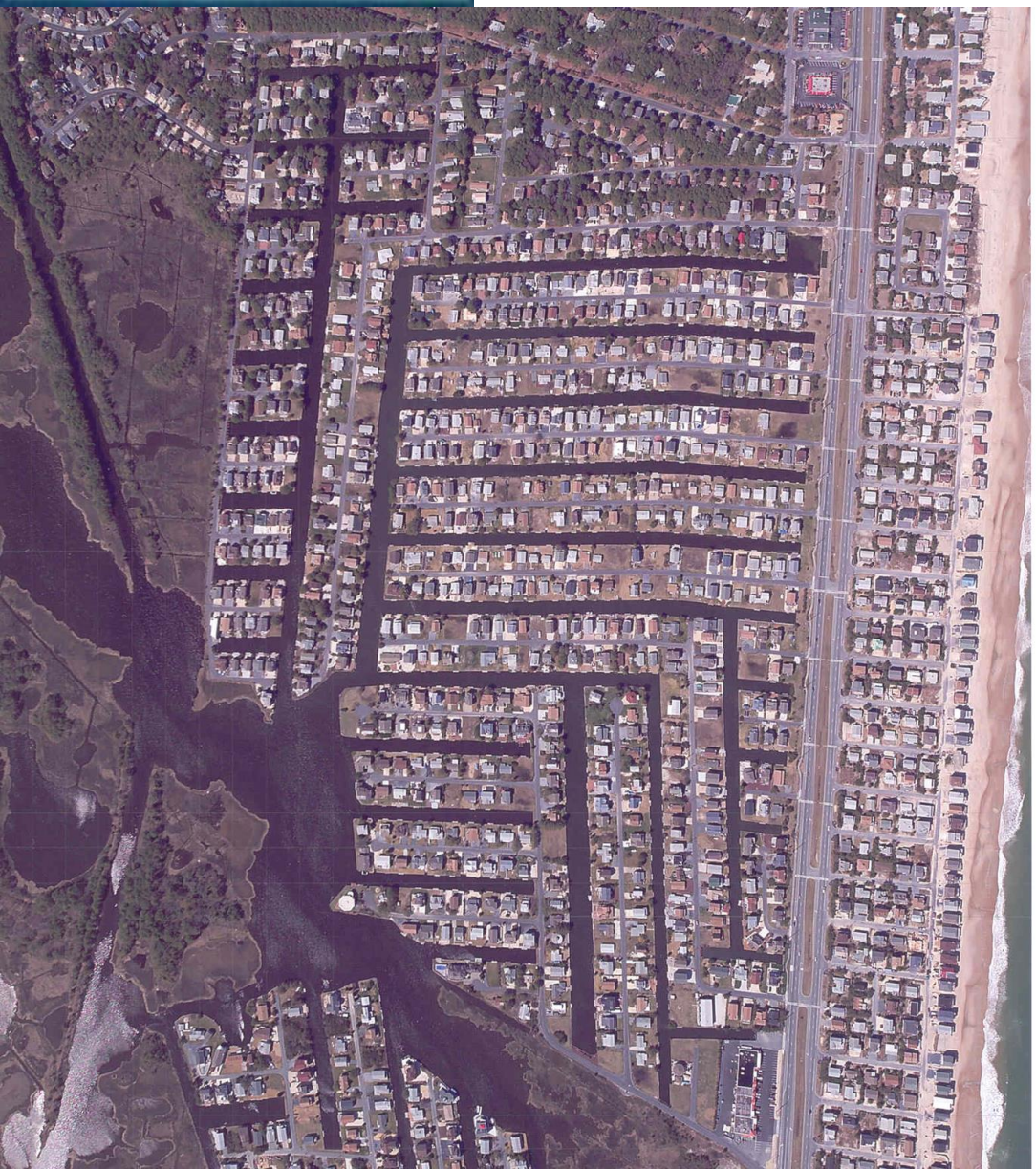
TOWN OF SOUTH BETHANY



Tidal Pump Presentation

to

John A. Hughes

Secretary of the DNREC

December 13, 2007

Purpose of Today's Meeting

- To bring John Hughes, Secretary of the DNREC, up to speed on Town of South Bethany's initiatives to improve the water quality in our canals and the Little Assawoman Bay. Today's focus will be on the Tidal Pump initiative

- To solicit feedback from John Hughes, Secretary of the DNREC, on next steps to promote the case for the Tidal Pump.

Agenda – Tidal Pump Presentation to John A Hughes, Secretary of DNREC

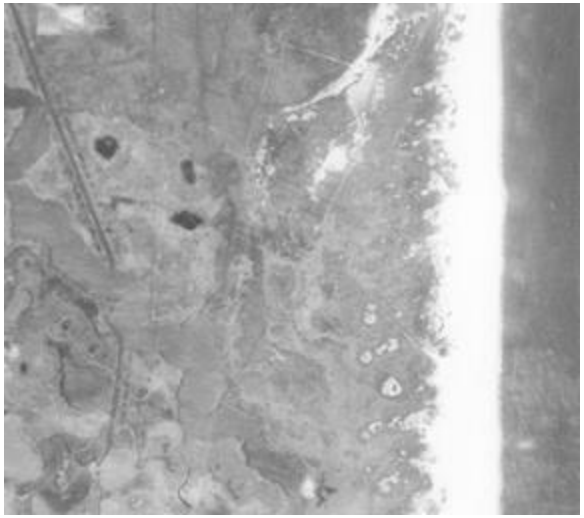
- **Introduction and Welcome**
- **Overview – Town of South Bethany Water Quality Improvement Initiatives – Focus on Tidal Pump**
  - Background/History
  - Tidal Pump Description, Operation and Cost
  - South Bethany Canals Flushing Study by Entrix, Inc.
  - Issues Identified During A DNREC Review
  - Additional Town of South Bethany Water Quality Initiatives
  - Summary of Overview of Tidal Pump & Water Quality Initiatives
- **Questions and Discussions**
  - Is the Tidal Pump an initiative worth pursuing?
  - Whom do we need to convince to be the “advocate” for the Tidal Pump Process?
  - Who owns the Tidal Pump when it is almost completely on state property?
  - What should be our path through the permitting process?
  - How do we go about obtaining the needed $7M funding?

