

# Instream Flow Needs White Clay Creek at Newark

WRADRB Fall Conference  
Nov 7, 2012

Gerald J. Kauffman  
University of Delaware  
Water Resources Agency



# CONGRESS QUILTS AFTER OVERRIDING WATER BILL VETO

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**\$24-Billion Pollution Plan Is  
Backed in a Final Defiant  
Encounter With Nixon**

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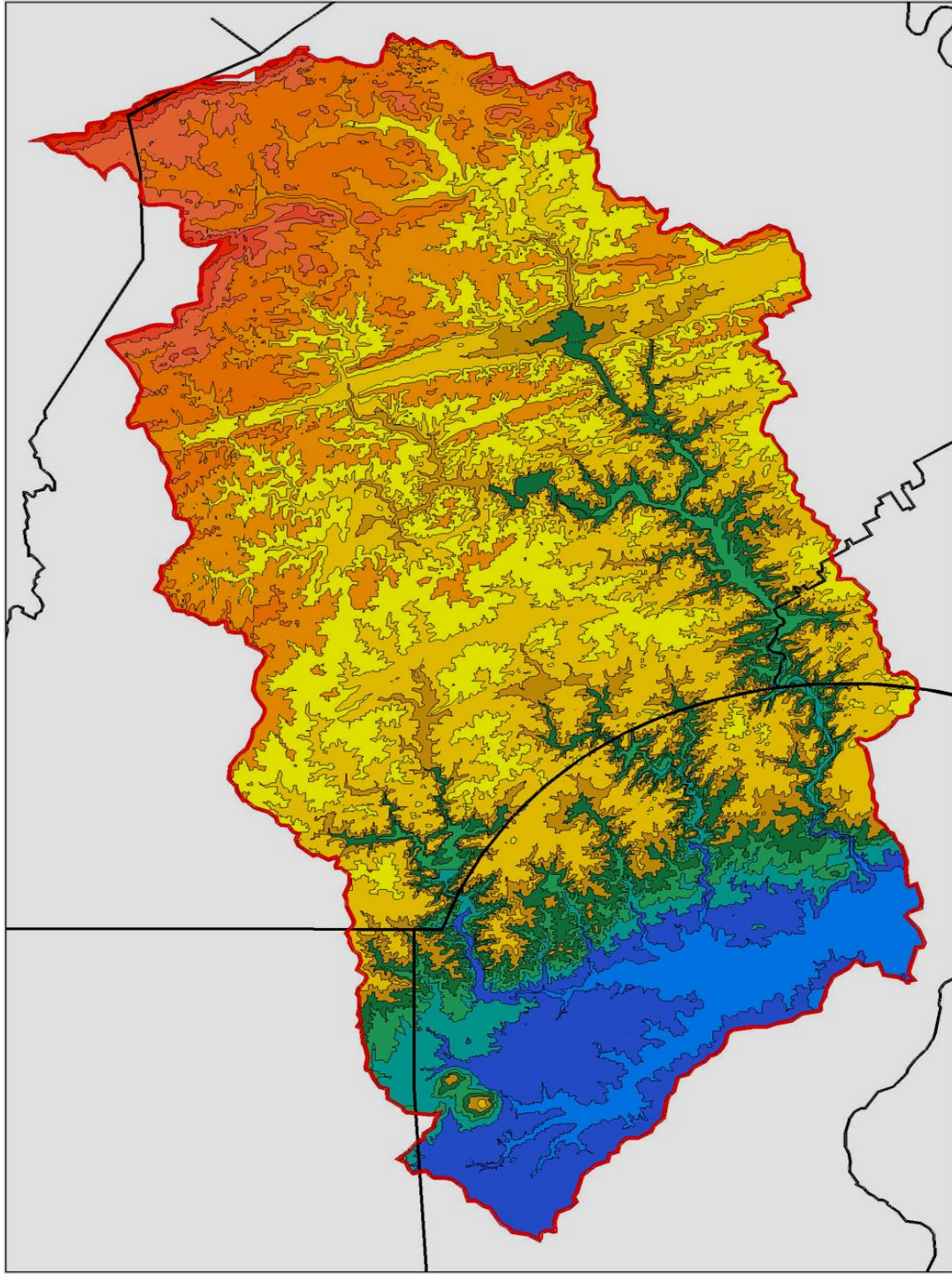
**HOUSE VOTE IS 247 to 23**

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**Both Chambers Also Reject  
Request by President for  
a Ceiling on Spending**

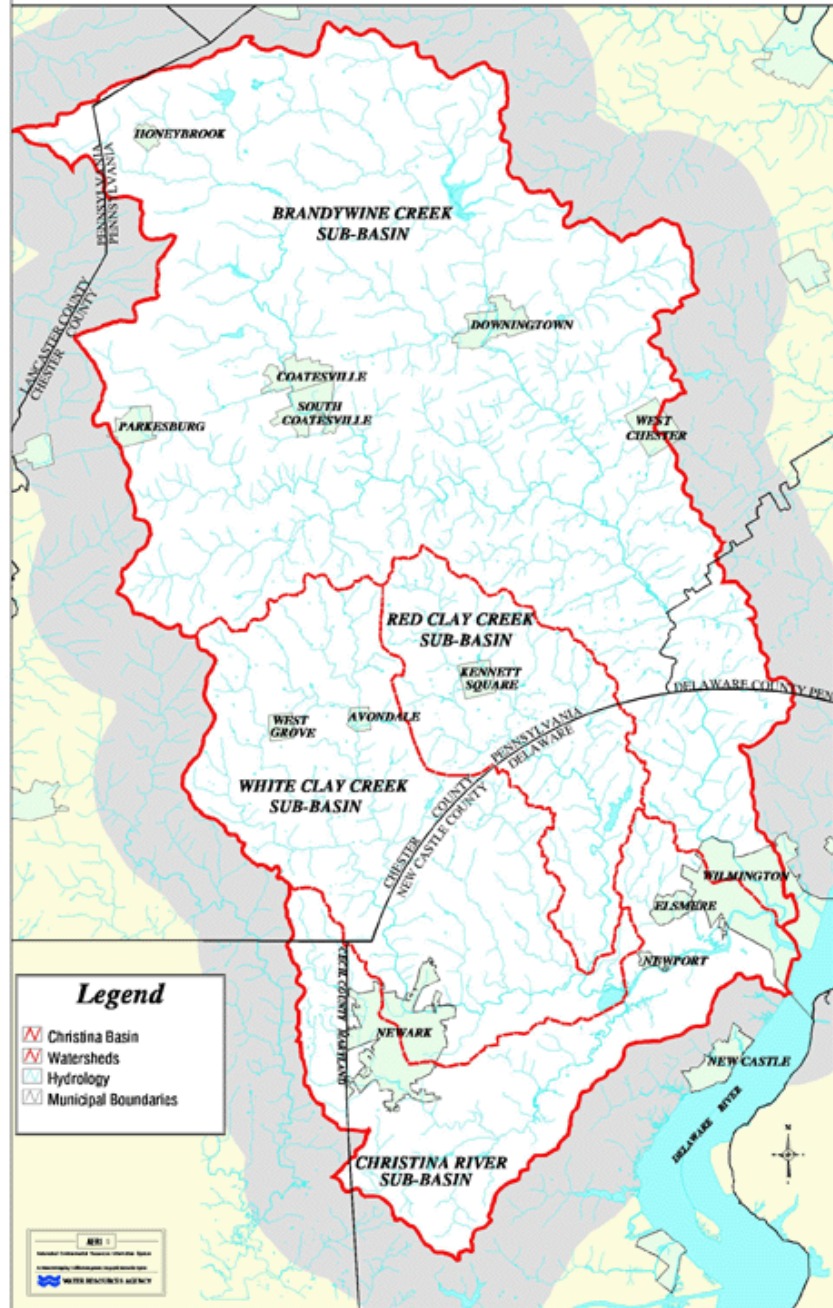
# DRBC Passby Flow Standard

- 14 mgd along White Clay Creek at Newark
- 84% flow exceedance
- 7 mgd for fishery
- 7 mgd for UWD at Stanton intake



