



# Results of the New Jersey Pilot Study for the National Ground-Water Monitoring Network

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## *Introduction*

Ground water is the source of drinking water for more than 130 million Americans each day. Of the 83,300 million gallons per day (Mgal/d) of ground water used in 2000, 68% was used for irrigation, about 23% was used for public supply and domestic use, 4% for industrial use, and the remainder for livestock, aquaculture, mining, and power generation (Hutson and others, 2004). About 35% of the Nation's irrigation water supply is obtained from ground water. Although overall water use in the USA has been relatively steady for more than 20 years, ground-water use has continued to increase, primarily as a percentage of public supply and irrigation. In addition to human uses, many ecosystems are dependent on ground-water discharge to streams, lakes, and wetlands.

The Nation's ground water resources are under stress and require increased interstate and national attention to assure sustainable use of the resource. State, Federal and local agencies have documented significant impacts to major and minor aquifers throughout the USA. Impacts include declining water levels and ground-water contamination from chemical use and waste disposal. In addition, climate change may result in increased flooding which could significantly affect ground-water quality and increased drought periods can significantly affect ground water levels. Increased ground-water demand is expected in all sectors of the economy, including the heavy use sectors of agriculture, drinking water, and energy production. Increased biomass production will increase demand on ground water for water supply to produce fuels and further degrade water quality as a result of increased agricultural application and residuals disposal. These activities threaten the aquifers directly as well as ground water dependent ecosystems and the baseflow of streams supported by ground water discharge. Proposals for geologic sequestration of carbon dioxide present the potential to acidify ground waters if migration of the carbon dioxide to adjacent aquifers occurs. Additionally, brackish and saline ground waters are likely to be increasingly developed and treated in water deficient areas and may compete as locations for carbon sequestration. As ground water uses increases it is imperative to improve the overall management of the resource. An integrated local, State, Tribal, Federal partnership

approach is needed to accommodate multi-jurisdictional issues, effective management of transboundary aquifers and promote stakeholder involvement.

Sustainable ground-water management is currently constrained by the lack of a nationally integrated ground-water monitoring network focused on providing water level and water quality data for regionally and locally important aquifers. The need for a national ground-water monitoring network has been recognized by numerous water resource agencies. To address this concern the Subcommittee on Ground Water (SOGW) was established in 2007 as an ad-hoc committee under the Federal Advisory Committee on Water Information (ACWI). The SOGW, which includes more than 70 people representing 55 different organizations, was charged with developing a framework that establishes and encourages implementation of a long-term ground-water quantity and quality monitoring network. This network is intended to provide data and information necessary for planning, management and development of ground-water supplies to meet current and future water needs, including ecosystem requirements. The SOGW issued a June 2009 report entitled A National Framework for Ground-Water Monitoring in the United States ([http://acwi.gov/sogw/pubs/tr/sogw\\_tr1\\_framework\\_june\\_2009\\_Final.pdf](http://acwi.gov/sogw/pubs/tr/sogw_tr1_framework_june_2009_Final.pdf)). This report describes a framework for the establishment and long-term operation and use of a National Ground-Water Monitoring Network (NGWMN).

The NGWMN is envisioned as a voluntary, integrated system of data collection, management, and reporting that provides the data needed to help address present and future ground-water management questions raised by Congress, Federal, State and Tribal agencies and the public. The NGWMN will be comprised of a compilation of selected wells from existing State, Federal and tribal ground-water monitoring programs. The focus of the network will be on assessing the baseline conditions and long-term trends in water levels and water quality. As proposed, the NGWMN will include two monitoring sub-networks: a sub-network that focuses on monitoring unstressed parts of principle aquifers and aquifer systems and a sub-network that targets areas of concern within aquifers and aquifer systems (typically contaminated areas and areas where water-level declines are of concern). Monitoring within the NGWMN will include four different categories: baseline monitoring, trend monitoring, surveillance monitoring, and special studies monitoring.

Ground-water level monitoring has been conducted for many decades in many states. Data from these networks have been used to help identify, develop, and manage ground-water supplies at the local and State level. Ground-water quality monitoring programs have been developed more recently in response to the focus on water quality that resulted from passage of the Safe Drinking Water Act; the Clean Water Act; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and other environmental laws. As of 2007, 37 states operated statewide or regional ground-water monitoring networks and 33 states have at least one active ground-water quality monitoring program. The state monitoring networks are funded using a combination of State and Federal funds. The networks are operated by a variety of State agencies, many of them in cooperation with the United States Geological Survey (USGS). The networks operate under a variety of specific State / Tribal / local goals and objectives and are not necessarily focused on all of the important aquifers within a State or Reservation. As a result it is very difficult to use these groundwater monitoring programs to evaluate ground-water availability and rates of use on a regional or national basis. Because many aquifers support

multiple jurisdictions, a focus on monitoring at the aquifer level rather than at a political subdivision is critical to facilitate sustainable ground water use.

Based on statements of interest from numerous states and multi-state groups, the SOGW selected five pilot projects: Illinois-Indiana, Texas, New Jersey, Montana and Minnesota. These five pilots vary in scale from an intra-state monitoring network that covers only a portion of one individual state to an inter-state network where two States share an aquifer. Information obtained from Pilot Projects will help to better understand the current status, range of coverage, and level of coordination of ground-water monitoring networks in the US, and will serve as a foundation for developing an estimate of the number and type of resources needed for full-scale implementation of the national monitoring network. The five pilot projects have been conducted through cooperative efforts between the State monitoring network managers, the SOGW and the USGS.

### **Purpose of Study**

One of the three key recommendations included in A National Framework for Ground-Water Monitoring in the United States is to develop and conduct a limited number of pilot studies to: (a) test the NGWMN concepts and approaches detailed in the Framework document; (b) evaluate the feasibility and resources necessary to implement a national network and (c) produce recommendations leading to full scale implementation. The pilot projects were initiated in early 2010 and are expected to be completed by March 2011 Each of the pilot projects has addressed the following objectives:

- 1) evaluate the feasibility of designing network segments within one or more principal, major or other important aquifers, using conceptual ground-water flow models as the primary network design element,
- 2) determine methods to establish unstressed and targeted sub-networks within the target aquifer(s),
- 3) test the design of the NGWMN and its ability to provide water level and quality data to large-scale assessments of the ground-water resource,
- 4) determine the feasibility and design parameters of a central, web-based data portal that will allow NGWMN to gather and disseminate data, as well as promote data sharing among data providers and the public,
- 5) test and assess the effectiveness of coordination, cooperation and collaboration mechanisms among federal, state, regional and local, and tribal data collectors, providers and managers,
- 6) investigate methods to ensure that data collected by the data providers and, therefore, the NGWMN as a whole are comparable. Data elements, including site characteristics, well construction and details, the frequency of water-level measurements, water-quality analytes, water-level measurement procedures, water-quality sampling procedures, and written standard operating procedures, will all be evaluated and,
- 7) determine the timeframe and costs associated with adding, upgrading, or developing a state, tribal, or local well network and data management system that meets the criteria and needs of the NGWMN and its on-going implementation.

Each pilot will need to evaluate potential monitoring points within each principal, major or other important aquifer for potential inclusion in the NGWMN and identify a subset of proposed monitoring points as meeting NGWMN's "stressed" or "unstressed" sub-network design criteria. In addition, each pilot will identify all costs of potential participation in a NGWMN that are specific to the particular Pilot State on a total and per well basis, as appropriate, including historical costs for the development and maintenance of their existing network; one-time start-up costs; and capital, operational, and maintenance costs associated with filling data gaps. Each pilot will also interface with the NGWMN data portal that is under development by the USGS.

## **Description of Study Area**

The New Jersey Pilot Study project area encompasses the entire state of New Jersey which includes the Coastal Plain physiographic province in the southern part of the state and the Valley and Ridge, Highlands, and Piedmont physiographic provinces in the northern part of the state. This area contains eight principal aquifer/aquifer systems as defined by USGS in the Ground Water Atlas of the United States (HA-730 Miller, 1999 and HA-730-LTrapp and Horn, 1997). These include the Sand and gravel aquifers, the Early Mesozoic basin aquifers, the Piedmont and Blue Ridge crystalline-rock aquifers, the Piedmont and Blue Ridge carbonate-rock aquifers, the New York and New England carbonate-rock aquifers, the Valley and Ridge aquifers, the Valley and Ridge carbonate-rock aquifers, and the Northern Atlantic Coastal Plain aquifer system. A map of the principal aquifers recognized in New Jersey is shown in Figure 1 and Figure 2 and summarized in Table 1.

North of the Fall Line in northern New Jersey, the principal aquifers consist of sand and gravel deposits, fractured shale, limestone, sandstone, conglomerate, and crystalline rocks. These aquifers include the glacially deposited sand and gravel aquifers, the shales and siltstones of the Newark Group or Early Mesozoic basin aquifer, the aquifers within the valley and ridge sedimentary units (corresponding to the Valley and Ridge aquifers, the Valley and Ridge carbonate-rock aquifers, and the New York and New England carbonate-rock aquifers), and the sedimentary, igneous and metamorphic crystalline rocks of the Highlands crystalline units (corresponding to the Piedmont and Blue Ridge crystalline-rock aquifers and the Piedmont and Blue Ridge carbonate-rock aquifers). Ground-water flow in these aquifers typically follows watershed boundaries from areas of recharge to areas of discharge near springs and streams. Hydrologic responses to pumping tend to be local and contained within surface watersheds, as opposed to the coastal plain aquifer system where drawdown can be observed over large distance beyond surface watershed boundaries.

New Jersey divides the Northern Atlantic Coastal Plain aquifer system into several different aquifers that are regionally important and hydrologically distinct from each other. These are finer scale delineations than either the principal or major aquifer definitions of USGS. New Jersey's Coastal Plain aquifers are the Kirkwood-Cohansey aquifer system, the Atlantic City 800-foot sand aquifer, the Piney-Point aquifer, the Vincentown aquifer, the Wenonah-Mount Laurel aquifer, the Englishtown aquifer, and the Potomac-Raritan-Magothy aquifer system. All but the Kirkwood-Cohansey are confined over much of their extent. The aquifers are recharged directly by precipitation in outcrop areas, by vertical leakage through confining beds, and by seepage from surface-water bodies. A conceptual model of the hydrogeologic framework for the Coastal



Plain aquifers has been developed by the USGS as part of the RASA program. The conceptual model is documented in Zapecza, 1989. These aquifers are all contained within the Northern Atlantic Coastal Plain aquifer system as defined in the National Atlas. Figure 3 shows a generalized cross section of the New Jersey Coastal Plain aquifer system and Table 1 links national and local aquifer names. For this report the Rio-Grande water bearing zone is lumped with the Atlantic City 800-ft sand aquifer.

The New Jersey Geological Survey (NJGS), part of the New Jersey Department of Environmental Protection (NJDEP), in cooperation with the United States Geological Survey-New Jersey Water Science Center (USGS-NJ) maintain an extensive network of ground-water monitoring wells throughout the principal aquifers. Refer to Figure 1 for a map of the water-level monitoring wells and Figure 2 for a map of the water-quality monitoring wells. These wells provide the back-bone of ground-water level and quality data across the state that are used in large part to sustainably manage the state's ground-water resources.

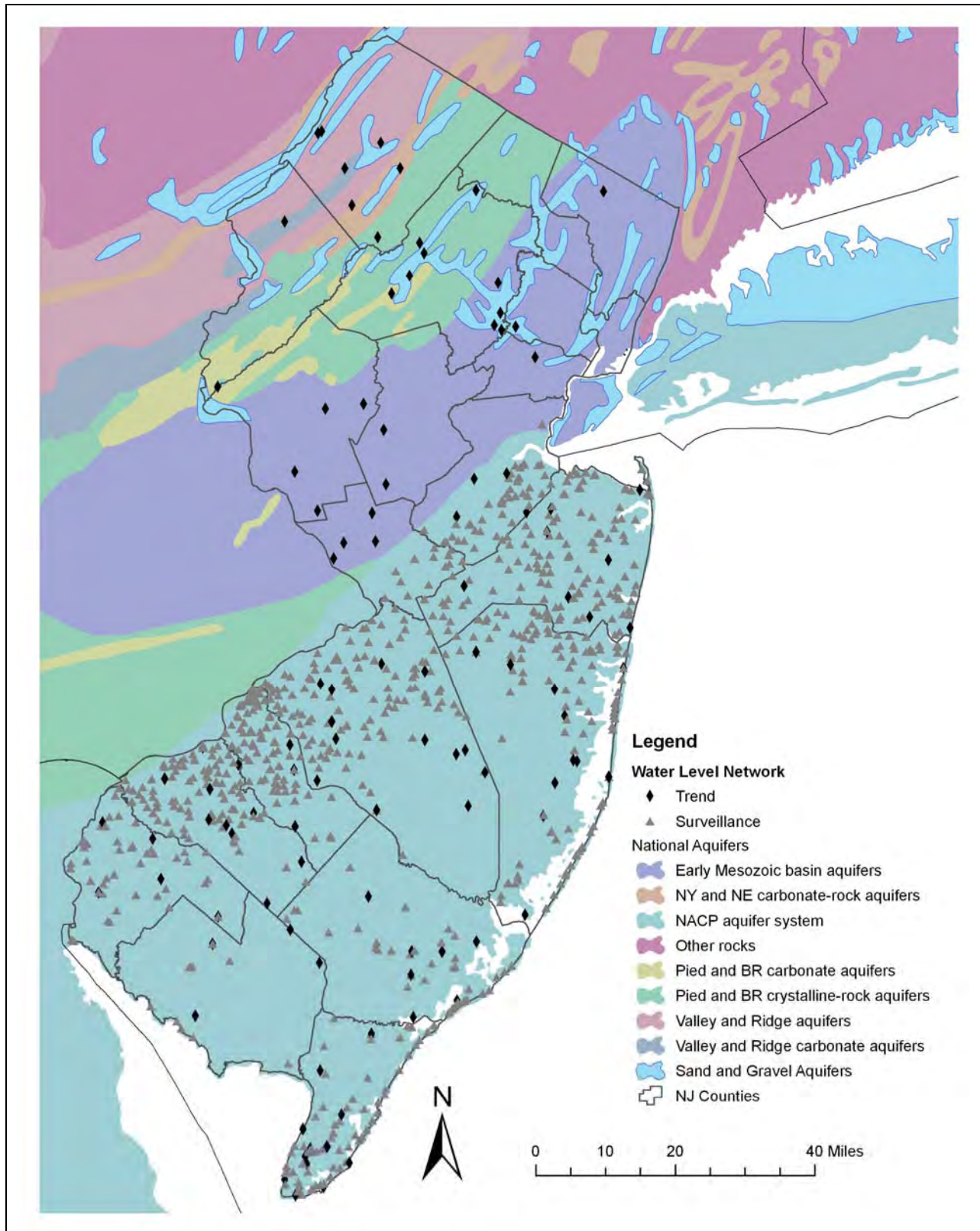


Figure 1. Map showing location of New Jersey's ground-water level monitoring network wells and the principal aquifers.

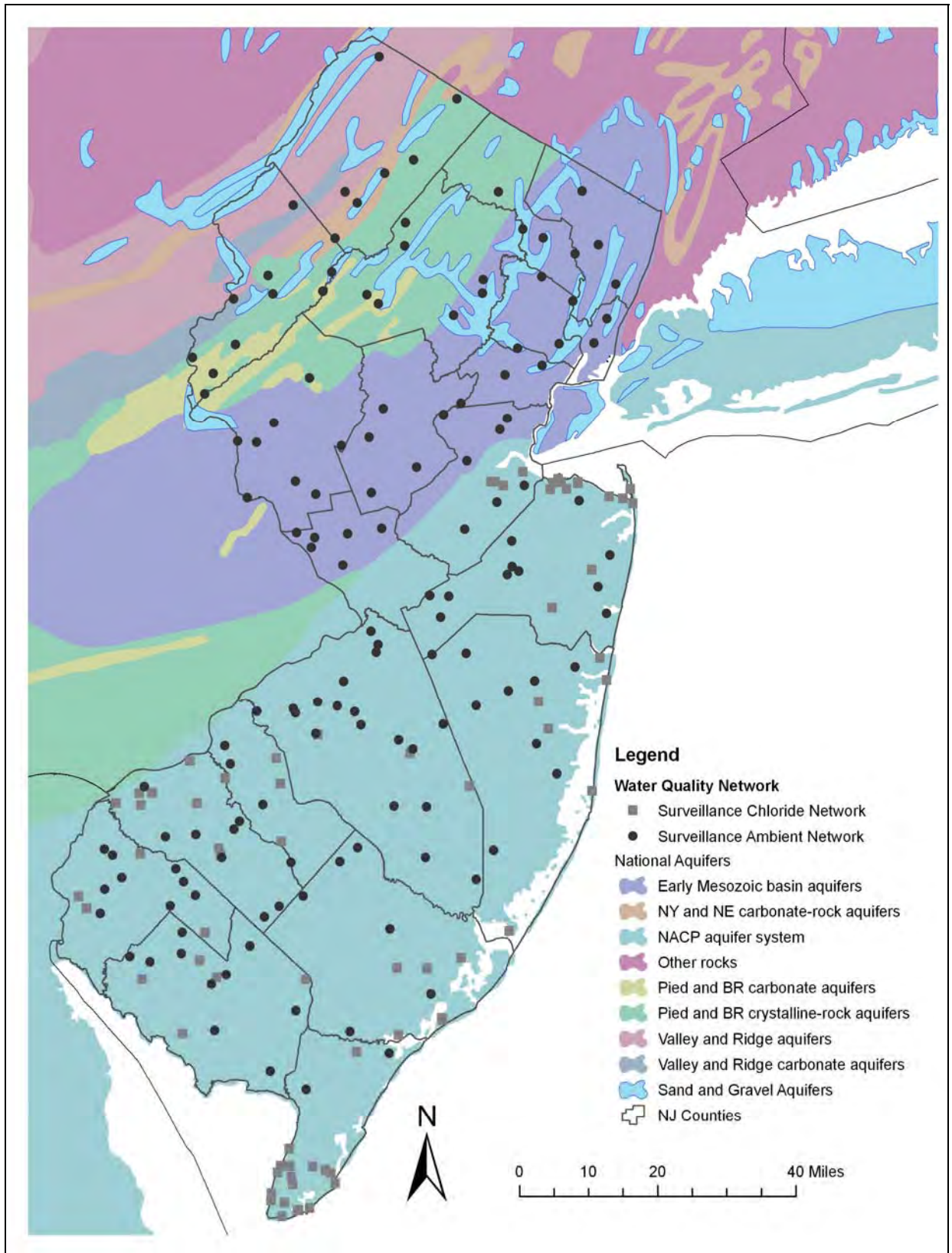


Figure 2. Map showing location of New Jersey’s ground-water quality monitoring network wells and the principal aquifers.

<b>Principal Aquifer</b>	<b>New Jersey Aquifer</b>	<b>Comment</b>
<i>Sand and gravel aquifers</i>	Glacial deposits	NJ has finer mapping scale for glacial deposits
<i>Early Mesozoic basin aquifers</i>	Equates to NJ's Piedmont Province	
<i>Piedmont and Blue Ridge crystalline-rock aquifers</i>	Equates to the NJ Highlands Province	Grouped for NJ Pilot Study Report
<i>Piedmont and Blue Ridge carbonate-rock aquifers</i>		
<i>Valley and Ridge aquifers</i>	Equates to NJ's Valley and Ridge Province.	Grouped for NJ Pilot Study Report
<i>Valley and Ridge Carbonate Rock aquifers</i>		
<i>New York and New England carbonate-rock aquifers</i>		
<i>Northern Atlantic Coastal Plain aquifer system</i>	<i>Kirkwood-Cohansey aquifer system</i>	
	<i>Atlantic City 800-foot sand aquifer</i>	
	<i>Piney Point aquifer</i>	
	<i>Vincentown Aquifer</i>	
	<i>Wenonah-Mount Laurel aquifer</i>	
	<i>Englishtown aquifer</i>	
	<i>Upper Potomac-Raritan-Magothy aquifer</i>	<i>Potomac-Raritan-Magothy aquifer system</i>
	<i>Middle Potomac-Raritan-Magothy aquifer</i>	
<i>Lower Potomac-Raritan-Magothy aquifer</i>		

Table 1. List of principal aquifers found in New Jersey.



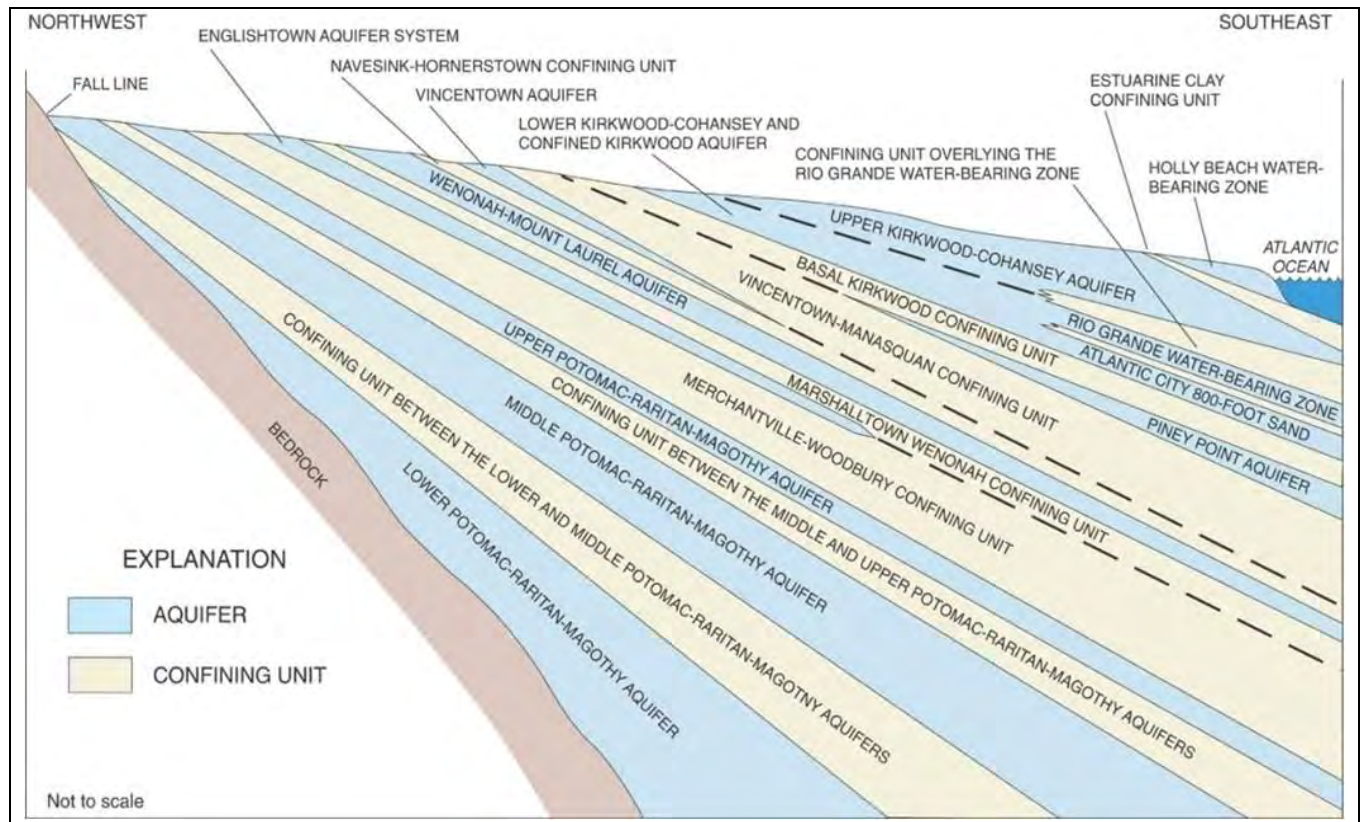


Figure 3. Generalized cross section of New Jersey's coastal plain aquifer system.

## *Collaboration and Cooperation*

### **Pilot Study**

The New Jersey Pilot Study primary partners include the New Jersey Geological Survey (NJGS) and the United States Geological Survey New Jersey Water Science Center (USGS-NJ). As the New Jersey Geological Survey is part of the New Jersey Department of Environmental Protection other divisions within the Department participate in the ground water monitoring network design, funding, and data utilization. These include the Division of Water Supply, the Division of Water Quality and the Division of Watershed Management. The USGS also periodically works with the State of Delaware as well as Delaware water utilities to collect data for the northern Atlantic Coastal Plain aquifers that are shared across the Delaware Bay.

### **Future Opportunities**

Several obvious opportunities exist for collaboration in the future. These include the northern Atlantic Coastal Plain aquifer system states of Maryland, Delaware and New York (Long Island). As of August 2010, the Geological Surveys of New Jersey, Delaware and Maryland had met to discuss opportunities for collaboration. The discussions centered on regionally consistent geologic and hydrogeologic naming conventions and mapping across state lines (primarily in the Potomac Formation) and in October all three states applied for a STATEMAP grant to fund a

joint project. Work done for this Pilot Study highlighted the importance of a consistent multi-state hydrogeologic framework and collection of comparable datasets. Other opportunities exist for collaboration in the sand and gravel valley-fill aquifers of northern New Jersey and southeastern New York. While these aquifers are relatively small compared to the coastal plain ones, they are the primary drinking water source (via wells and base flow to streams that discharge to reservoirs) for many of the major metropolitan regions of Rockland County New York and Northeastern New Jersey (e.g. the Hackensack, Ramapo, and Wanaque River basins).

## ***Water-Level Network***

USGS-NJ maintains a database of over 19,000 wells in New Jersey. These wells are included in USGS's database for numerous reasons ranging from their inclusion in a real-time water level network, use in a groundwater model, historic sampling, or location in a study/project area, etc. Of these 19,000 plus wells, NJGS and USGS-NJ are proposing that 982 of them be included in the National Ground-Water Level Monitoring Network. The trend monitoring network consists of 138 wells with long-term continuous water-level data which are used to evaluate long-term and seasonal trends in water levels. The surveillance network consists of 844 wells in the Northern Atlantic Coastal Plain aquifer system in southern New Jersey and is used to provide spatial detail on a five-year interval. See Figure 1 for location and type of monitoring wells.

### **Well Selection**

With the overall network goals in mind, all wells which fit the data requirements of the NGWMN Framework document (with a few exceptions noted later) were selected. About 50 additional long-term wells were not selected for the trend network because they are only measured intermittently (2-4 times per year) and did not have the continuous data necessary to evaluate seasonal variations. All wells which were measured during USGS-NJ 2008 Synoptic Water-Level Survey (DePaul, et al 2009) were selected for the water-level surveillance network. If wells were selected which did not meet all of the requirements of the network, then these wells and their corresponding data issues will be addressed in the gap analysis section.

### **Trend and Surveillance Networks**

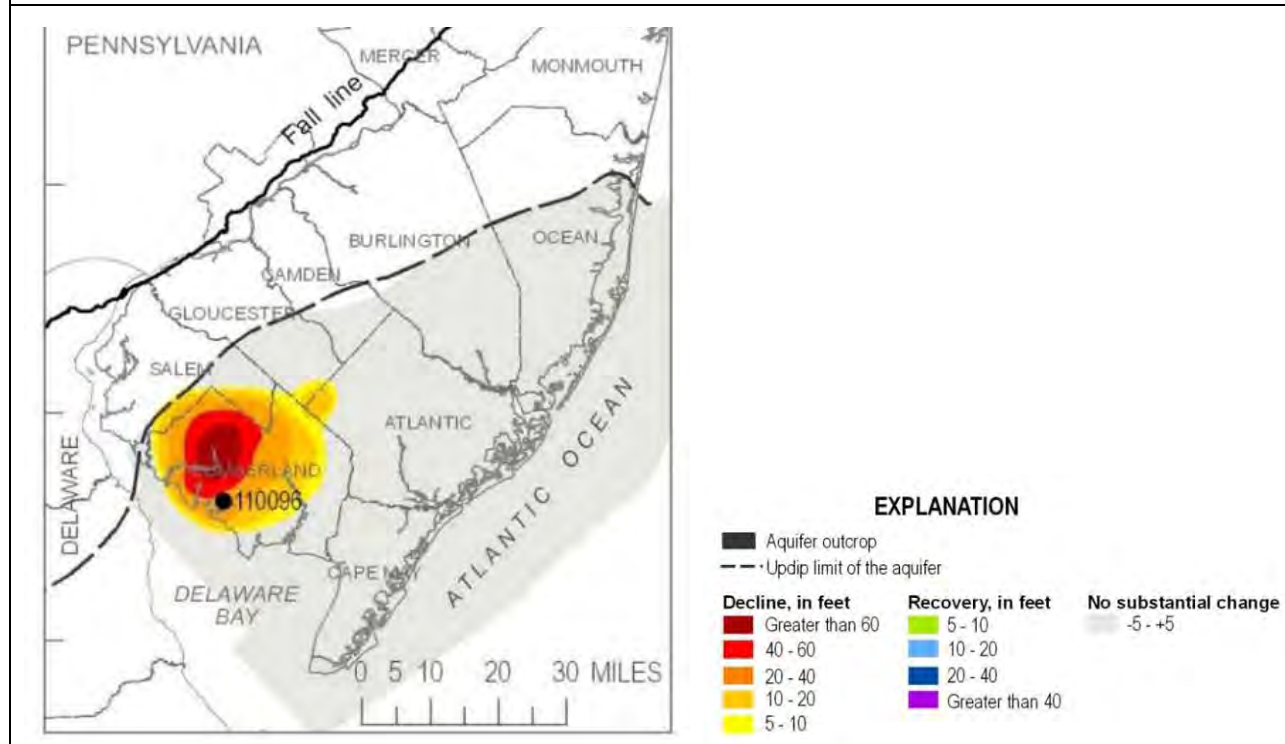
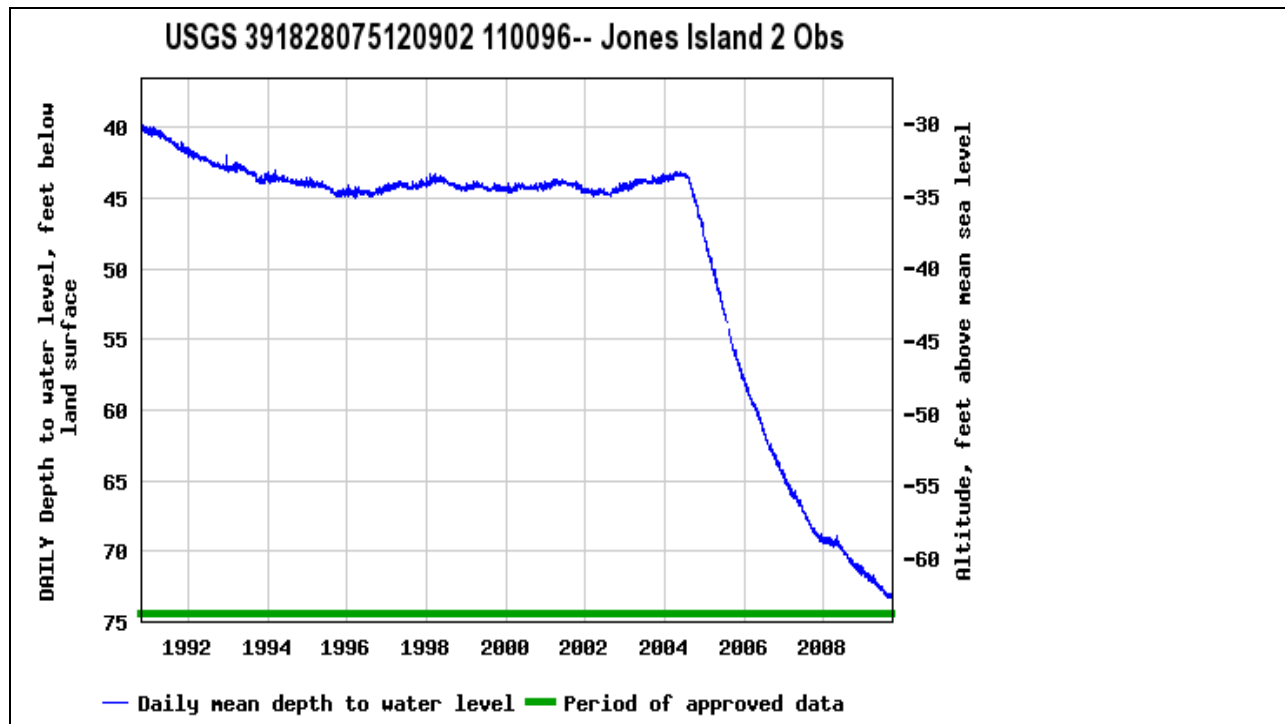
The trend water-level monitoring network consists of 138 wells with at least 5-years of continuous daily-value water-level data. These wells are located throughout the state in all of the principal aquifers. The purpose of this network is to provide detailed data on changes in water-levels; both long-term and seasonally. Sites from the NJ USGS/NJGS network that were selected for the NGWMN pilot project trend network are all of the network wells with long-term continuous water-level data and approaching five years of water-level data. Most of these wells are dedicated observation wells (e.g. not used for other purposes).

The surveillance network consists of 844 wells in the Northern Atlantic Coastal Plain aquifer system in southern New Jersey. These wells are measured every five years as part of an effort to create potentiometric surface maps for the nine aquifers in the Coastal Plain of New Jersey. The purpose of this network is to provide the spatial extent of the water-level changes that are

observed in the trend network. The extent and shape of the cones of depression can be determined using the data from this network. The surveillance network consists of all the wells that were measured as part of the New Jersey Synoptic Water-Level Survey (DePaul, et al 2009). Many of these wells have been measured every 5 years starting in 1978. The network consists of a mix of observation, domestic, industrial, irrigation, and public supply wells.

Public supply wells are needed in the network in order to provide a good spatial representation of the aquifers and to capture low water levels associated with withdrawals. New Jersey uses a protocol for these wells to ensure that the water levels measured represent the conditions in the aquifer around the well and not the pumping conditions in the well. These are described in all of the synoptic reports created using this data. Essentially, the well pumps are turned off for a minimum of 1 hour prior to measurement of the water level in the well. Withdrawals are also stopped at all other high-capacity wells (typically greater than 70 gpm pumps) within a quarter mile of the well being measured for at least 1 hour. Following standard USGS methods, measurements were made in each well until two consecutive and similar measurements were obtained at least 5 minutes apart. The resulting water-level measurement was considered representative of the local static conditions. This approach works well in the Coastal Plain of New Jersey (and other areas in the Northern Atlantic Coastal Plain) because the high permeability of the sand and gravel aquifers allows the water-levels at the recently pumped wells to recover fairly rapidly. This approach would not work in some wells in Northern New Jersey and in many other areas.

An example of the way the trend and surveillance networks work together to quantify changes over time and the spatial extent of change is given for the Piney Point aquifer in Cumberland County, New Jersey. Declines were observed in three observation wells in the Piney Point aquifer beginning in 2004. An example of the decline at the Jones Island 2 Obs well is shown in the hydrograph in Figure 4a. These declines were the result of a new withdrawal well in the Piney Point aquifer. The spatial extent of the water-level declines was determined after the aquifer was measured in the 2008 New Jersey Synoptic Network. Potentiometric surface and water-level change maps were produced based on this data. Figure 4b shows the spatial distribution of the water-level decline in the aquifer from 2003-2008. Used together, the trend network can characterize recent or ongoing changes in water-levels at specific locations and the surveillance network can provide spatial details on the extent of these changes.



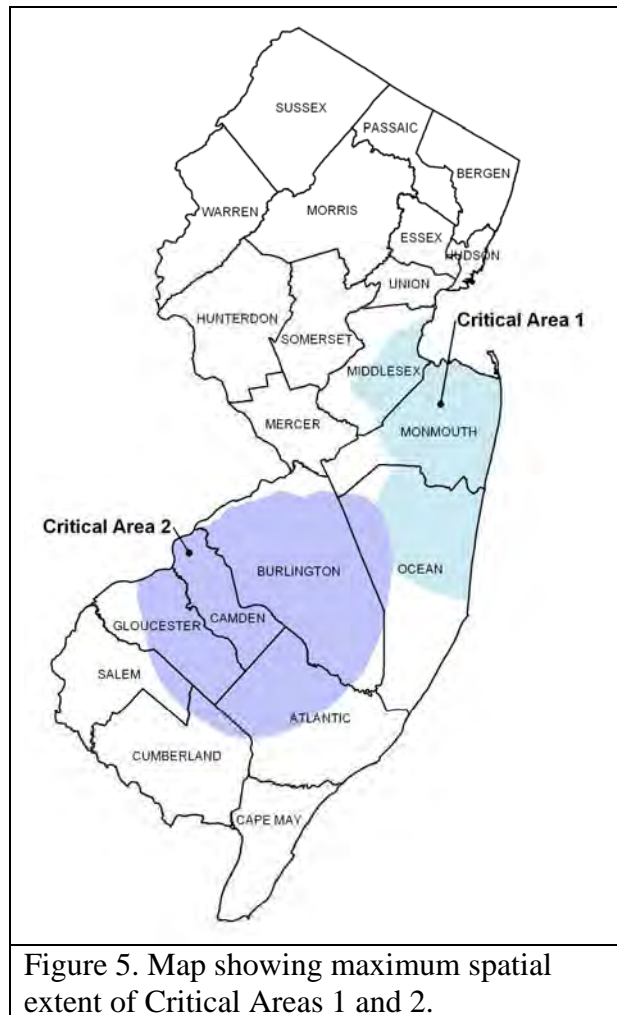
Figures 4a and 4b. (A-top) Water levels in the Piney Point aquifer from 1992 through 2008 at the Jones Island 2 observation well (trend well). (B-bottom) Water level change in the potentiometric surface of the Piney Point aquifer based on the aquifer's surveillance wells from 2003 to 2008. The black dot in Figure 4b is the Jones Island observation well.



## Definition of Unstressed and Targeted Subnetworks

The definition of the unstressed and targeted networks closely follows the recommendations from the NGWMN Framework document. Unstressed wells are considered to be background wells. Targeted wells are located in areas of focused interest. Targeted wells were selected based on water-level decline from predevelopment (or the earliest data available at a well) or their inclusions in one of the two areas in the Coastal Plain of New Jersey with managed ground-water resources.

For wells in the Coastal Plain of New Jersey, predevelopment water-levels at each monitoring point were determined using the NJ RASA Groundwater Flow Model (Voronin, 2003). For wells in northern New Jersey, the "pre-development" water level was determined using the first available water-level data measurement at a well. In some cases this is reported on the well completion report and in other cases it is the first measurement of the site in the database. The water-level decline was calculated as the difference between recent water levels in the well and the predevelopment water level. Confined wells with water-level declines of 40 ft or greater were designated as targeted wells. Unconfined wells with water-level declines of 25 ft or greater were designated as targeted wells.



In the late 1980's and early 1990's, two water-supply management areas were designated in the New Jersey Coastal Plain due to declining water-levels and the potential for saltwater intrusion (Figure 5). These areas are referred to as Critical Areas 1 and Critical Area 2.

Decreases in withdrawals from these aquifers were mandated when an alternate source was made available and applications for new withdrawals from each are closely scrutinized and limited. Critical Area 1 consists of Monmouth County and parts of Middlesex, and Ocean Counties. Wells completed in the Wenonah-Mount Laurel, Englishtown, Upper Potomac-Raritan-Magothy, and the Middle Potomac-Raritan-Magothy aquifers in this area are managed ground-water resources. Critical Area 2 consists of all of Camden County and parts of Burlington, Camden, Gloucester, Atlantic, Ocean, Salem, and Cumberland Counties. Wells completed in the Upper Potomac-Raritan-Magothy, Middle Potomac-Raritan-Magothy, and the Lower Potomac-Raritan-Magothy aquifers in this area are managed ground-water resources. All wells in

the designated aquifers within the boundaries of one of the Critical Areas were designated as targeted wells.

All wells which were not designated as targeted wells because of the magnitude of water-level decline or inclusion in a water supply Critical Area were designated as unstressed wells.

### **Principal Aquifers and Associated Ground-Water Level Monitoring Network**

The following sections briefly describe the principal aquifers found in New Jersey and the ground-water monitoring network located in each one. This section of the report is broken out by principal aquifer and the discussion of the unstressed and targeted region, if present, is combined under the aquifer. The geologic and hydrogeologic descriptions are primarily summarized from Ground Water Atlas of the United States: Delaware, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia, West Virginia (Trapp and Horn, 1997) and from Hydrogeologic Framework of the New Jersey Coastal Plain; Regional Aquifer System Analysis (Zapoczka, 1989). The reader is referred to those publications for a detailed discussion of the geology and hydrogeology of New Jersey. Where New Jersey has identified local aquifers of significance beyond the principal aquifers additional discussion has been included in this report. Aquifer and well network specific figures are included in each section to show general location of the aquifer and distribution of the well network. Table 2 summarizes the numbers of wells in each network and aquifer. The details on each well are included in Appendix 1.