The Last Few Hundred Years Have Not Been Kind To The Little Assawoman Bay

Inlets that once provided exchanges between the Little Assawoman Bay and the Atlantic Ocean have closed, resulting in poor flushing and poor circulation to the Little Assawoman Bay

- Current location of Indian River Inlet, Cut open in 1929, Stabilized with jetties in 1937. Jetties cause north shore to migrate west.
- Indian River Bay
- Assawoman Canal
- South Bethany
- Jefferson Creek
- **Closed Inlet Creek Inlet**
- Little Bay
- Little Assawoman Bay
- **Closed Assawoman Inlet**
- Fenwick Island, State Line
- **Closed Mattapany Inlet**
- Assawoman Bay
- Ocean City Inlet, formed and stabilized with jetties in 1933. Jetties cause south shore to migrate west.

Development and Civilization Have, Especially, Been Less Kind To The Little Assawoman Bay



May 7, 1938

July 20, 1954

3 Miles of Dead-End Canals

October 10, 1970

5 Miles of Dead-End Canals

Current View Circa 2005

5 Miles of Dead-End Canals

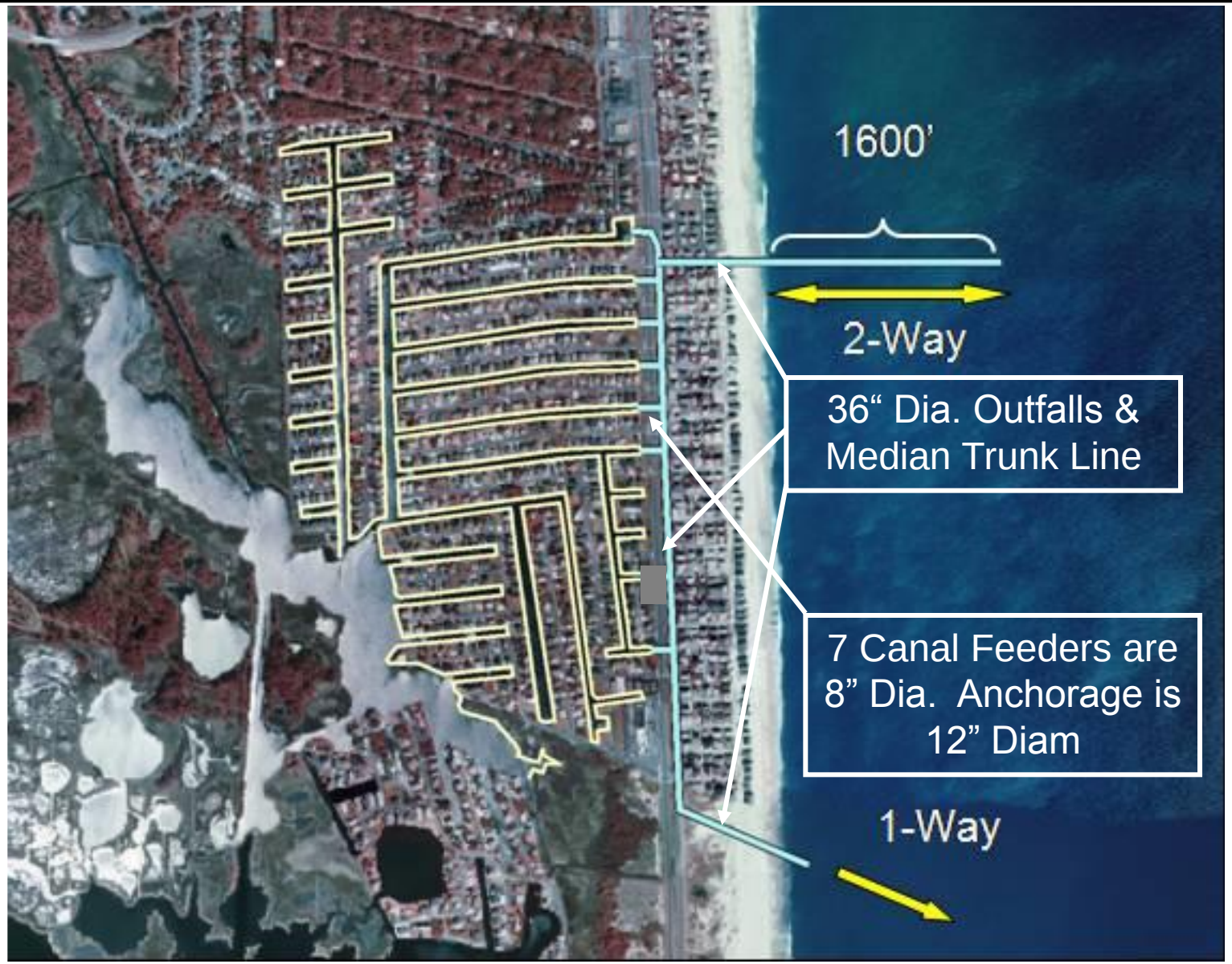
It Is Well Documented That An Increase In The Exchange Between The Inland Bays And The Ocean Would Be Beneficial to The Inland Bays

- *The Problem of Keeping Indian River Inlet Open* by R.P. Powell, Lieutenant-Colonel, Corps of Engineers, January 8, 1931. "There efforts should be confined to maintaining an inlet for increasing the salinity of the Bays and the restoration of marine life rather than one suitable for navigation."
- *Dynamic Systems at the Land-Sea Interface* by David E. Krantz
- *Salinity Control as a Mitigation Strategy for Habitat Improvement of Impacted Estuaries* by Bruce J. French and Dale Kerper
- *Delaware/Maryland Dead-end Canal Conference Proceedings: Challenges and Solutions, May 17, 2003 at Rusty Rudder*, Dewey Beach
- Letter from Senator George H. Bunting, Jr. included in above proceedings. "Some type of controlled flushing, I believe, will do more to cleanse the little Assawoman Bay and these lagoons than all the other important measures we are addressing today."
- Letter from Kent S. Price, Ph.D., Associate Professor Emeritus, College of Marine Studies, University of Delaware, 1,13,2006. "I …find it a very creative solution to a long standing dead end canal water quality problem that may be otherwise insoluble."
- City of Destin, FL has a large, 50,000 gpm, 250 hp, electric pump that pumps Gulf of Mexico water into Sandpiper Cove.

