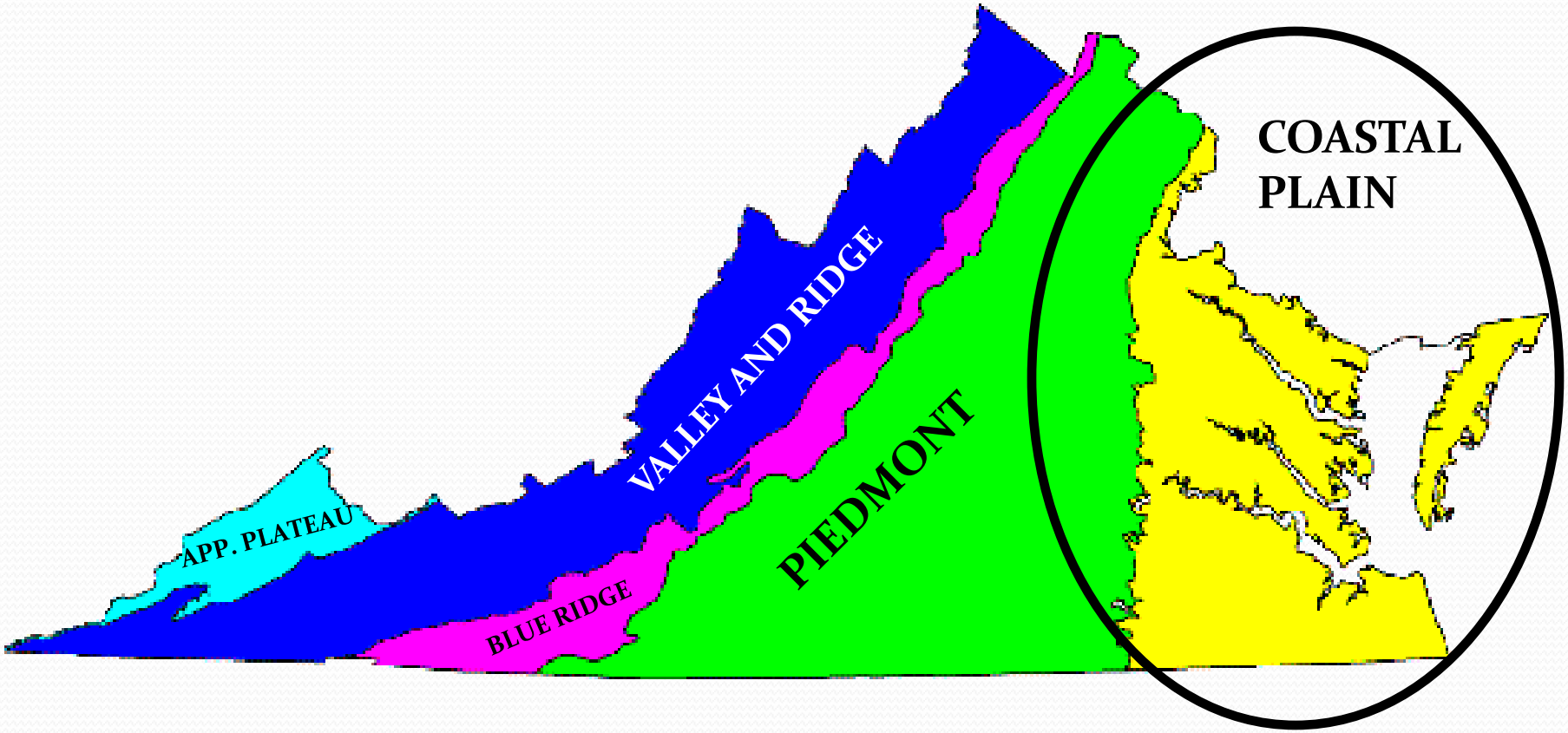
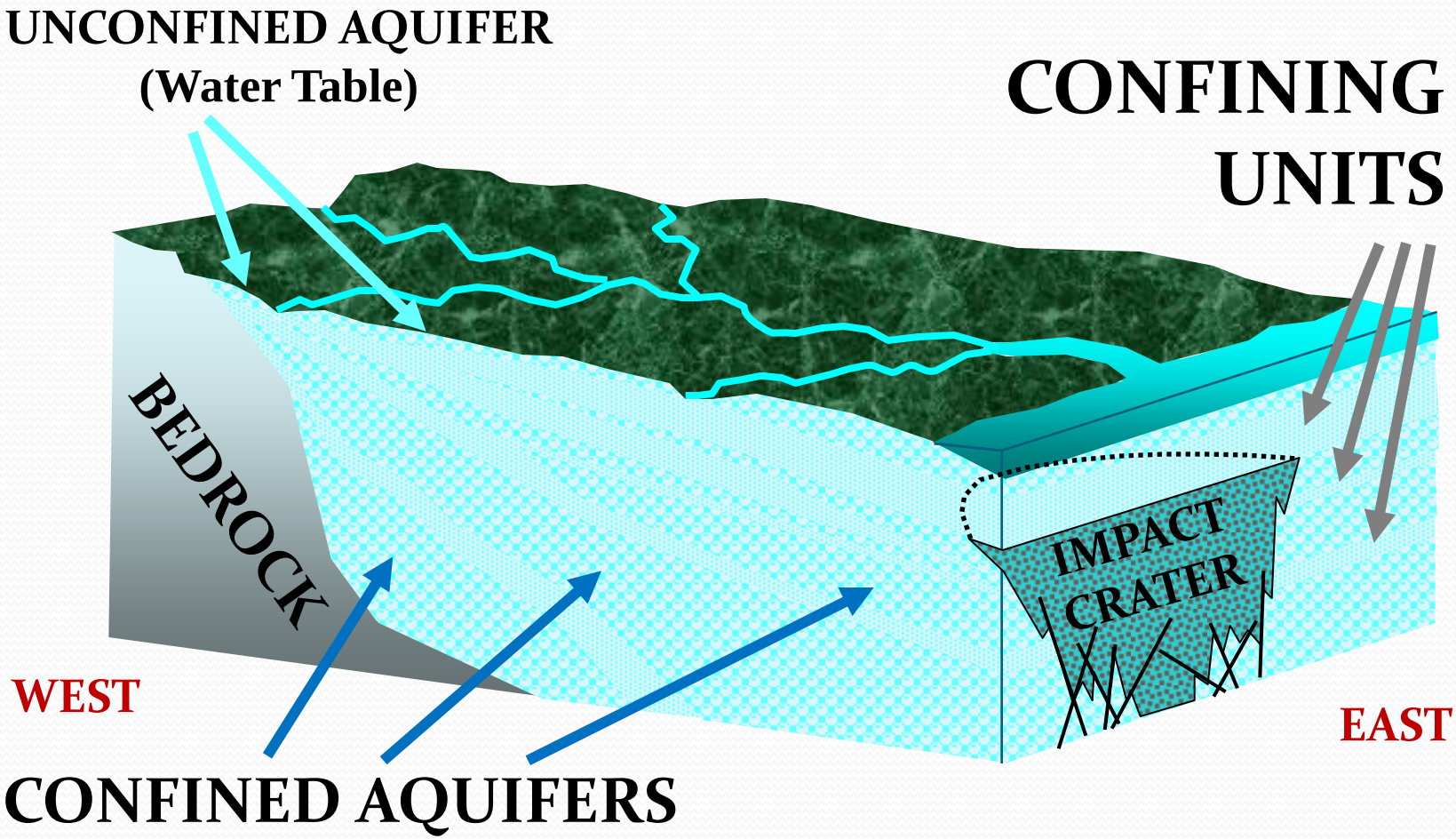
Permitting Groundwater Withdrawals in Virginias Coastal Plain

Office of Water Supply
Groundwater Withdrawal Permitting Program

Virginia Physiographic Provinces



Coastal Plain Aquifer System



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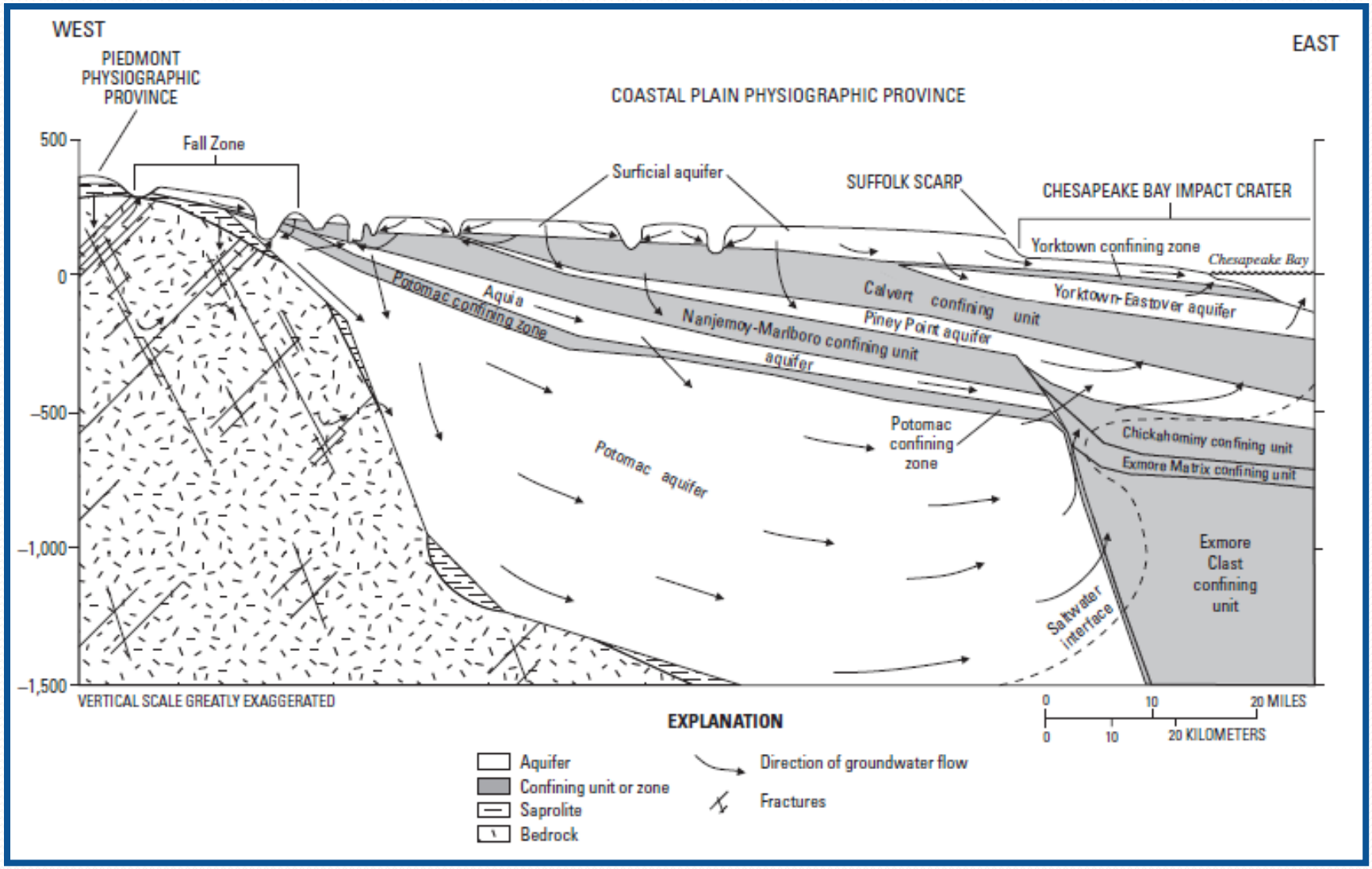


Decision Making Framework

Legacy of Research

Regulatory Actions

Expansion of GWMA

Virginia Coastal Plain Groundwater Initiative

Legacy of Research

Regulatory Actions

Virginia Well Capping Law (1956)

Ground Water Management Act of 1973

1986 Amendments to the GWM Act of 1973

Ground Water Management Act of 1992

(Chapter 25 of Title 62.1 -254)

Ground Water Management Act

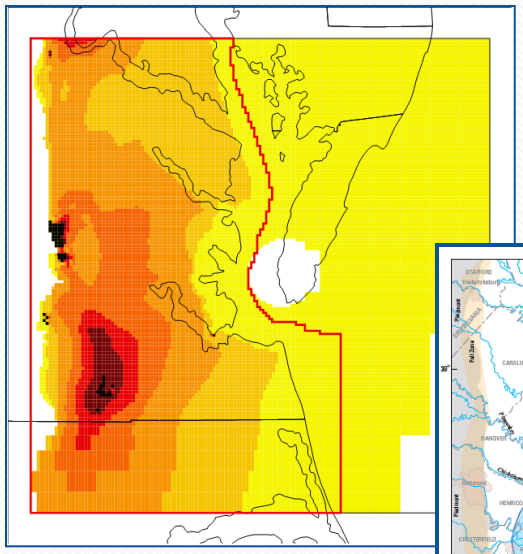
§ 62.1-254. Findings and purpose.

