

Meeting With Shawn M. Garvin, Regional Administrator and Water Protection Division Participants Environmental Protection Agency, Region III – September 26, 2012



Welcome From: Town of South Bethany Mayor, Kathleen Jankowski and Council Members Dr. George Junkin, Chair, Water Quality Committee and Sue Callaway, Chair, Community Enhancement Committee

South Bethany's Agenda For Today's Meeting To Communicate To You:

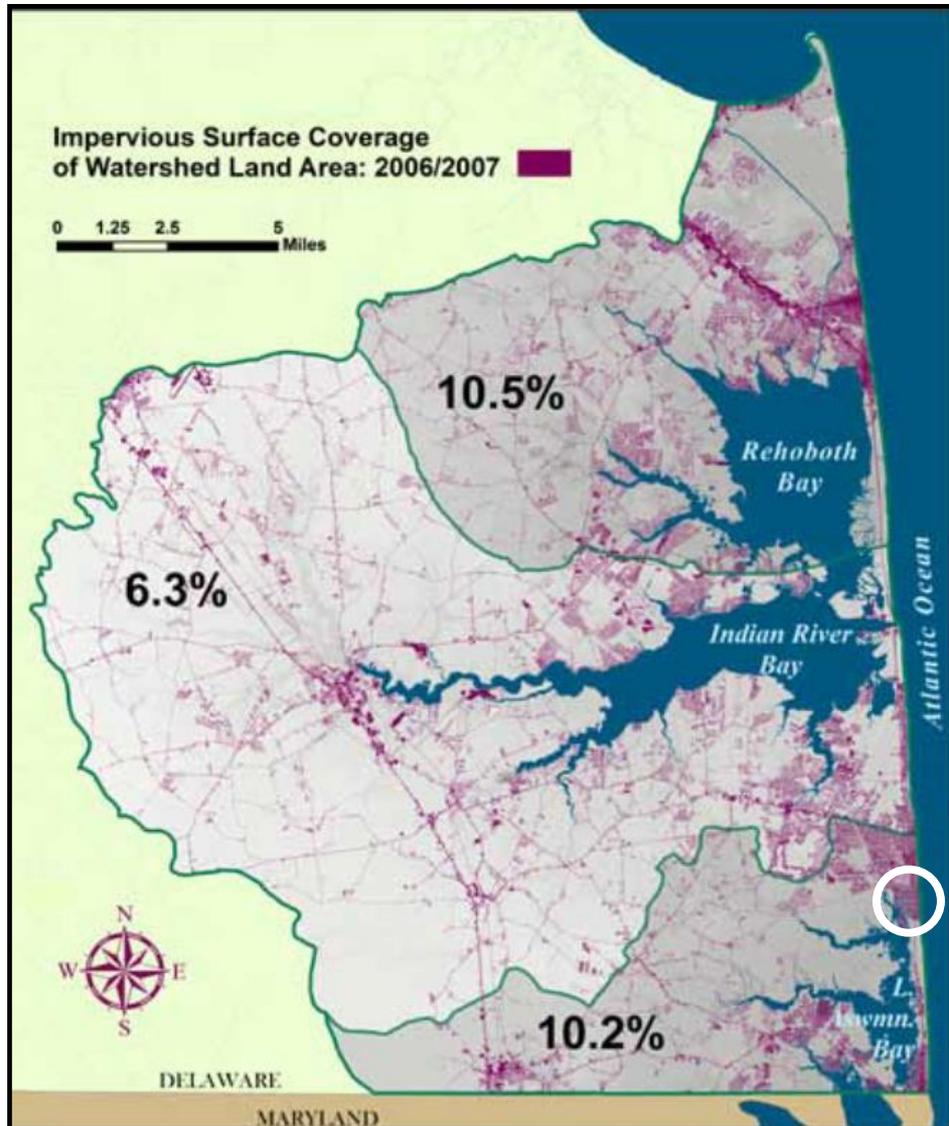
- Who we are and where we are located
- How South Bethany (SB) has developed over the past 60 years
- What the water quality problem is in the Inland Bays, specifically in SB
- The impact of the ocean and inland bays water quality on the coastal economy of SB and other coastal areas in Sussex County, DE
- What actions SB has taken since 1990 to promote water quality improvement
 - SB volunteers have led the research and actions in partnership with the CIB, DNREC, DeIDOT, DOA, and U of DE Sea Grant Program
 - Document the problem – Water quality monitoring and studies
 - Reduce nutrients and bacteria from entering the canals/Inland Bays – by creating Bioretention areas, rain gardens, Town Ordinances and community education
 - Improve Tidal Flushing by researching inlets and Tidal Pumps
 - Limit the amount of nutrients and low Dissolved Oxygen within the canals via a diffuser system
- The need for financial assistance to improve SB water quality.

Town of South Bethany (SB) – Geographic/Demographic Characteristics

- SB is a densely populated coastal urban community developed in 1952.
- Situated on ~ 300 acres located in SE Sussex County, DE, between the Atlantic Ocean, the Little Assawoman Bay and the Assawoman Canal.
- Adjacent to Bethany Beach to the north and Fenwick Island to the south. DE State Route 1 bisects the town from N. to S.
- ~ 1,200 single family homes valued at ~ \$600,000 each with a total home value of ~ \$72 Million.
- Total population is 1,364 with ~421 full-time and 943 part-time property owners.
- Premier water community with oceanfront and canal side properties.
- Tourist attraction and potential retirement community.
- 1/3 Town Revenue from Rental Income.



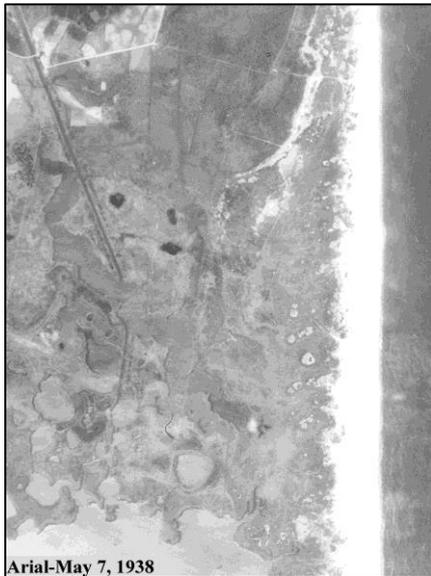
South Bethany is Located in the South East Area of the Inland Bays Watershed and the North East Corner of the Little Assawoman Bay Watershed



