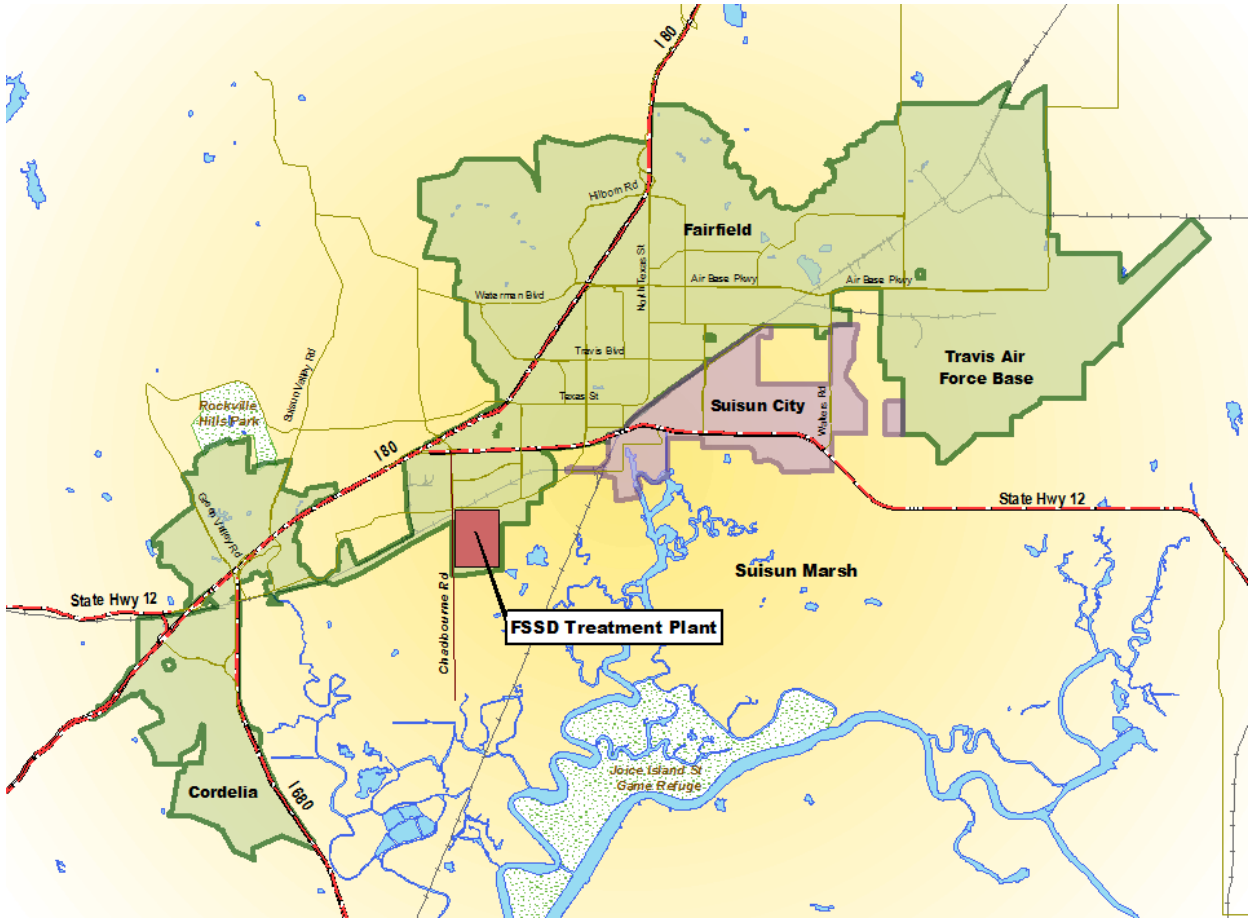
FSSD Nutrient Journey & Project

BACWA Permits Committee Meeting

June 16, 2026

History

- Formed in 1951 as Special District
- Governed by City Councils of Fairfield and Suisun City (10 member Board)
- Three small treatment plants replaced by current facility in 1976
- Serving 150,000 people (30% of Solano County) in:
  - Suisun City
  - Fairfield
  - Travis Air Force Base
  - Limited areas of unincorporated Solano Co.



