

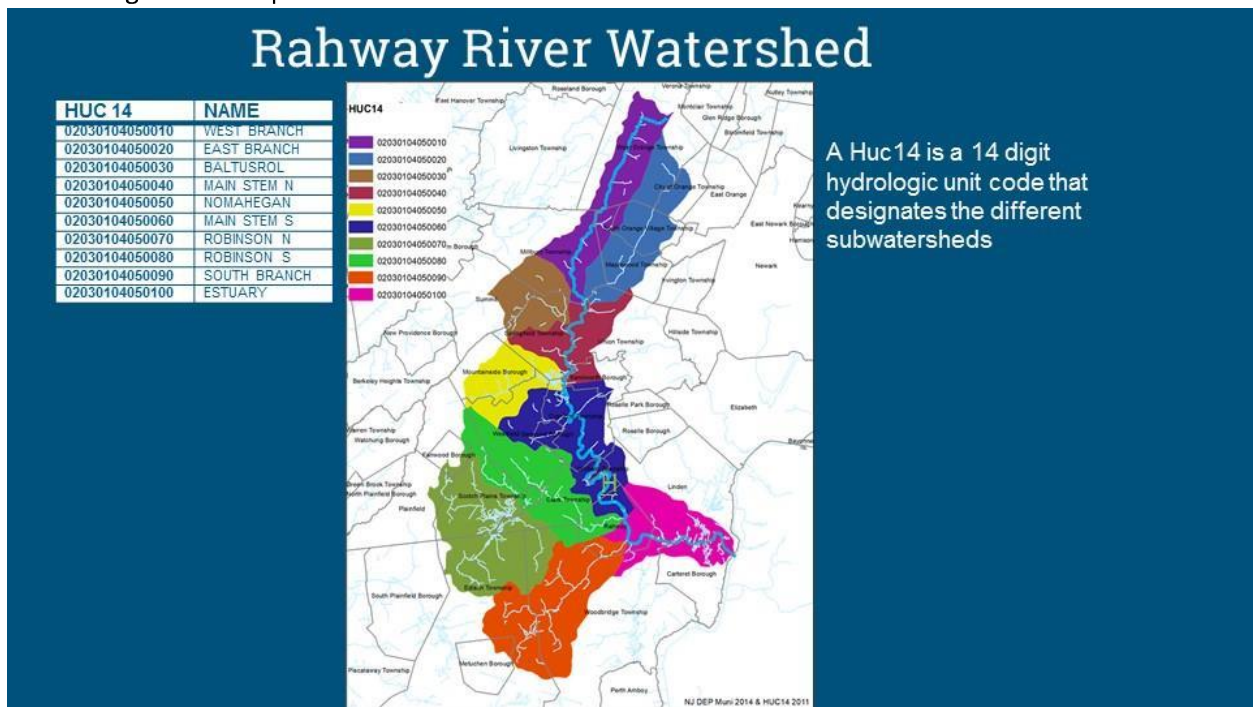
Water Quality Assessment Report

January 2019

Introduction

The Rahway River is approximately 24 miles long. It has four main branches, which drain about 80 square miles of mostly heavily-settled land in Essex, Union, and Middlesex counties. The watershed includes parts or all of twenty-four municipalities and is the source for drinking water in the City of Rahway. The riverbed follows a shallow gradient and often expands into the flood plain. Fortunately, much of the flood plain is maintained as parkland, with occasional reminders of the history of riverside industries and their legacy of pollution. In this report, we prepared some maps to present background information on the watershed of the Rahway River and some of the factors that affect the river's water quality.

Figure 1: The Rahway River is fed by tributaries in ten subwatersheds. Only recently has water monitoring been set up to assess each of the subwatersheds.