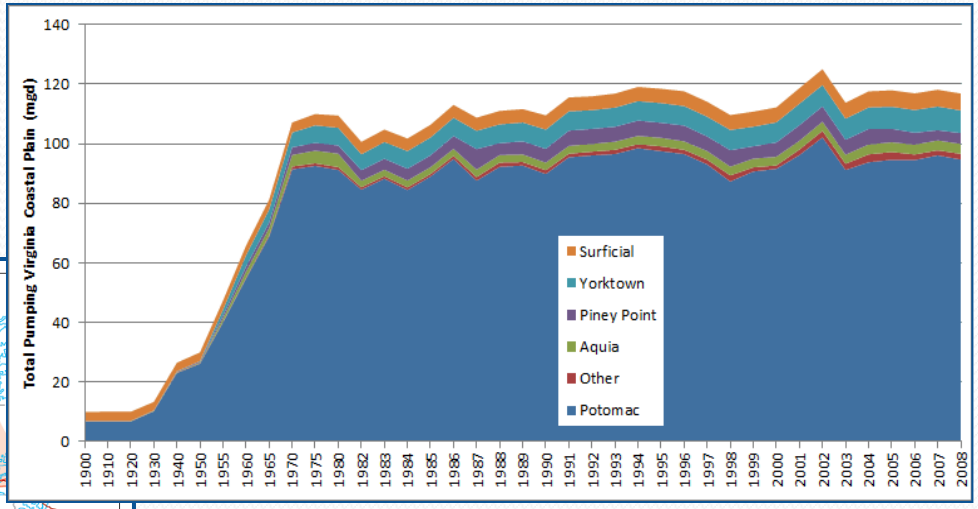
… the right to reasonable control of all ground water resources within this Commonwealth belongs to the public and that in order to conserve, protect, and beneficially utilize the groundwater of this Commonwealth and to ensure the public welfare, safety and health, provision for management and control of ground water resources is essential.

Groundwater Management Areas (GWMA)

- Protects existing users from new or expanding withdrawals.
- Assures continued resource viability into the future.
- Manages the resource comprehensively.

Groundwater Trends in Virginia





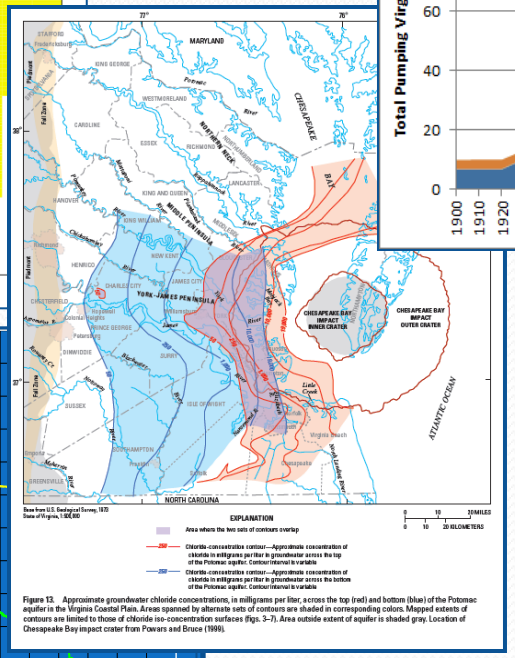
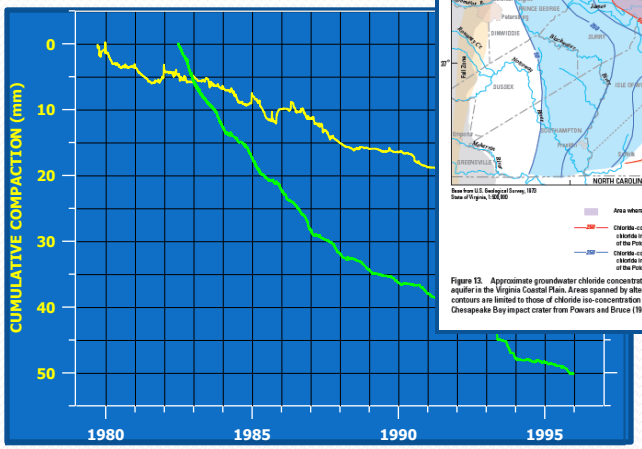
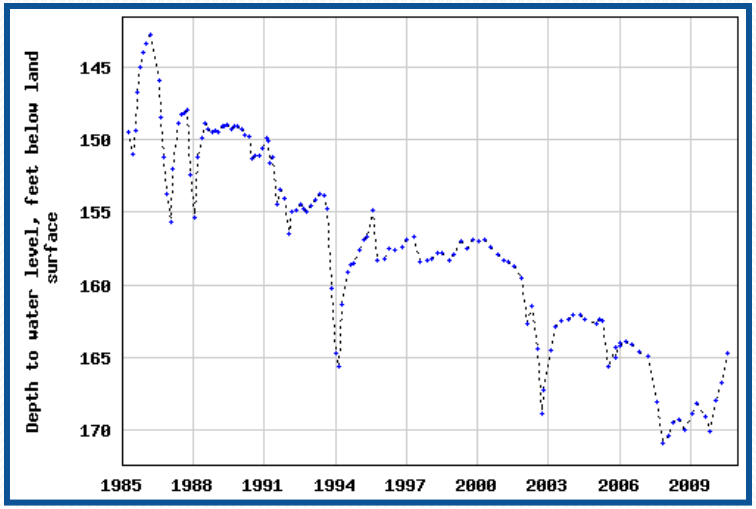


Figure 13. Approximate groundwater chloride concentrations, in milligrams per liter, across the top (red) and bottom (blue) of the Potomac aquifer in the Virginia Coastal Plain. Areas spanned by alternate sets of contours are shaded in corresponding colors. Mapped extents of contours are limited to those of chloride iso-concentration surfaces (figs. 3–7). Area outside extent of aquifer is shaded gray. Location of Chesapeake Bay impact crater from Powars and Bruce (1999).



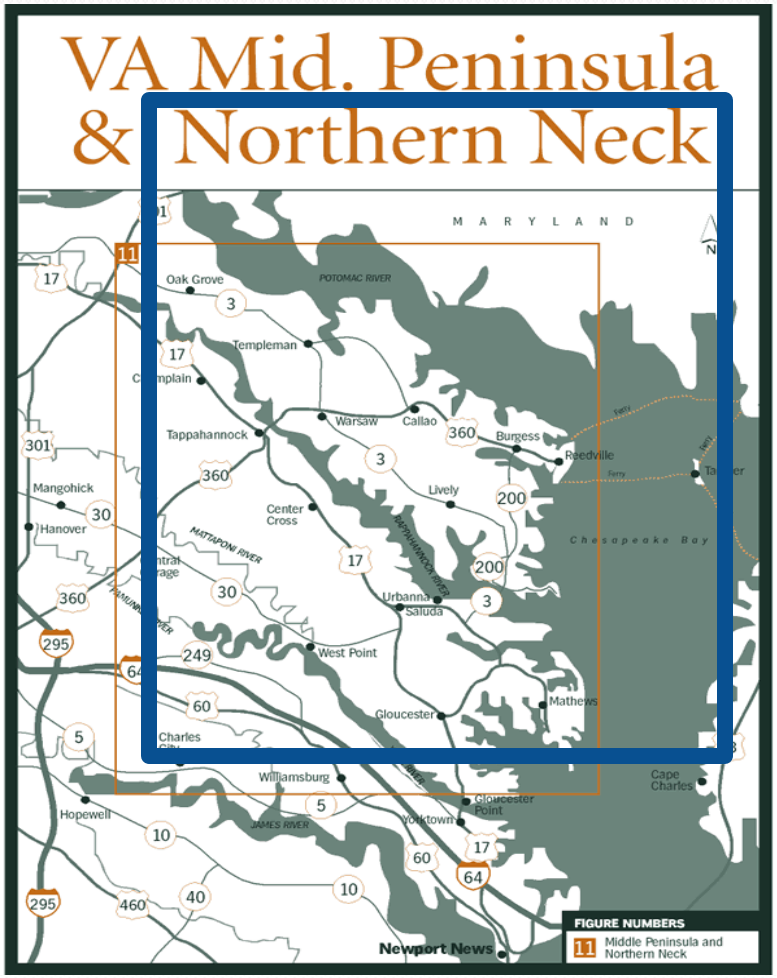


Expansion of a GWMA

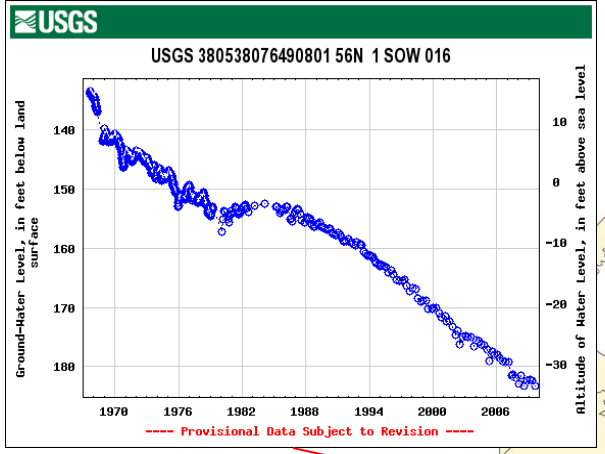
Criteria

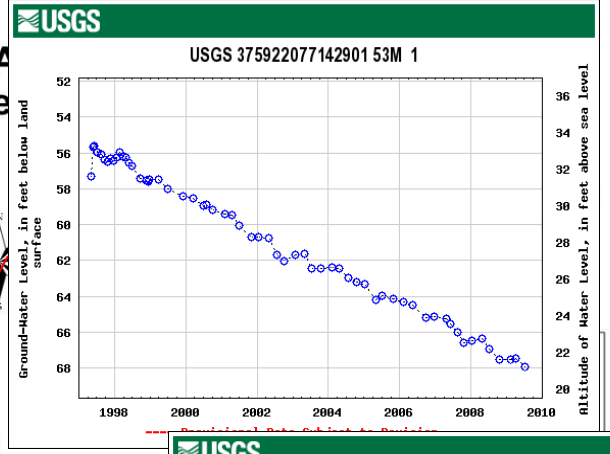
- Groundwater levels in the area are declining or are expected to decline excessively;
- The wells of two or more groundwater users within the area are interfering or may reasonably be expected to interfere substantially with one another;
- The available groundwater supply has been or may be overdrawn; or
- The groundwater in the area has been or may become polluted.