Nutrient Reduction Task Force

- Formed in 2022
- Meets quarterly

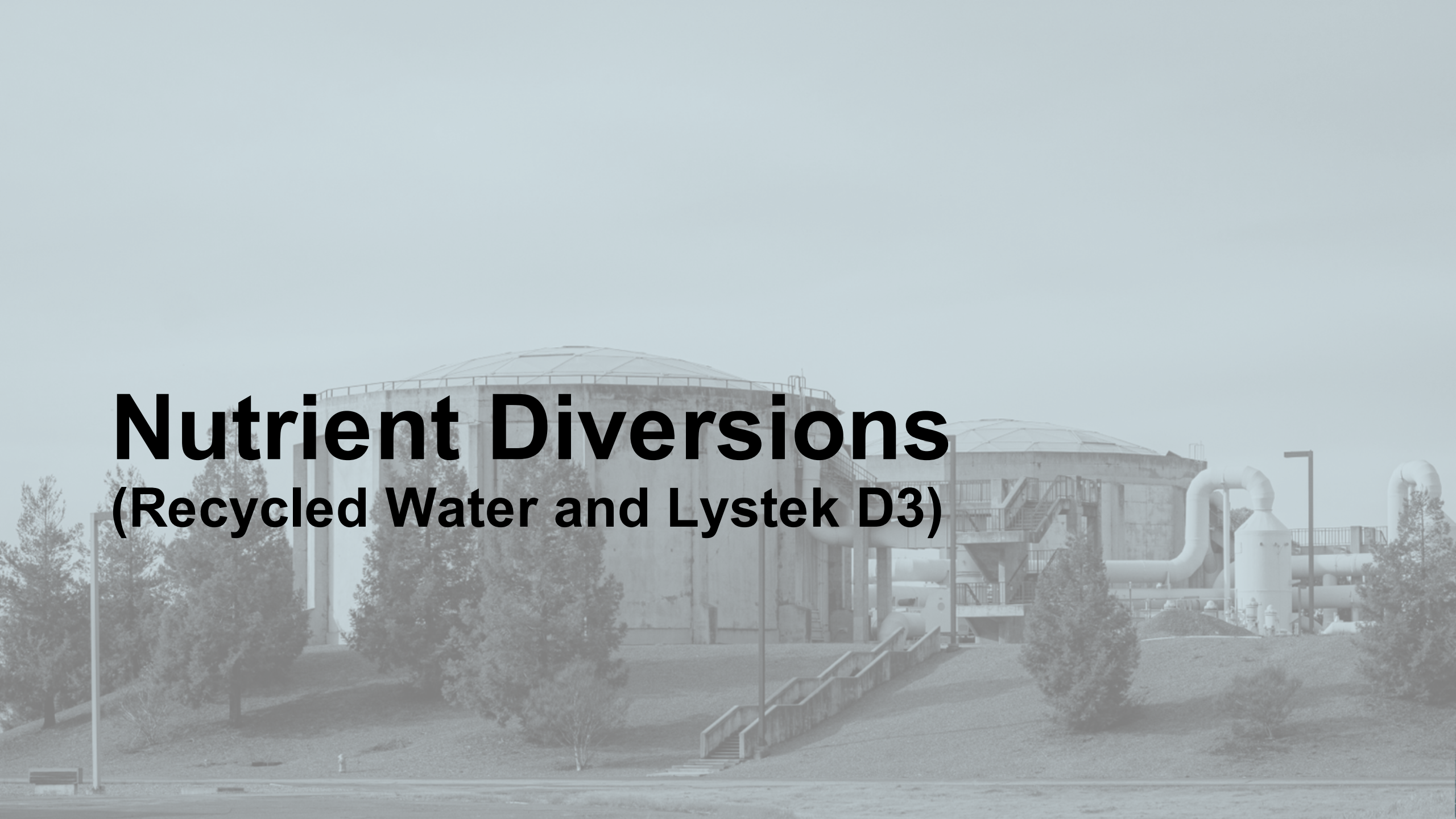
Multi-Pronged Approach

Nutrient Diversions

Nature-Based Solutions

Suisun Marsh Research

Treatment Plant Upgrades



Nutrient Diversions
(Recycled Water and Lystek D3)

Recycled Water

- Existing RW system – onsite and adjacent parcels (~1 mgd)
- FSSD does not own water rights to most of treated effluent
- Recycled Water Master Plan scheduled for FY26/27
- Concerns:
  - Does a reduction in FSSD discharge negatively impact the marsh (DO, salinity)?
  - Can the program be economically feasible given availability, quality, and affordability of Lake Berryessa water?

