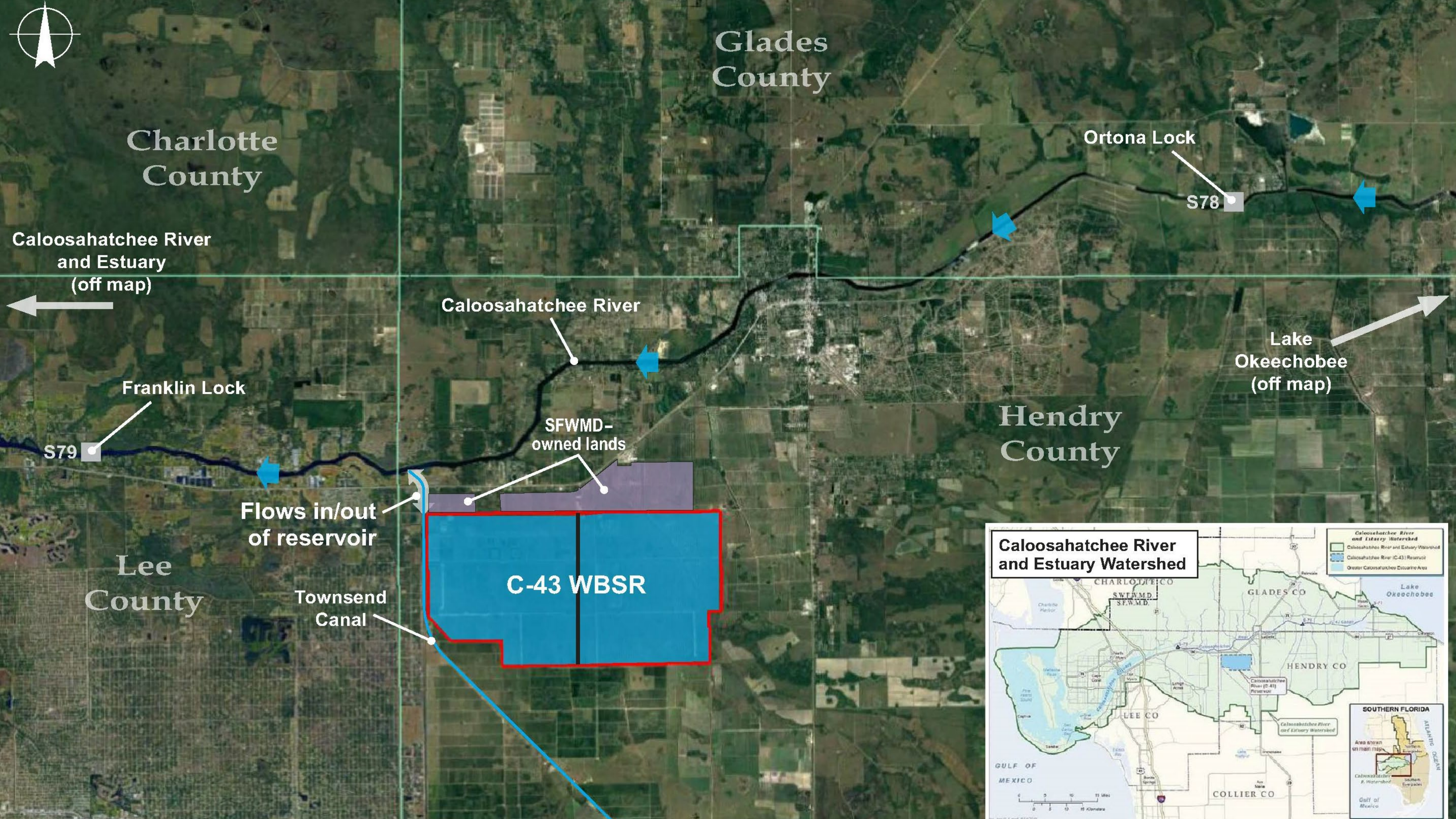
Project Background

Executive Order 19-12, January 10, 2019

- ***Provide additional treatment and improve the quality of water leaving the C-43 West Basin Storage Reservoir (WBSR)***

- Greater protection of Florida's environment and water quality

- Address Harmful algal blooms


Glades
County
Charlotte
County
Ortona Lock
S78
Caloosahatchee River
and Estuary
(off map)
Caloosahatchee River
Lake
Okeechobee
(off map)
Franklin Lock
S79
Hendry
County
SFWMD-
owned lands
Flows in/out
of reservoir
Lee
County
C-43 WBSR
Townsend
Canal
Caloosahatchee River
and Estuary Watershed
CHARLOTTE CO
GLADES CO
HENDRY CO
LEE CO
COLLIER CO
GULF OF
MEXICO
SOUTHERN FLORIDA
Lake
Okeechobee

Water Quality Component Feasibility Study (Phase I) Summary

Project Timeline

Technologies Reviewed

38 | 25 | 10 | 5

WQC Project Process to Date

2019		2020	2021
July 3, 2019 Water Quality Feasibility Study (WQFS) Kick Off	**April 3, 2020** Final Information Collection Summary Report	**November 20, 2020** Final WQFS	

Feasibility Study Factors Evaluated

- 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
- Cost benefit analysis to identify most cost-effective alternatives

Feasibility Study Recommended Alternatives

1. Alum Treatment (both in-reservoir and post-storage)
2. Stormwater Treatment Area (STA) with Bold and Gold®
3. Hybrid Wetland Treatment Technology (HWTT)
4. Sand Filter with Bold and Gold®
5. 5,000-acre STA (retained based on public feedback)

Final Study available:

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

Water Quality Component Siting Evaluation (Phase II) Overview

Project Timeline

Technologies Reviewed

38

25

10

5

WQC Project Process to Date

2019 **2020** **2021**

July 3, 2019
Water Quality Feasibility Study (WQFS) Kick Off

April 3, 2020
Final Information Collection Summary Report

November 20, 2020
Final WQFS

December 16, 2020
Water Quality Component (WQC) Siting Evaluation Kick Off

March 17, 2021
Final In Reservoir Alum Treatment Memorandum

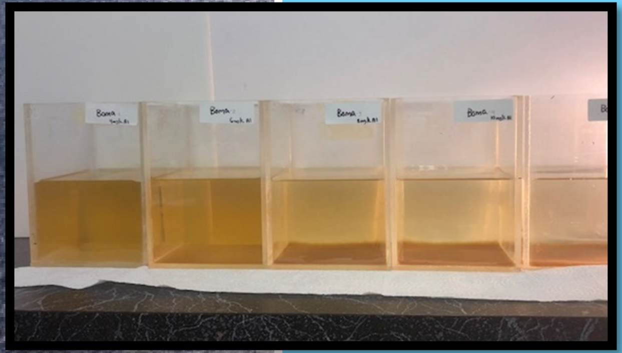
March 26, 2021
Final Siting Evaluation Report