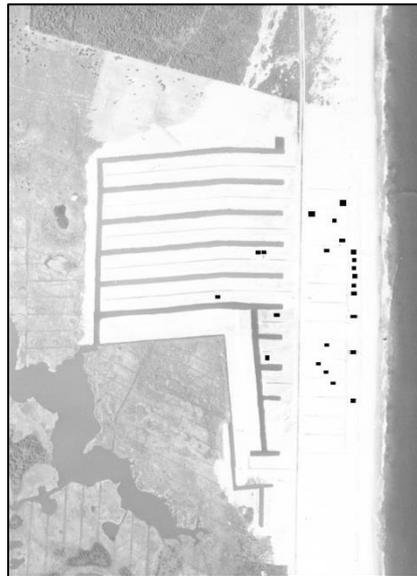
- The map to the left shows the average % of impervious surface coverage of the watershed land area in 2006/2007.
- Impervious surface coverage that comes with development makes stormwater management very difficult. This is one of the causes for water quality degradation that has caused the Delaware Inland Bays to be on the EPA's List of Impaired Waters.
- Other causes for water quality degradation are poor agriculture nutrient management practices, poor sanitary sewer wastewater management practices and other industrial poor management practices (i. e. power plants and factories)

South Bethany's Development Over The Last 60 Years Has Certainly Contributed to the Impervious Coverage Problem

SB was developed in 1952 before the 1990 stormwater management regulations and contains five (5) miles of dead-end canals. These canals are currently used mainly for boating and storm water management. In the past they were also used for swimming, fishing and crabbing. However, due to increased pollution (excess nutrients, high Enterococcus levels and low dissolved oxygen) as a result of stormwater runoff these canals are rarely used for fishing, crabbing or swimming and of concern to many kayakers.



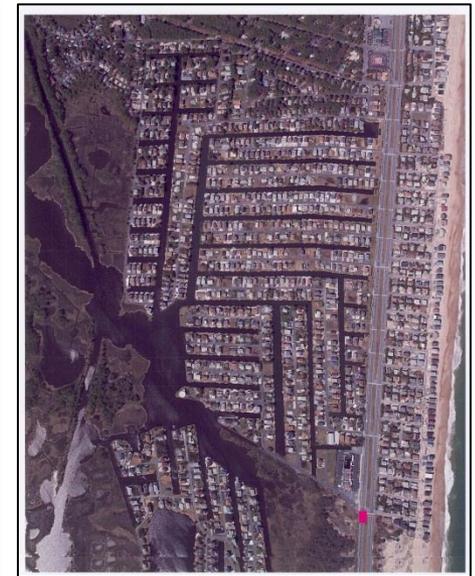
May 7, 1938



July 20, 1954



October 4, 1970



Circa 2005

Note that in 1970 there were not too many houses.
Citizens became concerned with water quality in 1990.

The Inland Bays Are Definitely Polluted

- DNREC has posted signs addressing the risks of making contact with Inland Bay waters
 - The waters of the Inland Bays contain organisms that are harmful to your health.
 - Swimming could result in an increased risk of rashes, infections or gastrointestinal distress especially after rainfall events.
- **Such informational signs while helpful can have a negative economic impact.**



Excess Nutrients, Nitrogen & Phosphorus, Feed Massive Algal Blooms – Spring 2012



2012 Algal Bloom In South
Bethany Canals



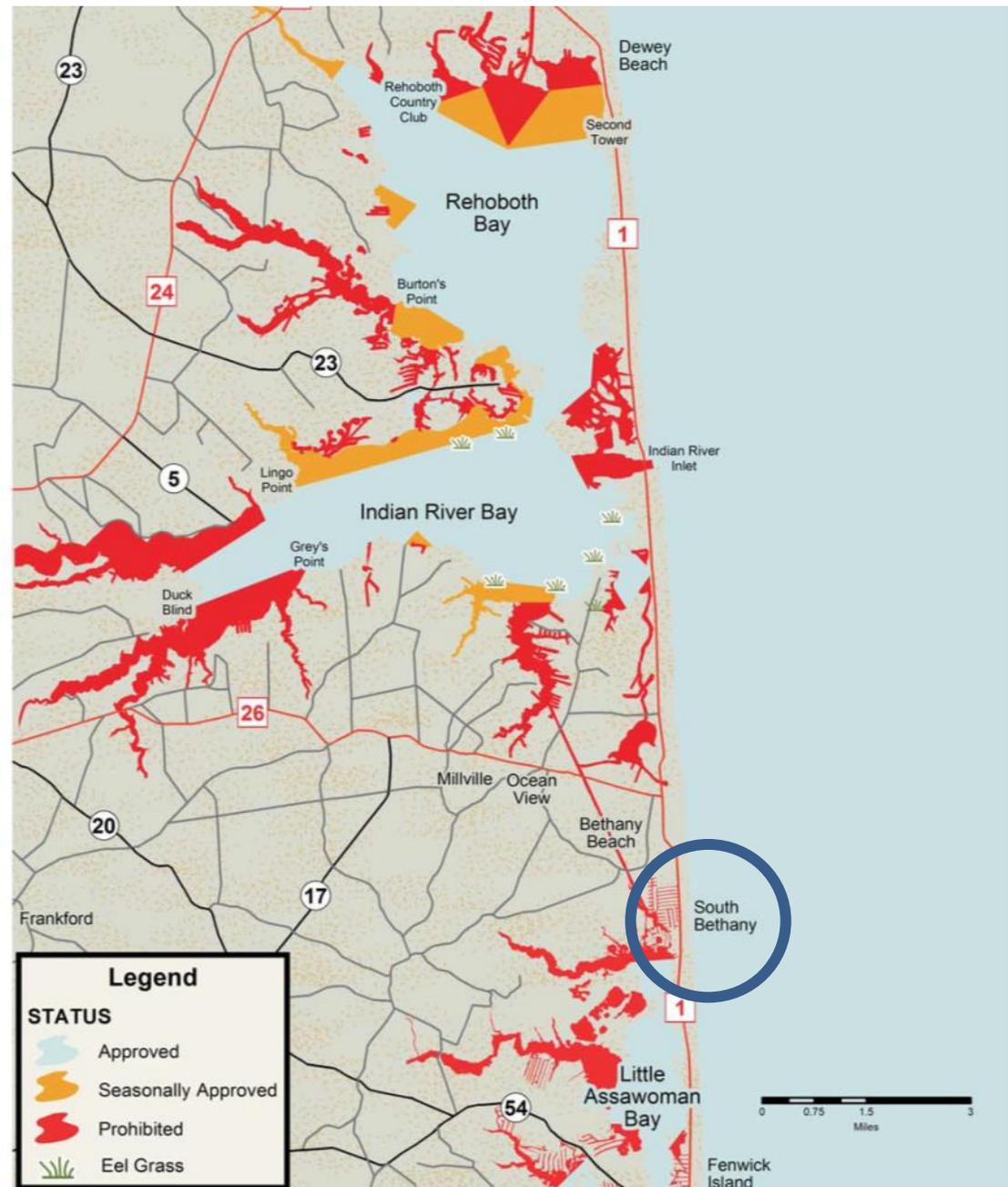
DNREC Algae Harvester Used
To Clean Up Canals

Realtors confirmed that both home sales and rentals were negatively impacted during this time period.

