

Student-Led Wastewater Design Strengthened by Professional Engineer Collaboration

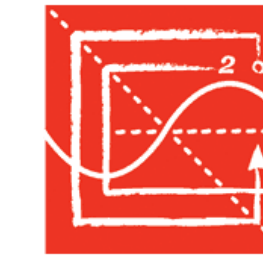
Chincoteague Wastewater Treatment Plant Improvements

2026 NCEES Engineering Education Award



PROJECT IMPACT

Licensed P.E. collaboration changed how students thought, designed, and justified a constructible wastewater solution that protects public health, improves coastal resilience, and supports long-term community growth.

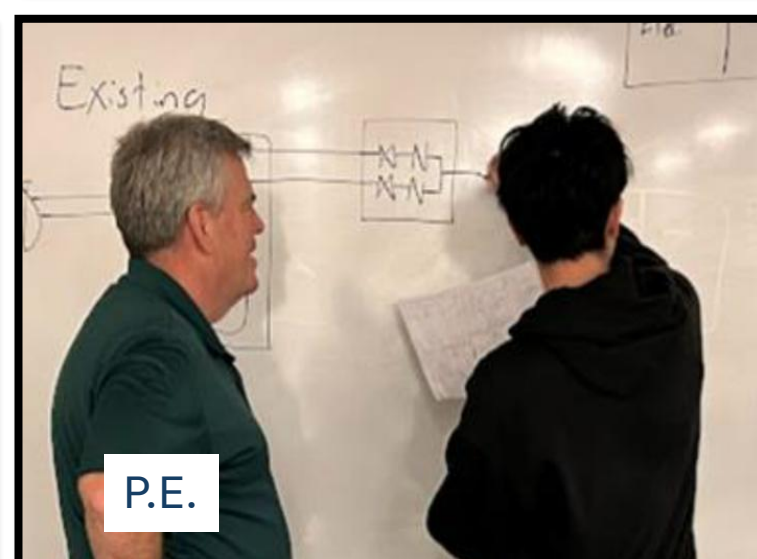


NCEES

1. DESCRIPTION AND CHALLENGE

THE PROJECT AT A GLANCE

- Students worked with licensed P.E.s on a real coastal wastewater facility to protect public health, maintain service, and design a constructible solution for future growth.
- Owned and Operated by Hampton Roads Sanitation District (HRSD) in Hampton Roads, Virginia
 - Existing Capacity:** 39,500 gpd
 - Proposed ADF:** 130,000 gpd
 - Peak Flow:** 260,000 gpd
 - Owner:** HRSD
 - Site:** Constrained coastal WWTP
 - Key Constraints:** flooding, corrosion, sea level rise, permitting, constructability
- The students did not just receive advice. P.E. review changed the recommended process, phasing, and constructability strategy.



Licensed P.E.s did not just advise the students; they changed how the students thought, designed, and justified the final wastewater solution.