# Christina Basin Water Quality Management Strategy

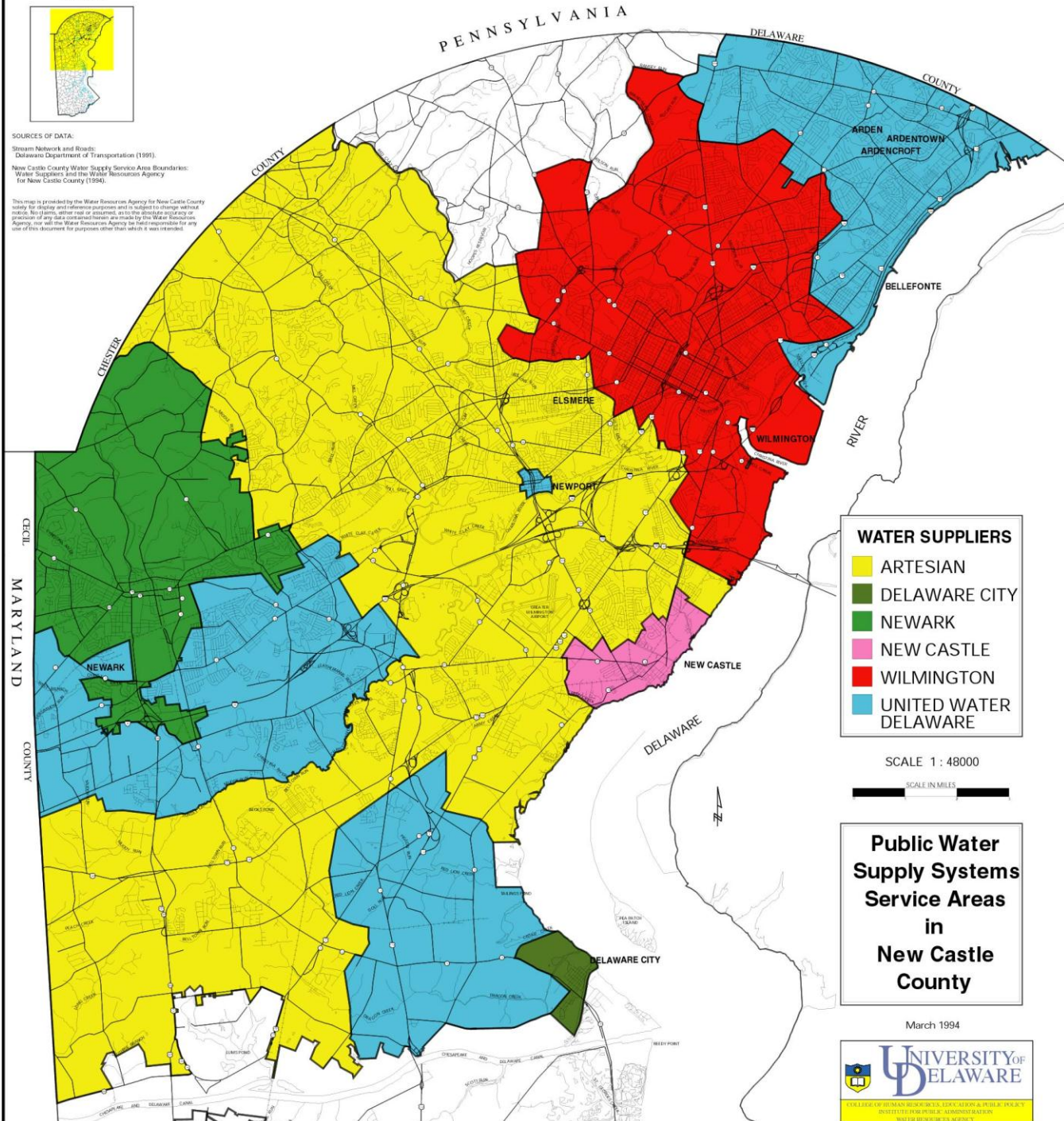
## Base Map





SOURCES OF DATA:  
 Stream Network and Roads:  
 Delaware Department of Transportation (1991).  
 New Castle County Water Supply Service Area Boundaries:  
 Water Suppliers and the Water Resources Agency  
 for New Castle County (1994).

This map is provided by the Water Resources Agency for New Castle County solely for planning and reference purposes and is subject to change without notice. No liability will be assumed for any errors or omissions. The Water Resources Agency and the Water Suppliers are not responsible for any use of this document for purposes other than which it was intended.



**WATER SUPPLIERS**

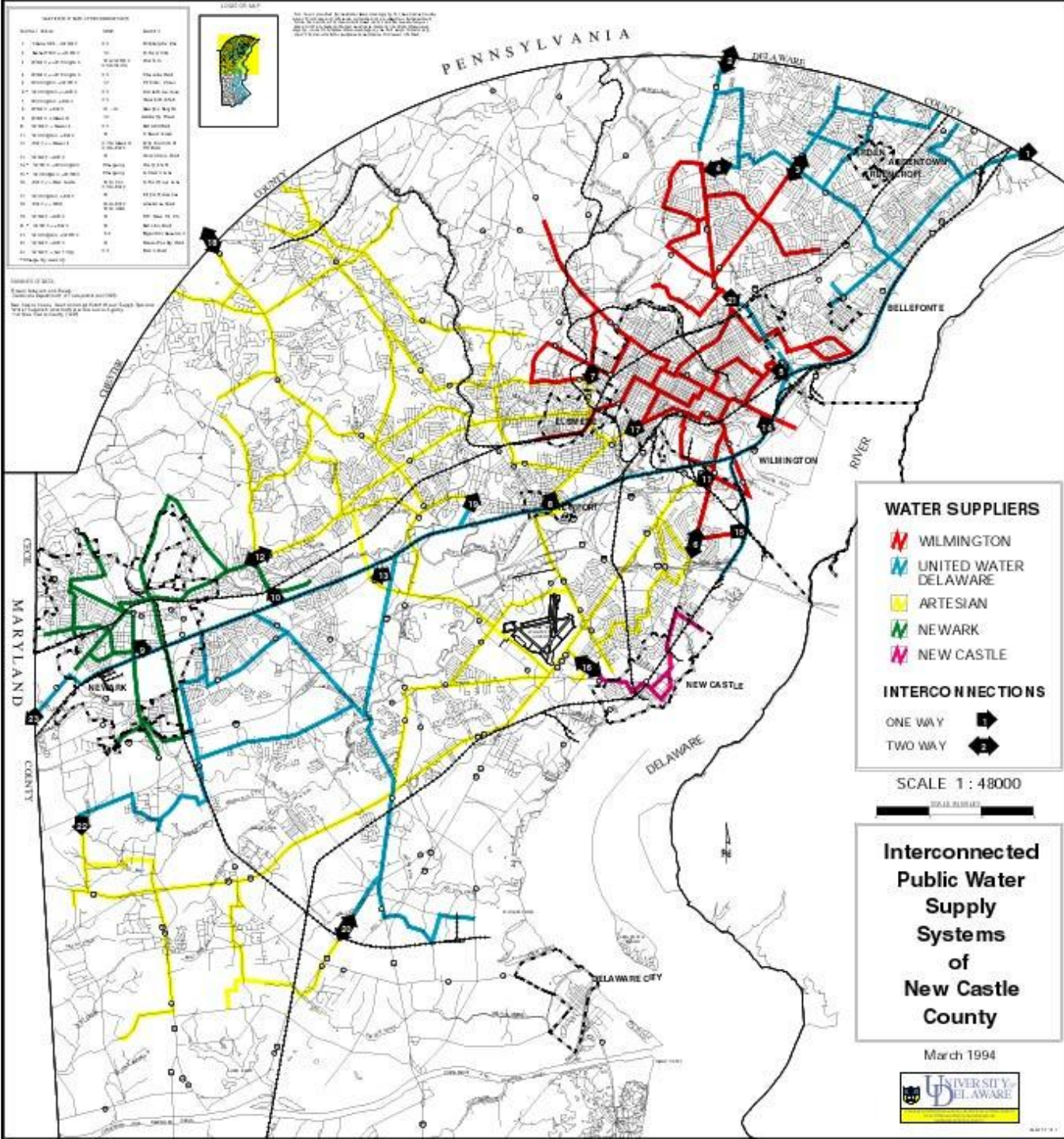
- ARTESIAN
- DELAWARE CITY
- NEWARK
- NEW CASTLE
- WILMINGTON
- UNITED WATER DELAWARE