FSSD-Lystek Direct Digestate Dilution (D3) Project

- P3 with Lystek International, on-site regional biosolids treatment facility producing Class A materials certified by the CDFA as a fertilizer product
- In 2023, FSSD and Lystek jointly implemented a program where Lystek would dilute hauled biosolids (25-30% solids) with FSSD digestate instead of FSSD utility water
  - Screw press flow rate reduced
  - Lower volume of high nitrogen return water
  - Nitrogen ends up in the fertilizer product where it can be beneficially used

D3 Project (cont.)

	Pre D3 Implementation	Post D3 Implementation
Est. Average Filtrate Flow	76,600 gpd	37,100 gpd
Avg. Filtrate N	900 mg/L	900 mg/L
Est. kg/d N Returned to Headworks	262 kg/d	127 kg/d

Reduction of 135 kg/d through D3 program, or ~12.5% reduction in effluent TIN

Nature-Based Solutions

Resiliency Planning

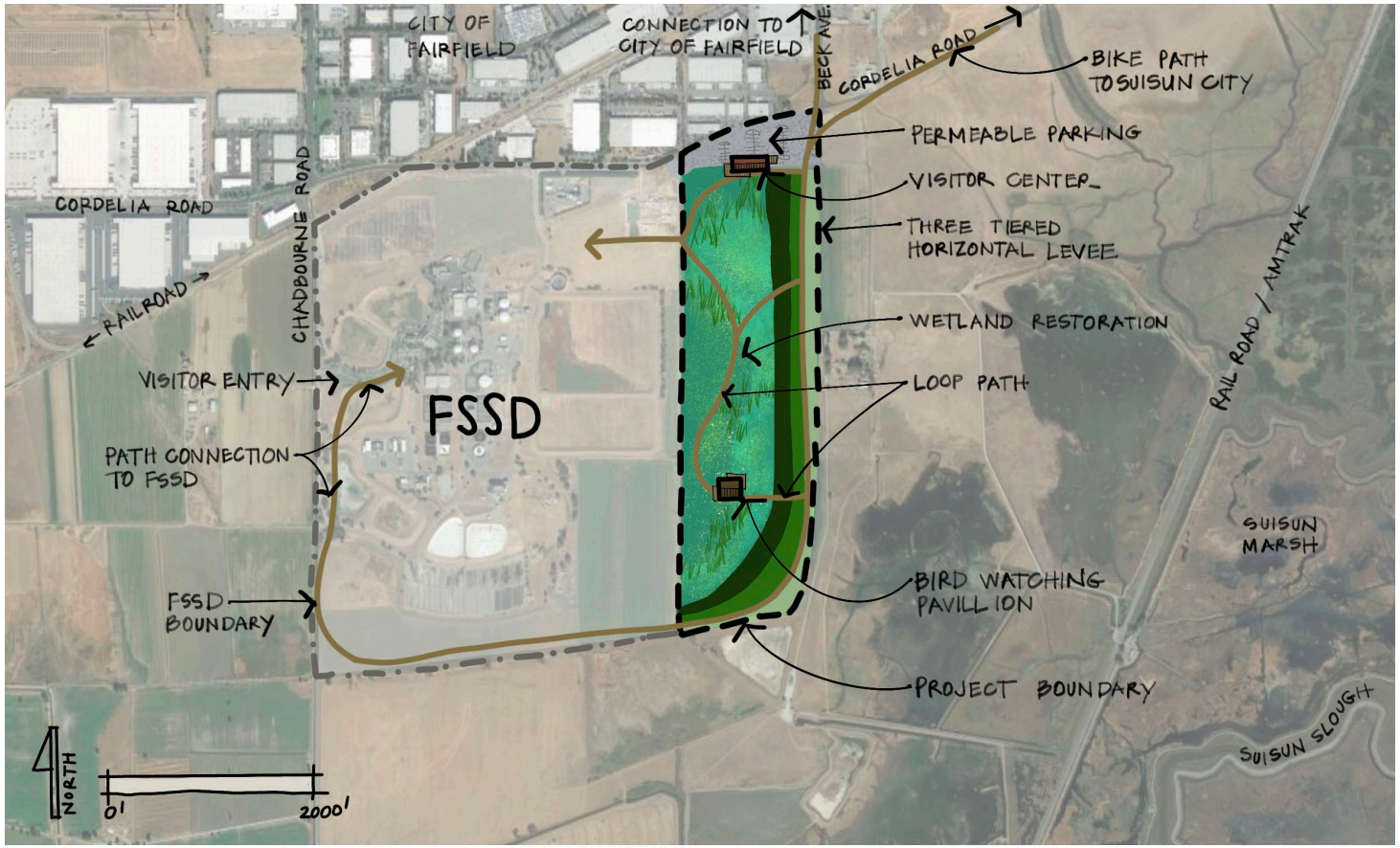
- The Vision: A flexible, plant-wide strategy delivering multi-benefit projects for sustainability and resilience
- The Approach: Integrates plant operations, natural systems, and community benefits. Organizes projects into near-, medium-, and long-term implementation.
  - Near term: Site improvements (e.g., Native Landscaping)
  - Medium term: Habitat and buffer systems (e.g., hedgerows, basin wetlands)
  - Long term: Transformational projects (e.g., community treatment wetland)