Table 2 shows that there are no targeted wells in any of the bedrock aquifers. This does not imply that there are no areas where water levels are of concern to New Jersey. Rather this is the result of the hydrogeologic properties of the bedrock aquifers themselves. While each principal aquifer has its own and variable range of hydraulic properties they all respond comparably to pumping. For example, in the Early Mesozoic Basin aquifers ground-water flow is typically limited to the bedding of the pumped well or by a joint zone. As a result, a monitoring well that might be nearby spatially, but that is not screened in the same layer/zone would not likely show the full extent of drawdown, if any at all. A monitoring well would need to be specifically placed and screened in order to 'observe' the full extent of drawdown. Hence, a monitoring network well would not show a targeted status unless it was in the same bedding zone as a large diversion. In the metamorphic and igneous aquifers ground-water flow is typically controlled by the degree of weathering in the near-surface portions of the formation. This coupled with the steep topographic divides tends to limit drawdown locally and within the surface watershed. Carbonate rocks have drawdown controlled by the specific secondary porosity that the well is open to and an observation well would have to be well connected in order to 'see' the drawdown.

The concept of a targeted observation well network works much better in New Jersey's Coastal Plain aquifer system where drawdown can extend much more predictably in the relatively homogeneous unconsolidated materials and where surface topographic divides are small and not typically no-flow boundaries.

<b>Principal Aquifer</b>	<b>NJ Aquifer</b>	<b>Network Type</b>	<b>Targeted Wells</b>	<b>Unstressed Wells</b>	<b>Total</b>
Sand and gravel aquifers	Same, but more extensively mapped in NJ	Trend	1	12	13
		Surveillance			0
Early Mesozoic basin aquifers	same	Trend		12	12
		Surveillance			0
Piedmont and Blue Ridge crystalline-rock aquifers and Piedmont and Blue Ridge carbonate-rock aquifers	same	Trend		2	2
		Surveillance			0
Valley and Ridge aquifers, Valley and Ridge Carbonate Rock aquifers, and New York and New England carbonate-rock aquifers	same	Trend		4	4
		Surveillance			0
Northern Atlantic Coastal Plain aquifer system	Kirkwood-Cohansey aquifer system	Trend	1	34	35
		Surveillance		39	39
	Atlantic City 800-foot sand aquifer (with Rio Grande wbz)	Trend	4	5	9
		Surveillance	76	21	97
	Piney Point aquifer	Trend	3	1	4
		Surveillance	29	19	48
	Vincentown aquifer	Trend		2	2
		Surveillance		23	23
	Wenonah-Mount Laurel aquifer	Trend	6	5	11
		Surveillance	68	51	119
	Englishtown aquifer	Trend	8	3	11
		Surveillance	55	21	76
	Upper Potomac-Raritan-Magothy aquifer system.	Trend	8	3	11
		Surveillance	167	36	203
	Middle Potomac-Raritan-Magothy aquifer system (with Undif. PRM)	Trend	13	4	17
		Surveillance	110	44	154
	Lower Potomac-Raritan-Magothy aquifer system.	Trend	6	1	7
		Surveillance	69	16	85
Subtotal Trend			49	89	138
Subtotal Surveillance			574	270	844
TOTAL			623	359	982

Table 2. Summary of ground-water level wells by principal aquifer, New Jersey aquifer, network type, and well status.

### *Sand and gravel aquifers*

The Quaternary age sand and gravel aquifers in northern New Jersey are primarily related to glaciation. These unconsolidated sand and gravel deposits mostly occur as long, narrow bands in the northern part of the state. Many of these deposits formed as glacial outwash that was deposited by meltwater from ice sheets. Some of the stream-valley alluvium consists of reworked glacial outwash. Most of the individual aquifers that compose the system are not hydraulically connected, but they do have similar hydrogeologic properties. Some of these aquifers can be locally confined where fine-grained lakebed sediments overlay them and act as a confining unit, however at the watershed scale they should be considered unconfined aquifers. New Jersey has mapped these aquifers to a finer scale and has a slightly more extensive areal coverage for the sand and gravel aquifers. Unconsolidated sands and gravels south of the fall line are included in the Northern Atlantic Coastal Plain aquifer system.

There are 13 water level monitoring wells in the Sand and gravel aquifers of northern New Jersey. See Figure 6 below. One well mapped outside the principal aquifer falls within New Jersey's mapped sand and gravel aquifers. This is a result of the finer mapping scale used by New Jersey. All of the wells listed are trend wells. The group of wells located to the southeast (underlain by the Early Mesozoic Basin aquifer) was originally installed to deal with water availability concerns as a result of large and sometimes conflicting potable water withdrawals in the aquifer. During peak summer pumping some of the sand and gravel aquifers that are locally confined become unconfined when water levels drop below the confining unit. In most years recharge is sufficient to revert to confined conditions during the late fall and early winter months. Most wells have recovered to within 25 feet of their background elevations through the active management of the ground-water diversions by the Department of Environmental Protection. However one well is still classified as targeted, the remaining 12 are unstressed.

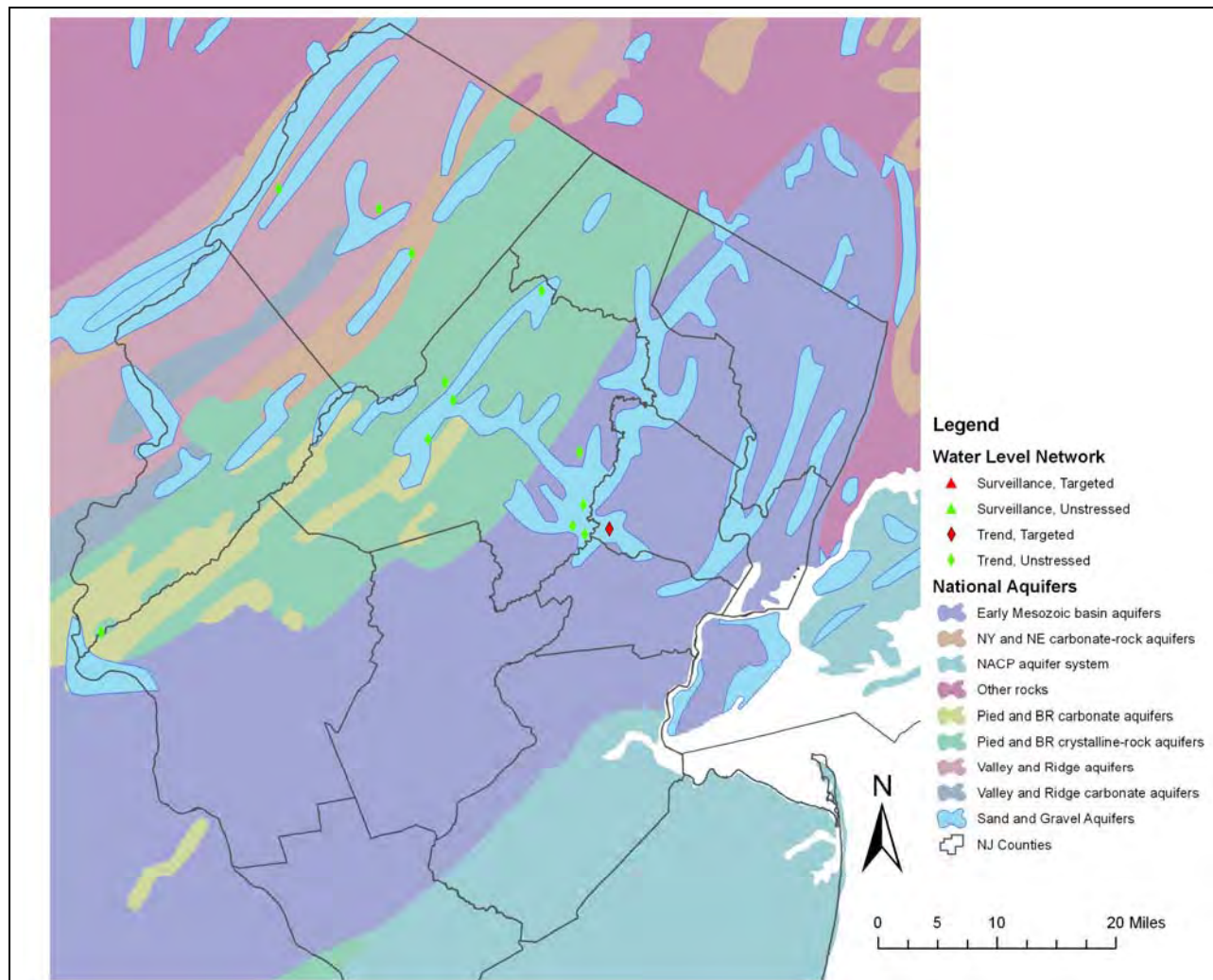


Figure 6. Map showing location of Sand and gravel aquifers and New Jersey’s ground-water level monitoring network.

### *Early Mesozoic basin aquifers*

The Early Mesozoic basin aquifers formed in rift valleys during the early stages of the opening of the Atlantic Ocean. The rift valleys were filled with eroded sediment from adjacent uplands and over time the sediments were compacted and cemented to form the conglomerates, sandstones, siltstones, and shales found today. These sedimentary rocks are Triassic and early Jurassic in age and have been tilted, folded and cut by several fault systems. The sedimentary rocks are interlayered with basalt flows and intruded by diabase dikes and sills. Some other minor formations are also included in this aquifer system.

Due to compaction and cementation, the pores in most of these strata are now reduced in size and poorly interconnected. Ground water moves primarily along joints, fractures, and bedding planes. The water-bearing fractures and bedding planes in each “layer-caked” aquifer are more or less continuous, but the hydraulic connection across the confining units between individual aquifers is poor and variable. Most of the water movement is parallel to the strike of the beds,



however jointing has also been found to control ground-water flow. The diabase and basalt that intrude the sedimentary rocks have very low primary porosity, but areas immediately adjacent to them can be very permeable.

There are 12 water level monitoring wells in the Early Mesozoic Basin aquifer of New Jersey. See Figure 7. All of the wells are trend wells and classified as unstressed.

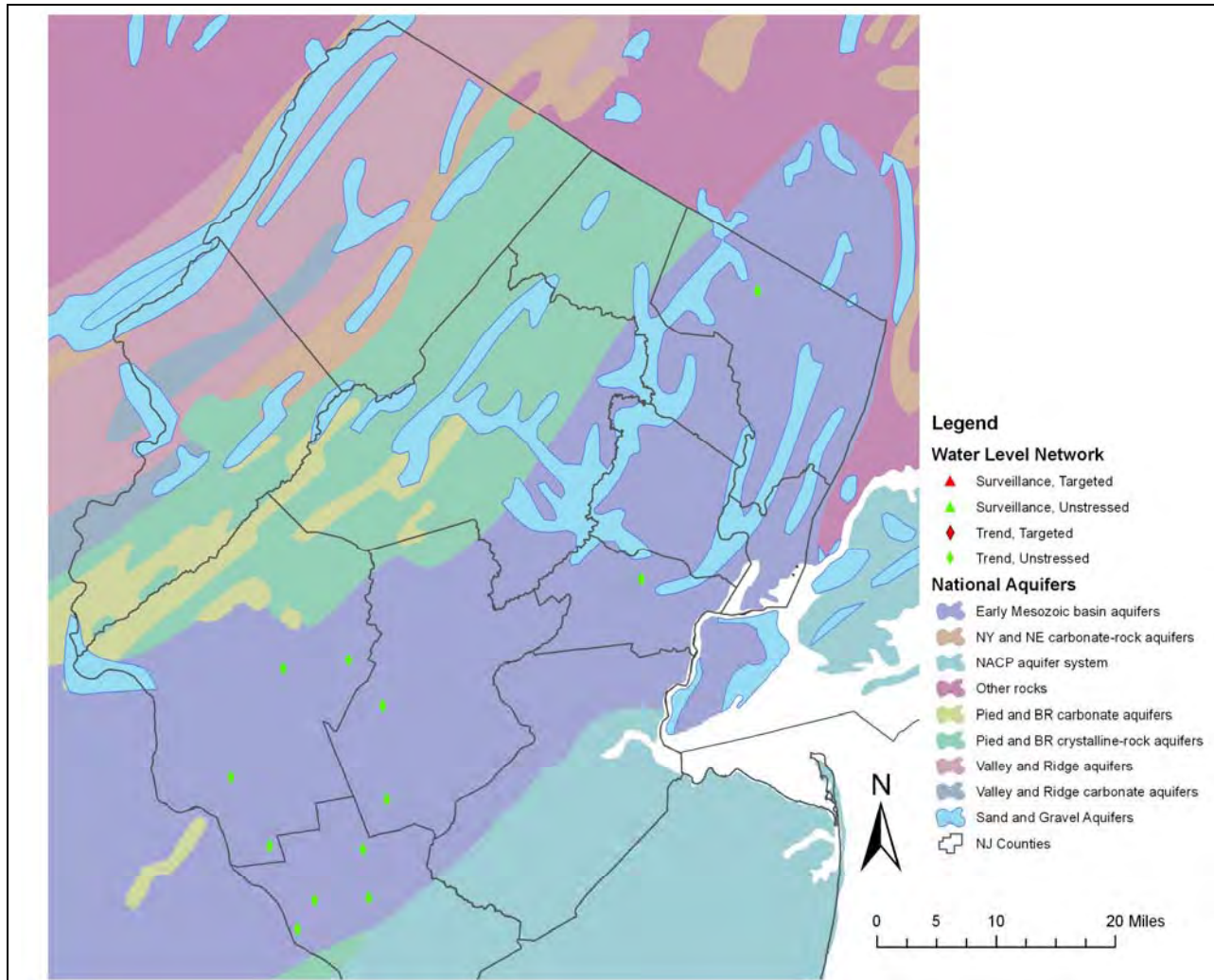


Figure 7. Map showing location of Early Mesozoic Basin Aquifers and New Jersey’s ground-water level monitoring network.

*Piedmont and Blue Ridge crystalline-rock aquifers and Piedmont and Blue Ridge carbonate-rock aquifers*

These two principal aquifers are located primarily within the Blue Ridge Province, or Highlands Province as it is known in New Jersey. The Piedmont and Blue Ridge crystalline-rock aquifers are made up of highly metamorphosed igneous and sedimentary rocks (granite, gneiss, and smaller amounts of marble) of Middle Proterozoic age. There are also northeast-southwest trending bands of Paleozoic sedimentary rocks equivalent to the Valley and Ridge Province

rocks which make up the Piedmont and Blue Ridge carbonate rock aquifers located in valleys within the NJ Highlands Province. In most of these metamorphic and igneous rocks, joints and fractures are the only openings that store and transmit water. The majority of these joints and fractures are found in the near surface portion of the formations. The main body of rock between the joints and fractures is almost impermeable. Ground-water movement is generally along short flow paths from upland recharge areas to the nearest stream or other discharge point. The carbonate rocks of the Piedmont and the Blue Ridge Provinces have virtually no primary permeability or porosity, and water in these rocks moves through secondary openings, such as bedding planes, joints, faults, and other partings, within the rock that have been enlarged by dissolution. In rocks that have a large content of sand, clay, or other non-carbonate minerals, dissolution is inhibited and enlargement of openings might not be extensive.

There are 2 water level monitoring wells in the Piedmont and Blue Ridge crystalline-rock aquifers and Piedmont and Blue Ridge carbonate-rock aquifers, one in each aquifer. See Figure 8. Both are classified as trend and unstressed. Similar to the early Mesozoic basin aquifers hydrogeologic impacts are limited in spatial extent to interconnected nearby fractures or other secondary porosity features.

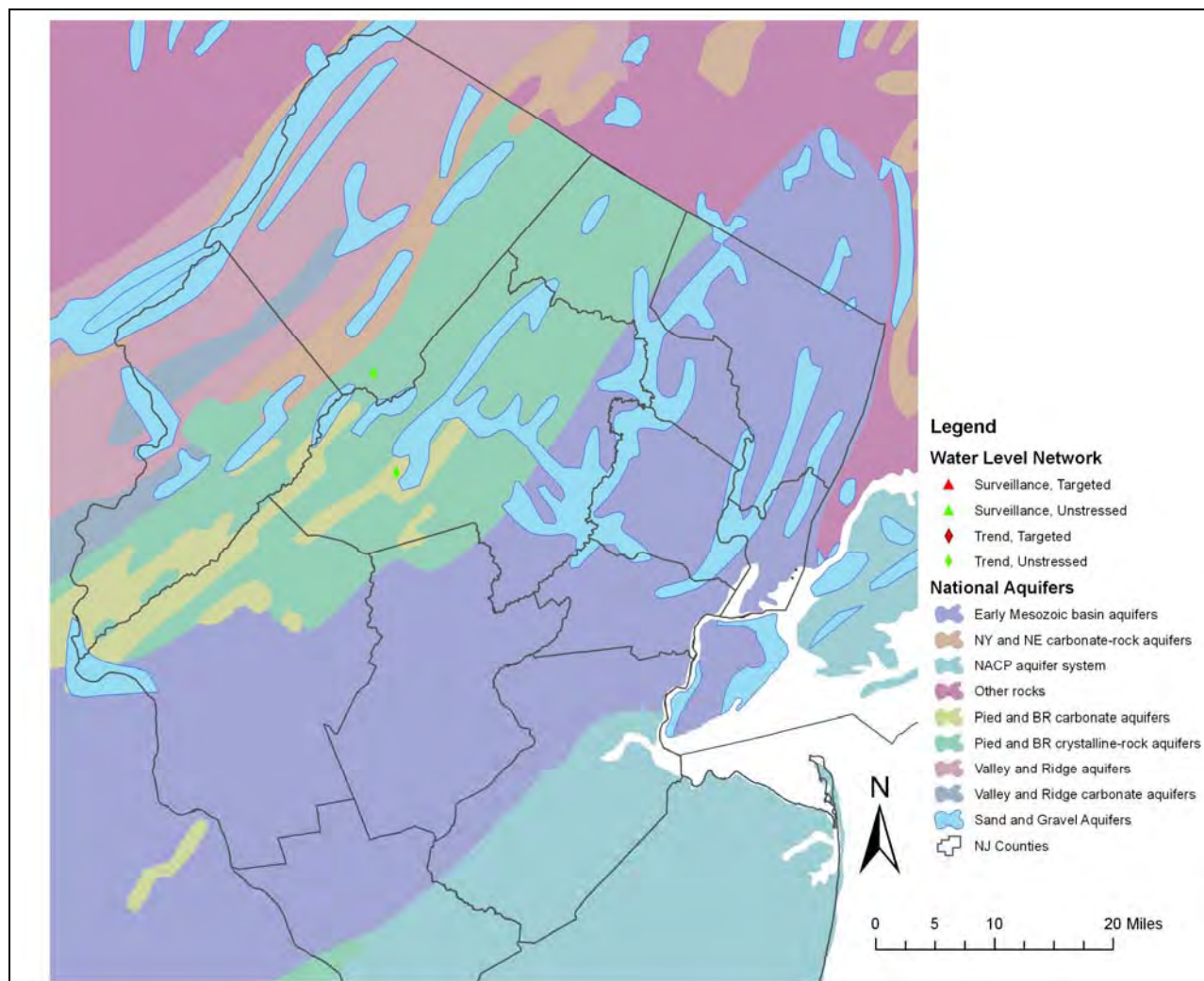


Figure 8. Map showing location of Piedmont and Blue Ridge crystalline-rock aquifers and Piedmont and Blue Ridge carbonate-rock aquifers and New Jersey’s ground-water level monitoring network.

*Valley and Ridge aquifers, Valley and Ridge Carbonate Rock aquifers, and New York and New England carbonate-rock aquifers*

Rocks within the New Jersey Valley and Ridge Province are comprised of the Valley and Ridge, Valley and Ridge Carbonate Rock, and the New York and New England carbonate-rock principal aquifers. These rocks consist of folded and faulted Paleozoic sedimentary rocks of Cambrian to Middle Devonian age and minor amounts of early Silurian age igneous rocks. Rocks are primarily sandstone, shale, and limestone. Carbonate rocks make up the primary aquifers, but availability varies by unit across the region depending on degree of fracturing and dissolution. Although the water-yielding character of the carbonate rocks depends on the degree of fracturing and development of solution cavities in the rock, the limestone formations generally yield moderate to large volumes of water. Sandstone formations also can yield large quantities of water to wells where the sandstone is fractured. Locally, fractured shale beds form productive



aquifers. In the Valley and Ridge aquifers, water moves mostly along fractures and bedding planes in all rock types and in solution openings in the carbonate rocks. A ground-water flow tends to be shallow except in highly dissolved carbonate units.

There are 4 water level monitoring wells in this group of principal aquifers; 2 in the Valley and Ridge, 2 in the Valley and Ridge carbonate-rock aquifers, and none in the New York and New England carbonate-rock aquifers. All are trend wells and unstressed. See Figure 9.

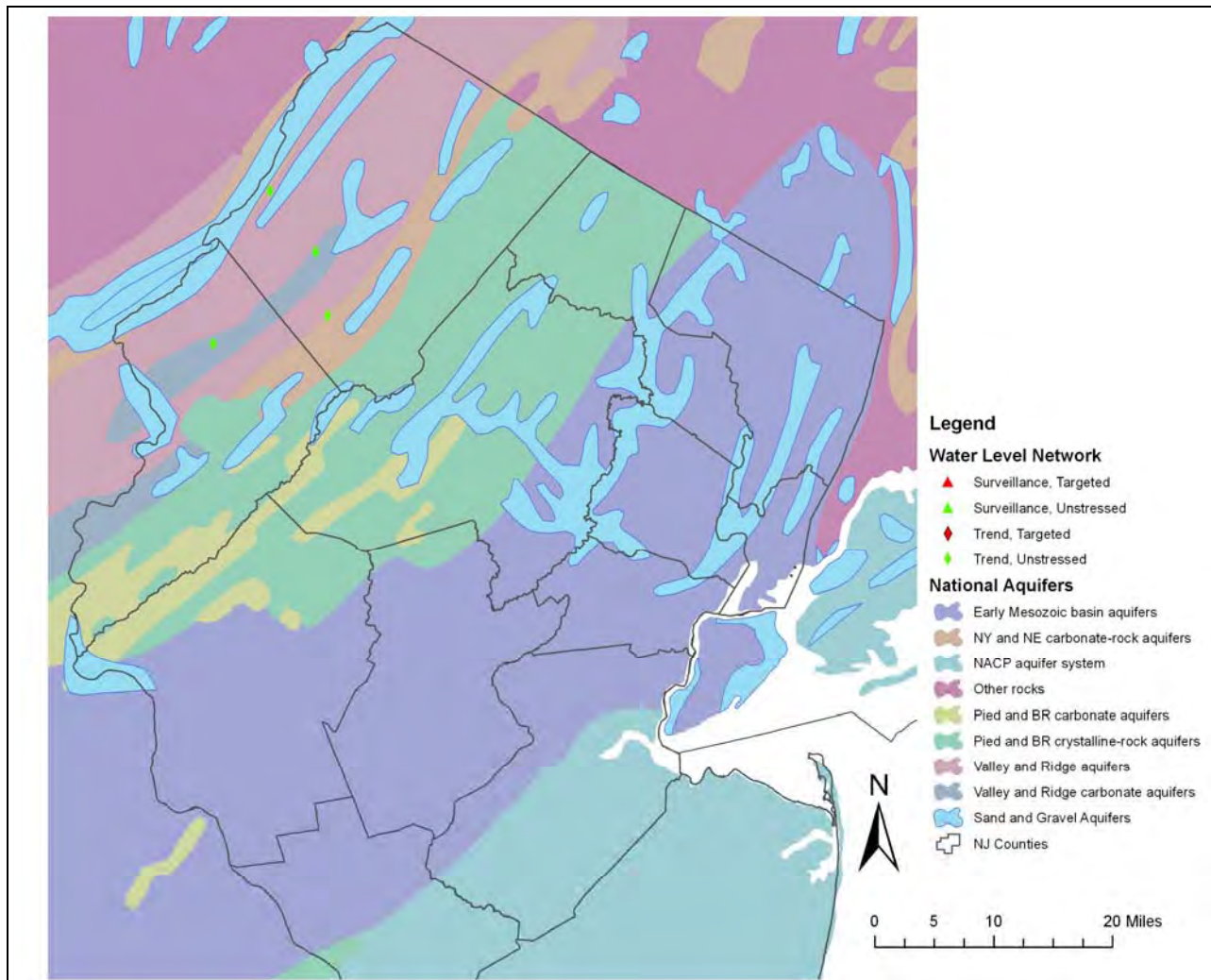


Figure 9. Map showing location of Valley and Ridge aquifers, Valley and Ridge Carbonate Rock aquifers, and New York and New England carbonate-rock aquifers and New Jersey’s ground-water level monitoring network.

*Northern Atlantic Coastal Plain aquifer system*

The Ground Water Atlas of the United States divides the Northern Atlantic Coastal Plain aquifer system into six major aquifers in sedimentary deposits that range in age from Early Cretaceous to Holocene. In New Jersey, the Coastal Plain is underlain by a wedge-shaped seaward-dipping mass of semi-consolidated to unconsolidated sediments that thickens toward the ocean and rests

on a surface of crystalline rock. The thickness of the sediments in Cape May County, New Jersey is more than 6,500 feet. The sediments consist of lenses and layers of clay, silt, and sand. The more permeable units compose aquifers of varying extent; some are traceable over long distances, whereas others are local. The aquifers are separated by confining units of clay, silt, and silty or clayey sand. Although water moves more readily through the aquifers than through the confining units, water can leak through the confining units, especially where they are thin or where they contain sand; the aquifers are all therefore hydraulically interconnected to some degree.

The sediments that compose the Northern Atlantic Coastal Plain aquifer system were deposited in non-marine, marginal marine, and marine environments. Interbedding of fine- and coarse-grained Coastal Plain sediments is complex because of shifting deltaic and alluvial deposition sites and because of repeated transgressions and regressions of the sea. Sediment types and textures, accordingly, can change greatly within short horizontal or vertical distances. Bodies of sand or gravel can change facies laterally and become clayey or silty and, thus, less permeable. Therefore, many local aquifers can be identified, but these local aquifers can be grouped on the basis of similar hydrologic characteristics and treated as regional aquifers.

Aquifer naming conventions vary significantly in the Northern Atlantic Coastal Plain aquifer system. Nationally six major aquifers separated by four regional confining units are defined. New Jersey defines nine aquifers in the coastal plain; the Kirkwood-Cohansey aquifer system, the Atlantic City 800-foot sand aquifer, the Piney Point aquifer, the Vincentown aquifer, the Wenonah-Mount Laurel aquifer, the Englishtown aquifer, and the Upper, Middle, and Lower Potomac-Raritan-Magothy aquifers. All but the Kirkwood-Cohansey are confined over much of their extent. Some of these aquifers can be traced across state lines while others are difficult to trace within New Jersey. Refer to Table 3 for a correlation between New Jersey, regional and principal aquifer names. Trapp 1992 defined a northern Atlantic Coastal Plain that New Jersey believes accurately relates local and Northern Atlantic Coastal Plain aquifers much more appropriately than the principal aquifer definition does.

The chloride water-quality ground-water monitoring wells are included on the figures since they are located in these aquifers and are closely linked to water levels and water quantity. Specifics of the chloride network are discussed in the chloride water-quality network section of this report.

<b>System</b>	<b>Series</b>	<b>Major Aquifer</b>	<b>NACP aquifer system from Trapp</b>	<b>New Jersey Aquifer Name</b>		
Quaternary	Holocene	Surficial	Surficial	Holly Beach		
Neogene	Pleistocene			Estuarine clay cu		
				Estuarine sand aquifer		
	Pliocene			confining unit		
	Miocene			Chesapeake	Upper Chesapeake	Kirkwood-Cohansey aquifer system
				confining unit		
Lower Chesapeake	AC 800-ft sands (w/ Rio Grande)					
confining unit						
Paleogene	Oligocene	Castle Hayne-Aquia	Castle Hayne- Piney Point	Piney Point		
	Eocene		confining unit			
	Paleocene		Beaufort-Aquia	Vincentown		
			confining unit			
Cretaceous		Severn-Magothy	Peedee-Severn	Wenonah-Mount Laurel		
			confining unit			
			Matawan-Black Creek	Englishtown		
			confining unit			
			Potomac 1 / Magothy 2	Upper PRM		
		Peedee-upper Cape Fear (not present in NJ)			confining unit	
		Potomac	Middle Potomac	Middle PRM		
			confining unit			
			Lower Potomac	Lower PRM		

Table 3. Correlation table for the Northern Atlantic Coastal Plain principal and major aquifer systems, the Northern Atlantic Coastal Plain aquifer system of Trapp, 1992, and the New Jersey Coastal Plain aquifer system.

*Kirkwood-Cohansey aquifer system*

The Chesapeake aquifer referred to as the Kirkwood-Cohansey aquifer system in New Jersey is predominantly a water-table aquifer that underlies most of the state south of the Fall Line. This aquifer system is composed of the Kirkwood Formation and the Cohansey Formation and, depending on location, can include overlying deposits of the Beacon Hill Gravel, the Bridgeton Formation, the Cape May Formation, and the Holly Beach Formation. In some regions Cohansey Formation clayey zones create a very leaky upper and lower zone. In its down dip region the Kirkwood Formation near the central and southern coast of New Jersey is overlaid by a diatomaceous clay confining unit. In this report it is treated as a separate aquifer, the Atlantic

City 800-foot sand aquifer. In the peninsular portions of Cape May County the Cohansey formation is overlain by an unnamed clay confining unit, which is overlain by the estuarine sand aquifer, which is confined by the estuarine clay, which is overlain by the Holly Beach formation water-table aquifer.

There are 74 water level network wells in the Kirkwood-Cohansey aquifer system. Thirty-five are trend wells and 39 and surveillance wells. One of the trend wells is targeted. See Figure 10.

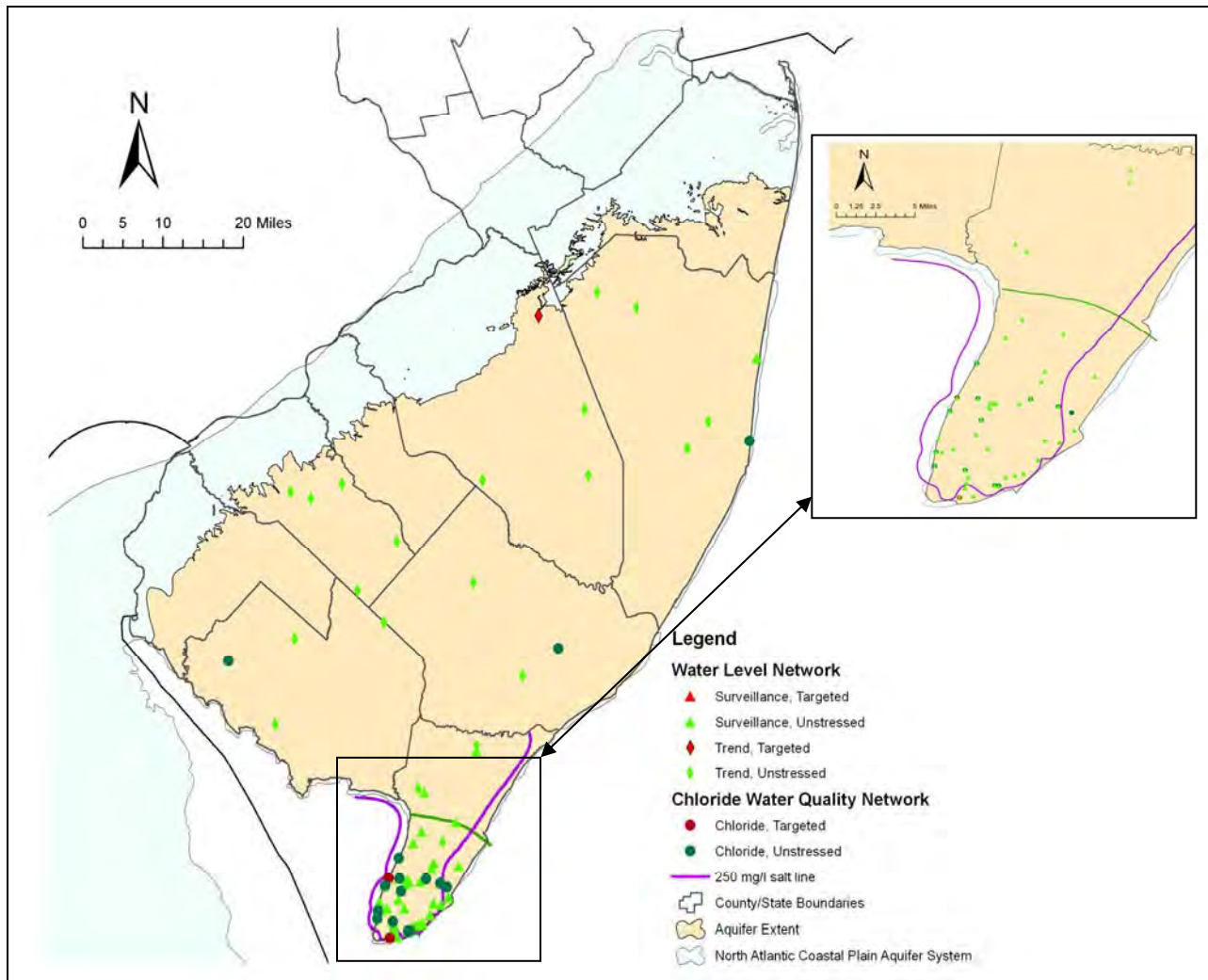


Figure 10. Map showing the location of the Kirkwood-Cohansey aquifer system and New Jersey's ground-water level and chloride ground-water quality monitoring networks. The blow-out box shows Cape May County where the Cohansey Formation is confined.

### *Atlantic City 800-foot sand aquifer*

Atlantic City 800-foot sand aquifer is a major water-bearing unit that lies within the lower part of the Kirkwood Formation. It is considered part of the principal Chesapeake aquifer and part of the lower Chesapeake aquifer using Trapp's 1992 Northern Atlantic Coastal Plain aquifer system convention. It is a major source of supply for southern New Jersey coastal communities. For this

report, the Rio Grande water-bearing zone is also included in this aquifer. The zone is located in the middle of the Kirkwood confining unit and can be an important source of water for Cape May County.

There are 106 wells in the Atlantic City 800-ft sand aquifer. Four of the trend wells are targeted and 5 are unstressed. Seventy-six of the surveillance wells are targeted and 21 are unstressed. See figure 11.

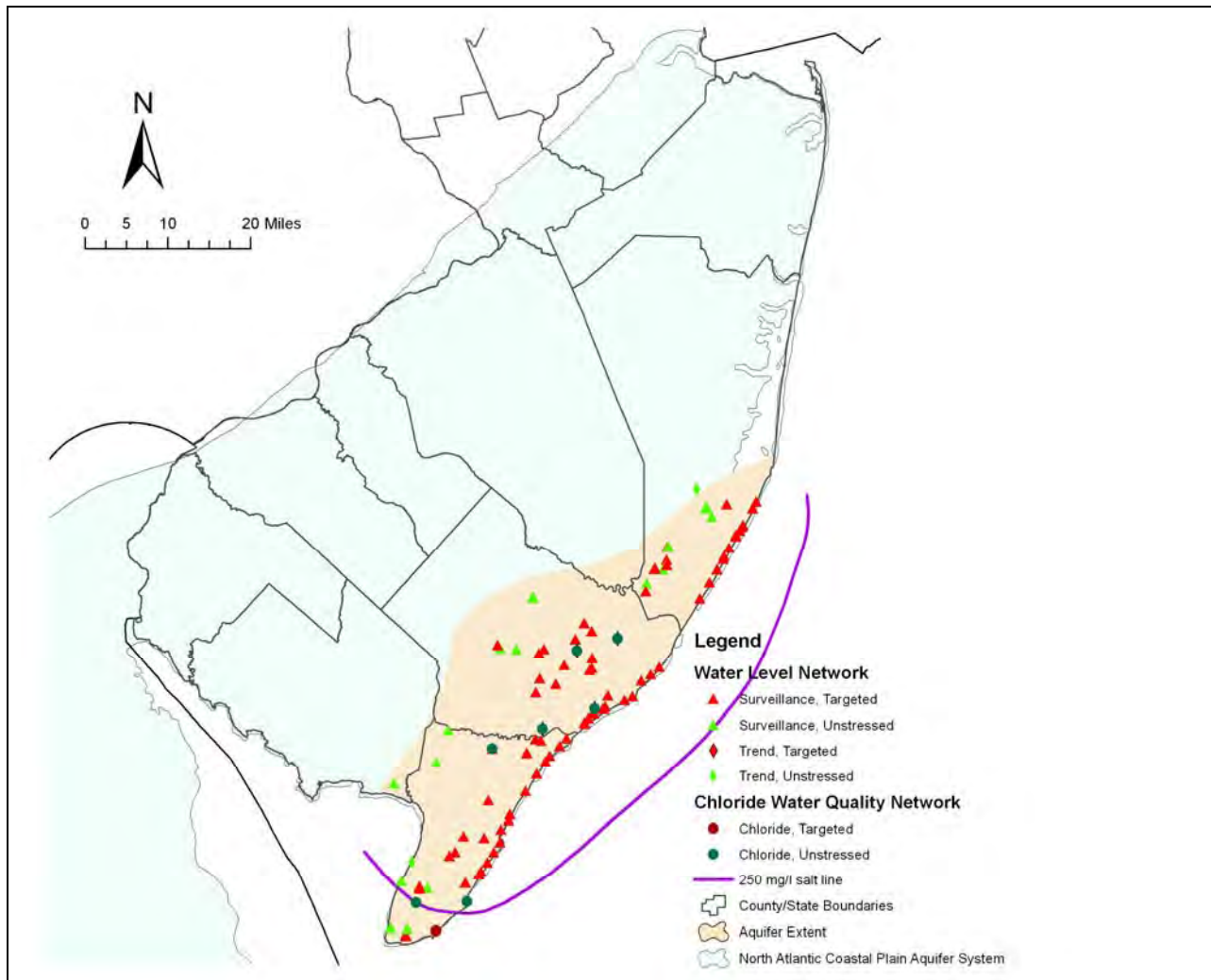


Figure 11. Map showing the location of the Atlantic City 800-foot sand aquifer, which includes the Rio-Grande water bearing zone, and New Jersey’s ground-water level and chloride ground-water quality monitoring networks.

### *Piney Point aquifer*

New Jersey’s Piney Point aquifer is part of the major aquifer Castle Hayne-Aquia aquifer. The Castle Hayne-Aquia aquifer also includes the underlying Vincentown aquifer which is distinctly different in New Jersey. Trapp, similar to New Jersey defines two separate aquifers, the Castle Hayne-Piney Point and the Beaufort-Aquia aquifer. The Piney Point aquifer in New Jersey does



not crop out, but can be traced from Delaware Bay northeastward to Ocean County. The aquifer is comprised of the Piney Point, Shark River, and Manasquan Formations. There is generally a northern section and southern section that are hydraulically distinct from each other.

There are 52 wells in the Piney Point aquifer. Three of the trend wells are targeted and one is unstressed. The remaining 48 are surveillance wells; with 29 targeted and 19 unstressed. See Figure 12.