The Inland Bays Are Definitely Polluted

Inland Bays Clamming Map

Many areas are
“**prohibited**” due
to pollution.



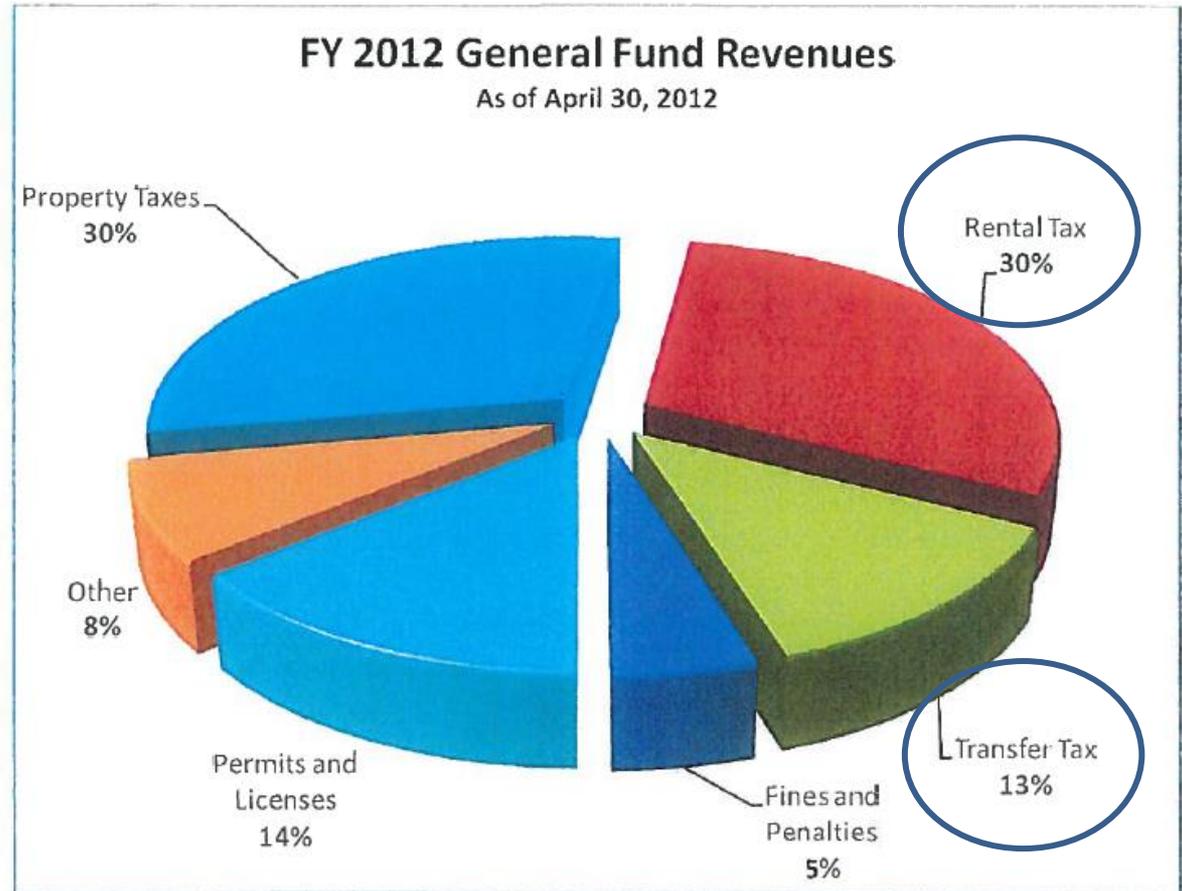
Governor Markell – “Clean water quality and nourished ocean beaches are vital to tourism, job growth and Delaware’s economy.”

- ***The Contribution of the Coastal Economy to the State of Delaware (June 2012)*** – “Delaware attracts more than 7 million visitors each year and the state’s coastal economy has a significant impact on Delaware’s overall economy – generating \$6.9 billion annually, including \$711 million in tax revenue and supporting 59,000 jobs. Beach tourism provides more than 10 percent of the state’s total employment, taxes, and business production.”
- **Representative Carney** – “Visitors support both the state and local economy. I’m very proud that investments by the federal government and DNREC will help Delaware preserve its coastline, maintain the cleanest water, and stay a destination area along the Atlantic Coast for many years to come.”
- **DNREC Secretary O’Mara** – “Delaware is emerging as the most pristine beach destination in the nation. By serving as stewards of our treasured natural resources, we can protect this advantage for years to come.”
- **NRDC** – “Concerns about water quality lead to permanent cautions regarding swimming in Rehoboth Bay, Indian River Bay, and Little Assawoman Bay. NRDC cites South Bethany as an example of a community that is creating green infrastructures such as its development of rain gardens.
- “Delaware has some of the best coastline and cleanest beaches in the country, which has remained that way due to the infrastructure put in place,” said **Sen. Carper**. “The secure dunes, beautiful stretches of sandy beach and regularly tested water keeps Delaware a safe and fun vacation destination – it’s no wonder the First State has some of the best beaches around.”

We need to improve the Inland Bays as we have improved our coastline.

Water Quality Can Impact 43% of South Bethany's Revenues

- SB's greatest assets are its beaches and canal network.
- Property values are impacted by the quality of these assets.
- 13 % of SB's income is acquired from the sales of homes.
- 30% of SB's income is acquired from property rentals.
- SB's goal is to make our community a desirable place to live or visit.



The Five Miles of Dead-End Canals Perform the Function of Stormwater Management Ponds

The South Bethany Canals Flushing Study – Entrix 2005 – demonstrates that there is essentially no flushing in the ends of the canals (See Figure). **Residence Time** is defined as the time it takes a concentration to reduce by 36.79%. The computer flushing model was run to simulate three months of tidal action. The areas in red did not reach the 36.79% reduction in the **three months**. The areas in green reached the 36.79% reduction in one month. The areas in dark blue reached 36.79% reduction in about one day. **The resulting finding is that the canals shown in red do indeed act as storm water management ponds since they have no significant exchange of water due to tidal action.** The study further shows that the South Bethany community must live with what enters the dead-end tidal canal waters for many months.