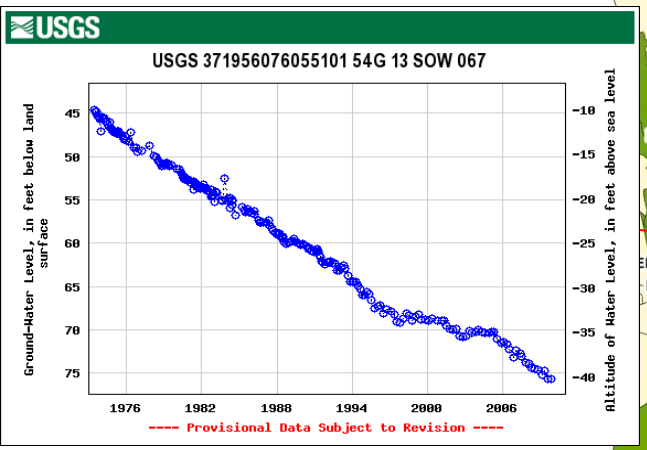
Declining Water Levels

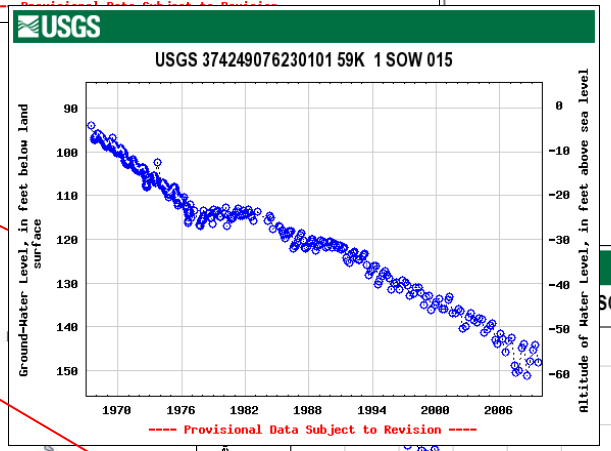


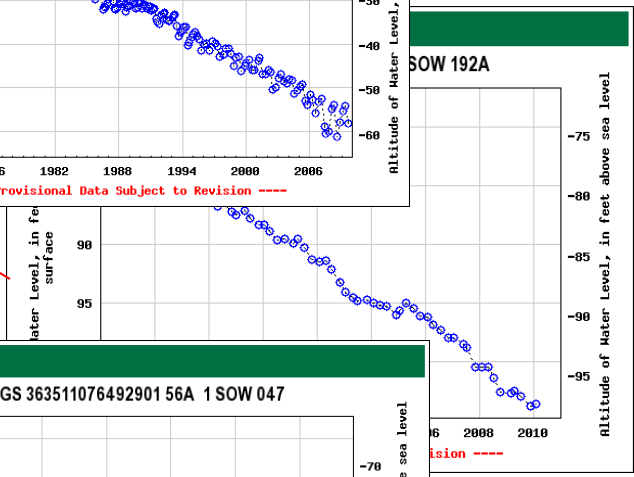
- Northern Neck
- Middle Peninsula

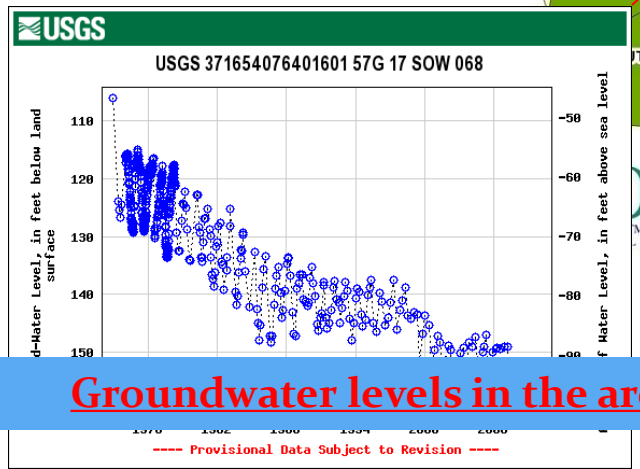


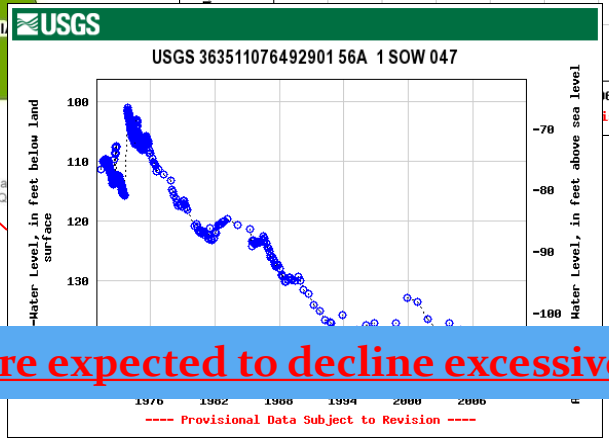


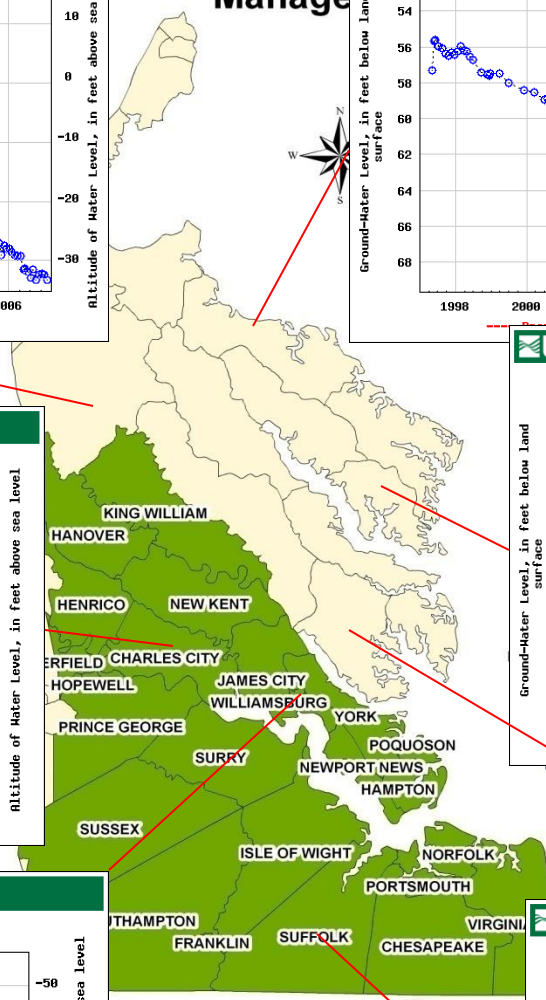




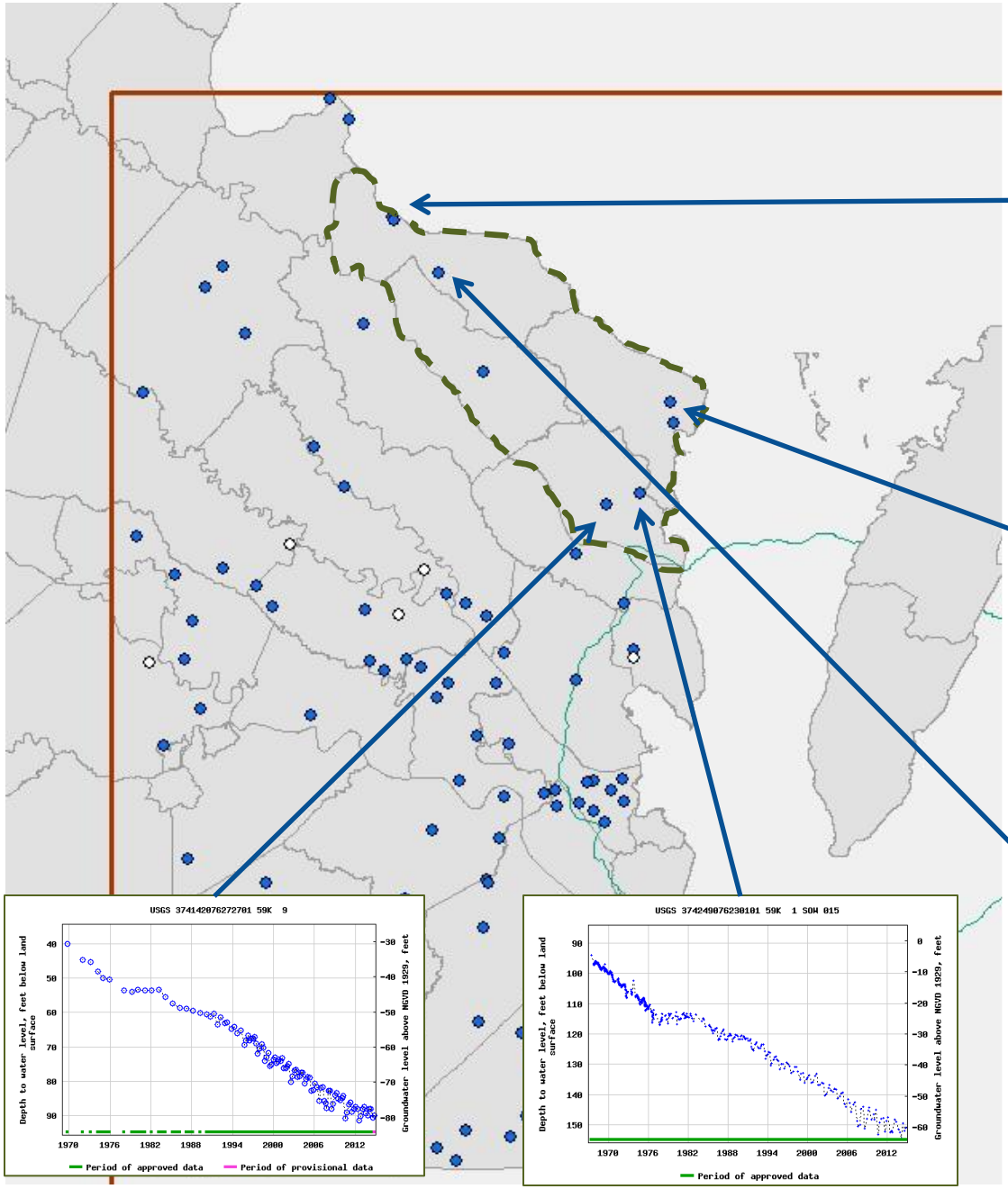


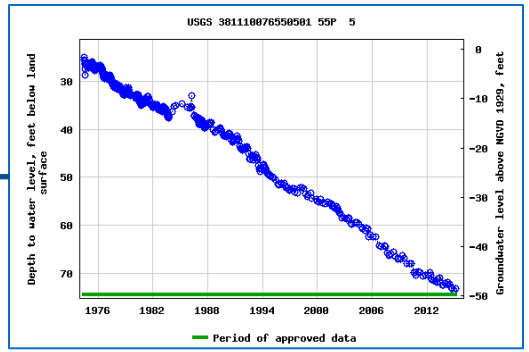


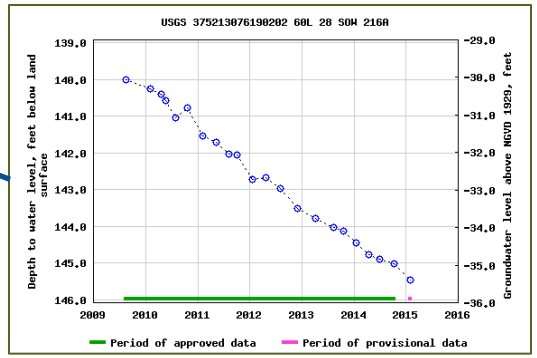


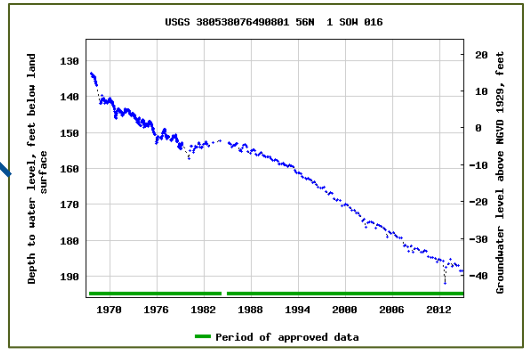


Groundwater levels in the area are declining or are expected to decline excessively