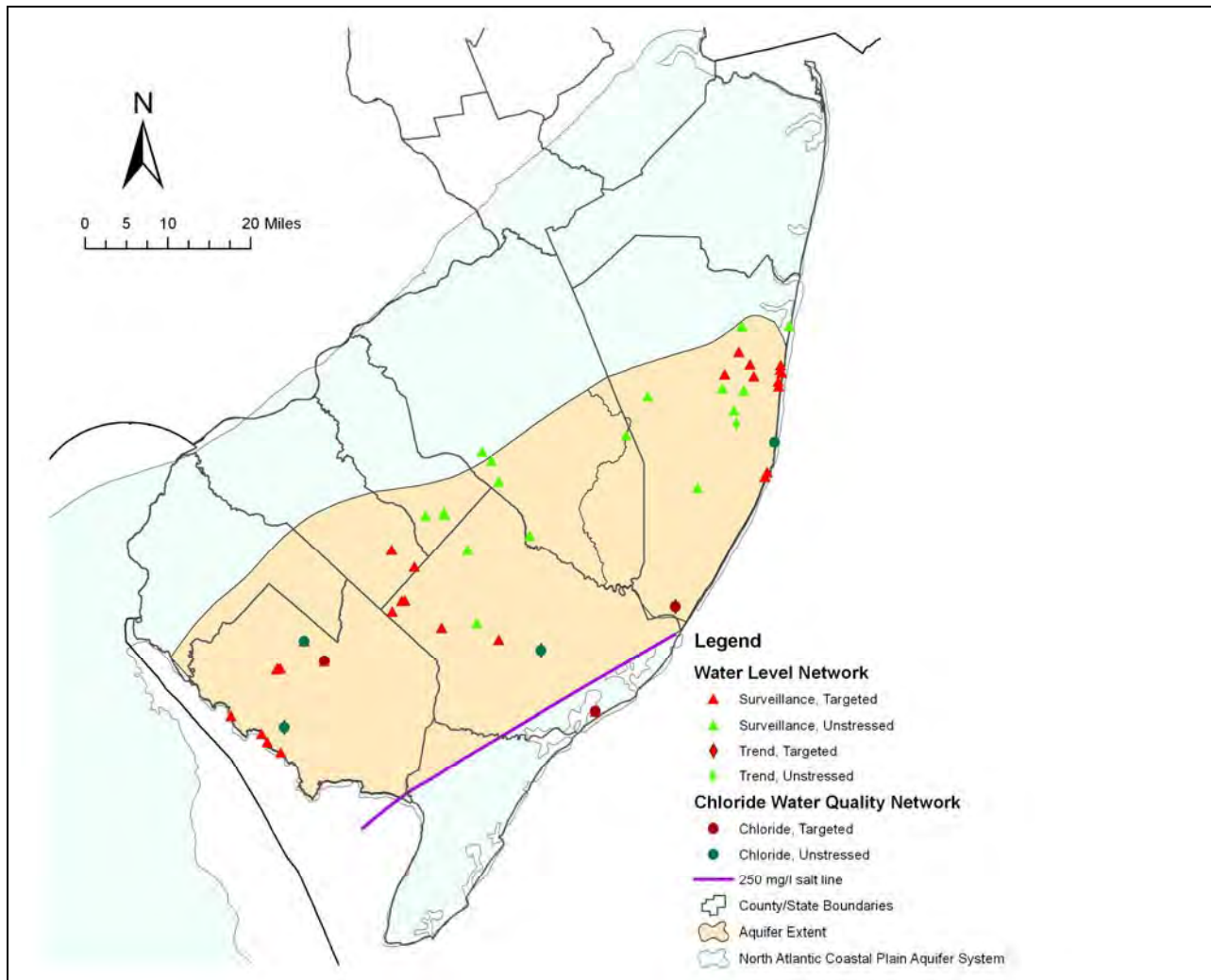


Figure 12. Map showing the location of the Piney Point aquifer and New Jersey’s ground-water level and chloride ground-water quality monitoring networks.

### *Vincentown Aquifer*

The Vincentown Formation is primarily a confining unit, but at its outcrop and for 8 to 10 miles down dip it is considered an aquifer. Thickness varies from 20 to 80 feet and is most productive in Monmouth and Salem Counties. Similar to the Piney Point aquifer, the principal aquifer lumps these two New Jersey aquifers into the Castle Hayne-Aquia aquifer. Trapp’s nomenclature, the Beaufort-Aquia aquifer, is preferred over the principal aquifer one.

There are 25 wells in the Vincenttown aquifer; 2 are trend wells, 23 are surveillance, and all are unstressed. See Figure 13.

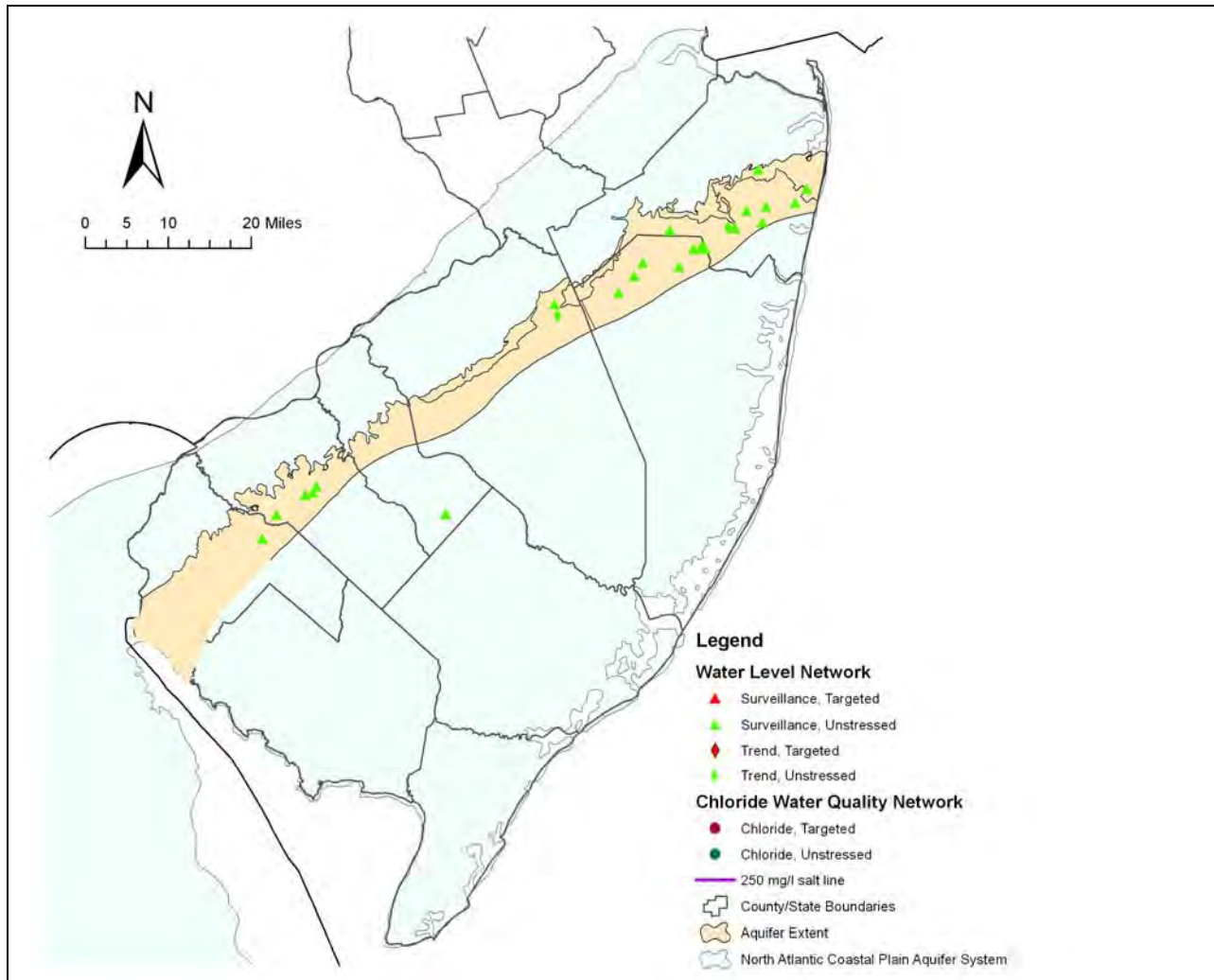


Figure 13. Map showing the location of the Vincenttown aquifer and New Jersey’s ground-water level monitoring network. No chloride monitoring wells are included in this network.

### *Wenonah-Mount Laurel aquifer*

The Wenonah-Mount Laurel aquifer is composed of the coarse grained fraction of the Wenonah Formation and the Mount Laurel Sand, both of Late Cretaceous age. This aquifer is part of the major Severn-Magothy aquifer and Peedee-Severn aquifer of Trapp. Heavy utilization occurs in Monmouth and northern Ocean Counties. Moving to the southwest, the aquifer is most productive within 10-15 miles out the outcrop area. Salt-water (250 mg/L isochlor) is observed in Cumberland County and towards Cape May County.

There are 130 wells in the Wenonah-Mount Laurel aquifer. Eleven of the wells are trend wells; 6 wells targeted and 5 wells are unstressed. There are 119 surveillance wells; 68 are targeted and 51 are unstressed. See Figure 14.

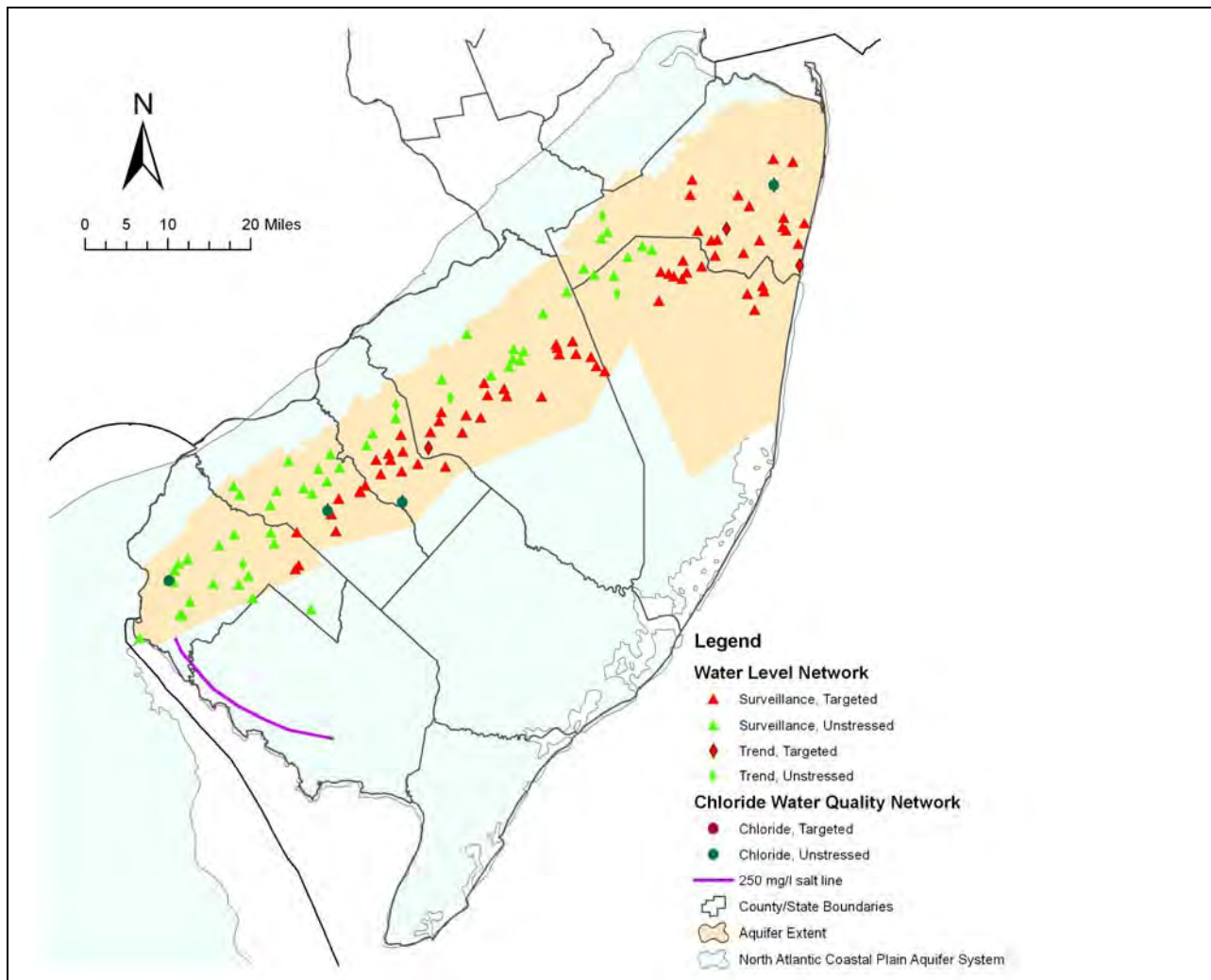


Figure 14. Map showing the location of the Wenonah-Mt Laurel aquifer and New Jersey’s ground-water level and chloride ground-water quality monitoring networks.

### *Englishtown aquifer*

The Englishtown aquifer is primarily a fine to medium grained sand of Late Cretaceous age (where it serves as an aquifer). This aquifer is part of the major Severn-Magothy aquifer and Black Creek-Matawan aquifer of Trapp. It is heavily pumped in Monmouth and northern Ocean Counties. In shallow areas one aquifer is observed, but in deeper downdip sections three lithofacies have been identified. To the southeast the aquifer thins in outcrop and in the subsurface where it becomes a relatively minor source of water.

There are 87 wells in the Englishtown aquifer network. Eleven of the wells are trend wells; eight are targeted and 3 are unstressed. There are 76 surveillance wells; 55 are targeted and 12 are



unstressed. See Figure 15. New Jersey has designated portions of the Englishtown as Critical Area 1. This is apparent as the large number of targeted wells observed in the northeastern portions of the aquifer.

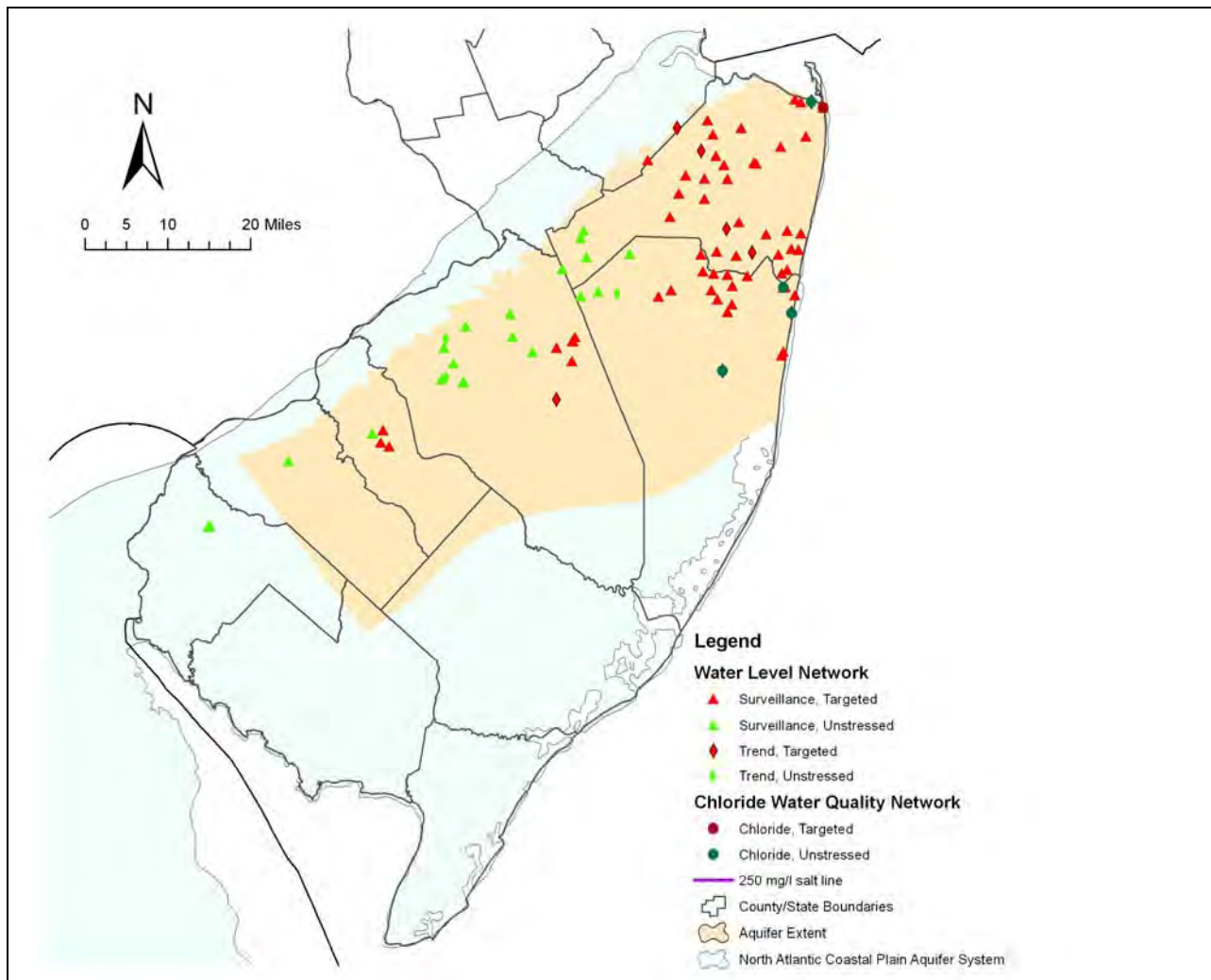


Figure 15. Map showing the location of the Englishtown aquifer and New Jersey’s ground-water level and chloride ground-water quality monitoring networks.

*Potomac-Raritan-Magothy aquifer system*

The Potomac Formation is the lowermost Cretaceous deposit in New Jersey. It is an interbedded fluvial and deltaic sand and clay laid down in marginal marine settings during early stages in the opening of the Atlantic Ocean. It overlies a basement of Paleozoic metamorphic rocks. The Raritan Formation is also a marginal-marine sand and clay found primarily in the Raritan embayment, located to the northeast of Trenton. The Magothy Formation unconformably overlies both the Raritan and Potomac formations and is also a marginal-marine sand and interbedded fine sand and silt.

The Cretaceous age sediments of the Potomac, Raritan, and Magothy Formations are generally combined hydrostratigraphically because of their similar lithology. In New Jersey, the Potomac-Raritan-Magothy aquifer systems as currently defined consists of an upper, middle, lower aquifer. The upper aquifer is generally sand of the Magothy Formation, which can be traced statewide, but the lower and middle aquifers are various sands in the Raritan and Potomac formations. These sands may have local or subregional continuity, but cannot be traced statewide. The spatial variability particularly in the Potomac and Raritan Formations creates numerous hydrostratigraphic correlation problems.

*Upper Potomac-Raritan-Magothy aquifer*

There are 214 water-level monitoring wells in this aquifer. There are 11 trend wells of which 8 are targeted and 3 which are unstressed. Of the 203 surveillance wells 167 are targeted and 36 are unstressed. See Figure 16. New Jersey has designated two regions of this aquifer as a critical area. Critical Area 1 and the high concentration of targeted wells are located to the northeast and Critical Area 2 and its high concentration of targeted wells are located to the southwest.

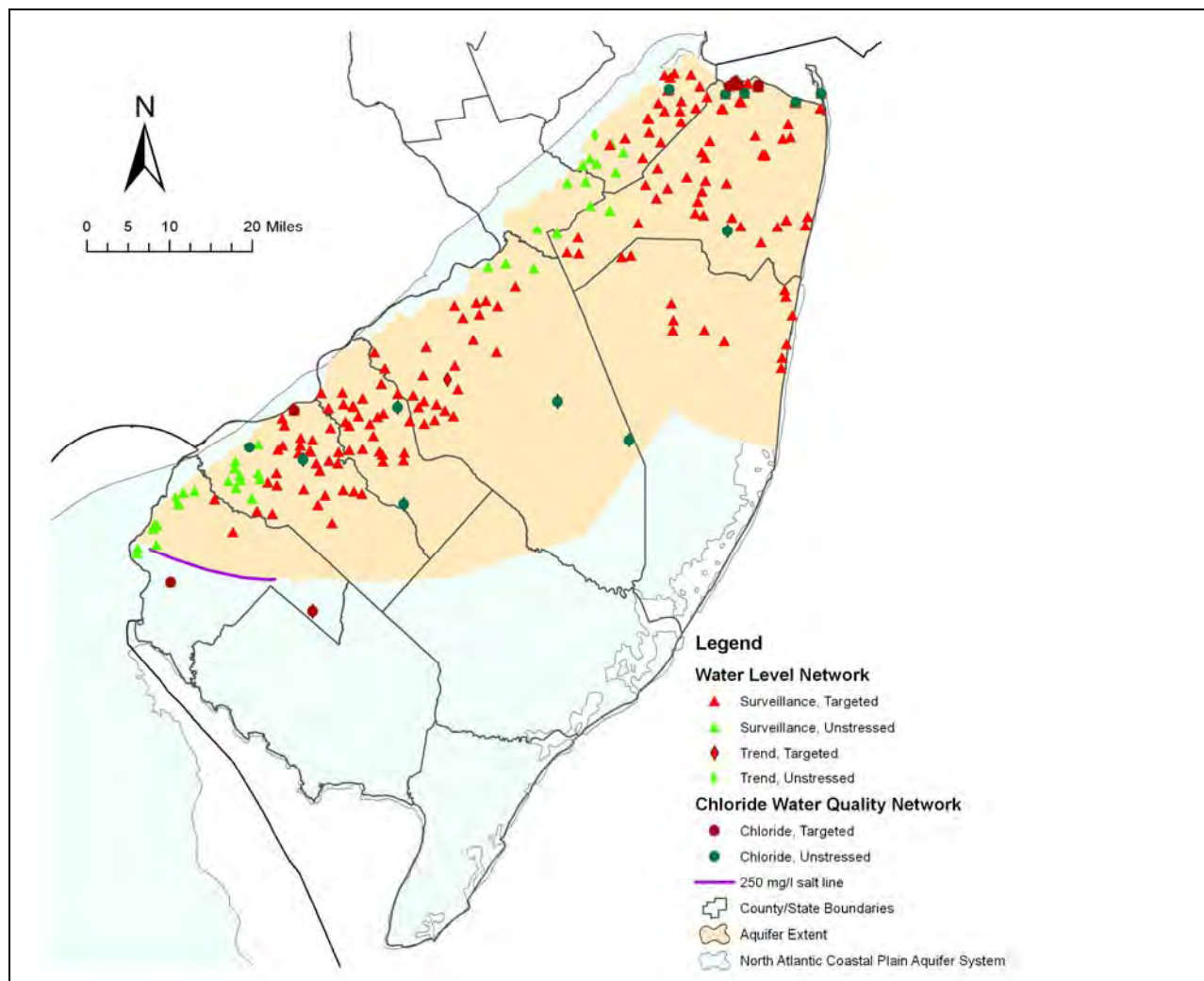


Figure 16. Map showing the location of the Upper Potomac-Raritan-Magothy aquifer and New Jersey’s ground-water level and chloride ground-water quality monitoring networks.

*Middle Potomac-Raritan-Magothy aquifer*

There are 171 water-level monitoring wells in this aquifer. There are 17 trend wells of which 13 are targeted and 4 which are unstressed. Of the 154 surveillance wells 110 are targeted and 44 are unstressed. See Figure 17. New Jersey has designated two regions of this aquifer as a critical area. Critical Area 1 and the high concentration of targeted wells is located to the northeast and Critical Area 2 and its high concentration of targeted wells is located to the southwest.

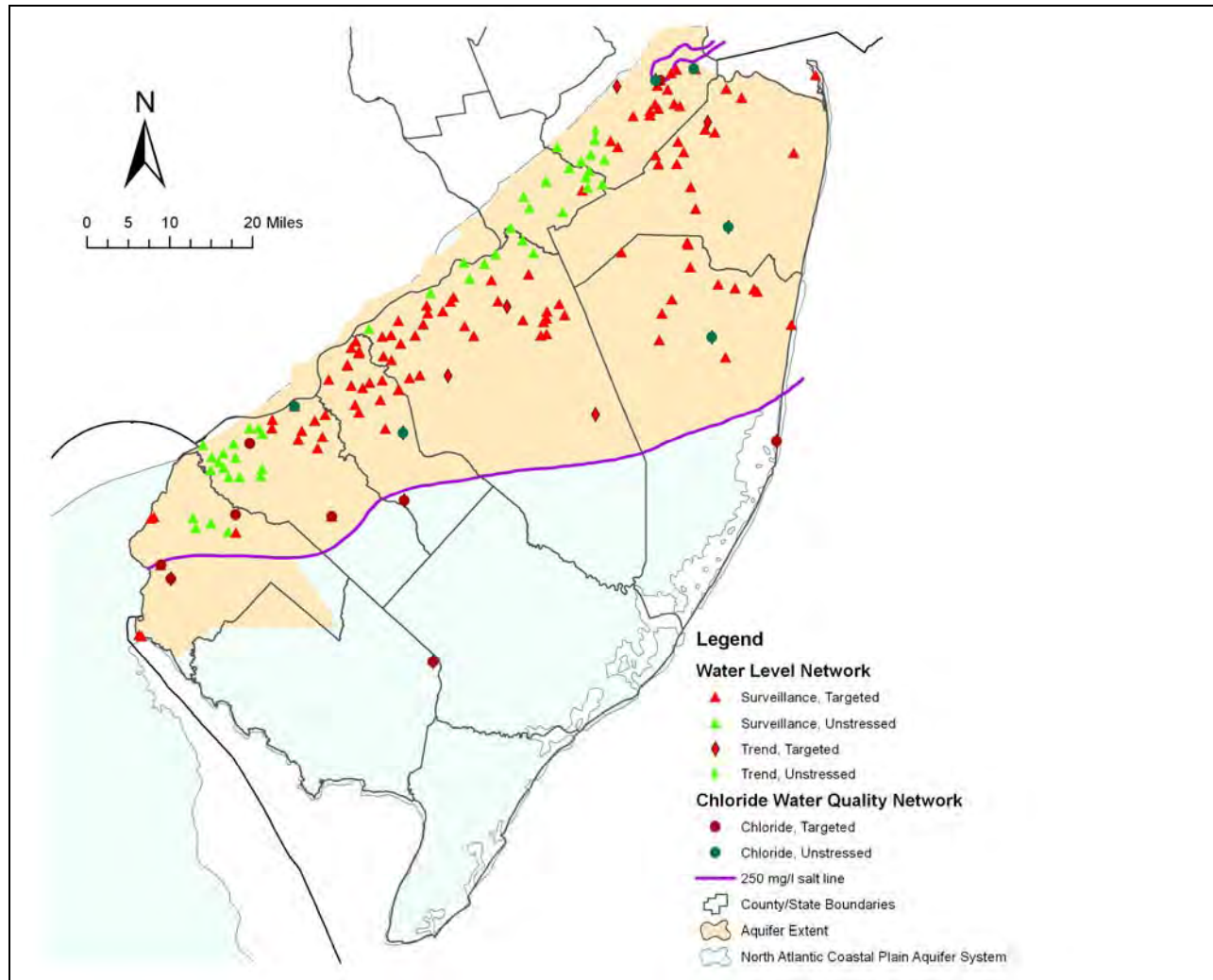


Figure 17. Map showing the location of the Middle Potomac-Raritan-Magothy aquifer and New Jersey’s ground-water level and chloride ground-water quality monitoring networks. Map includes wells identified as undifferentiated PRM.

*Lower Potomac-Raritan-Magothy aquifer*

There are 92 water-level monitoring wells in this aquifer. There are 7 trend wells of which 6 are targeted and 1 which is unstressed. Of the 85 surveillance wells 69 are targeted and 16 are unstressed. See Figure 18. Critical Area 2 contains most of the targeted wells located in the northern portion of this aquifer.

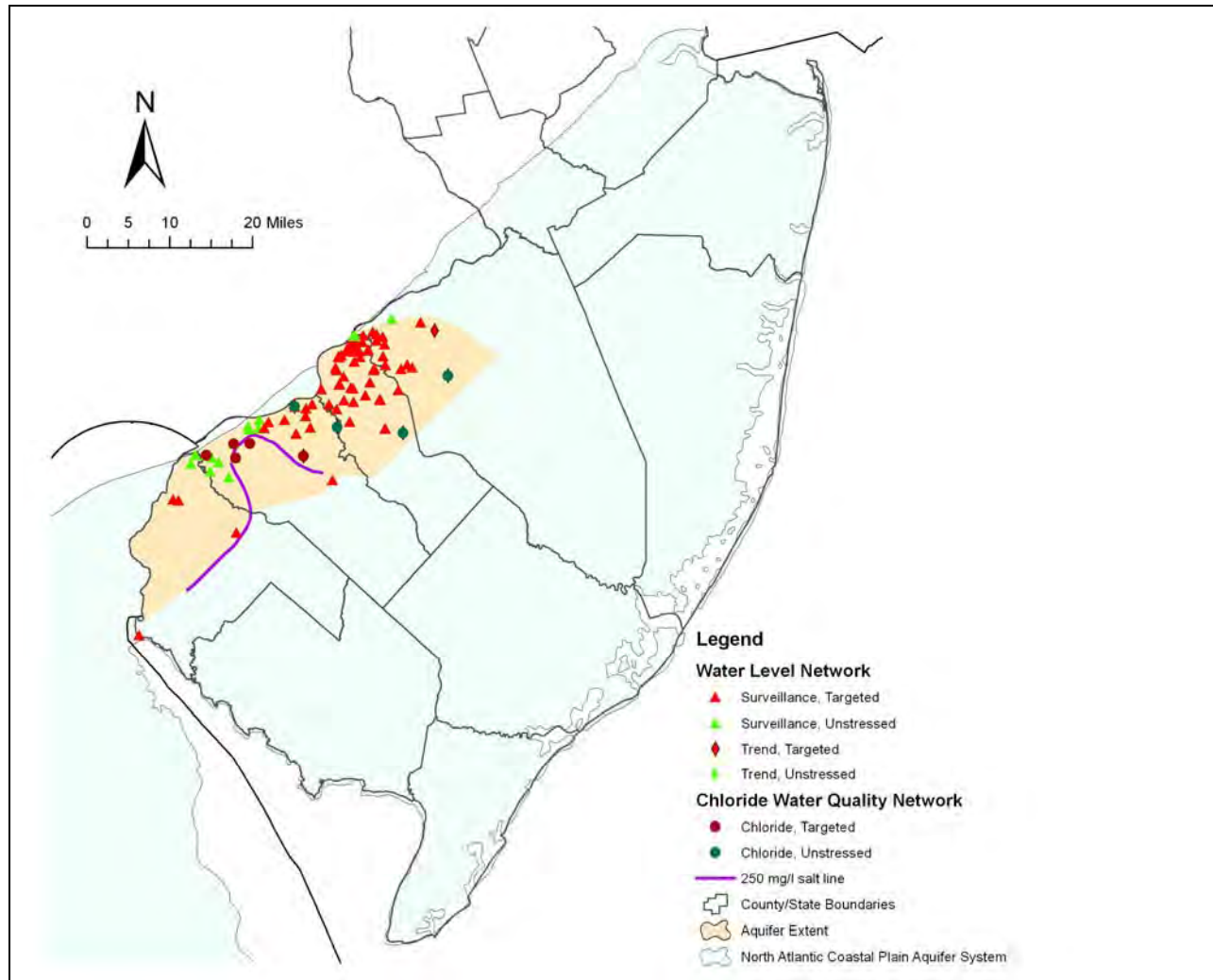


Figure 18. Map showing the location of the Lower Potomac-Raritan-Magothy aquifer and New Jersey’s ground-water level and chloride ground-water quality monitoring networks.

### Gap Analysis

The only spatial gaps observed in the trend network for New Jersey are in the Early Mesozoic Basins aquifer and the New York and New England carbonate-rock aquifers. There is a need to add 2 wells to this Early Mesozoic Basin aquifer to cover areas with ground-water withdrawals where there is no current monitoring. The New York and New England carbonate-rock aquifer does not have any NGWMN wells located in it. At least one well should be added to this aquifer. Except for these two issues, the number of wells in the Trend network is deemed satisfactory to address National scale issues throughout the state. The USGS and NJDEP are considering expanding the continuous water-level data collected to address more local issues, but the data currently available is adequate to address Regional and National scale issues. The surveillance network also contains adequate coverage for the 9 aquifers at the regional aquifer scale. The USGS-NJ has identified potential gaps in the Synoptic water-level network on which the surveillance network is based, but these are not considered gaps at the Regional and National scale.

The major gap identified in the water-level monitoring network for New Jersey is in the Surveillance network in the Northern Atlantic Coastal Plain. The 844 wells in this network are measured every 5-years as part of our cooperative Coastal Plain Synoptic water-level network. However, this 5-year frequency of measurement does not meet the requirements of the NGWMN Framework document for wells in a surveillance network. Using Table 4.5.2 in the Framework document, the frequency of measurement required for this network would be at least once annually and preferably should be up to twelve times annually. In order to minimally meet this requirement New Jersey would need to measure the 844 wells once every year. The costs to upgrade the measurement frequency to meet this requirement will be discussed in the Cost Estimates section of the report. These costs will be estimated based on the costs to plan the data collection, collect the data, review the data, and enter the data into the NWIS database. The costs associated with the synoptic network to produce potentiometric surface maps of the aquifers and to prepare a summary report will not be included in the analysis and would not be done as part of an upgraded NGWMN project.

## ***Water-Quality Network***

New Jersey has two established ground-water quality networks that are included in the NGWMN; an ambient shallow ground-water quality network and a chloride ground-water quality network (primarily in the confined aquifers of the New Jersey Coastal Plain). This report treats these two networks independently due to their different underlying purposes.

### **Ambient Ground Water Quality Network**

The New Jersey Ambient Ground Water Quality Monitoring Network (AGWQMN) is a cooperative surveillance network between the NJGS/NJDEP and the USGS, which provides information about land-use-related nonpoint source contaminant affects on shallow non-confined ground-water quality. The water table is the doorway into the ground-water system and is typically the most vulnerable to contamination. This shallow ground water then recharges deeper aquifers used for potable supplies and provides base flow to local streams and wetlands. The goals of the network are: (1) To assess the water quality status, (2) To assess water quality trends (long-term), (3) To evaluate contaminant transfer relations, and (4) To identify emerging issues.

### **Well Selection**

New Jersey's AGWQMN consists of 150 wells statewide; with 30 network wells sampled per year on a 5 year cycle. This frequency of sampling was decided upon to ensure the network meets the goals set at conception and yet be cost effective. This frequency of sampling has proven effective to date. An example of this is MTBE. The network has shown since the use of MTBE has been discontinued in NJ there has been a decrease in the frequency of detection of the compound in shallow ground water statewide. Because of the sampling frequency and the guidelines set by the Framework document this network will be classified as a surveillance network.



Well sites were located using a stratified-random site selection process as outlined by Scott (1990). Land use designations (undeveloped, agricultural, urban) were determined using 1986 and 1995 land use GIS coverages, 1995 aerial photographs, site visits, and estimations of ground-water flow directions based on the local geologic framework and site-specific topographic controls. Sixty of the wells are located in agricultural land use, another 60 in urban land use, and the remaining 30 in undeveloped land use areas.

The same chemical and physical characteristics are determined for each well water sample and include: field parameters such as pH, specific conductivity, dissolved oxygen, temperature, ground water level and alkalinity; major ions, trace elements, gross-alpha particle activity, volatile organic compounds (VOC), and pesticides. A list of these compounds can be found in Appendix 2. Over the past two years, all pesticide analytes have been dropped from the sampling list for the wells located in undeveloped land use areas (unstressed). This was done due to cuts in funding for the network. To date each well as been sampled twice and the third round of sampling has begun.

Out of the 150 wells in the network, 145 of them have been selected to be part of the NGWMN. The decision to exclude 5 of the wells was based on the fact they are installed in what is termed “other aquifers”, which are local aquifers and not part of a principal aquifer as defined by USGS.

### **Trend and Surveillance Networks**

All 145 of the AGWQMN monitoring wells selected to be part of the NGWMN are designated as surveillance wells due to the small sampling frequency. However, the current sampling frequency does provide the ability for long-term trend analysis.

### **Unstressed and Targeted Subnetworks**

One of the goals of the New Jersey Pilot Study and NGWMN was to assess all 145 water quality network wells, regardless of their land use affiliation, and classify them as “targeted” or “unstressed” as defined by the Framework document. Initially an approach was developed based upon measured water-quality parameters and water-quality standards to determine if a well could be classified as targeted or unstressed. Along the way this approach was deemed to be unworkable and an alternative approach was developed. The initial and alternative approaches are described below.

The initial approach devised by the New Jersey Pilot involved the use of drinking water standards to define targeted and unstressed conditions. Essentially a well would be classified as targeted if that well had a certain number of compounds whose concentrations exceeded (or in some cases was below, e.g. dissolved oxygen) the drinking water standard (either primary or secondary), or a standard set by the network manager.

One of the first problems encountered with this approach was for compounds that did not have drinking water standards or New Jersey ground water standards, but which could only be attributed to anthropogenic activities. To set a standard for these compounds the median concentration was obtained from all the data available for each individual compound from the

AGWQMN database. Then the standard deviation was derived, and the water-quality targeted standard would be set at the median value plus or minus one standard deviation depending on the compound. Unfortunately, this method of setting a standard was not practical for the majority of compounds. The high frequency of non-detects caused the standard deviation to be skewed and unusable. For the few compounds where a standard was able to be set using the described technique, it was observed that this standard did not accurately represent real-world conditions throughout the entire state. For example, a standard was able to be set for dissolved oxygen (DO). However, comparing DO between monitoring wells located in bedrock and those in sand, this standard could not be universally applied in New Jersey. Taking this into account it was decided to only use compounds that have drinking water standards to assess if a well was targeted or unstressed.

The next problem encountered with this initial approach was what to do with compounds where the concentration exceeds the standard set, but was from a naturally occurring source. Examples of these compounds are iron and manganese in the North Atlantic Coastal Plain, and arsenic in the Piedmont Province which are naturally occurring and in numerous cases exceed drinking water standards. To take into account these naturally occurring compounds, the well would only be considered targeted if it had more than one compound that had concentrations that exceed the standard.

Several other problems arose with this approach. They included 1) how to handle a well where the concentration of a compound was 2 or more times greater than the standard set, could only be attributed to anthropogenic activities, and was the only concentration to exceed the standard; 2) how to choose how many compounds must exceed the standard to truly reflect “stressed” ground-water quality. Ultimately, it was decided since the selection of the number of compounds whose concentrations exceeded the standard would have to be picked arbitrarily, and with no clear scientific reasoning this approach would not work.

As a workable alternative to the initial approach described above the following approach was used to classify each AGWGMN well as targeted or unstressed. The approach was based on the fact that the AGWQMN was developed to assess the affects of anthropogenic activities in urban and agricultural land uses and consisted of a subset of undeveloped land use wells to identify background or un-impacted water quality. Essentially, the undeveloped or un-impacted wells would be designated as unstressed since they were installed to determine background or unimpacted water quality. The remaining wells associated with urban and agricultural land uses would be designated as targeted. While not an ideal approach, it proved to be the one that was workable within the constraints of the NJ Pilot Study Project.

### **Principal Aquifers and Associated Ambient Ground Water Quality Monitoring Network**

One hundred and forty-five of the 150 Ambient Ground Water Quality Monitoring Network wells are included in the NGWMN. Table 4 summarizes the number of wells by aquifer and status.



<b>Principal Aquifer</b>	<b>NJ Aquifer</b>	<b>Network Type</b>	<b>Targeted Count</b>	<b>Unstressed Count</b>	<b>Total</b>
Sand and gravel aquifers	same	Surveillance	26	9	35
Early Mesozoic basin aquifers	same	Surveillance	21	1	22
Piedmont and Blue Ridge crystalline-rock aquifers and Piedmont and Blue Ridge carbonate-rock aquifers	same	Surveillance	5	0	5
Valley and Ridge aquifers, Valley and Ridge Carbonate Rock aquifers, and New York and New England carbonate-rock aquifers	same	Surveillance	1	1	2
Northern Atlantic Coastal Plain aquifer system	Kirkwood-Cohansey aquifer system	Surveillance	34	16	50
	Other aquifers	Surveillance	29	2	31
<b>TOTAL</b>			<b>116</b>	<b>29</b>	<b>145</b>

Table 4. Summary of ground-water quality wells by principal aquifer, New Jersey aquifer, network type, and well status.

#### *Sand and Gravel Aquifers*

Thirty five ground water quality surveillance wells from the AGWQMN are installed in unconsolidated sand and gravel aquifers in New Jersey's glaciated region (see Figure 19). Twenty six of these wells are classified as targeted, with the remaining nine classified as unstressed. Some of these wells are installed in the mapped principal aquifer and the rest are included since New Jersey has mapped them at the local scale in a comparable geologic setting even though they are not specifically located in a mapped principal aquifer. The majority of the wells are installed in areas where the glacial sediment has been mapped between 10 and 99 feet deep and some are screened at the contact between the glacial sediments and the bedrock. All the wells are set at the water table and are unconfined.