Georgia Vince, J-Tech

In-Reservoir Alum Injection System

- Based on the Feasibility Study results, in-reservoir alum treatment was the most cost-effective and could be applied at reservoir inflow pump station
- Additional evaluation was performed to determine dosing
- Construction cost estimate based on conceptual design $5M
- SFWMD executed a contract for full design to be completed October 2021
- Additional details later in presentation

WQATT Pilot Study Update

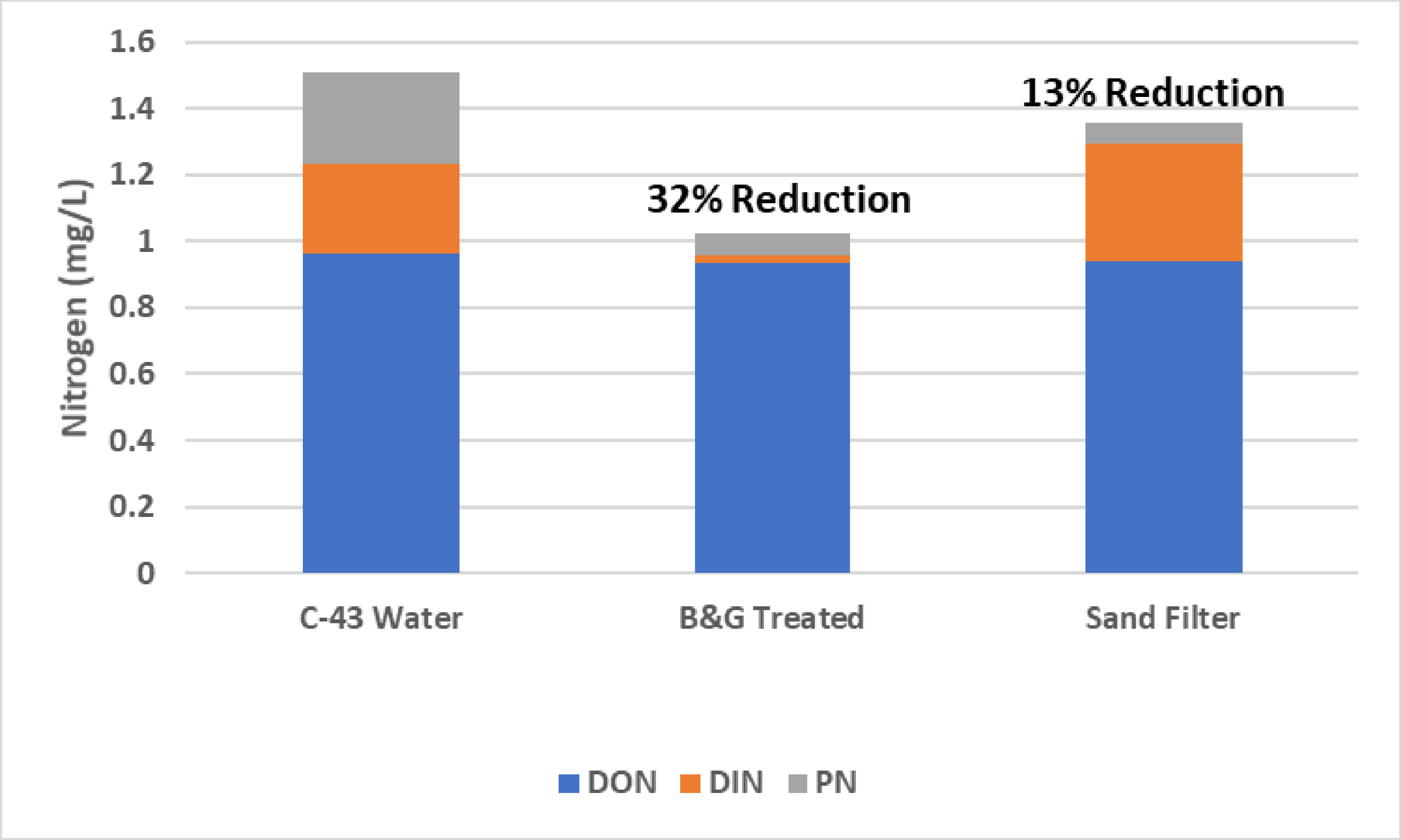


- Bold and Gold® patented media
  - TN removal average of 32%, mostly NOx
- Sand filter
  - TN removal average of 13%, mostly particulate N
- Aluminum sulfate (alum) jar test
  - Dosing for maximum nutrient removal was between 12–14 mg/L
  - TN removal: 43% wet season; 51% dry season
  - TP removal: 90% wet season; 94% dry season
- In-tank alum dosing
  - Testing dosing at 0.6 and 1.2 mg/L
  - TN removal 30% and 33%
  - TP removal 62% and 72%