USGS 381110076550501 55P 5
Depth to water level, feet below land surface
Groundwater level above NGVD 1929, feet
Period of approved data


USGS 375213076190202 60L 28 SOW 216A
Depth to water level, feet below land surface
Groundwater level above NGVD 1929, feet
Period of approved data
Period of provisional data

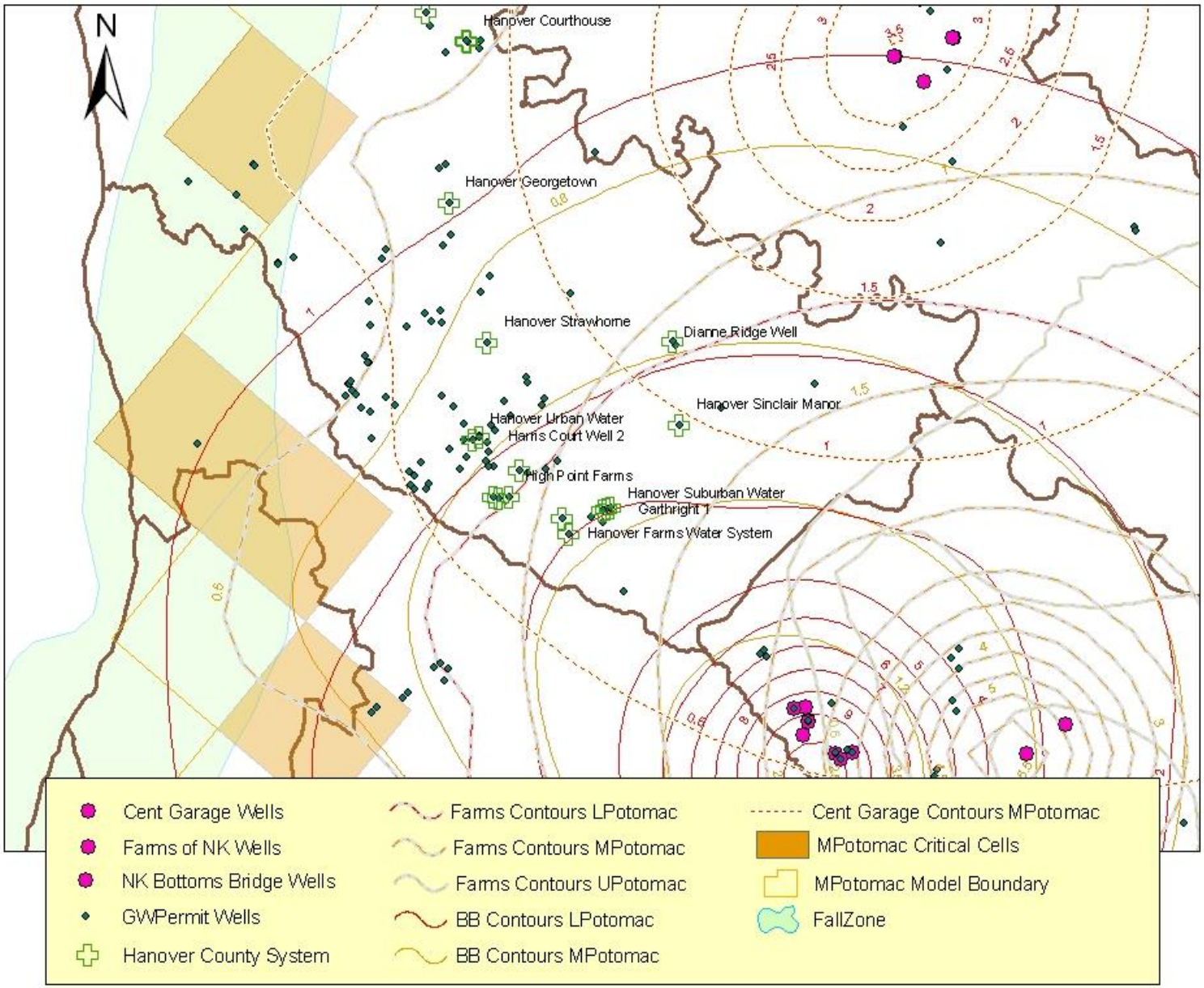

USGS 380538076490801 56N 1 SOW 016
Depth to water level, feet below land surface
Groundwater level above NGVD 1929, feet
Period of approved data

USGS 374142076272701 59K 9
Depth to water level, feet below land surface
Groundwater level above NGVD 1929, feet
Period of approved data
Period of provisional data

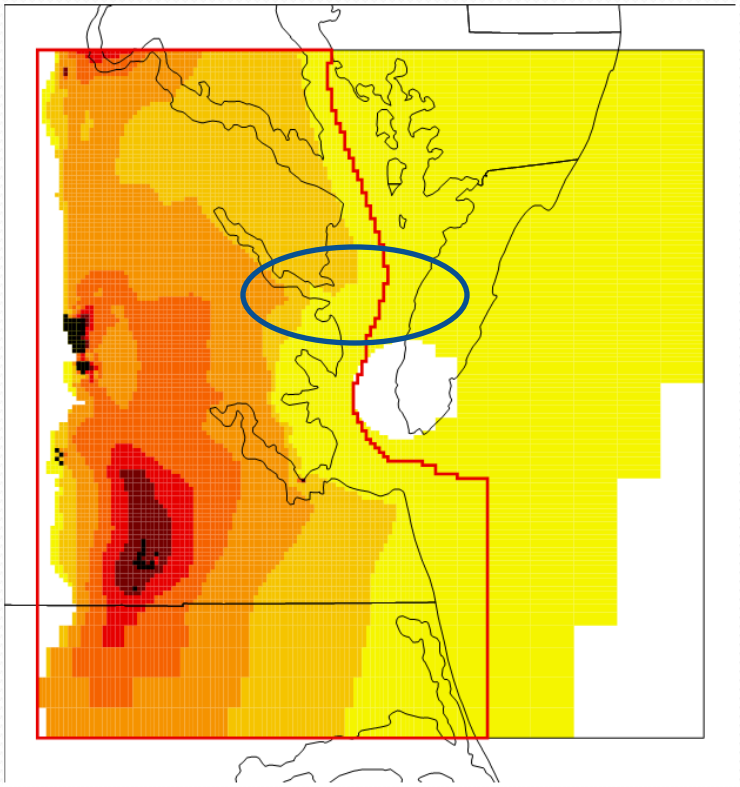
USGS 374249076230101 59K 1 SOW 015
Depth to water level, feet below land surface
Groundwater level above NGVD 1929, feet
Period of approved data

Well Interference

- Current withdrawals impact much of the entire undesignated region
- Historic pumping from other uses in Northern Neck and Middle Peninsula are likely to have smaller cones of depression that interfere with current permittee's cones of depression
- Current monitoring is insufficient to characterize the extent


N
Hanover Courthouse
Hanover Georgetown
Hanover Strawhorne
Dianne Ridge Well
Hanover Sinclair Manor
Hanover Urban Water
Harris Court Well 2
High Point Farms
Hanover Suburban Water
Garthright 1
Hanover Farms Water System
Cent Garage Wells
Farms of NK Wells
NK Bottoms Bridge Wells
GWPermit Wells
Hanover County System
Farms Contours LPotomac
Farms Contours MPotomac
Farms Contours UPotomac
BB Contours LPotomac
BB Contours MPotomac
Cent Garage Contours MPotomac
MPotomac Critical Cells
MPotomac Model Boundary
FallZone

Supply May Be Overdrawn



Legend

Available Storage Used

PCT_USED

- 0.00 - 0.10
- 0.11 - 0.25
- 0.26 - 0.50
- 0.51 - 0.75
- 0.76 - 1.00
- 1.01 - 72.50
- Head Below Unit Top

Values >1 indicate head is below the 80% criterion

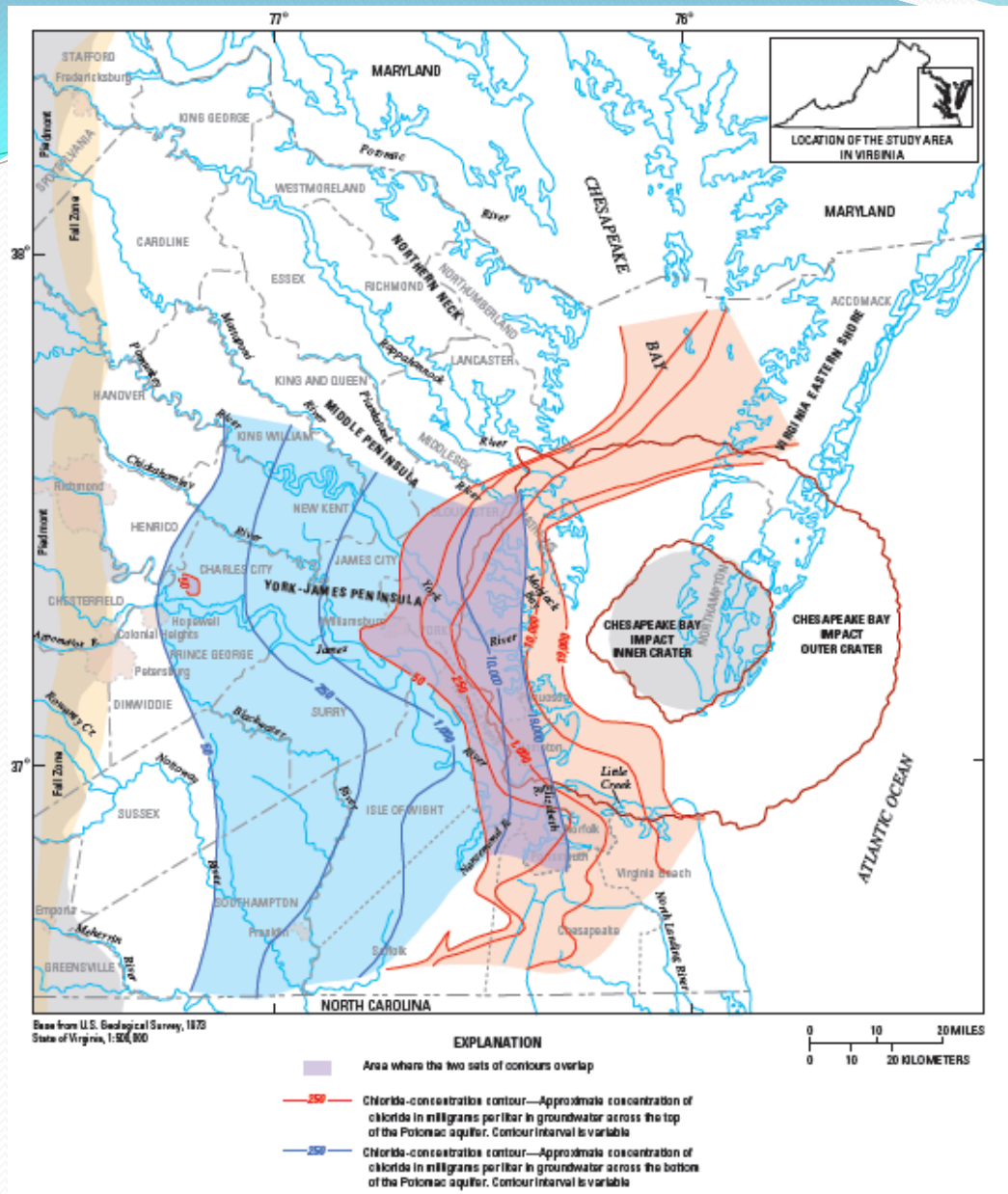
Simulated Change in Storage of Water in the Potomac Aquifer from Pre-development to 2008

Supply May Become Polluted

- Southern Lancaster, eastern Middlesex, eastern Gloucester, Mathews all have chloride concentration issues resulting from salt water intrusion.

