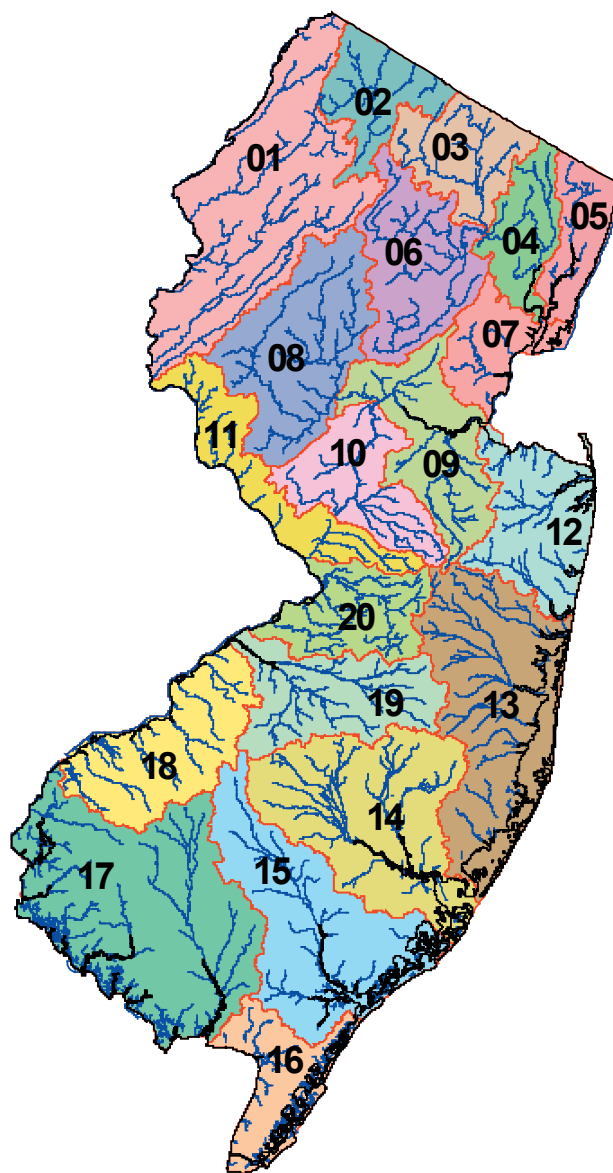




New Jersey Geological Survey  
Technical Memorandum 04-1



# Modifications to New Jersey's Watershed Management Area Boundaries, 1996-1999



New Jersey Department of Environmental Protection  
Land Use Management

**State of New Jersey**

James E. McGreevey, *Governor*

**Department of Environmental Protection**

Bradley M. Campbell, *Commissioner*

**Land Use Management**

Ernest P. Hahn, *Assistant Commissioner*

**Geological Survey**

Karl Muessig, *State Geologist*

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for more information contact:

**NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION**

Geological Survey  
P.O. Box 427  
Trenton, NJ 08625-0427  
(609) 984-6587  
<http://www.njgeology.org/>

Division of Watershed Management  
P.O. Box 418  
Trenton NJ 08625-0418  
(609) 292-7219  
<http://www.state.nj.us/dep/watershedmgt/index.html>

**On the cover**

Watershed management areas (WMAs) in New Jersey, showing boundaries in 2004. Major rivers are in blue, the coastline in black. The WMAs extend 5 miles to the east of the Atlantic barrier islands but this is not shown. Also not shown are those portions of the WMAs that cover the Raritan and Delaware Bays.

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**Modifications to New Jersey's  
Watershed Management Area Boundaries,  
1996-1999**

by

Jeffrey L. Hoffman

New Jersey Department of Environmental Protection  
Land Use Management  
Geological Survey  
P.O. Box 427  
Trenton, NJ 08625

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### **Epigram**

“On the catchment scale, the upstream/downstream water sharing is impossible to avoid and calls for development of a catchment hydrosolidarity that is based on an ethically supported, delicately balanced orchestration of seemingly incompatible land, water and ecosystem related activities.”

- Stockholm International Water Institute, 2002.

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## **Abstract**

In 1996 the New Jersey Department of Environmental Protection (DEP) divided the state into 20 watershed management areas (WMAs). Their boundaries were based on natural watershed boundaries and on areas of similar environmental characteristics and concerns. The WMAs were then grouped into five water regions. The WMAs are tools the DEP uses to help protect the environment through a watershed-based approach to environmental regulation and management.

