

# Groundwater Protection and Management Planning for the Eastern Shore of Virginia

## Using a Sustainable Development Approach



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# Quick Definitions

## What is an Aquifer

Any coarse grained material (sand, gravel) that can supply sufficient water for a beneficial use

## What is a Confining Unit

Any fine grained material (silt, clay) that can significantly restrict vertical movement of groundwater such that the resulting groundwater is under pressure.

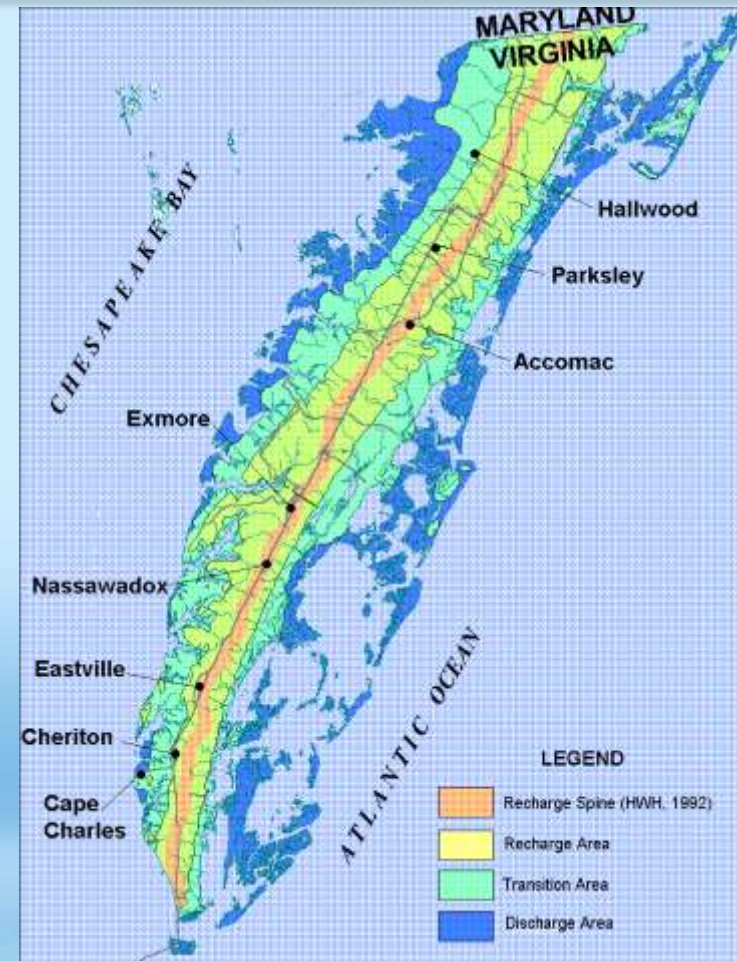
# Quick Definitions

## Water Table –vs- Confined Aquifer

- **Water Table**
  - Water is not “under pressure”
  - Well yield is lower than comparable confined aquifers
  - Replenished (recharged) directly by precipitation
  - More vulnerable to contamination from surface activities
- **Confined aquifer**
  - Water is under pressure, confined by an overlying layer(s) of silt and clay
  - Replenished from vertical flow through the confining unit (recharge is much lower than a water table aquifer)
  - More vulnerable to saltwater intrusion

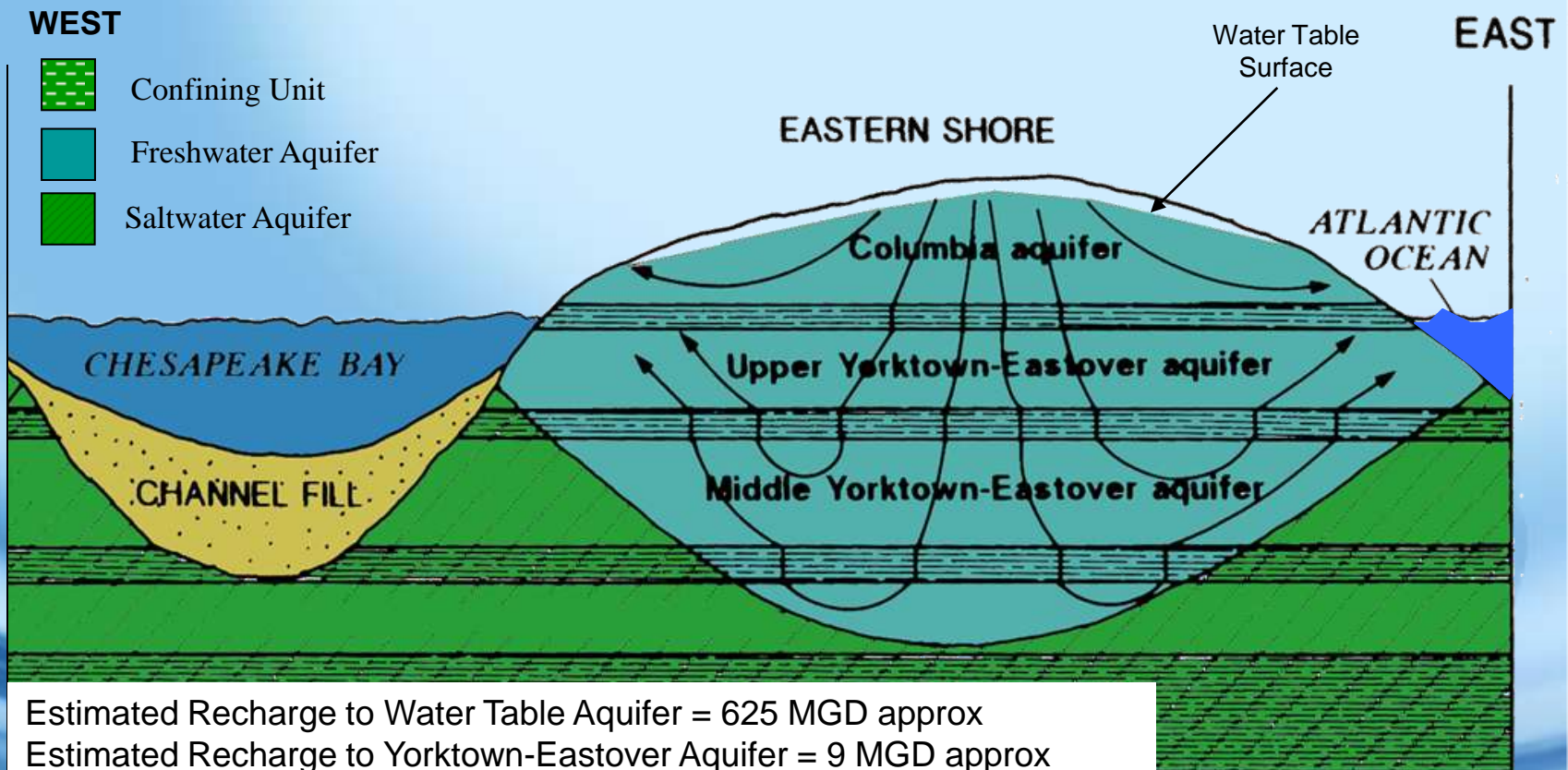
# Why the Eastern Shore of Virginia?