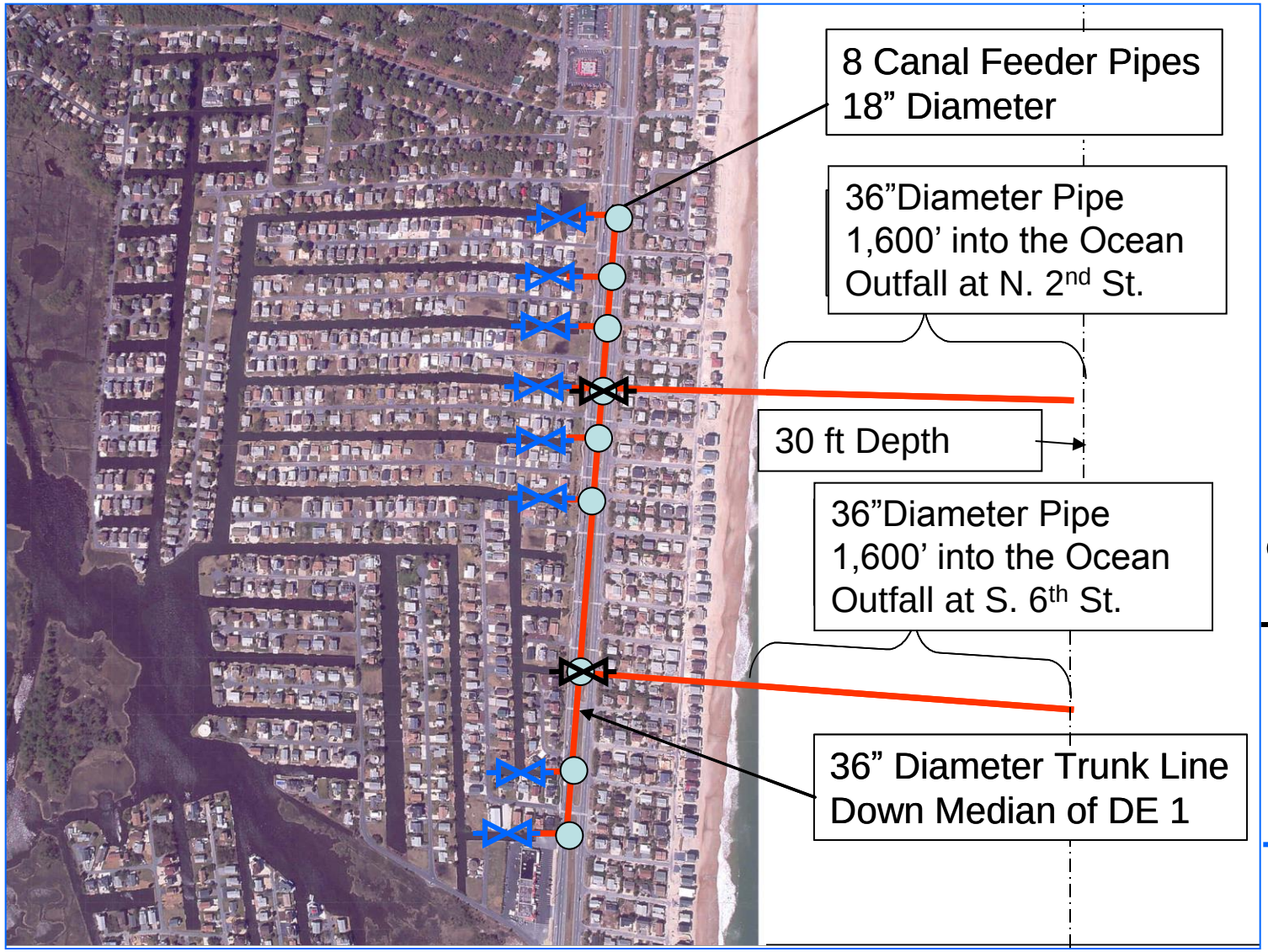
History of Tidal Pump Design & Analysis

- In 2002 Lloyd Hughes, a former Town of South Bethany Councilman, began researching the development of a system to flush and circulate the waters in the canals.
- In 2005 the Town of South Bethany issued a contract to Entrix, Inc and J.E. Edinger Associates for $17,000 to conduct a residence time analysis of Lloyd's proposed Tidal Pump design.
  - This analysis shows that residence times would be reduced from greater than 120 days to about 3 days.
- In 2006 the Town of South Bethany issued a contract to Oceaneering International, Inc. and KCI Technologies, Inc. for $50,000 to determine the feasibility, practicality and cost of the Tidal Pump design.
  - Their results verified that the Tidal Pump was practical and feasible.
  - They recommended that the pipes be High Density Polyethylene (HDPE) for corrosion and life considerations and that the Installation method into the ocean be Horizontal Directional Drill (HDD)
  - They recommended that the south outfall be the same as the north outfall.
  - They estimated the cost to be $250,000 for design, $5.2M to $ 6.7M for construction and $18,000/year for maintenance.

Initial Tidal Pump Design Only Had Two Outfalls for Canal Water But Only One Inlet For Ocean Water. This is The Design Analyzed by Entrix.