SCALE 1 : 48000  
 SCALE IN MILES

**Public Water  
 Supply Systems  
 Service Areas  
 in  
 New Castle  
 County**

March 1994





LEGEND OF MAP

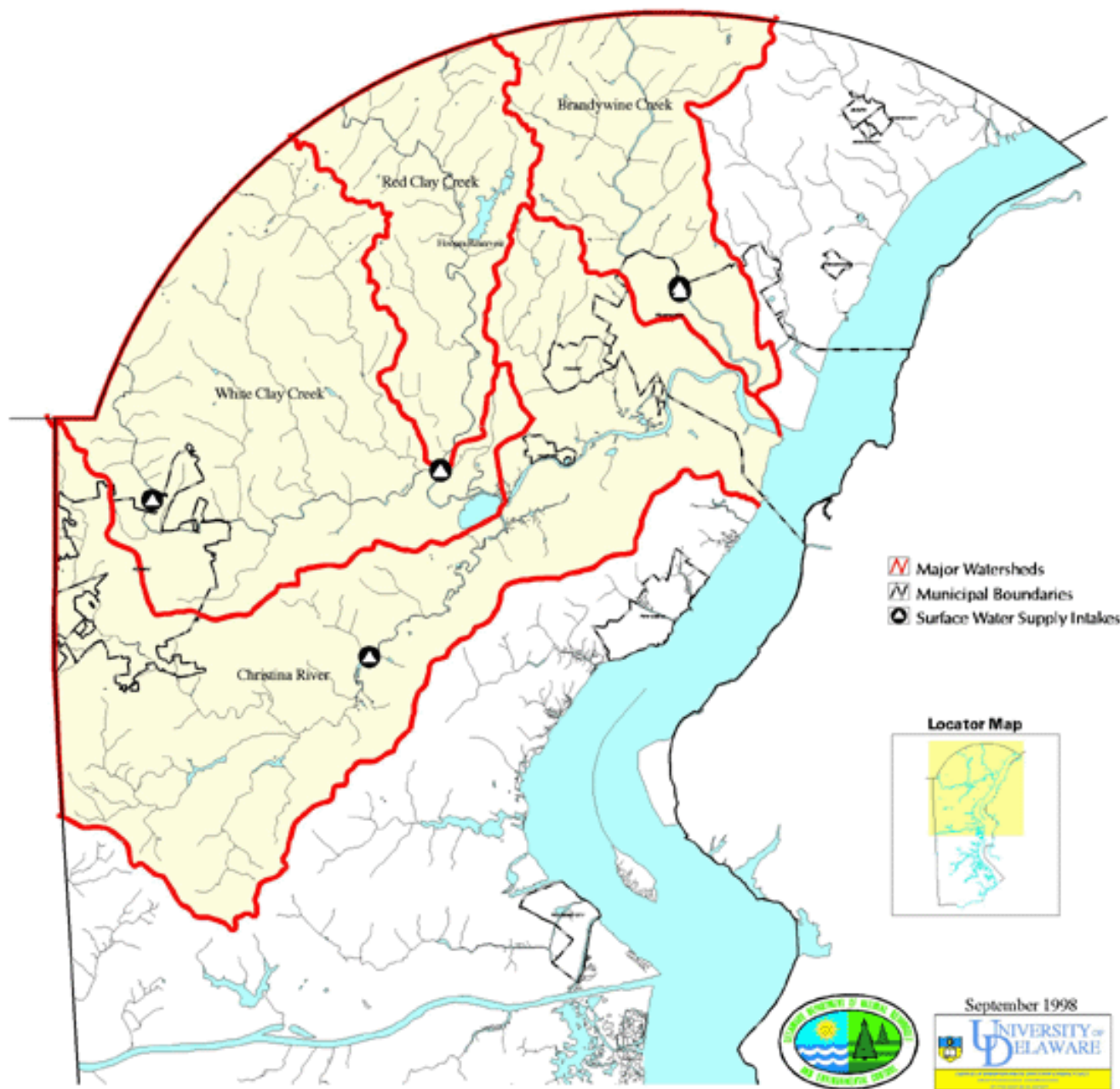
SYMBOL	NAME	NOTE
1	WILMINGTON	1.1
2	UNITED WATER DELAWARE	2.1
3	ARTESIAN	3.1
4	NEWARK	4.1
5	NEW CASTLE	5.1
6	WILMINGTON	6.1
7	UNITED WATER DELAWARE	7.1
8	ARTESIAN	8.1
9	NEWARK	9.1
10	NEW CASTLE	10.1
11	WILMINGTON	11.1
12	UNITED WATER DELAWARE	12.1
13	ARTESIAN	13.1
14	NEWARK	14.1
15	NEW CASTLE	15.1
16	WILMINGTON	16.1
17	UNITED WATER DELAWARE	17.1
18	ARTESIAN	18.1
19	NEWARK	19.1
20	NEW CASTLE	20.1
21	WILMINGTON	21.1
22	UNITED WATER DELAWARE	22.1
23	ARTESIAN	23.1
24	NEWARK	24.1
25	NEW CASTLE	25.1
26	WILMINGTON	26.1
27	UNITED WATER DELAWARE	27.1
28	ARTESIAN	28.1
29	NEWARK	29.1
30	NEW CASTLE	30.1
31	WILMINGTON	31.1
32	UNITED WATER DELAWARE	32.1
33	ARTESIAN	33.1
34	NEWARK	34.1
35	NEW CASTLE	35.1
36	WILMINGTON	36.1
37	UNITED WATER DELAWARE	37.1
38	ARTESIAN	38.1
39	NEWARK	39.1
40	NEW CASTLE	40.1
41	WILMINGTON	41.1
42	UNITED WATER DELAWARE	42.1
43	ARTESIAN	43.1
44	NEWARK	44.1
45	NEW CASTLE	45.1
46	WILMINGTON	46.1
47	UNITED WATER DELAWARE	47.1
48	ARTESIAN	48.1
49	NEWARK	49.1
50	NEW CASTLE	50.1



THE STATE OF DELAWARE HAS AUTHORIZED THE UNIVERSITY OF DELAWARE TO CONDUCT A STUDY OF THE WATER SUPPLY SYSTEMS OF NEW CASTLE COUNTY AND TO PREPARE A REPORT THEREON. THE UNIVERSITY OF DELAWARE HAS ACCEPTED THIS ASSIGNMENT AND IS PROVIDING THIS REPORT TO THE STATE OF DELAWARE.

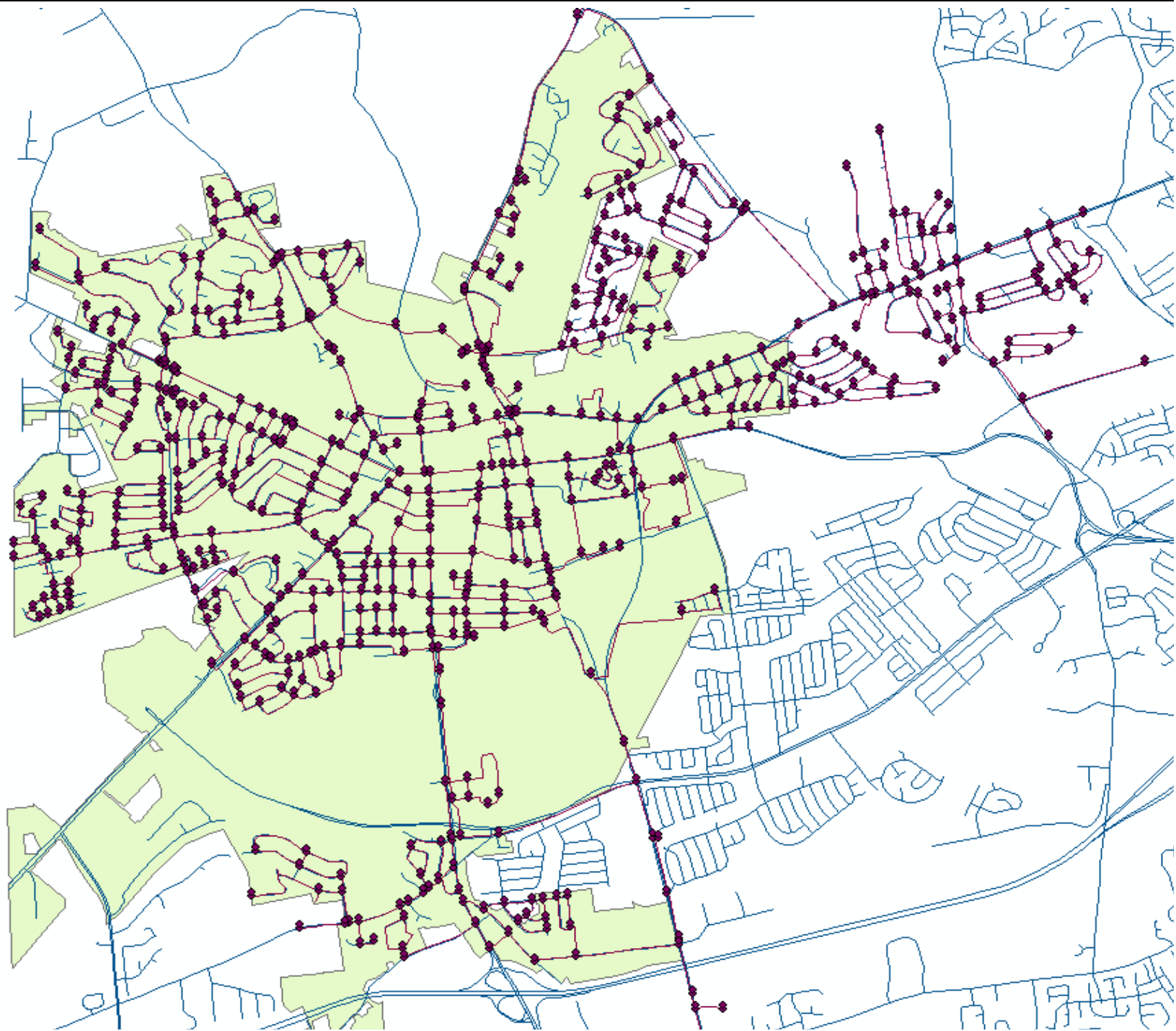
UNIVERSITY OF DELAWARE  
 DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING  
 WATER SUPPLY SYSTEMS STUDY  
 NEW CASTLE COUNTY, DELAWARE  
 PREPARED BY: DR. JAMES W. HARRIS, JR.  
 DATE: MARCH 1994