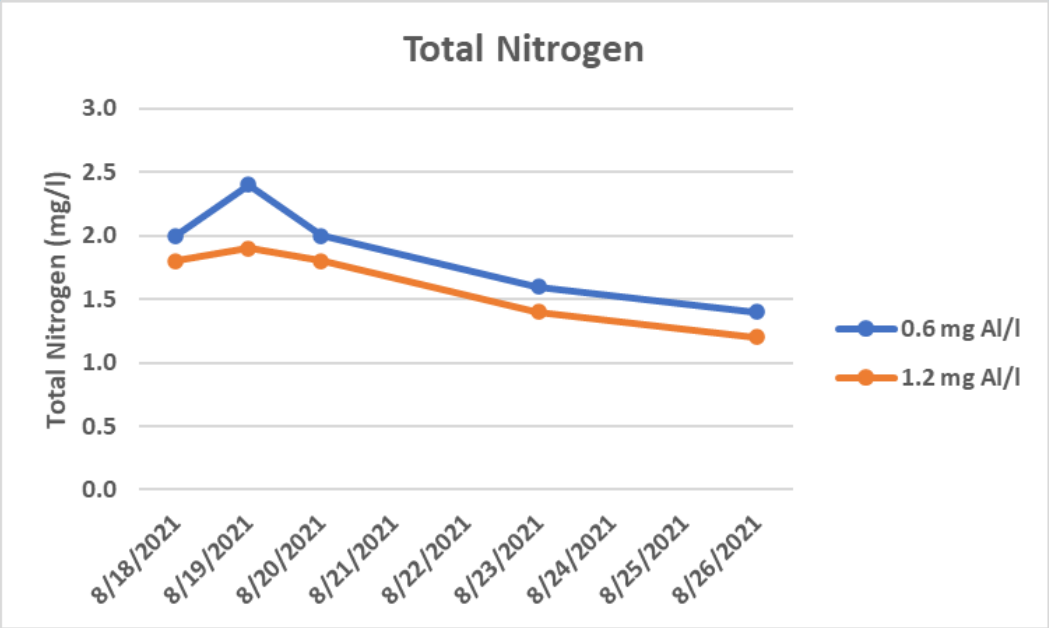
Cassondra Armstrong, SFWMD

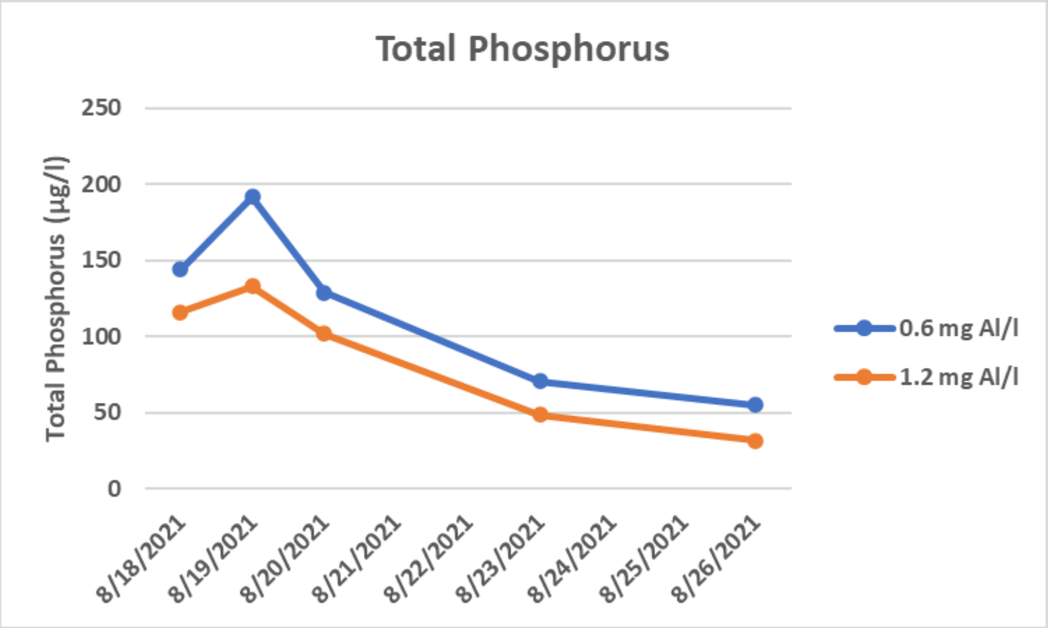
Nitrogen Removal with Filtration Media

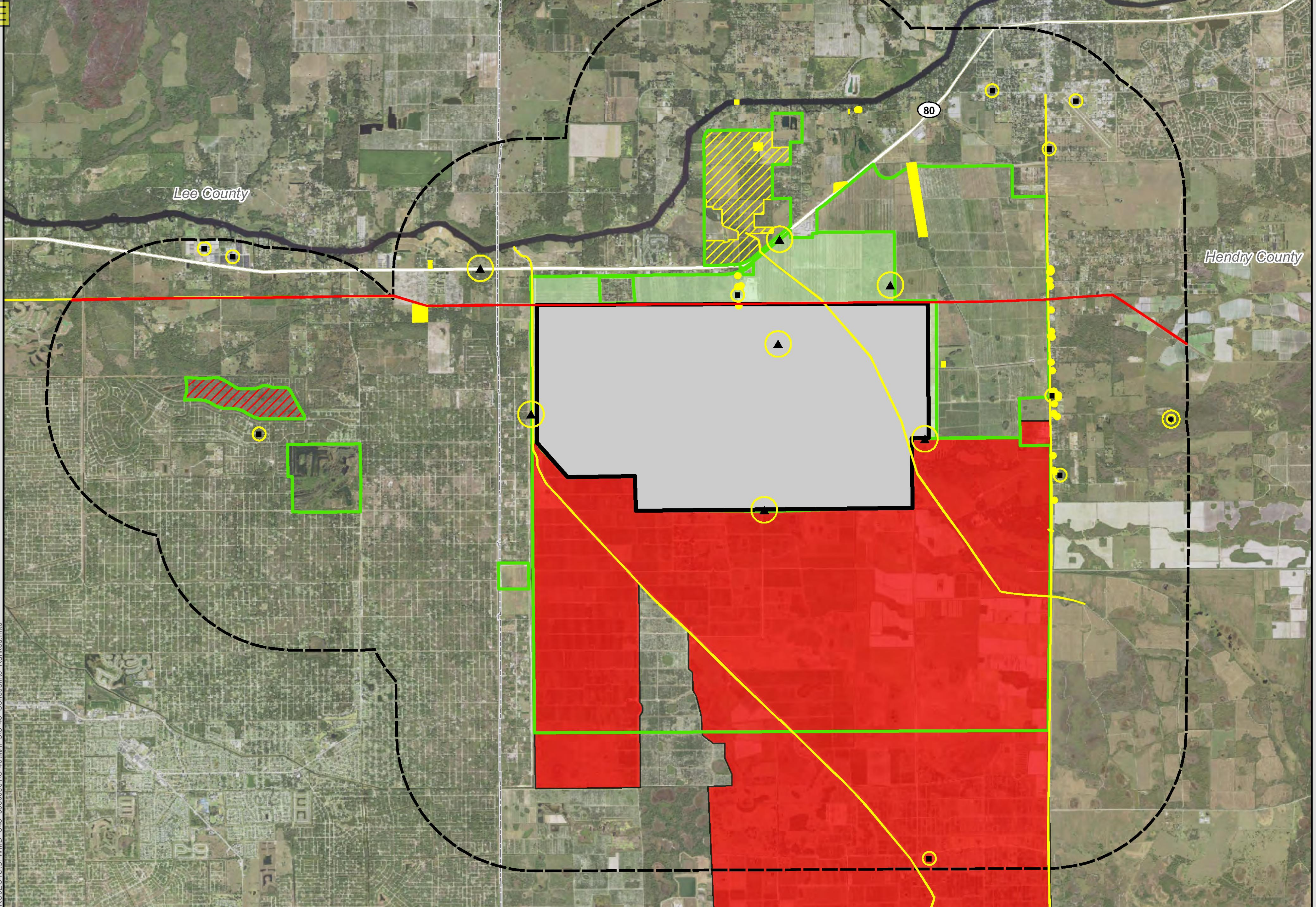
Cassondra Armstrong, SFWMD



In-tank Alum Dosing Comparison







ROJECTS\SFWMD C43 68690001\C-43\MAPS\C-43 Constraints Ranked.mxd

Project Opportunities and Constraints

Hendry and Lee Counties, FL

C-43 Reservoir

SFWMD Lands

Consolidated Ownership 2-mile Buffer

Project Area Opportunity

Consolidated Ownership

Constraints - May Require Mitigation

Eagle Nest with 330-foot and 660-foot Buffers

Caracara Nest (2021) and 300-meter Buffer

DEP Cleanup Site and 500-foot Buffer

Historical/Cultural Resource

PUD Zoning

Constraints - Avoidance

Major Transmission Lines

Rodina Planned Development

Protected Lands

Map Extent Covered by Consultation Areas for the Following Species:
Caracara
Everglades Snail Kite
Florida Bonneted Bat
Manatee

Map Extent Covered by Species Range for the Following Species:
Eastern Indigo Snake
Florida Panther
Wood Stork Foraging Area

N

0 0.5 1 2

Miles

Full-scale STA

- Feasibility Study did not include the cost for the land acquisition required for the full-scale (5,000 acre) STA
- Updated cost estimate for construction and land acquisition is approximately $300 million
- Socio-economic concerns related to purchase of this much land
- Therefore, the full-scale STA did not move forward to Conceptual Design

Georgia Vince, J-Tech

Water Quality Targets for the WQC

- Identified water quality treatment targets from the
- Based on S-79 (downstream) median dry season (November–April) TN, TP, and TSS concentrations
  - Most conservative values
  - During time of year when reservoir would likely be releasing

Parameter	Target	Percent Reduction
Total Nitrogen (TN)	1.23 mg/L	26%
Total Phosphorus (TP)	0.088 mg/L	40%


Questions?