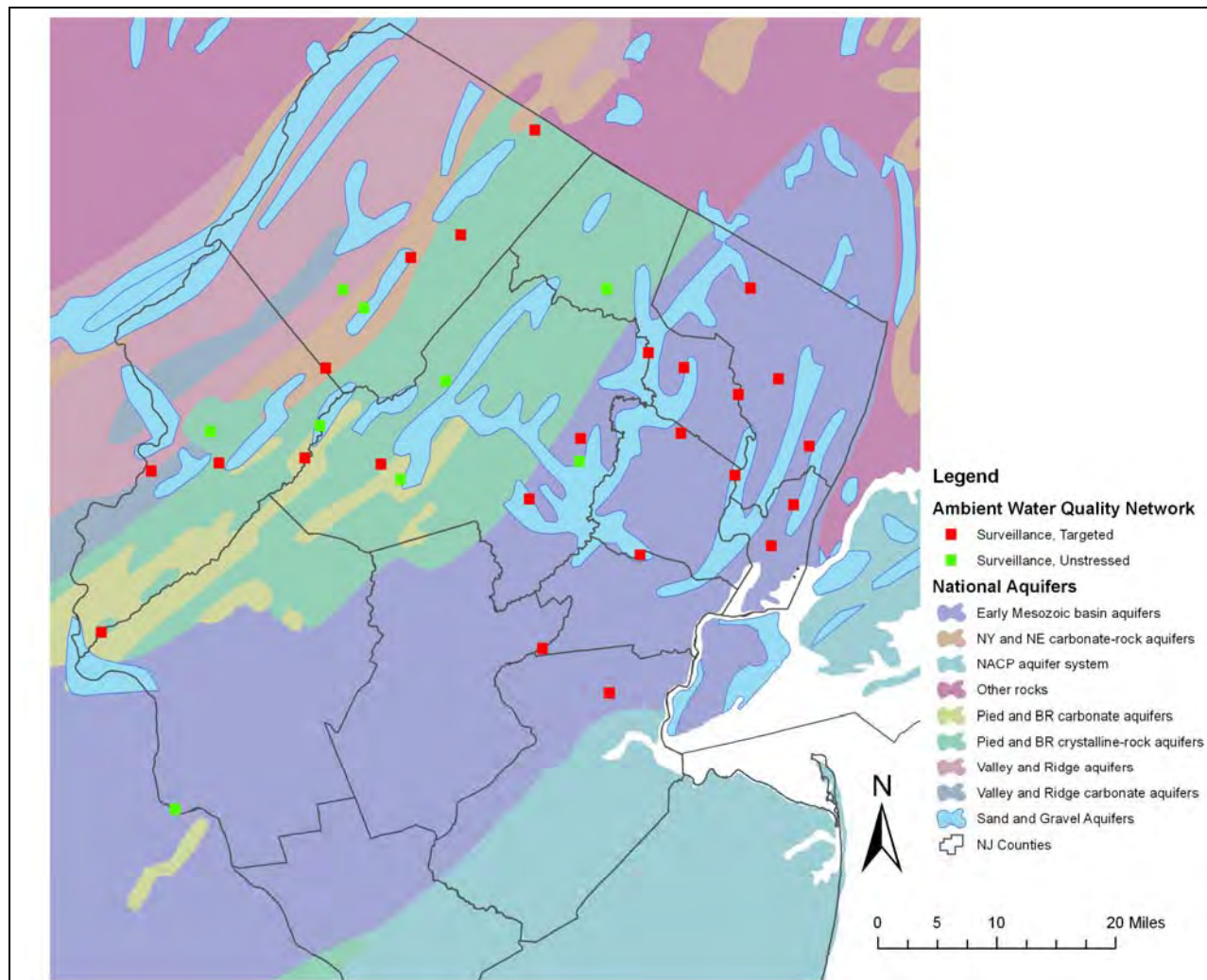


Figure 19. Map showing location of Sand and Gravel aquifers and New Jersey’s ground-water quality monitoring network.

*Early Mesozoic Basin Aquifers*

Twenty two shallow ground water quality wells are located in the Early Mesozoic Basin aquifers of New Jersey (see figure 20). Out of these 22 wells, 21 are classified as unstressed, and the remaining one is classified as targeted. All the wells are screened just 5 feet below the water table and samples are mostly obtained from the uppermost bedding zone or the weathered portion of the formation.

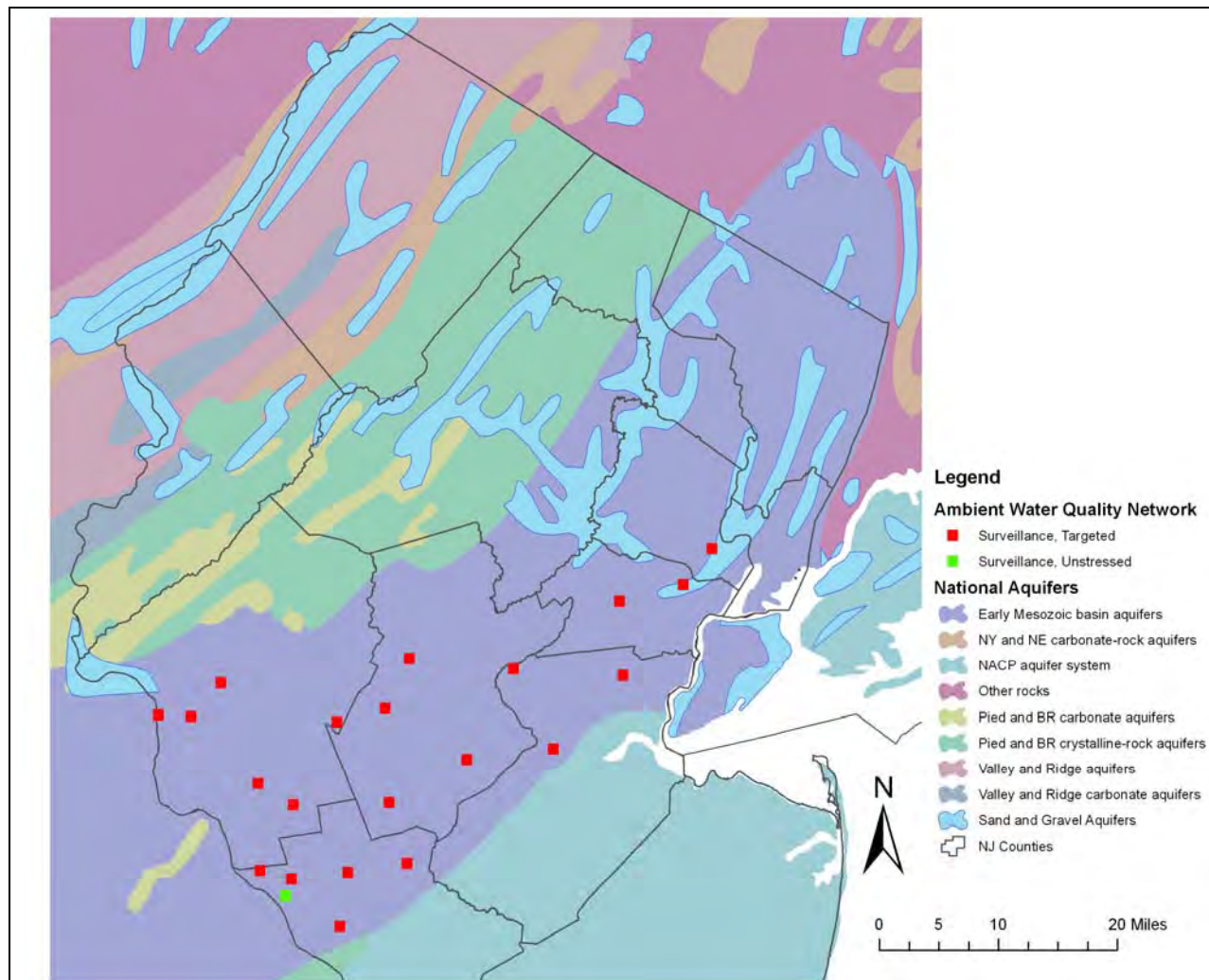


Figure 20. Map showing location of Early Mesozoic Basin aquifers and New Jersey’s ground-water quality monitoring network.

*Piedmont and Blue Ridge Crystalline-rock and Piedmont and Blue Ridge Carbonate-rock Aquifers*

Five shallow ground water monitoring wells are installed in the Piedmont and Blue Ridge crystalline and Piedmont and Blue Ridge carbonate-rock aquifers (see Figure 21). All five are set at the water table and are classified as targeted surveillance wells.

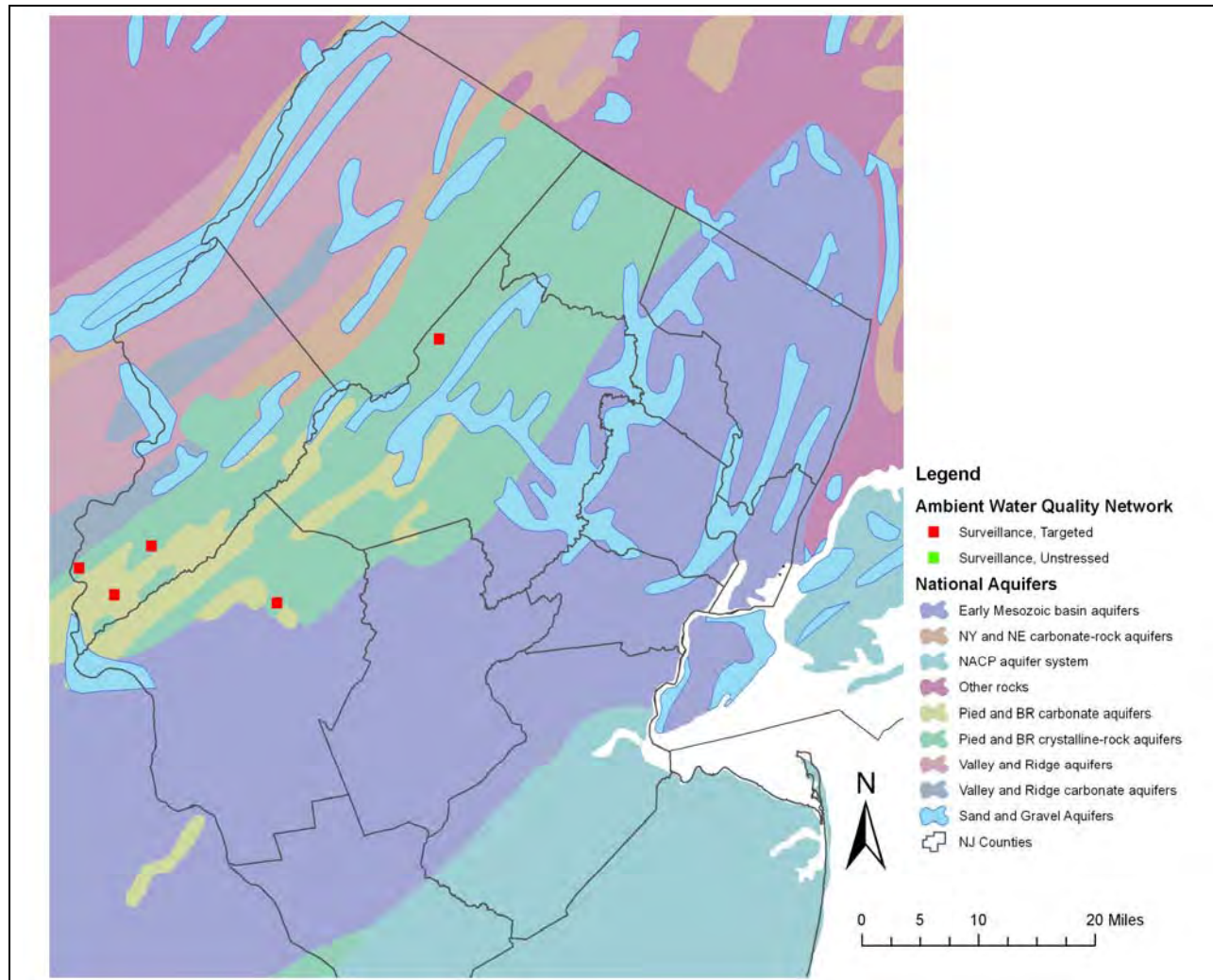


Figure 21. Map showing location of Piedmont and Blue Ridge Crystalline-rock and Piedmont and Blue Ridge Carbonate-rock aquifers and New Jersey’s ground-water quality monitoring network.

*Valley and Ridge and Valley and Ridge carbonate Aquifers*

There are 2 monitoring wells installed in the Valley and Ridge and Valley and Ridge carbonate Aquifers (see Figure 22). Both are installed in carbonate rocks (1 in dolomite and the other in limestone) and one is classified as targeted and the other as unstressed. All are screened at the first water producing fracture, solution opening or bedding plane, and are shallow unconfined wells.



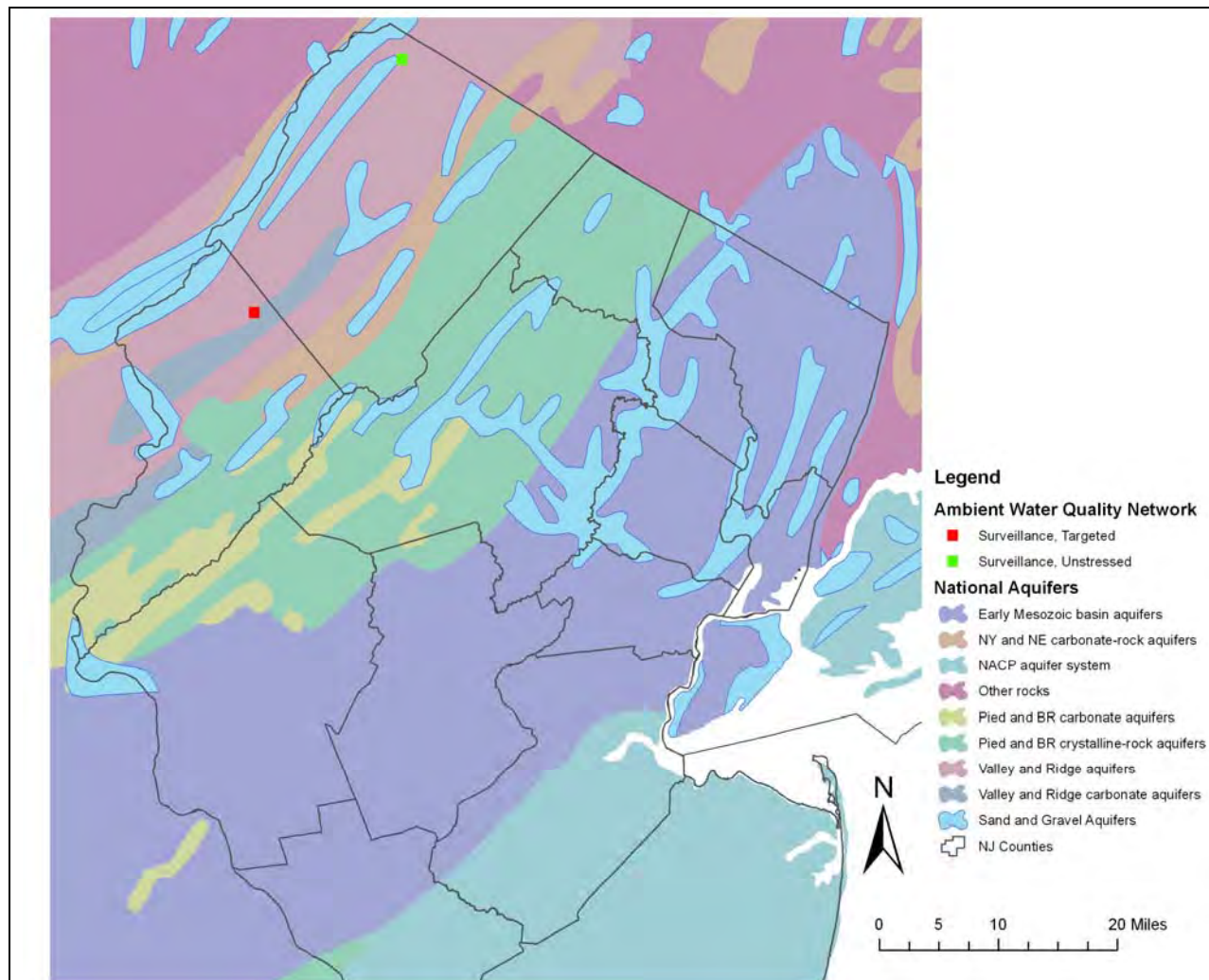


Figure 22. Map showing location of Valley and Ridge and Valley and Ridge carbonate aquifers and New Jersey’s ground-water quality monitoring network.

### *Northern Atlantic Coastal Plain*

The Northern Atlantic Coastal Plain contains the majority of the shallow ground water quality monitoring wells (81) from the AGWQMN (see Figure 23). Fifty of the wells are located in the local Kirkwood-Cohansey aquifer, with the remaining 31 wells dispersed throughout the other coastal plain water table aquifers. All the wells are surveillance wells, with 63 of them classified as targeted and the remaining 18 as unstressed wells. See Figure 22.

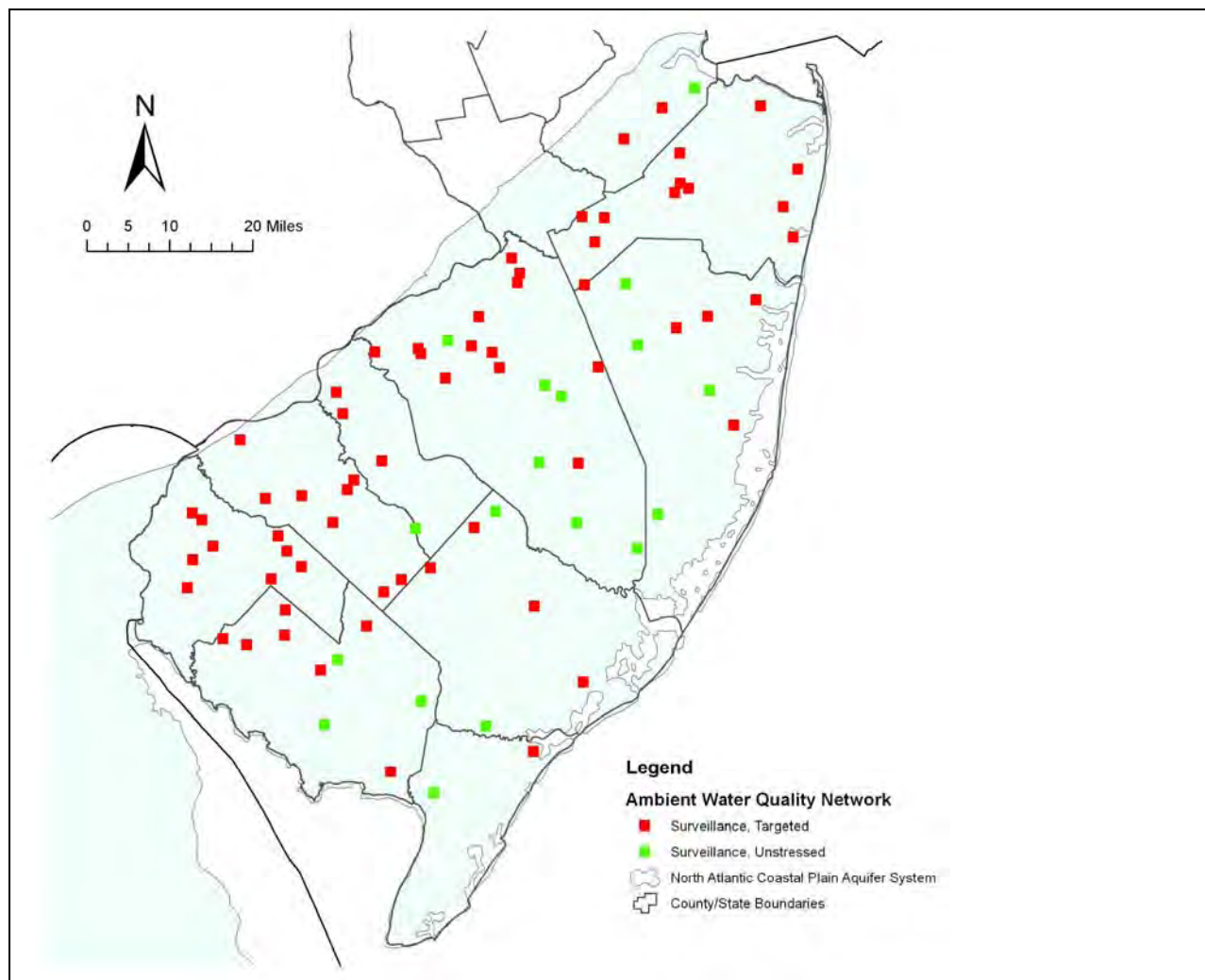


Figure 23. Map showing location of Northern Atlantic Coastal Plain aquifers and New Jersey's ground-water quality monitoring network.

## Gap Analysis

### *Spatial Gap*

The ground-water quality monitoring network spatially comprises the whole of New Jersey; however, two principal aquifers are underrepresented. The New York and New England carbonate-rock aquifer does not have any wells located in it and the Piedmont and Blue Ridge crystalline-rock aquifers is underrepresented in its northern reaches. There are numerous shallow wells installed within the spatial confines of the Piedmont and Blue Ridge aquifer, but they are not actually installed in the aquifer. These wells are installed in the glacial sediments above the aquifer. To address this issue more shallow wells need to be installed in these two aquifer systems to get a better representation of the status of the ground-water quality. They should be shallow wells so they can be added to the AGWQMN. The exact number of monitoring wells that would be needed to address this issue has not been decided upon. However, it is believed this data gap could be bridged with addition of 3 to 4 wells in each aquifer.

### *Temporal Gaps*

The largest data gap in regards to ground-water quality between the AGWQMN and the Framework document is the frequency of sampling. The SOGW Framework document states that each monitoring well should have a baseline of data over 5 consecutive years, with a sampling frequency of quarterly to twice per year. To date no individual AGWQMN well has 5 consecutive years of data. Obtaining a baseline for 145 wells may not be possible, but at least a baseline for the 30 unstressed wells in the network should be obtained for long-term trend analysis within this unstressed subnetwork and for comparison with the larger targeted subnetwork.

The Framework document also recommends that all surveillance wells be sampled annually. This would mean New Jersey would have to increase its yearly sampling from 30 wells per year to 145 wells annually. All 150 AGWQMN wells would have to be sampled annually, not just the 145 wells selected for the national network, to keep the integrity of NJ AGWQMN. The cost related to this increase in sampling will be discussed later in the cost estimate portion of the report.

It is not entirely clear from the Framework document, but a water quality trend network would require sampling more frequently than the surveillance network. To date New Jersey does not have any wells that meet the definition of a water quality trend network. More frequent sampling would be required to provide this information to the NGWMN.

Currently there are no analytes, data management or field practice gaps in the NJ AGWQMN when compared to the Framework document.

### *Bedrock Aquifer Ground-Water Quality Data Gap*

In the past through various projects New Jersey has sampled bedrock (or deep) aquifer water quality in portions of the state, but it does not currently sample or maintain a network of bedrock monitoring wells (Serfes, 1994, Serfes, 2004, and Walker and Jacobson, 2003). Bedrock aquifer implies water at depth where a pumping well would likely be installed, not shallow ground water. This ‘snap shot’ of bedrock water-quality data that is available is useful, but it does not provide the level of detail or kind of information that a trend or surveillance network as outlined by the NGWMN would provide. This type of monitoring network needs to be designed and implemented based on the work done to date and should also be designed to work in cooperation with the existing shallow AGWQMN. Ideally one bedrock aquifer well would be installed next to each of the 145 shallow wells. If the bedrock aquifer network is designed to work in cooperation with the AGWQMN, it would allow New Jersey to assess the relationship between shallow and bedrock unconfined aquifers in regards to general ground-water quality and land use impacts.



## Chloride Ground-Water Quality Monitoring Network

The chloride monitoring network is designed to collect data from the Coastal Plain aquifers of New Jersey. Data is collected from coastal areas and areas with salty ground water to delineate areas of saltwater intrusion and where potable ground water suitable for public use is available. Data is collected from nine confined aquifers in the Coastal Plain and from parts of the unconfined Kirkwood-Cohansey aquifer.

### Well Selection

The wells in the chloride network were selected from a larger chloride monitoring network operated as part the USGS/NJDEP cooperative synoptic network. A total of 87 wells were selected to be included in the NGWMN chloride monitoring network. All wells which have been measured since 2000 were selected to be a part of the chloride surveillance monitoring network. Data collected from these wells includes, at a minimum, field pH and specific conductance and laboratory determined values of chloride, sodium, and specific conductance.

<b>Principal Aquifer</b>	<b>NJ Aquifer</b>	<b>Well Type</b>	<b>Targeted Wells</b>	<b>Unstressed Wells</b>	<b>Total</b>
Northern Atlantic Coastal Plain aquifer system	Kirkwood-Cohansey aquifer system- unconfined	surveillance		3	3
	Kirkwood-Cohansey aquifer system- confined	surveillance	2	12	14
	Atlantic City 800-foot sand aquifer (with Rio Grande wbz)	surveillance	1	7	8
	Piney Point aquifer	surveillance	3	4	7
	Vincentown aquifer	surveillance			0
	Wenonah-Mount Laurel aquifer	surveillance		4	4
	Englishtown aquifer	surveillance	1	4	5
	Upper Potomac-Raritan-Magothy aquifer system.	surveillance	9	12	21
	Middle Potomac-Raritan-Magothy aquifer system (with Undif. PRM)	surveillance	9	7	16
Lower Potomac-Raritan-Magothy aquifer system.	surveillance	5	4	9	
<b>TOTAL</b>			<b>30</b>	<b>57</b>	<b>87</b>

Table 5. Summary of chloride ground-water quality wells by principal aquifer, New Jersey aquifer, well type, and well status.

## **Unstressed and Targeted Subnetworks**

Wells in the network were categorized as unstressed or targeted based on the most recent chloride value. In order to tag wells as targeted before they reach a problem, wells are tagged as targeted when they reach one-half the potable water standard of 250 mg/L. Therefore all wells where the recent chloride value is greater than 125 mg/L are designated as targeted in the chloride monitoring network. This may exclude some wells where there is an increasing trend in chloride but that have not yet reached the threshold value. In the future, the wells may be reevaluated and categorized based on trends in the chloride value.

## **Chloride Ground Water Quality Monitoring Network in the Northern Atlantic Coastal Plain**

The description of the Coastal Plain aquifers in New Jersey and their correlation with regional aquifers was presented as part of the description of the Northern Atlantic Coastal Plains aquifers in the water-level monitoring section earlier in the report. The locations of the wells in the chloride monitoring network are shown on the same figures as the water-level wells in the sections presented above.

### *Kirkwood-Cohansey aquifer system*

The locations of the chloride network wells in the Kirkwood-Cohansey aquifer system are shown in Figure 10. There are 3 wells in the chloride network in this aquifer. These wells are located along the coast and the Delaware Bay. There are also 14 wells in the confined Cohansey aquifer in the chloride monitoring network. These wells are located along the coast in Cape May County.

### *Atlantic City 800-foot sand aquifer*

The locations of the chloride network wells in the Atlantic City 800-ft sand are shown in Figure 11. There are 8 wells in the chloride network in this aquifer. Wells in the network are along the coast in Atlantic County to serve as early warning wells and throughout Cape May County to delineate the extent of the saltwater front already existing in the aquifer.

### *Piney Point aquifer*

The locations of the chloride network wells in the Piney Point aquifer are shown in Figure 12. There are 7 wells in the chloride network in this aquifer.

### *Vincentown Aquifer*

There are no wells in the chloride network wells in the Vincentown aquifer because there are not saltwater intrusion issues in the aquifer. This is primarily because the aquifer is only present in updip areas away from the coast, in downdip areas the sediments change from sand to silt or clay and the unit is no longer an aquifer.

### *Wenonah-Mount Laurel aquifer*

The locations of the chloride network wells in the Wenonah-Mount Laurel aquifer are shown in Figure 14. There are 4 wells in the chloride network in this aquifer.

#### *Englishtown aquifer*

The locations of the chloride network wells in the Englishtown aquifer are shown in Figure 15. There are 5 wells in the chloride network in this aquifer.

#### *Potomac-Raritan-Magothy aquifer system*

The locations of the chloride network wells in the Upper Potomac-Raritan-Magothy aquifer system are shown in Figure 16. There are 21 wells in the chloride network in this aquifer. There are two areas of saltwater concern in the aquifer. Wells are located along the Raritan Bay in Monmouth County to monitor saltwater intrusion occurring or potentially occurring in this area. Wells are also located in Burlington, Camden, and Gloucester Counties to monitor downgradient saltwater within the aquifer.

The locations of the chloride network wells in the Middle Potomac-Raritan-Magothy aquifer system are shown in Figure 17. There are 16 wells in the chloride network in this aquifer. There are two areas of saltwater concern in this aquifer as well. Wells are located near the outcrop of the aquifer in Middlesex County to monitor potential intrusion. Wells are also located down dip in Burlington, Camden, and Gloucester Counties to monitor saltwater in this part of the aquifer.

The locations of the chloride network wells in the Lower Potomac-Raritan-Magothy aquifer system are shown in Figure 18. There are 9 wells in the chloride network in this aquifer. Network wells in this area monitor saltwater in the downgradient portions of Burlington, Camden, and Gloucester Counties.

### **Gap Analysis**

The gap analysis for the chloride monitoring network will examine a few spatial gaps that occur in the network. Most of the gaps in the network are temporal, related to the requirements for frequency of measurement for a surveillance network.

#### *Spatial Gaps*

Maps of the existing network and wells that have been sampled in the past were examined and seven locations were determined that need additional monitoring. This includes two wells in the Atlantic City 800-foot sand in Cape May near the 250 mg/L chloride line. Two wells in the Piney Point in Cumberland County near the coast could serve as outpost wells. Three additional wells should be added in Salem County in the Upper (1) and Middle (2) Potomac-Raritan-Magothy aquifers near the 250 mg/L chloride line. This is a total of 7 wells that should be added to better delineate the current location of saltwater. These samples should be able to be taken at existing wells that have not been sampled as part of the recent network.

## *Temporal Gaps*

In the current network, selected wells are sampled every 5-10 years. The network would be a better sentinel network if the wells were sampled for chloride at least every 5 years as a surveillance network. To reach this goal 25 of the 87 current wells would have to be sampled on a 5-year interval instead of a 10-year interval. The costs to do this upgrade will be discussed in the cost section of the report.

The current requirements for sampling frequency of a surveillance water-quality network in the Framework document is a minimum of one sample per year. The costs of increasing the monitoring frequency to meet this requirement will also be estimated.

## ***Field Practices***

### **Ground-Water Level Monitoring Network**

This section will discuss field methods used in both the trend and surveillance monitoring networks. Practices common to both networks will be discussed first and then any differences will be described.

Field practices for the collection of water-level data at the USGS-NJ follow groundwater technical procedure documents that have been drafted by the USGS Office of Groundwater. Internal documents within the USGS-NJ document the implementation of these procedures within the office and the data processing to get the new data into the databases.

### *Training*

All individuals collecting water-level data are familiarized with the USGS-NJ technical procedures for the work they will be doing. Staff for the trend network receive a combination of training classes and on the job training to meet the training needs. Because the data collection effort for the surveillance network is large and requires bringing in a number of personnel, proper training for the collection is critical. In office and field training classes are held prior to each surveillance monitoring project to ensure proper training.

### *Site review and preparation*

Staff for the trend network have the proper tools and equipment necessary to measure the water levels in their network. Staff for the surveillance network are provided sets of tools by the project before being sent in to the field.

The trend network data are collected using software on a PDA that is prepared before each field trip. The data is also reported in a field notebook with a page for each network well as a backup. For the surveillance network, packets are prepared for the staff on a quad by quad basis. Each field personnel is provided with a packet of wells to measure on several 1:24k quad maps. The packets include: a list of wells to measure, pre-prepared field sheets, a map of the wells, copies

of field sheets from past surveillance projects for the selected wells, and a list of data for potential alternate wells. Field sheets are prepared for each well using data from the database.

All wells in the trend network are set up in the NWIS database before they are measured. Ideally, wells in the surveillance network are already in the database from prior measurements. If an existing well cannot be measured, an alternate is used. Preferably these would come from the list of wells already in our database. If a suitable well is not available, a new well may be selected. Technicians need to collect as much information about the well as possible so that well records and site information for the well can be collected and the site can be added to the database.

#### *Minimum data elements*

The field forms and PDA's used in both the trend and surveillance network, for the most part, have all the data required by the Framework document. The forms do not have a space to record weather conditions or equipment ID's of tapes used during measurement.

#### *Onsite preparation*

Site validation is most important on the surveillance network because the trend wells are generally measured ever two months by the same technician. The surveillance wells may be measured by different individuals in each cycle although an effort is made to have the same staff working on the same quad for several surveillance projects. Site verification for the surveillance network is accomplished by the well location sketches on the past field sheets and by use of handheld GPS devices.

When new sites are established for the surveillance network, procedures for establishing a measuring point are followed. These are sketched on the new field sheet and added to the database.

The only onsite preparation tasks listed in the Framework document that we do not perform are the decontamination of tapes between sites and calibration of steel and electric tapes.

#### *Water-level measurement*

Manual measurements made for the trend and surveillance networks follow the same procedures and criteria outlined in the Framework document. At least two measurements within 0.02 ft are required. Generally these are taken at least 5 minutes apart to ensure that the water-levels are stable. Steel tapes are the preferred measurement method and are used exclusively in the trend network. Electric tapes are often used in the surveillance network. If no other method is available airlines at public supply wells are used.

Automated water-levels are collected at all trend wells. Most of these are equipped with pressure transducers and dataloggers. Technical procedure documents for the collection of this data are available and used. At least two check measurements are made to ensure that the steel tape water level matches the instrument reading. The instrument is reset to match the manual water-levels (either manually or with shifts in the database if the difference is more than 0.03 feet. This is slightly more than the .01 feet requirement in the Framework document. The serial numbers of sensors used in the field is not generally tracked on the field sheets or in the database.

Automated water-level sites are visited every 8-10 weeks and generally meet the requirements set up in the Framework document.

### *Data handling and management*

The data handling and management of the water-level networks meet the guidance in the Framework document.

Discrete data for the trend network are entered into a PDA in the field. Continuous data are retrieved using a PDA or a laptop. This data are entered into the appropriate databases within 1 week of collection. The data are then checked by the collecting technician and reviewed by another technician. At the end of each month, all data are reviewed and approved by the District Groundwater Specialist. This process includes the checking of unit-values from the instruments against field measurements.

For the surveillance network, data are collected on a pre-prepared field form. The data are entered into an access database after collection and are checked against the field forms. This data are then input into the database and further checks on the data are included in this process.

### *Gap analysis*

A comparison between the NJ Pilot field practices and the Framework document and associated appendices identified some data gaps. In general the data gaps can be classified as minimal. A summary of the gaps are listed below:

- Weather conditions at time of data collection are currently not collected. Paper forms can be readily modified, but corrections to PDA forms would require programming work. It should be noted that the NGWMN does not appear to be able store this data.
- Measuring tapes are currently not decontaminated between wells. Steel tapes are wiped off, but not with a disinfectant.
- NJ does not currently have a protocol to calibrate steel or electric tapes. Options will be investigated.
- Different criteria are used when comparing manual to automatic data recorder measurements. NJ uses 0.03 ft (0.05 to 0.1 ft for wells deeper than 100ft) and the Framework document requires 0.01
- The required accuracy of continuous measurements of .02 ft may be good for most wells, but wells with deeper water-levels often require a higher PSI instrument that results in less accuracy. We suggest adding a depth of water-level component in determining the required accuracy of water-levels.

## **Ambient Ground Water Quality Monitoring Network**

All NJDEP/USGS employees who sample or perform pre-collection site review and preparation for ground-water quality monitoring are trained on proper use of equipment (sampling equipment, electric tape for water level, pumps, etc.), documentation, safety, data recording and entry, and decontamination methods. No training is provided for continuous recorder or pressure transducers because they are not currently used for ground-water quality monitoring. Training is



provided through mentoring, including field experience, courses offered by the NJDEP or USGS, vendor courses, and through educational background.

All ground-water quality samplers for the AGWQMN must pass yearly USGS National Field Quality Assurance samples, and if a NJDEP employee, they must be certified yearly by the NJDEP Office of Quality Assurance. This includes having all SOPs reviewed and passing a certification test.

### *Pre-Collection Site Review and Preparation*

A pre-collection site visit is done before any monitoring well is sampled for ground-water quality. This pre-collection site visit includes a data form, well permit and record, local map, hand drawn map of the well location, aerial photograph of well the location and pictures of the monitoring well. The data form includes the unique site ID, local ID, lock number, whether the well is flush mounted or a stick up, latitude and longitude, land use designation, pumping rate, turbidity and water level from previous sampling event, total well depth, and screened interval. A pre-collection site review and preparation equipment checklist, and SOPs (standard operating procedures) are used to ensure that the site visit and information gathered is correct and accurate.

At the time of the pre-collection site review the following tasks are performed and information gathered:

- Initial water level is obtained.
- The amount of water above screen in feet is recorded.
- Well is developed until a turbidity of less than 5 NTU is achieved and the final turbidity reading is recorded.
- Pumping rate is determined and recorded, ensuring the water level in the well remains above the screened interval.
- Start and end time of pumping period is recorded.
- Time the well takes to recover one foot is recorded.
- Final water level reading and the time it was taken is recorded.
- Current land use is recorded.
- A new GPS point is taken/retaken if the well has been recently installed.
- Determination if the monitoring well is functional or non-functional.
- Additional notes are taken, which may include if the well is accessible by foot or vehicle, road prone to flooding, and any repairs that need to be made to the well.

All this information recorded on the pre-collection field form, saved digitally, and then passed along to the sampler along with all the paperwork from the pre-collection site visit (e.g. well permit and record, photographs, etc.). If the well has been deemed to be non-functional for any reason, the well will be replaced at the same location or a new location if need be.

### *Minimum Data Elements*

The AGWQMN uses a standardized USGS data collection form that includes fields that meet all the minimum data elements required by the Framework document. A list containing sampling

bottles, USGS schedule number (which includes the list of compounds, and analytical methods for each schedule) preservation and handling for each sample is also utilized. Refer to Appendix 2 for a list of all forms and documents used in the water quality sampling.

### *Onsite Preparation*

The standardized USGS data collection form along with the pre-collection forms, equipment check list and the list containing sampling bottles meet the recommendations by the Framework document for on-site preparation.

Decontamination of equipment is done after each sampling event following approved SOPs on all equipment and documented. The equipment is then stored in a sterile environment until the next use. Calibration of equipment is performed no sooner than three days before the sampling event, and is recorded on the USGS data collection form. If the sampling is performed by NJDEP/NJGS staff the calibration is also recorded in binders/notebooks that are reviewed by the NJDEP Office of Quality Assurance. All calibrations are performed following approved SOPs and the vendor's equipment manual. This is in compliance with the Framework document recommendations.

### *Sampling Collection*

Ground water quality sampling for the AGWQMN follows low flow procedures set forth in the following documents:

- “Field Procedures Manual”, Section 1 pages 29-36 dated “Second Printing 1992”, and the USGS National Field Manual for the Collection of Water Quality Data, chapter A4 “Collection of Water Samples (Version 2.0, 9/2—6)”, pages 13-24 and 73-132.
- U.S. Geological Survey, variously dated, National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chaps. A1-A9, available online at <http://pubs.water.usgs.gov/twri9A>.
- U.S. Geological Survey, 2006, Collection of water samples (ver. 2.0): U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A4, September, accessed 3/2009 at <http://pubs.water.usgs.gov/twri9A4/>.
- Clean Metals Technology is employed for the metals testing to be done, as per EPA Method 1669, 7/1996, and “Clean Methods Techniques to be used when sampling for Trace-Metals in Aqueous Samples” document developed by Bill Honachefsky, Section Chief BFWBM NJDEP, 2005, “Field Sampling Procedures Manual”, NJDEP, Trenton, NJ, August 2005.

A NJDEP Quality Control Assurance Plan (QAPP) must be written and approved by all participating parties and approved by the NJDEP Office of Quality Assurance before any sampling can take place. The QAPP is good for 3 years and then must be resubmitted; amended if needed and be reapproved. This is in compliance with the Framework document recommendations.