The Tidal Pump Has All The Benefits Of An Inlet Without The Disadvantages



Benefits

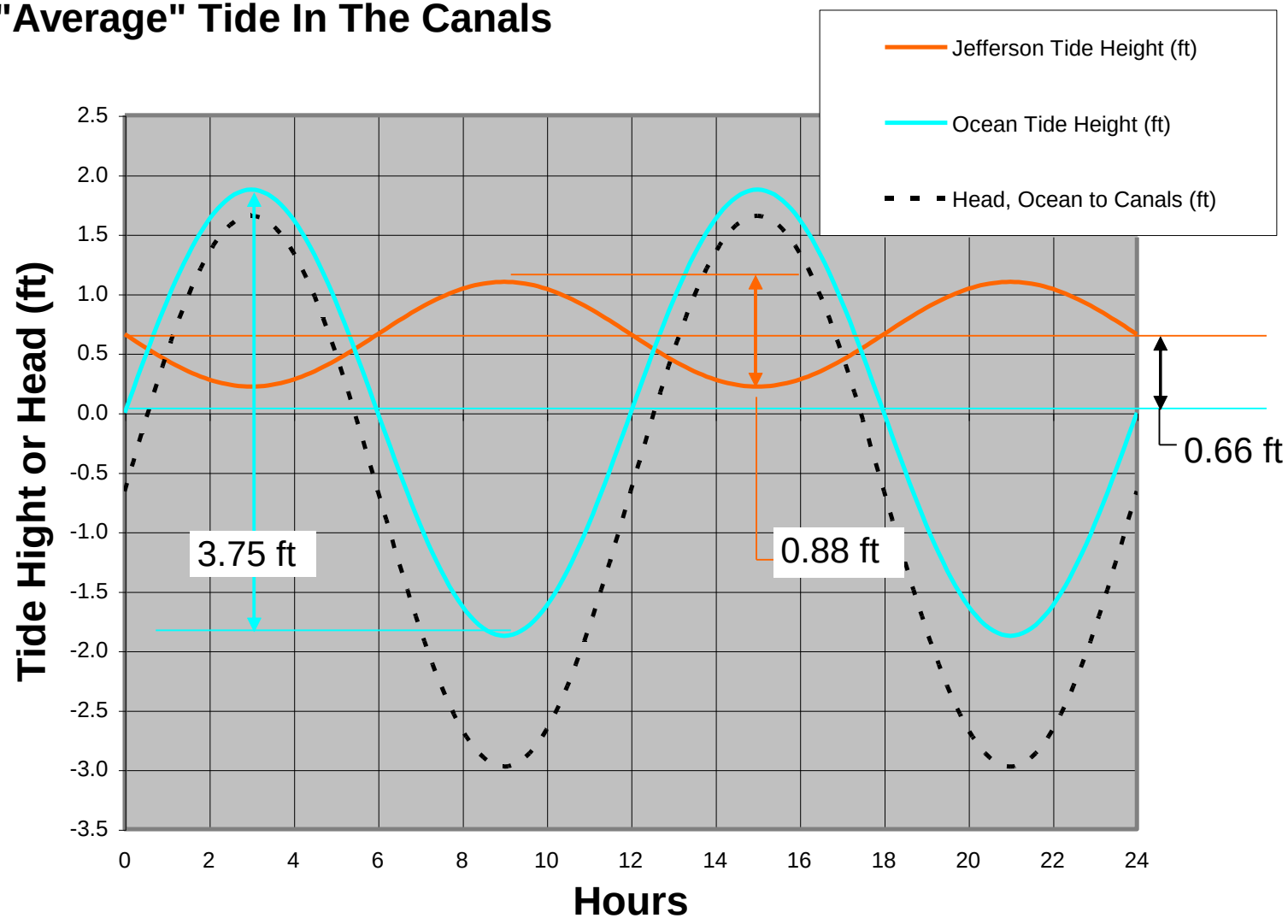
- Provides Flushing & Circulation
- No Impact to the Shore Line
- No Bridge Required

Legend

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

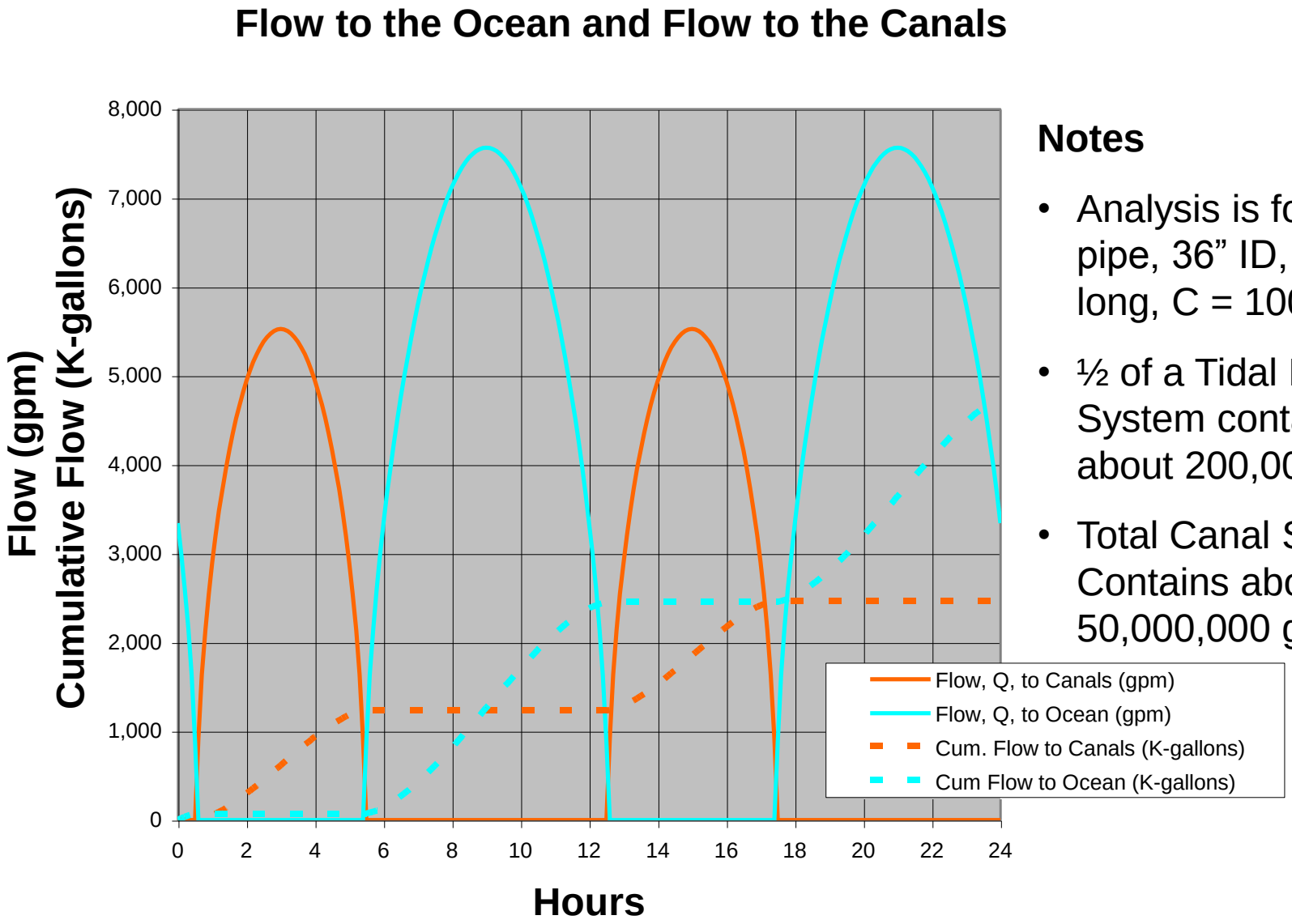
The Tidal Pump Uses Energy From The Tides – No Mechanical Pump Is Required