Overview of Water Quality Assessment in New Jersey

Water quality data from New Jersey have been reported to EPA since 1975 as part of the Federal Clean Water Act. Many characteristics of the state's water are assessed in relation to the various designated uses of the water. EPA standards for chemicals, bacteria, and toxic contaminants are used to assess whether the water sampled meets the criteria for its designated use, or is impaired. Impaired waters and the source of the impairment are listed as a required part of DEPs reporting to EPA. In 1992, the Ambient Biomonitoring Network (AMNET) added benthic macroinvertebrate biodiversity as an indicator of water quality (biological assessment) and also developed a habitat assessment, based on physical parameters of the site. Four rounds of statewide measurements were completed by 2009 and continue at designated sites in each subwatershed. The AMNET reports are found here

<https://www.nj.gov/dep/wms/bfbm/downloads.html#rar>, and the full reports, which include the 303d lists of impaired waters are found here [https://www.nj.gov/dep/wms/bears/assessment.htm#/. The latest complete report is from 2012, issued in 2014.](https://www.nj.gov/dep/wms/bears/assessment.htm#/)

Retrieval of historical data

We contacted Kimberly Cenno at NJDEP, Division of Water Monitoring and Standards, to request data for the Rahway River HUC 14s. Jack Pflaumer answered our request: NJDEP uses the National Water Quality Monitoring Council’s Water Quality Portal, <https://www.waterqualitydata.us/>, to retrieve data, which includes data from EPA’s STORET and USGS’s NWIS databases. All of NJDEP’s water quality data can be obtained through the Portal as well as all of the water quality data collected by other stakeholders who upload into NJ’s WQDE database or directly to STORET. Biswarup Guha (Biswarup.Guha@dep.nj.gov) from the NJDEP sent us an excel file with the data from 1998 to 2018 for the HUC 14s in the Rahway River retrieved from the portal. This includes 35,313 discrete samples, close to 20,000 from freshwater sites, and the rest from the estuary. The only data not available through the Portal is continuous data collected by data logger equipment. The Rutgers website, <http://njdep.rutgers.edu/continuous/>, includes a map of the sites and there are none in the Rahway River watershed.

Water Quality Assessment in the Subwatersheds

Table 1 shows that monitoring sites have been added to cover each of the HUC 14 subwatersheds. Sites in the shaded subwatersheds were added to the assessment assessed in the 2012 report (issued in 2014). The significant finding is that all of the sites assessed in 2004 had exceedances in phosphorous (Table 2) and all the sites assessed in 2012 were scored as “poor” (Table 3).

Table 1: Overview of the data on Rahway River water monitoring in the past 2 decades

HUC 14	NAME	SITES/ORGS	SAMPLES	DATES
02030104050010	WEST BRANCH	Lake (2001) stream(1998-2013)	1309	1998-2013
02030104050020	EAST BRANCH	Americorps	80	2011-14
02030104050030	BALTUSROL	DEP, Americorps	20	2012, 14
02030104050040	MAIN STEM N	USGS, DEP, Americorps	5855	1998-2015
02030104050050	NOMAHEGAN	DEP, Americorps	885	2011-14
02030104050060	MAIN STEM S	USGS, DEP, Americorps	7669	1998-2017
02030104050070	ROBINSON N	USGS, DEP, Americorps	195	2000-2014
02030104050080	ROBINSON S	USGS, DEP, Americorps	2552	1998-2014
02030104050090	SOUTH BRANCH	USGS, DEP, Americorps	1913	2000-15
02030104050100	ESTUARY	Harbor discharge	14,826	Includes Arthur Kill

Table 2: Exceedances at sampling sites for the AMNET program in 2004.