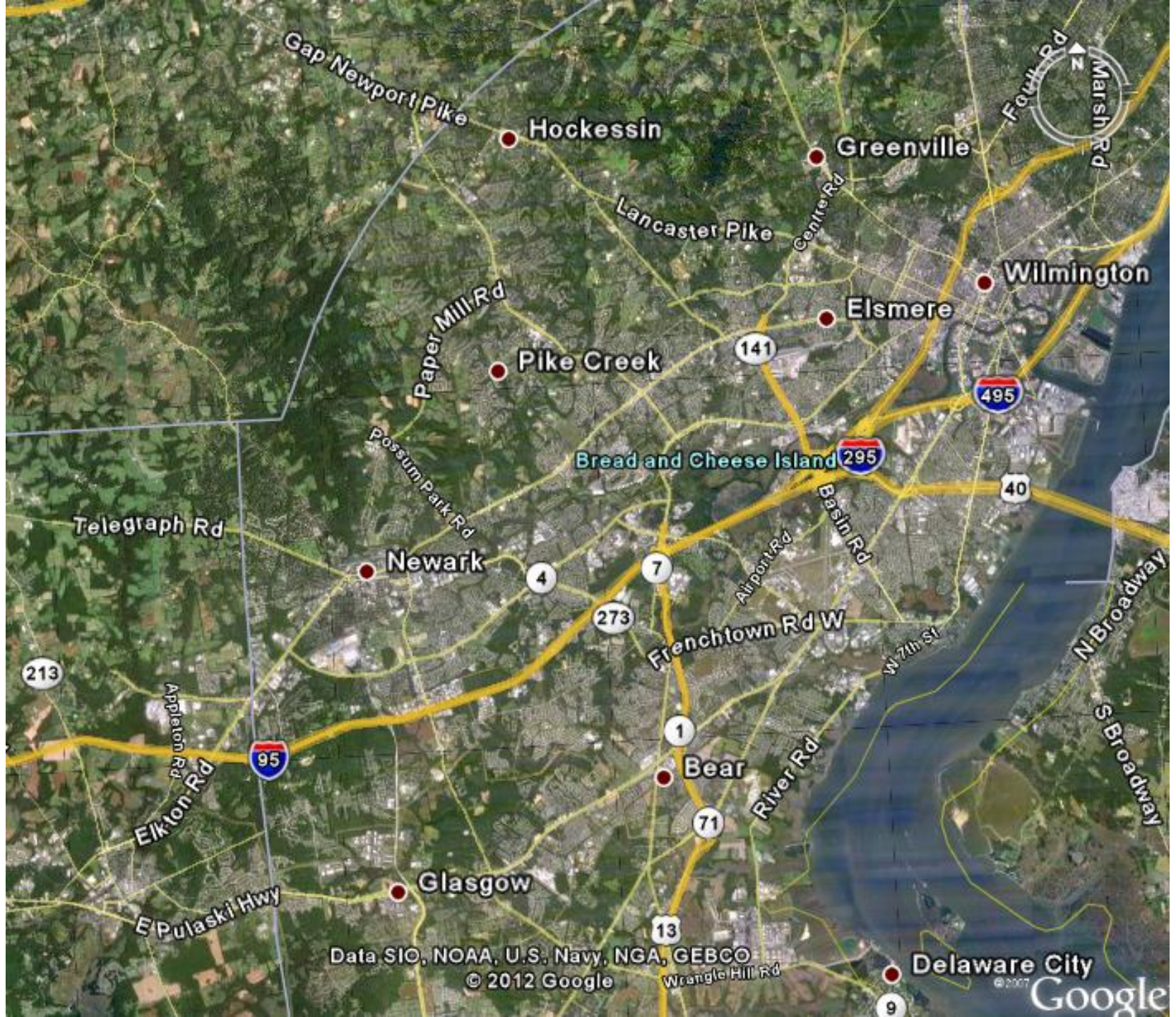
**Figure 3-1. Public Surface Water Supplies**





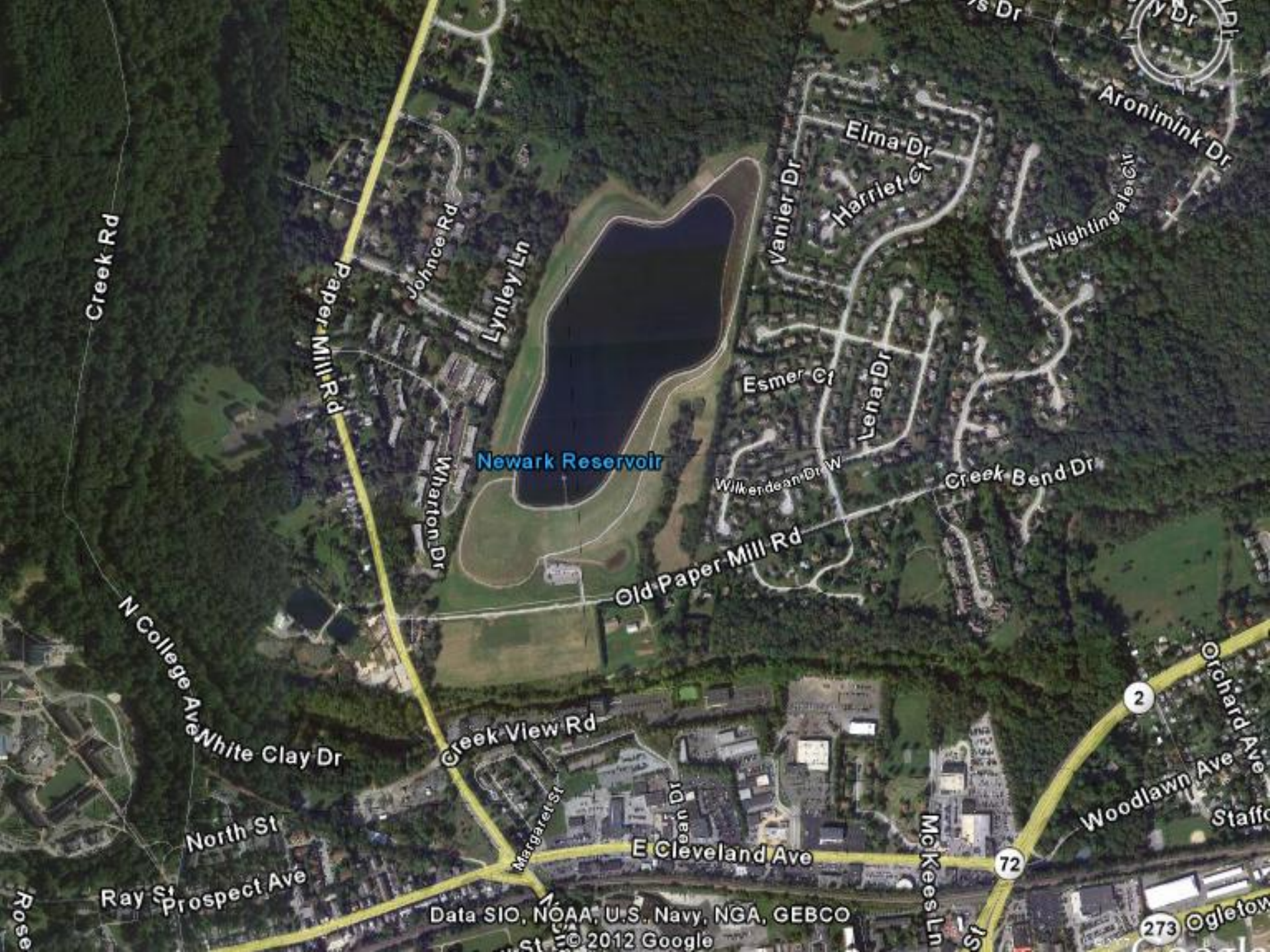
Characteristic	Description
Circa	1888
Supply	White Clay Creek (3.0 mgd) South Wellfield (3.0 mgd) Laird Tract wells(1.6 mgd)
Water Treatment Facilities	White Clay Creek Filtration Plant : 3 mgd South Wellfield Iron Treatment Plant: 2 mgd
Treatment	Screening, Sedimentation, Flocculation, Sand Filtration, Fluoridation, pH adjustment, Chlorination
Storage	Raw Water: Newark Reservoir (317 mg) Finished Water: 7 Storage Tanks (8 mg)
Mains	100 miles
Population/Connections	33,000/9,000
Service Area	25 sq mi
Demand	Normal:4.0 mgd Max. Monthly: 4.9 mgd Peak: 6.5 mgd
Interconnections	United Water Delaware Academy Street: 3 mgd United Water Delaware Red Mill Rd: 1.4 mgd





Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
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Newark Reservoir