NbS – Potential On Our Property…

Community Treatment Wetland

Construct a 100±-acre treatment wetland

- Reduce nutrients reaching the San Francisco Bay
- Sea-level rise adaptation and resilience for FSSD and surrounding properties
- Equitable access to open space and walking trails



Treatment Wetland Concept Design - Challenges

- EPA WQIF-funded pre-design effort resulted in a Basis of Design Report, 30% concept plans, and a document of research questions
- Key findings:
  - **Permitting**: major construction in Secondary Marsh Management Area
  - **Construction**: significant need for imported fill (huge cost driver), primarily for berms that are wide enough to support heavy equipment for O&M, and flood protection berm
  - **O&M**: consideration for seasonal operational changes with manual slide gate controls, concerns with vegetation/silt management over time considering potential habitat value and need to consistently meet nitrogen discharge limit

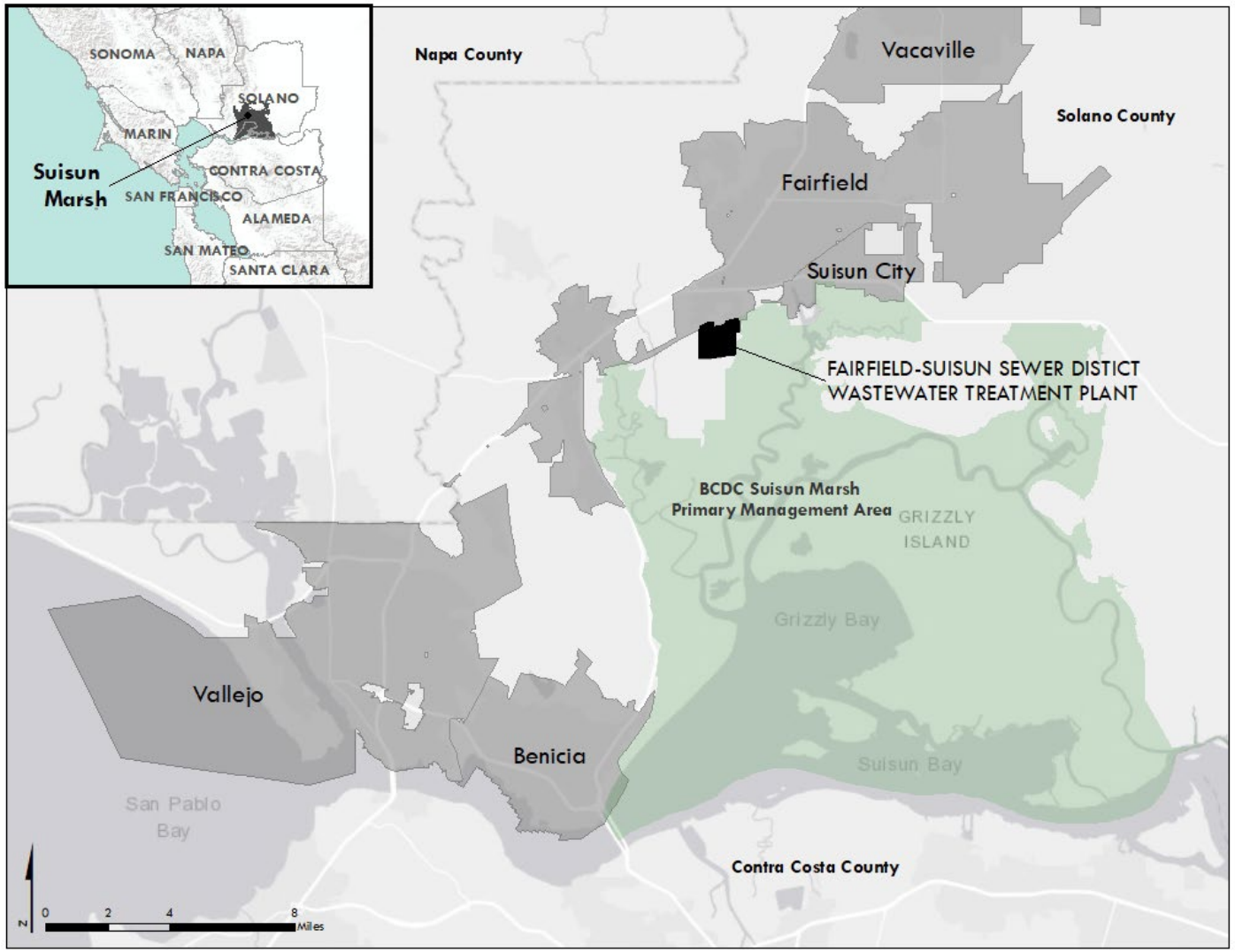
Suisun Marsh Studies

Suisun Marsh: A huge Natural Treatment System

Suisun Marsh Research (116,000-acre)

- the nation's largest brackish water marsh
- the largest wetland on the Pacific Coast
- Supports abundant plant life
- Stopover for 1.5 million migratory birds traversing the Pacific Flyway each year

- **How is the Marsh using FSSD's discharge?**
  - **Research proposal with UC Davis (Dr. John Durand)**