Amnet#	Stream Name	Station Location	Exceedances
AN0192	Rahway R	Northfield Ave	Tot Phos, TDS
AN0193	Rahway R	Rt 82 (Morris Ave) nr Washington Ave	Tot Phos
AN0194	Rahway R	Rt 509 Kenilworth Blvd	Tot Phos
AN0195	Rahway R	River Rd & Church St	Tot Phos, TSS
AN0197	Robinsons Br trib	Raritan Rd (Terrell Rd) Off Shackamaxon Lk	Tot Phos
AN0198	Robinsons Br trib	Lamberts Mill Rd	Tot Phos
AN0199	Robinsons Br	Rt 27	Tot Phos
AN0200	Rahway R S Br	Parsonage Rd	Tot Phos, TDS, PCB, Dioxin
AN0201	Rahway R S Br	in Merrill Park off Fairview Rd; off of Dover Rd	Tot Phos, TDS, PCB, Dioxin

The 1992 AMNET report assessed most sites in the RRW as “moderately impaired,” or “fair: pollution varies from moderate to high levels, certain uses prohibited.” The main non-point source pollutants were fecal coliforms and the water was not safe for swimming. Phosphorous and total dissolved solids were also excessive. Kings Creek, which enters the Arthur Kill on the south side of Tremley Point, was an impaired waterway due to point source pollution of arsenic, copper, mercury, lead, cadmium and nickel.

The 1999 AMNET Report added a habitat assessment, based on physical parameters and also scored the macroinvertebrate biodiversity. The Rahway River sites were mostly “moderately impaired”. TMDLs for fecal coliforms were addressed. In the latest AMNET report (Round 4, data from 2009) all of the sampled sites scored "poor". The data from 2011 will be included in the 2014 report, due to be released soon. The scores are presented as maps on the following pages, and compared in the table below.

Table 3: Bio rating of Impairment and Habitat scores for sites on the Rahway River

Site location	Macroinvertebrate Biodiversity				Habitat scores, based on physical parameters				Station
	1992	1999	2004	2009	2000	2004	2009	2011-12	
W Branch	good	good	poor	poor	Optimal	Poor	Marginal	Optimal	192
Springfield	fair	fair	fair	poor	Subopt	Subopt	Subopt	Subopt	193
Nomahegan	good	poor	poor	poor	Subopt	Marginal	Subopt	Subopt	194
At Rahway	good	fair	fair	poor	Subopt	Subopt	Subopt	Subopt	195
Robinson	fair	good	poor	poor	Marginal	Marginal	Subopt	Marginal	196
Robinson	good	good	poor	poor	Subopt	Subopt	Subopt	Subopt	197
Robinson	good	good	poor	poor	Subopt	Subopt	Subopt	Subopt	198
Robinson	good	good	poor	poor	Subopt	Subopt	Subopt	Subopt	199
S Branch	fair	fair	poor	poor	Marginal	Marginal	Marginal	Subopt	200
S Branch	poor	good	fair	poor	Marginal	Marginal	Marginal	Subopt	201