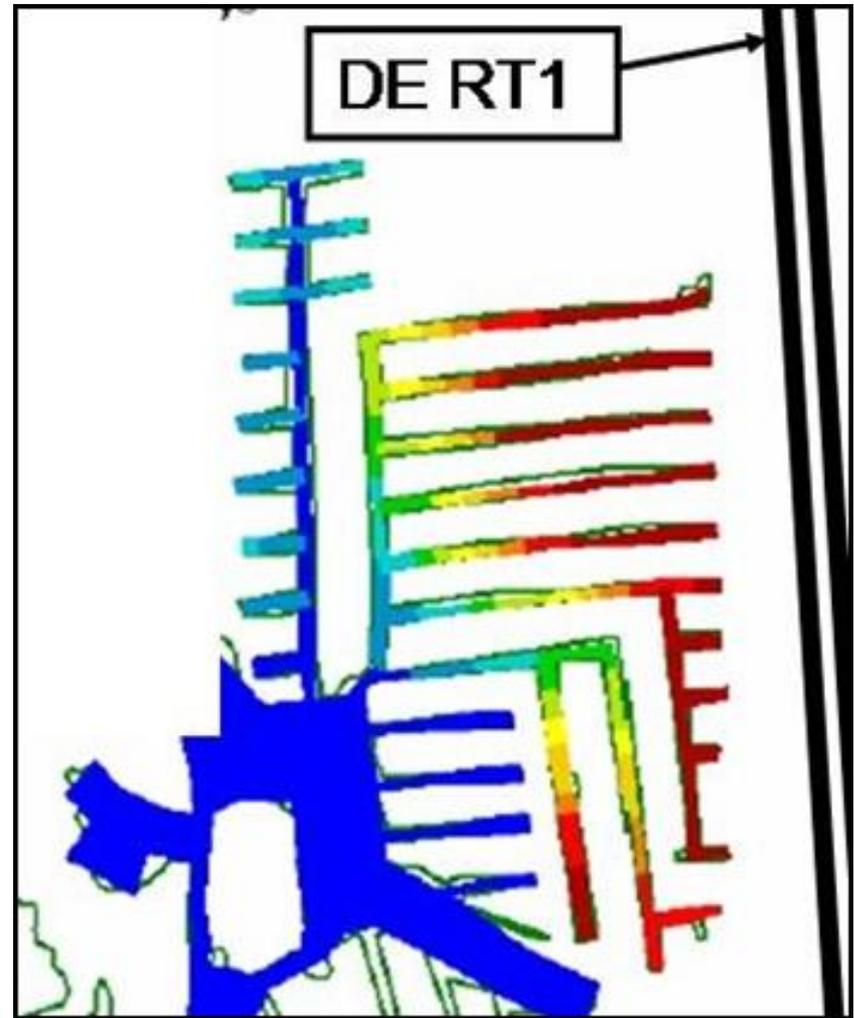
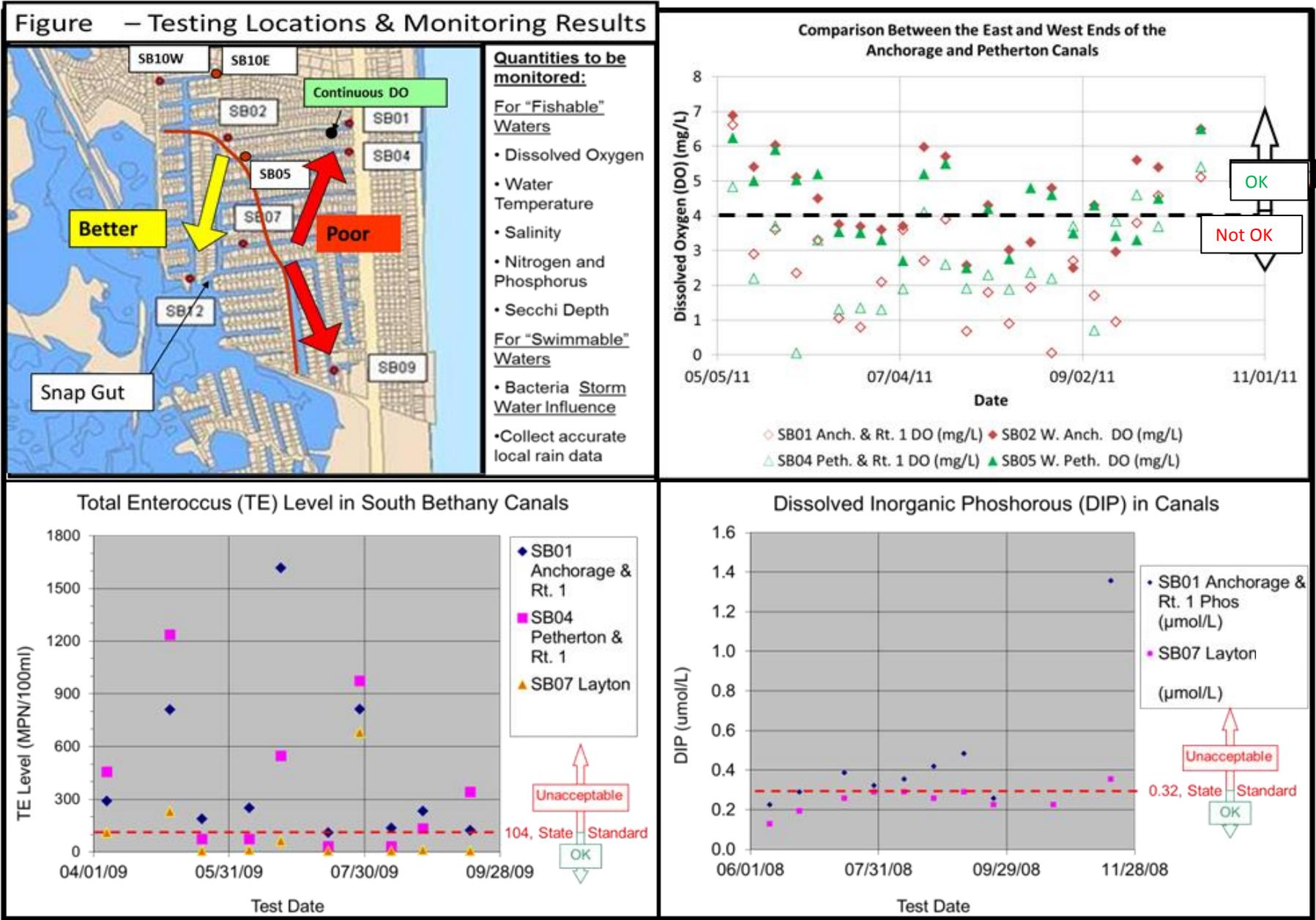


Figure - Residence Times in Canals

Citizen Monitoring Test Results Show Increased Degradation as the Test Site Gets Closer To The Canal Dead-Ends – Consistent With The Flushing Study



The Town of South Bethany Has Been Actively Addressing the Water Quality Issues Since 1990