- Designated by the USEPA as a Sole Source Aquifer - no significant fresh water streams or rivers
- Limited resource - recharge occurs in a “Spine Area”



# Why the Eastern Shore of Virginia?

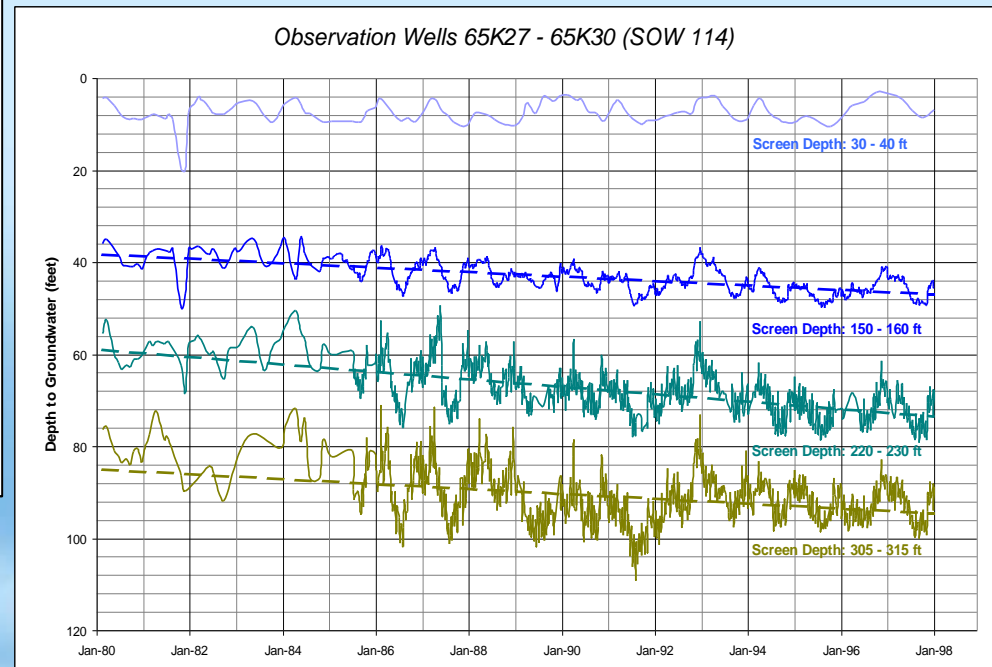
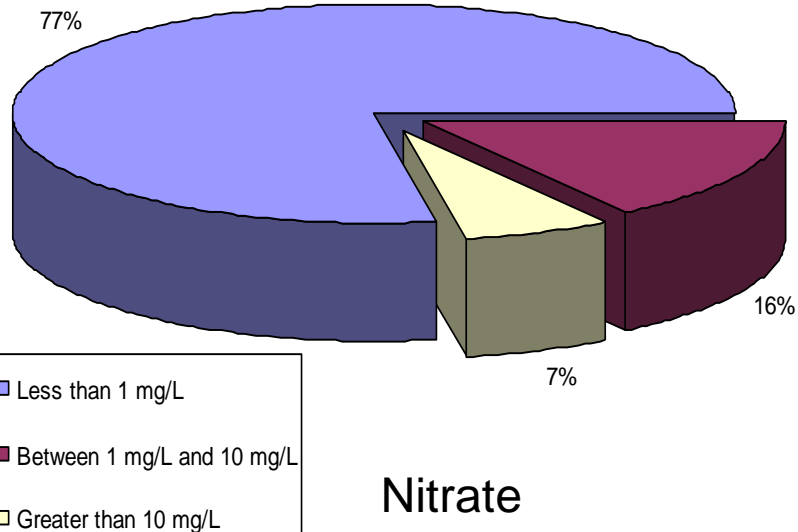
**Fresh ground water is restricted to depths less than 350 feet**



Estimated Recharge to Water Table Aquifer = 625 MGD approx  
Estimated Recharge to Yorktown-Eastover Aquifer = 9 MGD approx  
(based on USGS Eastern Shore Model)