Bio Impairment scores

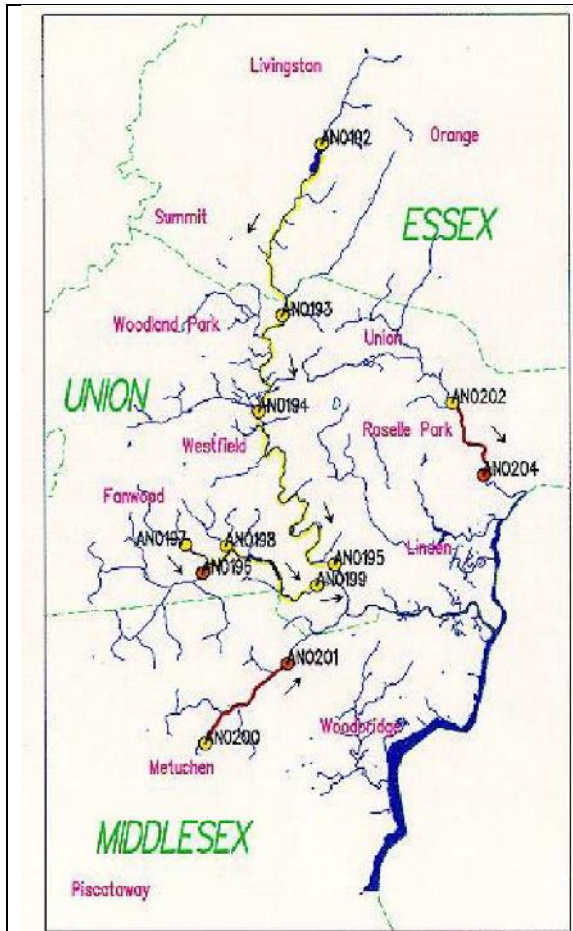
Excellent - Not impaired

Fair to Good - moderately impaired

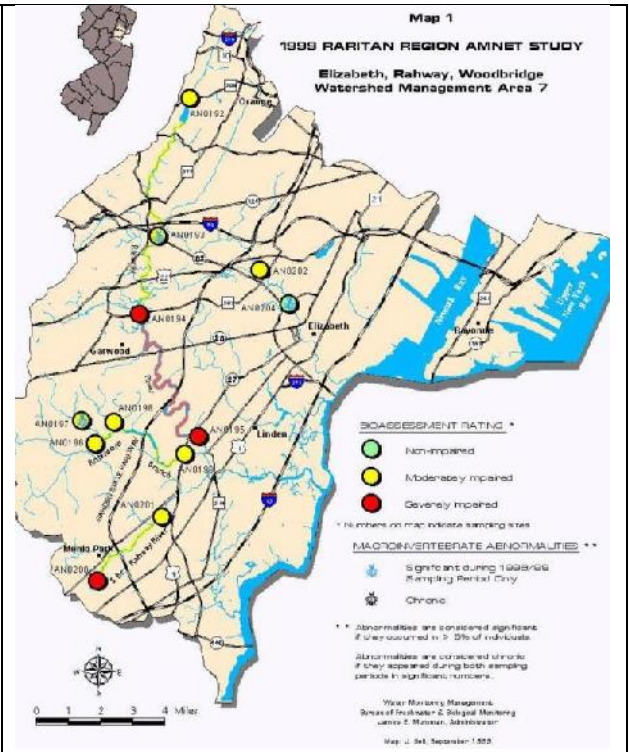
Poor – severely impaired

Maps show sampling sites in 1992, 1999, 2004, and 2009, indicating the level of impairment.

All sites on the Rahway River and its tributaries scored as “poor” in 2009, the most recent round. Maps from AMNET reports are shown at full size in the Appendix.