Creek Rd

Paper Mill Rd

Johnce Rd

Lynley Ln

Wharton Dr

Vanier Dr

Elma Dr

Harriet Ct

Esmer Ct

Lena Dr

Wilkeand Dr W

Nightingale Ct

Aronimink Dr

Old Paper Mill Rd

Creek Bend Dr

N College Ave  
White Clay Dr

Creek View Rd

Margaret St

E Cleveland Ave

McKees Ln

Orchard Ave  
Woodlawn Ave  
Staffo

North St

Ray St  
Prospect Ave

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

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2

72

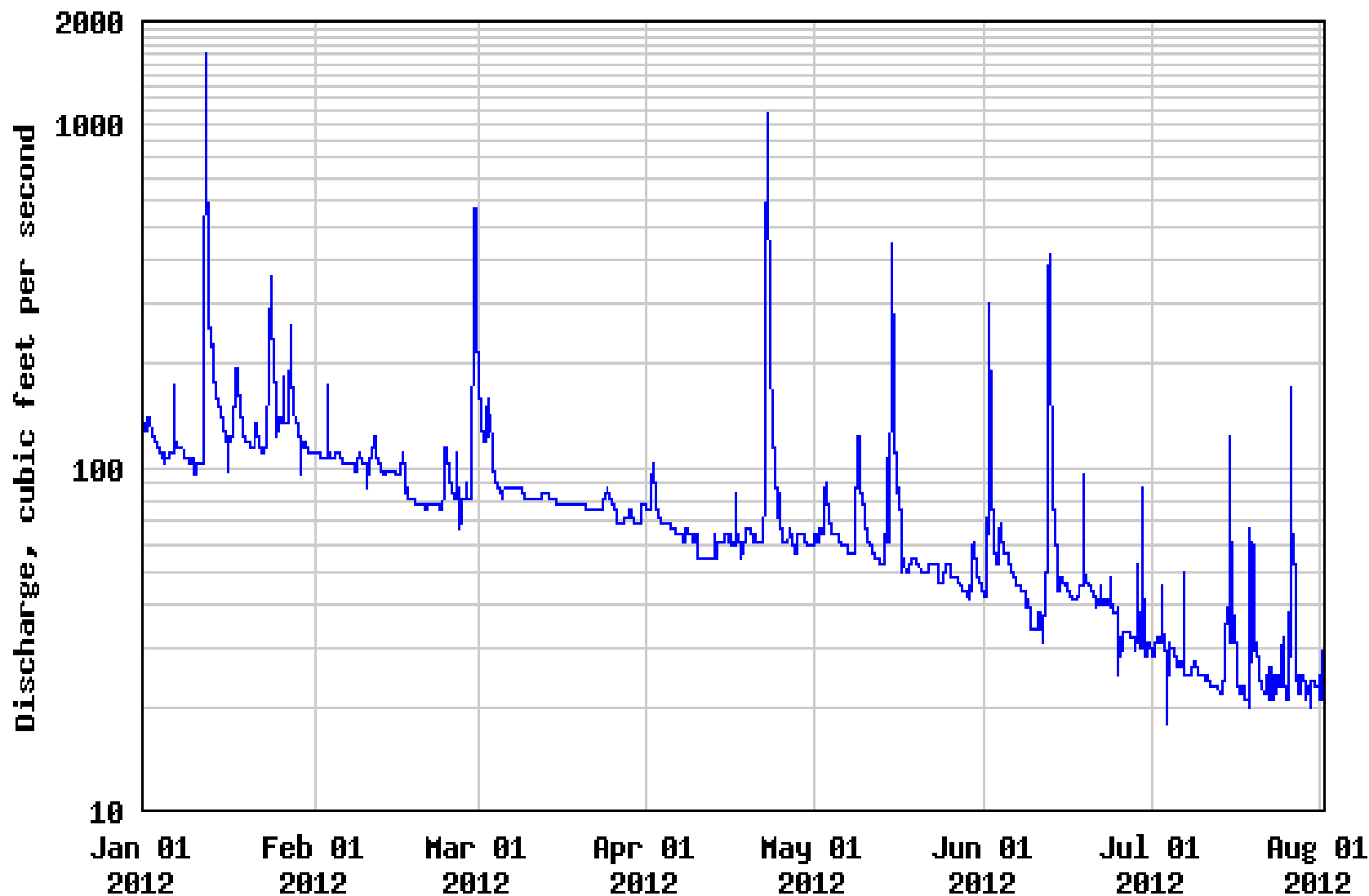
273

Ogletow

Rose

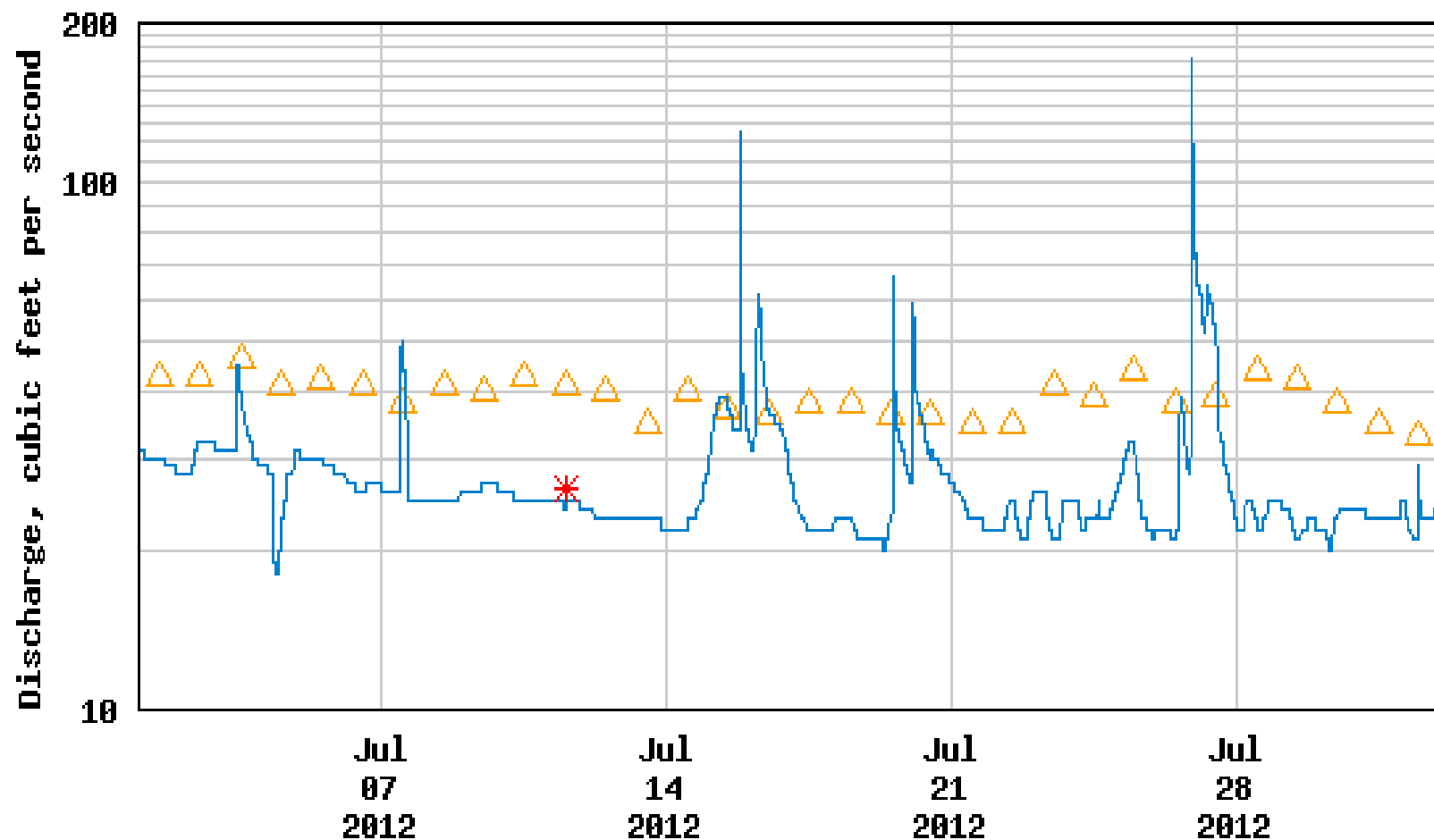


# USGS 01478650 WHITE CLAY CREEK AT NEWARK, DE



---- Provisional Data Subject to Revision ----

## USGS 01478650 WHITE CLAY CREEK AT NEWARK, DE



---- Provisional Data Subject to Revision ----

- △ Median daily statistic (18 years) \* Measured discharge
- Discharge

**Map 1**  
 This map shows the location of the City of Newark, Delaware, and its surrounding areas. The map is divided into several sections, each representing a different type of Water Resource Protection Area (WRPA). The map is titled "Map 1" and is located in the bottom left corner of the page.

**Map 2**  
 This map shows the location of the City of Newark, Delaware, and its surrounding areas. The map is divided into several sections, each representing a different type of Water Resource Protection Area (WRPA). The map is titled "Map 2" and is located in the bottom left corner of the page.

**Map 3**  
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**Map 4**  
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**Map 5**  
 This map shows the location of the City of Newark, Delaware, and its surrounding areas. The map is divided into several sections, each representing a different type of Water Resource Protection Area (WRPA). The map is titled "Map 5" and is located in the bottom left corner of the page.

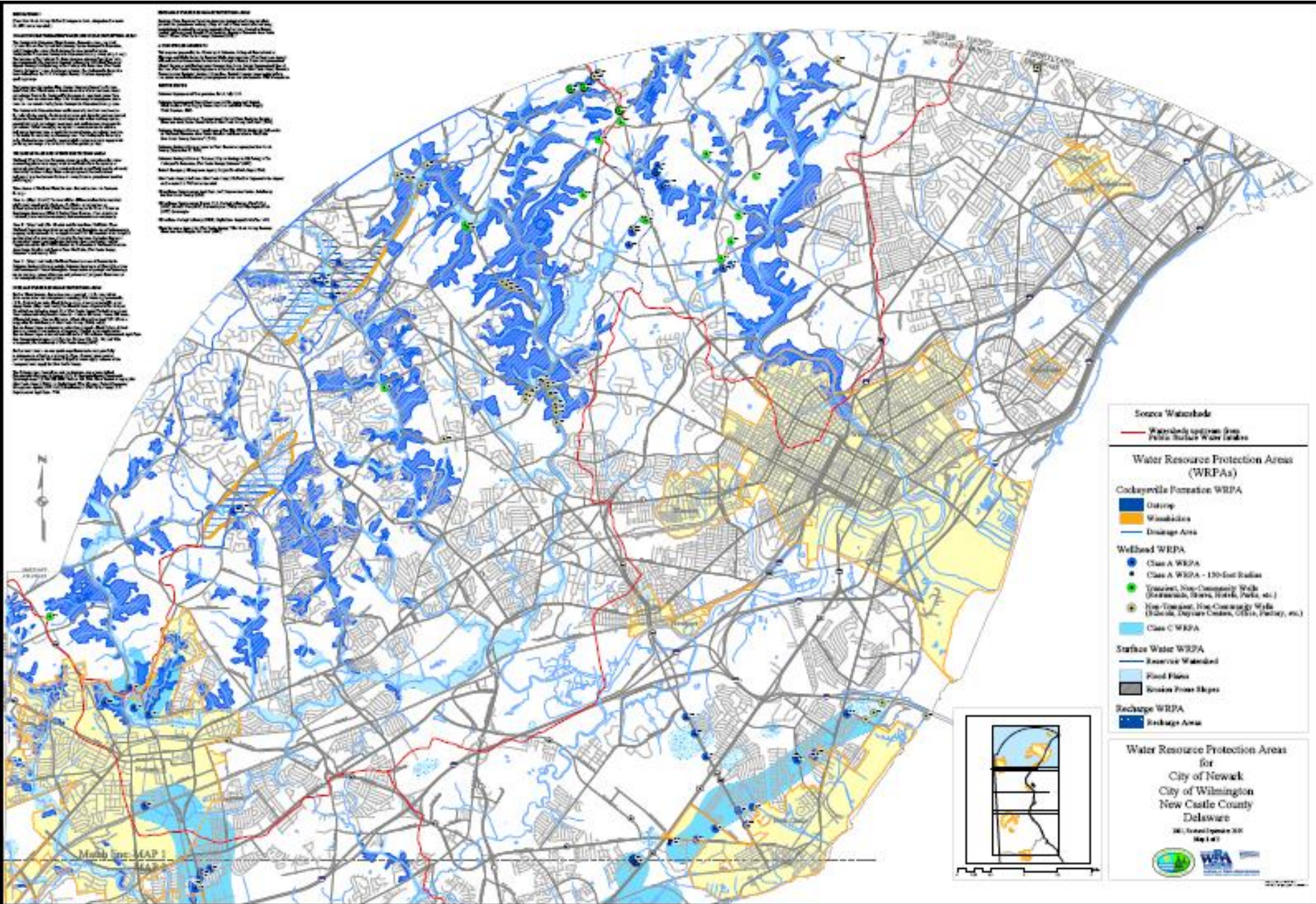
**Map 6**  
 This map shows the location of the City of Newark, Delaware, and its surrounding areas. The map is divided into several sections, each representing a different type of Water Resource Protection Area (WRPA). The map is titled "Map 6" and is located in the bottom left corner of the page.