Water Quality Component Conceptual Design

Project Timeline

Technologies Reviewed

ID of Alt 5

38 → 25 → 10 → 5 → 4 → 3 → 1

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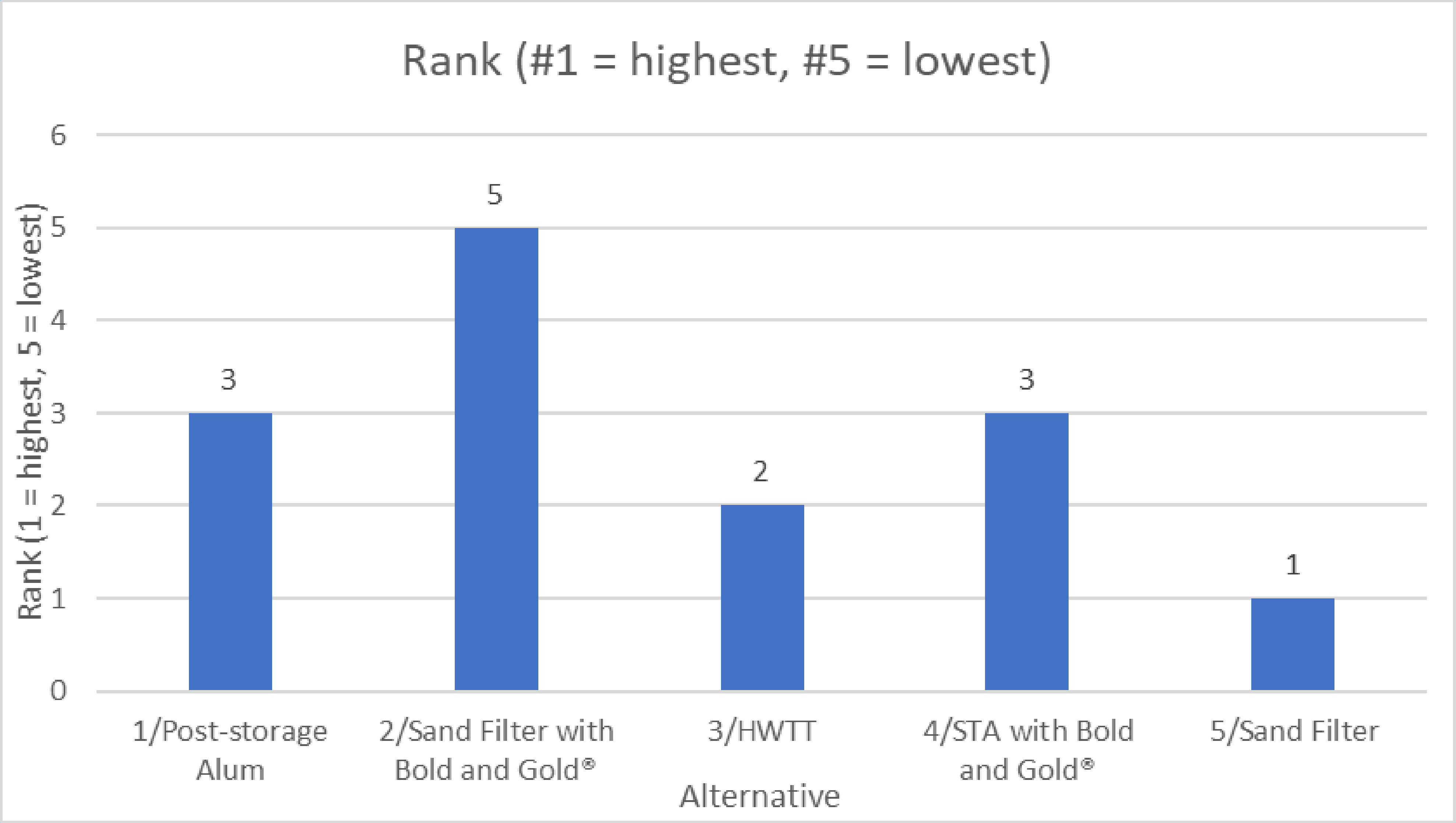
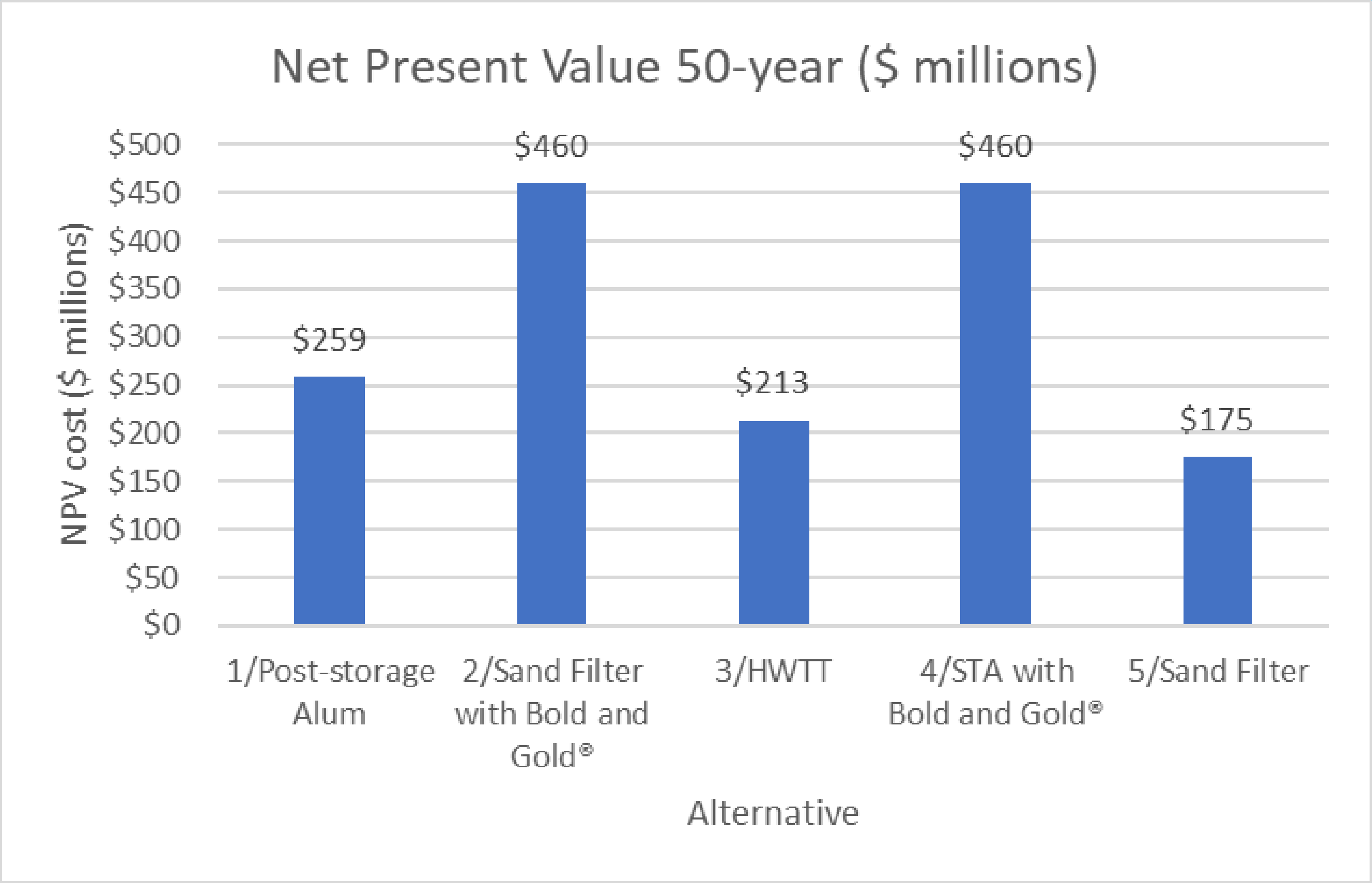
Matrix Development and Results

- Natural Systems/Habitat Value/Ecosystem Services
- Confidence in Performance
- Operational Simplicity
- Energy Efficiency
- Net Present Value (cost over 50 years) has the most weight
- Criteria were scored
- Alternatives were ranked based on scoring