Since 1996 several WMA boundaries have changed for one or more of the following reasons:

(1) to ensure that a stream-monitoring station is at the downstream end of the WMA; (2) to respond to requests of local watershed groups to merge areas of similar characteristics; and (3) to make WMA boundaries match federally-defined watersheds more effectively.

As new needs arise the WMA boundaries may have to be modified. In such cases, if the affected parties agree, their boundaries will be changed as appropriate.

## **Introduction**

In 1996 the New Jersey Department of Environmental Protection (DEP) reorganized from a media-based approach to a watershed-based one. This was done in order to facilitate better coordination of all environmental permitting and protection efforts (Cohen, 1997). As part of this approach, New Jersey was divided into 20 watershed management areas (WMAs). WMA boundaries were based on drainage areas and on grouping areas of similar environmental characteristics and concerns.

The DEP's Division of Watershed Management is the lead in this management approach. More information on its activities is available at:

<http://www.state.nj.us/watershedmgt/index.html>

As the watershed-based management approach evolved, DEP and local participants recognized a need to slightly modify several WMA boundaries. This has been done twice since the WMAs were first established. The first change involved a small area in northeastern New Jersey. The second change was done in conjunction with a significant reevaluation of watershed boundaries throughout New Jersey by the United States Geological Survey (USGS).

This report details the changes that have been made since the WMAs were originally set up in 1996 and the reasons for each change.

## Watershed Boundaries

A watershed is defined as an area which drains to a common location. Watersheds may be defined on various scales, such as all of the Mississippi River Basin that drains to the Gulf of Mexico, or that portion of a hillside which drains to a small brook.

The DEP's WMA boundaries are based on drainage basin boundaries supplied by the USGS. The USGS has set up a nested hierarchy of watersheds, with 21 regional watersheds (called 'accounting units') across the nation (Seaber and others, 1987). Accounting units are divided into cataloging units, and then into watersheds and sub-watersheds. Each is numbered using a Hydrologic Unit Code (HUC) consisting of 2 digits for accounting units, 8 for cataloging units, 11 for watersheds and 14 for subwatersheds. Informally, the various levels of nested watersheds are simply called HUC2, HUC8, HUC11 and HUC14 watersheds. GIS coverages of the national watersheds are available at:

<http://www-atlas.usgs.gov/atlasftp.html>

There are 12 HUC8, 150 HUC11, and 921 HUC14 watersheds in New Jersey (Ellis and Price, 1995). Figure 1 shows HUC8 and HUC11 watershed boundaries in New Jersey. These boundaries were reevaluated in 1999 and some slight modifications made (Bob Schopp, US Geological Survey, oral communication, 2002). This was done in conjunction with the second round of WMA boundary reevaluation.

Digital coverages of HUC11 and HUC14 watersheds in New Jersey are available from the Geographical Information System web page of the DEP:

<http://www.nj.gov/dep/gis/>

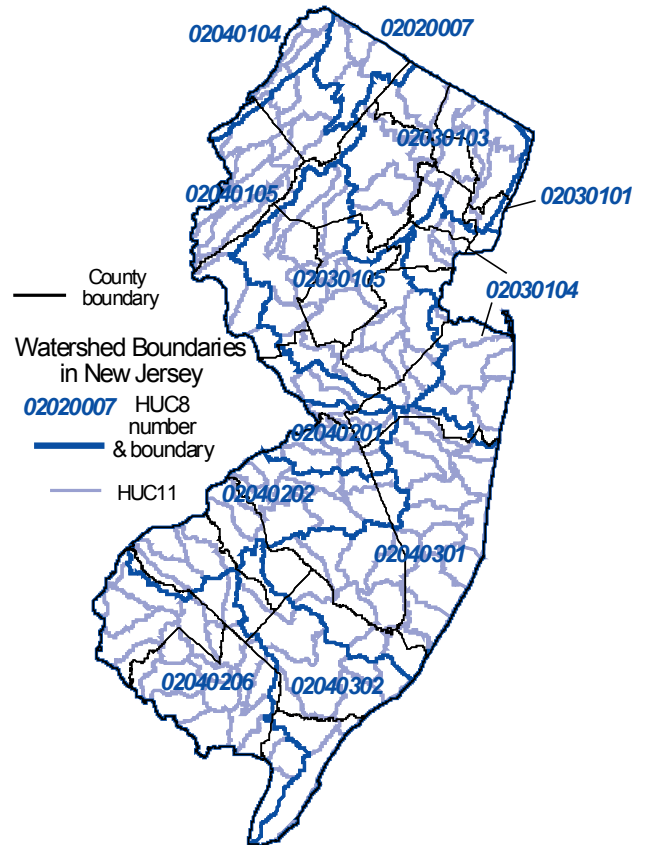


Figure 1. HUC8 and HUC11 hydrologic unit watersheds in New Jersey



## Watershed Management Area Boundaries

The watershed management area boundary changes described below were initially suggested either by DEP staff or citizens involved with local watershed groups. All changes were approved by DEP senior management before they became final.

WMA boundaries, version 1, 1996

Starting in the early 1990s, a work group began discussions on how to orient DEP's approach to managing and regulating environmental decisions. The work group decided that a watershed-based approach, where all decisions relating to a specific watershed area would be coordinated by one group of people, would ensure better coordination among the various groups in the DEP who were currently making these decisions. After much discussion, 20 watershed management areas (WMAs) were set up (fig. 2, table 1). They were then grouped into 5 water regions (table 2). All watershed boundaries followed HUC14 boundaries. Cohen (1997) describes this process in more detail.

WMA boundaries, version 2, 1997

The first modification to the original WMA boundaries arose when considering how to monitor the effects of proposed activities in WMA 06 (Upper and Mid-Passaic, Whippany and Rockaway). The Pompton River flows into the Passaic River at Two Bridges. The United States Geological Survey maintains both a continuous streamflow-monitoring station (id # 01389005) and a water-quality monitoring station (id # 01382000) on the Passaic River at this junction.

The Passaic River flows through the Great Piece Meadows just upstream of this confluence. In the original WMA version the HUC11 watershed which contains the Great Piece Meadows was assigned to WMA 03 (Pompton, Pequannock, Wanaque and Ramapo). Because the water-quality monitoring station at Two Bridges will be an important station in determining the effectiveness of environmental protection efforts in upstream areas, it is advantageous to have WMA bound-

Table 1. Names and numbers of watershed management areas

#	Name
01	Upper Delaware
02	Wallkill
03	Pompton, Pequannock, Wanaque, Ramapo
04	Lower Passaic and Saddle
05	Hackensack, Hudson, and Pascack
06	Upper and Mid-Passaic, Whippany, and Rockaway
07	Arthur Kill
08	North and South Branch Raritan
09	Lower Raritan, South River, and Lawrence
10	Millstone
11	Central Delaware
12	Monmouth
13	Barneгат Bay
14	Mullica
15	Great Egg Harbor
16	Cape May
17	Maurice, Salem, and Cohansey
18	Lower Delaware
19	Rancocas
20	Assiscunk, Crosswicks, and Doctors

Table 2. Water regions and watershed management areas

Water Region		Watershed Management Areas
#	Name	#
1	Northeast	03, 04, 05, 06
2	Raritan	07, 08, 09, 10
3	Atlantic	12, 13, 14, 15, 16
4	Northwest	01, 02, 11
5	Lower Delaware	17, 18, 19, 20

aries meet at this confluence. In addition, moving this portion of land that drains to the Passaic River, and not to the Pompton River watershed, made the boundaries cleaner in an administrative and technical sense.

This change to the WMA 03 and 06 boundaries was made in the summer of 1997. Figure 3 shows version 2 of the WMA boundaries.

WMA boundaries, version 3, 1999

As the DEP and local citizen-led watershed groups worked on watershed activities using the WMA boundaries they discovered the need for additional changes to these boundaries.

The version 2 change of WMA boundaries was designed to make the confluence of the Pompton River with the Passaic River the downstream end of both WMA 06 and WMA 03 and the upstream end of WMA 04. However a close examination showed that Deepavaal Brook, which drains part of the Great Piece Meadows, had been assigned to WMA 06 in spite of the fact that it enters the Passaic River downstream of the Passaic-Pompton confluence. To more accurately reflect natural drainages, this small area was moved from WMA 06 to WMA 04 (Lower Passaic and Saddle).

On NJ's Atlantic Coast the DEP is investigating many management practices intended to protect coastal water quality. In order to make clear DEP's regulatory responsibility, the WMA boundaries along the Atlantic Coastline (WMAs 12, 13, 14, 15 and 16) were extended 5 miles offshore.