**Map 7**  
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**Map 8**  
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**Map 9**  
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**Map 10**  
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**Source Watershed**

- Watershed system from Public Surface Water Utilities

**Water Resource Protection Areas (WRPAs)**

**Cockayville Formation WRPA**

- Outcrop
- Watershed
- Drainage Area

**Wellhead WRPA**

- Class A WRPA
- Class A WRPA - 150-foot Radius (Reservoir, Non-Community Well (Domestic, Green, Private, Public, etc.))
- Non-Community, Non-Community Wells (School, Daycare Center, Office, Factory, etc.)
- Class C WRPA

**Surface Water WRPA**

- Reservoir Watershed
- Flood Plains
- Reservoir Flood Slopes

**Recharge WRPA**

- Recharge Area

**Water Resource Protection Areas for City of Newark, City of Wilmington, New Castle County, Delaware**

2011, Revised September 2011  
 Map 1 of 1

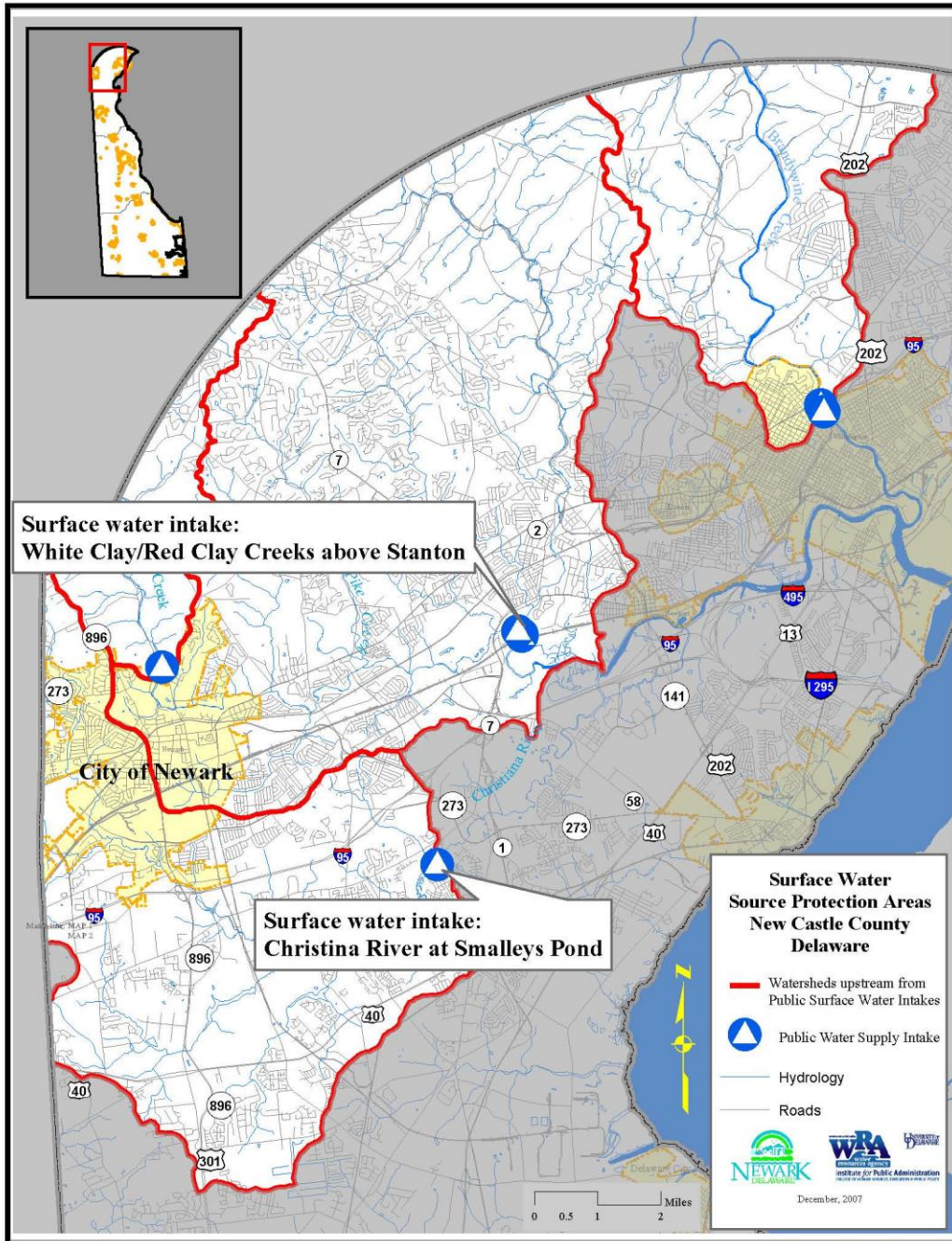
Map 1 - MAP 1



# Report on the Joint Task Force for Northern New Castle County, Phase 2, 7Q10, Fall 1995

- White Clay Creek near Stanton (UWD)
  - Alewife
  - American Eel
  - Blueback Herring
  - Sea Lamprey
  - Striped Bass
  - Smallmouth Bass
  - Yellow Perch
- White Clay Creek near Newark (City of Newark)
  - American Eel
  - Rainbow/Brown Trout
  - Largemouth Bass
  - Smallmouth Bass

<b>Date of Sampling</b>	<b>June 6, 1996</b>	<b>June 6, 1996</b>
Location	WCA	WCB
American Eel	4	8
Am. Brook Lamprey	7	1
Margined Madtom		2
White Sucker	69	54
Rosyside Dace		65
Satinfin Shiner	24	23
Cutlips Minnow	6	11
Common Shiner	15	35
Spottail Shiner	3	14
Swallowtail Shiner	38	15
Bluntnose Minnow	2	1
Blacknose Dace	23	23
Longnose Dace	1	52
Creek Chub	21	14
Tesselated Darter	44	31
Rainbow Trout		1
Rock Bass		4
Redbreast Sunfish	1	
Pumpkinseed	1	
Bluegill	1	
Total Fish	260	254









A person wearing a red life vest and a white cap, wading in the water and holding a tall white vertical pole.

A person wearing a bright green t-shirt and a white cap, wading in the water next to the person with the pole.

A person wearing a dark blue t-shirt and khaki pants, standing on the rocky bank and using a yellow level.

A person wearing a red tank top, black shorts with white stripes, and a wide-brimmed hat, standing on the rocky bank.

# Cross Section Data - wccxsec



Exit Edit Options Plot Help

River:

Plot Options

Keep Prev XS Plots

Reach:  River Sta.:

Description:

### Cross Section X-Y Coordinates

	Station	Elevation
1	0	65.9
2	17	61.9
3	27	57.3
4	37	56.9
5	47	57.8
6	57	57.7
7	75	58.9
8	86	65.1
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		