Matrix Criteria Ranking



Net Present Value (50-year) Ranking



WQC Plan Evaluation and Selection

1. ~~Alum Treatment (post- reservoir storage)~~
2. ~~Stormwater Treatment Area (STA) with Bold and Gold®~~
3. ~~Sand Filter with Bold and Gold®~~
4. ~~Hybrid Wetland Treatment Technology (HWTT)~~
5. 150- acre Sand Filter

Project Timeline

Technologies Reviewed

ID of Alt 5

38 | 25 | 10 | 5 | 4 | 3 | 1

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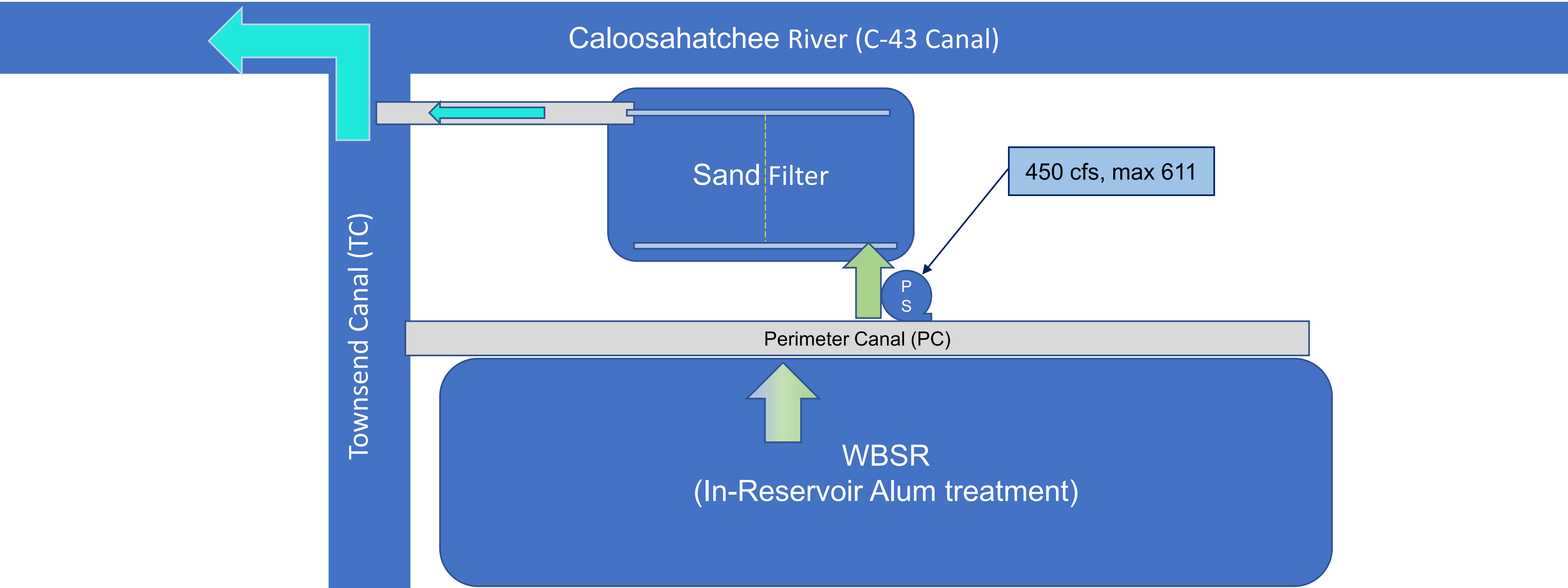
WQC Selected