Delaware Bay borders both WMA 17 (Maurice, Salem, and Cohansey) and 16 (Cape May). In order to set clear regulatory responsibility for conditions which affect water quality the offshore part of New Jersey in the Delaware Bay were assigned to WMA 17. This did not affect the onshore extent of WMA 16. This reassignment was primarily a clarification of internal DEP responsibility.

The Division of Watershed Management determined the Salem River and Alloway Creek watersheds, which had been located in southwestern WMA 18 (Lower Delaware) had more in common with the watersheds of WMA 17 (Maurice, Salem, and Cohansey). These watersheds were reassigned to WMA 17, with the result that the boundary between WMA 17 and 18 moved north. This had the additional benefit of aligning the WMA 17-18 boundary along that of a HUC8 watershed boundary. Before the change, WMA 18 was split between two HUC8 watersheds. Oldman's Creek was retained in WMA 18. With the exception of Oldman's Creek this reassignment brought the boundary between WMAs 17 and 18 in alignment with a HUC8 boundary. The U.S. Geological Survey agreed to move the HUC8 boundary south to make it coincide with the WMA 17-18 boundary in this area.

The citizens watershed groups in the original WMA 19 (Rancocas) determined that land use in southwestern WMA 19 (consisting of the Cooper River, Pennsauken Creek and Pompeston-Swedes Run watersheds) had more in common with WMA 18 (Lower Delaware). These watersheds were reassigned to WMA 18 thereby moving the boundary between WMA 18 and 19 to the north.

The first and second versions of the WMAs had WMA 19 almost entirely in the Lower Delaware HUC8 (02040202) except for a small area which fell in the Crosswicks-Neshaminy HUC8 (02040201). This area, a total of 7.2 square miles, is drained by a series of small tributaries that flow directly into the Delaware River. It was reassigned to WMA 20 so that WMA 19 was not split between two different HUC8 watersheds thereby assisting the DEP in reporting watershed-related information to the EPA.

These changes were made during the summer of 1999. Figure 4 shows version 3 of the WMA boundaries.

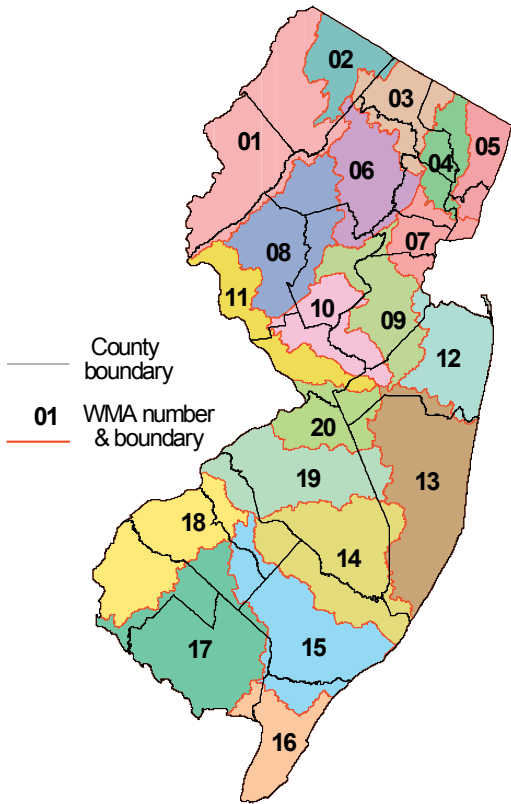


Figure 2. Watershed Management Areas, 1996 (version 1).