1992, main stem was moderately impaired



1999, main stem was severely impaired



2004, most sites were moderately impaired



2009, all sites were scored as poor

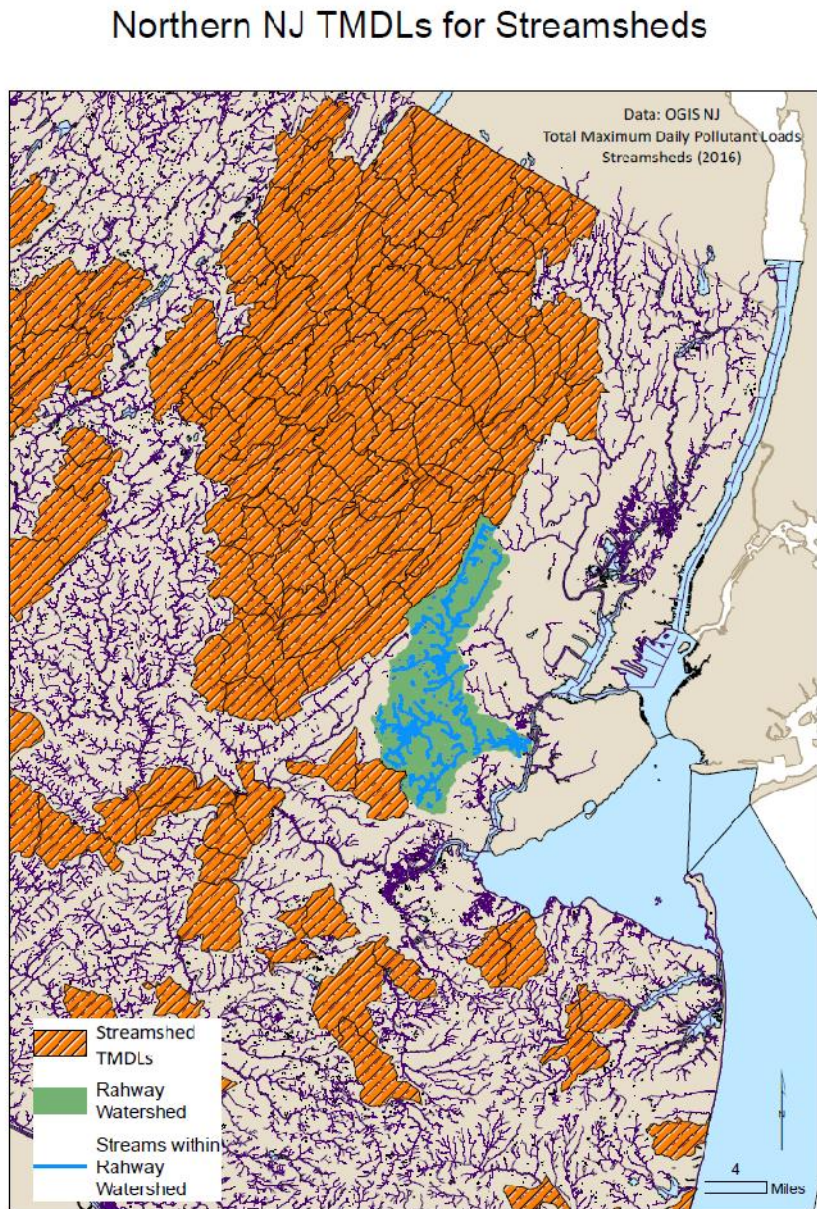
Table 4: Most recent 303d list of Impaired Waters for Rahway River watershed from 2014 Integrated Report. A detailed list of these sites, with TMDL status and designated use is in Appendix 9.

Assessment Unit	AU Name	Cause	Listing Station
02030104050010-01	Rahway River WB	Phosphorus (Total)	01393960
02030104050010-01	Rahway River WB	Sulfates	01393960
02030104050010-01	Rahway River WB	Total Dissolved Solids	01393960
02030104050040-01	Rahway River (Kenilworth Blvd to EB / WB)	Arsenic	01394500
02030104050040-01	Rahway River (Kenilworth Blvd to EB / WB)	Phosphorus (Total)	01394500
02030104050060-01	Rahway River (Robinsons Br to Kenilworth Blvd)	Arsenic	01395000,7-rah-1
02030104050060-01	Rahway River (Robinsons Br to Kenilworth Blvd)	Mercury in Fish Tissue	Rahway R at Valley Road Pond
02030104050060-01	Rahway River (Robinsons Br to Kenilworth Blvd)	Oxygen, Dissolved	Nomahegan Park Lake-07, Rahway River Park Lake-07
02030104050060-01	Rahway River (Robinsons Br to Kenilworth Blvd)	Phosphorus (Total)	01394630,01395000,Bloodg oods Pond-07
02030104050070-01	Robinsons Br Rahway R (above Lake Ave)	Phosphorus (Total)	01395500
02030104050070-01	Robinsons Br Rahway R (above Lake Ave)	Phosphorus (Total)	01395500
02030104050080-01	Robinsons Br Rahway R (below Lake Ave)	Arsenic	01395003,7-Rob-1
02030104050080-01	Robinsons Br Rahway R (below Lake Ave)	Phosphorus (Total)	01395200,01395500,01396003
02030104050090-01	Rahway River SB	Dioxin (including 2,3,7,8-TCDD)	HEP
02030104050090-01	Rahway River SB	PCB in Fish Tissue	HEP
02030104050090-01	Rahway River SB	Phosphorus (Total)	01395030
02030104050090-01	Rahway River SB	Total Dissolved Solids	01395030
02030104050100-01	Rahway River (below Robinsons Branch)	Benzo(a)pyrene (PAHs)	HEP
02030104050100-01	Rahway River (below Robinsons Branch)	Chlordane in Fish Tissue	HEP
02030104050100-01	Rahway River (below Robinsons Branch)	DDT in Fish Tissue	HEP
02030104050100-01	Rahway River (below Robinsons Branch)	Dieldrin	HEP
02030104050100-01	Rahway River (below Robinsons Branch)	Dieldrin	HEP
02030104050100-01	Rahway River (below Robinsons Branch)	Dioxin (including 2,3,7,8-TCDD)	HEP
02030104050100-01	Rahway River (below Robinsons Branch)	Heptachlor epoxide	HEP