Analysis Is For "Average" Tide off of South Bethany And The "Average" Tide In The Canals



The above values came from John Tally, Director and State Geologist of the Delaware Geological Survey

The Tide Difference Between The Canals And The Ocean Drives Thousands of Gallons Per Minute Through The Tidal Pump

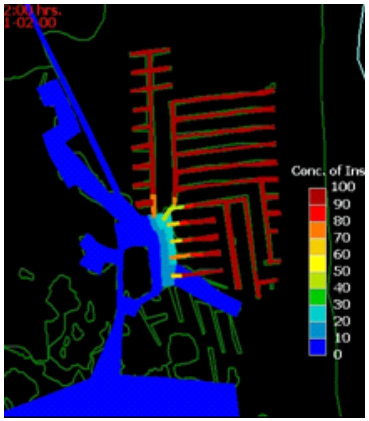


Notes

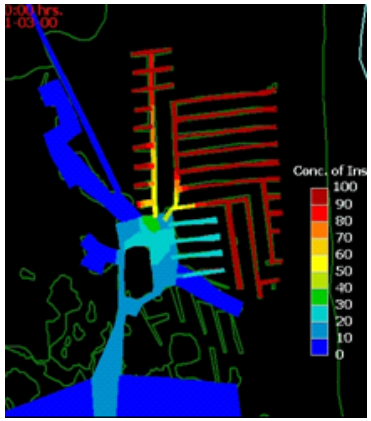
- Analysis is for one pipe, 36” ID, 2,400 ft long, C = 100
- ½ of a Tidal Pump System contains about 200,000 gal.
- Total Canal System Contains about 50,000,000 gal.

Entrix Analysis Verifies That Residence Times Within The Canal System Will Be Reduced By An Order Of Magnitude (1 of 3)

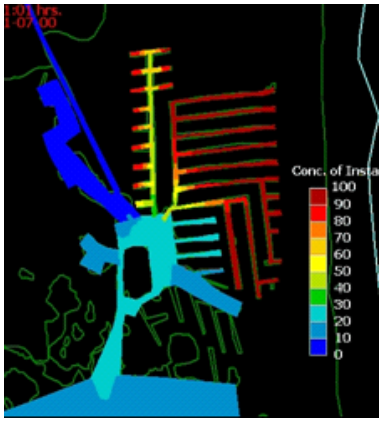
No Tidal Pump – Entrix Analysis



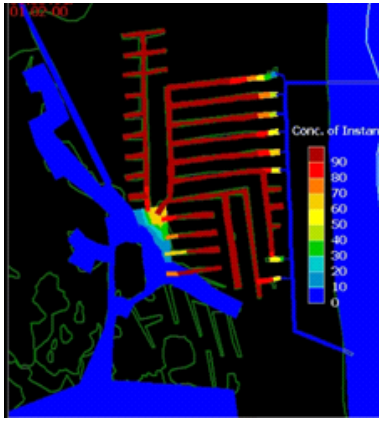
Time, Start

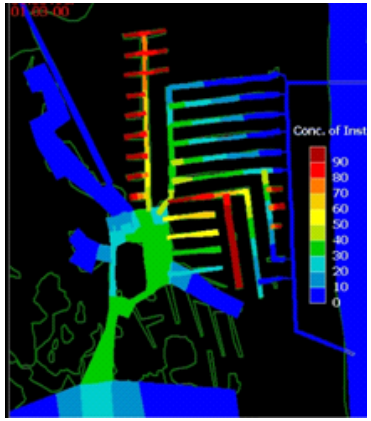


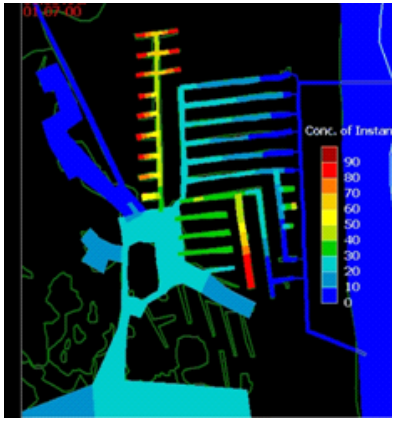
Time, 1 Day



Time, 5 Days

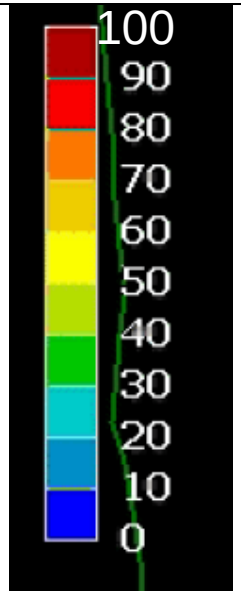






With The Tidal Pump

Concentration of Instantaneous Dye (mg/L)

