South Bethany

Canal Water Quality Committee (CWQC)

State of the Canals -

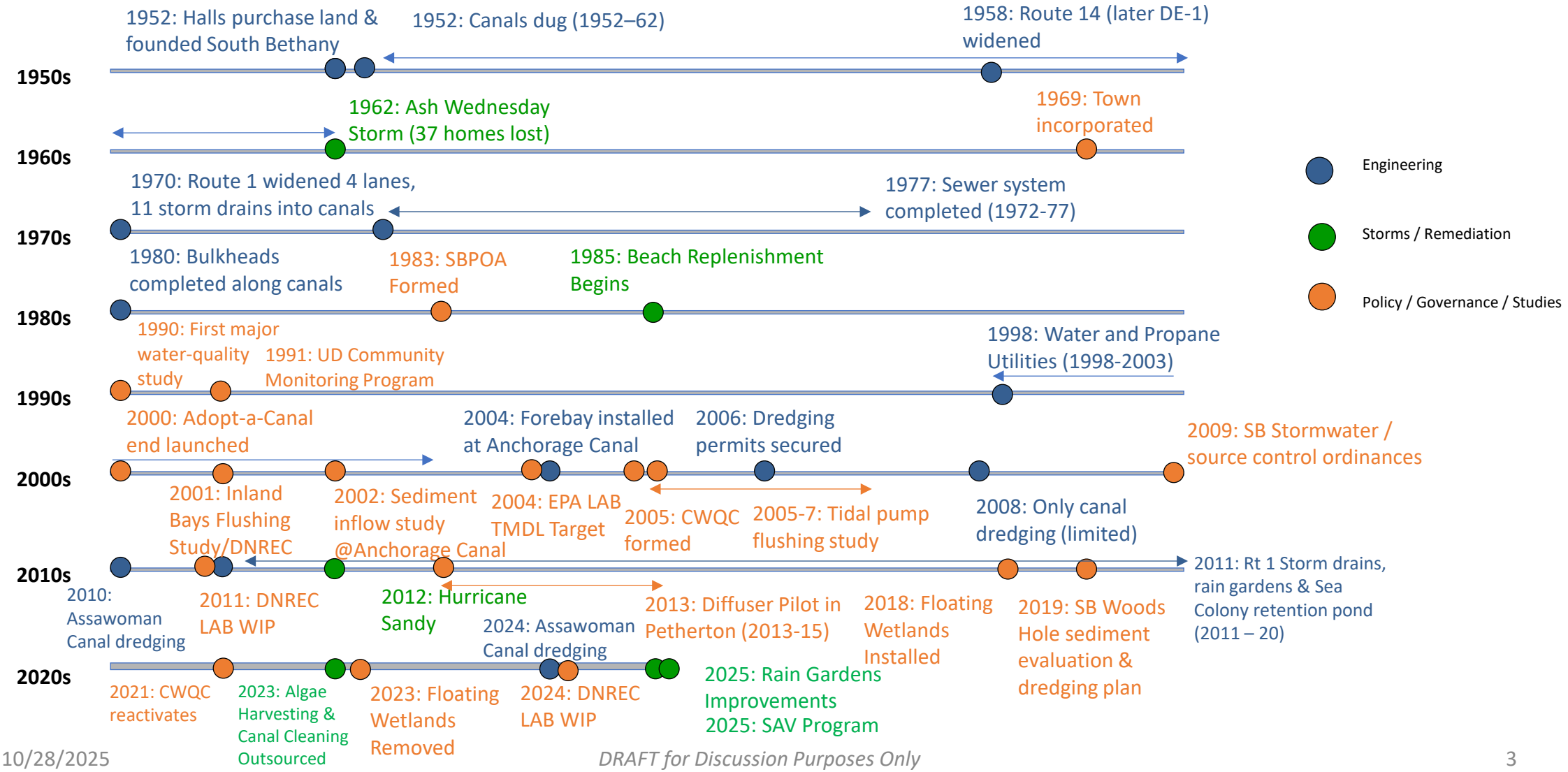
Historical Perspective & Need for Value-Engineered Improvements