- Water quality monitoring shows that there has been a decline in water quality from 1990 to about 2004 when DelDOT installed a forebay at the Anchorage Canal.
 - In 1990, citizens were concerned that measurements showed highest enterococcus level was 103 colony forming units/100mL.
 - In 1996, high enterococcus levels (>3,000 colony forming units/100mL) were recorded at the east and west end of Anchorage and Petherton. The highest levels were at the east ends.
 - In 2001, the first flush (the first 1,000 cubic feet) into the Anchorage Canal carried in excess of 100,000 colony forming units of total coliforms/100mL and 10,000 colony forming units of fecal coliforms/100mL.
 - In 2012 the highest enterococcus level measured was 2,247 colony forming units/100mL
- Some actions initiated to mitigate the problem
 - In 2001 Entrix study showed that flushing (a new inlet) would have a positive impact on water quality, yet it would cost \$50 to \$100 Million to complete. For the Little Assawoman Bay the flushing would be accomplished by creating an inlet at the narrows between Little Bay and the Little Assawoman Bay. *No further actions have been initiated relative to this project.*

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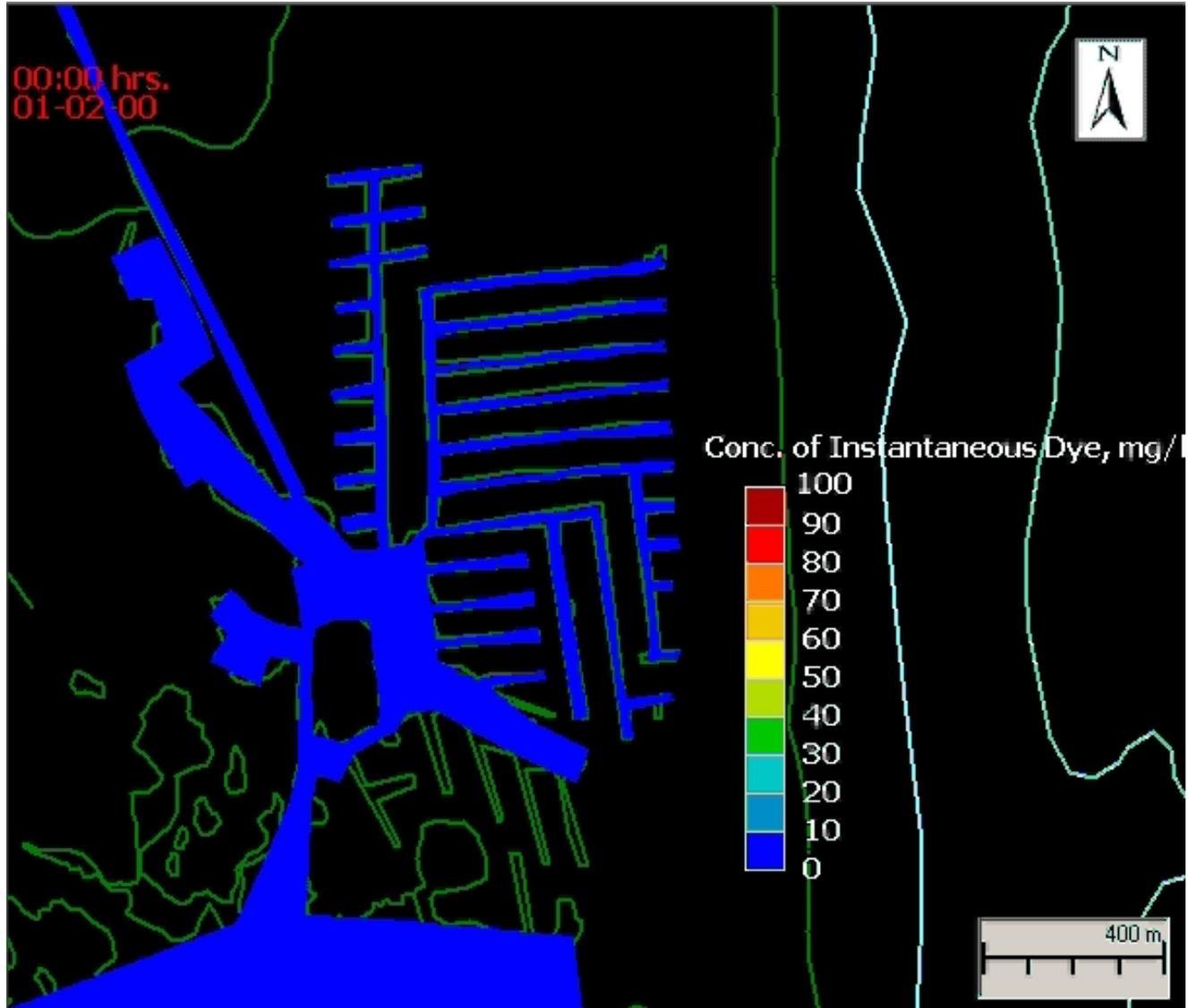
The Town of South Bethany Has Been Actively Addressing the Water Quality Issues Since 1990 (Continued)

- Some actions initiated to mitigate the problem
 - In 2003, Councilman Lloyd Hughes proposed a “Tidal Pump” based on the 2001 Entrix Study.
 - In 2004, DeIDOT installed a forebay that is 30% efficient at removing sediments from stormwater.
 - In 2005, SB funded a \$17,000 study by Entrix. The Entrix study showed that the Tidal Pump would reduce residence times in the SB Canals from over 120 days to just a few days. *See slides 15 & 16 for demonstration of study results.*
 - In 2007, SB funded a \$50,000 study by Oceaneering and KCI Technologies. This study showed that the tidal pump would work. It showed where improvement could be made to the initial concept. It determined that the cost would be about \$7 Million and that it would take about two years for design and construction. *See slide 17 for description of revised Tidal Pump.*

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Instantaneous Dye Dump – Current Conditions – 4 Month Duration