WQC Plan – Post-storage Sand Filter

Georgia Vince, J-Tech

Examples of Florida sand filter projects

Post-storage Operation Reservoir Discharge



In-Reservoir Alum Injection System

Jim Bays,
J-Tech

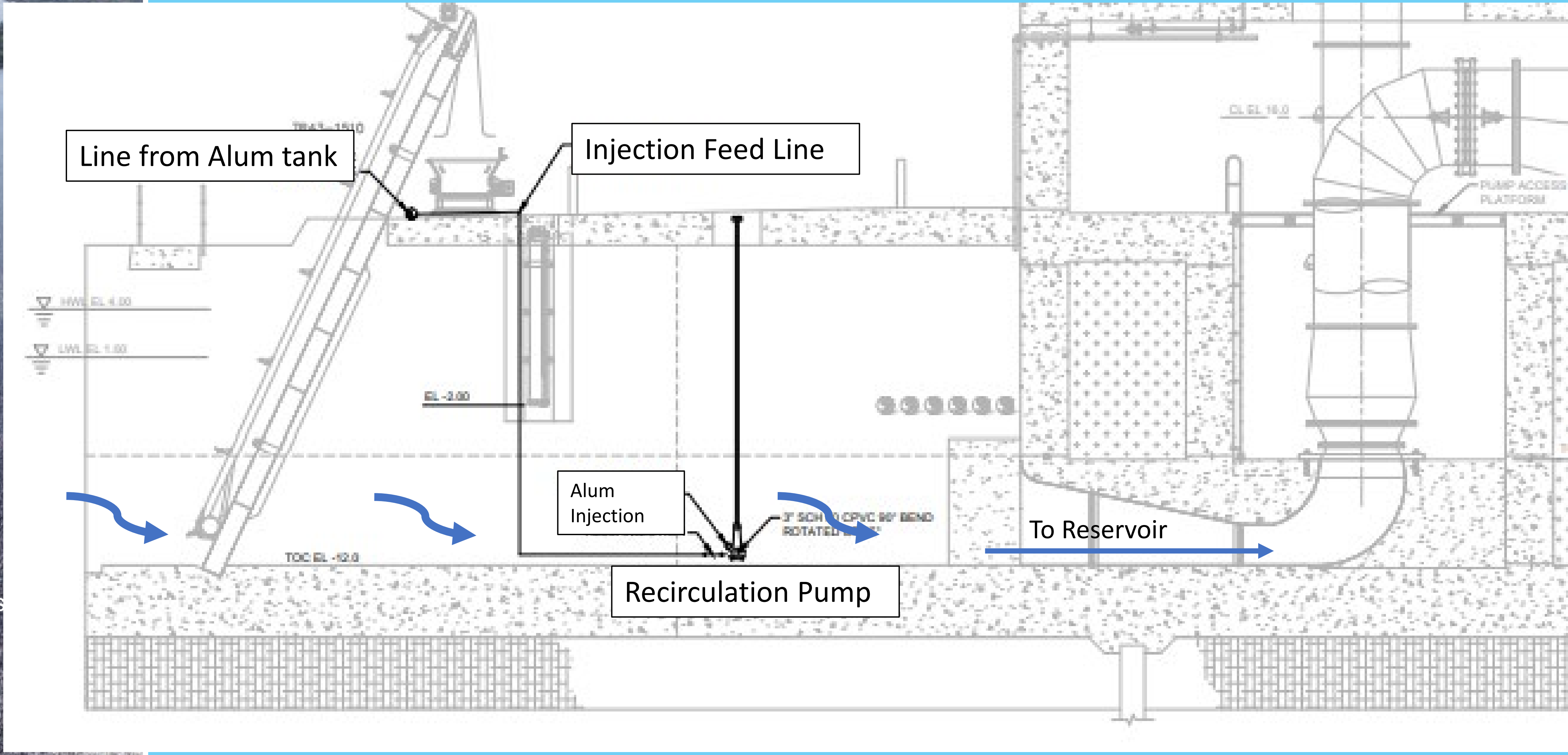
Literature Review

- Selected case histories from Florida and other states
- 20 years of study
- Effectiveness has been proven for alum application
- 20-40% total nitrogen reduction
- 60-90% total phosphorus reduction
- No toxic responses
- No effect to reservoir components/materials at proposed concentrations
- Similar results noted for alum sulfate and aluminum chlorohydrate

Residuals

- Alum dosing: 0.6 mg/L
- Residual accumulation low
  - Less than 0.3 cm/year in Cell 1
  - Most deposits in Cell 1
  - Sedimentation modeling evaluation
- Consolidation of floc in first 30 days
- 60–90 days for stabilization
- 100 years = 13 inches accumulation
- Long-term fate is crystallization within the sediments