October 24, 2025

Shift from Experimenting to Engineering

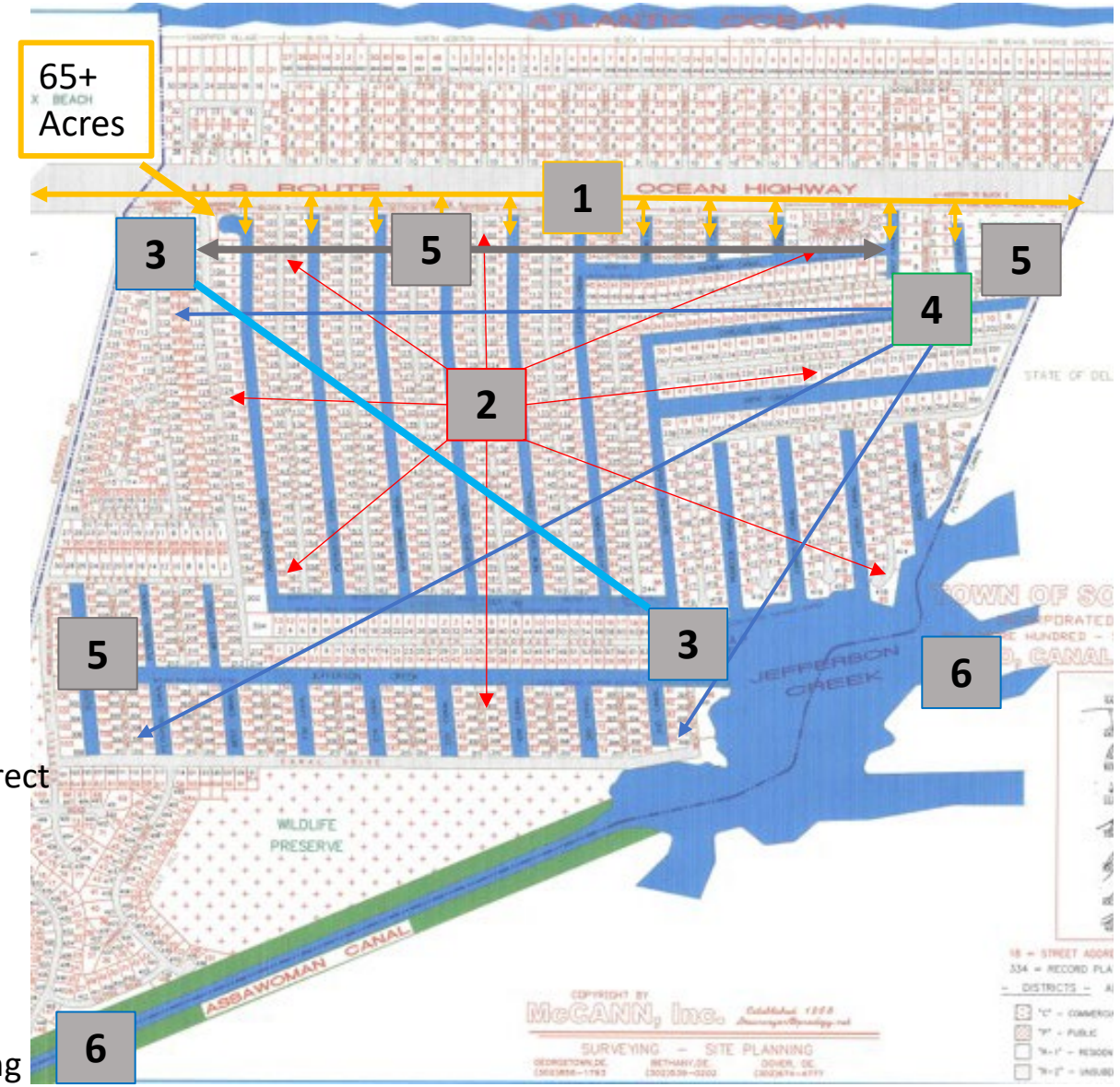
- ***Canals & Beaches are distinctive assets*** - affecting property values and the Town's brand.
- ***Structural design -*** of the canal system is a significant contributor to our ongoing issues;
- ***Increased Contaminants*** - recurring and increasing stormwater runoff and poor water circulation compound the situation.
- ***Deferred Maintenance*** - we have not kept up with routine maintenance or necessary investments.

History of South Bethany & Canal Network



What Impacts Our Water Quality and Flooding Risk

1. **Route 1 Stormwater:** Direct contaminated runoff from the highway (11 pipes) and 65+ acres from adjacent northern communities;
2. **Townwide Stormwater & Runoff:** Direct and Indirect contaminated runoff from roads and properties;
3. **Lack of Circulation:** Single-entry-point canal system structure results in very little circulation and limited tidal flow;
4. **Other Contamination:** fertilizers, pesticides, homeowners' direct drains, vegetation, and retired septic systems;
5. **Sediment Build-Up:** canal shallowing from decades of stormwater sediment, decayed organic matter, and contaminants, with only one limited dredging in our 70+ year history in 2008; and,
6. **Inland Bays**: similar challenges with the contiguous areas bring additional contaminants and resiliency risks.