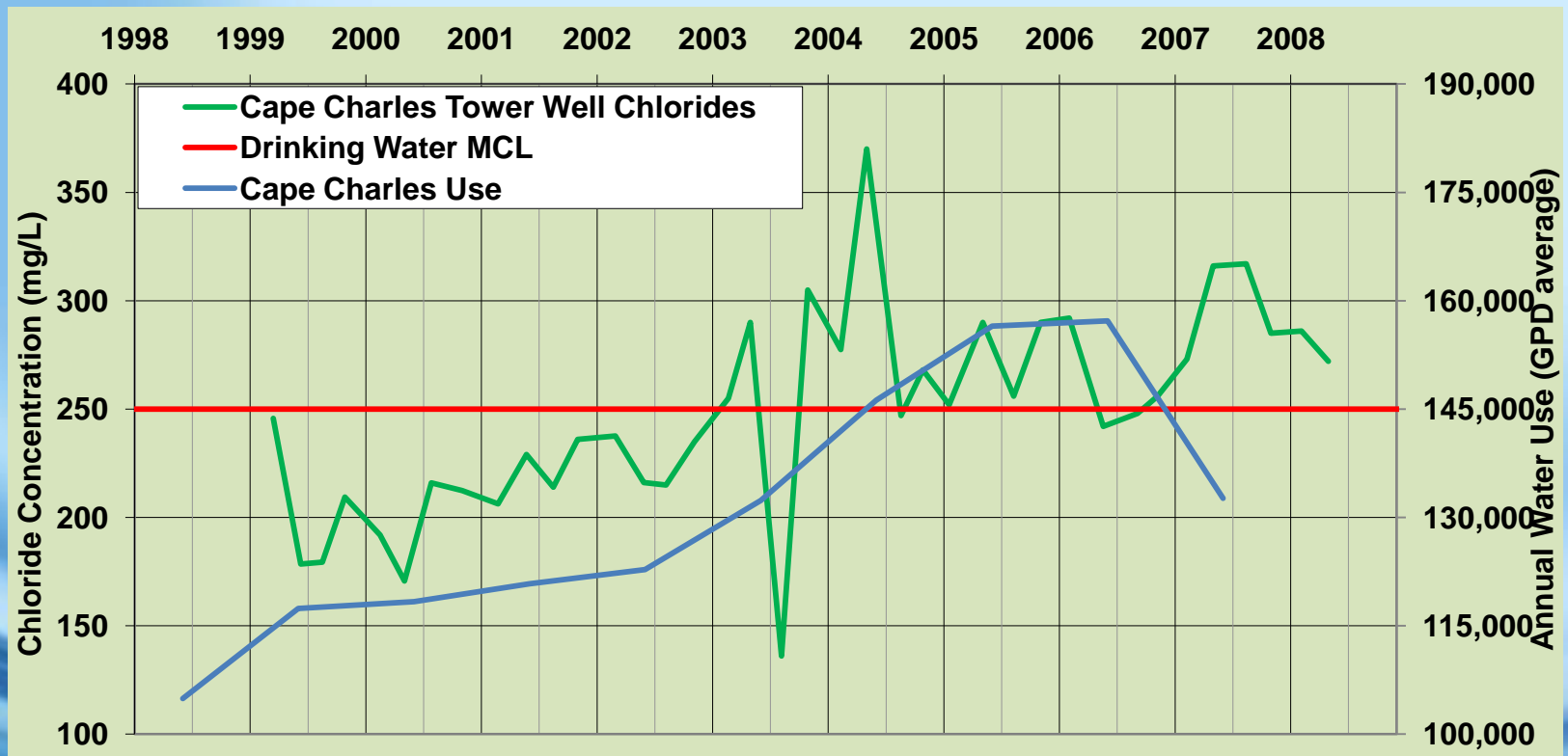
# Why the Eastern Shore of Virginia?

**Multiple contamination threats - to the water table from land use activities and to the confined aquifers from over pumping**



# Why the Eastern Shore of Virginia?

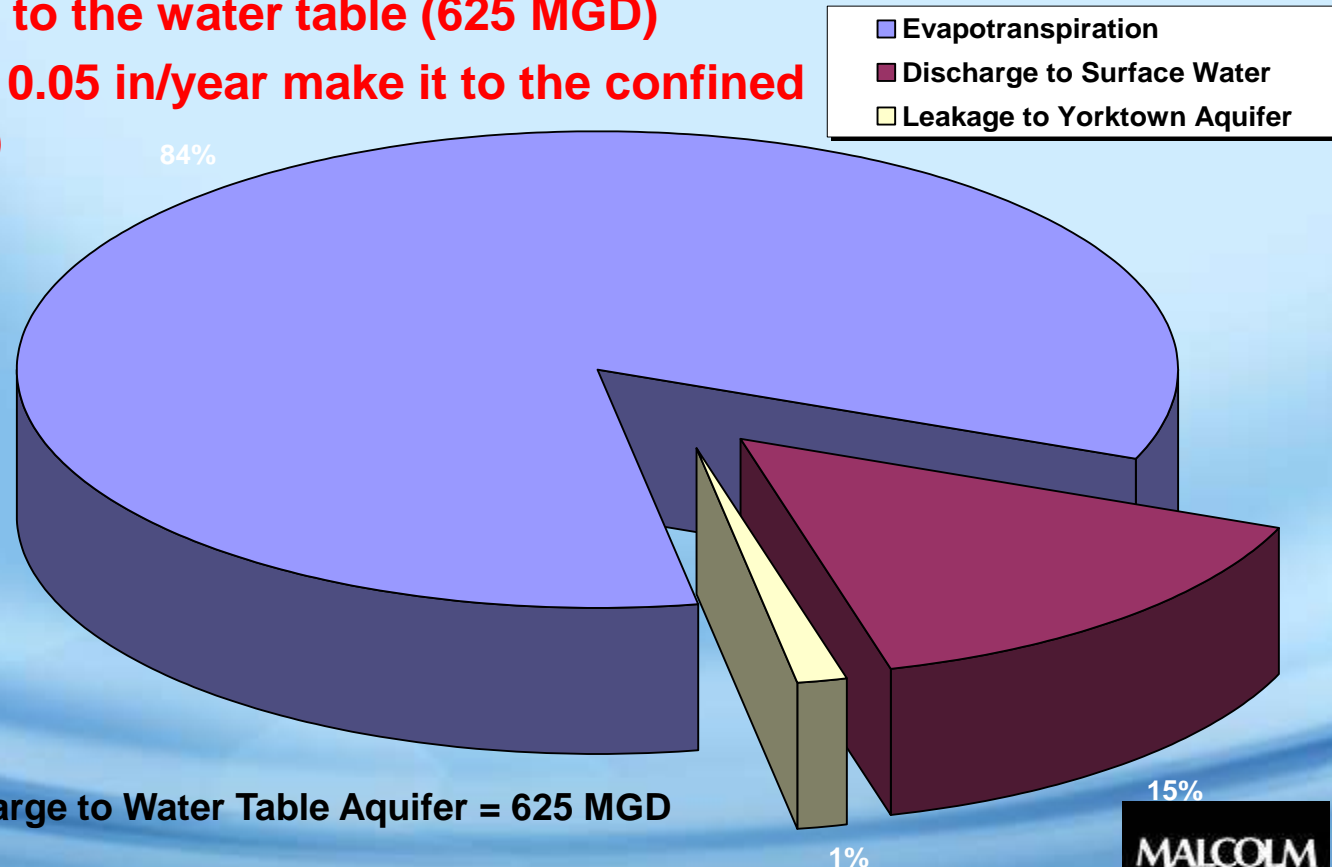
**Most likely cause for a loss of fresh ground water is salt water intrusion due to over pumping**