### Downstream Reach Lengths

LOB	Channel	ROB
100	100	100

### Manning's n Values

LOB	Channel	ROB
0.03	0.03	0.03

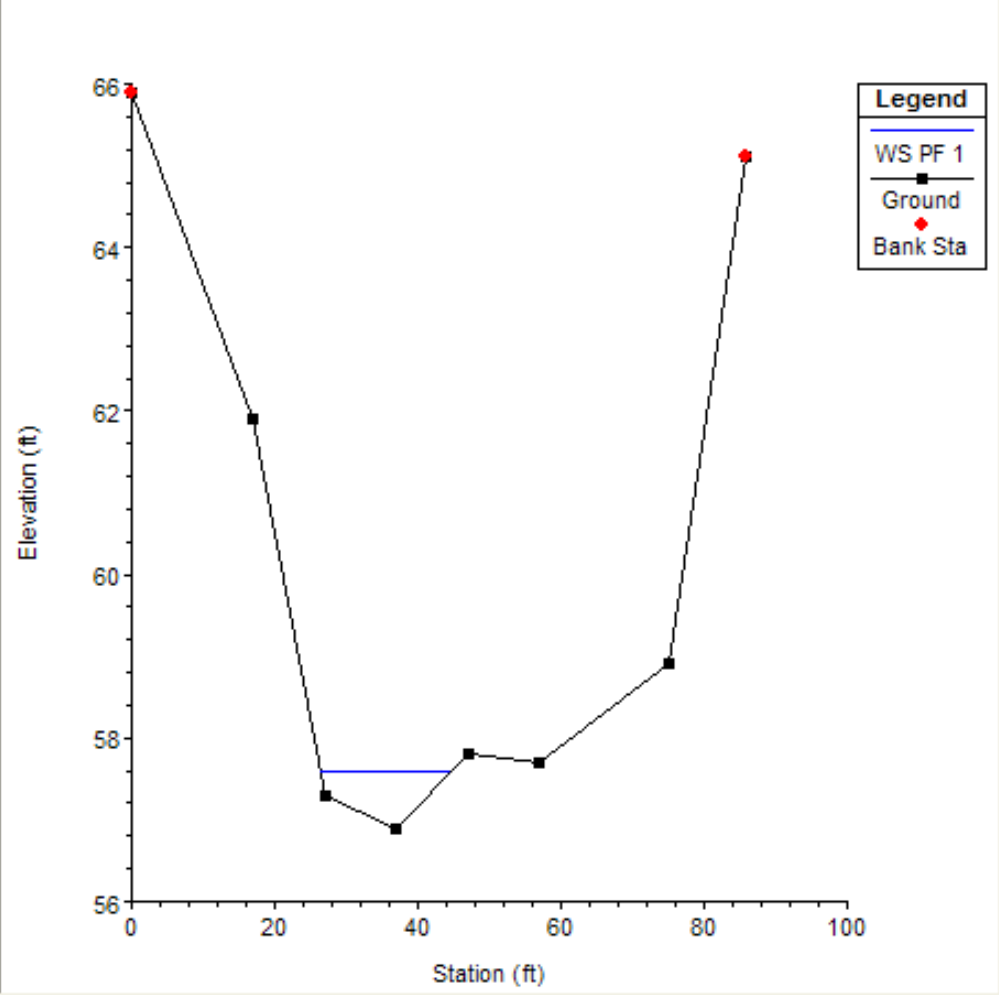
### Main Channel Bank Stations

Left Bank	Right Bank
0	86

### Cont\Exp Coefficients

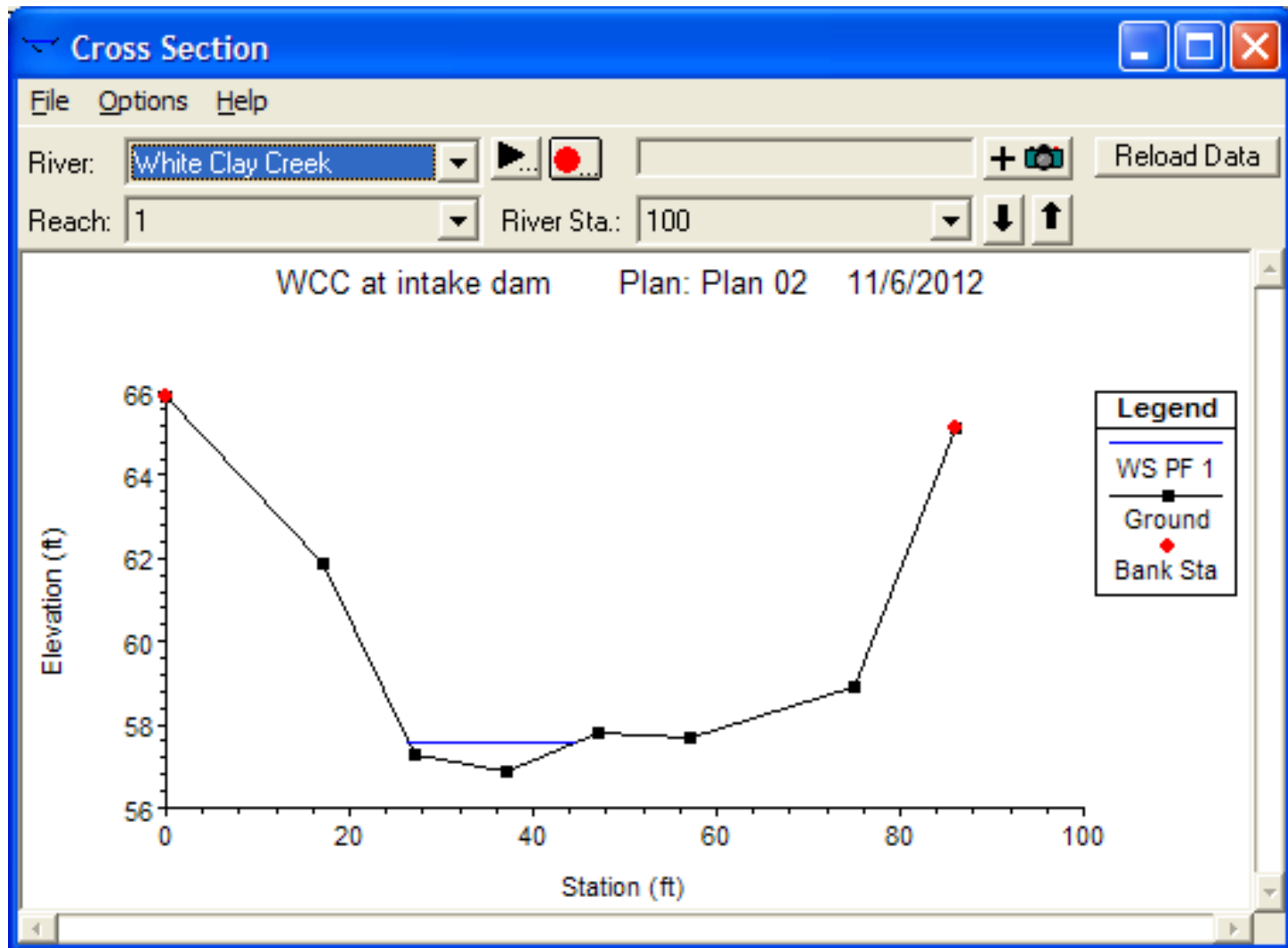
Contraction	Expansion
0.1	0.3

WCC at intake dam Plan: Plan 02 11/6/2012



Edit Station Elevation Data (ft)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	Max Chl Dpth (ft)	W.S. Elev (ft)	Crit W.S. (ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	100	PF 1	24.00	56.90	0.69	57.59	57.54	3.17	7.56	18.24	0.87
1	000	PF 1	24.00	56.00	0.49	56.49	56.43	2.27	10.57	34.03	0.72