Studies Have Confirmed the Challenges

- *"Observations over the last several decades have indicated a decline in water quality in South Bethany canals. The canal system and resulting infrastructure were developed prior to Federal Clean Water Act as well as water quality and storm water management regulations instituted by the State in the 1990's. …*
- ***… The area of impervious surfaces (roads, roofs) and direct runoff pathways into the canals, has [further] contributed to the issue**."*

- South Bethany Canals Sediment Evaluation, August 15, 2019. Woods Hole Group.

Studies Have Confirmed the Challenges (Con't)

- The South Bethany Canals Flushing Study, Entrix 2005, illustrated that there is essentially **no flushing at the ends of the canals** (Figure 2, Residence Time in Canals)

- The resulting finding is that the **canals shown in red act as stormwater management ponds** since they have no significant exchange of water due to tidal action.

The South Bethany Canals Flushing Study – Entrix 2005

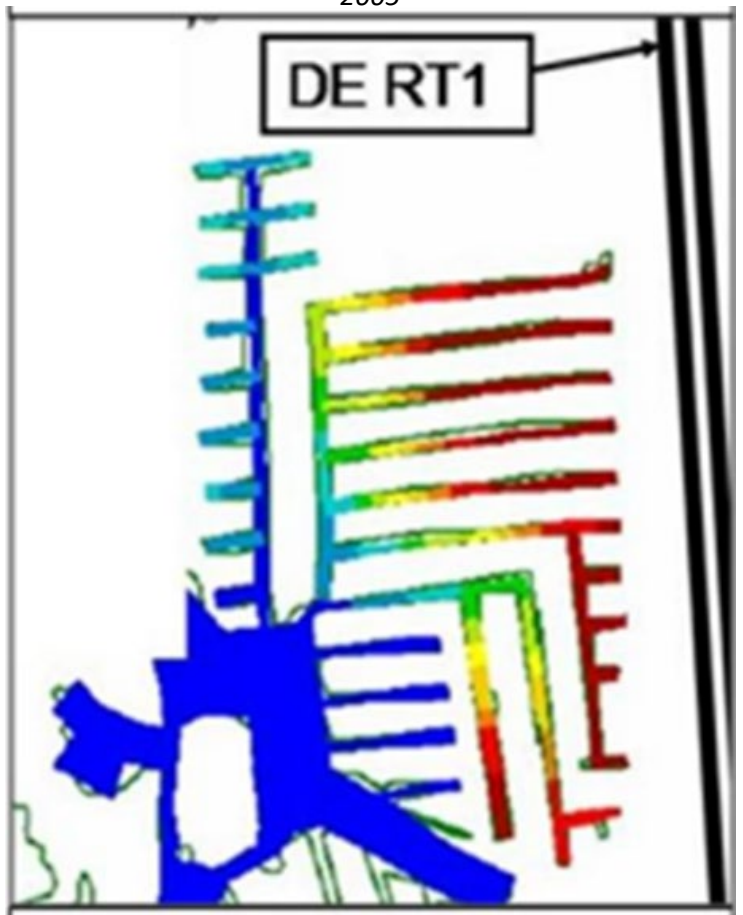


Figure 2. Residence Times in Canals

Blue – 1 day

Green – 1 month

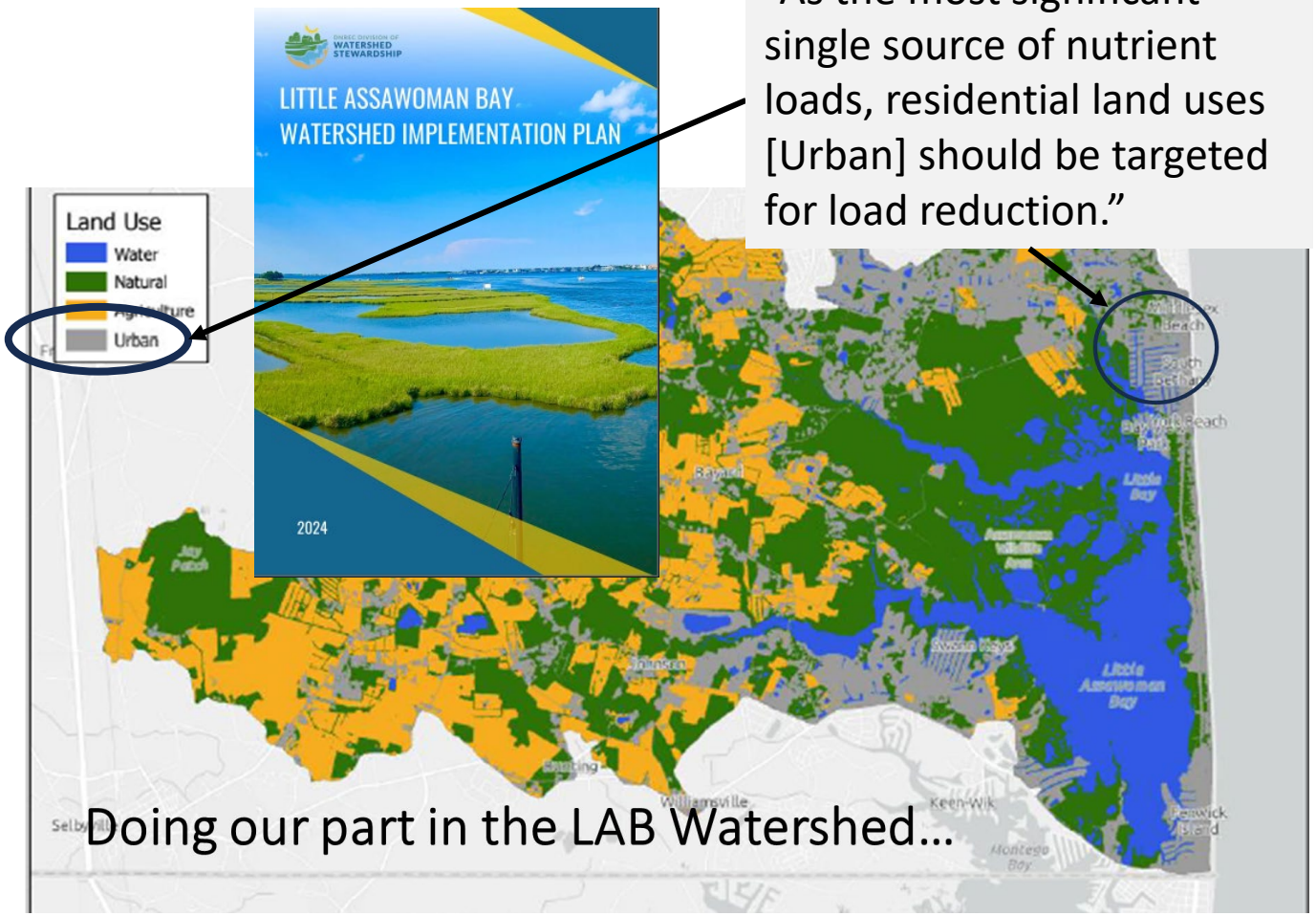
Red – more than 3 months; and likely much longer, if at all

Impact of & SB's Role in the LAB Watershed

"The Little Assawoman Bay (LAB) Total Maximum Daily Load (TMDL), established in 2004, requires a 40% reduction in both nitrogen and phosphorus for the watershed to meet water quality standards. …55% of the assessed waters in the [LAB] are currently considered impaired." - *Little Assawoman Bay Watershed Implementation Plan, 2024. DNREC*

- DE has not met these standards, with limited improvements from 1990 to 2022.
- Best Management Practices (BMPs) are key to reducing TMDL, and where SB should focus efforts: impervious surface elimination, nutrient management, runoff reduction, and stormwater treatment.

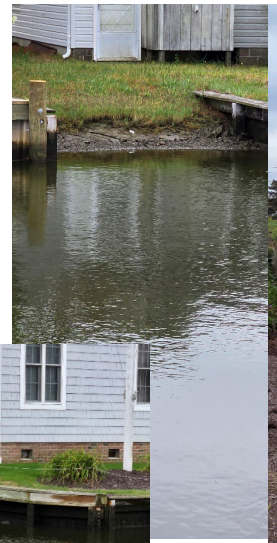
"As the most significant single source of nutrient loads, residential land uses [Urban] should be targeted for load reduction."