In-Reservoir Alum Injection System



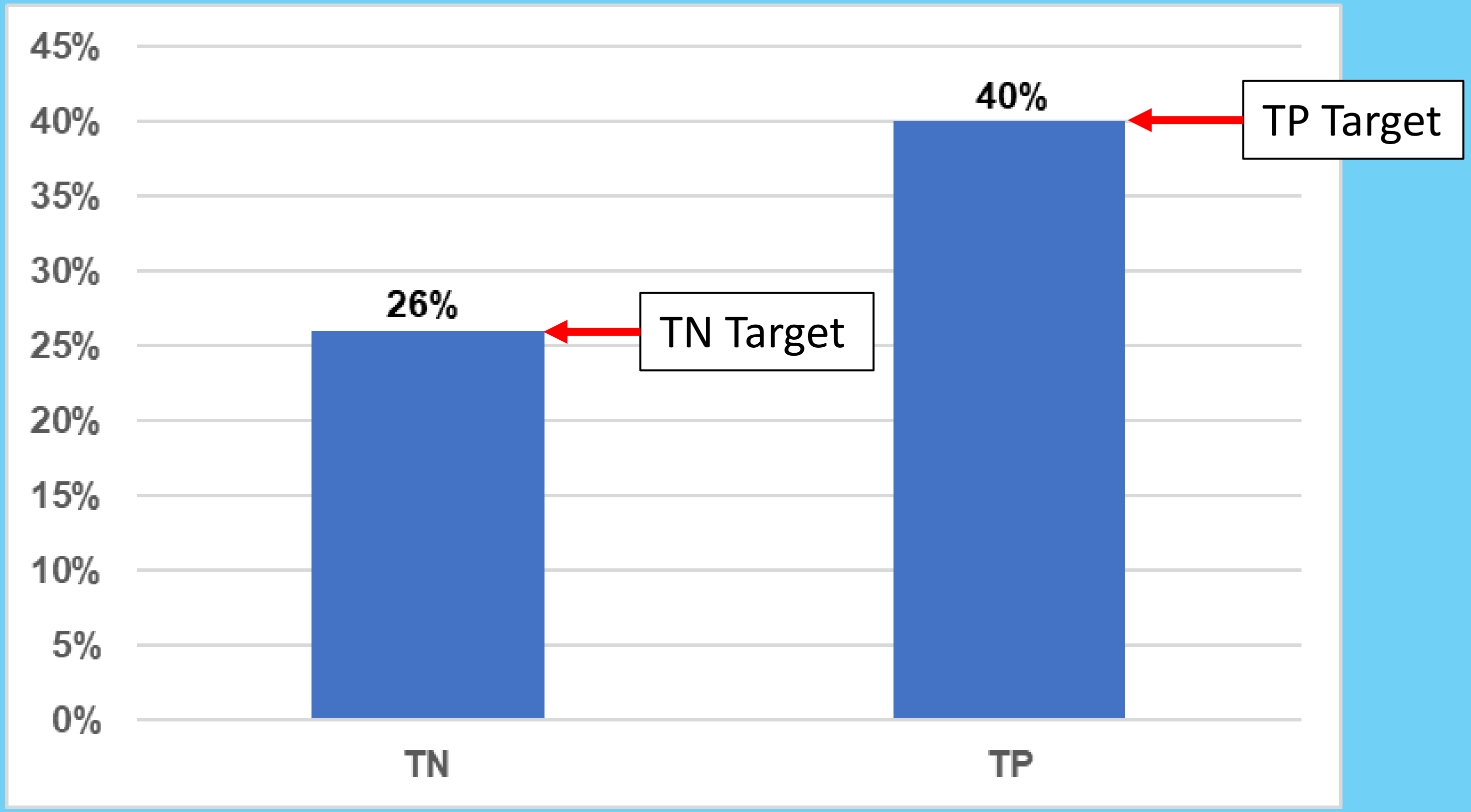
Jim Bays
J-Tech

In-Reservoir Alum Injection Additional Evaluation

- During design alum model was updated – new version includes algae analysis
- Evaluated increase in dosing, up to 3x original dose
- Results:
  - No increased corrosion effects
  - No significant increase in sedimentation/residuals
  - Alum levels below EPA standards
  - Increased dose did not have significant increase in nutrient removal
- Conclusion – original dose (0.6 mg/L) was proven to meet downstream water quality targets using updated model
- No cost increase

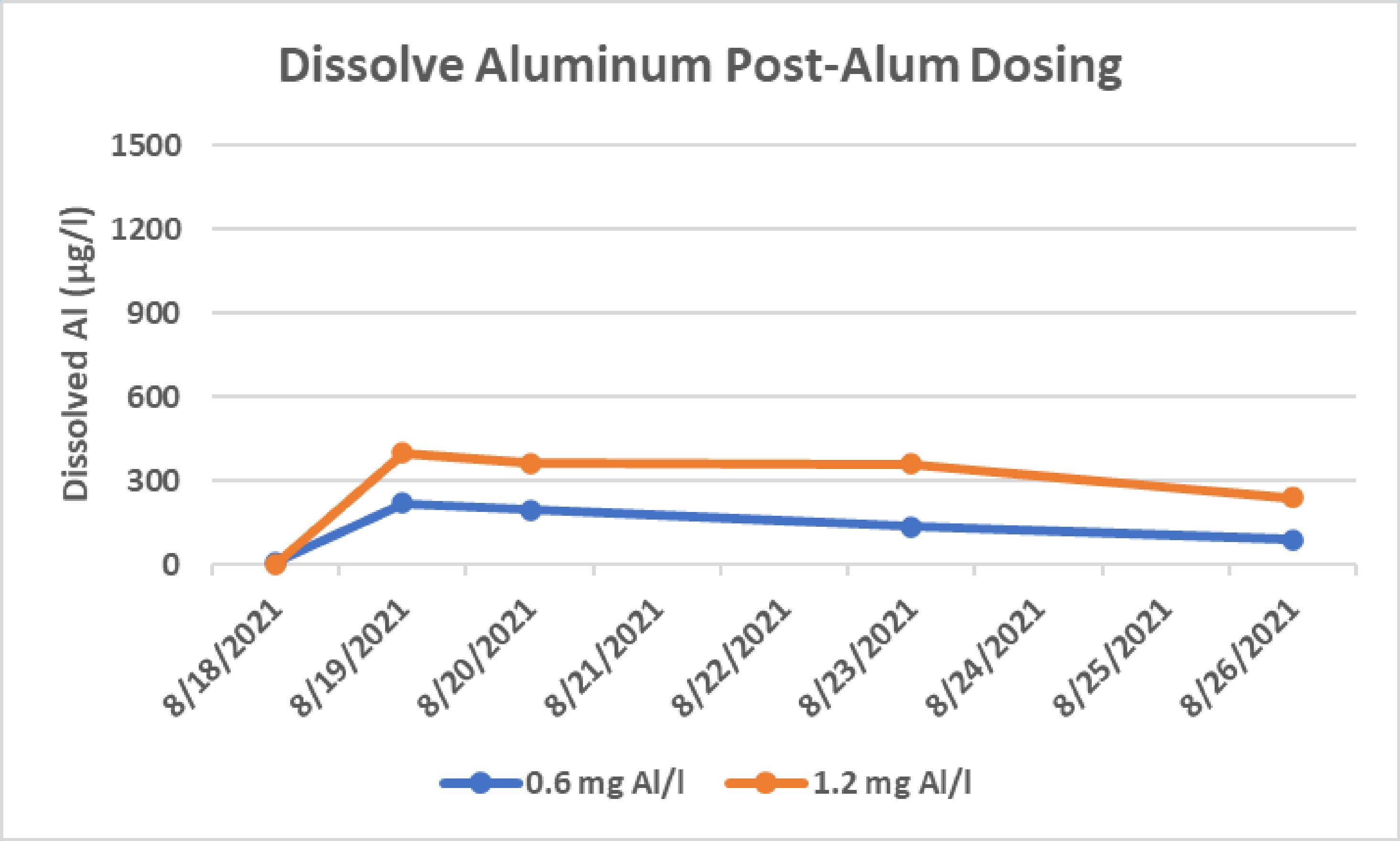
In-Reservoir Alum Nutrient Reduction Achieves Water Quality Targets