# X-Y-Z Perspective Plot



File Options

Upstream RS: 100



Rotation Angle

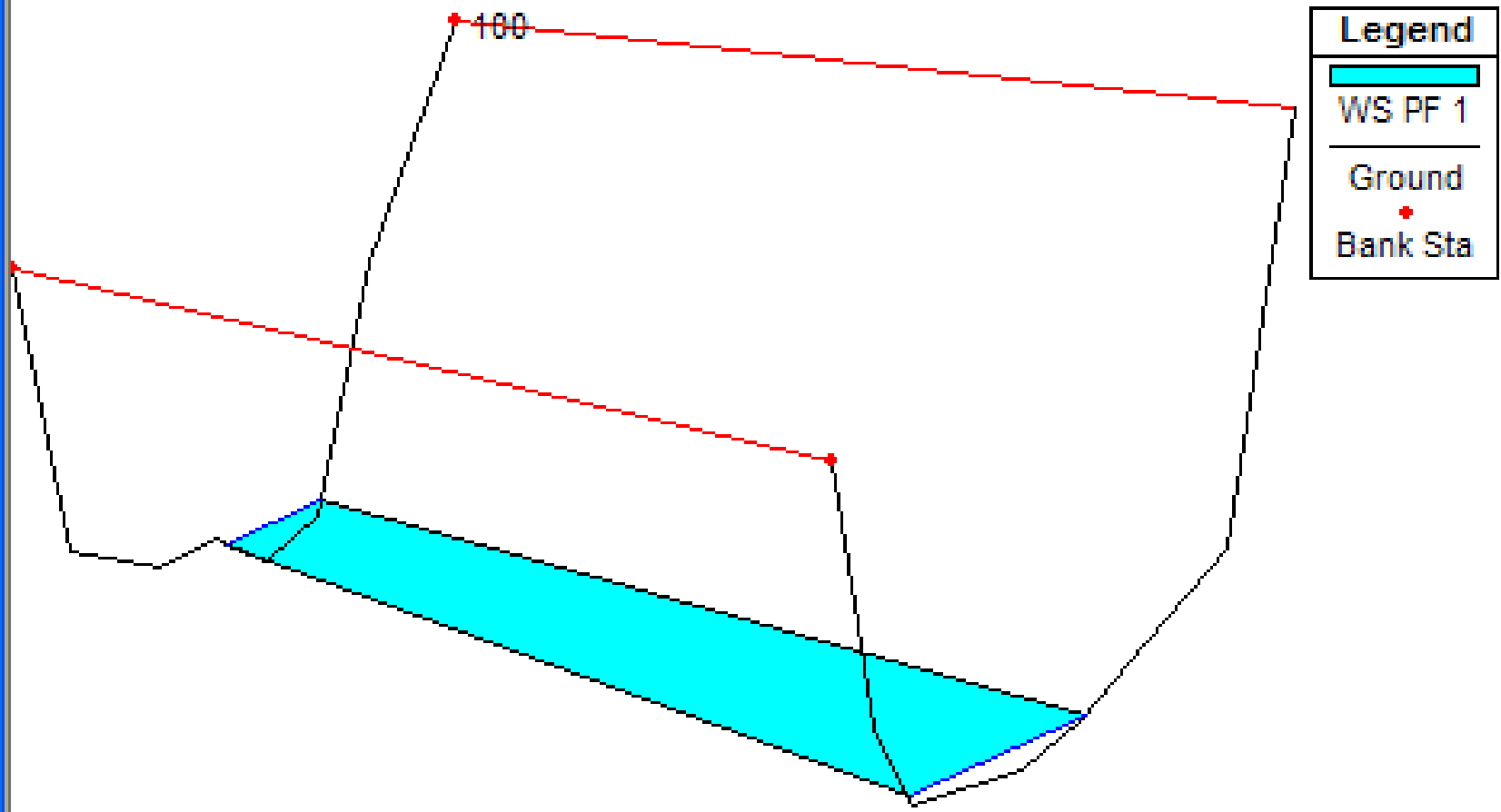
56

Downstream RS: 000

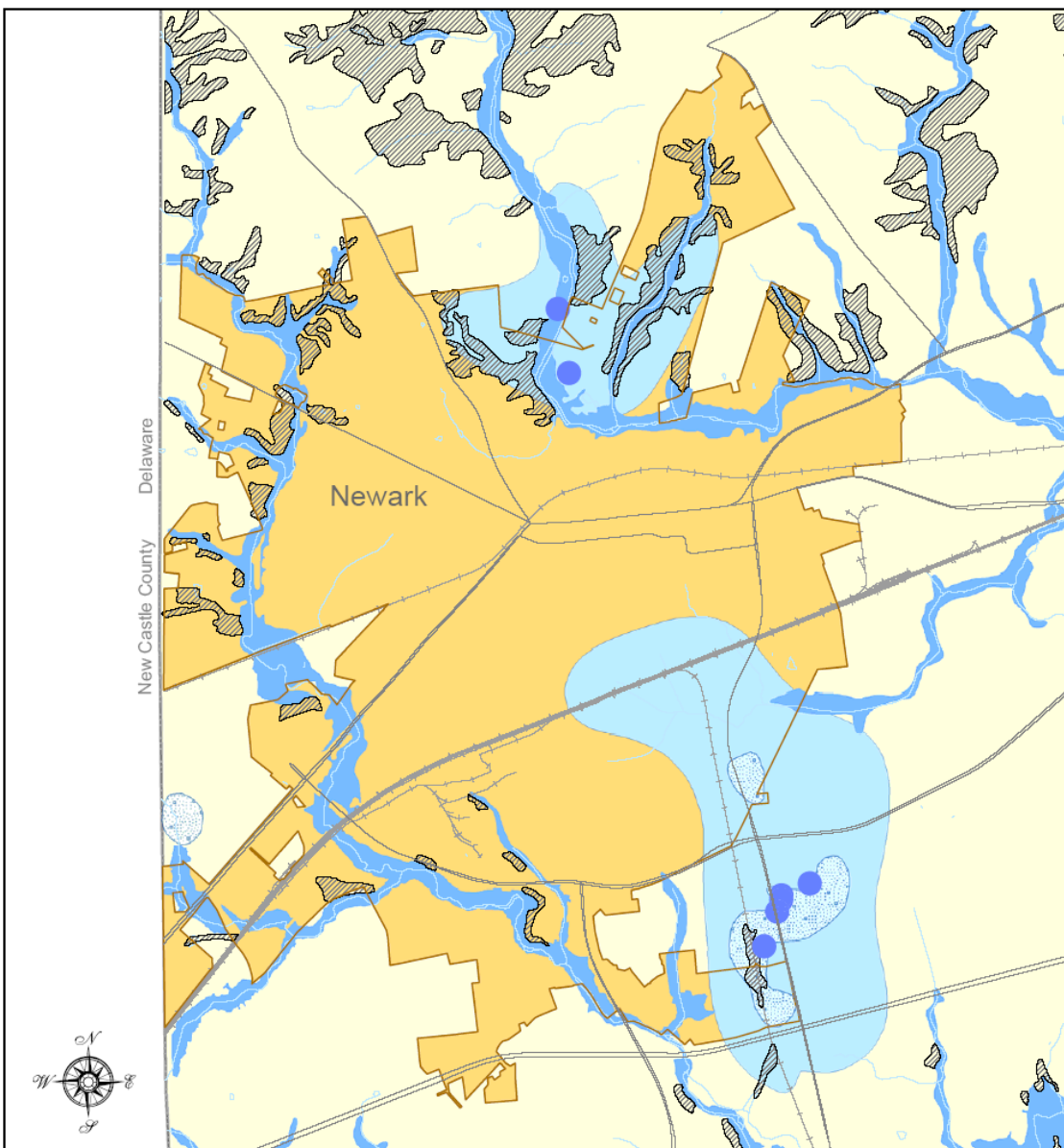
Azimuth Angle

30

WCC at intake dam Plan: Plan 02 11/6/2012



Legend	
	WS PF 1
	Ground
	Bank Sta

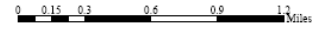


- Wellhead WRPA**
- Class A WRPA
  - Class C WRPA
- Surface Water WRPA**
- Flood Plain
  - Erosion Prone Slopes
- Recharge WRPA**
- Recharge Area
- Municipal Boundaries**
- Municipal Boundaries
  - Roads
  - Hydrology
  - Railroads

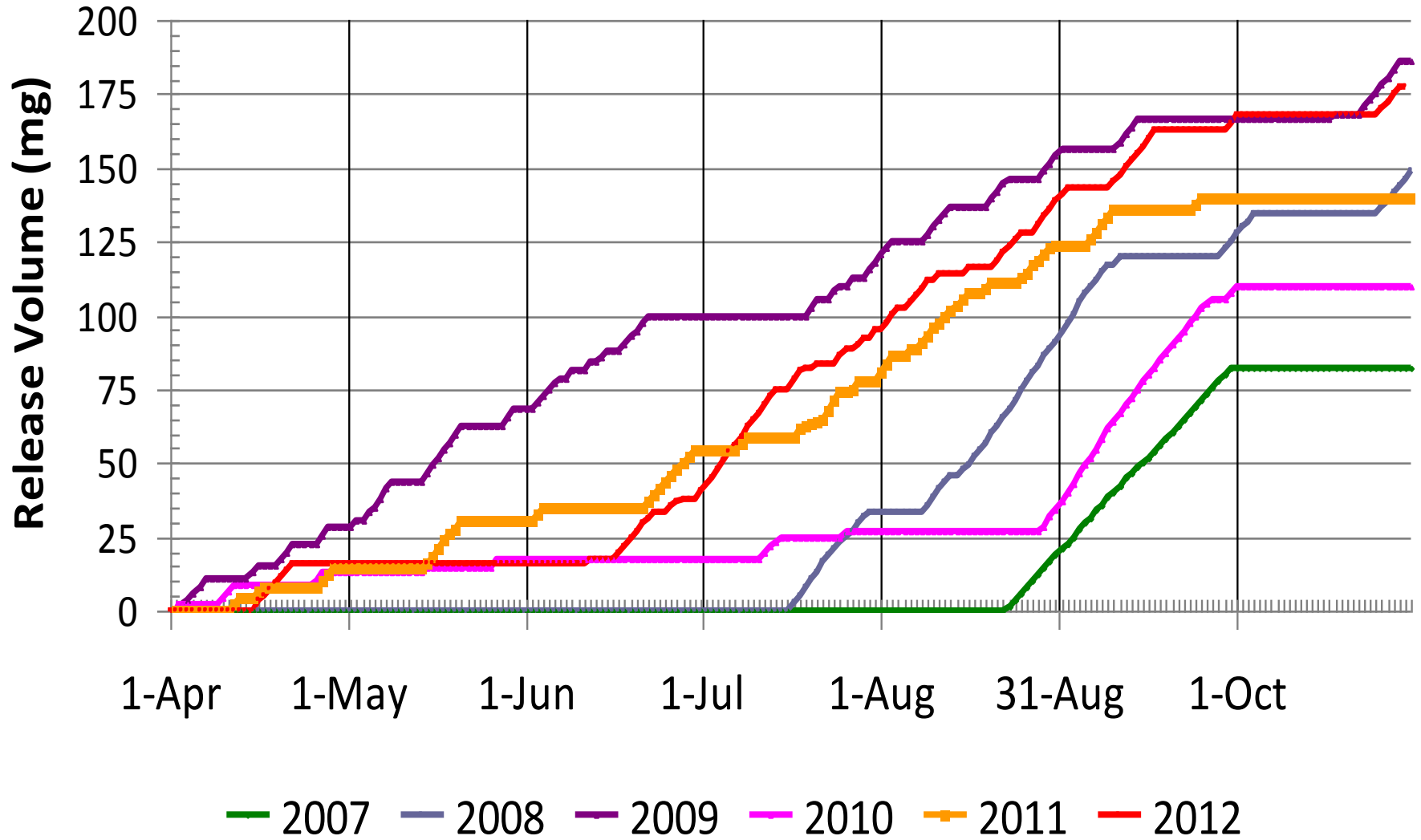
Source:  
 Wellhead Areas - Delaware Department of Natural Resources and Environmental Control (DNREC), 2004.  
 Facilities Recharge Areas - Delaware Geological Survey (DGS), 2003.  
 Municipal Boundaries - Office of State Planning and Coordination, February 2004.  
 Hydrology - USGS 7.5 Minute Series Topographic Maps. Created in cooperative agreement between the State of Delaware and the USGS (1991-1993).  
 Centurina Roads - Delaware Department of Transportation (DelDOT) 2001. Developed from Digital Orthophoto Quarter Quads, 1997.

Note:  
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March 2004



# Newark Reservoir Release



# Newark Reservoir Release

	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
Mg	82	149	186	110	140	180
Days	40	59	78	46	67	76
% Use	11%	16%	21%	13%	18%	21%

# Questions?