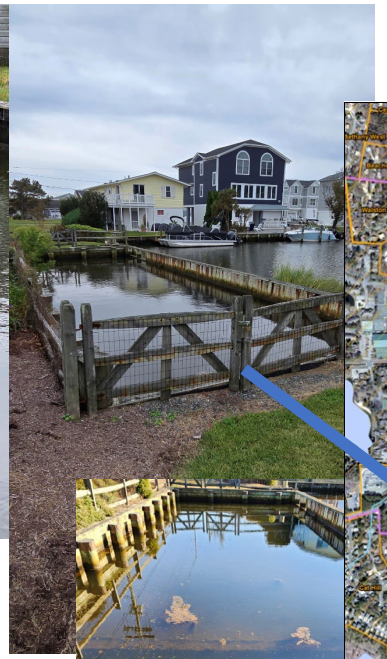


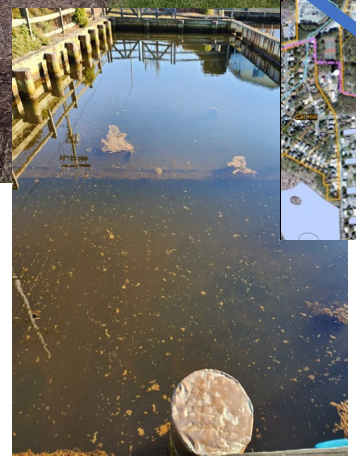
Issues today: contamination, sediment…

…algae, organic matter, inversions…

…and bulkheads, canal ends, ramps & only one significantly undersized forebay.





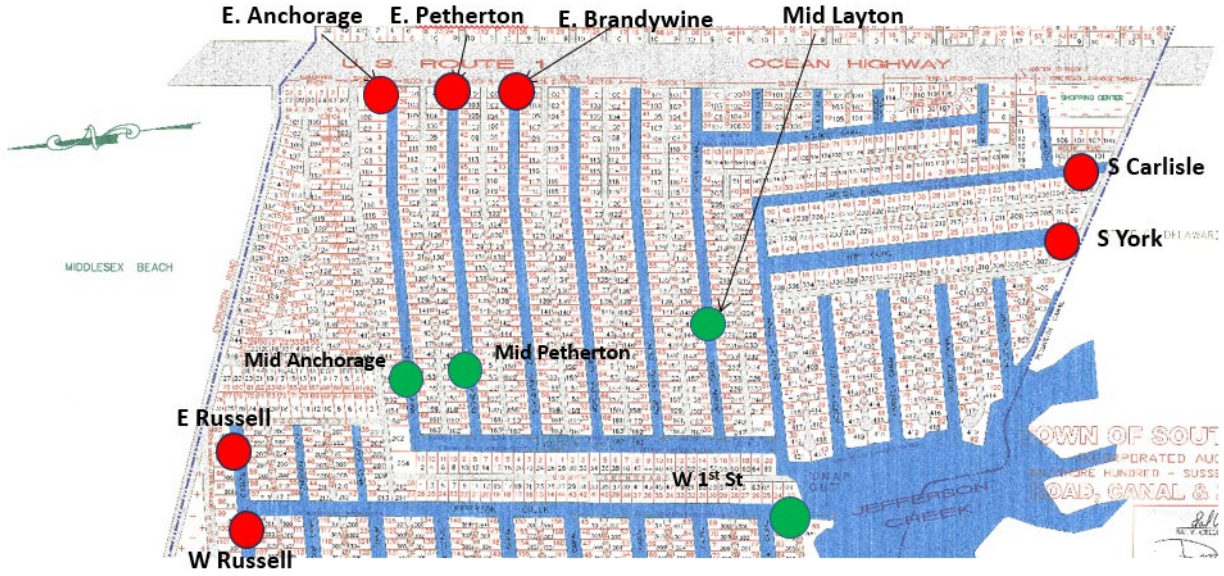


CONCEPTUAL POLLUTION AND STORMWATER CONTROL STRATEGY FOR THE ANCHORAGE CANAL DRAINAGE AREA, CIB 2010

Robust 30+ Years of Water Quality Data…

Eleven Monitoring Sites Include 4 Mid Canal and 7 Dead End Locations

Generally, sites furthest from Bay have lowest DO



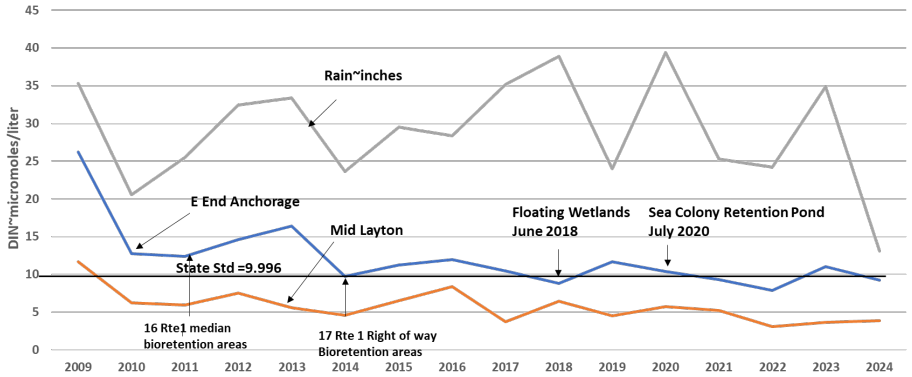
- Citizen Water Quality Monitoring Program
  - Administered by the University of Delaware, Sea Grant Program, Since 1991
- Volunteer team of six
  - Will Case, Mark Giler, Phil Iacangelo, Bill MacLachlan, Jack Whitney, Dave Wilson
- Monitoring throughout the year
  - May-Sept once a week
  - October and April twice a month
  - November-March once a month
- Parameters monitored
  - Dissolved oxygen (DO), salinity, air and water temperature measured with a digital meter
  - Water clarity measured with a Secchi disk
  - Water samples collected for bacteria, total (TN) and inorganic (DIN) nitrogen, total (TP) and inorganic (DIP) phosphorus (DIP), and harmful algae blooms
  - Observations of algae accumulations and fish kills