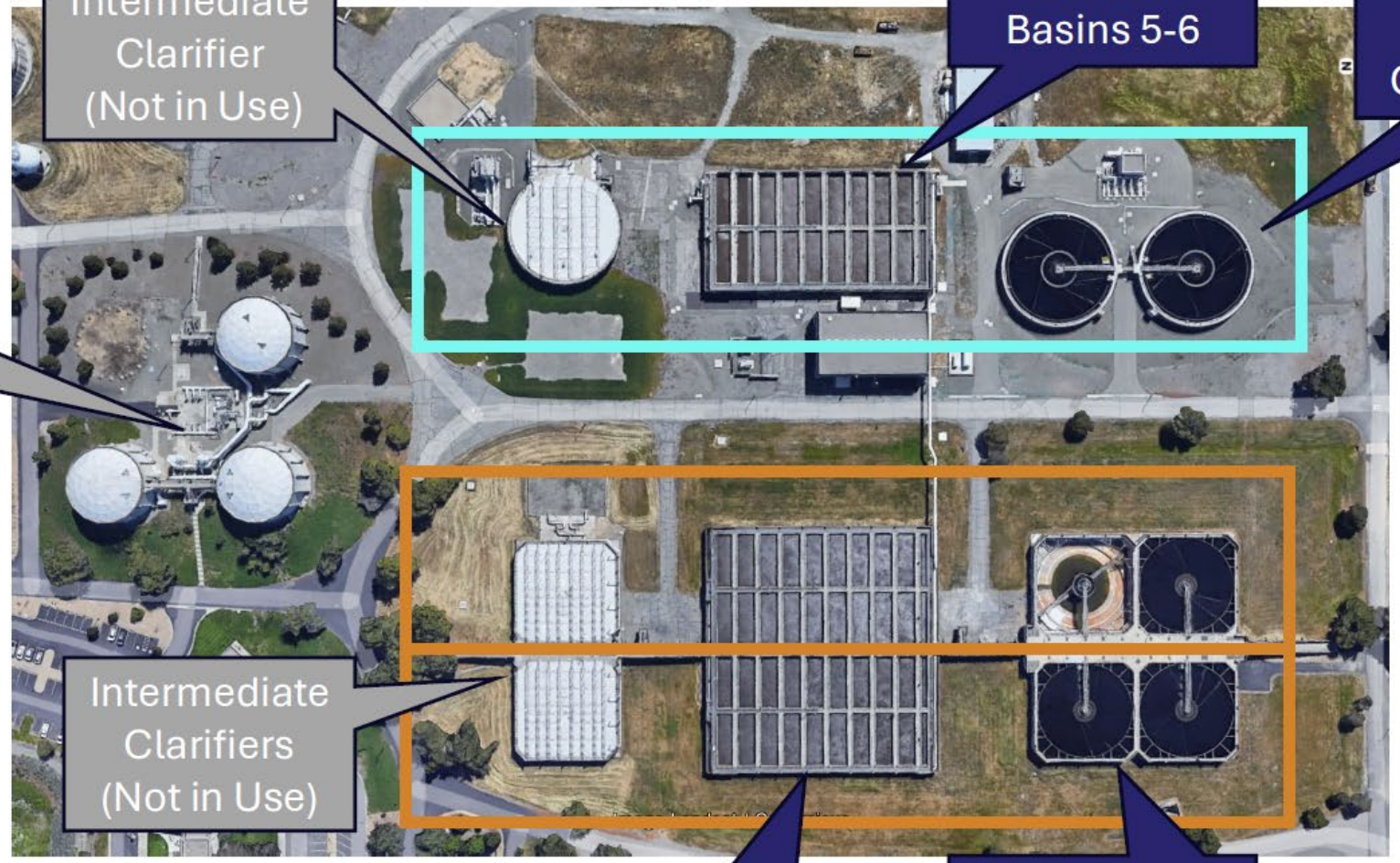


UC Davis Suisun Marsh Nutrient Examination

- Purpose: to study how nutrients from the FSSD WWTP move through Suisun Marsh and influence the ecosystem
- Key Findings:
  - Nutrients are highest at the outfall and decline rapidly. By Grizzly Bay, nutrient signals are undetectable
  - No clear impact to food web from effluent nitrogen, according to isotope analysis
- Evidence supports possible site-specific nutrient regulation for FSSD (i.e., credit for marsh attenuation)
- Next Step: Working with SFEI for additional monitoring and modeling of nutrient transport and ecosystem effects, building the technical basis for adaptive, site-specific nutrient management

Treatment Plant Upgrades

Existing Secondary Process



Train C
(Constructed in 2006)
(w/ anoxic zones)
15-30% TIN removal

Train B

Train A
(no anoxic zones)
0% TIN removal

Project Background

- Multi-benefit project:
  - Nitrogen removal to meet regulatory limits
  - Improvements to process stability and settleability
  - Standardize treatment process across all three secondary trains
  - Combine work with needed R&R improvements
  - Electrical improvements help facilitate future upgrades to secondary process

Board Approval Timeline

Project Phasing

Phase 1 (2028)

Update A/B Trains:

- Create anoxic zones
- Install anoxic mixers
- Replace aeration diffusers
- Structural rehabilitation
- Electrical backbone

FSSD Final TIN Limit = 880 kg/d

Modeled Phase 1 = 892 kg/d

Phase 2 (2031, Scope/Timing TBD)

Add mixed liquor recycle in Trains A thru C

Option to add additional baffling for multiple anoxic zones

Modeled Phase 2 = 538 kg/d

Optimization (TBD)