02030104050100-01	Rahway River (below Robinsons Branch)	Hexachlorobenzene	HEP
02030104050100-01	Rahway River (below Robinsons Branch)	Mercury in Fish Tissue	HEP
02030104050100-01	Rahway River (below Robinsons Branch)	Oxygen, Dissolved	NJHDG-22,Passaic-19
02030104050100-01	Rahway River (below Robinsons Branch)	PCB in Fish Tissue	HEP

EPA regulations call for the establishment of Total Maximum Daily Load (TMDL) within 15 years of the first appearance on the 303(d) list, as has been done for neighboring watersheds. TMDLs for fecal coliforms have been set up, but not attained. This map shows that the Rahway River streams lack TMDLs.

Figure 3: TMDLs in neighboring watersheds: Passaic and Raritan



The TMDL priority is given for individual pollutants shown in Table 4 mapped to the affected subwatersheds. However, information is incomplete as sampling sites were not present for East Branch, Baltusrol Brook, and Nomahegan subwatersheds.

Figure 4: Phosphorous

<https://www.dropbox.com/s/6p8tcj9rt55jl1m/NJ%202014%20Integrated%20WQ%20Priorities%20PHOSPHORUS%201200.pdf?dl=0>

Figure 5: Sulfates

<https://www.dropbox.com/s/1rerh8rbhpojetn/NJ%202014%20Integrated%20WQ%20Priorities%20Sulfates%201200.pdf?dl=0>

Figure 6: Dissolved solids

<https://www.dropbox.com/s/9yx43f7zsm961ru/NJ%202014%20Integrated%20WQ%20Priorities%20DISSOLVED%20SOLIDS%201200.pdf?dl=0>

Figure 7: Arsenic

<https://www.dropbox.com/s/2sar3vwzd1omdvn/NJ%202014%20Integrated%20WQ%20Priorities%20ARSENIC%201200.pdf?dl=0>

Figure 8: Dissolved oxygen

<https://www.dropbox.com/s/qi5sxbz2z15psyph/NJ%202014%20Integrated%20WQ%20Priorities%20LOW%20DISSOLVED%20OXYGEN%201200.pdf?dl=0>

Figure 9: Mercury

<https://www.dropbox.com/s/v5fo4s1t0h8omn2/NJ%202014%20Integrated%20WQ%20Priorities%20MERCURY%201200.pdf?dl=0>

Figure 10: PCBs

<https://www.dropbox.com/s/ofeff3ja9vuf9im/NJ%202014%20Integrated%20WQ%20Priorities%20PCBs%201200.pdf?dl=0>

Contaminants found only in the lower Rahway River below Robinson's Branch

Figure 11: BenzoPAH

<https://www.dropbox.com/s/f7qyxr0nekim5qd/NJ%202014%20Integrated%20WQ%20Priorities%20BenzoPAHs%201200.pdf?dl=0>