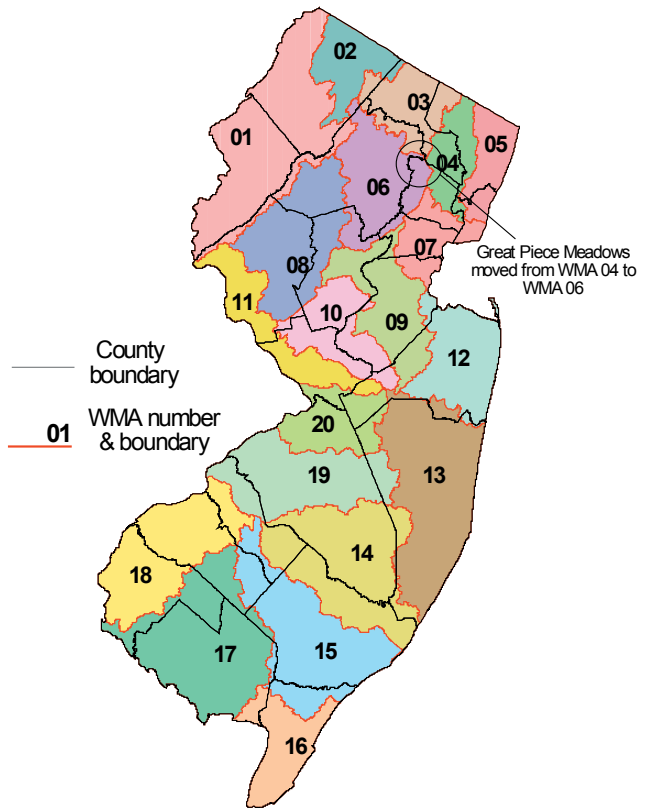


Figure 3. Watershed Management Areas, 1997 (version 2, with changes from version 1).

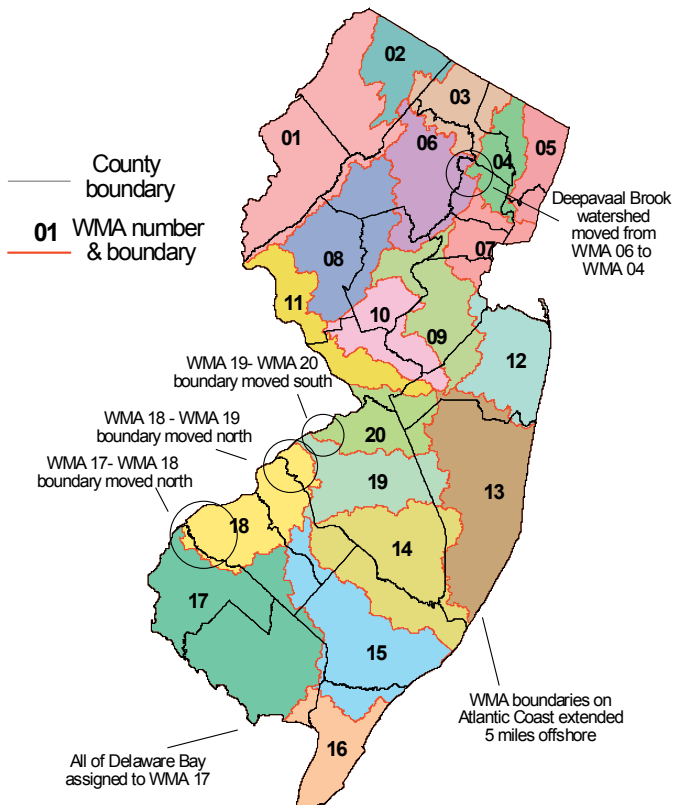


Figure 4 Watershed Management Areas, 1999 (version 3, with changes from version 2).

Changes were made to the official geographical information system (GIS) coverages of WMA boundaries available on the DEP's GIS web site. The current version of the watershed boundaries is available from the GIS downloads page of the DEP:

<http://www.nj.gov/dep/gis/>

Owing to technical difficulties, and the version 2 GIS coverages built into numerous data sets, the version 3 set of WMA boundaries propagated through other DEP GIS data sets during the next year or so. Unwary users occasionally will discover an old graphic showing version 2 or version 1 WMA boundaries. Care must be taken to ensure that the correct version of the WMA boundaries is used by regulators, permittees, and the general public.

**Compatibility with Federal Efforts**

The U.S. Environmental Protection Agency (EPA) uses the HUC8 watersheds (cataloging units) as its basis for reporting and retrieving environmental information. The EPA's Surf Your Watershed program is available on the Internet at:

<http://www.epa.gov/surf/>

WMA and HUC8 boundaries do not match everywhere. Figure 5 shows HUC8 watershed and WMA boundaries. Table 3 correlates HUC8 watersheds and WMAs.

It is important to note that HUC8 boundaries extend beyond the borders of New Jersey. For programmatic and jurisdictional reasons, WMA boundaries are confined to the political boundaries of New Jersey, including a 5-mile buffer strip off the Atlantic Coast shoreline.