Hours in the day 
Date 



Jan 2, 2000
to
Apr 30, 2000

Dye concentration
starts at 100 mg/L
on Jan 1, 2000
within the canals

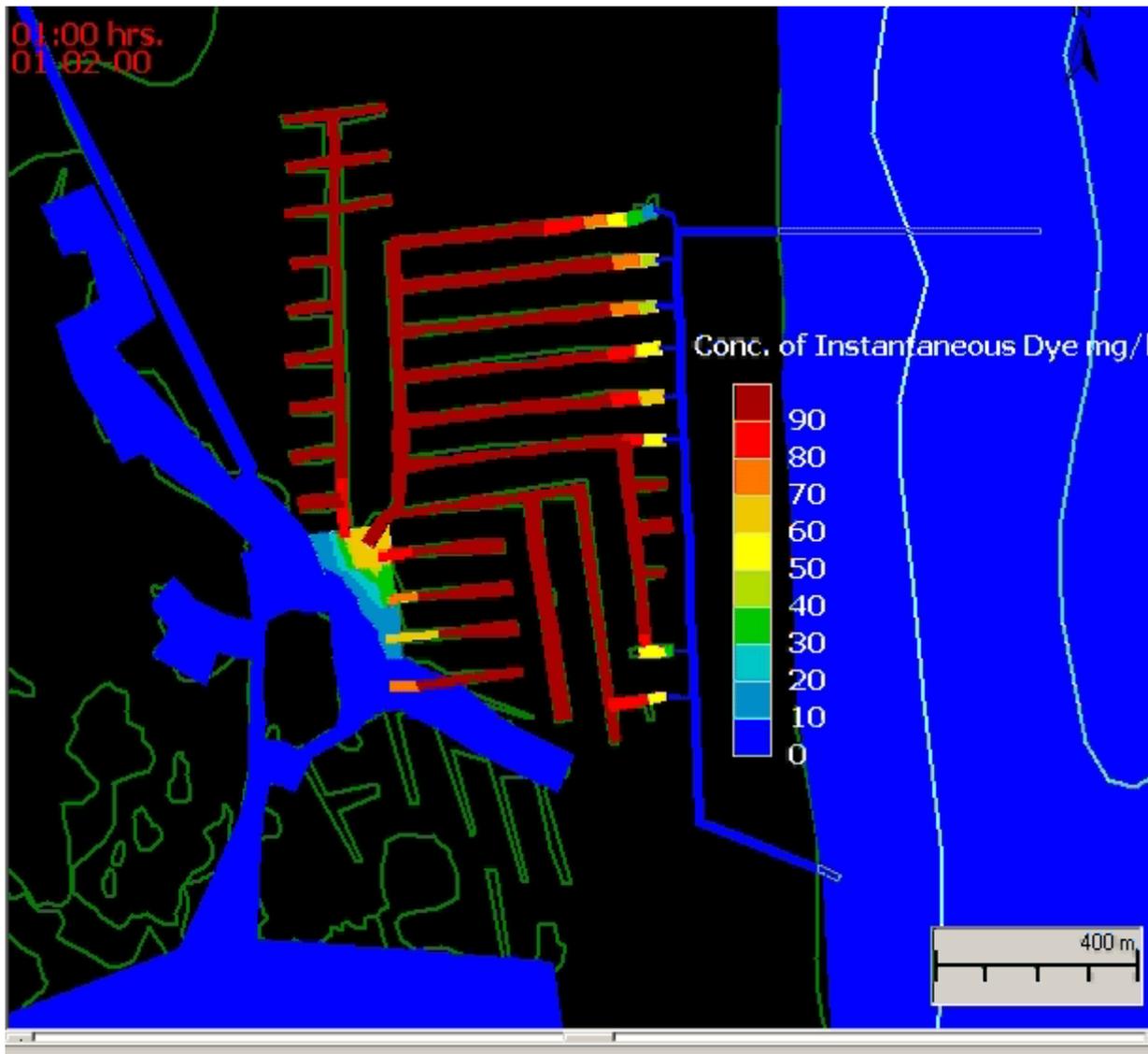
Click on photo,
then click on 
to play the
simulation.

Instantaneous Dye Dump – Tidal Pump Conditions – 1 Month Duration

Hours in the day 
Date 

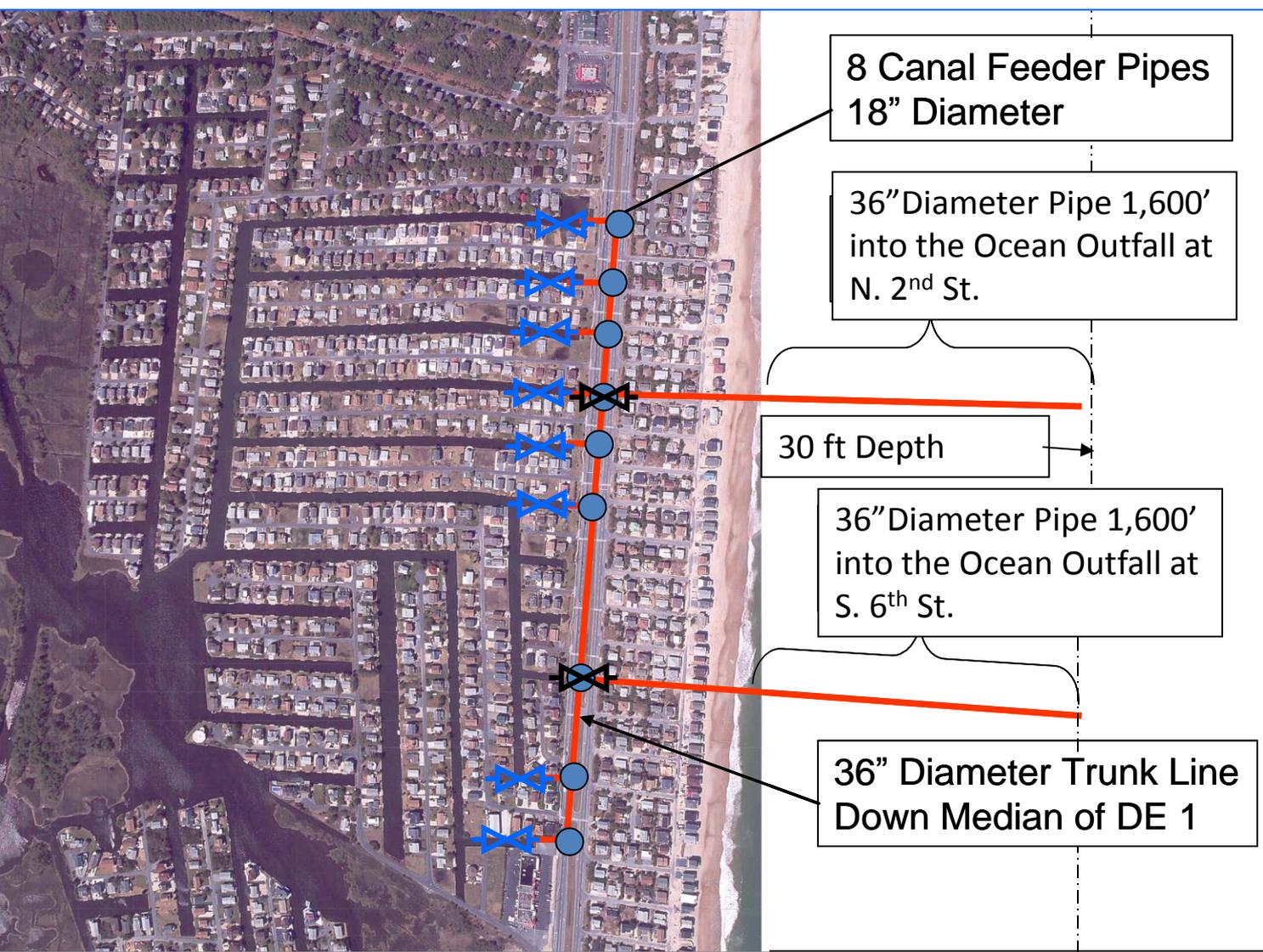
Jan 2, 2000
to
Jan 31, 2000

Dye concentration starts at 100 mg/L on Jan 1, 2000 within the canals



Click on photo, then click on  to play the simulation.