# Why the Eastern Shore of Virginia?

- **Limited Recharge:**

- **Of the 44-inches of annual precipitation only 5 to 6 inches infiltrate to the water table (625 MGD)**
- **And only about 0.05 in/year make it to the confined aquifer (9 MGD)**

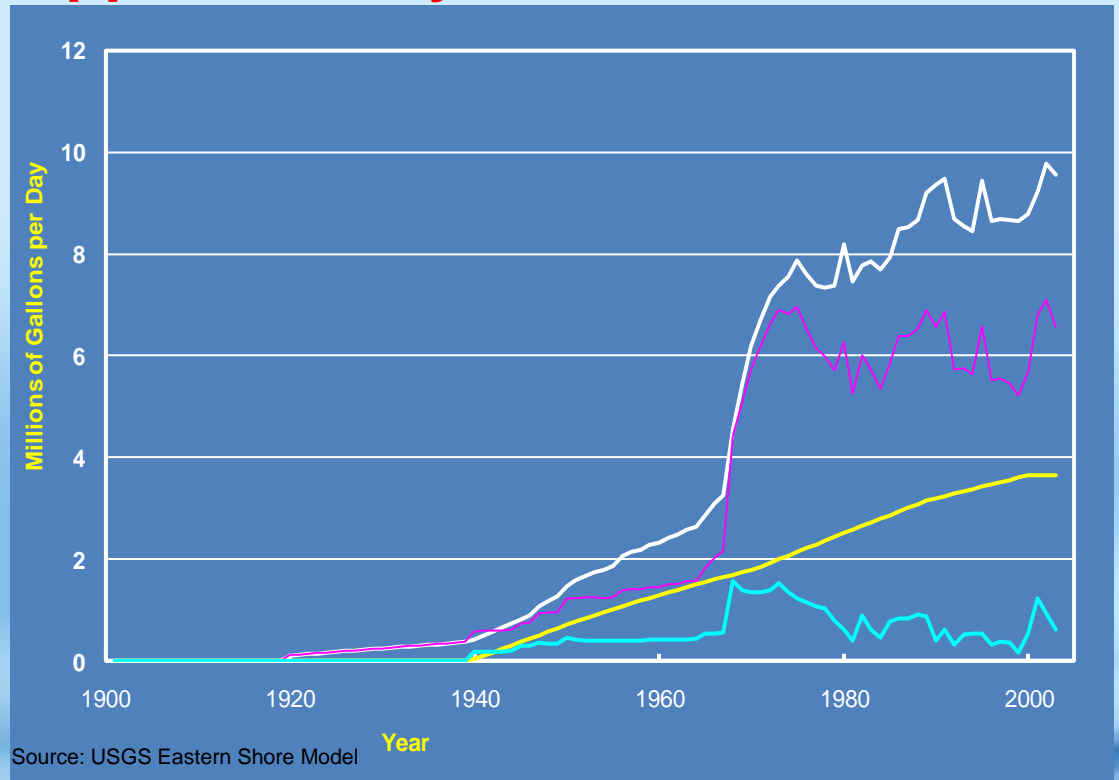


**Total Estimated Recharge to Water Table Aquifer = 625 MGD**

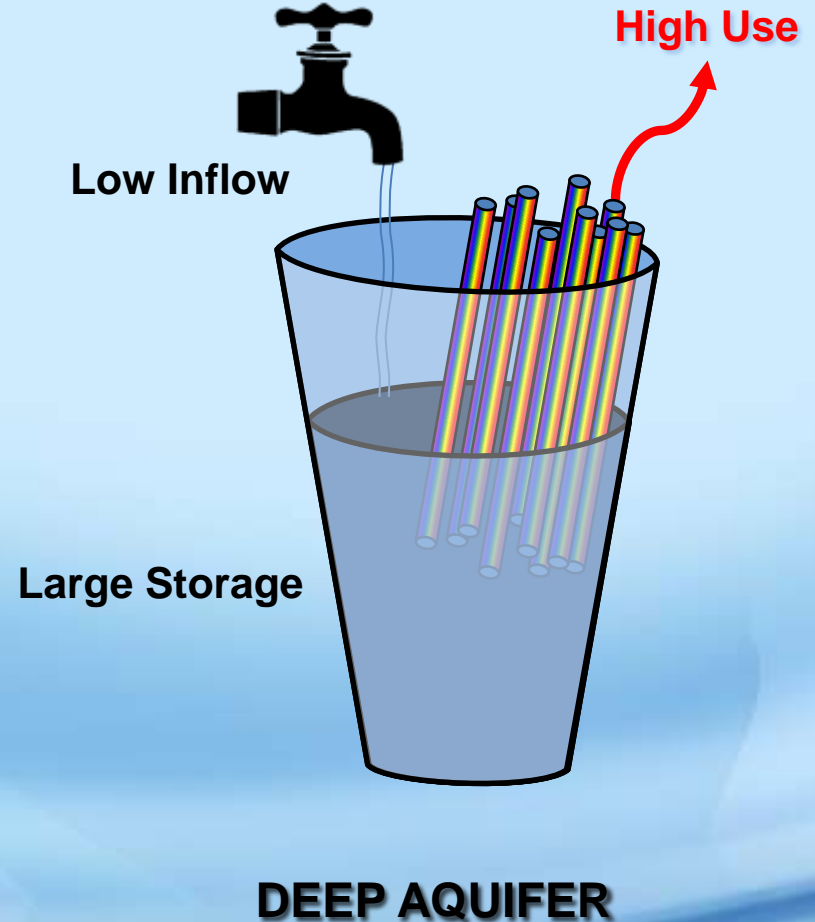


# Why the Eastern Shore of Virginia?

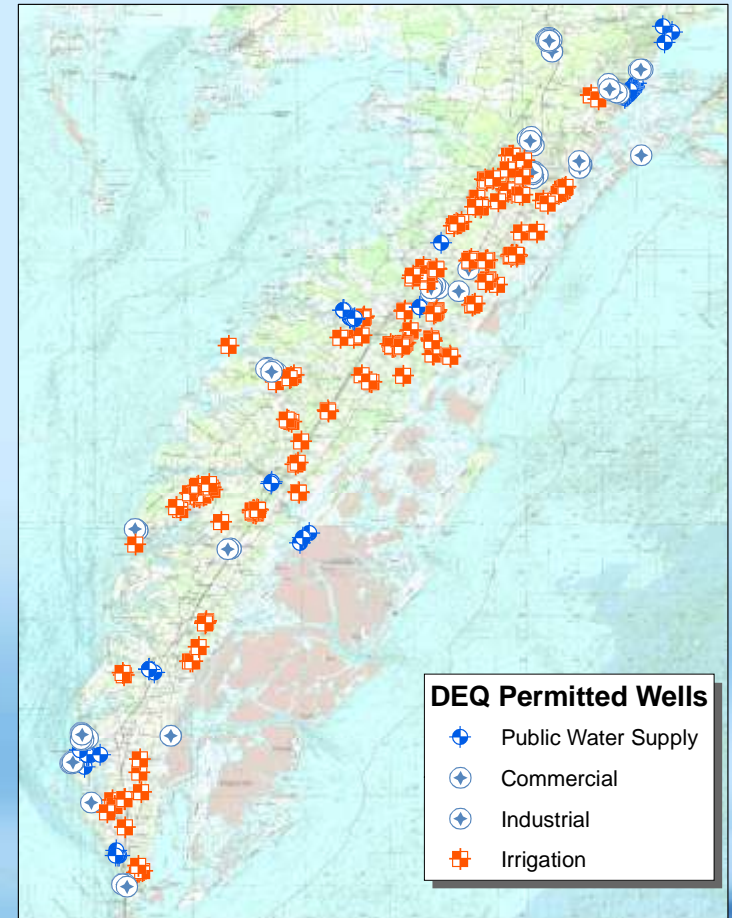
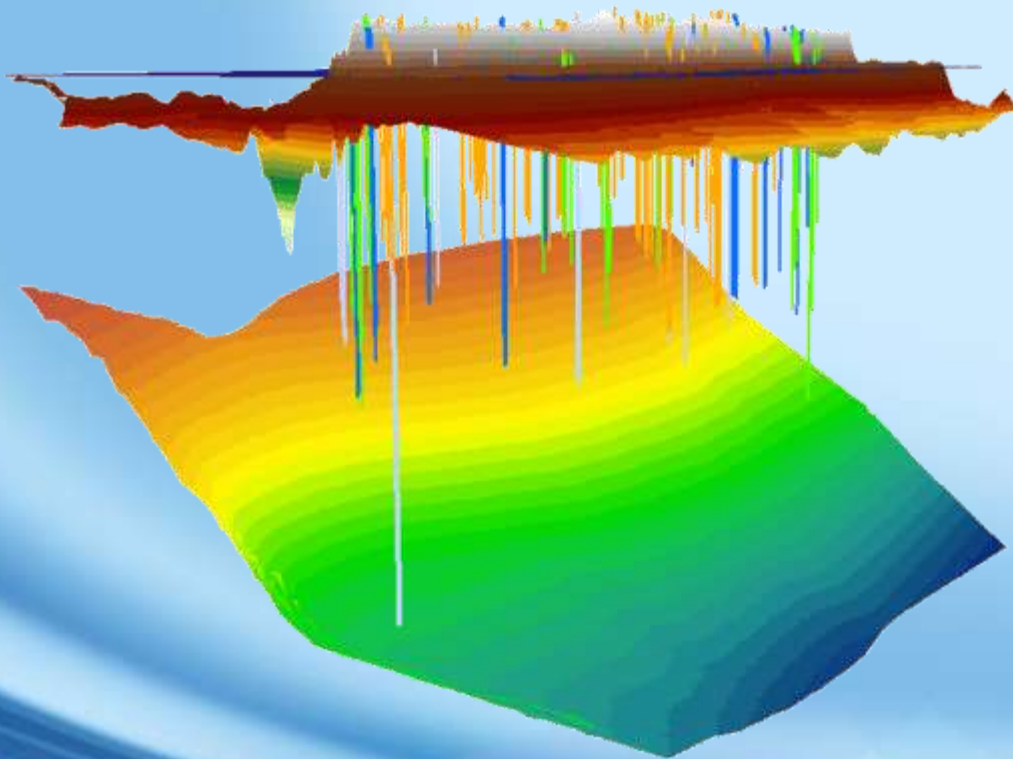
- **Current Yorktown-Eastover Aquifer use exceeds recharge by approximately 1 MGD**



# Water Table / Yorktown Dilemma



# Major Groundwater Withdrawals are Numerous Across the Shore



# Who is Doing the Planning?

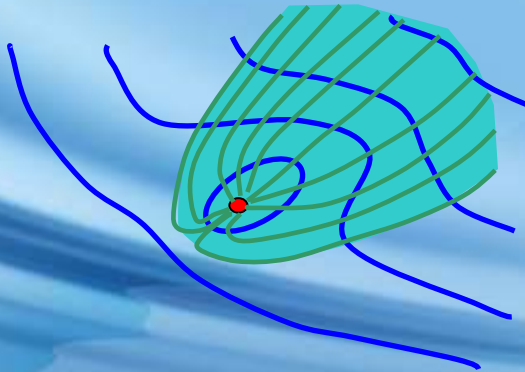
- **Eastern Shore of Virginia Ground Water Committee**
  - **Bi-county committee formed in 1990 by Accomack and Northampton Counties**
  - **11-member committee includes elected officials, citizens, and local government staff**
  - **Mandate is to assist local governments and residents of the Eastern Shore in:**
    - **Understanding, protecting and managing ground water resources**
    - **Preparing a ground water resources protection and management plan**
    - **Serving as an educational and informational resource**
    - **Initiating special studies concerning the protection and management of the Eastern Shore ground water resource.**
  - **With Coordination and Assistance from the**
    - **Accomack-Northampton Planning District Commission**
    - **State and Federal Agencies (VDEQ, VDH, NRCS, USGS, others)**

# The PLAN

- **The Ground Water Committee has facilitated a significant number activities to support resource preservation and protection over the past 19 years**
- **This presentation will focus only on the Plan – past and present**