**Future Changes**

Watershed management areas are a tool used by the DEP and citizen watershed groups. If a good reason arises, and affected parties agree, WMA boundaries will be changed as appropriate. The goal is to provide the best possible tools to enable the DEP, in conjunction with local watershed groups, to protect and manage the environment of New Jersey.

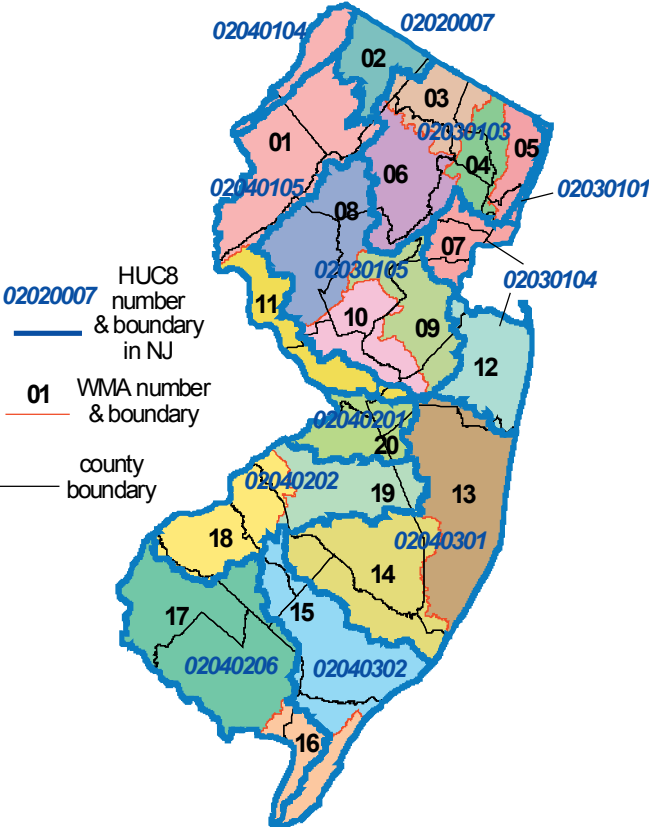


Figure 5. HUC8 and current watershed management area boundaries in New Jersey.

Table 3. HUC8 watersheds in New Jersey, with associated watershed management areas

HUC8		Associated WMAs
number	name	
02020007	Rondout	all of 02
02030101	Lower Hudson	part of 05
02030103	Hackensack-Passaic	all of 03 and 06, part of 05
02030104	Sandy Hook-Staten Island	all of 07 and 12
02030105	Raritan	all of 08, 09, and 10
02040104	Middle Delaware-Mongaup-Brodhead	part of 01
02040105	Middle Delaware-Musconetcong	all of 11, part of 01
02040201	Crosswicks-Neshaminy	all of 20
02040202	Lower Delaware	all of 18 and 19
02040206	Cohansey-Maurice	all of 17, part of 16
02040301	Mullica-Toms	all of 13 and 14
02040302	Great Egg Harbor	all of 15, part of 16

Table 4. Internet resources

Resource	Internet Link
NJDEP GIS coverages	<a href="http://www.nj.gov/dep/gis/">http://www.nj.gov/dep/gis/</a>
USGS national HUC boundaries	<a href="http://www-atlas.usgs.gov/atlasftp.html">http://www-atlas.usgs.gov/atlasftp.html</a>
EPA's Surf Your Watershed program	<a href="http://www.epa.gov/surf/">http://www.epa.gov/surf/</a>
NJDEP Division of Watershed Management	<a href="http://www.state.nj.us/dep/watershedmgt/index.html">http://www.state.nj.us/dep/watershedmgt/index.html</a>

## References

- Cohen, Sandra, 1997, Draft statewide watershed management framework document for the State of New Jersey: N.J. Department of Environmental Protection, Office of Environmental Planning, Trenton, N.J., 78p.
- Ellis, W.H. and Price, C.V., 1995, Development of a 14-digit hydrologic coding scheme and boundary data set for New Jersey: U.S. Geological Survey Water-Resource Investigations Report 95-4134, 1 plate, scale 1: 250,000.
- Seaber, P.R., Kapinos, F.P., and Knapp, G.L., 1987, Hydrologic Unit Maps: U.S. Geological Survey Water-Supply Paper 2294, 63p.
- Stockholm International Water Institute, 2002, The History of Hydrosolidarity: Water Front newsletter, No. 4, 20p, available on the Internet at <http://www.siwi.org/>.