The Tidal Pump Would Provide Flushing & Circulation To The South Bethany Canals And To The Northern End Of The Little Assawoman Bay (Particularly Little Bay)



Benefits

- Provides Flushing & Circulation
- No Impact to the Shore Line
- No Bridge Required

Legend

- 9 Man Holes
- ⊗ 2 Electrically Powered Gate Valves (36") in Median
- ⊗ 8 Manual Gate Vales (18") at Canals

The Town of South Bethany Has Been Actively Addressing the Water Quality Issues Since 1990 (Continued)

- Some actions initiated to mitigate the problem
 - In 2008, the South Bethany Tidal Pump Committee met with the Joint Permit Processing Committee. The Committee focused on the uniqueness of the project and the need for an environmental impact study.
 - In 2010, *Conceptual Pollution and Stormwater Control Strategy for the Anchorage Canal Drainage Area* by the Center for Watershed Protection and JMT. Presents 25 potential retrofits that would minimize nutrient loading into the Anchorage Canal. This was funded by a grant that SB was instrumental in receiving from the U.S. Army Corps of Engineers. The grant plus matching funds totaled ~\$72,000.
 - In 2011, the Anchorage Canal Phase II Retrofit funded by an EPA grant through DNREC was completed in December 2011. This project created twelve bioretention areas in the Route 1 Median. This grant, plus matching funds and DE DOA, Urban and Community Forestry Division, tree grant funds, totaled ~\$120,000. *See slide 19.*
 - In 2012, \$45,000 DeIDOT grant funded eleven rain gardens around stormwater drains and six rain gardens in the Route 1 Median. *See slide 20.*

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Article In Summer 2012 Issue of

Story by Laura Walter

Photography by R. Chris Clark

*going green
on delmarva*



Water off the Road

Green in the Middle

South Bethany's Dual-Purpose Highway

West Side Rain Gardens – Before and After Pictures

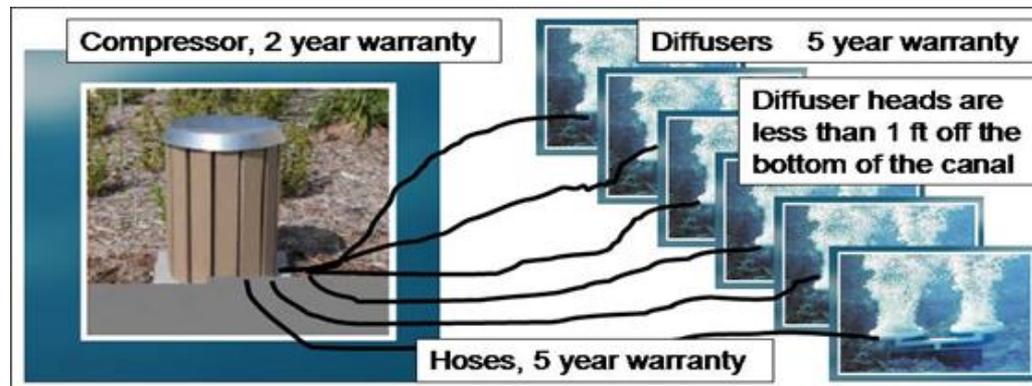


The Town of South Bethany Has Been Actively Addressing the Water Quality Issues Since 1990 (Continued)

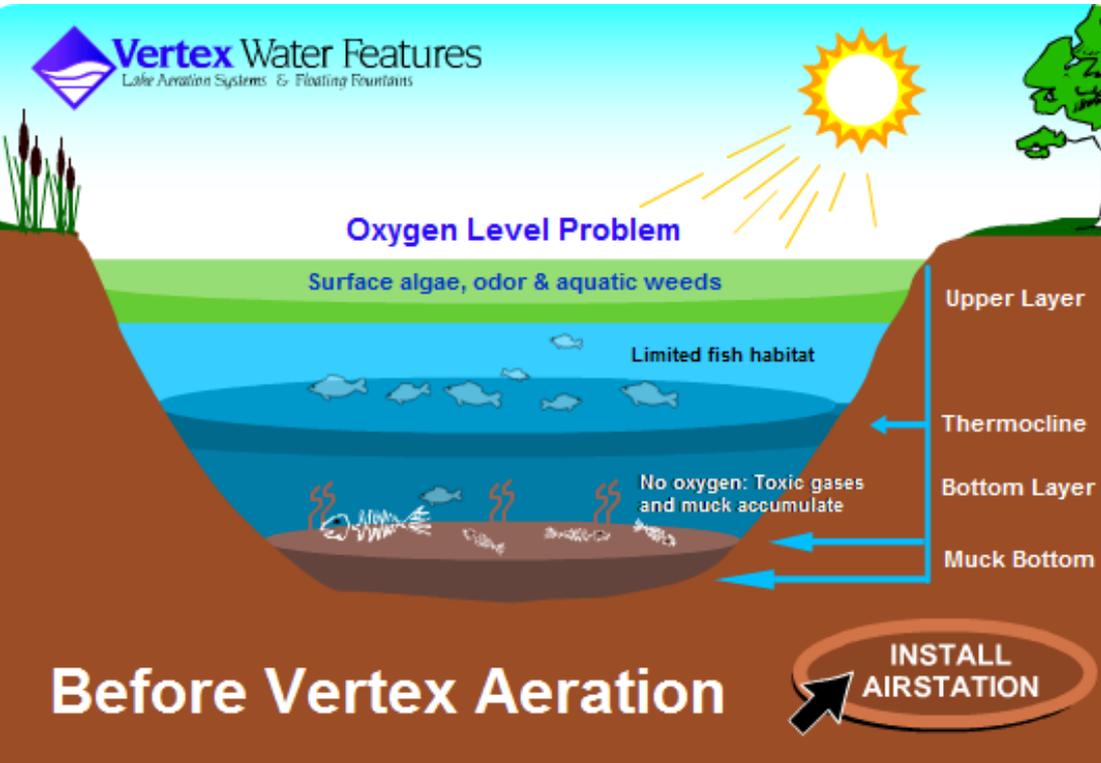
- Some actions initiated to mitigate the problem
 - In 2010, SB decided to seek an interim solution to actively improve the water quality in the canals, since they were unsuccessful in obtaining support for the Tidal Pump which would have resolved all the water quality problems.
 - In 2010, Grant Proposal for *The Evaluation of Diffusers as a Method for Improving the Ecological Condition of Dead-End Canals* submitted by South Bethany Property Owners Association (SBPOA) to the Financial Assistance Branch, Division of Water Resources Department of Natural Resources and Environmental Control. The SBPOA proposal was not selected.
 - In 2012, Urban Waters Small Grants Proposal for *Demonstration Project Showing that Diffusers will Improve the Ecological Condition of Dead-End Tidal Canals* submitted by South Bethany to the U.S. Environmental Protection Agency, Office of Water, Immediate Office. The Town's proposal was not selected.
 - In 2012, SB receives bid for a Pilot Diffuser System funded by Town of South Bethany. *See following slides that describe the diffuser system*