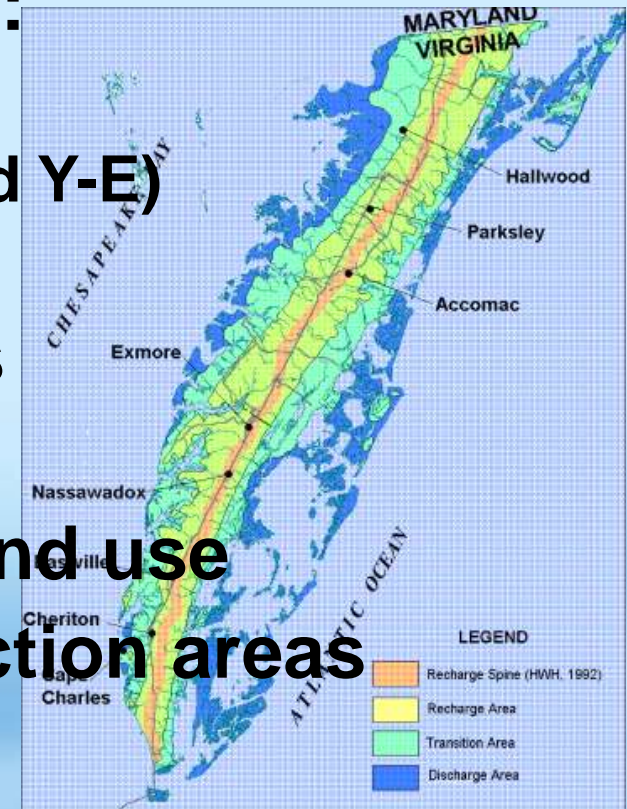
# Original Approach - 1992

- **Structured around “Wellhead Protection”**
- **Generally approached issues separately**
- **Focus on identifying resources, use, potential contaminant threats**
- **Focus on the fresh water portions of the Yorktown-Eastover Aquifer**



# Scope of the Original Plan

- Identify fresh water resources:
  - Confined fresh water aquifers
  - Recharge spine (for the confined Y-E)
  - Water budget/balance
- Identify contamination threats
- Monitor ground water uses
- Manage existing and future land use
- Delineate ground water protection areas



# Original Plan Recommendations

- ✓ **Manage Wellhead Protection and Recharge Areas**
    - **Restrict Mass Drainfields in Recharge Areas**
  - ✓ **Implement Chesapeake Bay Program**
    - **Private Well Ordinance**
  - ✓ **Review Zoning, Subdivision Regulations, and Site Plans to address groundwater quality and quantity**
    - **Register ALL USTs**
  - ✓ **Monitor Groundwater Withdrawals**
  - ✓ **Develop Land Use/Water Quality Database**
  - ✓ **Promote Research and Education**
- ✓ (indicates partial or fully complete)  
– (indicates incomplete)



# Notable Accomplishments



Prepared in cooperation with the Virginia Department of Environmental Quality, the Accomack-Northampton Planning District Commission, and the USGS Office of Groundwater

## Simulation of Groundwater-Level and Salinity Changes in the Eastern Shore, Virginia



<http://pubs.usgs.gov/sir/2009/5066/>

Scientific Investigations Report 2009-5066

- **Technical Assistance to the Counties**
- **Support and Promote Research**
- **Facilitate and Implement Protection Measures**
- **Develop Tools for Resource Protection and Preservation**

# Change happens over 17-years

- **Most of the plan recommendations were at least partially implemented by the two Counties**
- **Great deal of research furthered understanding of the resource**
- **And changing land use pressures in**
  - **agricultural**
  - **“suburbanization”**

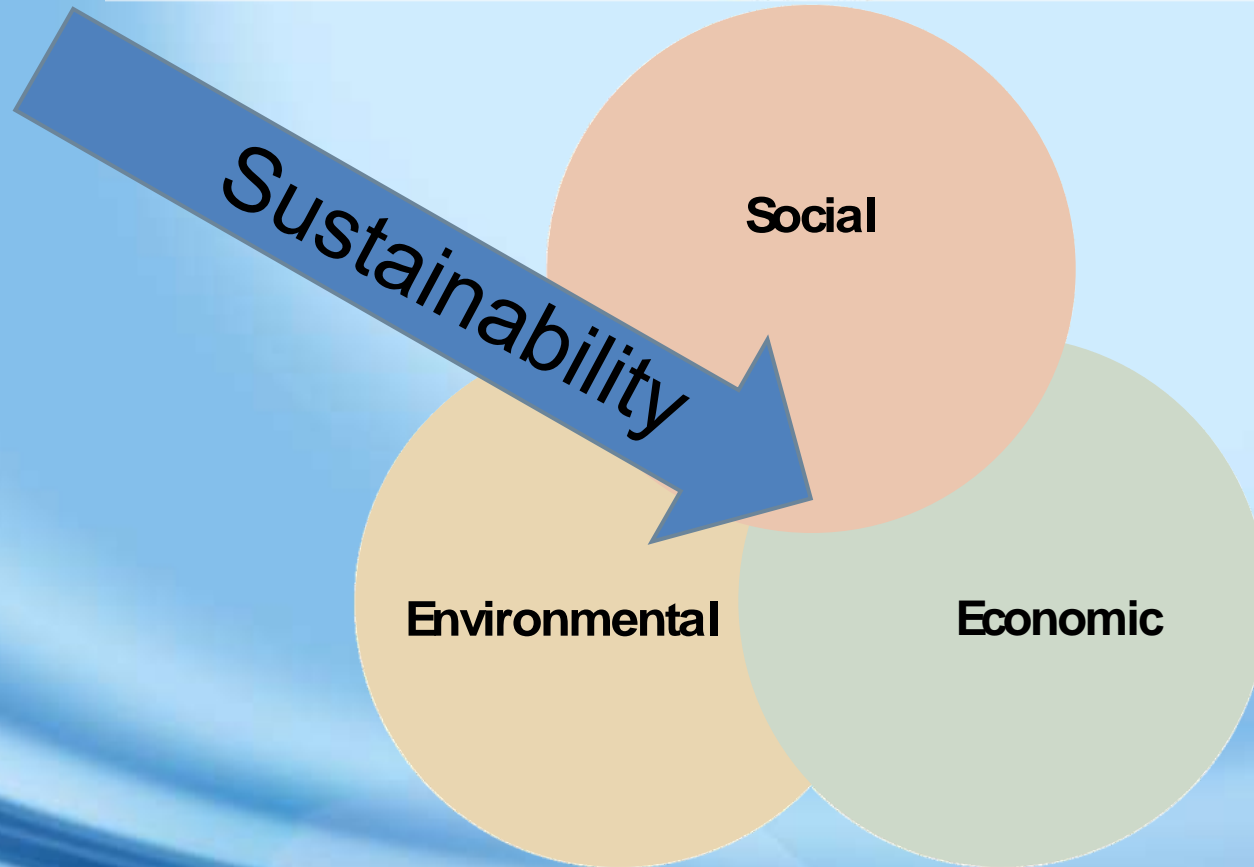
# Revision and Update of the Plan

- In January 2008 the Ground Water Committee completed a review of the original Plan and voted to “overhaul” 1992 Protection and Preservation Plan
- In June 2008 the Committee elected to complete the revision and update using a *Sustainability* approach