- Not enough information at this time in other parts of the area

Saltwater Intrusion Changes in Water Quality



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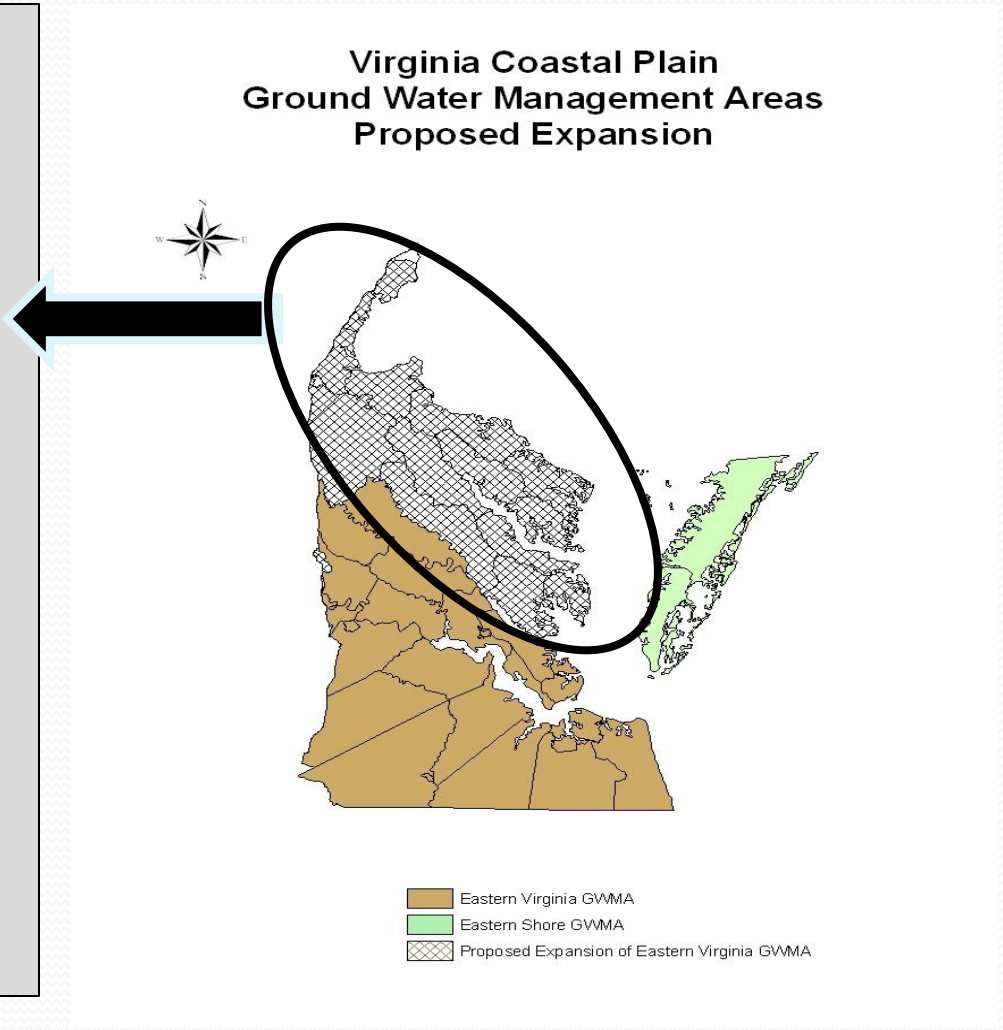
Eastern Virginia GWMA

Counties:

Caroline	Essex
Gloucester	King George
King and Queen	Lancaster
Mathews	Middlesex
Northumberland	Richmond
Westmoreland	

* Only those portions east of I-95 are included for*

Stafford	Fairfax
Prince William	Spotsylvania



Regulatory Actions

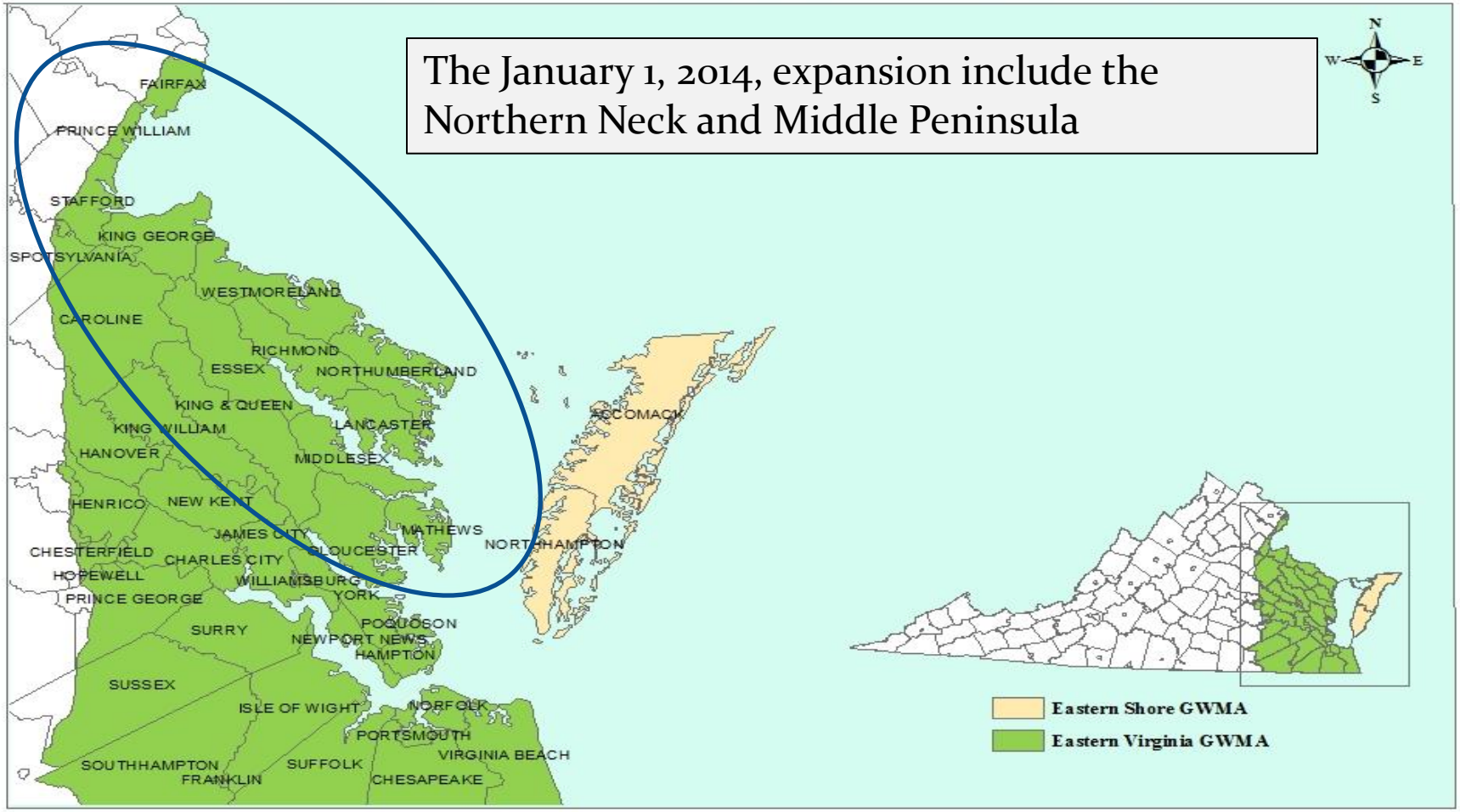
- NOIRA – July 2009
- Advisory Committee – 2009-2010
- Governor's Review Completed - Sept/Oct 2013

<u>Regulations became Effective January 1, 2014</u>

Resulted in

- Revised Groundwater Withdrawal Regulations
- Expansion of the Eastern Virginia Groundwater Management Area

COMMONWEALTH OF VIRGINIA
GROUNDWATER MANAGEMENT AREAS (GWMA)



Effective: January 1, 2014
Prepared By: Virginia Department of Environmental Quality
Groundwater Withdrawal Permitting Program

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Who did this affect?

- Persons or entities located within a the expanded area
  - Existing Users
    - Any person or entity that **has** withdrawn 300,000 gallons or more of groundwater in any one month prior to January 1, 2014.
  - New and Expanded Users
    - Any person or entity that **plans to modify an existing withdrawal** or intends to **create a new withdraw** 300,000 gallons or more of groundwater in any one month.

Existing Users

Is an existing user “Grandfathered”?

The regulations allow for an existing user to apply for a permit based on historic use for the first 10 year permit term. This initial permits application is less burdensome and is less expensive to acquire.

Special Conditions

Permits will include various conditions (in accordance with the regulations) to assist in future permitting and to help manage future costs, time and resources for applicants.

New or Expanded Users

Information / tasks required for complete application:

- Water Use Reporting values or estimated water use amount
- Completes well construction information for all wells
- VDH Waterworks Operation Permit if a PWS
- Geophysical Investigations (ex: aquifer test, pump test, camera survey etc)
- Water Conservation & Management Plan
- Mitigation Plan – applies to AOIs
- Local Governing Body Approval
- Alternatives Analysis
- Justification of Future Need
- Install water meters

Draft Permits & Facilitation

- Permitting is a joint effort (DEQ/Applicant)
- Reach goals and ensure permits effectively promote and can accomplish :
  - Reducing Use
  - Raising Pumps
  - Gaining Access to Alternate Sources
  - Implementing more stringent Water Conservation measures
  - Replacing wells (Construction)
  - Installing observations wells or conducting studies
  - **Being fully prepared for permit renewal**

Expansion Update

Resulted in:

- Public Outreach and Community Pre-Application Meetings
- Receipt of 123 Applications
- Hiring of additions FTE's for permit processing

Current Status

- 100% of Existing Users applications have been reviewed
- Notification of Deficiency Letters mailed
- Will begin issuing Existing User Permits Spring-Summer 2015

Existing User Applications

County	No# of Applicants
Caroline	13
Essex	9
Fairfax	6
Gloucester	4
King & Queen	4
King George	16
Lancaster	12
Middlesex	11
Northumberland	22
Prince William	1
Richmond	5
Spotsylvania	2
Stafford	1
Westmorland	17

Revisit - Ground Water Management Act

§ 62.1-263 Criteria for issuance of permits.

- In no case shall a permit be issued for more ground water than can be applied to the proposed beneficial use.
- In evaluating permit applications, the Board shall ensure that the maximum possible safe supply of ground water will be preserved and protected for all other beneficial uses.