### *Sampling Preservation, Handling, and Transport*

The list of sampling bottles that is utilized during the onsite preparation includes the proper preservation and handling for each sample taken during the sampling event. Transport of the samples to the laboratory is performed in clean coolers or containers that are designed to keep the contents at a constant even temperature (for all AGWQMN samples, 4° C), that prevent spillage of samples and prevent damage to the sample bottles. All samples are shipped daily by express mail (24 hr) unless samples were obtained after 4pm on Friday. In which case the samples will be shipped the following Monday. This is in compliance with the Framework document recommendations.

### *Automated Water Quality Measurements*

Automated Water Quality Measurements are not utilized currently in the AGWQMN.

### *Data Handling, Management and Recording*

Field QC and data collection forms will be kept in the USGS – Trenton, NJGS, and Bureau of Freshwater and Biological Monitoring files.

The Project Officer will validate all Field data following the procedures in:

- “Guidance for Review of Environmental Measurement QC Data for Water Monitoring Projects” (NJDEP 1984) Procedure 2.0.
- USGS – NWIS QW VALID 90.1 Program with in house quality assurance products.

Laboratory data documentation and reduction will be performed following the follow guidance:

- Quality Control Manual – USGS-Open File Report 87-457
- Techniques of Water Resources Investigation of the United States Geological Survey, Quality Assurance practices for the Chemical Analysis of Water and Fluvial Sediments, Book #5, Chapter A6.

The USGS Laboratory is audited annually by its own quality assurance branch, which employs USGS, EPA and DOE auditors. USEPA Region 8, Office of Drinking Water, audits the USGS laboratory every 3 years for certification to analyze drinking water constituents.

Data reports from the USGS Laboratory are received by the USGS in Trenton where they are copied and electronically sent to the NJDEP/NJGS. The data is also stored in the USGS NWIS (<http://nj.usgs.gov>) computerized data system.

### *Sampling Frequency*

Currently 30 AGWQMN wells are sampled per year, with 1 complete sampling cycle being completed every 5 years. This allows New Jersey to get a snap shot of the ground-water quality

yearly, and to assess long-term trends. To be able to interpret any seasonal or immediate trends the sampling frequency would have to be increased.

### *Gap Analysis*

The NJ AGWQMN is in compliance with all the SOGW recommend field practices, except for sampling frequency, which is addressed in the cost estimate, and other sections of this report.

## **Chloride Ground-Water Quality Monitoring Network**

### *Site review and preparation*

All of the requirements for site review and preparation in Appendix 5 of the Framework document are consistent with the preparation for sampling for the chloride monitoring network.

Prior to going into the field the field sheets for each site are prepared and the necessary equipment is assembled and cleaned

### *Minimum data elements*

Data collected as part of a sample for the chloride network meet the required elements in Appendix 5 except for the recording of weather conditions at the time of sampling. Sampling data is recorded in a field notebook or on field forms for this network.

### *Onsite preparation*

Site verification is accomplished through two major factors. Many of the samples collected for this network are collected coincidentally with a required 5-year pumping of the wells in the water-level network to assure hydraulic connection with the aquifer. In many cases the sampling is performed by the technician who routinely measures water-levels at the well and is familiar with the site. GPS coordinates and sketches/photographs of all wells are available to the technicians so that they can ensure that they are at the correct location.

Cleaning of the sampling point is performed as needed, but is generally not required for the collection of a routine chloride sample.

Depth to water in each well is measured before sampling and recorded on water-level field sheets or on an electronic form to be entered into the database.

### *Sample Collection*

In general the sample collection procedures for this network match the Framework guidelines. Ideally three casing values are pumped and Temperature, Conductivity, pH, and Dissolved Oxygen are monitored every 3-5 minutes. This meets the Framework criteria. The criteria for Temperature, Conductivity, and pH are the same as the Framework guidelines. The criteria for dissolved oxygen is 0.02 mg/L.

Lower purge volumes of at least 1.5 to 2 times the casing volume may be used on some large, deep wells, but the field parameter stabilization criteria remains the same.

When active public supply wells are sampled, the purge volume may be reduced because the well has been recently pumped.

Care is taken during sampling to minimize contamination by preparing the work area and the vehicle appropriately.

### *Sampling Preservation, Handling, and Transport*

Samples are preserved and handled according to USGS guidelines and match those set in the Framework document. Samples for trace-elements and major cations are preserved using laboratory-grade nitric acid. Samples are shipped to the lab and analyzed within the laboratory holding time criteria (less than 28 days).

### *Data handling and management*

Field QC and data collection forms will be kept in the USGS-NJ.

The USGS Laboratory is audited annually by its own quality assurance branch, which employs USGS, EPA and DOE auditors. USEPA region 8, Office of Drinking Water, audits the USGS laboratory every 3 years for certification to analyze drinking water constituents.

Data reports from the USGS Laboratory are received by the USGS in Trenton. Data is reviewed and sample reruns are requested, when necessary. The data is stored in the USGS NWIS (<http://nj.usgs.gov>) computerized data system.

### *Gap Analysis*

The only gap, in addition to the monitoring frequency identified in the Chloride monitoring network field practices is that some deep wells or actively pumped wells do not meet the well bore purging criteria. However, at least 1.5 casing volumes are pumped and parameters must stabilize before sampling.

## ***Data Management System***

All data is stored in the USGS National Water Information Systems (NWIS) databases and are reviewed, backed up, and archived according to USGS policies.

For this section, all of the network wells have been reviewed and compared to the minimum data elements in the Framework document in Appendix 6. Appendix 3 of this report contains the elements in Appendix 6 of the Framework document and provides an indication of how the 1124 sites in the NJ Pilot database match the required elements. Elements that do not exist in the USGS NWIS database are identified in the “COMMENTS” column.

A general issue is that New Jersey has older wells in the database that may not have all of the data either available or it has not been entered into the database. These are valued network wells where a long history of data is available. Eliminating these sites from the network would create gaps in the spatial and temporal network that could not be replaced. New Jersey is planning to make sure that any new wells added to the networks have complete datasets and the data are populated in the database.

Major items that are missing for many of the wells are summarized below:

- Lithology. Working on. Missing 865 wells
- Depth Source. Working on. Missing 263 wells
- Screen Interval. Missing at 68 wells.
- Well logs and wells records. Missing for 78 wells.
- Casing material. Missing in 465 wells.
- Screen material. Missing in 501 wells.
- Measuring point for water-level sites. Working on. Missing in about 220 wells
- Measuring point for water-quality sites. Missing in about 100 wells.
- Well depth. Missing for 3 wells. Will be updated at next site visit.
- May need to log using optical televiewer or similar for some wells to determine screen interval
- Have well owner information in the database, but do not want to include in network due to privacy and security concerns

Measuring point data is available for all of the water-level trend sites and for most of the water-level surveillance sites. Data for several hundred surveillance sites is being added to the database.

A mapping of the NJ NWIS data elements to the Framework elements identified in the Framework document Appendix 6 is summarized in the New Jersey Pilot Report's Appendix 3.

## ***Proposed Changes to the Framework Document***

New Jersey's ground-water monitoring network has been in continual development since the early 1900s. It has been evolving through time to address the changing water resource needs of the state. It has expanded from New Jersey's densely populated northeastern corner to the southern coastal plain in response to population growth and changing industrial and agricultural water use practices. The methods of data collection, storage, and dissemination have also evolved in response to changing technologies. At this point New Jersey's network and associated data techniques are fairly well synched with those recommended by the NGWMN Framework document. Based upon New Jersey's experiences there are several modifications that it feels the SOGW should consider.

The first set of recommendations has to do with the definitions of the surveillance and trend networks and the frequency of measurements required for each. The New Jersey Pilot group believes that some clarifications should be made in the definitions of each type. In New Jersey's opinion, trend networks should consist of continuous data (e.g. daily) at a set of 'backbone' wells



spread throughout the principal aquifers. New Jersey's cost analysis shows that continuous data recorders provide much more detail at a lesser cost than less frequent (e.g. monthly) manual measurements. This reflects the relatively low cost of ADRs and the greater cost of skilled labor. Surveillance or synoptic networks should consist of a denser, more detailed network of wells that fully characterize water levels throughout the aquifers and should capture pumping centers, recharge areas, etc, but which are sampled less frequently (e.g. annual data). This may be the goal of the Framework document, but it is not clearly outlined in the report.

The frequency of measurements recommended by the Framework document for surveillance networks is fairly short and under some conditions turns a surveillance network into a trend network. New Jersey monitors its surveillance network once every five years for the 9 major aquifers in its Coastal Plain region and has found this to be a cost effective approach. A one-year cycle might be reasonable depending on the extent of the aquifer and associated costs, but monitoring much more frequently than annually is unreasonable. The 5-year frequencies would also apply to the ambient and chloride water-quality surveillance networks.

The overall approach New Jersey uses to manage its surveillance water-level monitoring network very closely follows the description of a surveillance network as listed in section 1.4.4.2 of the Framework document. However the frequency of measurements suggested in Table 4.5.2 does not meet the purpose of the surveillance network described in section 1.4.4.2 of an "overall snapshot of ground-water conditions" and should have a monitoring frequency "much less than Trend monitoring". The text and table sections of the Framework documents should be clarified and made consistent.

The requirement for a baseline period of 5-years for a surveillance network essentially turns the surveillance network into a trend network for five years and adds greatly to the cost. The purpose of the baseline period was to categorize the wells as targeted or unstressed. New Jersey is able to do that with a 5-year network measurement interval. A larger hurdle in determining the targeted/unstressed network was the determination of predevelopment water-levels. One advantage of the longer-term baseline sampling is that it can 'average out' the effects of drought and wet years (this is particularly true for shallow water levels and water quality).

In New Jersey potable uses make up the majority of ground-water withdrawals. As a result, New Jersey finds it necessary to utilize potable supply wells in its surveillance network. However, the Framework document does not recommend use of potable wells. This requirement would limit a major group of wells distributed throughout New Jersey's aquifers as well as located in areas of drawdown. New Jersey recommends that potable supply wells be allowed in the network assuming they follow a protocol where the well and other nearby wells are shutdown and water levels are not rapidly changing. The specific times, distances, and rates would vary depending on hydrogeologic properties and might not apply in all settings, but in New Jersey's coastal Plain aquifer it has proven effective.

One of the more difficult tasks of this pilot study was the definition and classification of wells as targeted or unstressed. New Jersey Pilot believes that much better definitions of these conditions are needed. There may be a suite of definitions that participants can choose from or that apply only in certain hydrogeologic settings. The list doesn't need to be completely inclusive, but it

should give future participants more guidance (as well as allow them to ultimately choose their own definitions) than currently exists.

The NGWMN is a national network and does not, nor should not try to take the place of local networks. However in some hydrogeologic settings principal aquifers simply do not provide enough detail to accurately describe water levels or conditions within an aquifer. This is particularly true in the North Atlantic Coastal Plain aquifer system in New Jersey. This principal aquifer consists of multiple aquifers with very different water levels and hydrogeologic properties. Data from wells within this principal aquifer would have a very diverse set of water quality and levels and simply confuse the data user. While the NGWMN does not need to utilize New Jersey's hydrostratigraphy it should use one viable in a regional context. This might require the use of major aquifer designation or an even finer scaled one. In this particular case, New Jersey recommends use of the Trapp 1992 (see Table 3).

In addition to designating smaller scale aquifers in the NGWMN, as suggested above, the database should allow the use of local aquifer names. This database addition would facilitate the use of the data by users who are only familiar with the local names and place their well and aquifer in a larger regional context.

A comparison of New Jersey's field techniques with those required by the Framework document identified some potential problems. The list below summarizes those findings.

- The accuracy of the water level measurement needs to reflect the type of network and the overall depth of the water level and the type of data recorder. For example, a 5-year measurement in a surveillance well in New Jersey's Coastal Plain might only require an accuracy of 0.1 ft to provide meaningful data over its hundreds of square mile extent. Or a high psi pressure transducer may not have the ability to measure water levels to the required 0.01 ft (e.g. In-Situ LevelTroll 500 –100psi gage is accurate to 0.23 ft).
- The Framework document should provide additional specifications on how to correct for ADR drift and on acceptable ranges of drift.
- Change criteria for matching continuous and tapedown water levels from .01 ft to .03 ft.
- Weather condition information is important for shallow water levels and water quality, but not necessarily for deeper confined aquifers. The database should be modified to only require this information for a subset of the network where it is needed.
- New Jersey believes that the SOGW should consider adding a requirement to periodically pump water-level wells to ensure connection with the aquifer.

A comparison of New Jersey's database management procedures with those required by the Framework document identified some potential problems. The list below summarizes those findings.

- Well owner name and contacts in network database should not be included due to privacy and security concerns.
- Some long-term monitoring wells do not have complete data to meet the Framework requirements. Eliminating these wells would create spatial and temporal gaps that can not be replaced. New Jersey suggests letting legacy wells not comply completely with the Framework document, but requiring new wells to fully comply. Alternatively, a reduced

number of required elements could be specified (location and aquifer) and population of the rest of the fields could be encouraged by not required.

- Many of the data elements required in the Framework document are not shown on the Data Portal. If users are required to submit/collect this data, it should be displayed on the Portal.
- The Framework document and Data Portal should add a major aquifer code and also allow the use of local aquifer names. This would facilitate the use by local users and encourage them to link their local aquifer with the larger regional aquifer.

The analyte list is fairly extensive and adds a significant cost to the network. While New Jersey believes that all the parameters are valuable, they can be reduced to reduce costs if funding becomes a problem.

Since the NGWMN is likely to be populated by existing wells, the SOGW should consider the impacts to participants if only part of an existing network is included in the NGWMN, particularly if the national network will fund an expansion of the existing local network. This situation arose with New Jersey's Ambient network. The network consists of 150 wells, but only 145 of them fell within a principal aquifer and are included in the NGWMN. If the proposed changes are implemented to the ambient network it would create two networks, each with a slightly different operating procedure. In order to allow the states to continue to analyze data and draw valid conclusions these networks need to be operated consistently. Concerns about losing the ability to utilize historic data could potentially limit participation into the NGWMN.

## ***Benefits of the Network***

New Jersey has a long and active history of ground-water management. Examples range from the Neutral Zone well in the Central Passaic basin glacial aquifer, to the Critical Area 1 and 2 programs in the Coastal Plain implemented in the 1980's and 1990's, to the recently released Great Egg-Mullica Basin and Cape May County ground-water management studies, and to quantifying links between land use and shallow ground-water quality. The ground-water monitoring network played an active role in all of these cases; the neutral zone well acting as a referee between two water utilities, the critical area monitoring network showing first declines and then recoveries in response to withdrawal cutbacks, the water-level wells providing calibration points for ground water models in the Great Egg and Mullica River Basins, the chloride network driving ground-water management decisions in Cape May County, and the ambient network identifying the reduction in MTBE levels in response to banning its use as a fuel additive. Ultimately New Jersey's ground-water monitoring network provides the baseline data necessary to monitor, quantify, and adaptively manage New Jersey's ground-water resources.

The New Jersey ground-water monitoring water-level and water-quality networks have numerous benefits to the state. Ground-water networks:

- quantify background or undeveloped water quality and identify anthropogenic effects on water quality

- monitor for saltwater intrusion which has a direct effect upon potability of Coastal Plain aquifers
- Long-term water-level trend networks monitor wells throughout state with daily water-level data. These data show long-term and seasonal trends.
- The trend network data are periodically complemented with surveillance network data which allows further definition of influences of withdrawals on a larger spatial but less frequent temporal scale
- Trend wells provide critical real-time water level data used for drought management. These wells over the long term can be used to quantify effect of ground-water development and climate change
- The data collected feeds directly into numerous regulatory programs as well as ground water models, water availability estimates, and local and regional water supply planning

Participation in the NGWMN provides several direct benefits to New Jersey. These are primarily related to developing a single consistent dataset for shared inter-state ground-water resources. Having a single hydrostratigraphic nomenclature is the basis for managing a resource shared between two or more states. There are two examples of this in New Jersey worth mentioning. The first is the Potomac (or lower PRM aquifer) and Piney Point aquifers in the North Atlantic Coastal Plain aquifer system that are shared between Delaware and New Jersey (as well as Maryland). Increased usage of these two aquifers has caused drawdown to extent beyond state boundaries and creates some water supply conflicts. Having an agreed upon and consistent dataset provides the hydrogeologic foundation from which to develop management options. Basically you need to agree on the hydrostratigraphy/hydrogeology before you can address water supply problems. The second example is in the buried valley glacial aquifers shared between New York and New Jersey. In this example it is not ground-water withdrawals that are affecting wells, but ground-water withdrawals that are reducing baseflow in streams which supply surface water to downstream reservoirs. In this case disagreement has led to legal challenges. The NGWMN can provide the underlying hydrogeologic baseline data and aquifer properties so the policy makers can begin their discussion with a single set of comparable data. These benefits for New Jersey could apply to any state with a shared principal aquifer.

## ***Cost Estimates***

This section summarizes the three areas of cost estimates from the New Jersey Pilot Study Group as requested in the Framework document. The first will be the direct costs incurred by the pilot study participants throughout the one-year pilot. The second will be the estimated costs to manage and operate the wells that are proposed for the NGWMN in the various sub-networks. The third will include cost estimates to fill all of the gaps identified in previous sections.

### *Costs to Participate in the Pilot Study*

The costs incurred in the 1-year pilot study were primarily the salaries of the five individuals who worked on the pilot project most directly and the authors of this report. The five individuals worked a total of 645 hours for a total salary cost of approximately \$38,000.

### *Trend Water-level Monitoring Network Costs: Current O&M*

The cost to operate the 138 continuous recorder wells for the NGWMN is estimated assuming an annual rate of \$3,300 per well for the operation and maintenance of a continuous recorder that provides hourly and daily data. The annual total cost of the water-level trend network is \$455,400.

### *Trend Water-level Monitoring Network Costs: Spatial Gaps*

The data for the trend network is generally sufficient to meet the spatial and temporal standards for the NGWMN. However, New Jersey identified the need for 2 wells in the Early Mesozoic Basin aquifer and 1 well in the New York and New England carbonate rock aquifer. This could be accomplished using existing wells and would therefore only require an additional \$9,900 per year.

### *Surveillance Water-Level Monitoring Networks Costs: Current O&M*

The surveillance network currently operating in the New Jersey Coastal Plain is set up to measure water-levels and produce a water-level status report with aquifer potentiometric maps every five years. For the Pilot Study only the cost of collecting the water-level data every five years, including the preparation, data collection, and data-processing is included. The estimated cost to operate the current NJ surveillance water-level network on a five-year interval is \$450,000.

### *Surveillance Water-Level Monitoring Networks Costs: Temporal Gaps*

The costs associated with changes that would be needed in the surveillance network to meet the Framework guidelines are mainly associated with the frequency of measurement of water levels. There are also some small costs associated with modifying data collection techniques.

In order to strictly meet the surveillance network frequency criteria in Table 4.5.2 in the Framework document several assumptions were made. Based on ground-water withdrawals in the New Jersey Coastal Plain, the aquifer withdrawals were set to "Many Withdrawals" for all wells and the known aquifer properties were used to generally determine the low or high conductivity factor to determine measurement frequency. All wells in the Potomac-Raritan-Magothy aquifer system and the Kirkwood-Cohansey aquifer system were assumed to be high conductivity. This accounts for 481 of the wells in the surveillance network and results in a daily sampling frequency. This would be accomplished by continuous water-level monitoring at a \$3,300 per well annual cost; for a total of \$1,587,300. All the rest of the Coastal Plain aquifers were classified as 'low' conductivity. This accounted for 363 wells. The measurement frequency for low conductivity wells in areas of many withdrawals is once per month. The estimated cost to collect monthly data for these wells would be the \$2,322,500 (\$450,000 prorated to 363 of the 844 wells 12 times a year). In fact, it would be more cost effective to install continuous recorders on these wells at a cost of \$3,300 per well for a total for \$1,198,000. The total cost of meeting the frequency requirements in Table 4.5.2 for the 844 wells in the Surveillance network would be \$2,785,300 annually. Essentially, the requirements in the Framework document turn this surveillance network with 844 wells into a trend network.

A compromise that would better meet the spirit of the surveillance network as described on page 15 in the Framework document would be annual measurement of water levels. This would provide the spatial details to support the long-term continuous monitoring at the trend network sites. We have suggested changes to the Framework document to reduce the monitoring frequency at surveillance wells to once per year or once every five years. The cost to measure the surveillance network wells once per year would be an additional \$450,000. There would be no additional cost involved with measuring the wells every 5 years since that is already occurring.

#### *Ambient Ground-Water Quality Monitoring Network Costs: Current O&M*

New Jersey typically samples 30 AGWQMN wells per year. For FY 2011, sampling costs are budgeted at \$144,535 or \$4,817 per well. The cost are broken out as follows: Labor for field work - \$6,460; Data handling labor - \$30,654; Direct science support - \$12,687; Supplies and equipment - \$2,114; National Water Quality Lab, USGS - \$50,000; and Indirect overhead - \$42,620. This budget only covers the sampling of the 30 wells. Maintenance costs per well are estimated to be between \$1,500 and \$2,500 a year (or 18 to 36 man hours), depending on the condition of the well. This equates to a total of approximately \$7,000 per well per year for operation, maintenance, and sampling of an AGWQMN well.

#### *Ambient Ground-Water Quality Monitoring Network Costs: Spatial Gaps*

The addition of the recommended 6 to 8 monitoring wells in the New York and New England carbonate-rock aquifers and the Piedmont and Blue Ridge crystalline-rock aquifers would lead to higher overall costs to the network. In the past, it has cost roughly between \$120 and \$150 per foot to drill a well in rock. AGWQMN wells are typically 30 feet deep, equating to a per well cost of \$4,500. If New Jersey was to add an additional 8 monitoring wells to close the gap in the above mentioned aquifers it would cost \$36,000 (using the high end of the cost per installation of 1 well). The yearly cost to sample the additional wells once per year is \$56,000.

#### *Ambient Ground-Water Quality Monitoring Network Costs: Temporal Gaps*

According to Table 4.5.1 in the Framework document, water quality surveillance wells should be sampled at least once annually and for a subset of the wells (primarily the glacial and Kirkwood-Cohansey wells) twice annually. Assuming that 30 wells are already sampled per, an additional 115 wells would need to be sampled. This equates an additional \$805,000 per year to sample and maintain each well once. New Jersey would argue that all 150 (not just the 145 wells selected for the NGWMN) receive the additional sampling so that the trend and statistical comparisons made to date could be continued.

Decreasing the number of analytes would be one way to bring down costs. For example, pesticides are no longer sampled for in the unstressed, undeveloped land use monitoring wells. While this cut has allowed the State of NJ to sample for all the analytes desired in the targeted monitoring wells, it leaves a data gap. Many of the pesticides or its degrades are persistent in ground water, and/or could be deposited in undeveloped areas through atmospheric deposition. Making further cuts in the number of analytes sampled for would create a larger data gap, and



would not benefit New Jersey. Ideally funding needs to be maintained to ensure all shallow ground water quality monitoring wells are sampled for the exact same analytes.

#### *Ambient Ground-Water Quality Monitoring Network Costs: Bedrock Aquifer Network Gaps*

If New Jersey was to implement a statewide bedrock aquifer ground-water quality monitoring network, the start up costs would be the greatest. The cost of installing the wells, 79 in the coastal plain and 71 in the rock formations, would be approximately \$1,460,000. This amount was obtained by figuring each monitoring well would be set at a depth of 100 feet, and it would cost \$150 per foot in a rock formation, and \$50 per foot in the coastal plain. The cost of installing each well could be higher, but without a formal bid the range above is a rough estimate. The cost per well would be based on the depth of the well and the rock formation the well would be set in. The State would also need to purchase permanent or removable pumps that could pump from these deeper depths. The purchase of the equipment could run between \$10,000 and \$20,000. However, after the installation and purchasing of pumping equipment, the costs of the network should be on par of operating the AGWQMN at \$7,000 per well. It could also be expected to take twice as long to sample each well, since it will take longer to withdraw 3 well volumes before taking the sample.

#### *Ambient Ground-Water Quality Monitoring Network Costs: Recommendations*

For large scale monitoring networks that spatially represent each aquifer, the sampling frequency, while ideal, is not cost effective. If temporal variations are also a concern, the costs can be expected to at least double. A decision needs to be made on how many wells can accurately be used to represent the ground-water quality in a given aquifer. For each State this could be different, especially if land use or other factors are taken into consideration. There is also a need for the SOGW to prioritize if temporal or spatial data is more important. The limiting factor is always cost, and under the current fiscal times and even when funding is plentiful, operating a spatially and temporally sound ground water quality network, while definitely needed to protect the environmental and human health, is expensive.

The most cost effective way to meet the AGWQMN goals and the recommendations of the Framework document are to allow for the data collection of a 5-year baseline for the 30 unstressed wells and to keep sampling 30 wells annually on a 5-year cycle with no additional monitoring wells.

#### *Chloride Water Quality Monitoring Well Network Costs: Current O&M*

The cost to operate the chloride monitoring network in its current form is about \$15,500 per year. This equates to approximately \$1,500 per sample for most wells. However about 10% of the wells may cost as much as \$3,500 per sample.

#### *Chloride Water Quality Monitoring Well Network Costs: Spatial Gaps*

The cost to include seven additional wells in the chloride network would be \$10,500 for annual sampling of the wells or about \$1,500 per well.

### *Chloride Water Quality Monitoring Well Network Costs: Temporal Gaps*

Substantial changes would be needed to the sample collection frequency to meet the requirements set forth in Table 4.5.1 of the Framework document. First, the current frequency of measurement is greater than the 5-year minimum requirement. The cost to bring the entire network up a five-year sampling frequency would be \$30,000 per year. Using Table 4.5.1 all of the wells are confined aquifers. However, 54 of the wells are in the Kirkwood-Cohansey or Potomac-Raritan-Magothy aquifers and are characterized as "high" hydraulic conductivity and would require sampling every 2 years. This would cost \$48,500 per year. Maintaining a 5-year frequency on the remaining 33 wells would cost \$9,900 per year. This would be a total cost of \$58,400 per year.

### *Field Practice Gaps Costs*

Changes in field practices that would be required for the water-level trend network were described above. These changes could be accommodated at an additional cost of \$50 per well per year. This would add \$6,900 to the total cost of the water-level trend network.

Changes in field practices for the water-level surveillance network could be accommodated at an estimated cost of \$25 per well per year for a total of \$21,000.

Changes in the field practices of the chloride monitoring network would require pumping of larger volumes from deeper wells. This is estimated to cost an additional \$10,000 for these wells. In general these will also be from the Potomac-Raritan-Magothy aquifer system and will need to be sampled every other year so this cost can be spread out over 2 years for an annual cost of \$5,000.

### *Data Management Gap Costs*

There are several data elements that would need to be addressed in order to meet the current Framework requirements. Four wells do not have a depth entered in the database; these wells would need to be sounded at an approximate cost of \$1,000. Sixty-eight wells do not have screen interval information available and don't have well records available. The best way to determine the screen interval for these wells would be to use an optical televiewer and log the wells. This would cost about \$100,000 for the 68 wells. This would be substantially cheaper than installing new wells and would allow us to maintain the long period of record at these wells. Other information is available for additional fields for a number of wells, the cost of pulling the well logs or obtaining the wells logs and adding the data to the database would be \$20,000.

### *Cost Summary*

New Jersey currently spends approximately \$1,130,000 to operate and maintain the wells included in the NGWMN. Refer to Table 6 for a per sub-network summary of current operation and maintenance costs. This assumes the water-level surveillance and chloride networks are sampled once every five years and one-fifth of the ambient water quality network is sampled per

year. To address the major network gaps (assuming some of New Jersey Framework changes- primarily frequency of measurements are accepted) would require an additional \$140,000 to \$200,000 per year in O&M and a one-time capital cost of \$160,000. If all the identified gaps are filled (primarily in the spatial and temporal gaps) annual O&M costs would need to increase above current spending by \$2.4 million to \$2.9 million and one-time capital costs of \$1.6 million would be required. Refer to table 7 for details on the costs associated with the identified gaps.

<b>Network</b>	<b>Cost Per Well</b>	<b>Number of Wells</b>	<b>Total Per Network</b>
Water-Level Trend	\$3,300	138	\$455,000
Water Level Surveillance <sup>1</sup>	\$530	844	\$450,000
Ambient Water Quality <sup>2</sup>	\$7,000	30	\$210,000
Chloride Water Quality <sup>1</sup>	\$1,500	10	\$15,000

Table 6. Operation and maintenance costs per well and network totals for New Jersey’s Monitoring Networks.

- 1- this is the cost to sample the network once every five years.
- 2- this is the cost to sample one-fifth of the network every year (so the entire network is sampled once every five years).

Table 7. Summary of costs associated with identified gap in New Jersey's NGWMN.

Network	Gap	Incremental Changes Needed To Meet Guidelines	Estimated Capital Costs	Estimated Annual O&M costs
<b>Spatial Gaps</b>				
Water-Level Trend network	Early Mesozoic Basin aquifer	2 new wells	none	\$6,600
	New York and New England carbonate-rock aquifer	1 new well	none	\$3,300
Water-Level Surveillance network	none			
Ambient Water-Quality network	Gaps in Valley and Ridge and Piedmont and Blue Ridge	8 new wells	\$36,000 (\$4,500 per well to install)	\$56,000 (\$5,000 per well for sampling, \$2,000 or 36 hours per well for maintenance)
	Bedrock aquifer well network	150 bedrock wells	\$1,460,000 plus \$10,000 for new equip	\$1,050,000 (\$5,000 per well for sampling, \$2,000 per well for maintenance)
Chloride network	improved delineation of "salt lines"	7 new wells in NACP aquifer	minimal (use existing wells)	\$10,500
<b>Field Practice Gaps</b>				
Water-Level Trend network	Record weather conditions	revise techniques; \$50 per well per year for 138 wells	none	\$6,900
	Decontaminate tapes			
	Calibrate tapes			
	Manual/continuous changed to .01 ft difference			
	Track serial numbers of transducers			
	Manual measurements repeated to .01 ft			

<b>Network</b>	<b>Gap</b>	<b>Incremental Changes Needed To Meet Guidelines</b>	<b>Estimated Capital Costs</b>	<b>Estimated Annual O&amp;M costs</b>
	Accuracy of continuous measurement			
Water-Level Surveillance network	Record weather conditions	revise techniques; \$25 per well per year for 844 wells		\$21,000
	Decontaminate tapes			
	Calibrate tapes			
	Manual measurements repeated to .01 ft			
Ambient Water-Quality network	none			
Chloride network	Pump deep wells at least 3 casing volumes	~20 wells, most wells sampled every other year		\$5,000
<b>Data Management Gaps</b>				
Water-Level Trend network, Water-Level Surveillance network, and Chloride network combined	4 Wells with missing depth	Sound 4 wells	\$1,000	
	68 wells with missing screen interval	Optical televiewer log of 68 wells	\$100,000	
	Lithology, Casing info, screen material, and measuring points missing at a number of wells	Pull available records and enter into database	\$20,000	
Ambient Water-Quality network	none			
<b>Temporal gaps</b>				
Water-Level Trend network	none			
Water-Level Surveillance network	Meet Framework criteria of Quarterly Measurement or Daily measurement for low/high k wells with moderate/high withdrawals	363 monthly measured wells	none	\$2,322,500

Network	Gap	Incremental Changes Needed To Meet Guidelines	Estimated Capital Costs	Estimated Annual O&M costs
		363 wells with continuous recorders, more cost effective option		\$1,198,000
		481 wells with daily data at \$3,300 each	none	\$1,587,300
		<b>Total</b>		<b>\$2,785,300</b>
	Meet compromise of annual measurement for all wells	annual measurement	none	\$450,000
	Suggested NJ change of every 5 years	none	none	\$0
Ambient Water-Quality network	Annual sampling requirement	115 wells/year (currently only 30 wells per year sampled)	none	\$805,000 (\$5,000 per well for sampling, \$2,000 per well for maintenance)
Chloride network	Meet framework criteria of 2 or 5 year sampling	54 wells every two years; remaining 33 wells every 5-years	none	\$58,400
	Suggested NJ change to 5-year frequency	none	none	\$30,000
<b>Analyte gaps</b>				
Water-Level Trend network	none			
Water-Level Surveillance network	none			
Ambient Water-Quality network	none			

<b>Network</b>	<b>Gap</b>	<b>Incremental Changes Needed To Meet Guidelines</b>	<b>Estimated Capital Costs</b>	<b>Estimated Annual O&amp;M costs</b>
Chloride network	none			



## ***Acknowledgements***

We would like to acknowledge the members of the ACWI Subcommittee on Ground Water who assisted the New Jersey Pilot as part of the NJ Pilot work group. These members participated in monthly conference calls and provided assistance as needed. The workgroup members were William Cunningham, Robert Schreiber, Emery Cleaves, and Chuck Job. We would also like to acknowledge the members of the Portal work group who provided assistance and worked with us to get our wells into the prototype portal. Thanks to Jessica Lucido, Nate Booth, Jessica Thompson, and I-Lin Kuo.

## ***References Cited***

- dePaul, V.T., Rosman, Robert, and Lacombe, P.J., 2009, Water-level conditions in selected confined aquifers of the New Jersey and Delaware Coastal Plain, 2003: U.S. Geological Survey Scientific Investigations Report 2008-5145, 123 p., 9 pl.
- Miller, James A., 1999, Ground Water Atlas of the United States: Introduction: U.S. Geological Survey Hydrologic Atlas 730.
- Scott, J.C., 1990, Computerized stratified random site-selection approaches for design of a ground-water-quality sampling network, U.S. Geological Survey, WRI Report 90-4101.
- Serfes, M., 1994, Natural Ground-Water Quality in Bedrock of the Newark Basin, New Jersey, New Jersey Geological Survey Geological Survey Report GSR 35.
- Serfes, M., 2004, Ground-Water Quality in the Bedrock Aquifers of the Highlands and Valley and Ridge Physiographic Provinces of New Jersey, New Jersey Geological Survey Geological Survey Report GSR 39.
- Trapp Jr., H. and Horn, M.A., 1997, Ground Water Atlas of the United States: Delaware, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia, West Virginia, U.S. Geological Survey Hydrologic Atlas 730-L.
- Voronin, L.M., 2003, Documentation of revisions to the regional aquifer system analysis model of the New Jersey Coastal Plain, 2003, U.S. Geological Survey Water-Resources Investigations Report 03-4268.
- Walker, R.L. and Jacobson, E., 2003, Reconnaissance of hydrogeology and ground-water quality in Pennsauken Township and vicinity, Camden County, New Jersey, 1996-98, U.S. Geological Survey Water-Resources Investigations Report 03-4247.
- Zapeczka, O.S., 1989, Hydrogeologic framework of the New Jersey Coastal Plain: U.S. Geological Survey Professional Paper 1404-B.





Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ-Targeted Reason	WL-Targeted Reason	Synoptic Network
1	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-109.58	Confined		Decline > 40 ft	Y
2	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-106.32	Confined		Decline > 40 ft	Y
3	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-23.18	Confined			Y
4	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N		2	-61.56	Confined	Chloride < 125 mg/L	Decline > 40 ft	Y
5	Chesapeake Aquifer	122KRKDU	122KRKDU, Rio Grande water-bearing zone of the Kirkwood Formation	N			-0.72	Confined			Y
6	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N			-7.7	Unconfined			N
7	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-34.55	Confined			Y
8	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-100.48	Confined		Decline > 40 ft	Y
9	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-93.86	Confined		Decline > 40 ft	Y
10	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-104.43	Confined		Decline > 40 ft	Y
11	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-93.86	Confined		Decline > 40 ft	Y
12	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N		4	-80.98	Confined	Chloride < 125 mg/L	Decline > 40 ft	Y
13	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-115.55	Confined		Decline > 40 ft	Y
14	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-110.04	Confined		Decline > 40 ft	Y
15	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-106.23	Confined		Decline > 40 ft	Y
16	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-30.93	Confined			Y
17	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-111.5	Confined		Decline > 40 ft	Y
18	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-23.92	Confined			Y
19	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-85.52	Confined		Decline > 40 ft	Y
20	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-27.05	Confined			Y
21	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-96.47	Confined		Decline > 40 ft	Y
22	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N		22	-113.23	Confined	Chloride < 125 mg/L	Decline > 40 ft	Y
23	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N		3	-82.69	Confined	Chloride < 125 mg/L	Decline > 40 ft	Y
24	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-82.43	Confined		Decline > 40 ft	Y
25	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-60.01	Confined		Decline > 40 ft	Y
26	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-56.6	Confined		Decline > 40 ft	Y
27	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N		6	-18.13	Unconfined	Chloride < 125 mg/L		N
28	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N		6	-0.22	Unconfined			N
29	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N			8.9	Unconfined			N
30	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N		321	-63.42	Confined	Chloride > 125 mg/L	Decline > 40 ft	Y
31	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-105.61	Confined		Decline > 40 ft	Y
32	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-77.57	Confined		Decline > 40 ft	Y
33	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-89.17	Confined		Decline > 40 ft	Y
34	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-84.32	Confined		Decline > 40 ft	Y
35	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-84.78	Confined		Decline > 40 ft	Y
36	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N		68	-56.22	Confined	Chloride < 125 mg/L	Decline > 40 ft	Y
37	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-87.31	Confined		Decline > 40 ft	Y
38	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-87.84	Confined		Decline > 40 ft	Y
39	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		URBAN				Urban or Agricultural land use		N
40	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-23.1	Confined			Y
41	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-72.3	Confined		Decline > 40 ft	Y
42	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-106.27	Confined		Decline > 40 ft	Y
43	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		WETLANDS				Undeveloped land use		N
44	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		URBAN				Urban or Agricultural land use		N
45	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		FOREST				Undeveloped land use		N
46	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		URBAN				Urban or Agricultural land use		N
47	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		AGRICULTURE				Urban or Agricultural land use		N
48	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-48.55	Confined		Decline > 40 ft	Y
49	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-96.65	Confined		Decline > 40 ft	Y
50	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-90.99	Confined		Decline > 40 ft	Y
51	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-79.51	Confined		Decline > 40 ft	Y
52	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-87.7	Confined		Decline > 40 ft	Y
53	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-87.28	Confined		Decline > 40 ft	Y
54	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-57.08	Confined		Decline > 40 ft	Y
55	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-104.87	Confined		Decline > 40 ft	Y
56		227PSSC	227PSSC, Passaic Formation	N			-1.15	Unconfined			Y
57		112SDFD	112SDFD, Stratified drift		URBAN				Urban or Agricultural land use		N
58		112SDFD	112SDFD, Stratified drift		URBAN				Urban or Agricultural land use		N
59		112SDFD	112SDFD, Stratified drift		URBAN				Urban or Agricultural land use		N
60	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-26.49	Confined		Critical Area	Y
61	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-24.83	Confined		Critical Area	Y
62	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-18.51	Confined			Y
63	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-41.92	Confined		Decline > 40 ft	Y
64	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-36.14	Confined			Y
65	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	N			-30.24	Confined			Y
66	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-28.77	Confined			Y
67	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-23.95	Confined		Critical Area	Y
68	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-28.12	Confined		Critical Area	Y
69	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-24.92	Confined		Critical Area	Y
70	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-29.34	Confined		Critical Area	Y
71	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-29.4	Confined		Critical Area	Y
72	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-13.47	Confined		Critical Area	Y
73	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-22.1	Confined		Critical Area	Y





Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ-Targeted Reason	WL-Targeted Reason	Synoptic Network	
74	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-6.67	Confined			Y	
75	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-92.27	Confined		Critical area and decline > 40 ft	Y	
76	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-96.24	Confined		Critical area and decline > 40 ft	Y	
77	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-2.39	Confined			Y	
78	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-3.15	Confined			Y	
79	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-53.14	Confined		Decline > 40 ft	Y	
80	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-37.82	Confined		Critical Area	Y	
81	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-5.2	Unconfined			Y	
82	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-58.98	Confined		Critical area and decline > 40 ft	Y	
83	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-53.28	Confined		Critical area and decline > 40 ft	Y	
84	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-61.27	Confined		Critical area and decline > 40 ft	Y	
85	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-87.99	Confined		Critical area and decline > 40 ft	Y	
86	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-85.23	Confined		Critical area and decline > 40 ft	Y	
87	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-26	Confined			Y	
88	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	2			3.21	Confined			Y	
89	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-66.47	Confined		Critical area and decline > 40 ft	Y	
90	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-18.53	Confined			Y	
91	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			2	-56.77	Confined		Y	
92	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			19	-56.83	Confined	Chloride < 125 mg/L	Y	
93	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2				-64.61	Confined		Y	
94	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			8	-31.36	Confined	Critical Area	Y	
95	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2				-37.87	Confined	Critical Area	Y	
96	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2				-67.21	Confined	Critical area and decline > 40 ft	Y	
97	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2				-65.58	Confined	Critical area and decline > 40 ft	Y	
98	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2				-49.49	Confined	Critical area and decline > 40 ft	Y	
99	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	2				-70.98	Confined	Critical area and decline > 40 ft	Y	
100	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	2				-58.85	Confined	Critical area and decline > 40 ft	Y	
101	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	2				-66.84	Confined	Critical area and decline > 40 ft	Y	
102	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	2				-68.2	Confined	Critical area and decline > 40 ft	Y	
103	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N				-24.97	Confined		Y	
104	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N				-14.3	Confined		Y	
105	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N				-15.91	Confined		Y	
106	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N				-74.17	Confined	Decline > 40 ft	Y	
107	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N				-104.32	Confined	Decline > 40 ft	Y	
108	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N				-35.27	Confined		Y	
109	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N				-5.55	Confined		Y	
110	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	2				-65.69	Confined	Critical area and decline > 40 ft	Y	
111	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N				-4.7	Confined		Y	
112	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N				4.34	Unconfined		N	
113	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N				1.41	Unconfined		N	
114	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N				-55.11	Confined	Decline > 40 ft	Y	
115	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	2				-59.03	Confined	Critical area and decline > 40 ft	Y	
116	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N				-2.47	Confined		Y	
117	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2				-50.2	Confined	Critical area and decline > 40 ft	Y	
118	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2				-50.14	Confined	Critical area and decline > 40 ft	Y	
119	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N				-90.89	Confined	Decline > 40 ft	Y	
120	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N				-4.88	Confined		Y	
121	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N				8.03	Unconfined		N	
122	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2				-63.43	Confined	Critical area and decline > 40 ft	Y	
123	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2				-42.86	Confined	Critical area and decline > 40 ft	Y	
124	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2				-40.4	Confined	Critical area and decline > 40 ft	Y	
125	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N				5	4.77	Confined	Y	
126	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	2				3	-54.66	Confined	Critical area and decline > 40 ft	Y
127	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N				6.94	Unconfined		N	
128	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N				-56.57	Confined	Decline > 40 ft	Y	
129	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2				-85.95	Confined	Critical area and decline > 40 ft	Y	
130	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N				-81.27	Confined	Decline > 40 ft	Y	
131	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N				-78.41	Confined	Decline > 40 ft	Y	
132	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N				-53.65	Confined	Decline > 40 ft	Y	
133	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N				11.51	Confined		Y	
134	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2				-56.7	Confined	Critical area and decline > 40 ft	Y	
135	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2				-64.21	Confined	Critical area and decline > 40 ft	Y	
136	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N				-21.28	Confined		Y	
137	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N				-77.27	Confined	Decline > 40 ft	Y	
138	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2				-44.15	Confined	Critical area and decline > 40 ft	Y	
139	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2				-45.96	Confined	Critical area and decline > 40 ft	Y	
140	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2				-70.05	Confined	Critical area and decline > 40 ft	Y	
141	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N				-46.67	Confined	Decline > 40 ft	Y	
142	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2				-115.46	Confined	Critical area and decline > 40 ft	Y	
143	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2				-99.35	Confined	Critical area and decline > 40 ft	Y	
144	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N				-0.62	Confined		Y	
145	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N				-15.05	Unconfined		Y	
146	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2				-64.79	Confined	Critical area and decline > 40 ft	Y	
147	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2				-95.51	Confined	Critical area and decline > 40 ft	Y	
148	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2				-66.3	Confined	Critical area and decline > 40 ft	Y	







Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ-Targeted Reason	W/L-Targeted Reason	Synoptic Network
149	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-29.45	Confined			Y
150	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-61.13	Confined		Critical area and decline > 40 ft	Y
151	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-10.42	Confined			Y
152	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-50.03	Confined		Decline > 40 ft	Y
153	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-43.06	Confined		Critical area and decline > 40 ft	Y
154	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-19.73	Confined			Y
155	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-53.63	Confined		Critical area and decline > 40 ft	Y
156	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-47.79	Confined		Critical area and decline > 40 ft	Y
157	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-37.88	Confined		Critical Area	Y
158	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-4.42	Confined			Y
159	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-68.43	Confined		Decline > 40 ft	Y
160	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-3.67	Unconfined			Y
161	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-30.33	Confined		Critical Area	Y
162	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-8.34	Confined			Y
163	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-25.25	Confined			Y
164	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-74.01	Confined		Critical area and decline > 40 ft	Y
165	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-39.64	Confined		Critical Area	Y
166	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-84.96	Confined		Decline > 40 ft	Y
167	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-79.13	Confined		Decline > 40 ft	Y
168	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-66.82	Confined		Critical area and decline > 40 ft	Y
169	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-29.25	Unconfined		Decline > 25 ft	Y
170	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			0.83	Confined			Y
171	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N			-37.51	Unconfined		Decline > 25 ft	N
172	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-105.5	Confined		Decline > 40 ft	Y
173	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-51.08	Confined		Decline > 40 ft	Y
174	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-71.25	Confined	Chloride < 125 mg/L	Critical area and decline > 40 ft	Y
175	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-40.19	Confined		Decline > 40 ft	Y
176	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-69.15	Confined	Chloride < 125 mg/L	Critical area and decline > 40 ft	Y
177	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	AGRICULTURE				Urban or Agricultural land use		N
178	Castle Hayne-Aquia Aquifer	125HRRS	125HRRS, Hornerstown Sand	N	AGRICULTURE				Urban or Agricultural land use		N
179	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-85.11	Confined		Decline > 40 ft	Y
180	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-64.09	Unconfined		Decline > 25 ft	Y
181	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			0.48	Unconfined			Y
182	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			3.25	Unconfined			Y
183	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			27.55	Confined			Y
184	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-30.33	Confined			Y
185	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-45.85	Unconfined		Critical area and decline > 25 ft	Y
186	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-78.07	Confined		Decline > 40 ft	Y
187	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N	FOREST		-1.12	Unconfined	Undeveloped land use		Y
188	Severn-Magothy Aquifer	211MRSL	211MRSL, Marshalltown Formation	N	URBAN				Urban or Agricultural land use		N
189	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N	AGRICULTURE				Urban or Agricultural land use		N
190	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	FOREST				Undeveloped land use		N
191	Castle Hayne-Aquia Aquifer	124MNSQ	124MNSQ, Manasquan Formation	N	AGRICULTURE				Urban or Agricultural land use		N
192	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N	AGRICULTURE				Urban or Agricultural land use		N
193	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-108.17	Confined		Decline > 40 ft	Y
194	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-34.83	Confined		Critical Area	Y
195	Castle Hayne-Aquia Aquifer	125HRRS	125HRRS, Hornerstown Sand	N	AGRICULTURE				Urban or Agricultural land use		N
196	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-74.06	Confined		Critical area and decline > 40 ft	Y
197	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-53.03	Confined		Decline > 40 ft	Y
198	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-44.6	Confined		Decline > 40 ft	Y
199	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-64.32	Confined		Decline > 40 ft	Y
200	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	FOREST				Undeveloped land use		N
201	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	FOREST				Undeveloped land use		N
202	Severn-Magothy Aquifer	211MRSL	211MRSL, Marshalltown Formation	N	URBAN				Urban or Agricultural land use		N
203	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2	URBAN		-26.34	Unconfined	Urban or Agricultural land use	Critical area and decline > 25 ft	Y
204	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N	URBAN				Urban or Agricultural land use		N
205	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	FOREST				Undeveloped land use		N
206	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	FOREST				Undeveloped land use		N
207	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	AGRICULTURE				Urban or Agricultural land use		N
208	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N	URBAN				Urban or Agricultural land use		N
209	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N	AGRICULTURE				Urban or Agricultural land use		N
210	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-8.45	Confined		Critical Area	Y
211	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-74.48	Confined		Critical area and decline > 40 ft	Y
212	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-22.9	Confined			Y
213	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-21.91	Confined		Critical Area	Y
214	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	2			-30.3	Confined		Critical Area	Y
215	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			-6.81	Confined			Y
216	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-23.52	Confined			Y
217	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-24.22	Confined			Y
218	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-62.39	Confined		Decline > 40 ft	Y
219	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-59.63	Confined		Critical area and decline > 40 ft	Y
220	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-0.28	Unconfined			Y
221	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-62.26	Confined		Critical area and decline > 40 ft	Y
222	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-41.64	Confined		Critical area and decline > 40 ft	Y
223	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-33.36	Unconfined		Critical area and decline > 25 ft	Y













Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ- Targeted Reason	W/L- Targeted Reason	Synoptic Network
299	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-5.51	Confined		Critical Area	Y
300	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-16.23	Confined		Critical Area	Y
301	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-34.39	Confined			Y
302	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-33.57	Confined			Y
303	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-107.84	Confined		Decline > 40 ft	Y
304	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-53.98	Confined		Critical area and decline > 40 ft	Y
305	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-61.62	Confined		Critical area and decline > 40 ft	Y
306	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-63.26	Confined		Critical area and decline > 40 ft	Y
307	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-62.05	Confined		Decline > 40 ft	Y
308	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-66.66	Confined		Critical area and decline > 40 ft	Y
309	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-64.28	Confined		Critical area and decline > 40 ft	Y
310	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-66.59	Confined		Critical area and decline > 40 ft	Y
311	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-93.44	Confined		Critical area and decline > 40 ft	Y
312	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		FOREST				Undeveloped land use		N
313	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-134.97	Confined		Decline > 40 ft	Y
314	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		URBAN				Urban or Agricultural land use		N
315	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-13.46	Confined		Critical Area	Y
316	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-30.74	Confined		Critical Area	Y
317	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-16.85	Confined		Critical Area	Y
318	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-18.29	Confined			Y
319	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-28.23	Confined		Critical Area	Y
320	Severn-Magothy Aquifer	211MCVL	211MCVL, Merchantville Formation		URBAN				Urban or Agricultural land use		N
321	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system		URBAN				Urban or Agricultural land use		N
322	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-27.62	Confined		Critical Area	Y
323	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-27.55	Confined		Critical Area	Y
324	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-23.83	Confined		Critical Area	Y
325	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-24.2	Confined		Critical Area	Y
326	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-31.39	Confined		Critical Area	Y
327	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-22.8	Confined		Critical Area	Y
328	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-23.24	Confined		Critical Area	Y
329	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-18.48	Confined		Critical Area	Y
330	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-18.58	Confined		Critical Area	Y
331	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-17.78	Confined		Critical Area	Y
332	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-0.74	Confined			Y
333	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-50.93	Confined		Critical area and decline > 40 ft	Y
334	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-75.08	Confined		Decline > 40 ft	Y
335	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			4.73	Confined			Y
336	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-68.04	Confined		Decline > 40 ft	Y
337	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-159.65	Confined		Critical area and decline > 40 ft	Y
338	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			0	Confined			Y
339	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-14.01	Confined			Y
340	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-50.53	Confined		Critical area and decline > 40 ft	Y
341	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-17.05	Confined			Y
342	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-60.26	Confined		Decline > 40 ft	Y
343	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-60.99	Confined		Decline > 40 ft	Y
344	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N			-10.54	Confined			Y
345	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N		71			Chloride < 125 mg/L		N
346	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N		62	-14.56	Confined	Chloride < 125 mg/L		Y
347	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N			-12.78	Confined			Y
348	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N			-13.9	Confined			Y
349	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N			-16.07	Confined			Y
350	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N			-11.47	Confined			Y
351	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N			-9.37	Confined			Y
352	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N		18	-11.74	Confined	Chloride < 125 mg/L		Y
353	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N		11	-8.2	Confined	Chloride < 125 mg/L		Y
354	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N			-17.76	Confined			Y
355	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N			-16.72	Confined			Y
356	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N		9	-6.85	Confined	Chloride < 125 mg/L		Y
357	Chesapeake Aquifer	122KRKDU	122KRKDU, Rio Grande water-bearing zone of the Kirkwood Formation	N			-31.92	Confined			Y
358	Chesapeake Aquifer	122KRKDU	122KRKDU, Rio Grande water-bearing zone of the Kirkwood Formation	N			-20.3	Confined			Y
359	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N			-12.53	Confined			Y
360	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N			-8.38	Unconfined			Y
361	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N		48	-51.91	Confined		Decline > 40 ft	Y
362	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N		12	-0.1	Confined	Chloride < 125 mg/L		Y
363	Surficial Aquifer	112HLBC	112HLBC, Holly Beach water-bearing zone	N		91	3.27	Unconfined			N
364	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N		38	-0.31	Confined	Chloride < 125 mg/L		Y
365	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-53.76	Confined		Decline > 40 ft	Y
366	Chesapeake Aquifer	121CNSY	121CNSY, Cohansey Sand	N			1.33	Confined			Y
367	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-79.45	Confined		Decline > 40 ft	Y
368	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-86.75	Confined		Decline > 40 ft	Y
369	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-87.88	Confined		Decline > 40 ft	Y
370	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-93.32	Confined		Decline > 40 ft	Y
371	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-94.19	Confined		Decline > 40 ft	Y
372	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-51.35	Confined		Decline > 40 ft	Y
373	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-74.16	Confined		Decline > 40 ft	Y













Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ-Targeted Reason	WL-Targeted Reason	Synoptic Network
449	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		URBAN				Urban or Agricultural land use		N
450	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		AGRICULTURE				Urban or Agricultural land use		N
451	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		AGRICULTURE				Urban or Agricultural land use		N
452	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		AGRICULTURE				Urban or Agricultural land use		N
453	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		AGRICULTURE				Urban or Agricultural land use		N
454	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-96.04	Confined		Decline > 40 ft	Y
455	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		FOREST				Undeveloped land use		N
456	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		FOREST				Undeveloped land use		N
457	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		AGRICULTURE				Urban or Agricultural land use		N
458	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-190.47	Confined		Decline > 40 ft	Y
459	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-194.14	Confined		Decline > 40 ft	Y
460	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-193.1	Unconfined		Decline >25 ft	Y
461		112SFDF	112SFDF, Stratified drift	N			6.1	Unconfined		shows decline relative to well 130014	N
462		227PSSC	227PSSC, Passaic Formation		URBAN				Urban or Agricultural land use		N
463		112SFDF	112SFDF, Stratified drift		URBAN				Urban or Agricultural land use		N
464		112SFDF	112SFDF, Stratified drift		URBAN				Urban or Agricultural land use		N
465	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2		110	-70.7	Confined		Critical area and decline > 40 ft	Y
466	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-56.51	Confined		Critical area and decline > 40 ft	Y
467	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-41.09	Confined		Critical area and decline > 40 ft	Y
468	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-31.51	Confined		Critical Area	Y
469	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2		75	-66.43	Confined		Critical area and decline > 40 ft	Y
470	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2		37	-76.87	Confined		Critical area and decline > 40 ft	Y
471	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			5.22	Confined			Y
472	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-52.32	Confined		Critical area and decline > 40 ft	Y
473	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-6.32	Confined			Y
474	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N		820	-11.64	Confined			Y
475	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-18.3	Confined			Y
476	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-8.99	Confined			Y
477	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-69.46	Confined		Critical area and decline > 40 ft	Y
478	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-53.07	Confined		Critical area and decline > 40 ft	Y
479	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-14.17	Confined		Critical Area	Y
480	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-29.49	Confined			Y
481	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-34.3	Confined			Y
482	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-30.32	Confined			Y
483	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-71.83	Confined		Critical area and decline > 40 ft	Y
484	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2		22	-54.36	Confined		Critical area and decline > 40 ft	Y
485	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-46.9	Confined		Critical area and decline > 40 ft	Y
486	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-41.83	Confined		Critical area and decline > 40 ft	Y
487	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-38.24	Confined		Critical Area	Y
488	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-26.93	Confined		Critical Area	Y
489	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-9.14	Unconfined		Critical Area	Y
490	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2		79	-20.19	Confined		Critical Area	Y
491	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-32.19	Confined		Critical Area	Y
492	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-35.46	Unconfined		Critical area and decline > 25 ft	Y
493	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-42.02	Confined		Critical area and decline > 40 ft	Y
494	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-40.61	Confined		Critical area and decline > 40 ft	Y
495	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-35.24	Confined			Y
496	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-40.26	Confined		Critical area and decline > 40 ft	Y
497	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-17.2	Confined			Y
498	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N		143	-10.69	Confined	Chloride > 125 mg/L		Y
499	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-30.13	Confined		Critical Area	Y
500	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-11.7	Confined			Y
501	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system				1.45	Unconfined			N
502	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-54.53	Confined		Critical area and decline > 40 ft	Y
503	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-31.48	Confined			Y
504	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-38.29	Confined		Critical Area	Y
505	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-25.4	Confined		Critical Area	Y
506	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-61.11	Confined		Critical area and decline > 40 ft	Y
507	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	N			-7.76	Unconfined			Y
508	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-16.32	Confined			Y
509	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-3.45	Confined			Y
510	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N		849	-23.84	Confined	Chloride > 125 mg/L		Y
511	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-16.88	Confined			Y
512	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-19.66	Confined			Y
513	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N		253	-13.83	Confined	Chloride > 125 mg/L		Y
514	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-3.46	Confined			Y
515	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N		12	-55.88	Confined	Chloride < 125 mg/L	Critical area and decline > 40 ft	Y
516	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	2			8.77	Confined			Y
517	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N		130	-12.4	Confined			Y
518	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-9.57	Confined			Y
519	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-8.95	Confined			Y
520	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenhonah-Mount Laurel aquifer	N			2.78	Unconfined			Y
521	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N		580	-13.84	Confined	Chloride > 125 mg/L		Y
522	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N		14	-9.89	Confined	Chloride < 125 mg/L		Y
523	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N		213	-9.65	Confined	Chloride > 125 mg/L		Y





Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ-Targeted Reason	W/L-Targeted Reason	Synoptic Network
524	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N		3	-10.61	Confined	Chloride < 125 mg/L		Y
525	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-13.51	Confined		Critical Area	Y
526	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2		26	-42.2	Confined	Chloride < 125 mg/L	Critical area and decline > 40 ft	Y
527	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2		152	-31.26	Confined	Chloride > 125 mg/L	Critical Area	Y
528	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-14.69	Confined		Critical Area	Y
529	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2		30	-11.58	Confined	Chloride < 125 mg/L	Critical Area	Y
530	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2		130	1.1	Confined	Chloride > 125 mg/L	Critical Area	Y
531	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2		27	-2.31	Confined	Chloride < 125 mg/L	Critical Area	Y
532	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-11.83	Confined		Critical Area	Y
533	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-0.77	Unconfined		Critical Area	Y
534	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-2.61	Confined		Critical Area	Y
535	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			31.18	Confined			Y
536	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			13.86	Confined			Y
537	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2		200	-61.53	Confined	Chloride > 125 mg/L	Critical area and decline > 40 ft	Y
538	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-72.67	Confined		Critical area and decline > 40 ft	Y
539	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-61.38	Confined		Critical area and decline > 40 ft	Y
540	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			2.59	Confined			Y
541	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			7.79	Confined			Y
542	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-10.91	Confined			Y
543	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-19.55	Confined			Y
544	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N			17.11	Unconfined			N
545	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-59.64	Confined		Critical area and decline > 40 ft	Y
546	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			34.69	Confined			Y
547	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N			19.94	Unconfined			N
548	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-50.16	Confined		Decline > 40 ft	Y
549	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-40.77	Unconfined		Critical area and decline > 25 ft	Y
550	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-51.74	Confined		Critical area and decline > 40 ft	Y
551	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			21.14	Unconfined			Y
552	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-35.78	Confined			Y
553	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-8.2	Unconfined		Critical Area	Y
554	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-8.97	Confined			Y
555	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N		1	-52.46	Confined	Chloride < 125 mg/L	Decline > 40 ft	Y
556	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-30.21	Confined		Critical Area	Y
557	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	2			-11.07	Confined		Critical Area	Y
558	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-53.71	Confined		Decline > 40 ft	Y
559	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			22.63	Confined			Y
560	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	AGRICULTURE		1.74	Unconfined		Urban or Agricultural land use	N
561	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	AGRICULTURE					Urban or Agricultural land use	N
562	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	URBAN					Urban or Agricultural land use	N
563	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N			6.22	Unconfined			N
564	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-64.93	Confined		Decline > 40 ft	Y
565	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	URBAN					Urban or Agricultural land use	N
566	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-18.01	Confined			Y
567	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-112.73	Confined		Decline > 40 ft	Y
568	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-50.5	Confined		Decline > 40 ft	Y
569	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			17.93	Confined			Y
570	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-78.35	Unconfined		Critical area and decline > 25 ft	Y
571	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-71.79	Confined		Decline > 40 ft	Y
572	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-117.64	Unconfined		Decline > 25 ft	Y
573	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-0.3	Confined			Y
574	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			21.42	Confined			Y
575	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	AGRICULTURE					Urban or Agricultural land use	N
576	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-24.26	Confined			Y
577	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-25.24	Confined			Y
578	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-36.77	Confined		Critical Area	Y
579	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-26.55	Confined			Y
580	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-38.43	Confined			Y
581	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-48.3	Confined		Decline > 40 ft	Y
582	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	URBAN					Urban or Agricultural land use	N
583	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N	AGRICULTURE					Urban or Agricultural Land use	N
584	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	AGRICULTURE					Urban or Agricultural Land use	N
585	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			27.32	Confined			Y
586	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			16.39	Confined			Y
587	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-47.06	Confined		Decline > 40 ft	Y
588	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-35.87	Confined			Y
589	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-38.96	Confined			Y
590	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	2			-10.14	Confined		Critical Area	Y
591	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-82.59	Unconfined		Critical area and decline > 25 ft	Y
592	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			12.94	Confined			Y
593	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-54.32	Confined		Decline > 40 ft	Y
594	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	2			-53.16	Confined		Critical area and decline > 40 ft	Y
595	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-61.71	Confined		Decline > 40 ft	Y
596	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-42.1	Confined		Decline > 40 ft	Y
597	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-36.35	Unconfined		Decline > 25 ft	Y
598	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-13	Unconfined			Y





Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ-Targeted Reason	WL-Targeted Reason	Synoptic Network
599	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-6.56	Confined			Y
600	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-41.99	Confined		Decline > 40 ft	Y
601		112SFDF	112SFDF, Stratified drift		URBAN				Urban or Agricultural land use		N
602		112SFDF	112SFDF, Stratified drift		URBAN				Urban or Agricultural land use		N
603		231SCKN	231SCKN, Stockton Formation	N			4.26	Unconfined			N
604		227PSSC	227PSSC, Passaic Formation	N			1.03	Unconfined			N
605		227PSSC	227PSSC, Passaic Formation	N			0.65	Unconfined			N
606		231SCKN	231SCKN, Stockton Formation	N			-0.6	Unconfined			N
607		111ALVM	111ALVM, Holocene Alluvium- some may be in galciated, but not all		UNDEVELOPED				undeveloped land use		N
608		227PSSC	227PSSC, Passaic Formation		AGRICULTURE				Urban or Agricultural land use		N
609		400PCMB	400PCMB, Precambrian Erathem		AGRICULTURE				Urban or Agricultural land use		N
610		227PSSC	227PSSC, Passaic Formation		AGRICULTURE				Urban or Agricultural land use		N
611		231LCKG	231LCKG, Lockatong Formation		AGRICULTURE				Urban or Agricultural land use		N
612		227PSSC	227PSSC, Passaic Formation		URBAN				Urban or Agricultural land use		N
613		227PSSC	227PSSC, Passaic Formation		AGRICULTURE				Urban or Agricultural land use		N
614		227PSSC	227PSSC, Passaic Formation		AGRICULTURE				Urban or Agricultural land use		N
615	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	N			-35.12	Confined			Y
616	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	N			-39.62	Confined			Y
617	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	N			-9.48	Confined			Y
618	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	N			-30.98	Confined			Y
619	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	N			-12.08	Confined			Y
620		231LCKG	231LCKG, Lockatong Formation	N			16.75	Unconfined			N
621	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-19.67	Confined			Y
622	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-13.65	Confined			Y
623	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-20.9	Confined			Y
624	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-16.12	Unconfined			Y
625	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	N			-17.88	Confined			Y
626	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	N			-22.64	Confined			Y
627	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	N			3.98	Confined			Y
628	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	N			2.11	Confined			Y
629		227PSSC	227PSSC, Passaic Formation	N			2.5	Unconfined			N
630		231SCKN	231SCKN, Stockton Formation	N			0.79	Unconfined			N
631		227PSSC	227PSSC, Passaic Formation	N			3.07	Unconfined			N
632	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-29.09	Unconfined		Decline >25 ft	Y
633	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-11.35	Unconfined			Y
634		231SCKN	231SCKN, Stockton Formation		URBAN				Urban or Agricultural land use		N
635		227PSSC	227PSSC, Passaic Formation		AGRICULTURE				Urban or Agricultural land use		N
636		231LCKG	231LCKG, Lockatong Formation		AGRICULTURE				Urban or Agricultural land use		N
637		227PSSC	227PSSC, Passaic Formation		URBAN				Urban or Agricultural land use		N
638		231SCKN	231SCKN, Stockton Formation		URBAN				Urban or Agricultural land use		N
639		227PSSC	227PSSC, Passaic Formation		FOREST				Undeveloped land use		N
640	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-8.28	Confined			Y
641	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	N			-11.63	Confined			Y
642	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	N			-15.74	Confined			Y
643	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	N			-19.93	Confined			Y
644	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	N			-19.2	Confined			Y
645	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-6.1	Unconfined		Critical Area	Y
646	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-40.2	Confined		Critical area and decline > 40 ft	Y
647	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-0.75	Unconfined		Critical Area	Y
648	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-13.87	Confined		Critical Area	Y
649	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			4.14	Unconfined		Critical Area	Y
650	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	1			-44.76	Confined		Critical area and decline > 40 ft	Y
651	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-45.11	Confined		Critical area and decline > 40 ft	Y
652	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-16.87	Confined		Critical Area	Y
653	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-3.73	Unconfined		Critical Area	Y
654	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-53.41	Confined		Critical area and decline > 40 ft	Y
655	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-36.48	Confined		Critical Area	Y
656	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-32.77	Confined		Critical Area	Y
657	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-17.44	Unconfined		Critical Area	Y
658	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-55.42	Confined		Critical area and decline > 40 ft	Y
659	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-59.52	Confined		Critical area and decline > 40 ft	Y
660	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-35.01	Unconfined		Critical area and decline > 25 ft	Y
661	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-58.87	Confined		Critical area and decline > 40 ft	Y
662	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-9.62	Confined		Critical Area	Y
663	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-18.95	Confined		Critical Area	Y
664	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-29.26	Confined		Critical Area	Y
665	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			11.8	Unconfined		Critical Area	Y
666	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-43.61	Confined		Critical area and decline > 40 ft	Y
667	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	N			-24.2	Confined			Y
668	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-37.03	Confined		Critical Area	Y
669	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-11.12	Unconfined			Y
670	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	N			-29.82	Confined			Y
671	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	N			-27.4	Confined			Y
672	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-17.62	Unconfined		Critical Area	Y
673	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1		15	-20.53	Unconfined	Chloride < 125 mg/L	Critical Area	Y







Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ-Targeted Reason	WL-Targeted Reason	Synoptic Network
674	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1		486	-11.34	Confined	Chloride > 125 mg/L	Critical Area	Y
675	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-31.32	Confined		Critical Area	Y
676	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1		9			Chloride < 125 mg/L		N
677	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-30.68	Confined		Critical Area	Y
678	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1		37	-2.33	Confined	Chloride < 125 mg/L	Critical Area	Y
679	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1		44	-0.28	Confined		Critical Area	Y
680	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	N			-20.09	Confined			Y
681	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	N			-17.3	Unconfined			Y
682	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-38.36	Confined			Y
683	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	N			-35.38	Unconfined		Decline >25 ft	Y
684	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			11.95	Unconfined		Critical Area	Y
685	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-82.46	Unconfined		Critical area and decline > 25 ft	Y
686	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	N			-34.78	Confined			Y
687	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-38.11	Confined		Critical Area	Y
688	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-49.9	Unconfined		Critical area and decline > 25 ft	Y
689	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-45.27	Confined		Critical area and decline > 40 ft	Y
690	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-63.71	Unconfined		Critical area and decline > 25 ft	Y
691	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-56.02	Confined		Critical area and decline > 40 ft	Y
692	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	N			-16	Confined			Y
693	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	N			-45.08	Confined		Decline > 40 ft	Y
694	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1	FOREST		-10.12	Unconfined		Critical Area	Y
695	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1	URBAN				Urban or Agricultural land use		N
696		227PSSC	227PSSC, Passaic Formation		URBAN				Urban or Agricultural land use		N
697	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1	URBAN				Urban or Agricultural land use		N
698		227PSSC	227PSSC, Passaic Formation		URBAN				Urban or Agricultural land use		N
699		227PSSC	227PSSC, Passaic Formation		URBAN				Urban or Agricultural land use		N
700	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer		FOREST				Undeveloped land use		N
701		112SFDF	112SFDF, Stratified drift		URBAN				Urban or Agricultural Land		N
702	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	N			-40.24	Confined		Decline > 40 ft	Y
703	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-34.92	Confined			Y
704	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-37.81	Confined			Y
705	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-13.01	Confined		Critical Area	Y
706	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			0.88	Confined		Critical Area	Y
707	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-48.81	Confined		Critical area and decline > 40 ft	Y
708	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1		8	-104.36	Confined		Critical area and decline > 40 ft	Y
709	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-96.68	Confined		Critical area and decline > 40 ft	Y
710	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-120	Confined		Critical area and decline > 40 ft	Y
711	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-117.07	Confined		Critical area and decline > 40 ft	Y
712	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-57.88	Confined		Critical area and decline > 40 ft	Y
713	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-36.32	Confined		Critical Area	Y
714	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-44.59	Confined		Critical area and decline > 40 ft	Y
715	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-58.97	Confined		Critical area and decline > 40 ft	Y
716	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-81.53	Confined		Critical area and decline > 40 ft	Y
717	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-22.65	Confined		Critical Area	Y
718	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			9.58	Confined		Critical Area	Y
719	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-67.39	Confined		Critical area and decline > 40 ft	Y
720	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			34.4	Confined		Critical Area	Y
721	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-30.19	Confined		Critical Area	Y
722	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-70.01	Confined		Critical area and decline > 40 ft	Y
723	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-65.09	Confined		Critical area and decline > 40 ft	Y
724	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1		2	-28.52	Confined	Chloride < 125 mg/L	Critical Area	Y
725	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-16.46	Confined		Critical Area	Y
726	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-1.21	Confined		Critical Area	Y
727	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-46.01	Confined		Critical area and decline > 40 ft	Y
728	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-33.68	Confined		Critical Area	Y
729	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-120.27	Confined		Critical area and decline > 40 ft	Y
730	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-134.55	Confined		Critical area and decline > 40 ft	Y
731	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-62.91	Confined		Critical area and decline > 40 ft	Y
732	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-82.38	Confined		Critical area and decline > 40 ft	Y
733	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-69.06	Confined		Critical area and decline > 40 ft	Y
734	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-16.65	Confined		Critical Area	Y
735	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system			650			Chloride > 125 mg/L		N
736	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1		226	-25.15	Confined	Chloride > 125 mg/L	Critical Area	Y
737	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system			194			Chloride > 125 mg/L		N
738	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1		16	-27.27	Confined	Chloride < 125 mg/L	Critical Area	Y
739	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1		562	-18.76	Confined	Chloride > 125 mg/L	Critical Area	Y
740	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-54.19	Confined		Critical area and decline > 40 ft	Y
741	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-29.91	Confined		Critical Area	Y
742	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-66.35	Confined		Critical area and decline > 40 ft	Y
743	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-61.25	Confined		Critical area and decline > 40 ft	Y
744	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-65.05	Confined		Critical area and decline > 40 ft	Y
745	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-66.4	Confined		Critical area and decline > 40 ft	Y
746	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			10.39	Confined		Critical Area	Y
747	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-44.76	Confined		Critical area and decline > 40 ft	Y
748	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-50.69	Confined		Critical area and decline > 40 ft	Y





Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ-Targeted Reason	WL-Targeted Reason	Synoptic Network
749	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-55.59	Confined		Critical area and decline > 40 ft	Y
750	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-41.7	Confined		Critical area and decline > 40 ft	Y
751	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			8.12	Confined		Critical Area	Y
752	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-21.43	Confined		Critical Area	Y
753	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-35.97	Confined		Critical Area	Y
754	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-39.85	Confined		Critical Area	Y
755	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-48.97	Confined		Critical area and decline > 40 ft	Y
756	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1		23	-8.19	Confined	Chloride < 125 mg/L	Critical Area	Y
757	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-11.2	Confined		Critical Area	Y
758	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	N			-57.79	Confined		Decline > 40 ft	Y
759	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-60.46	Confined		Critical area and decline > 40 ft	Y
760	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-86.76	Confined		Critical area and decline > 40 ft	Y
761	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-46.7	Confined		Critical area and decline > 40 ft	Y
762	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1		3	-28.61	Confined	Chloride < 125 mg/L	Critical Area	Y
763	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-46.37	Confined		Critical area and decline > 40 ft	Y
764	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-12.91	Confined		Critical Area	Y
765	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-110.18	Confined		Critical area and decline > 40 ft	Y
766	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-116.38	Confined		Critical area and decline > 40 ft	Y
767	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-117.69	Confined		Critical area and decline > 40 ft	Y
768	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			0.72	Confined			Y
769	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			18.01	Confined			Y
770	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			6.42	Confined			Y
771	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			14.33	Confined			Y
772	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-129.85	Confined		Critical area and decline > 40 ft	Y
773	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-92.28	Confined		Critical area and decline > 40 ft	Y
774	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-61.01	Confined		Critical area and decline > 40 ft	Y
775	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-107.12	Confined		Critical area and decline > 40 ft	Y
776	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-98.87	Confined		Critical area and decline > 40 ft	Y
777	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-106.18	Confined		Critical area and decline > 40 ft	Y
778	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			12.97	Confined			Y
779	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-23.96	Confined		Critical Area	Y
780	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-32.91	Confined		Critical Area	Y
781	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-92.64	Confined		Critical area and decline > 40 ft	Y
782	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-64.65	Confined		Critical area and decline > 40 ft	Y
783	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-27.28	Confined		Critical Area	Y
784	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1		1	-19.27	Confined	Chloride < 125 mg/L	Critical Area	Y
785	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-52.72	Confined		Decline > 40 ft	Y
786	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-63.67	Confined		Critical area and decline > 40 ft	Y
787	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-75.45	Confined		Critical area and decline > 40 ft	Y
788	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-36.72	Confined			Y
789	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-11.62	Confined		Critical Area	Y
790	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-23.95	Confined		Critical Area	Y
791	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-102.94	Confined		Critical area and decline > 40 ft	Y
792	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-87.62	Confined		Critical area and decline > 40 ft	Y
793	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			22.17	Confined		Critical Area	Y
794	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-68.53	Confined		Critical area and decline > 40 ft	Y
795	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-52.54	Confined		Critical area and decline > 40 ft	Y
796	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1		774	-32.75	Confined	Chloride > 125 mg/L	Critical Area	Y
797	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1		4830	-12.38	Confined	Chloride > 125 mg/L	Critical Area	Y
798	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-70.81	Confined		Critical area and decline > 40 ft	Y
799	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	2			-50.72	Confined	Chloride < 125 mg/L	Critical area and decline > 40 ft	Y
800	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			19.28	Confined			Y
801	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-51.98	Confined		Critical area and decline > 40 ft	Y
802	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1		3	-65.54	Confined		Critical area and decline > 40 ft	Y
803	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1		2	-51.28	Confined	Chloride < 125 mg/L	Critical area and decline > 40 ft	Y
804	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			-7.82	Unconfined			Y
805	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-21.69	Confined		Critical Area	Y
806	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-16.64	Confined		Critical Area	Y
807	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			-10.74	Confined			Y
808	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-5.17	Confined		Critical Area	Y
809	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-110.18	Confined		Critical area and decline > 40 ft	Y
810	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			11.39	Confined			Y
811	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			13.53	Confined			Y
812	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			5.76	Confined		Critical Area	Y
813	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-125.76	Confined		Critical area and decline > 40 ft	Y
814	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-55.25	Confined		Critical area and decline > 40 ft	Y
815	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-53.57	Confined		Critical area and decline > 40 ft	Y
816	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-3.44	Confined		Critical Area	Y
817	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			0.08	Confined	Chloride < 125 mg/L	Critical Area	Y
818	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N		6	12.08	Confined			Y
819	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-12.74	Confined		Critical Area	Y
820	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-55.19	Confined		Critical area and decline > 40 ft	Y
821	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-68.44	Confined		Critical area and decline > 40 ft	Y
822	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-40.01	Confined		Critical area and decline > 40 ft	Y
823	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-29.12	Confined		Critical Area	Y







Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ-Targeted Reason	W/L-Targeted Reason	Synoptic Network
824	Potomac Aquifer	211FRNG	211FRNG, Farrington aquifer, Potomac-Raritan-Magothy aquifer system	1			-60.01	Confined		Critical area and decline > 40 ft	Y
825	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-49.84	Confined		Critical area and decline > 40 ft	Y
826	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	1			-54.29	Confined		Critical area and decline > 40 ft	Y
827	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-38.43	Confined		Critical Area	Y
828	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-2.9	Confined		Critical Area	Y
829	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-53.73	Confined		Critical area and decline > 40 ft	Y
830	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-59.62	Confined		Decline > 40 ft	Y
831	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1		15200	-5.03	Confined	Chloride > 125 mg/L	Critical Area	Y
832	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			7.25	Unconfined			Y
833	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer		AGRICULTURE				Urban or Agricultural Land		N
834	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-21.87	Confined		Critical Area	Y
835	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			7.3	Confined			Y
836	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			9.15	Confined			Y
837	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			-11.25	Confined			Y
838	Severn-Magothy Aquifer	211MLRL	211MLRL, Mount Laurel Sand		AGRICULTURE				Urban or Agricultural land use		N
839	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		URBAN				Urban or Agricultural land use		N
840	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		URBAN				Urban or Agricultural land use		N
841	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer		URBAN				Urban or Agricultural land use		N
842	Severn-Magothy Aquifer	211RDBK	211RDBK, Red Bank Sand		URBAN				Urban or Agricultural land use		N
843	Severn-Magothy Aquifer	211MRSL	211MRSL, Marshalltown Formation		URBAN				Urban or Agricultural land use		N
844	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N	AGRICULTURE		27.81	Unconfined	Urban or Agricultural land use		N
845	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1	AGRICULTURE				Urban or Agricultural land use		N
846	Severn-Magothy Aquifer	211RDBK	211RDBK, Red Bank Sand		AGRICULTURE				Urban or Agricultural land use		N
847	Severn-Magothy Aquifer	211RDBK	211RDBK, Red Bank Sand		AGRICULTURE				Urban or Agricultural land use		N
848	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-43.01	Confined		Critical area and decline > 40 ft	Y
849	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system		AGRICULTURE				Urban or Agricultural land use		N
850	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-30.62	Confined		Critical Area	Y
851	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-95.58	Confined		Critical area and decline > 40 ft	Y
852	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-45.1	Confined		Decline > 40 ft	Y
853	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-10.28	Confined		Critical Area	Y
854	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	1			21.25	Confined			Y
855	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-21.41	Confined		Critical Area	Y
856	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-8.96	Confined		Critical Area	Y
857	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-8.26	Confined		Critical Area	Y
858	Severn-Magothy Aquifer	211ODBG	211ODBG, Old Bridge aquifer, Potomac-Raritan-Magothy aquifer system	1			-25.18	Confined		Critical Area	Y
859	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	1			-73.44	Confined		Critical area and decline > 40 ft	Y
860	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			-3.81	Confined			Y
861		112SDFD	112SDFD, Stratified drift	N			19.62	Unconfined			N
862		112SDFD	112SDFD, Stratified drift	N			-2.45	Unconfined			N
863		112SDFD	112SDFD, Stratified drift	N			0.85	Unconfined			N
864		112SDFD	112SDFD, Stratified drift	N			-1.23	Unconfined			N
865		112SDFD	112SDFD, Stratified drift	N			1.92	Unconfined			N
866		112SDFD	112SDFD, Stratified drift	N			2.2	Unconfined			N
867		400PCMB	400PCMB, Precambrian Erathem	N			5.2	Unconfined			N
868		112SDFD	112SDFD, Stratified drift	N			3.96	Unconfined			N
869		112SDFD	112SDFD, Stratified drift	N			2.51	Unconfined			N
870		112SDFD	112SDFD, Stratified drift		UNDEVELOPED				undeveloped land use		N
871		112SDFD	112SDFD, Stratified drift		URBAN				Urban or Agricultural land use		N
872		112SDFD	112SDFD, Stratified drift		URBAN				Urban or Agricultural land use		N
873		112SDFD	112SDFD, Stratified drift		FOREST				Undeveloped land use		N
874		112SDFD	112SDFD, Stratified drift		FOREST				Undeveloped land use		N
875		112SDFD	112SDFD, Stratified drift		FOREST				Undeveloped land use		N
876		112SDFD	112SDFD, Stratified drift		URBAN				Urban or Agricultural land use		N
877		400PCMB	400PCMB, Precambrian Erathem		URBAN				Urban or Agricultural land use		N
878		112SDFD	112SDFD, Stratified drift		URBAN				Urban or Agricultural land use		N
879	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-59.97	Confined		Decline > 40 ft	Y
880	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-124.45	Confined		Critical area and decline > 40 ft	Y
881	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	1			-53.01	Confined		Decline > 40 ft	Y
882	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N		2	3.46	Unconfined	Chloride < 125 mg/L		N
883	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N		8	-22.12	Confined	Chloride < 125 mg/L		Y
884	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	1		815	-34.86	Confined	Chloride > 125 mg/L	Critical Area	Y
885	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N			5.12	Unconfined			Y
886	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N		3	-63.9	Confined		Decline > 40 ft	Y
887	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-116.9	Confined		Critical area and decline > 40 ft	Y
888	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-122.51	Confined		Critical area and decline > 40 ft	Y
889	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-129.78	Confined		Critical area and decline > 40 ft	Y
890	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	1			-54.49	Confined		Critical area and decline > 40 ft	Y
891	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-124.92	Confined		Critical area and decline > 40 ft	Y
892	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N			-0.05	Unconfined			Y
893	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-72.79	Confined		Critical area and decline > 40 ft	Y
894	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	1		1	-55.59	Confined	Chloride < 125 mg/L	Critical area and decline > 40 ft	Y
895	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-44.52	Confined		Decline > 40 ft	Y
896	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N		4	-44.63	Confined		Decline > 40 ft	Y
897	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-43.68	Confined		Decline > 40 ft	Y
898	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	1			-62.78	Confined		Critical area and decline > 40 ft	Y





Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ-Targeted Reason	W/L-Targeted Reason	Synoptic Network
899	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	1			-68.97	Confined		Critical area and decline > 40 ft	Y
900	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-105.41	Confined		Critical area and decline > 40 ft	Y
901	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-31.13	Confined			Y
902	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			3.85	Confined			Y
903	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-6.43	Confined			Y
904	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N			2.28	Unconfined			N
905	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-75.75	Confined		Critical area and decline > 40 ft	Y
906	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			8.16	Confined			Y
907	Severn-Magothy Aquifer	211MLRL	211MLRL, Mount Laurel Sand	N			-8.67	Confined			Y
908	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-96.88	Confined		Critical area and decline > 40 ft	Y
909	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-70.06	Confined		Decline > 40 ft	Y
910	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			-7.76	Unconfined			Y
911	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			6.39	Confined			Y
912	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-145.87	Confined		Critical area and decline > 40 ft	Y
913	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-140.32	Confined		Critical area and decline > 40 ft	Y
914	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-139.27	Confined		Critical area and decline > 40 ft	Y
915	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-170.19	Confined		Critical area and decline > 40 ft	Y
916	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	1			-60.06	Confined		Critical area and decline > 40 ft	Y
917	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-124.9	Confined		Critical area and decline > 40 ft	Y
918	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-145.81	Confined		Critical area and decline > 40 ft	Y
919	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-136.01	Confined		Critical area and decline > 40 ft	Y
920	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-105.18	Confined		Critical area and decline > 40 ft	Y
921	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-90.86	Confined		Critical area and decline > 40 ft	Y
922	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-55.36	Confined		Decline > 40 ft	Y
923	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	1			-56.89	Confined		Critical area and decline > 40 ft	Y
924	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-108.51	Confined	Chloride < 125 mg/L	Critical area and decline > 40 ft	Y
925	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-63.09	Confined		Critical area and decline > 40 ft	Y
926	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N			12.74	Unconfined			N
927	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N			10.54	Unconfined			N
928	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-33.94	Confined			Y
929	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-101.99	Confined	Chloride < 125 mg/L	Critical area and decline > 40 ft	Y
930	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-61.21	Confined		Critical area and decline > 40 ft	Y
931	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-140.78	Confined		Critical area and decline > 40 ft	Y
932	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-103.71	Confined	Chloride < 125 mg/L	Critical area and decline > 40 ft	Y
933	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-43.83	Confined		Decline > 40 ft	Y
934	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-54.72	Confined		Decline > 40 ft	Y
935	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-49.54	Confined		Decline > 40 ft	Y
936	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	1			-76.97	Confined		Critical area and decline > 40 ft	Y
937	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-76.15	Confined		Critical area and decline > 40 ft	Y
938	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	N			-52.67	Confined		Decline > 40 ft	Y
939	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-60.89	Confined		Decline > 40 ft	Y
940	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-17.49	Confined			Y
941	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	1			-58.97	Confined		Critical area and decline > 40 ft	Y
942	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	1			-55.86	Confined		Critical area and decline > 40 ft	Y
943	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-40.82	Confined		Decline > 40 ft	Y
944	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-50.31	Confined		Decline > 40 ft	Y
945	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-70.39	Confined		Decline > 40 ft	Y
946	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-46.18	Confined		Decline > 40 ft	Y
947	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	1			-49.82	Confined		Critical area and decline > 40 ft	Y
948	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			-12.7	Confined			Y
949	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			9.94	Confined			Y
950	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-20.4	Confined			Y
951	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-45.34	Confined		Critical area and decline > 40 ft	Y
952	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-21.25	Confined			Y
953	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-45.4	Confined		Critical area and decline > 40 ft	Y
954	Chesapeake Aquifer	122KRKDU	122KRKDU, Rio Grande water-bearing zone of the Kirkwood Formation	N			-13.74	Confined			Y
955	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	1			-55.36	Confined		Critical area and decline > 40 ft	Y
956	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-60.21	Confined		Critical area and decline > 40 ft	Y
957	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-87.54	Confined		Critical area and decline > 40 ft	Y
958	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-53.67	Confined		Critical area and decline > 40 ft	Y
959	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-101.31	Confined		Critical area and decline > 40 ft	Y
960	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	1			-93.58	Confined		Critical area and decline > 40 ft	Y
961	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-55.12	Confined		Decline > 40 ft	Y
962	Chesapeake Aquifer	122KRKDU	122KRKDU, Rio Grande water-bearing zone of the Kirkwood Formation	N			-23.17	Confined			Y
963	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-43.92	Confined		Decline > 40 ft	Y
964	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			15.12	Confined			Y
965	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincentown aquifer	N			-18.54	Confined			Y
966	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-26.14	Confined			Y
967	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-52.69	Confined		Decline > 40 ft	Y
968	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-75.29	Confined		Critical area and decline > 40 ft	Y
969	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-131.03	Confined		Critical area and decline > 40 ft	Y
970	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N			7.34	Unconfined			N
971	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-44.93	Confined		Decline > 40 ft	Y
972	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-43.32	Confined		Decline > 40 ft	Y
973	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-10.87	Confined			Y





Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ-Targeted Reason	W/L-Targeted Reason	Synoptic Network
974	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-39.1	Confined			Y
975	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	1			-41.58	Confined		Critical area and decline > 40 ft	Y
976	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-1.29	Confined			Y
977	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-3.88	Unconfined			Y
978	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N		131	-48.54	Confined	Chloride > 125 mg/L	Decline > 40 ft	Y
979	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-49.67	Confined		Decline > 40 ft	Y
980	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-19.22	Confined			Y
981	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-114.45	Unconfined		Critical area and decline > 25 ft	Y
982	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-87.99	Unconfined		Critical area and decline > 25 ft	Y
983	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-21.71	Unconfined			Y
984	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-95.44	Confined		Critical area and decline > 40 ft	Y
985	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-120.2	Confined		Critical area and decline > 40 ft	Y
986	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-120.75	Confined		Critical area and decline > 40 ft	Y
987	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		WETLANDS				Undeveloped land use		N
988	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		FOREST				Undeveloped land use		N
989	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		FOREST				Undeveloped land use		N
990	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		FOREST				Undeveloped land use		N
991	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		URBAN				Urban or Agricultural land use		N
992	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		URBAN				Urban or Agricultural Land		N
993	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system	N	URBAN		-1.36	Unconfined	Urban or Agricultural land use		N
994	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		URBAN				Urban or Agricultural land use		N
995	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-39.77	Confined			Y
996	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-1.58	Confined			Y
997	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-105.76	Confined		Critical area and decline > 40 ft	Y
998	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-21.15	Confined			Y
999	Chesapeake Aquifer	122KRKDU	122KRKDU, Rio Grande water-bearing zone of the Kirkwood Formation	N			-40.93	Confined		Decline > 40 ft	Y
1000	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	1			-62.42	Confined		Critical area and decline > 40 ft	Y
1001	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-53.84	Confined		Decline > 40 ft	Y
1002	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	1			-54.36	Confined		Critical area and decline > 40 ft	Y
1003	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-21.6	Confined			Y
1004	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-69.47	Confined		Decline > 40 ft	Y
1005	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-54.78	Confined		Decline > 40 ft	Y
1006	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-43.91	Confined		Decline > 40 ft	Y
1007	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-45.73	Confined		Decline > 40 ft	Y
1008	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-12.85	Confined			Y
1009	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-54.65	Confined		Decline > 40 ft	Y
1010	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	1			-52.67	Confined		Critical area and decline > 40 ft	Y
1011	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-29.86	Confined			Y
1012	Castle Hayne-Aquia Aquifer	124PNPN	124PNPN, Piney Point aquifer	N			-47.86	Confined		Decline > 40 ft	Y
1013	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-48.82	Confined		Decline > 40 ft	Y
1014	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-58.48	Confined		Decline > 40 ft	Y
1015	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-11.99	Confined			Y
1016	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	1			-175.52	Confined		Critical area and decline > 40 ft	Y
1017	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-18.49	Confined			Y
1018	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-17.86	Confined			Y
1019	Chesapeake Aquifer	122KRKDL	122KRKDL, Atlantic City 800-Foot sand of the Kirkwood Formation	N			-41.69	Confined		Decline > 40 ft	Y
1020		112SFDF	112SFDF, Stratified drift		FOREST				Undeveloped land use		N
1021		112SFDF	112SFDF, Stratified drift		URBAN				Urban or Agricultural land use		N
1022		112SFDF	112SFDF, Stratified drift		URBAN				Urban or Agricultural Land		N
1023		112SFDF	112SFDF, Stratified drift		URBAN				Urban or Agricultural land use		N
1024	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N		8	-28.08	Confined			Y
1025	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-31.07	Confined			Y
1026	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-14.21	Confined			Y
1027	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-50.03	Confined		Decline > 40 ft	Y
1028	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-10.66	Confined			Y
1029	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-1.31	Confined			Y
1030	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-31.91	Confined			Y
1031	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-11.25	Confined			Y
1032	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-21.98	Confined			Y
1033	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N		444	-40.53	Confined	Chloride > 125 mg/L	Decline > 40 ft	Y
1034	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-29.85	Confined			Y
1035	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-50.56	Confined		Decline > 40 ft	Y
1036	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-37.4	Confined			Y
1037	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-30.97	Confined			Y
1038	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			-1.59	Confined			Y
1039	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N		153	-32.14	Confined	Chloride > 125 mg/L		Y
1040	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-15.4	Confined			Y
1041	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N		1720	-40.62	Confined	Chloride > 125 mg/L	Decline > 40 ft	Y
1042	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N		86	-8.12	Confined	Chloride < 125 mg/L		Y
1043	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N		697	-38.32	Confined	Chloride > 125 mg/L		Y
1044	Castle Hayne-Aquia Aquifer	125VNCC	125VNCC, Vincentown aquifer	N			-21.23	Confined			Y
1045	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-30.14	Confined			Y
1046	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-47.46	Confined		Decline > 40 ft	Y
1047	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-44.03	Confined		Decline > 40 ft	Y
1048	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-3.74	Confined			Y








Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ-Targeted Reason	WL-Targeted Reason	Synoptic Network
1049	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			7.3	Unconfined			Y
1050	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-42.92	Confined		Decline > 40 ft	Y
1051	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-10.68	Confined			Y
1052	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-11.27	Confined			Y
1053	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-15.51	Confined			Y
1054	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-15.14	Confined			Y
1055	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-43.14	Confined		Decline > 40 ft	Y
1056	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-62.9	Confined		Decline > 40 ft	Y
1057	Severn-Magothy Aquifer	211EGLS	211EGLS, Englishtown aquifer system	N			0.09	Confined			Y
1058	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			9.09	Confined			Y
1059	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-8.74	Confined			Y
1060	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		AGRICULTURE				Urban or Agricultural land use		N
1061	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-12.56	Confined			Y
1062	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		AGRICULTURE				Urban or Agricultural land use		N
1063	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		AGRICULTURE				Urban or Agricultural land use		N
1064	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		URBAN				Urban or Agricultural land use		N
1065	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N		3320	-62.26	Confined	Chloride > 125 mg/L	Decline > 40 ft	Y
1066	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-25.62	Confined			Y
1067	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-49.37	Confined		Decline > 40 ft	Y
1068	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-30.43	Confined			Y
1069	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-1.42	Unconfined			Y
1070	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-23.11	Confined			Y
1071	Potomac Aquifer	211MRPA	211MRPA, Potomac-Raritan-Magothy aquifer system, undifferentiated	N			-58.77	Unconfined		Decline >25 ft	Y
1072	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-29.01	Unconfined		Decline >25 ft	Y
1073	Castle Hayne-Aquia Aquifer	125VNCN	125VNCN, Vincetown aquifer		AGRICULTURE				Urban or Agricultural land use		N
1074	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		AGRICULTURE				Urban or Agricultural land use		N
1075	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer		AGRICULTURE				Urban or Agricultural land use		N
1076	Chesapeake Aquifer	121CKKD	121CKKD, Kirkwood-Cohansey aquifer system		AGRICULTURE				Urban or Agricultural land use		N
1077	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			1.12	Confined			Y
1078	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-45.54	Confined		Decline > 40 ft	Y
1079	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-90.4	Confined		Decline > 40 ft	Y
1080	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-32.73	Confined			Y
1081	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-1.24	Confined			Y
1082	Severn-Magothy Aquifer	211MRSL	211MRSL, Marshalltown Formation		AGRICULTURE				Urban or Agricultural land use		N
1083	Potomac Aquifer	211MRPAL	211MRPAL, Lower Potomac-Raritan-Magothy aquifer	N			-15.19	Confined			Y
1084	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-16.88	Confined			Y
1085	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-9.87	Confined			Y
1086	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-6.07	Confined			Y
1087	Severn-Magothy Aquifer	211MRPAU	211MRPAU, Upper Potomac-Raritan-Magothy aquifer	N			-12.62	Confined			Y
1088	Potomac Aquifer	211MRPAM	211MRPAM, Middle Potomac-Raritan-Magothy aquifer	N			-54.59	Confined		Decline > 40 ft	Y
1089	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-11.52	Confined			Y
1090	Severn-Magothy Aquifer	211MLRW	211MLRW, Wenonah-Mount Laurel aquifer	N			-16.52	Confined			Y
1091		227PSSC	227PSSC, Passaic Formation	N	AGRICULTURE		8.15	Unconfined	Urban or Agricultural land use		N
1092		227PSSC	227PSSC, Passaic Formation	N	AGRICULTURE		-2.16	Unconfined	Urban or Agricultural land use		N
1093		227PSSC	227PSSC, Passaic Formation		AGRICULTURE				Urban or Agricultural land use		N
1094		227PSSC	227PSSC, Passaic Formation		AGRICULTURE				Urban or Agricultural land use		N
1095		351BDVL	351BDVL, Bossardville Limestone	N			2.76	Unconfined			N
1096		371ALNN	371ALNN, Allentown Dolomite	N			5.41	Unconfined			N
1097		112SFDF	112SFDF, Stratified drift	N			-1.17	Unconfined			N
1098		371ALNN	371ALNN, Allentown Dolomite	N			-0.59	Unconfined			N
1099		112SFDF	112SFDF, Stratified drift	N			-3.74	Unconfined			N
1100		112SFDF	112SFDF, Stratified drift	N			2.5	Unconfined			N
1101		400PCMB	400PCMB, Precambrian Erathem	N			0.73	Unconfined			N
1102		112SFDF	112SFDF, Stratified drift		UNDEVELOPED				undeveloped land use		N
1103		112SFDF	112SFDF, Stratified drift		AGRICULTURE				Urban or Agricultural land use		N
1104		112SFDF	112SFDF, Stratified drift		AGRICULTURE				Urban or Agricultural land use		N
1105		350GRPD	350GRPD, Green Pond Formation		UNDEVELOPED				Undeveloped land use		N
1106		112SFDF	112SFDF, Stratified drift		AGRICULTURE				Urban or Agricultural land use		N
1107		112SFDF	112SFDF, Stratified drift		AGRICULTURE				Urban or Agricultural land use		N
1108		112SFDF	112SFDF, Stratified drift		URBAN				Urban or Agricultural land use		N
1109		227PSSC	227PSSC, Passaic Formation	N			0.98	Unconfined			N
1110		227PSSC	227PSSC, Passaic Formation		URBAN				Urban or Agricultural land use		N
1111		112SFDF	112SFDF, Stratified drift		URBAN				Urban or Agricultural land use		N
1112		227PSSC	227PSSC, Passaic Formation		URBAN				Urban or Agricultural land use		N
1113		112SFDF	112SFDF, Stratified drift		URBAN				Urban or Agricultural land use		N
1114		361MRBG	361MRBG, Martinsburg Shale	N			0.53	Unconfined			N
1115		112SFDF	112SFDF, Stratified drift		FOREST				undeveloped land use		N
1116		112SFDF	112SFDF, Stratified drift		UNDEVELOPED				undeveloped land use		N
1117		112SFDF	112SFDF, Stratified drift	N	AGRICULTURE		2.79	Unconfined	Urban or Agricultural land use		N
1118		112SFDF	112SFDF, Stratified drift		URBAN				Urban or Agricultural land use		N
1119		371ALNN	371ALNN, Allentown Dolomite		AGRICULTURE				Urban or Agricultural Land		N
1120		364JKBG	364JKBG, Jacksonburg Limestone		AGRICULTURE				Urban or Agricultural land use		N
1121		371ALNN	371ALNN, Allentown Dolomite		AGRICULTURE				Urban or Agricultural Land		N
1122		112SFDF	112SFDF, Stratified drift		AGRICULTURE				Urban or Agricultural land use		N
1123		360KTTN	360KTTN, Kittatiny Limestone		URBAN				Urban or Agricultural Land		N

Row #	Organization	SiteNumber	SiteName	Latitude	Longitude	Horizontal Datum	Altitude	alt_datum_cd	National Aquifer Code	Local Aquifer Name	Water Quality SubNetwork	WQ Baseline Achieved	WQ Unstressed
1124	USGS NJ / NJGS	404900075043601	410568-- MW95	40.81676464	-75.07628556	NAD83	315	NGVD29	N100GLCIAL	Stratified drift	Yes	No	No

Row #	WQ_Well_Type	Water Quality_System_Name	Water Level SubNetwork	WL Baseline Achieved	WL_Unstressed	WL Well Type	Water Level System Name	QW_Network	National Aquifer Name
1124	SURVEILLANCE	NJ WSC NWIS QWDATA DATABASE	No					Ambient	Sand and gravel aquifers (glaciated regions)

Row #	Major Aquifer Name	Local Aquifer Code	Local Aquifer	Critical Area	Land Use Category	Recent Chloride	Water Level Decline	Aquifer Type	WQ-Targeted Reasson	WL-Targeted Reasson	Synoptic Network
1124		112SFDF	112SFDF, Stratified drift		AGRICULTURE				Urban or Agricultural land use		N

**Appendix 2. Ambient Ground-Water Quality Monitoring Network Forms and Associated Data.**

November 2006  U. S. GEOLOGICAL SURVEY GROUND-WATER QUALITY NOTES FIELD ID \_\_\_\_\_  
 NWIS RECORD NO \_\_\_\_\_

Station No. \_\_\_\_\_ Station Name \_\_\_\_\_ Field ID \_\_\_\_\_  
 Sample Date \_\_\_\_\_ Mean Sample Time (watch) \_\_\_\_\_ Time Datum \_\_\_\_\_ (eg, EST, EDT, UTC)  
 Sample Medium \_\_\_\_\_ Sample Type \_\_\_\_\_ Sample Purpose (71999) \_\_\_\_\_ Purpose of Site Visit (50280) \_\_\_\_\_ QC Samples Collected? Y N  
 Project No. \_\_\_\_\_ Proj Name \_\_\_\_\_ Project No. \_\_\_\_\_ Proj Name \_\_\_\_\_  
 Sampling Team \_\_\_\_\_ Team Lead Signature \_\_\_\_\_ Date \_\_\_\_\_

FIELD MEASUREMENTS								
Property	Parm Code	Method Code	Result	Units	Re-mark Code	Value Qualifier	Null Value Qualifier	NWIS Result-Level Comments
Water Level (see p. 8 for codes and units)								
Flow Rate	00059			gal/min				
Sampling Depth	78890 00003			ft blw msl ft				
Depth to top of sampling interval	72015			ft blw lsd				
Depth to bottom of sampling interval	72016			ft blw lsd				
Temperature, Air	00020	THM04 (thermistor) THM05 (thermometer)		°C				
Temperature, Water	00010	THM01 (thermistor) THM02 (thermometer)		°C				
Specific Conductance	00095	SC001 (contacting sensor)		µS/cm				
Dissolved Oxygen	00300	MEMBR (amperometric) LUMIN (luminescent)		mg/L				
Barometric Pressure	00025			mm Hg				
pH	00400	PROBE (electrode)		units				
ANC, unfiltered, incremental	00419	TT001		mg/L				
Alkalinity, filtered, incremental	39086	TT013		mg/L				
Carbonate, filtered, incremental	00452	TT019		mg/L				
Bicarbonate, filtered, incremental	00453	TT017		mg/L				
Hydroxide, filtered, incremental	71834	TT023		mg/L				
Turbidity [see attachment for codes]								
Redox potential (Eh)	63002			mvolts				
Hydrogen sulfide odor detected?	71875	SNIF1 (sniff test, acidified sample) SNIF2 (sniff test, unacidified sample)	#	Yes No	M detect U non-detect			Sample acidified beforehand? yes no
Hydrogen sulfide, unfiltered, measured	99119	ISE01 (electrode) KIT01 (Chemetrics) KIT02 (Hach)		mg/L				
Other								
Other								
Other								

SAMPLING INFORMATION			
Parameter	Pcode	Value	Information
Sampling Condition*	72006		Sampler/Pump Type (make/model): _____
Sampling Method*	82398		Pump/Sampler ID: _____
Sampler Type*	84164		Sampler Material: stainless steel pvc teflon other _____
*see p. 8 for values			Tubing Material: teflon plastic tygon copper other _____
			Filter type(s): capsule disc 142mm 25mm GFF membrane

COMPILED BY: \_\_\_\_\_ DATE \_\_\_\_\_ CHECKED BY: \_\_\_\_\_ DATE \_\_\_\_\_ LOGGED INTO NWIS BY: \_\_\_\_\_ DATE \_\_\_\_\_

1

GW Form version 8.0

Figure 1A. Page one of the Ambient Networks field notes and data form

FIELD ID \_\_\_\_\_

### SAMPLING CONDITIONS

Aquifer name \_\_\_\_\_ Depth pump set at: \_\_\_\_\_ ft blw lsd msl mp

Sampling point description \_\_\_\_\_

GW Color: *brown gray blue green other* \_\_\_\_\_ GW Clarity: *clear turbid muddy other* \_\_\_\_\_

GW Odor: *yes no describe* \_\_\_\_\_

Sample in contact with: *atmosphere oxygen nitrogen other* \_\_\_\_\_

Weather: *sky-* *clear partly cloudy cloudy precipitation-* *none light medium heavy snow sleet rain mist* \_\_\_\_\_

*wind-* *calm light breeze gusty windy est. wind speed* \_\_\_\_\_ mph *temperature-* *very cold cool warm hot*

Observations:

Sample Comments (for NWIS; 300 characters max.):

---

### LABORATORY INFORMATION Sample Set ID \_\_\_\_\_

**SAMPLES COLLECTED:**

Nutrients: \_\_\_WCA \_\_\_FCC \_\_\_FCA Major cations: \_\_\_FA \_\_\_RA Major anions: \_\_\_FU Trace elements: \_\_\_FA \_\_\_RA

Mercury: \_\_\_FAM \_\_\_RAM \_\_\_Wis. Hg Lab Lab pH/SC/ANC: \_\_\_RU

VOC: GCV (\_\_\_ vials) Organics: \_\_\_GCC filtered \_\_\_ unfiltered \_\_\_ \_\_\_C18 \_\_\_Kansas OGRG Lab

Suspended solids: \_\_\_SUSO Turbidity: \_\_\_TBY

Phenols: \_\_\_PHE Oil&Grease: \_\_\_OAG Methylene Blue Active Substances: \_\_\_MBAS Color: \_\_\_RCB

Carbon: \_\_\_TPCN \_\_\_PIC filter1-vol filtered \_\_\_\_\_ mL filter2-vol filtered \_\_\_\_\_ mL filter3-vol filtered \_\_\_\_\_ mL \_\_\_DOC \_\_\_TOC

Radon: \_\_\_RURCV (Radon sample collection time: \_\_\_\_\_) Stable isotopes: \_\_\_FUS \_\_\_RUS

Radiochemicals: \_\_\_FUR \_\_\_RUR \_\_\_SUR \_\_\_FAR \_\_\_RAR \_\_\_RURCT \_\_\_BOD \_\_\_COD

Other: \_\_\_\_\_ (Lab \_\_\_\_\_) Other: \_\_\_\_\_ (Lab \_\_\_\_\_) Other: \_\_\_\_\_ (Lab \_\_\_\_\_)

Other: \_\_\_\_\_ (Lab \_\_\_\_\_) Other: \_\_\_\_\_ (Lab \_\_\_\_\_) Other: \_\_\_\_\_ (Lab \_\_\_\_\_)

Microbiology: \_\_\_\_\_ (Lab \_\_\_\_\_)

Laboratory Schedules: \_\_\_\_\_

Lab Codes: \_\_\_\_\_ add/delete \_\_\_\_\_ add/delete \_\_\_\_\_ add/delete \_\_\_\_\_ add/delete \_\_\_\_\_ add/delete

Comments: \_\_\_\_\_

Date shipped: \_\_\_\_\_ Lab(s): \_\_\_\_\_

**\*\*Notify the NWQL in advance of shipment of potentially hazardous samples—phone 1-866-ASK-NWQL or email LabLogin@usgs.gov**

Comments:

2

GW Form version 8.0

Figure 1B. Page two of the Ambient Networks field notes and data form.



Calibrated by: \_\_\_\_\_ Location: \_\_\_\_\_ FIELD ID \_\_\_\_\_  
 Date: \_\_\_\_\_ Time: \_\_\_\_\_

**METER CALIBRATIONS/FIELD MEASUREMENTS**

**TEMPERATURE** Meter make/model \_\_\_\_\_ S/N \_\_\_\_\_ Thermistor S/N \_\_\_\_\_ Thermometer ID \_\_\_\_\_  
 Calibration criteria:  $\pm 1$  percent or  $\pm 0.5$  °C for liquid-filled thermometers  $\pm 0.2$  °C for thermistors  
 Lab Tested against NIST Thermometer/Thermistor? Y N Date: \_\_\_\_\_  $\pm$  \_\_\_\_\_ °C  
 Measurement Location: FLOW-THRU CHAMBER SINGLE POINT AT \_\_\_\_\_ ft blw LSD VERTICAL AVG. OF \_\_\_\_\_ POINTS  
 Field Readings # 1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_ #4 \_\_\_\_\_ #5 \_\_\_\_\_ MEDIAN: \_\_\_\_\_ °C Method Code \_\_\_\_\_ Remark \_\_\_\_\_ Qualifier \_\_\_\_\_

---

**pH** Meter make/model \_\_\_\_\_ S/N \_\_\_\_\_ Electrode No. \_\_\_\_\_ Type: GEL LIQUID OTHER \_\_\_\_\_  
 Sample: FILTERED UNFILTERED FLOW-THRU CHAMBER SINGLE POINT AT \_\_\_\_\_ ft blw LSD VERTICAL AVG. OF \_\_\_\_\_ POINTS

pH Buffer	Buffer Temp	Theoretical pH from table	pH Before Adj.	pH After Adj.	Slope	Millivolts
pH 7						
pH 7						
pH 7						
pH ____						
pH ____						
pH ____						
CHECK pH ____						

Temperature correction factors for buffers applied? Y N  
 BUFFER LOT pH 7: \_\_\_\_\_  
 NUMBERS: pH \_\_\_\_: \_\_\_\_\_  
 CHECK pH \_\_\_\_: \_\_\_\_\_  
 BUFFER EXP. pH 7: \_\_\_\_\_  
 DATES: pH \_\_\_\_: \_\_\_\_\_  
 CHECK pH \_\_\_\_: \_\_\_\_\_

Calibration Criteria:  $\pm 0.1$  pH units

Field Readings #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_ #4 \_\_\_\_\_ #5 \_\_\_\_\_ MEDIAN: \_\_\_\_\_ units Method Code \_\_\_\_\_ Remark \_\_\_\_\_ Qualifier \_\_\_\_\_

---

**SPECIFIC CONDUCTANCE** Meter make/model \_\_\_\_\_ S/N \_\_\_\_\_ Sensor Type: Dip Flow-thru Other \_\_\_\_\_  
 Sample: Flow-thru chamber Single point at \_\_\_\_\_ ft blw lsd Vertical avg. of \_\_\_\_\_ points

Std Value $\mu$ S/cm	Std Temp	SC Before Adj.	SC After Adj.	Std Lot No.	Std type (KCl; NaCl)	Std Exp. Date

Calibration Criteria:  $\pm 5$  % for SC  $\leq 100$   $\mu$ S/cm or 3% for SC  $> 100$   $\mu$ S/cm  
 AUTO TEMP COMPENSATED METER \_\_\_\_\_  
 MANUAL TEMP COMPENSATED METER \_\_\_\_\_  
 CORRECTION FACTOR APPLIED? Y N  
 CORRECTION FACTOR= \_\_\_\_\_

Field Readings #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_ #4 \_\_\_\_\_ #5 \_\_\_\_\_ MEDIAN: \_\_\_\_\_  $\mu$ S/cm Method Code \_\_\_\_\_ Remark \_\_\_\_\_ Qualifier \_\_\_\_\_

---

**DISSOLVED OXYGEN** Meter make/model \_\_\_\_\_ S/N \_\_\_\_\_  
 Sensor Type: Amperometric Luminescent Probe No. \_\_\_\_\_  
 Sample: Flow-thru chamber Single point at \_\_\_\_\_ ft blw lsd Vertical avg. of \_\_\_\_\_ points BOD bottle Stirrer Used? Y N  
 Water-Saturated Air Air-Saturated Water Air Calibration Chamber in Water Air Calibration Chamber in Air Winkler Titration Other \_\_\_\_\_

Calibration Temp °C	Barometric Pressure mm Hg	DO Table Reading mg/L	Salinity Correction Factor	DO Before Adjustment	DO After Adjustment

Zero DO Check \_\_\_\_\_ mg/L Adj. to \_\_\_\_\_ mg/L Date: \_\_\_\_\_  
 Zero DO Solution Date \_\_\_\_\_ Thermistor Check? Y N Date \_\_\_\_\_  
 Membrane Changed? N Y N/A Date: \_\_\_\_\_ Time: \_\_\_\_\_  
 Barometer Calibrated? N Y Date: \_\_\_\_\_ Time: \_\_\_\_\_  
 Battery Check: REDLINE \_\_\_\_\_ RANGE \_\_\_\_\_

Calibration Criteria:  $\pm 0.2$  mg/L

Field Readings #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_ #4 \_\_\_\_\_ #5 \_\_\_\_\_ MEDIAN: \_\_\_\_\_ mg/L Method Code \_\_\_\_\_ Remark \_\_\_\_\_ Qualifier \_\_\_\_\_

Figure 1C. Page three of the Ambient Networks field notes and data form.



FIELD ID \_\_\_\_\_

TURBIDITY Meter make/model \_\_\_\_\_ S/N \_\_\_\_\_ Type: turbidimeter submersible spectrophotometer

Sample: pump discharge line flow-thru chamber single point at \_\_\_\_\_ ft blw LSD MSL MP Sensor ID \_\_\_\_\_

Sample: Collection Time: \_\_\_\_\_ Measurement Time: \_\_\_\_\_ Measurement: In-situ/On-site Vehicle Office lab NWQL Other \_\_\_\_\_

Sample diluted?  Y  N Vol. of dilution water \_\_\_\_\_ mL Sample volume \_\_\_\_\_ mL

TURBIDITY VALUE =  $A \times (B+C) / C$   
 where:  
 A= TURBIDITY VALUE IN DILUTED SAMPLE  
 B= VOLUME OF DILUTION WATER, mL  
 C= SAMPLE VOLUME, mL

Calibration Criteria: ±0.5 TU or ± 5%	Lot Number or Date Prepared	Expiration Date	Concentration (units)	Calibration Temperature °C	Initial instrument reading	Reading after adjustment
Stock Turbidity Standard						
Zero Standard (DIW)						
Standard 1						
Standard 2						
Standard 3						

Comments/Calculations:

Field Readings #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_ #4 \_\_\_\_\_ #5 \_\_\_\_\_

MEDIAN \_\_\_\_\_ Parameter Code \_\_\_\_\_ FNU NTU NTRU FNMU FNRU FAU FBU AU METHOD CODE \_\_\_\_\_ Remark \_\_\_\_\_ Qualifier \_\_\_\_\_

### WELL and WATER-LEVEL INFORMATION

WELL \_\_\_\_\_ SPRING \_\_\_\_\_ MONITOR \_\_\_\_\_ SUPPLY \_\_\_\_\_ OTHER \_\_\_\_\_

SUPPLY WELL PRIMARY USE: DOMESTIC \_\_\_\_\_ PUBLIC SUPPLY \_\_\_\_\_ IRRIGATION \_\_\_\_\_ OTHER \_\_\_\_\_

Casing Material: \_\_\_\_\_ Altitude (land surface) \_\_\_\_\_ ft abv MSL

Measuring Point: \_\_\_\_\_ ft abv blw LSD MSL

Well Depth \_\_\_\_\_ ft abv blw LSD MSL MP

Sampling condition (72006) pumping (8) flowing (4) static (n/a)  
[see reference list for additional fixed-value codes]

Water Level: \_\_\_\_\_ ft blw LSD (72019) ft blw MP (61055) ft abv MSL (NGVD 1929) (62610)  
 ft abv MSL (NAVD 1988) (62611) [enter the selected pcode on p. 1.]

Water Level Method: steel tape electric tape airline other \_\_\_\_\_

Comments:

**Depth to Water and Well Depth**

	1ST	2ND	3RD (optional)
Time			
Hold (for DTW)			
- Cut			
= DTW from MP <small>[electric tape reading]</small>			
- Measuring point (MP)			
= DTW from LSD			
Hold (for well depth)			
+ Length of tape leader			
= Well depth below MP			
- MP			
= Well depth below LSD			

### WATER-LEVEL DATA FOR GWSI

DATE WATER LEVEL MEASURED (C235) \_\_\_\_\_ TIME (C709) \_\_\_\_\_ WATER LEVEL TYPE CODE (C243) **L M S**

Month Day Year below land surface below meas. pt. sea level

WATER LEVEL (C237/241/242) \_\_\_\_\_ MP SEQUENCE NO. (C248) \_\_\_\_\_  
(Mandatory if WL type=M)

WATER LEVEL DATUM (C245) \_\_\_\_\_  
(Mandatory if WL type=S)

NGVD 29

NAVD 88

Other (See GWSI manual for codes)

National Geodetic Vertical Datum of 1929 North American Vertical Datum of 1988

SITE STATUS FOR WATER LEVEL (C238)

A	B	C	D	E	F	G	H	I	J	M	N	O	P	R	S	T	V	W	X	Z
<small>atmos. pressure</small>	<small>tide stage</small>	<small>ice</small>	<small>dry</small>	<small>recently flowing</small>	<small>flowing</small>	<small>nearby flowing</small>	<small>nearby flowing</small>	<small>injector site</small>	<small>injector site monitor</small>	<small>plugged measurement discontinued</small>	<small>measure-ment</small>	<small>obstruct- tion</small>	<small>pumping</small>	<small>recently pumped</small>	<small>nearby pumped</small>	<small>nearby pumped</small>	<small>foreign sub- pumped</small>	<small>well des- troyed</small>	<small>affected by surface water</small>	<small>other</small>

METHOD OF WATER-LEVEL MEASUREMENT(C239)

A	B	C	E	F	G	H	L	M	N	O	R	S	T	V	Z
<small>airline</small>	<small>analog</small>	<small>calibrated</small>	<small>est- mated</small>	<small>trans-ducer</small>	<small>pressure gage</small>	<small>calibrated pres. gage</small>	<small>geophysi- cal logs</small>	<small>manometer</small>	<small>non-res. gage</small>	<small>observed</small>	<small>reported</small>	<small>steel tape</small>	<small>electric tape</small>	<small>calibrated elec. tape</small>	<small>other</small>

WATER LEVEL ACCURACY (C276) **0 1 2 9** SOURCE OF WATER-LEVEL DATA (C244) **A D G L M O R S Z**

foot tenth hun- dredth not to nearest foot other gov't diller's log geol- ogist geophysi- cal logs memory owner other reporting other reported agency

PERSON MAKING MEASUREMENT (C246) \_\_\_\_\_ MEASURING AGENCY (C247) (SOURCE) \_\_\_\_\_ RECORD READY FOR WEB (C858) **Y C P L**

checked; ready for web display not checked; no web display proprietary; no web display local use only; no web display

Figure 1D. Page four of the Ambient Networks field notes and data form.

**WELL PURGE LOG** FIELD ID \_\_\_\_\_

<b>Allowable Drawdown:</b> _____ <i>ft</i> <b>Purge method:</b> STANDARD    LOW-FLOW    OTHER _____										
Time	Water Level blw MP LSD	Draw-down ft	Well Yield gpm	Pumping Rate gpm	Water Temp °C	Conductivity μS/cm	pH units	Dis-solved oxygen	Turbidity	Comments [clarity, etc.]
									MEDIAN VALUES	
									QUIESCENT PH	
									FINAL FIELD MEASUREMENTS	

Well Volume (gal) =  $V = 0.0408 HD^2$  or Well Volume =  $H \times F$   
 where:  
 $V$  is volume of water in the well, in gallons  
 $H$  is height of water column, in feet  
 $D$  is inside Diameter of well, in inches  
 $F$  is casing Volume Factor (see table)

$H$  = Well depth - Static water level = \_\_\_\_\_ feet  
 Diameter, inside ( $D$ ) = \_\_\_\_\_ inches  
 1 well volume ( $V$ ) = \_\_\_\_\_ gallons

Parameter	Stability Criteria*
pH	± 0.1 units (± 0.05 units if instrument display 2 or more digits to the right of the decimal)
Temperature (T)	± 0.2° C (thermistor)
Specific Conductivity (SC)	± 5%, of SC < 100 μS/cm ± 3%, for SC > 100 μS/cm
Dissolved Oxygen (DO)	± 0.2 mg/L
Turbidity (TU)	± 10%, for TU < 100: ambient TU is < 5 or most ground-water systems (visible TU > 5)

\*allowable variation between 5 or more sequential field-measurement values

**Purge Volume = (n)(V) = \_\_\_\_\_ gallons [Actual = \_\_\_\_\_ gal]**  
 where:  
 $n$  is number of well volumes to be removed during purging  
 $V$  is volume of water in the well, in gallons  
 $Q$  = estimated pumping rate = \_\_\_\_\_ gallons per minute  
 Approximate purge time = (purge volume)/ $Q$  = \_\_\_\_\_ minutes

VOLUME FACTORS	
DIAMETER (in.)	1.0 1.5 2.0 3.0 4.0 4.5 5.0 6.0 8.0 10.0 12.0 24.0 36.0
CASING VOL.	0.04 0.09 0.16 0.37 0.65 0.83 1.02 1.47 2.61 4.08 5.88 23.5 52.9

Screened/Open Interval: TOP \_\_\_\_\_ ft blw LSD MSL  
 Bottom \_\_\_\_\_ ft blw LSD MSL  
 Depth to Top of Sampling Interval \_\_\_\_\_ ft blw LSD MSL  
 Depth to Bottom of Sampling Interval \_\_\_\_\_ ft blw LSD MSL

**Depth to set pump from MP (all units in feet) :**

Distance to top of screen from LSD	
+ MP	
- (7 to 10 x diameter (ft) of the well)	
= Depth to pump intake from MP	

**Depth to pump from LSD (all units in feet) :**

- MP	
= Depth pump set from LSD MSL	

**Notes/Calculations:**

5 GW Form version 8.0

Figure 1E. Page five of the Ambient Networks field notes and data form.