# Sustainable “Mandate” Adopted by the Committee

- **New Sustainable Use approach is more systematic than the original Wellhead Protection Plan**
  - **Sustainable development is defined as:**
    - *“...the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”* (United Nation's World Commission on Environment and Development 1987)
    - **And meets the following conditions:**
      - 1. *“Renewable resources such as fish, soil, and groundwater must be used no faster than the rate at which they regenerate.”*
      - 2. *“Pollution and wastes must be emitted no faster than natural systems can absorb them, recycle them, or render them harmless.”* (Herman E. Daly, 1971)

# Sustainability is a Balancing Act



# Focus Issues for Sustainability Effort

- **Stakeholders needs and requirements**
- **Source, quantity and quality of available water resources**
- **Threats to water supply**
- **Recognizing new and emerging technologies and processes**
- **Cost constraints**
- **Recognize that this will be a “living” document**

# Identify Stakeholders

- **Primary Users:**
  - **Individual domestic (residential)**
  - **Municipal / Public Water Supply**
  - **Developers**
  - **Agriculture**
  - **Industry**

# Identify Stakeholders

- **Other Primary Stakeholders**
  - **Government Agencies**
    - Local
    - State
    - Federal
  - **Non-Governmental Organizations**

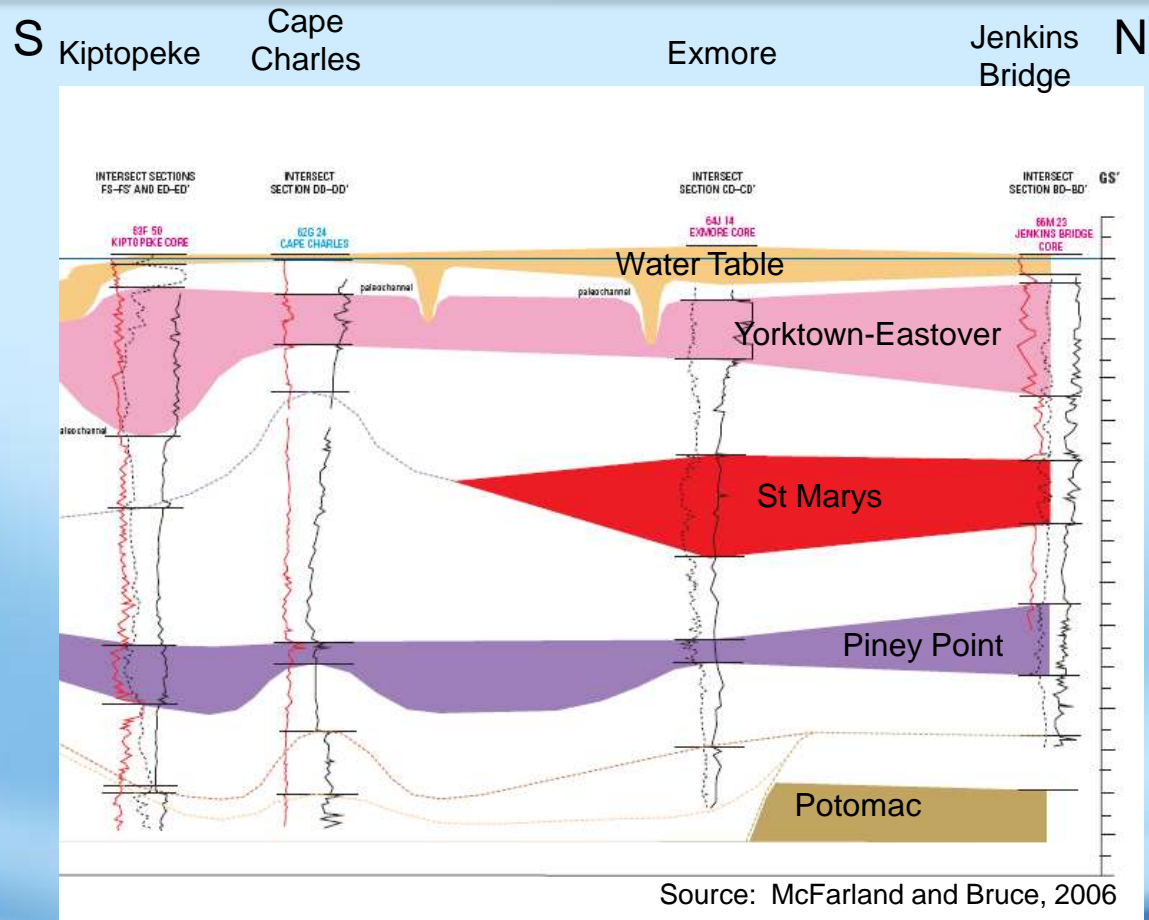


# All Potential Sources of Water Will Be Evaluated

- **Fresh Groundwater**
  - Unconfined (Water Table) Columbia Aquifer
  - Yorktown-Eastover Aquifer (Confined)
- **Brackish Groundwater**
  - Yorktown-Eastover Aquifer (portions)
  - St. Marys Aquifer
  - Piney Point Aquifer
  - Potomac Aquifer
- **Fresh Surface Water**
  - Streams and Creeks
  - Dug Ponds
  - Storm water
- **Brackish / Saline Surface Water**
  - Atlantic Ocean
  - Chesapeake Bay
  - Creeks and Bays
- **Reuse**
  - Municipal / Domestic
  - Industrial