DEQ's Goal

To protect the aquifer and provide for current and future water needs of the public in the Commonwealth

DEQ Perspective

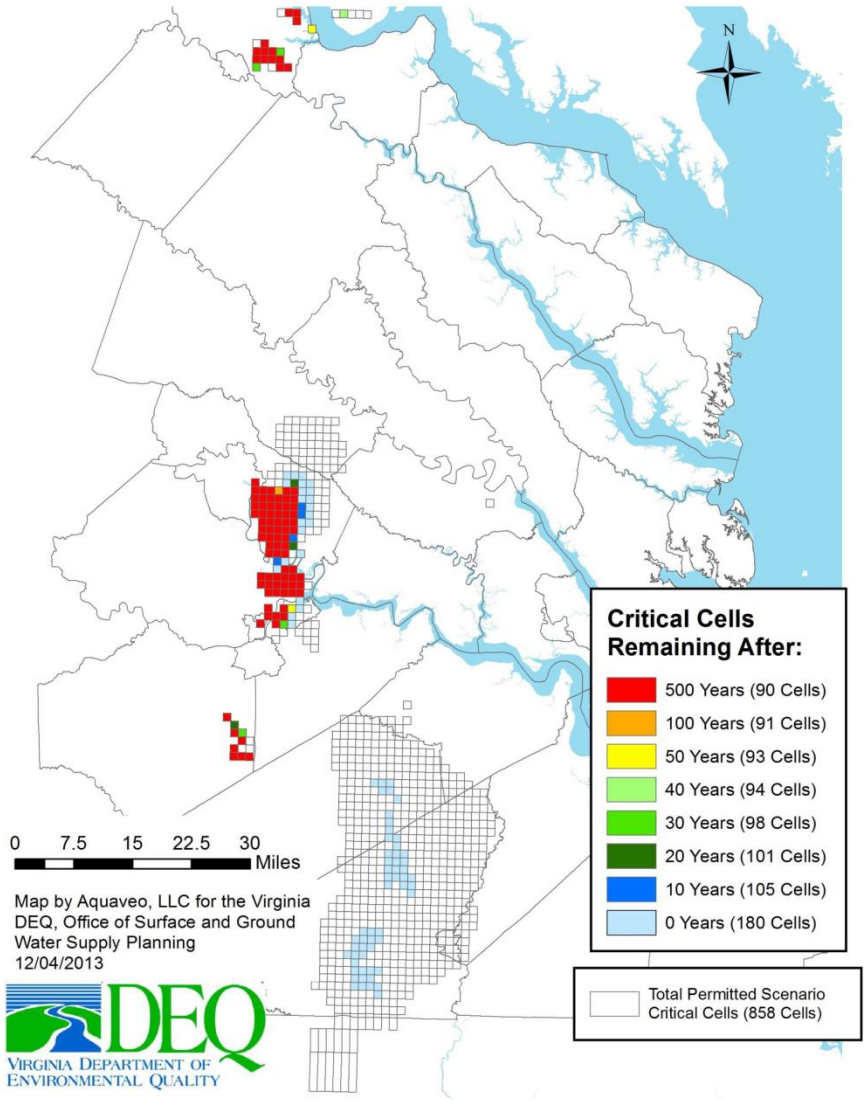
Need a Virginia Coastal Plain wide Groundwater Initiative

Virginia Coastal Plain Groundwater Initiative

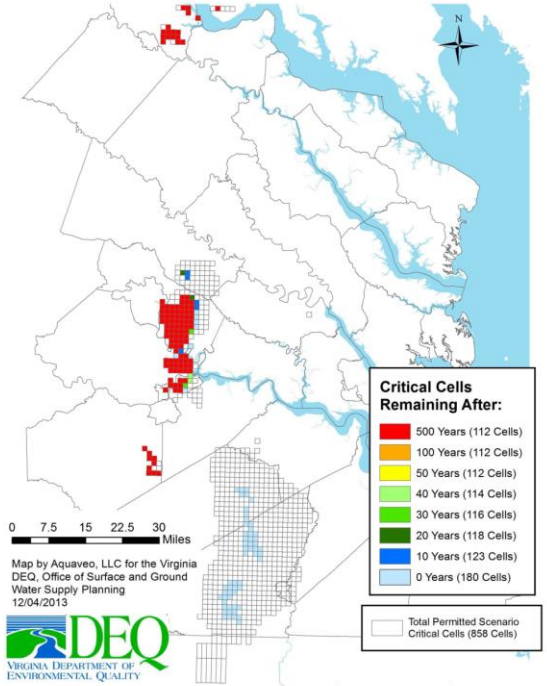
Initial Steps Taken:

- Updated Groundwater Model (VAHydro-GW)
- DEQ conducted groundwater optimization evaluations
- Investigation of the Economic Impacts of Coastal Plain Aquifer Depletion and Actions that may be needed to Maintain Long-term Availability and Productivity (VT Report)
- Conducted Virginia Coastal Plain Groundwater Initiative Meeting with top 14 users
- DEQ correspondence to Water Commission
- 2015 Legislative actions

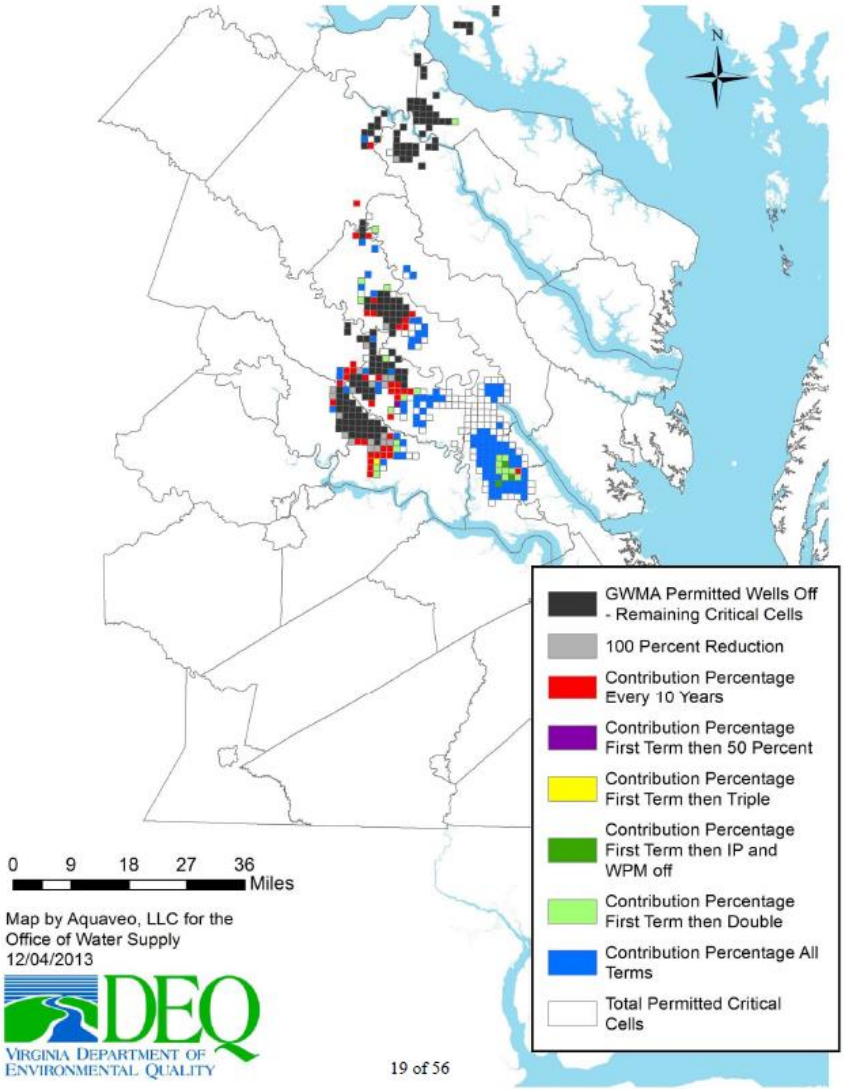
Senario: All GWMA Wells Off Potomac Aquifer



Senario: Largest Ten GWMA Withdrawals Off Potomac Aquifer



Piney Point Aquifer - Optimization Scenarios



Map by Aquaveo, LLC for the Office of Water Supply
12/04/2013

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

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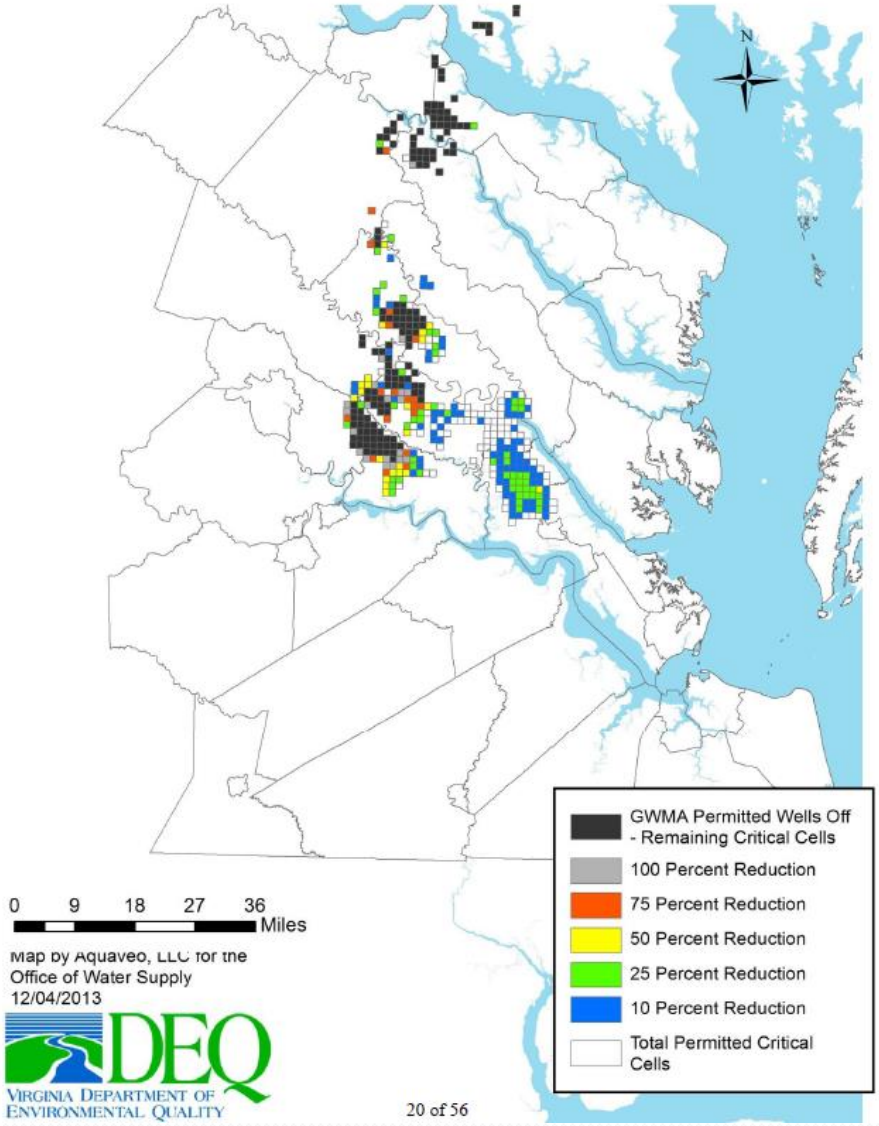

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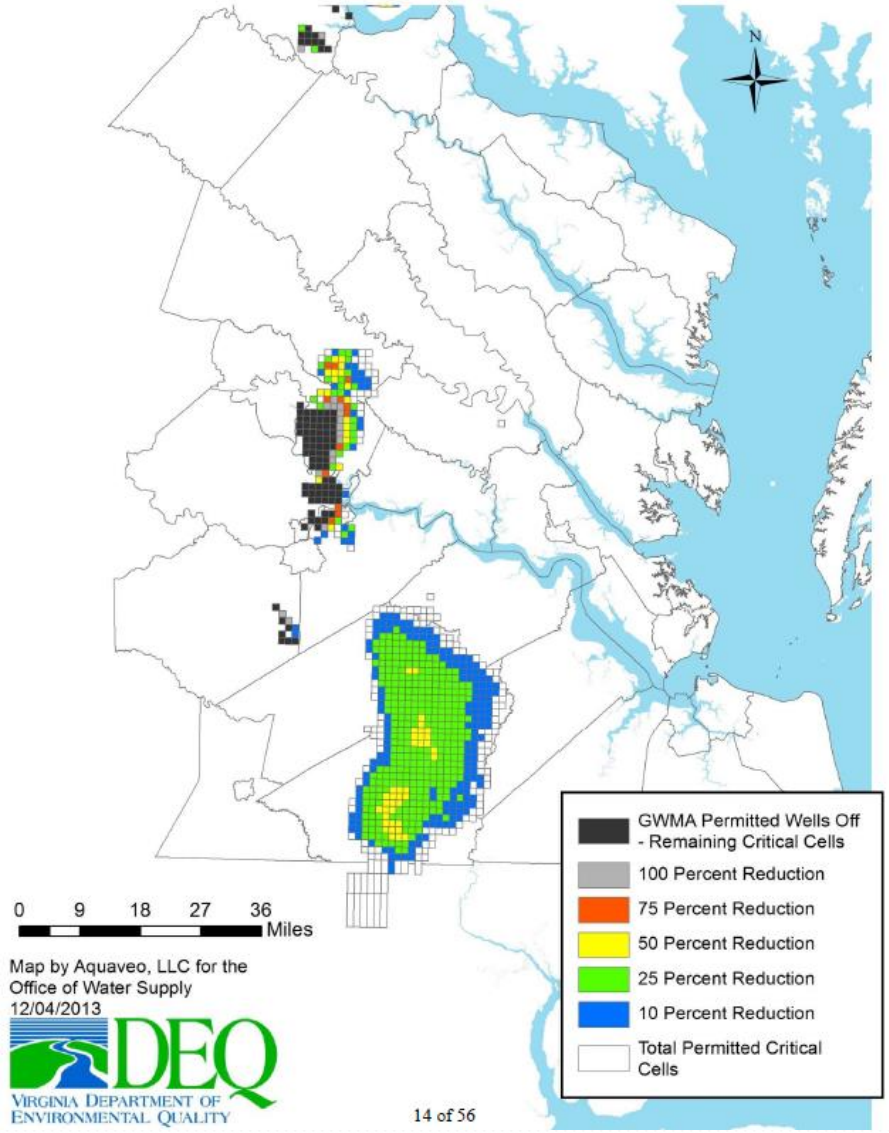