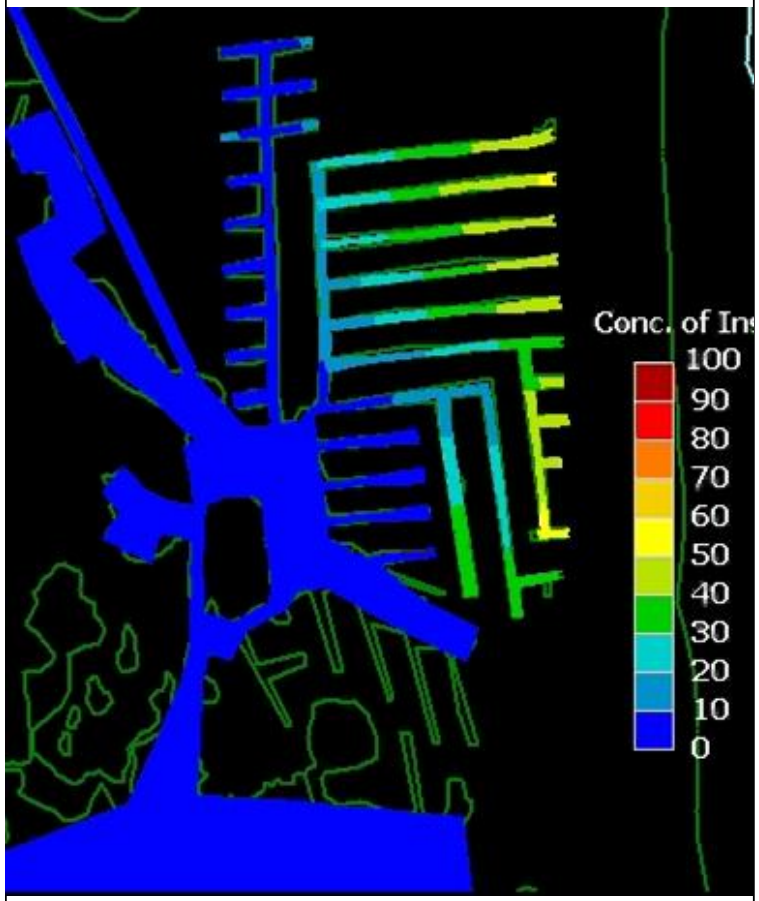


Entrix used measured tide data from the Lewis Breakwater tide gage and the Jefferson Creek tide gage beginning with 01/01/2000.

Entrix Analysis Verifies That Residence Times Within The Canal System Will Be Reduced By An Order Of Magnitude (2 of 3)

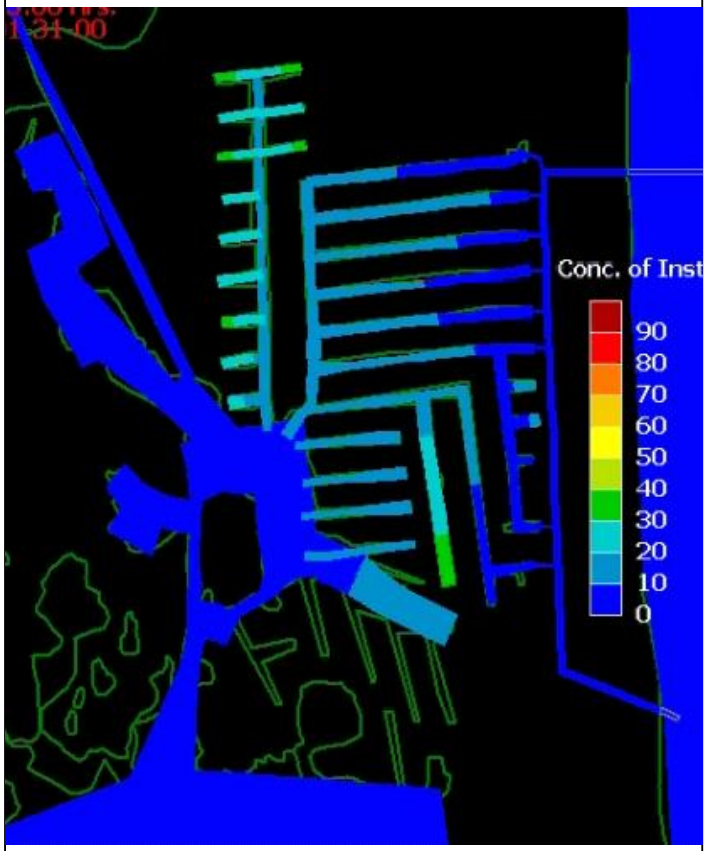
No Tidal Pump

3 Months

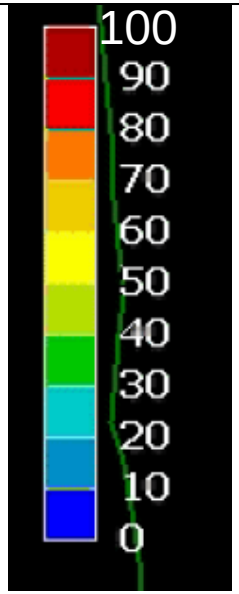


With The Tidal Pump

1 Months



Concentration of Instantaneous Dye (mg/L)

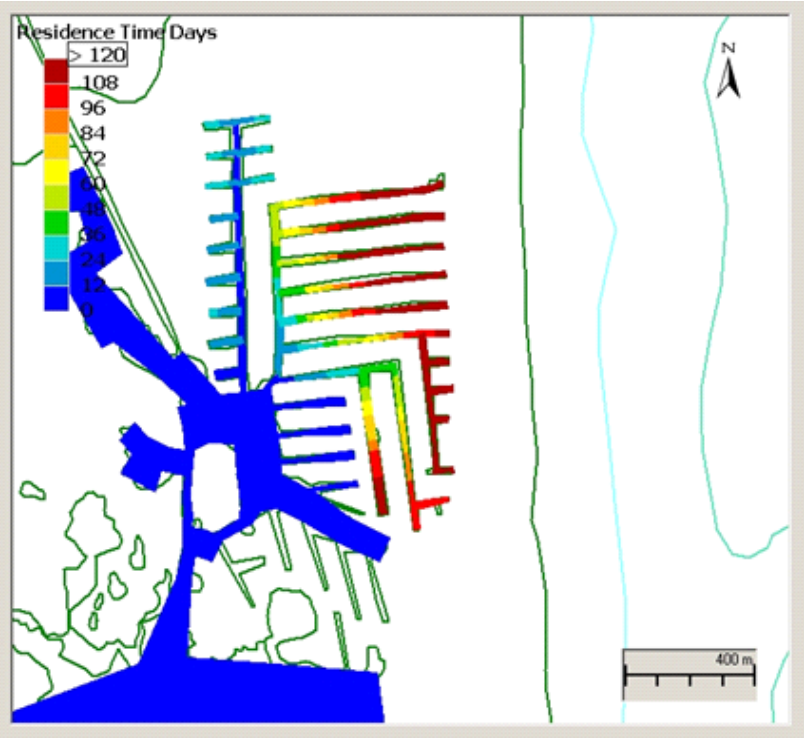


When we watch the video you will see how the flow will help the Little Assawoman Bay