Parameter	Target	Percent Reduction
Total Nitrogen (TN)	1.23 mg/L	26%
Total Phosphorus (TP)	0.088 mg/L	40%



Cassondra Armstrong, SFWMD

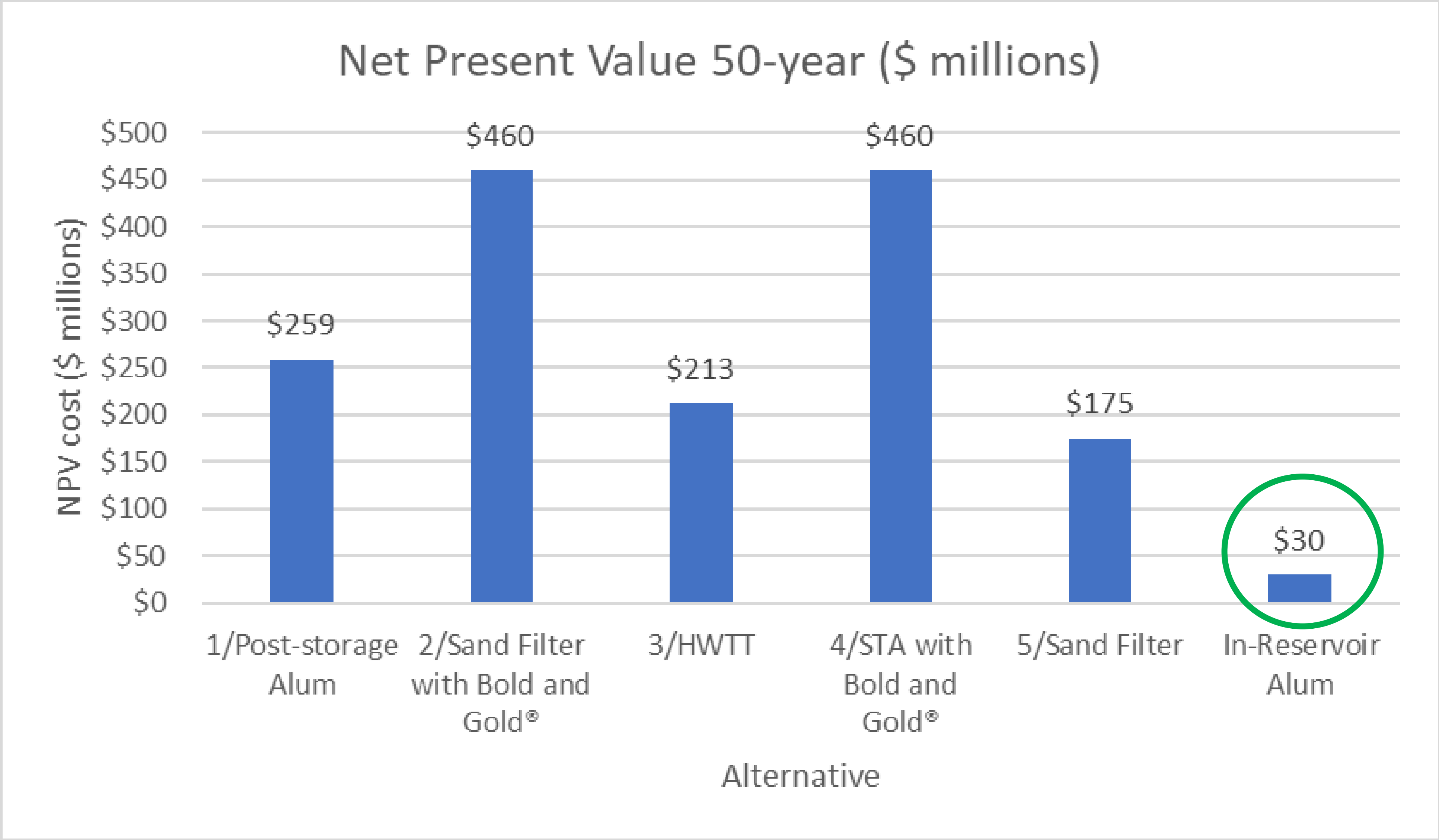
Post-Dosing Residuals



Sulfate concentrations increased from 27 mg/L to 29 mg/L and was within natural variability of parameter in the C-43

Net Present Value (50-year) Ranking

Georgia Vince, J-Tech



Water Quality Component Plan Selection

SFWMD WQC Plan Selection

- In-reservoir alum injection meets water quality targets, is most cost-effective, and will be online concurrent with the reservoir
- Sedimentation rates, sulfate concentrations, and potential for alum micro floc
  - Not an issue for reservoir operation or benthic and wildlife health
- SFWMD-owned lands available for future water quality projects


Questions?

SFWMD Project Manager: Kim Fikoski

kfikoski@sfwmd.gov

Project Website:

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