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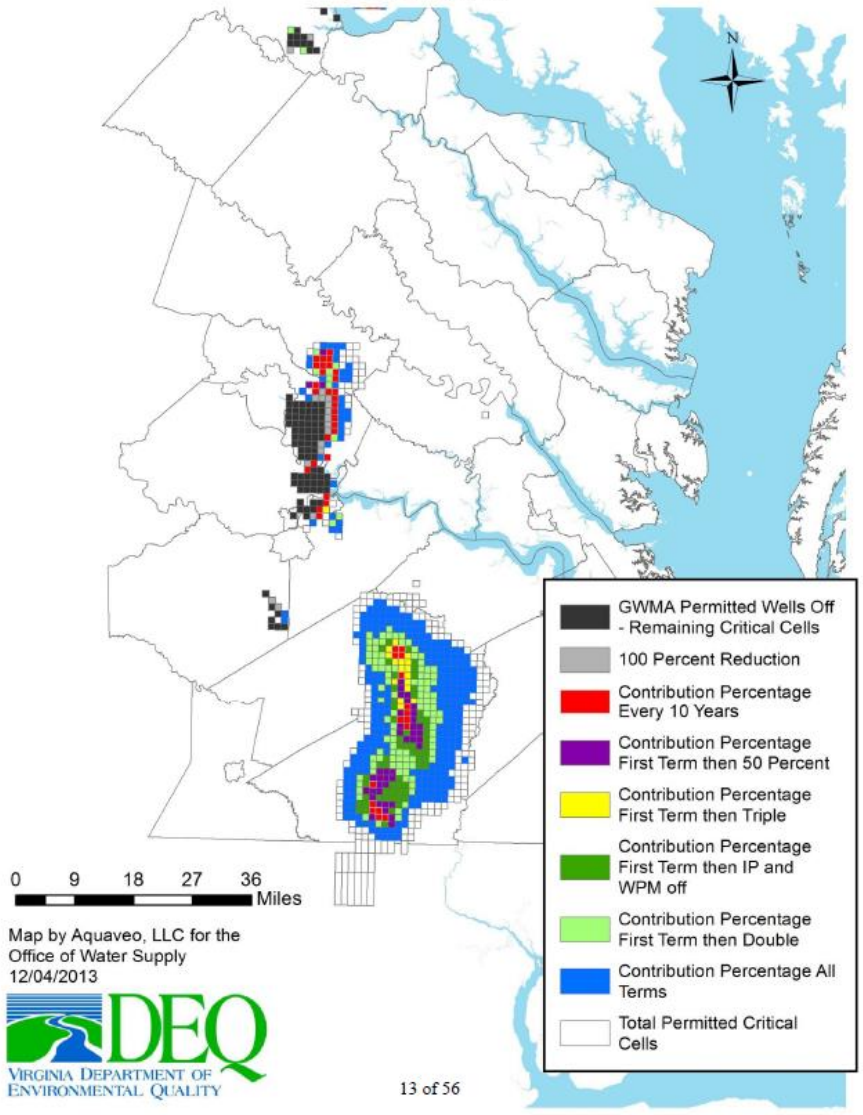

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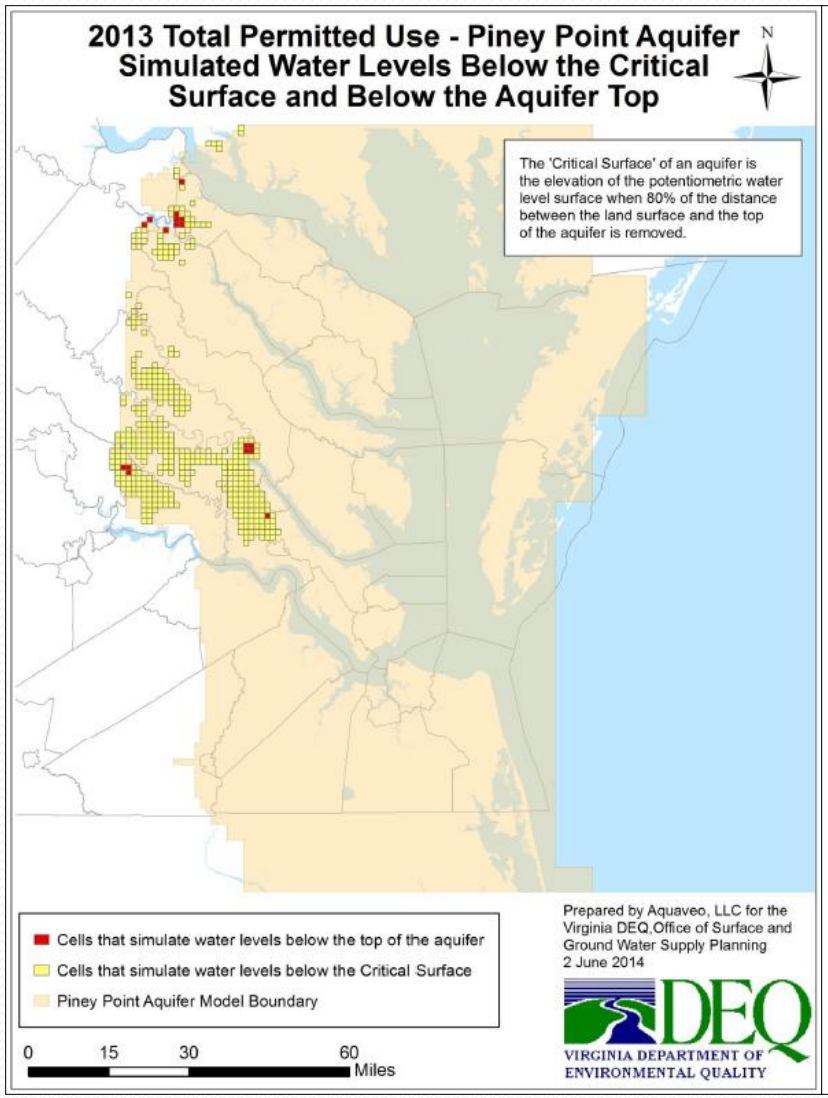
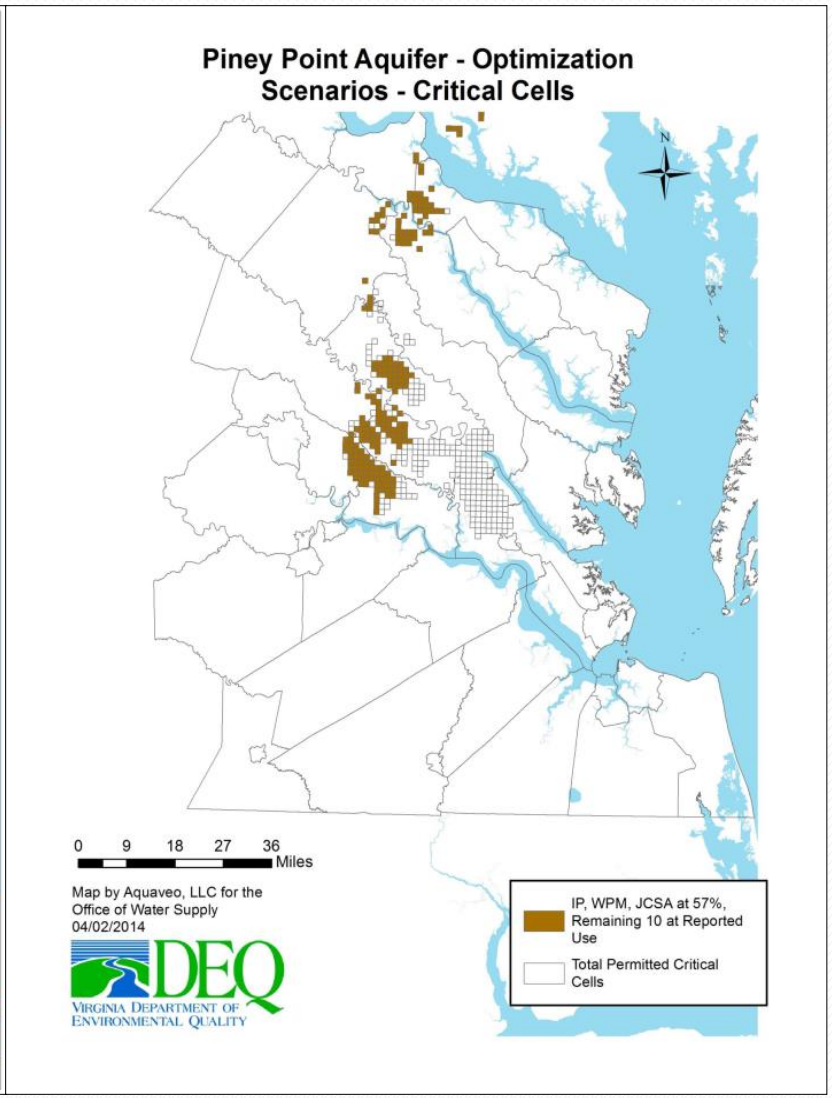
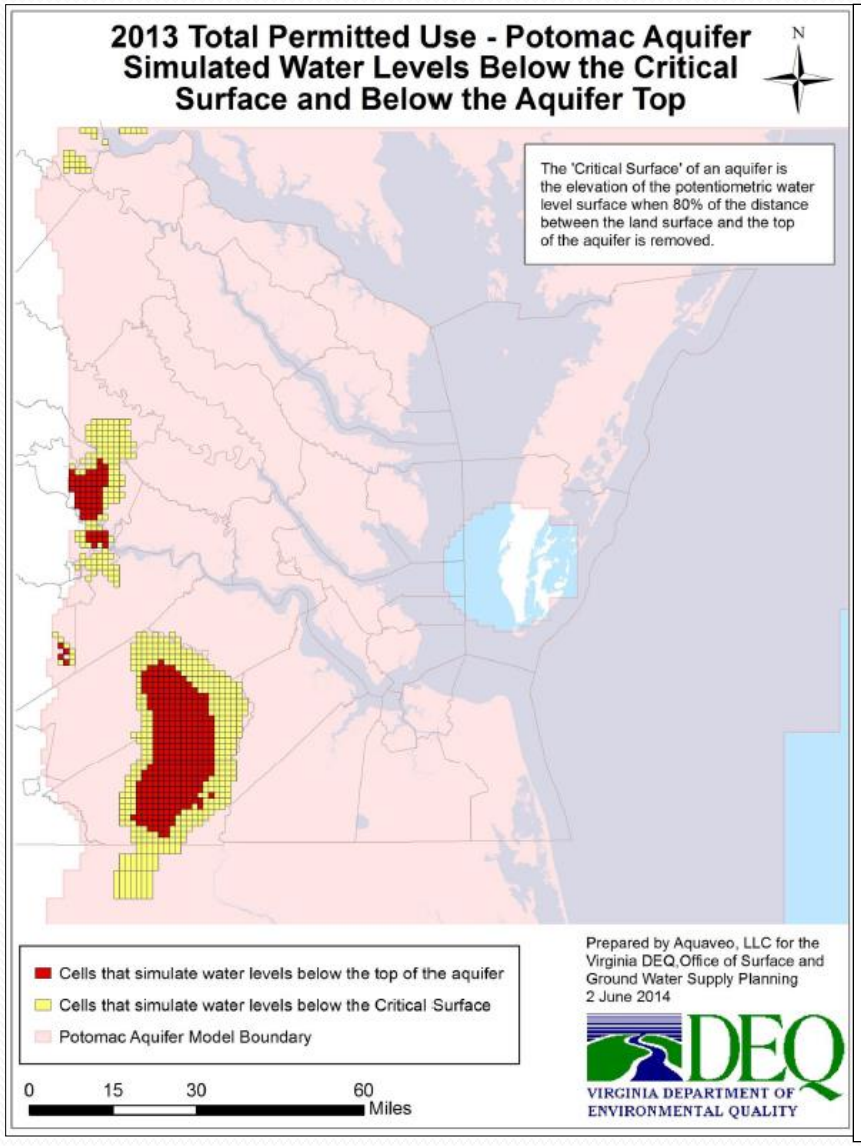