PROJECT DRIVERS



CAPACITY

Meet current demand and accommodate future growth



COASTAL RESILIENCE

Design for flooding, corrosion, and sea level rise



OPERATIONS

Maintain treatment reliability and operational flexibility



COST EFFECTIVENESS

Optimize lifecycle cost and value to the community

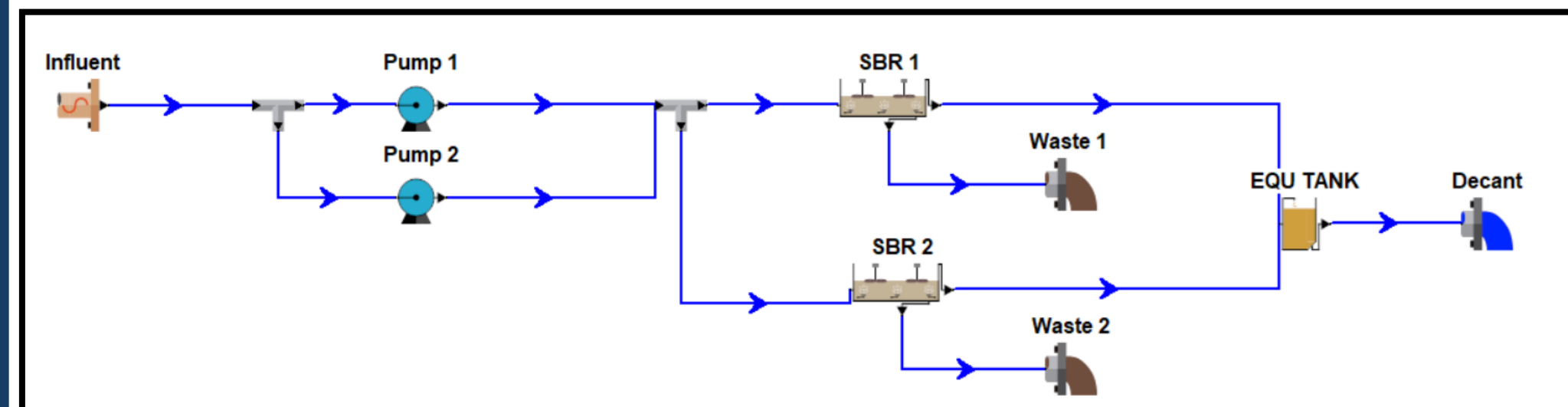


COMPLIANCE

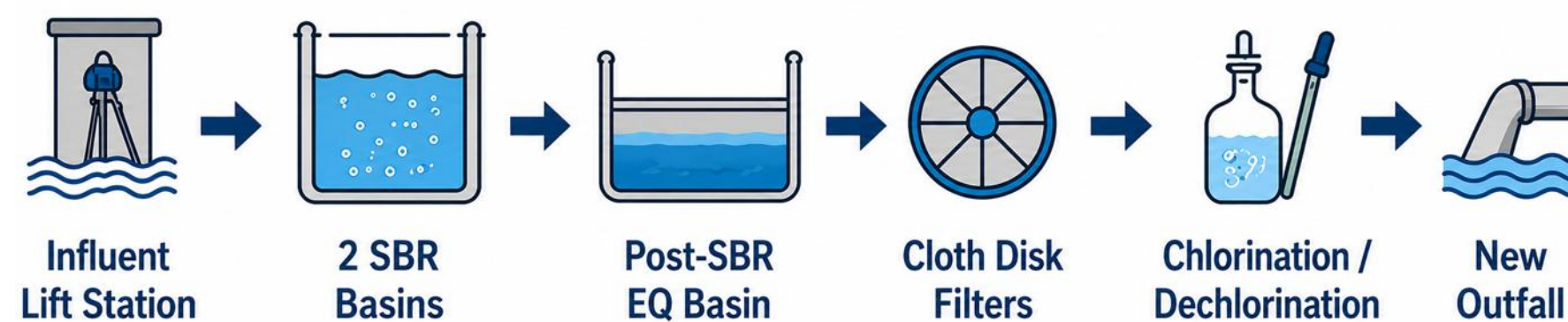
Meet VPDES requirements and protect Chincoteague Bay

2. RECOMMENDED DESIGN SOLUTION

BIOWIN PROCESS MODELING



PROCESS FLOW DIAGRAM



Students and licensed P.E.s reviewed the existing WWTP P&ID and site constraints before revising the recommended design.

ALTERNATIVES EVALUATED (MADM)

1	MBBR	Moderate performance, Higher O&M
2	MBR	High performance, High capital & O&M
3	SBR (SELECTED)	Best overall balance, Selected alternative
4	EAAS	Complex operation, Higher energy

SBR selected for flexibility, compact footprint, cost efficiency, and nutrient removal performance.

KEY DESIGN METRICS

Selected Process SBR	2 SBR Basins
Post-SBR EQ 0.024 MG	Construction Cost \$2.41M
O&M \$92,000 per year	50-Year Lifecycle Cost \$7.37M
Construction Duration 5 months	Envision Score Silver (37%)

3D MODEL SITE LAYOUT



PROJECT OUTCOMES



Improved resilience in a coastal environment



Protected public health and Chincoteague Bay water quality



Expanded capacity for future growth and seasonal peaks



Maintained operations through phased MOPO planning

3. NCEES CRITERIA DEMONSTRATED

How professional engineer involvement strengthened student learning and project outcomes

CRITERIA

EVIDENCE

RESULT

1

Collaboration with Licensed P.E.s

- Licensed P.E.s reviewed process alternatives and design criteria
- Students brought technical questions and received direct feedback
- Faculty integrated and validated decisions with P.E. input

Meaningful P.E. collaboration demonstrated

2

Public Health, Safety & Welfare

- Improves wastewater reliability and effluent quality
- Protects Chincoteague Bay from nutrient pollution
- Supports public health in a vulnerable coastal community

Clear public benefit demonstrated

3

Multidiscipline Participation

- Environmental: treatment process and compliance
- Civil / structural: hydraulics, tanks, and infrastructure
- Construction, cost, and permitting were integrated

Integrated engineering practice

4

Student Learning Proven with Evidence

- SBR design was revised after P.E. review of footprint constraints
- MOPO planning changed after reviewing HRSD operational needs
- Geotechnical uncertainty informed the test-pile recommendation

Before-and-after learning is visible

5

Real-World Impact & Engineering Awareness

- Addresses wastewater challenges in a real community
- Shows how engineering decisions affect health and the environment
- Builds leadership, communication, and professional responsibility

Strong connection to real-world outcomes

PROJECT IMPACT

Student Learning

P.E. feedback directly changed the SBR design, MOPO planning, and geotechnical recommendations.

Public Benefit

Improves wastewater reliability and helps protect Chincoteague Bay water quality.

Constructible Solution

Compact SBR layout supports phased construction, operational continuity, and site constraints.

Long-Term Value

Cost-efficient, resilient solution designed to support future community growth.

Real collaboration. Real engineering. Real outcomes.