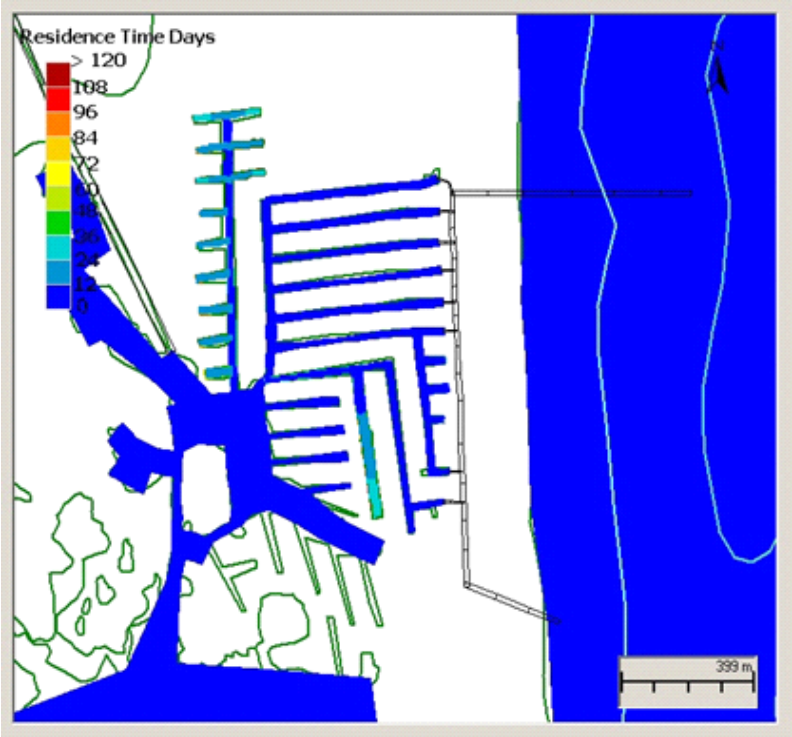
Entrix Analysis Verifies That Residence Times Within The Canal System Will Be Reduced By An Order Of Magnitude (3 of 3)

Residence Time Comparison

>120 Days Compared to ~3 Days

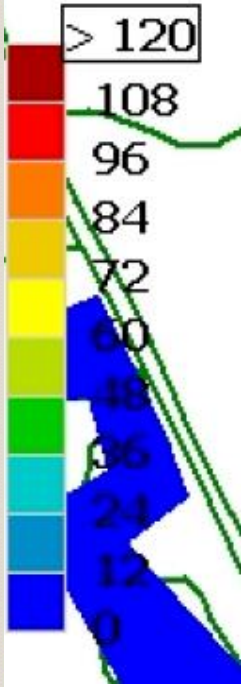


No Tidal Pump



With Tidal Pump

Residence Times in Days



Residence time is defined as the time it takes to reduce a concentration by 36.79%

Show The Video

On November 20, 2007 The Town of South Bethany Hosted a Tidal Pump Meeting to Discuss Comments Developed by The DNREC

Attendee	Affiliation
Gary Jayne, Mayor	Town of South Bethany
Jay Headman, Committee Chair	Town of South Bethany
Lloyd Hughes, Tidal Pump Designer	Town of South Bethany
George Junkin, Tidal Pump Analyst	Town of South Bethany
Tony Pratt	DNREC
Hassan Mirsajndi	DNREC
Toni Graff	DNREC
Michael Powell	DNREC
Greg Williams	DNREC
Lisa Pietro	DNREC
John Schneider	DNREC
Tim Wolf	KCI
Chris Overcash	KCI

South Bethany Is Addressing Issues That Have Been Identified During A DNREC Review Of The Entrix and Oceaneering/KCI Reports

1. The Tidal Pump depends on the tide difference between the Ocean and the canals to make it work. How can you show where the Ocean tide is relative to the canal tide without a tide gage off the coast of South Bethany?
   - Committee is working with John Talley and Sandy Schenck from the Delaware Geological Survey at the University of Delaware to document this difference analysis.
   - Committee is performing a variance analyses to show the impacts due to potential variations in the relative elevations of the canal water with respect to the ocean water.

South Bethany Is Addressing Issues That Have Been Identified During A DNREC Review Of The Entrix and Oceaneering/KCI Reports

2. Since the head to drive the flow is relatively low, friction loses in the pipes could reduce the flow to almost zero.
   - Lloyd Hughes, George Junkin and KCI have all done analyses that show there will be adequate flow even if the friction losses are unrealistically high. We will periodically clean (pig) the lines so that the lines do not get fouled. This is what is included in the Oceaneering/KCI maintenance costs of $18,000 per year.

South Bethany Is Addressing Issues That Have Been Identified During A DNREC Review Of The Entrix and Oceaneering/KCI Reports

3. There is a dead spot somewhere between the Indian River Inlet and the Ocean City Inlet. Could the Tidal Pump cause this dead spot to move into the Assawoman Canal? Could the Tidal Pump stop the tidal current flow through the Assawoman Canal?
   - Literature and analysis will be reviewed relative to currents in the Assawoman Canal. One pertinent report is the Indian River Inlet Report from January, 1931.
   - The Entrix analysis shows that there is essentially no current through the Assawoman Canal.

South Bethany Is Addressing Issues That Have Been Identified During A DNREC Review Of The Entrix and Oceaneering/KCI Reports

4. How will the Tidal Pump affect the salinity in the canals and the Little Assawoman Bay? Will this affect be good or bad?
   - Committee is
     - Obtaining salinity records from Muns Farestad at the University of Delaware to understand the baseline salinity over the period of two or three years.
     - Contacting Ed Lewandowski at the CIB to obtain information on what the "desired" salinity ranges should be to support sea grass, fish, oysters, clams, crabs, etc. He is searching the internet for similar data.
     - Working with DNREC to establish what "target" salinities should be
     - Doing analysis to estimate what the affects of the Tidal Pump would be.
   - South Bethany Home Owners Association is currently monitoring water quality at seven locations within South Bethany to establish baseline data and then monitor progress in making improvements to the water quality.

South Bethany Is Addressing Issues That Have Been Identified During A DNREC Review Of The Entrix and Oceaneering/KCI Reports

5. What is the affect from pumping the “polluted” canal water into the ocean? In particular what are the implications of pumping water containing bacteria contamination?
   - The Committee is working with the city manager of Rehoboth to obtain any environmental assessment/studies they did for their stormwater project. We are also working with Peter Hansen, DNREC Surface Water Discharges Section Program Manager to obtain information on this issue.
   - One of our water quality improvement initiatives is to improve the performance of the existing Anchorage forebay by retrofitting stormwater BMP retrofits. This is being worked in coordination with DelDOT, DNREC, CIB and the Anchorage watershed stakeholders.
   - South Bethany Home Owners Association is currently monitoring water quality at seven locations within South Bethany to establish baseline data for the water that would be pumped into the ocean.