…highlight continued water quality challenges

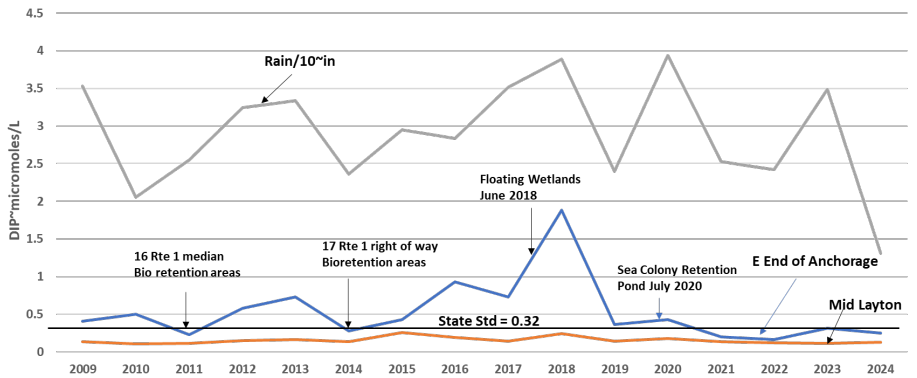
Blue Lines = Canal Ends

Orange Lines = Mid-Canals

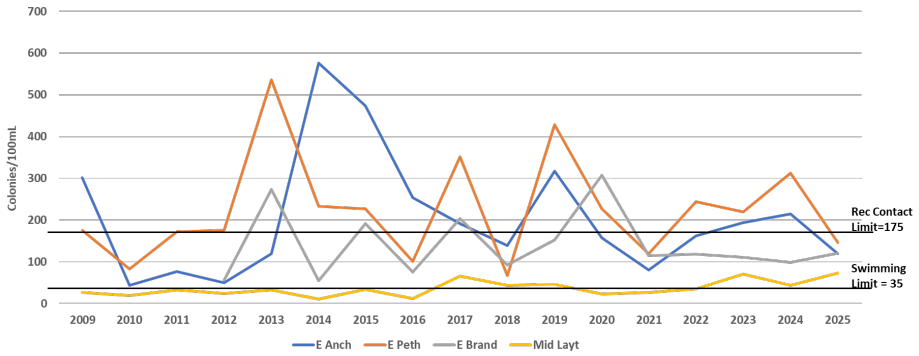
Dissolved Inorganic Nitrogen



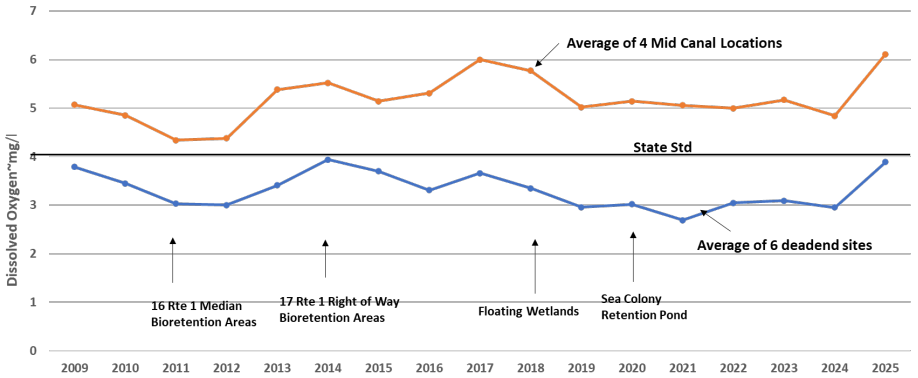
Dissolved Inorganic Phosphorus



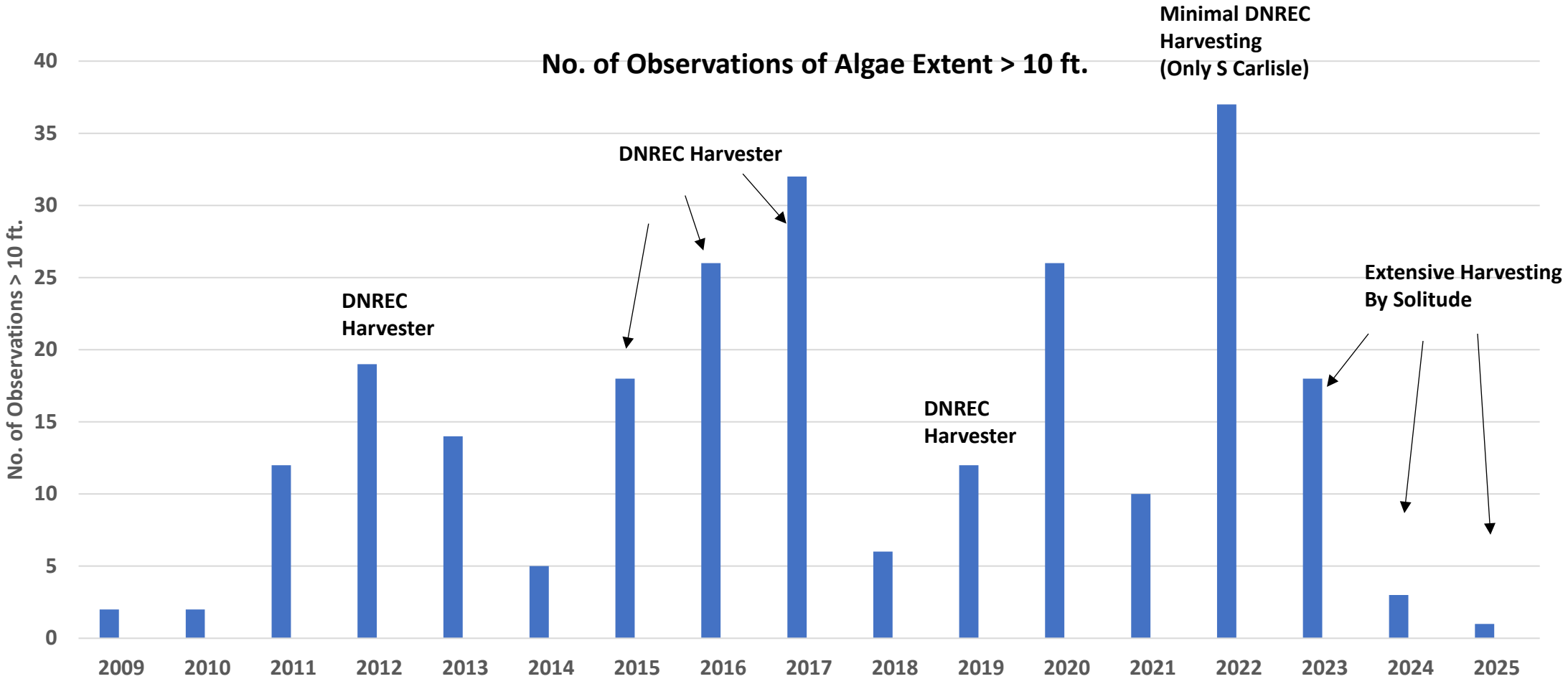
Bacteria



Average Dissolved Oxygen (DO)



Algae remains an issue, but newer Harvesting approach & consistency appear to help



Where do we go next?

Remediation and mitigation actions must address the structural and ongoing contamination factors, which is only possible with a long-term engineering-driven view.

Our challenge is how to prioritize all the possible options to get “best bang for the buck”…

Engineering Policy / Governance / Studies * Potential Capital Budget Item

- **Selectively update Town regulations and enhance enforcement of contamination activities (i.e., fertilizers, grass clippings, direct waste into canals, vegetation overhang, bulkheads);**
- **Improve management of all the Town’s and Route 1 stormwater drains (e.g., rain gardens);**
- **Installation of more forebays in the dead-end canals*;**
- **Explore approved, eco-friendly water treatment options;**
- **Divert Route 1 stormwater completely outside of South Bethany;**
- **Increase the circulation within the Canal System (e.g., inter-canal connections*, tidal flow connection with ocean, new inlet to the south);**
- **Vacuum dredging to remove existing contaminants, improve tidal flow and navigability*; and,**
- **“Living” berms and shorelines, enhanced drainage systems, and raised bulkheads*.**

As such, CWQC Recommendation is to:

Authorize a comprehensive engineering study to understand the benefits to water quality and water levels related to possible capital infrastructure projects.