2013 Total Permitted Use - Piney Point Aquifer
Simulated Water Levels Below the Critical
Surface and Below the Aquifer Top
N
The 'Critical Surface' of an aquifer is the elevation of the potentiometric water level surface when 80% of the distance between the land surface and the top of the aquifer is removed.
Cells that simulate water levels below the top of the aquifer
Cells that simulate water levels below the Critical Surface
Piney Point Aquifer Model Boundary
0 15 30 60
Miles
Prepared by Aquaveo, LLC for the Virginia DEQ,Office of Surface and Ground Water Supply Planning
2 June 2014
DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY


Piney Point Aquifer - Optimization
Scenarios - Critical Cells
N
0 9 18 27 36
Miles
Map by Aquaveo, LLC for the Office of Water Supply
04/02/2014
DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
IP, WPM, JCSA at 57%, Remaining 10 at Reported Use
Total Permitted Critical Cells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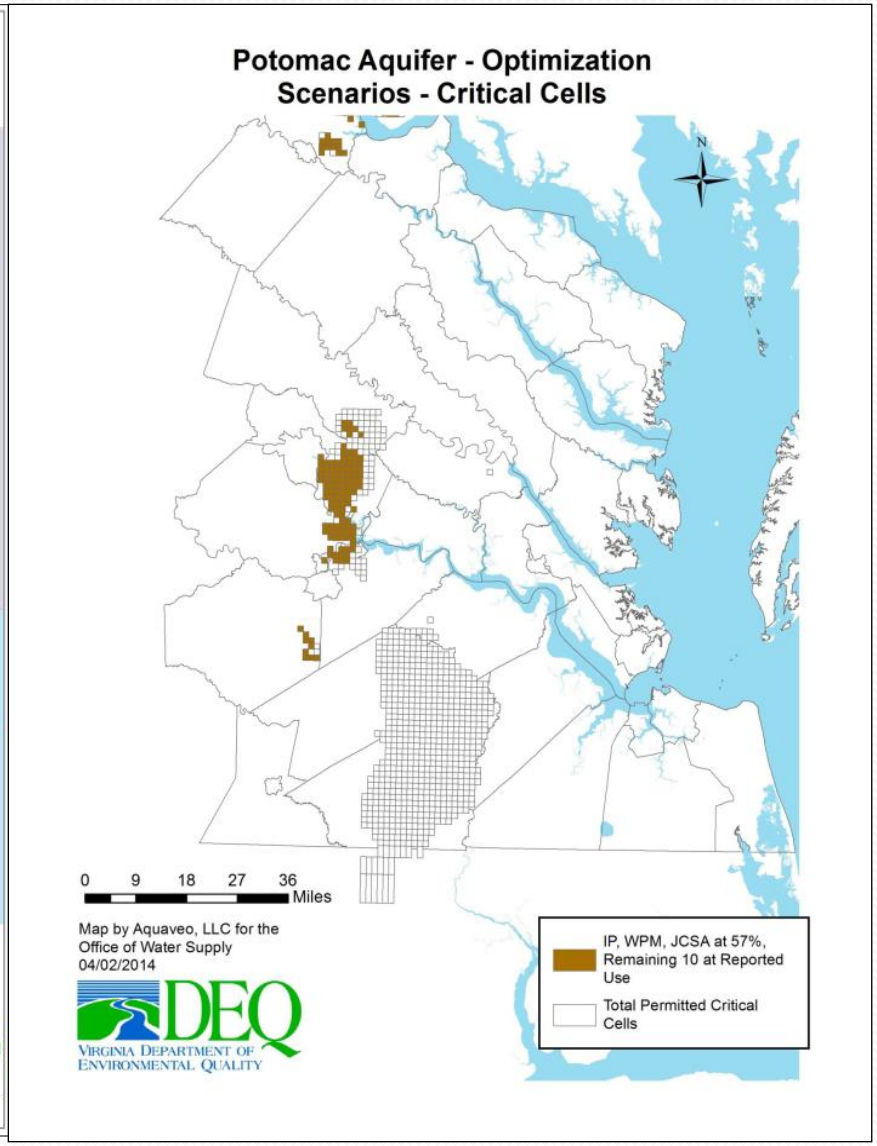
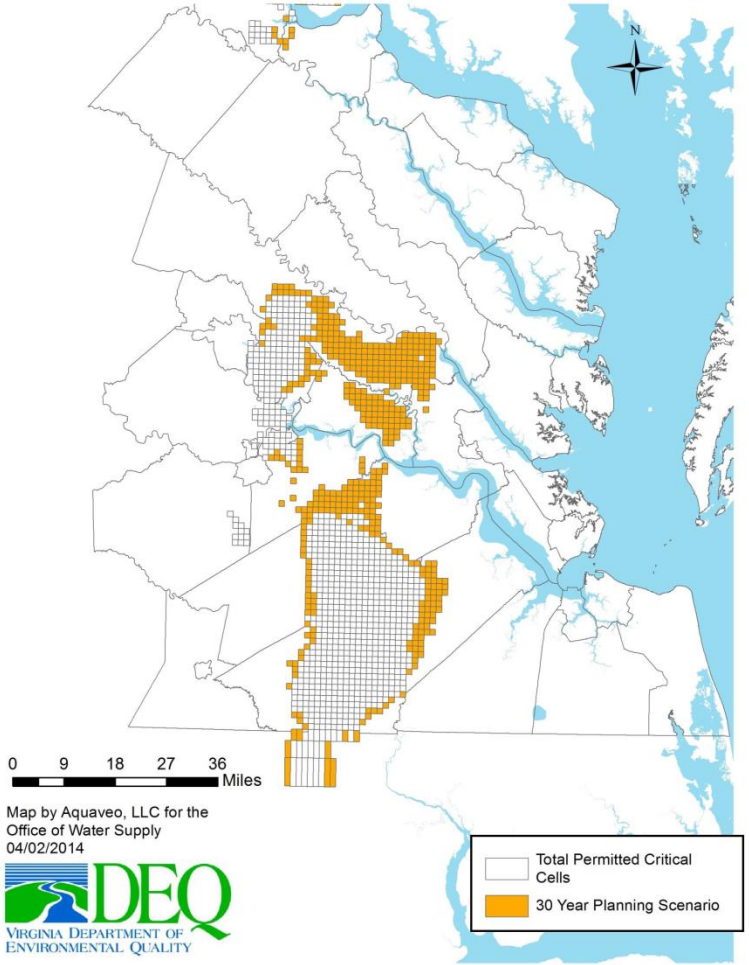
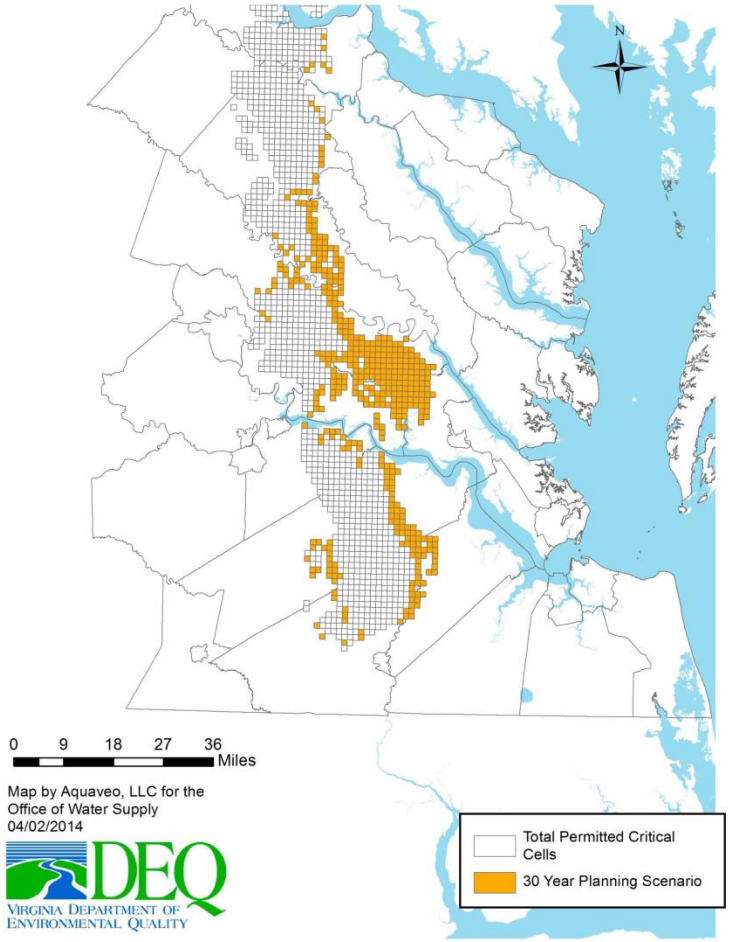

Potomac Aquifer - Optimization Scenarios - Critical Cells
N
0 9 18 27 36
Miles
Map by Aquaveo, LLC for the Office of Water Supply
04/02/2014
DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
IP, WPM, JCSA at 57%, Remaining 10 at Reported Use
Total Permitted Critical Cells

Potomac Aquifer - Optimization Scenarios - Critical Cells



Aquia Aquifer - Optimization Scenarios - Critical Cells



Expected Results

- Restoration of areas with groundwater levels below regulatory standards
- Permitted withdrawals will be at 40-50 mgd and unregulated withdrawals estimated at 30-40 mgd
- Gains from the reductions will be lost without addressing expected growth in unregulated sector

Path Forward

Reduce current permitted use

- Identified potential permitting solutions
  - Reductions expected to stabilize groundwater level declines by 2025
  - 14 users permitted for 87% of withdrawal
  - Impacts actual use of 3 permittees
  - Individual reduction targets discussed with each permittee requested that they provide a 10 year reduction plan for what they can achieve
  - Goal is to issue all remaining permits by end of 2015

Caveats

- Stabilizing the system cannot be achieved without reductions
- Reductions slow declines and lay ground work for long term solutions
- Need comprehensive strategy to provide for future growth and development
- Some present capacity continues to be available in upper aquifers and in the northeastern portion of the coastal plain

Next Steps

- Reduce current permitted use
- Evaluate alternatives
  - Conservation
  - Reuse
  - Desalination
- Legislation

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Have you Heard ?

Water levels continue to decline in the primary aquifers.

Land is subsiding.

Salt water intrusion is occurring.

Primary aquifers are not being pumped sustainably.