FIELD ID \_\_\_\_\_

### ALKALINITY/ANC CALCULATIONS

BEGINNING H<sub>2</sub>O TEMP. \_\_\_\_\_ °C

BEGINNING H<sub>2</sub>O TEMP. \_\_\_\_\_ °C

### CALCULATIONS

PH	ΔPH	VOL ACID DC OR mL	ΔVOL ACID DC OR mL	ΔPH ΔVOL ACID	PH	ΔPH	VOL ACID DC OR mL	ΔVOL ACID DC OR mL	ΔPH ΔVOL ACID

ALKALINITY OR ANC (meq/L) =  $1000 (B) (C_a) (CF) / V_s$

ALKALINITY (mg/L AS CaCO<sub>3</sub>) =  $50044 (B) (C_a) (CF) / V_s$

where:

B = volume of acid titrant added from the initial pH to the bicarbonate equivalence point (near pH 4.5), in milliliters. To convert from digital counts to milliliters, divide by 800 (1.00 mL = 800 counts)

C<sub>a</sub> = concentration of acid titrant, in milliequivalents per milliliter (same as equivalents per liter, or N)

CF = Hach cartridge correction factor (default value is 1.01) [see OWQ WaQI Note 2005.02 for info]

V<sub>s</sub> = volume of sample, in milliliters

For samples with pH ≤ 9.2:

BICARBONATE (meq/L) =  $1000 (B-2A) (C_a) (CF) / V_s$

BICARBONATE (mg/L) =  $61017 (B-2A) (C_a) (CF) / V_s$

CARBONATE (meq/L) =  $2000 (A) (C_a) (CF) / V_s$

CARBONATE (mg/L) =  $60009 (A) (C_a) (CF) / V_s$

where:

A = volume of acid titrant added from the initial pH to the carbonate equivalence point (near pH 8.3), in milliliters. To convert from digital counts to milliliters, divide by 800 (1.00 mL = 800 counts)

NOTE: For samples with pH > 9.2, these equations for bicarbonate and carbonate will fail to give accurate results.

**Use the Alkalinity Calculator at**  
<http://oregon.usqs.gov/alk> or PCFF [<http://water.usqs.gov/usqs/owa/pcff.html>]

END H<sub>2</sub>O TEMP. \_\_\_\_\_ °C

END H<sub>2</sub>O TEMP. \_\_\_\_\_ °C

**FIRST TITRATION RESULTS**

DATE \_\_\_\_\_

BEGIN TIME \_\_\_\_\_ END TIME \_\_\_\_\_

ALKALINITY/ANC \_\_\_\_\_ meq/L

ALKALINITY/ANC \_\_\_\_\_ mg/L AS CaCO<sub>3</sub>

BICARBONATE \_\_\_\_\_ mg/L \_\_\_\_\_ meq/L AS HCO<sub>3</sub><sup>-</sup>

CARBONATE \_\_\_\_\_ mg/L \_\_\_\_\_ meq/L AS CO<sub>3</sub><sup>2-</sup>

ACID: 1.6N 0.16N 0.01639N

OTHER: \_\_\_\_\_

ACID LOT No. \_\_\_\_\_

ACID EXPIRATION DATE \_\_\_\_\_

SAMPLE VOLUME: \_\_\_\_\_ mL

FILTERED UNFILTERED

METHOD: INFLECTION POINT GRAN

FIXED ENDPOINT

STIRRING METHOD: MAGNETIC MANUAL

**SECOND TITRATION RESULTS**

DATE \_\_\_\_\_

BEGIN TIME \_\_\_\_\_ END TIME \_\_\_\_\_

ALKALINITY/ANC \_\_\_\_\_ meq/L

ALKALINITY/ANC \_\_\_\_\_ mg/L AS CaCO<sub>3</sub>

BICARBONATE \_\_\_\_\_ mg/L \_\_\_\_\_ meq/L AS HCO<sub>3</sub><sup>-</sup>

CARBONATE \_\_\_\_\_ mg/L \_\_\_\_\_ meq/L AS CO<sub>3</sub><sup>2-</sup>

ACID: 1.6N 0.16N 0.01639N

OTHER: \_\_\_\_\_

ACID LOT No. \_\_\_\_\_

ACID EXPIRATION DATE \_\_\_\_\_

SAMPLE VOLUME: \_\_\_\_\_ mL

FILTERED UNFILTERED

METHOD: INFLECTION POINT GRAN

FIXED ENDPOINT

STIRRING METHOD: MAGNETIC MANUAL

pH meter calibration		Meter make/model:		S/N	
Calibration Location:					
Electrode No. _____		Slope		Millivolts	
Type: gel liquid	pH 7				
other _____	pH _____				
pH buffer	Buffer temp	Theoretical pH from table	pH before adj.	pH After adj.	
pH 7					
pH _____					
Check pH _____					

Comments/Calculations:

Field titration by: \_\_\_\_\_ Checked by: \_\_\_\_\_

Figure 1F. Page six of the Ambient Networks field notes and data form.

FIELD ID \_\_\_\_\_

QUALITY-CONTROL INFORMATION

**PRESERVATIVE LOT NUMBERS**

7.5N HNO<sub>3</sub> \_\_\_\_\_ (METALS&CATIONS)      6N HCl \_\_\_\_\_ (Hg)      4.5N H<sub>2</sub>SO<sub>4</sub> \_\_\_\_\_ (NUTRIENTS&DOC)      Conc. H<sub>2</sub>SO<sub>4</sub> \_\_\_\_\_ (COD, PHENOL, O&G)      NaOH \_\_\_\_\_ (CYANIDE)

OTHER \_\_\_\_\_      1:1 HCl \_\_\_\_\_ (VOC)      Number of drops of HCL added to lower pH to ≤ 2 \_\_\_\_\_ (NOTE: Maximum number of drops = 5)

**BLANK WATER LOT NUMBERS**

Inorganic (99200) \_\_\_\_\_      2nd Inorganic (99201) \_\_\_\_\_

Pesticide (99202) \_\_\_\_\_      2nd Pesticide (99203) \_\_\_\_\_      Spike vials (99104) \_\_\_\_\_

VOC/Pesticide (99204) \_\_\_\_\_      2nd VOC/Pesticide (99205) \_\_\_\_\_      Surrogate vials \_\_\_\_\_

**FILTER LOT NUMBERS**

capsule \_\_\_\_\_ pore size \_\_\_\_\_ type \_\_\_\_\_

disc \_\_\_\_\_ pore size \_\_\_\_\_ type \_\_\_\_\_

142mm GFF \_\_\_\_\_ pore size \_\_\_\_\_ type \_\_\_\_\_ (organics)

47mm GFF \_\_\_\_\_ pore size \_\_\_\_\_ type \_\_\_\_\_ (organics)

25mm GFF \_\_\_\_\_ pore size \_\_\_\_\_ type \_\_\_\_\_ (organic carbon)

142mm membrane \_\_\_\_\_ pore size \_\_\_\_\_ type \_\_\_\_\_ (inorganics)

other \_\_\_\_\_ pore size \_\_\_\_\_ type \_\_\_\_\_

**QC SAMPLES**

Starting date for set of samples (99109) (YMMDD) \_\_\_\_\_      Ending date for set of samples (99110) (YMMDD) \_\_\_\_\_

Sample Type	NWIS Record No.	Sample Type	NWIS Record No.	Sample Type	NWIS Record No.
Equip Blank _____	_____	Sequential _____	_____	Trip Blank _____	_____
Field Blank _____	_____	Spike _____	_____	Other _____	_____
Split _____	_____	Concurrent _____	_____	Other _____	_____

NWQL schedules/lab codes (QC Samples) \_\_\_\_\_

Comments \_\_\_\_\_

(Circle appropriate selections)

**99100 Blank-solution type**

- 10 Inorganic grade (distilled/deionized)
- 40 Pesticide grade (OK for organics and organic carbon)
- 50 Volatile-organic grade (OK for VOCs, organics, and organic carbon)
- 200 Other

**99101 Source of blank water**

- 10 NWQL
- 40 NIST
- 55 Wisconsin Mercury Lab
- 140 EMD Chemicals
- 150 Ricca Chemical Company
- 200 Other

**99105 Replicate-sample type**

- 10 Concurrent
- 20 Sequential
- 30 Split
- 40 Split-Concurrent
- 50 Split-Sequential
- 200 Other

**99102 Blank-sample type**

- 1 Source Solution
- 30 Trip
- 60 Filter
- 70 Preservation
- 80 Equipment (done in non-field environment)
- 90 Ambient
- 100 Field
- 200 Other

**99108 Spike-solution volume, mL** \_\_\_\_\_

**99106 Spike-sample type**

- 10 Field
- 20 Laboratory

**99107 Spike-solution source**

- 10 NWQL

**99111 QC sample associated with this environmental sample**

- 1 No associated QA data
- 10 Blank
- 30 Replicate Sample
- 40 Spike sample
- 100 More than one type of QA sample
- 200 Other

**99112 Purpose, Topical QC data**

- 1 Routine QC (non-topical)
- 10 Topical for high bias (contamination)
- 20 Topical for low bias (recovery)
- 100 Topical for variability (field equip)
- 110 Topical for variability (field collection)
- 120 Topical for variability (field personnel)
- 130 Topical for variability (field processing)
- 140 Topical for variability (shipping&handling)
- 200 Topical for variability (lab)
- 900 Other topical QC purpose

A complete set of fixed-value codes can be found online at:  
<http://www.nwis.er.usgs.gov/currentdocs/index.html>

Figure 1G. Page seven of the Ambient Networks field notes and data form.



REFERENCE LIST FOR CODES USED ON THIS FORM

**Sample Medium Codes**

- 6 Regular Ground water
- S Quality-control sample (associated environmental sample -6 (GW))
- For replicates and spikes
- Q Artificial

A complete set of fixed-value codes can be found online at:  
<http://www.nwis.er.usgs.gov/currentdocs/index.html>

**Time Datum Codes**

Time Zone	Std Time	UTC Offset (hours)	Daylight Time Code	UTC Offset (hours)
Hawaii-Aleutian	HST	-10	HDT	-9
Alaska	AKST	-9	AKDT	-8
Pacific	PST	-8	PDT	-7
Mountain	MST	-7	MDT	-6
Central	CST	-6	CDT	-5
Eastern	EST	-5	EDT	-4
Atlantic	AST	-4	ADT	-3

**71999 Sample purpose**

- 10 Routine
- 15 NAWQA
- 50 GW Network
- 110 Seepage Study
- 120 Irrigation Effects
- 130 Recharge
- 140 Injection

**Sample Type Code**

- 9 Regular
- 7 Replicate
- 2 Blank
- 1 Spike

**Value Qualifiers**

- e see field comment
- f sample field preparation problem
- k counts outside the acceptable range

**Null-value Qualifiers**

- e required equipment not functional or available
- f sample discarded; improper filter used
- o insufficient amount of water
- p sample discarded; improper preservation
- q sample discarded; holding time exceeded
- r sample ruined in preparation

**50280 Purpose of site visit**

- 2001 Primary (primary samples should not exist for a site for more than one date per HIP, and the primary sampling date generally has the highest number of NAWQA analytes)
- 2002 Supplemental (to fill in missing schedules not sampled or lost)
- 2003 Temporal characterization (for previously sampled schedules; includes LIP and seasonal samples)
- 2004 Resample (to verify questionable concentrations in primary sample)
- 2098 Ground-water quality control
- 2099 Other (ground-water related samples with medium code other than "6", such as soil samples or core material)

**82398 Sampling method**

- 4010 Thief sampler
- 4020 Open-top bailer
- 4025 Double-valve bailer
- 4030 Suction pump
- 4040 Submersible pump
- 4045 Submersible multiple impeller (turbine) pump
- 4050 Squeeze pump
- 4060 Gas reciprocating pump
- 4070 Gas lift
- 4080 Peristaltic pump
- 4090 Jet pump
- 4100 Flowing well
- 4110 Resin trap collector
- 8010 Other

**84164 Sampler type**

- 4010 Thief Sampler
- 4020 Open-top Bailer
- 4025 Double-valve Bailer
- 4030 Suction Pump
- 4035 Submersible Centrifugal Pump
- 4040 Submersible Positive-pressure Pump
- 4041 Submersible Helical Rotor Pump
- 4045 Submersible Gear Pump
- 4050 Bladder Pump
- 4060 Gas Reciprocating Pump
- 4070 Gas Lift
- 4075 Submersible Piston Pump
- 4080 Peristaltic Pump
- 4090 Jet pump
- 4095 Line-Shaft Turbine Pump
- 4100 Flowing Well
- 8010 Other

**72006 Sampling Condition**

- 0.01 The site was dry (no water level is recorded)
- 0.02 The site had been flowing recently
- 0.03 The site was flowing, head could not be measured
- 0.04 A nearby site that taps the Aquifer was flowing
- 0.05 Nearby site tapping same Aquifer had been flowing recently
- 0.06 Injector site
- 0.07 Injector site monitor
- 0.08 Measurement discontinued
- 0.09 Obstruction encountered in well above water surface
- 0.10 The site was being pumped
- 0.11 The site had been pumped recently
- 0.12 Nearby site tapping the same Aquifer was being pumped
- 0.13 Nearby site tapping the Same Aquifer was pumped recently
- 0.14 Foreign substance present on the surface of the water
- 0.16 Water level affected by stage in nearby site
- 0.17 Other conditions affecting the measured water level
- 2 Undesignated
- 4 Flowing
- 5 Flowing on gas lift
- 8 Pumping
- 10 Open hole
- 18 Producing
- 19 Circulating
- 22 Lifting
- 23 Flowing to Pit
- 24 Water Flooding
- 25 Jetting
- 30 Seeping
- 31 Nearby well pumping
- 32 Nearby well taking water
- 33 Well taking water

**Alkalinity/ANC Parameter Codes**

- 39086 Alkalinity, water, filtered, incremental titration, mg/L
- 00418 Alkalinity, water, filtered, fixed endpoint, mg/L
- 29802 Alkalinity, water, filtered, Gran titration, mg/L
- 00419 ANC, water, unfiltered, incremental titration
- 00410 ANC, water, unfiltered, fixed endpoint, mg/L
- 29813 ANC, water, unfiltered, Gran titration, mg/L
- 29804 Bicarbonate, water, filtered, fixed endpoint, mg/L
- 63786 Bicarbonate, water, filtered, Gran, mg/L
- 00453 Bicarbonate, water, filtered, incremental, mg/L
- 00440 Bicarbonate, water, unfiltered, fixed endpoint, mg/L
- 00450 Bicarbonate, water, unfiltered, incremental, mg/L
- 29807 Carbonate, water, filtered, fixed endpoint, mg/L
- 63788 Carbonate, water, filtered, Gran, mg/L
- 00452 Carbonate, water, filtered, incremental, mg/L
- 00445 Carbonate, water, unfiltered, fixed endpoint, mg/L
- 00447 Carbonate, water, unfiltered, incremental, mg/L
- 29810 Hydroxide, water, filtered, fixed endpoint, mg/L
- 71834 Hydroxide, water, filtered, incremental, mg/L
- 71830 Hydroxide, water, unfiltered, fixed endpoint, mg/L
- 71832 Hydroxide, water, unfiltered, incremental, mg/L

**71875 Hydrogen Sulfide Odor**

Value

# none entered (null)

Remark Code	Method Code
M detect	U un-acidified sample
U non-detect	V acidified sample

**00003 Sampling depth, ft**

**78890 Sampling depth, ft blw msl**

**00059 Flow rate, instantaneous, gallons per minute**

**72004 Pump or flow period prior to sampling, minutes**

**Water Level**

- 61055 Water level, depth below measuring point, feet
- 62610 Ground-water level above NGVD 1929, feet
- 62611 Ground-water level above NAVD 1988, feet
- 72019 Depth to water level, feet below land surface

Parameter and method codes for field measurements and turbidity can be found in separate attachments at <http://water.usgs.gov/usgs/owq/Forms.html>

Figure 1H. Page eight of the Ambient Networks field notes and data form.

**U.S. GEOLOGICAL SURVEY – NATIONAL WATER QUALITY LABORATORY  
ANALYTICAL SERVICES REQUEST**

**THIS SECTION MANDATORY FOR SAMPLE LOGIN**

NWIS RECORD NUMBER  SAMPLE TRACKING ID	N J  User Code	Project Account	LAB USE ONLY  NWQL LABORATORY ID	
STATION ID	Begin Date (YYYYMMDD)	Begin Time	6	9
District Contact Phone Number	End Date (YYYYMMDD)	End Time	District Contact Email	

**SITE / SAMPLE / SPECIAL PROJECT INFORMATION (Optional)**

34 State	County	Geologic Unit Code	H Analysis Status*	9 Analysis Source*	X Hydrologic Condition*	X Hydrologic Event*	Chain of Custody	Sample Set
CLO6 NWQL Proposal Number	NWQL Contact Name		NWQL Contact Email			Program/Project		

Station Name: \_\_\_\_\_ Field ID: \_\_\_\_\_

Comments to NWQL: \_\_\_\_\_

**Hazard (please explain):**

**ANALYTICAL WORK REQUESTS: SCHEDULES AND LAB CODES (CIRCLE A=add D=delete)**

SCHED 1: \_\_\_\_\_ SCHED 2: \_\_\_\_\_ SCHED 3: \_\_\_\_\_ SCHED 4: \_\_\_\_\_ SCHED 5: \_\_\_\_\_ SCHED 6: \_\_\_\_\_

Lab Code: \_\_\_\_\_ A D    Lab Code: \_\_\_\_\_ A D    Lab Code: \_\_\_\_\_ A D    Lab Code: \_\_\_\_\_ A D    Lab Code: \_\_\_\_\_ A D

Lab Code: \_\_\_\_\_ A D    Lab Code: \_\_\_\_\_ A D    Lab Code: \_\_\_\_\_ A D    Lab Code: \_\_\_\_\_ A D    Lab Code: \_\_\_\_\_ A D

Lab Code: \_\_\_\_\_ A D    Lab Code: \_\_\_\_\_ A D    Lab Code: \_\_\_\_\_ A D    Lab Code: \_\_\_\_\_ A D    Lab Code: \_\_\_\_\_ A D

**SHIPPING INFORMATION (Please fill in number of containers sent)**

___ ALF	___ COD	___ FA	___ FCN	___ IQE	___ IRM	___ RA	___ RU	___ SUR	___ TPCN
___ BGC	___ CRB	___ FAM	___ FU	___ IQL	___ MBAS	___ RAM	___ RUR	___ SUSO	___ UAS
___ C18	___ CU	___ FAR	___ FUS	___ IQM	___ OAG	___ RAR	___ RURCT	___ TBI	___ WCA
___ CC	___ CUR	___ FCA	___ GCC	___ IRE	___ PHE	___ RCB	___ RURCV	___ TBV	___
___ CHY	___ DOC	___ FCC	___ GCV	___ IRL	___ PIC	___ RCN	___ RUS	___ TOC	___

NWQL Login Comments: \_\_\_\_\_

Collected by: \_\_\_\_\_ Phone No. \_\_\_\_\_ Date Shipped: \_\_\_\_\_

Lab/P Code	Value	Remark	Lab/P Code	Value	Remark	Lab/P Code	Value	Remark
21/00095 Specific Conductance: uS/cm @ 25 deg C			51/00400 pH Standard Units					

**FIELD VALUES**

Field Comments: \_\_\_\_\_

\*MANDATORY FOR NWIS

Figure 2. Ambient Network analytical services request form.



**GW REQUIREMENTS**

SCHED #	BOTTLE TYPE	LABEL	TREATMENT
1923	500mL,CLR,PLY	RU	RAW, UNTREATED.
1622	500mL,CLR,PLY	FU	FILTERED, UNTREATED.
	250mL,CLR,PLY, AR (CAPPED)	FA	FILTERED, ACIDIFY W/ULTREX HNO3 IN POLYVIAL TO pH<2.
	250mL, GLASS, AR	FAM	FILTERED, ACIDIFY W/2mL, 6N HCL IN POLYVIAL; FOAM SLEEVE.
25	125mL,BRN,PLY	FCC	FILTERED, CHILL.
2612 - A	125mL, BRN, GLASS	DOC	FILTER THRU PALL CAPSULE FILTER, ACIDIFY W/1mL 4.5N H2SO4, CHILL.
2033 4200 - A	1000mL, BRN, GLASS, BAKED (organic filtration)	GCC	FILL ONLY TO SHOULDER, CHILL.
1307	3 X 40mL, BRN, GLASS, GCV VIAL	GCV	FILL SO NO HEAD SPACE, ACIDIFY W/ 1-3 DROPS HCL. FOAM SLEEVE. CHILL.
1307	3 X 40mL, BRN, GLASS, GCV VIAL	AMBIENT BLANK	FILL W/VOC BLANK H2O, NO HEAD SPACE, FOAM SLEEVE, CHILL. KEEP TOGETHER. MARK TIME AT 1MIN. BEFORE ENV. SAMPLE.
<b>FAR for GROSS ALPHA/BETA - TO EBERLINE LAB</b>			
1792	1000mL, CLR, PLY, AR (CAPPED) [ GOES TO EBERLINE]	FAR	FILTERED, ACIDIFY W/HNO3 TO PH<2
<b>ALKALINITY TITRATION IN FIELD</b>			
PC39086	1000mL, CLR, PLY	ALK	FILTERED. FILL W/LITTLE OR NO HEAD SPACE. CHILL IF DO NOT TITRATE IMMEDIATELY.
ACCT# 2454003LB		New Eberline schedule 1792 effective 04-01-04	

\*\*\*VOC and Ambient blanks will be mailed with other chilled samples. Each set of vials should be sleeved together such that ea. individual vial is cushioned. Ambient blanks require their own ASR form and should state: "ATTN Donna Rose: Do not log in blank unless MTBE or BTEX is >/= 0.2".

\*\*\*If SC < 90 uS, request proposal # CL07013, Add LC 8419 and LC 8430, and Delete LC 68 and 70 comment: "Attn H. Ardourel,- LL pH and ANC.

\*\*\*1 liter FAR must be shipped day of collection; analysis has to be done in 72 hours.

Mail FAR to: Eberline Services  
2030 Wright Ave.  
Richmond, California 94804-0040  
510-235-2633

O:\HDAP\QW Unit\Bottle Requirements\bt1.req.10\gw10\gw.10.doc

Figure 3. Sampling bottle and sample handling/preservation list utilized by the Ambient Network

Table 1. Constituent List for the Ambient Ground-Water-Quality Monitoring Network for the NJDEP-USGS Cooperative Program 2011 WY

<b>STORET PARAMETER CODE</b>	<b>CONSTITUENT OR COMPOUND NAME</b>	<b>REMARKS</b>
<b>-----WATER COLUMN ROUTINE PARAMETERS-----</b>		
<b>FIELD-DETERMINED PARAMETERS</b>		
39086	ALKALINITY	
00453	BICARBONATE	
00095	SPECIFIC CONDUCTANCE	
00400	PH, WW, FIELD	
00010	WATER TEMPERATURE	
00020	AIR TEMPERATURE	
00025	BAROMETRIC PRESSURE	
00300	OXYGEN DISSOLVED	
00301	OXYGEN DIS. PERCENT	
63676	TURBIDITY	
<b>SCHEDULE 1923, COMMON IONS</b>		
00915	CALCIUM DISSOLVED	
00925	MAGNESIUM DISSOLVED	
00930	SODIUM DISSOLVED	
00935	POTASSIUM DISSOLVED	
90410	ACID NEUT. CAP., WW, LAB	
00945	SULFATE DISSOLVED	
00940	CHLORIDE DISSOLVED	
00950	FLUORIDE DISSOLVED	
00955	SILICA DISSOLVED	
70300	RESIDUE, DISS. AT 180 C	
90095	SP. CONDUCTANCE, LAB	
00403	PH, WW, LAB	
00900	HARDNESS TOTAL	computed
70301	DISSOLVED SOLIDS SUM	computed
<b>SCHEDULE 1622, TRACE METALS</b>		
01106	ALUMINUM	
01095	ANTIMONY	
01000	ARSENIC	
01005	BARIUM	
01010	BERYLLIUM	
01020	BORON	
01025	CADMIUM	
01030	CHROMIUM	
01040	COPPER	
01046	IRON	
01049	LEAD	
01056	MANGANESE	
71890	MERCURY	



<b>STORET PARAMETER CODE</b>	<b>CONSTITUENT OR COMPOUND NAME</b>	<b>REMARKS</b>
01065	NICKEL	
01145	SELENIUM	
01090	ZINC	
<b>SCHEDULE 1307, VOCS</b>		
34030	BENZENE	
32102	TETRACHLOROMEHTANE	
32105	DIBROMOCHLOROMETHANE	
32101	BROMODICHLOROMETHANE	
99834	1, 4-BROMOFLUOROBENZENE SURROGATE	
34496	1, 1-DICHLOROETHANE	
99832	1, 2-DICHLOROETHANE SURROGATE	
34501	1, 1-DICHLOROETHYLENE	
34541	1, 2-DICHLOROPROPANE	
34423	DICHLOROMETHANE	
34010	TOLUENE	
39180	TRICHLOROETHYLENE	
39175	VINYL CHLORIDE	
34566	1, 3-DICHLOROBENZENE	
77128	STYRENE	
77093	CIS -1,2-DICHLOROETHYLENE	
32104	BROMOFORM	
34301	CHLOROBENZENE	
32106	CHLOROFORM	
34668	DICHLORODIFLUO ROMETHANE	
32103	1, 2-DICHLOROETHANE	
34546	1,2-TRANSDICHLOROETHYLENE	
34371	ETHYLBENZENE	
34475	TETRACHLOROETHYLENE	
34506	1,1,1 -TRICHLOROETHANE	
34488	TRICHLOROFLUOROMETHANE	
34536	1,2 -DICHLOROBENZENE	
34571	1,4 -DICHLOROBENZENE	
78032	Tert-BUTYL METHYL ETHER	
77652	TRICHLOROTRIFLUOROETHANE	
85795	M-,P- XYLENE	
77135	O- XYLENE	
50005	TERT-PENTYL METHYL ETHER	
99833	TOLUENE - D8 SURROGATE	
50004	ETHYL TERT-BUTYL ETHER	
81577	DI-ISOPROPYLETHER	
81576	DIETHYL ETHER	
<b>SCHEDULE 2033, PESTICIDES</b>		
49295	1-NAPHTHOL	
61618	2-CHLORO-2,6-DIETHYLACETANILIDE	

<b>STORET PARAMETER CODE</b>	<b>CONSTITUENT OR COMPOUND NAME</b>	<b>REMARKS</b>
61620	2-ETHYL-6-METHYLANILINE	
61625	3,4-DICHLOROANILINE	
61627	3,5-DICHLOROANILINE	
61633	4-CHLORO-2-METHYLPHENOL	
49260	ACETOCHLOR	
46342	ALACHLOR	
82660	2,6-DIETHYLANILINE	
39632	ATRAZINE	
82686	AZINPHOS-METHYL	
61635	AZINPHOS-METHYL-OXON	
82673	BENFLURALIN	
82680	CARBARYL	
82674	CARBOFURAN	
38933	CHLORPYRIFOS	
61636	CHLORPYROFOS, OXYGEN ANALOG	
82687	CIS-PERMETHRIN	
79846	CIS-PROPICONAZOLE	
04041	CYANAZINE	
61585	CYFLUTHRIN	
61586	CYPERMETHRIN	
82682	DACTHAL	
04040	2-Chloro 4-isopropylamino-6-amino-s-triazine {CIAT}	
39572	DIAZINON	
61638	DIAZINON, OXYGEN ANALOG	
99994	DIAZINON-D10	
38775	DICHLORVOS	
38454	DICROTOPHOS	
39381	DIELDRIN	
82662	DIMETHOATE	
82677	DISULFOTON	
61640	DISULFOTON SULFONE	
34362	ALPHA-ENDOSULFAN	
61590	ENDOSULFAN SULFATE	
82668	EPTC	
82346	ETHION	
61644	ETHION MONOXON	
82672	ETHOPROPHOS	
61591	FENAMIPHOS	
61645	FENAMIPHOS SULFONE	
61646	FENAMIPHOS SULFOXIDE	
62169	DESULFINYLPIPRONIL AMIDE	

<b>STORET PARAMETER CODE</b>	<b>CONSTITUENT OR COMPOUND NAME</b>	<b>REMARKS</b>
62167	FIPRONIL SULFIDE	
62168	FIPRONIL SULFONE	
62170	DESULFINYL FIPRONIL	
62166	FIPRONIL	
04095	FONOFOS	
99995	ALPHA-HCH-D6	
04025	HEXAZINONE	
61593	IPRODIONE	
61594	ISO FENPHOS	
61595	LAMBDA-CYHALOTHRIN	
61652	MALAOXON	
39532	MALATHION	
61596	METALAXYL	
61598	METHIDATHION	
82667	PARATHION-METHYL	
39415	METOLACHLOR	
82630	METRIBUZIN	
82671	MOLINATE	
61599	MYCLOBUTANIL	
61600	OXYFLUORFEN	
61664	PARAOXON-METHYL	
82683	PENDIMETHALIN	
82664	PHORATE	
61666	PHORATE OXYGEN ANALOG	
61601	PHOSMET	
61668	PHOSMET OXON	
04037	PROMETON	
04036	PROMETRYN	
82676	PROPYZAMIDE	
82679	PROPANIL	
82685	PROPARGITE	
04035	SIMAZINE	
62852	TEBUCONAZOLE	
82670	TEBUTHIURON	
61606	TEFLUTHRIN	
82675	TERBUFOS	
61674	TERBUFOS OXYGEN ANALOG SULFONE	
04022	TERBUTHYLAZINE	
82681	THIOBENCARB	
79847	TRANS-PROPICONAZOLE	
61610	TRIBUFOS	

<b>STORET PARAMETER CODE</b>	<b>CONSTITUENT OR COMPOUND NAME</b>	<b>REMARKS</b>
82661	TRIFLURALIN	
	LAB FILTRATION FOR S2033	LC4200
<b>SCHEDULE 25, NUTRIENTS</b>		
00671	PHOSPHORUS, PHOSPHATE, ORTHO.	
00623	NITROGEN, AMMONIA + ORGANIC NITRO.	
00613	NITROGEN, NITRITE	
00608	NITROGEN, AMMONIA	
00631	NITROGEN, NITRITE + NITRATE	
<b>SCHEDULE 1792</b>		
62639	ALPHA RADIOACTIVITY, 30-DAY	
62636	ALPHA RADIOACTIVITY, 72-HOUR	
62645	BETA RADIOACTIVITY, 30-DAY	
62642	BETA RADIOACTIVITY, 72-HOUR	
<b>LAB CODE ADD-ONS</b>		
LC 2612	DISSOLVED ORGANIC CARBON	
<b>QUALITY ASSURANCE</b>		
4	FIELD BLANKS	
30	VOC AMBIENT BLANKS	

Appendix 3. Data Elements

DataElements

Data Element	Definition	USGS Data Element	Table	FieldName	C code	Source	comment
1.0 Point of Contact							
1.1 Source of data	Primary source or provider of data	source_agency_cd	sitefile_01	agency_cd	C4	Sitefile web service	ref table
1.1.1 Organization name		none	none	none	none	Same for all sites	
1.1.2 Mailing address		none	none	none	none	"	
1.1.2.1 City, Town, Village		none	none	none	none	"	
1.1.2.2 State name		none	none	none	none	"	
1.1.2.3 Zip code		none	none	none	none	"	
1.1.3 Telephone number		none	none	none	none	"	
1.1.4 email		none	none	none	none	"	
2.0 Site Identification							
2.1 Site id	Unique Site Identifier	Site Identification Number	sitefile_01	site_no	C1	Sitefile web service	
3.0 Geologic/Hydrologic Description							
3.1 HUC	Hydrologic Unit Code	Hydrologic Unit Code	sitefile_01	huc_cd	C20	Sitefile web service	
3.2 Lithology code	Aquifer lithology of primary contributing unit	Lithology Code, Lithologic Modifier	gw_geoh_01	lith_cd, lith_cs	C96, C97		
3.3 Aquifer	USGS atlas designation of aquifer	USGS aquifer	sitefile_01				
	Primary aquifer	Primary aquifer code	sitefile_01	aqfr_cd	C714	Sitefile web service	ref table
	National Aquifer	National aquifer Code	sitefile_01	nat_aqfr_cd	C715	Sitefile web service	ref table
3.4 Local Aquifer Name	Aquifer Name						
		Aquifer Name	NWIS ref list				
		National aquifer Name	NWIS ref list				
3.5 Aquifer type	Type of Aquifer	Aquifer Type Code	sitefile_01	aqfr_type_cd	C713	Sitefile web service	
3.6 Aquifer conditions		NOT IN NWIS database					
4.0 Well Location							
4.1.1 Latitude	Latitude (DMS)	Latitude	sitefile_01	lat_va	C9	Sitefile web service	
4.1.2 Longitude	Longitude (DMS)	Longitude	sitefile_01	long_va	C10	Sitefile web service	
4.1.3 Datum	Horizontal reference datum	Lat/Long datum	sitefile_01	coord_datum_cd	C36	Sitefile web service	ref table
4.1.4 Accuracy	Location Horizontal accuracy	Lat/Long accuracy	sitefile_01	coord_acy_cd	C11	Sitefile web service	ref table
4.1.5 Method	Location collection method	Lat/Long method	sitefile_01	coord_meth_cd	C35	Sitefile web service	ref table
	Latitude (DD) NAD83	Latitude NAD83 (dd)	sitefile_01	dec_lat_va	C909	Sitefile web service	
	Longitude (DD) NAD83	Longitude NAD83 (dd)	sitefile_01	dec_long_va	C910	Sitefile web service	
4.2 Altitude at well head							
4.2.1 Altitude of Is at well head		NOT IN NWIS database					
4.2.2 Method	Method used to determine Altitude	Method Altitude determined	sitefile_01	alt_meth_cd	C22	Sitefile web service	ref table
4.2.3 Altitude Land Surface	Altitude of land surface at well	Altitude of Land Surface	sitefile_01	alt_va	C16	Sitefile web service	Why is this twice?
4.2.4 Accuracy	Accuracy of land surface measurement	Altitude accuracy code	sitefile_01	alt_acy_va	C18	Sitefile web service	
4.2.5 Datum	Vertical Reference datum	Altitude datum	sitefile_01	alt_datum_cd	C22	Sitefile web service	
4.3 Well Address							
4.3.1 Owner name	PII?		site_owner_01			NJ NWIS database	
4.3.2 Mailing address			site_owner_01			NJ NWIS database	
4.3.3 City			site_owner_01			NJ NWIS database	
4.3.4 State			site_owner_01			NJ NWIS database	
4.3.5 Country			site_owner_01			NJ NWIS database	
4.3.6 Zip code			site_owner_01			NJ NWIS database	
4.3.7 Time zone	Standard Time zone of well	Standard Time zone code	sitefile_01	tz_cd	C813	Sitefile web service	ref table
4.3.8 Daylight Savings zone flag	Daylight savings time flag	Local standard time flag	sitefile_01	local_time_fg	C814	Sitefile web service	Y or N
5.0 Well Characteristics							
5.1 Site id	Unique Site Identifier	Site Identification Number	sitefile_01	site_no	C1	Sitefile web service	
5.2 Depth of well	Depth of well (ft below land surface)	Well depth	sitefile_01	well_depth_va	C28	Sitefile web service	
5.3 Depth Source	contributing source of well depth data	Source of depth data	sitefile_01	depth_src_cd	C29	Sitefile web service	ref table
5.6 Casing	Casing depth of well	Depth to bottom of casing	gw_csng_01	csng_bottom_va	C78	NJ NWIS database	Multitple casings

DataElements

5.7 Top of screened interval	Top of screen interval	Depth to top of open interval	gw_open_01	open_top_va	C83	NJ NWIS database	Multiple screens
5.8 Bottom of screened interval	Bottom of Screen Interval	Depth to bottom of screen interval	gw_open_01	open_bottom_va	C84	NJ NWIS database	Multiple screens
5.9 Casing material	Casing Material	Casing Material	gw_csng_01	casing_material_cd	C80	NJ NWIS database	Multiple casings
5.10 Screen material/type	Opening material type	Material Type	gw_open_01	open_material_cd	C86	NJ NWIS database	Multiple screens
5.11 Well type (network)	Specified well type (background/targeted)	NOT IN NWIS database	catalog			Portal catalog	
5.12 Well Purpose	Indication of well purpose (WL/WQ/Both)	NOT IN NWIS database	catalog			Portal catalog	
5.13 Well Logs	indication of well log available	Type of log	gw_logs_01	logs_cd = DR or DG		NJ NWIS database	
5.2 Measurement Location							
5.2.1 Measuring Point	Description of measuring Point	Measuring point description	gw_mpnt_01	mpnt_ds	C324	NJ NWIS database	start-end-date
5.2.2 Measuring Point Value	Height of MP above land surface elevation	Height of measuring point	gw_mpnt_01	mpnt_height_va	C325	NJ NWIS database	
5.2.3 Measuring point accuracy of meas	indication of accuracy of MP measurement	only available for altitude of MP wells				NJ NWIS database	
6.0 Measurement/Sampling Event							
6.1 Monitoring Purpose	Specified monitoring purpose (baseline, surveillance, trend, special)	NOT IN NWIS database	catalog			Portal catalog	
6.2 Date & Time							
6.2.1 Time Zone code	Standard Time zone of well	Standard Time zone code	sitefile_01	tz_cd	C813	Sitefile web service	ref table
6.2.2 Measurement/Sampling Date/Time							
6.2.2.1 WL Measurement Date/Time							
6.2.2.2 WL Measurement Date	Calendar date YYYYMMDD	Measurement Date/Time	gw_lev_01	lev_dt	C235	NJ NWIS database or NWISWEB	
6.2.2.3 WL Measurement Time							
6.2.3 QW Sampling Date/Time							
6.2.3.1 Sample Collection Date						QW web service	
6.2.3.2 Sample Collection Time						QW web service	
6.3 Measurement/Sample Site Use							
6.3.1 Site Use	Use of area around well	Primary use of site	sitefile_01	site_use_1_cd	C23	Sitefile web service	not quite same
6.4 Level Elevation Measurement Data							
6.4.1 Water Level	Water level, in feet	Water level referenced to Land surface	gw_lev_01	lev_va	C237	NJ NWIS database or NWISWEB	
6.4.2 WL Method	Method of water -level measurement	Method of measurement	gw_lev_01	lev_meth_cd	C239	NJ NWIS database or NWISWEB	ref table
6.4.3 WL Accuracy	Accuracy of water level measurement in ft	Water -level accuracy	gw_lev_01	lev_acy_cd	C276	NJ NWIS database or NWISWEB	ref table
6.4.4 WL Status	Status of water level	Site status for water-level	gw_lev_01	lev_status_cd	C238	NJ NWIS database or NWISWEB	ref table
6.5 Sampling Point Elevation Measurement							
6.5.1 QW sampling WL	Water level, in feet	Water level referenced to Land surface	gw_lev_01	lev_va	C237	QW web service	
6.5.2 QW sampling WL method	Method of water -level measurement	Method of measurement	gw_lev_01	lev_meth_cd	C239		
6.5.3 QW sampling WL accuracy	Accuracy of water level measurement in ft	Water -level accuracy	gw_lev_01	lev_acy_cd	C276		
6.6 Sample Collection							
6.6.1 Sample Type						QW web service	
6.6.2 Sample ID						QW web service	
6.6.3 Sample Method						QW web service	
7.0 QW Results							
7.1 Result Value						QW web service	
7.1.1 Result Units						QW web service	
7.1.3 Analyte Name						QW web service	
7.1.4 Chemical ID		NOT IN NWIS database					
7.1.5 Biological ID		NOT IN NWIS database					
7.1.6 Biological System Context Name		NOT IN NWIS database					
7.2 Analyte Method							
Daily value water levels		Mean Depth to water BLS Date			72019 stat cd =3	DV web services or NWISWEB	