Objective: defining what to do and in what order and making clear the obligations between the Town and Residents.

Benefits:

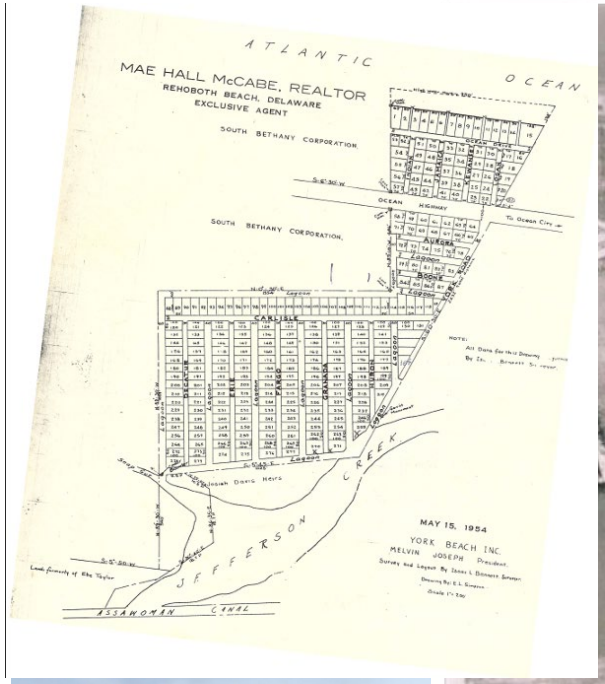
- ✓ Provides a comprehensive fact base for decision making and funding support.
- ✓ Establishes engineer-supported improvement targets and expectations.
- ✓ Enables objectivity to evaluate options and manage overall risks to South Bethany.
- ✓ Provides additional information to align with other efforts across Little Assawoman Bay (e.g., LAB watershed implementation plan, CIB).

Next Step for Consideration

1. Formation of a new Task Group
   - Include Town staff, members from CWQC & Resiliency Committee, current resiliency engineering firm, GIS group, and other external experts (e.g., DNREC, CIB, DelDOT, UD);
   - Objective to frame and define the scope for an engineering project
2. Update capital planning and projects report
   - Would include pursuing additional funding support from grants and joint efforts (e.g., DNREC water quality, FEMA/DEMA, DelDOT)
   - Town financing plan for capital improvements (e.g., bonds, special assessment)

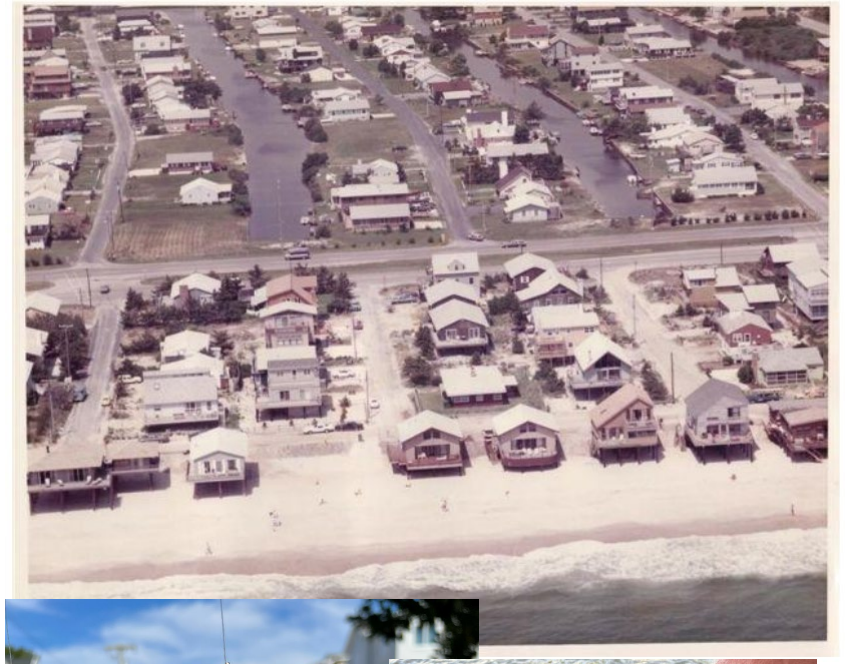
Our Canal Network is a 75+ year-old asset that requires more investments to enhance community enjoyment, preserve the value of our properties, and sustain South Bethany's distinctive brand.

1954 Original Plans



1961 Aerial View of South Bethany

1986 Aerial View of South Bethany



Thank You.