# Groundwater Aquifers

- **Fresh Groundwater is restricted to the Columbia (Water Table) aquifer and significant portions of the Yorktown-Eastover aquifer**
- **Brackish groundwater is found in portions of the Yorktown-Eastover, all of the St. Marys Aquifer, Piney Point, and Potomac aquifers**
- **The Columbia, Yorktown-Eastover, and Piney Point aquifers are found throughout the Eastern Shore**
- **St. Marys and Potomac Aquifers are absent in the southern portion of the Shore**



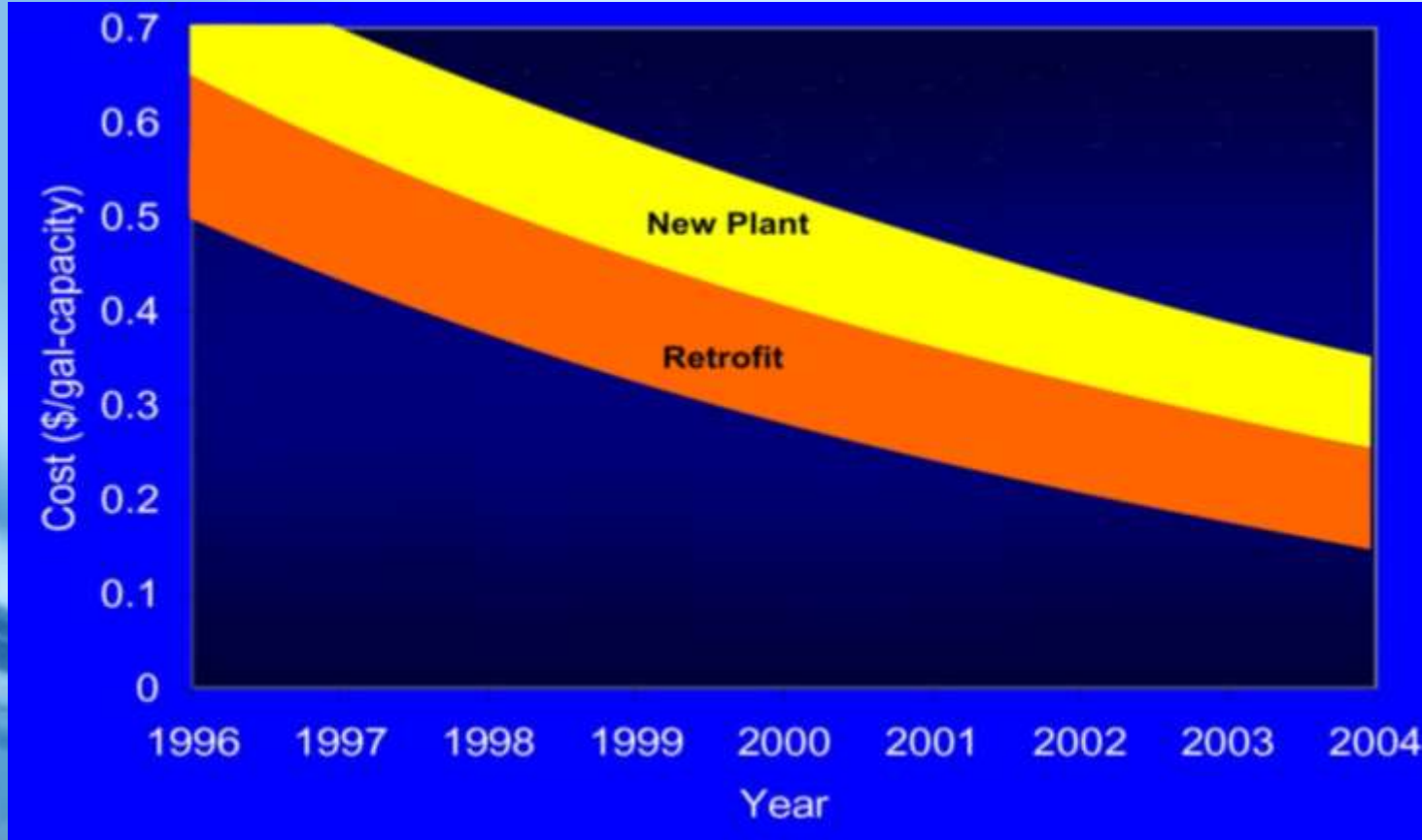
# New and Emerging Technologies and Processes

- **Alternate Sources to Fresh Groundwater:**
  - Saltwater Treatment (Membrane and Ultrafiltration)
  - Reuse
  - Aquifer Storage and Retrieval / Recovery (ASR)
- **Reduction:**
  - Conservation
  - Buried Infrastructure and System Improvements



# Cost Constraints

- Some technologies that, 20-years ago were considered cost prohibitive in many areas are now cost competitive:
  - Membrane desalting technologies have decreased on average 10% per-year over the past 10-years.



# First Step - Facilitate Stakeholder Involvement

- Subcommittees
- Questionnaires
- Stakeholder Meetings

**Groundwater Committee Public Survey**  
(Please fill out and return to address at bottom)

The Eastern Shore of Virginia Ground Water Committee is initiating the first major update of the Ground Water Supply Protection and Management Plan that was adopted by the Committee in 1992. The updated Plan will be centered on the concept of maintaining a sustainable resource. Completing the following questionnaire will aid the Committee in assessing the needs of all Stakeholders on the Eastern Shore of Virginia.

- 1) Where do you get your water? Private Well, Public Supply, Private System, Other \_\_\_\_\_
- 2) Where does your wastewater go? Septic System, Municipal Sewer, Other \_\_\_\_\_
- 3) What do you believe the major ground water resource and ground water supply issues on the Eastern Shore are?

# Agricultural Stakeholder Advisory Group

- Formed in 2007 to address “*sustainability*” issues
- Members included representatives from:
  - County Extension Agents
  - S&W Conservation District
  - VA Dept of Ag & Consumer Services (VDACS)
  - Farm Bureau
  - County BOS
  - ES Ground Water Committee
- Subcommittee formed August 2008

# Immediate Next Steps

- **Complete Stakeholder Meetings**
- **Complete “snapshot” of current conditions – compile available information on:**
  - **Fresh Ground Water Resource**
  - **Other Available Waters**
  - **Current and Future Water Needs**
  - **Available and Emerging Technologies and Processes**

# Path Forward? It doesn't have to be complex...