Air flow control improvements

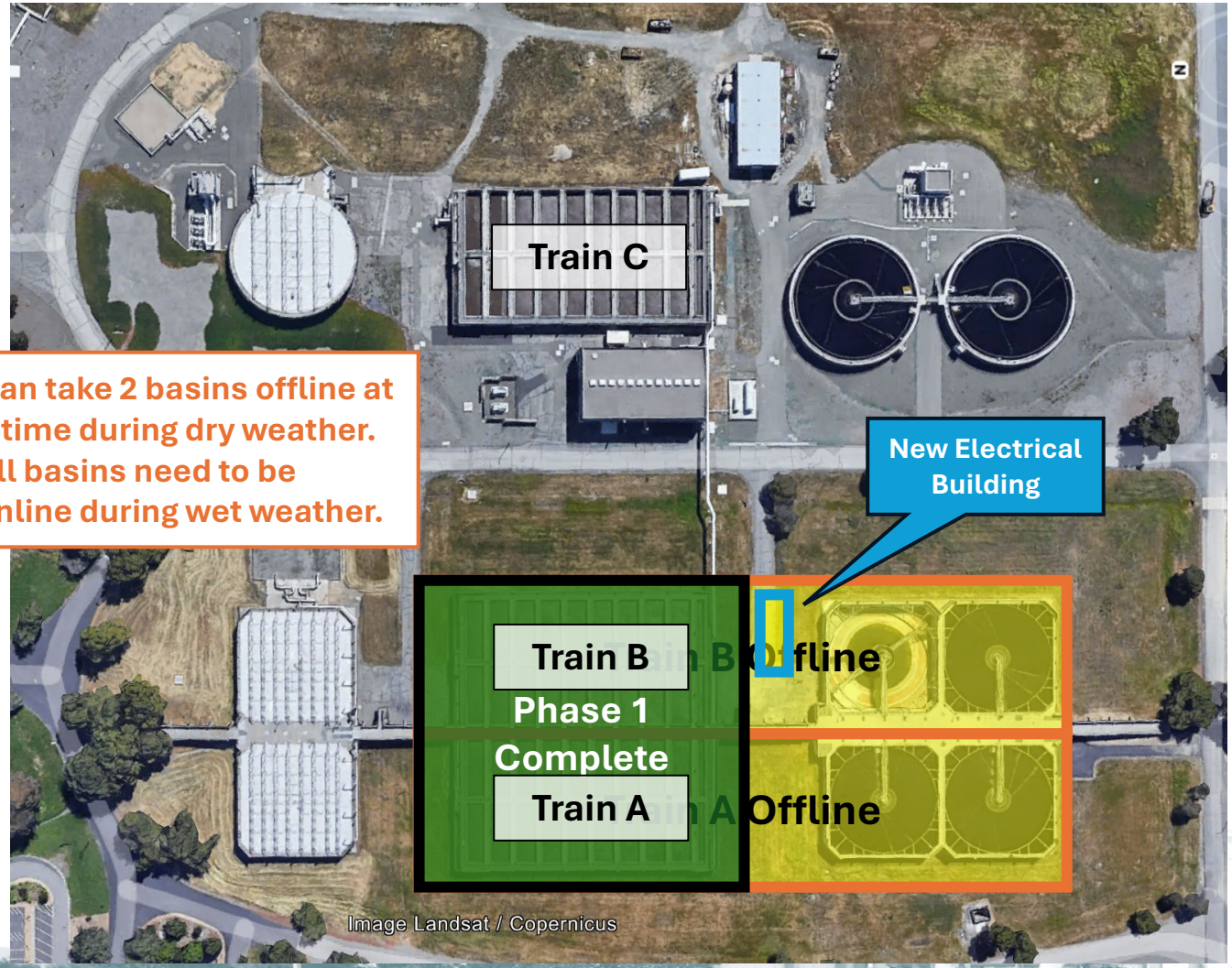
Ammonia-based aeration control

Future intensification

Why Deliver the Project in Phases

- “Right size” the initial improvements to control cash flow
- Monitor scientific research developments in San Francisco Bay and Suisun Marsh
- Provide flexibility for potential changes to final nitrogen limits, compliance timeline, and trading program
- Observe actual nitrogen removal performance with Phase 1 project (currently trending better than modeled)
- Evaluate other nutrient removal opportunities and technologies

Construction Sequencing



- Can take 2 basins offline at a time during dry weather.
- All basins need to be online during wet weather.

Jul 2025	NTP
Dec 2025	Electrical building & MCCs approved
Apr-Jul 2026	Train B modifications; Temp power for new equipment
Jul-Oct 2026	Train A modifications; Temp power for new equipment
Mar 2027	Electrical building delivered
Fall 2027	Substantial completion

Total Project Cost (Phase 1 Anoxic Zones)

Item	Cost
Preliminary Design	$197,520
Phase 1 Final Design	$930,460
Construction Cost (Bid)	$12,390,000
ESDC	$665,630
Materials Testing/Special Inspection	$50,000
Change Orders to date	$263,691
Other Potential Changes	TBD
Total	**$13,657,301**