Demonstration Project Showing that Diffusers will Improve the Ecological Condition of Dead-End Tidal Canals

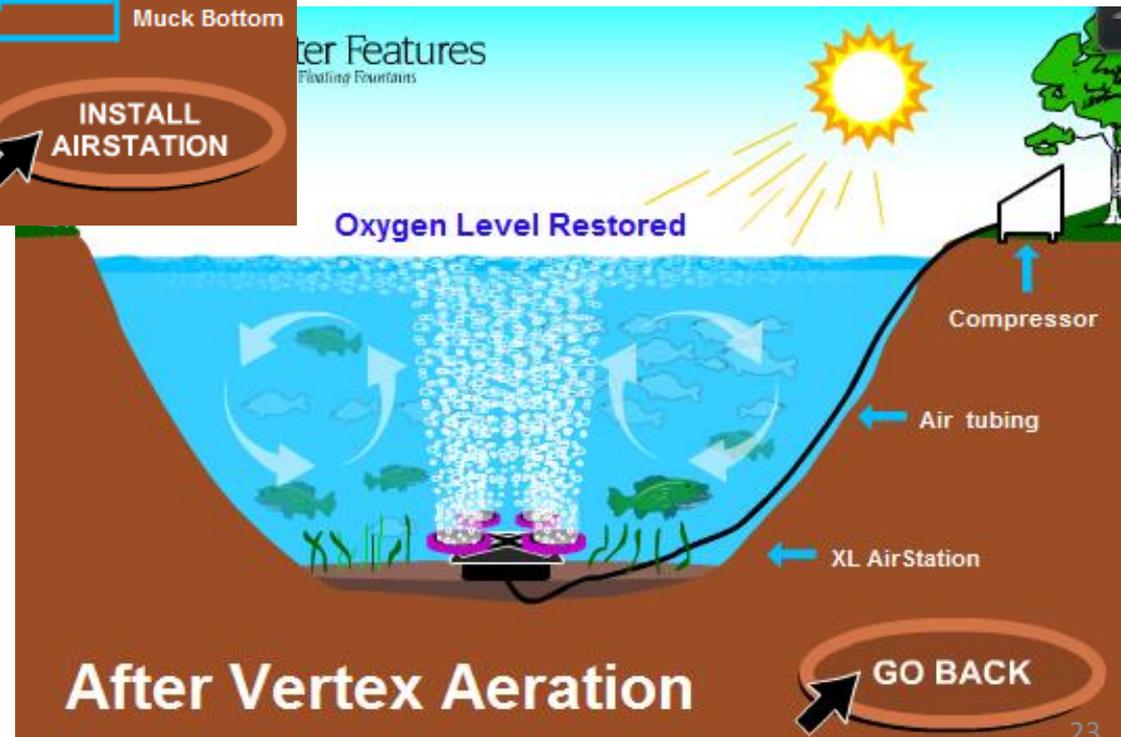
For the Pilot study, there will be six (6) diffusers equally spaced along the *experimental* Anchorage Canal. Each diffuser will be independently supplied with compressed air through weighted tubes that will lie along the bottom of the canal from one compressor that is located on land at the east end of the canal. The compressor will be supplied from an electrical outlet located on the power pole at the end of the canal along Route 1. The Petherton Canal will serve as the *control* canal.



How Diffusers Work



http://www.vertexwaterfeatures.com/aeration_system_flash.php



Benefits Of The Diffuser Pilot Project to Community Led by Volunteer Team

It is expected that

- Quantitative data collected by Water Quality Monitoring Program volunteers will show that diffusers do improve the ecological conditions of dead-end tidal canals.
- The dissolved oxygen in the east end of the Anchorage Canal will be increased to about the same level that currently exists in the west end of the Anchorage Canal.
- The Total Enterococcus levels will be significantly decreased.
- The nutrient levels will be slightly reduced.
- This innovative diffuser approach, will become a new method for other U.S. communities with dead-end tidal canals to use in their quest to restore the canal water quality to “fishable and swimmable” condition.
- Information and data developed from the diffuser project will be used to further expand the educational programs relative to water quality currently being carried out within the community and elsewhere.
- The existing established working relationships among the diverse Anchorage Canal stakeholders, the Town of South Bethany, Center for the Inland Bays (CIB), DNREC, Inland Bays Foundation (IBF), DeIDOT, University of Delaware and Delaware Sea Grant Program will be strengthened.

The Future For South Bethany's Water Quality

- The ultimate environmental improvement is that the Town's five-mile network of canals will be restored to their **“fishable and swimmable”** condition.
- The Town continues to institute and enforce ordinances limiting homeowner water runoff and impervious surfaces.
- Install bioretention and rain garden areas to minimize the amount of pollution that enter our canals.
- Create additional rain gardens and bioretention areas along the East Side of the Route 1 corridor.
- However, even with these efforts there will continue to be some pollution that enters the canals. A parallel strategy of PREVENTION and ACTION is required to restore the water quality in the canals since there is essentially no circulation at the dead ends.
- **Establish funding partnership with Environmental Protection Agency to act immediately to improve the SB Canal Water Quality.**

EPA and South Bethany Partnership

Potential Funding Opportunities

Short-Term Investments – 2012-2013

- Based on SB's years of measuring low DO, investment in prevention activities, and research of diffuser systems, EPA funds Pilot Diffuser Project in South Bethany
 - Cost ~ \$31,000
- Based on SB's original \$65,000 investment in the Tidal Pump feasibility study, EPA funds the environmental impact study for the Tidal Pump System – Cost ~ 50,000

Long-Term Investments – 2014

- Based on successful Pilot Diffuser Project Outcomes, EPA funds 10 additional diffuser systems for the most distressed dead-end canals – Cost ~ \$200,000
- Based on results of Environmental Impact Study, fund the Tidal Pump System - \$7 Million