South Bethany Is Addressing Issues That Have Been Identified During A DNREC Review Of The Entrix and Oceaneering/KCI Reports

6. Storms cause large head differences. Where are the closure valves? What is the plan of operation for closure?
   - The current design has a 36” electrically operated gate valve on each of the two outfall lines going to the ocean. These are located in the Route 1 Median.
   - The current design has an 18” manually operated gate valve on each of the eight canal feeder lines. These valves are located at the ends of the pipes where they meet the canal.
   - These two sets of valves provide redundancy that assures that the system can be closed down and would be used during maintenance activities.
   - The current plan is that the two 36” valves would be closed during storm events.

Councilman Jay Headman Leads a Water Quality Improvement Committee Whose Goal Is To **Make The South Bethany Canals "Fishable & Swimmable"**

- In June of 2007 the town established the water quality committee.
- Town of South Bethany Water Quality Committee Initiatives are:
  - Implementation of the Tidal Pump
  - Water Quality Monitoring Program
  - Oyster Gardening
  - Continuing education of homeowners
    - to eliminate impervious surfaces
    - to eliminate piping of gray water and storm water into the canals
    - to minimize fertilizer and to use native plants.
  - Work with DelDot, the CIB, DNREC, The Town of South Bethany, homeowners and stakeholders to reduce the pollutants that enter the South Bethany Canals
    - Highest priority is stormwater run off from Route 1
    - Develop ordinances relative to impervious surfaces and piping storm water and gray water into the canals
    - Support state and federal initiatives that limit nutrients from entering the Inland Bays

Al Rae, President of SBPOA, is Leading a Group to Monitor Water Quality in the South Bethany Canals

Quantities to be monitored:

- For "Fishable" Waters
  - Dissolved Oxygen
  - Water Temperature
  - Salinity
  - Nitrogen and Phosphorus
  - Secchi Depth
- For "Swimmable" Waters
  - Bacteria
- Storm Water Influence
  - Collect accurate local rain data

We have been working with Ed Whereat from the University of Delaware to establish the location of the monitoring sites, establish monitoring processes and conduct training.

Al Allenspach, a Member of The SBPOA, is Leading Over 30 SBPOA Oyster Gardeners

George Junkin, a Member of The SBPOA, Leads the Initiative to Develop Alternatives Together With DelDot, DNREC & CIB to Improve The Route 1 Stormwater Runoff Issue

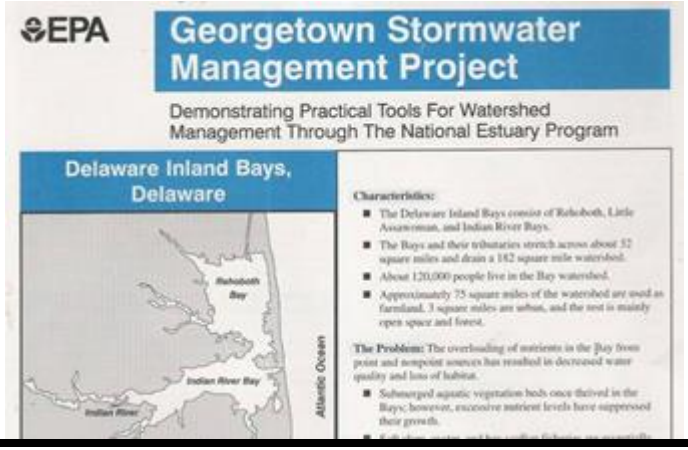
- Four alternatives were presented and discussed at a joint meeting, August 27, 2007, attended by representatives from DNREC, DelDOT, CIB, University of Delaware and the Town of South Bethany.

1 – Do nothing. Live with existing forebay

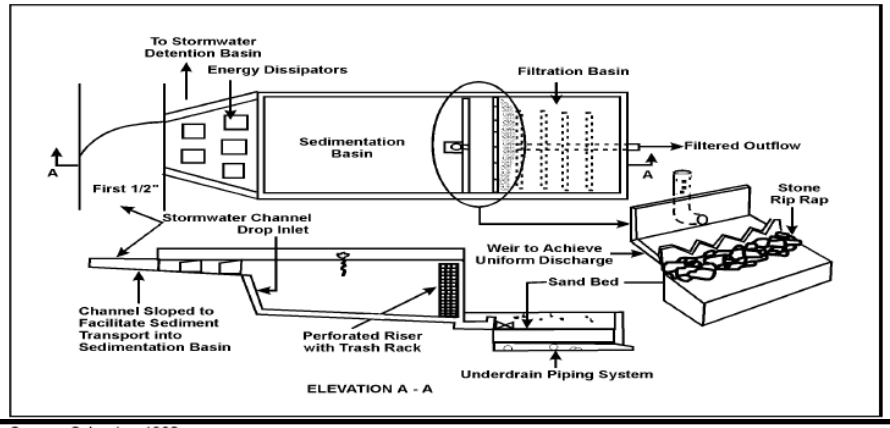
DelDOT installed the existing forebay in early 2004

2 – Outfall to Ocean like Rehoboth

3 – Build artificial wetland south of town in St. Park



4 – Design a large Austin Sand Filter at Anchorage



Summary – Town of South Bethany Water Quality Improvement Initiatives

- The Tidal Pump is the only initiative that will make a significant impact to the quality of water in the dead end canals and the Little Assawoman Bay. (Dead-End Canal Conference May 2003)
- Even if the Tidal Pump is implemented, the stormwater runoff from Route 1 into the South Bethany Canals must be addressed.
- The Town of South Bethany is very serious about improving the quality of water in their canals and the Little Assawoman Bay
  - Formed the water quality committee that must report monthly to the town council.
  - Thousands of man-hours have been donated by South Bethany homeowners on initiatives to improve water quality.
  - Spent $70,000 of town funds on the Tidal Pump initiative.
  - The town will continue to work with DNREC, DelDot, CIB and other federal and state agencies to improve the quality of the water in their canals and the Little Assawoman Bay.

Questions and Discussions

- Is the Tidal Pump an initiative worth pursuing?
- Whom do we need to convince to be the “advocate” for the Tidal Pump Process?
- Who owns the Tidal Pump when it is almost completely on state property?
- What should be our path through the permitting process?
- How do we go about obtaining the needed $7M funding?