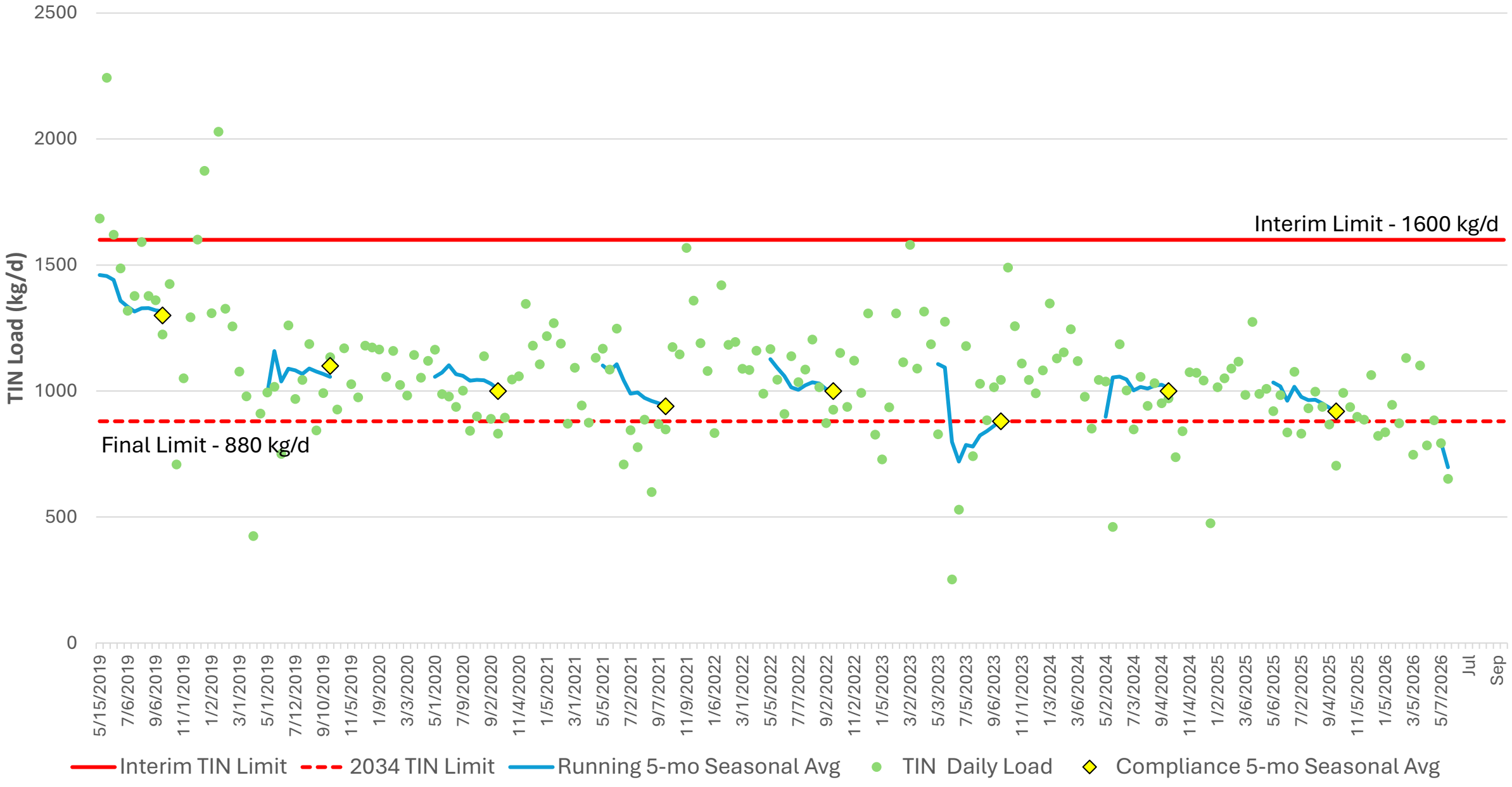
Engineer's Estimate
Hazen and Sawyer
$16,345,000

6 bidders on project
Bid range: $12.4 - $18.2 M

Bid Award to
C. Overaa & Co.
$12,390,000

Wrap-Up

FSSD Nutrient Loads



Nutrient Pathway Options

	Marsh Research	Recycled Water Master Plan	D3 Project	Community Treatment Wetlands (30% Design)	Phase 1 WWTP Upgrades
Cost	$200K	$430K	$150K ($30K by FSSD)	$53M to $129M *(depending on import fill)*	$12.4M
Schedule	2 Years (2026)	2 Years (2029)	6 Months (2023)	9 Years	2 Years (2026-2028)
Roadblocks	Regulatory Uncertainty; System Complexity	Cost of treatment and distribution infrastructure	Operational coordination	Funding/ Permitting	Funding/Rate Impacts
Est. Nitrogen Discharge	NA	TBD	945 kg/d	570 kg/d	892 kg/d
Other Benefits	Improved Management	Water Supply	Beneficial Reuse of Nitrogen	Habitat/ Community/ Other Pollutants	Operational/ settling stability

Facing the Nutrient Challenge

- FSSD has explored multiple avenues to meet current TIN limits and provide future flexibility
- Advanced “easy” projects (e.g., D3), committed to early action on major secondary treatment upgrades, while hedging against future changes.
- Strongly considered NbS given FSSD’s favorable geography (ownership of open land adjacent to existing marsh) but found not to be cost-effective and would not have been able to meet compliance timeline.
- Open to future developments in nutrient trading program as a seller, given the right structure and fit. Phase 2 could be optimized for trading (up to ~300 kg/d initially).

Questions