Figure 12: Chlordane

<https://www.dropbox.com/s/d5yyeidqvh1ws07/NJ%202014%20Integrated%20WQ%20Priorities%20Chlordane%201200.pdf?dl=0>

Figure 13: DDT

<https://www.dropbox.com/s/7pkpqm2ophjbsset/NJ%202014%20Integrated%20WQ%20Priorities%20DDT%201200.pdf?dl=0>

Figure 14: Dieldrin

<https://www.dropbox.com/s/g15cb5g94har4ml/NJ%202014%20Integrated%20WQ%20Priorities%20Dieldrin%201200.pdf?dl=0>

Figure 15: Dioxin

<https://www.dropbox.com/s/e8wt1dzurtcz0sp/NJ%202014%20Integrated%20WQ%20Priorities%20DIOXIN%201200.pdf?dl=0>

Figure 16: Heptachlor

<https://www.dropbox.com/s/86amtuiay7uy5sm/NJ%202014%20Integrated%20WQ%20Priorities%20Heptachlor%20epoxide%201200.pdf?dl=0>

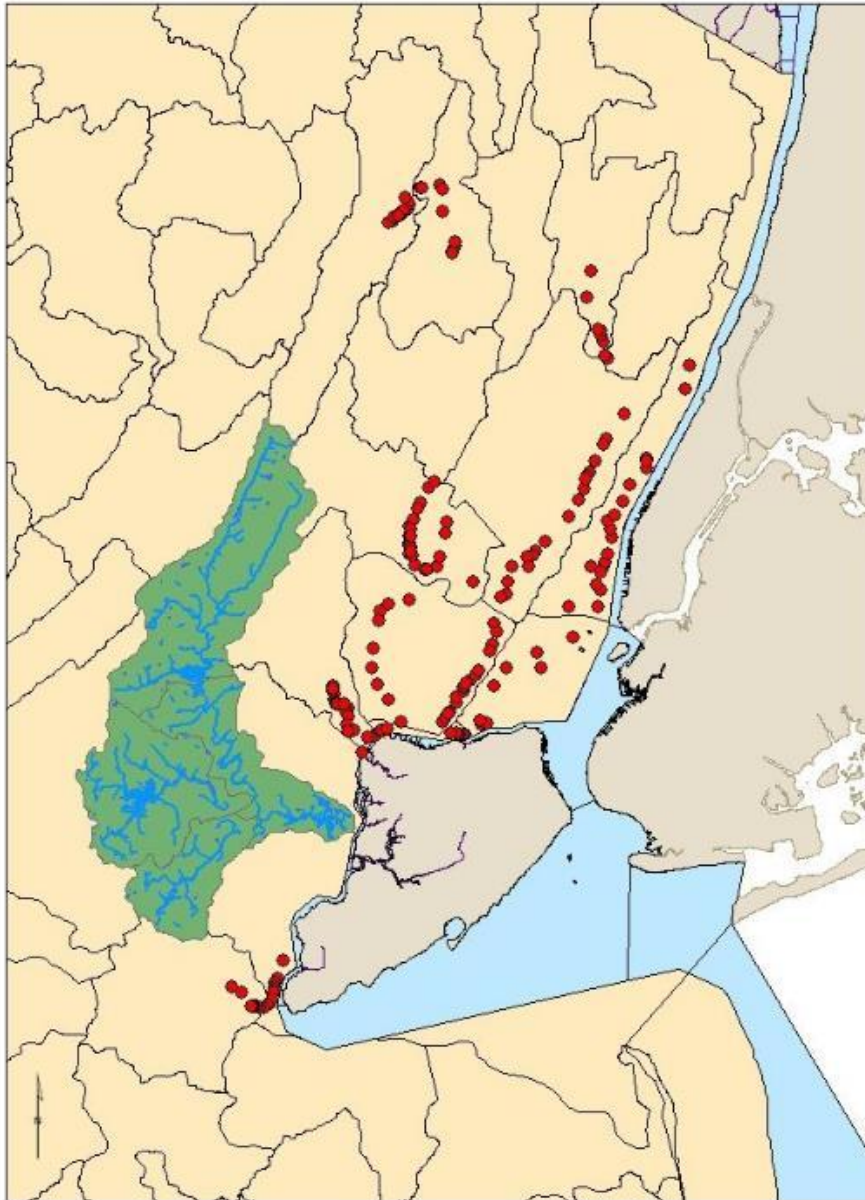
Figure 17: Hexachlorobenzene

<https://www.dropbox.com/s/i283bh65arihfsu/NJ%202014%20Integrated%20WQ%20Priorities%20Hexachlorobenzene%201200.pdf?dl=0>

Figure 18: Stormwater and sewage in the Rahway River Watershed

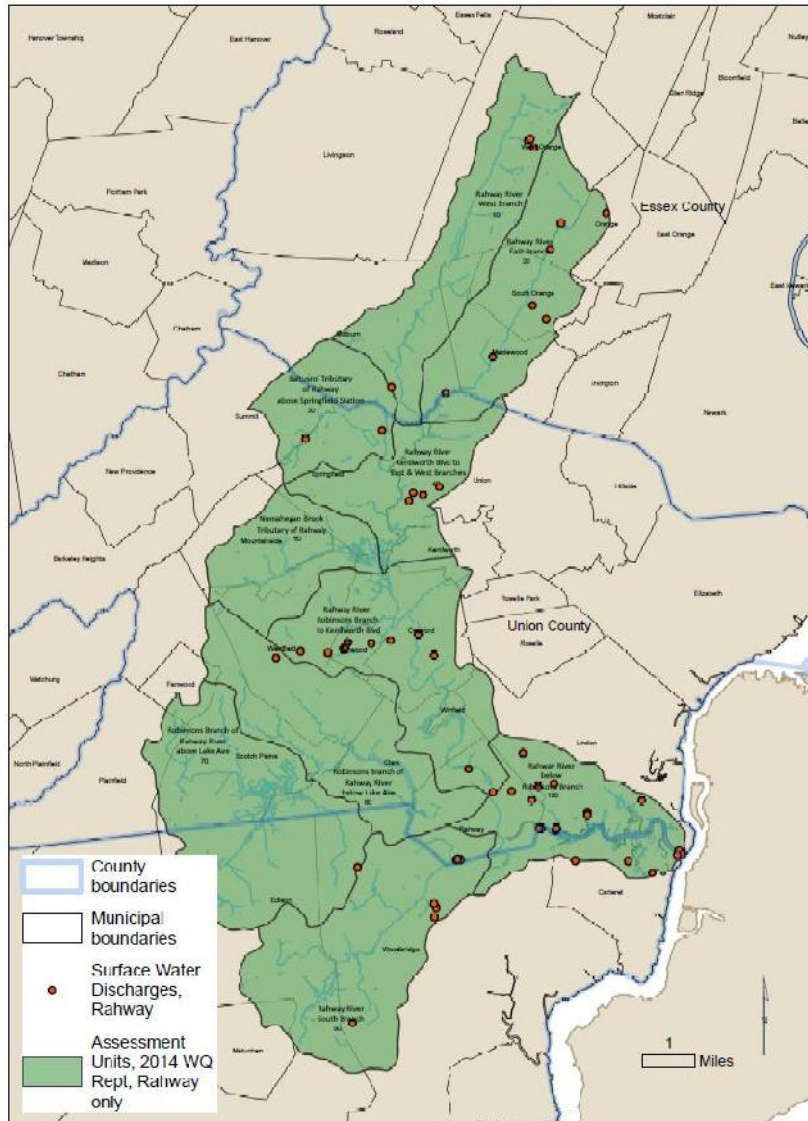
While neighboring communities are plagued by Combined Sewage Overflows, these are not generally a problem for the Rahway River watershed towns, where the two systems use a different set of pipes. However, unintended infiltration of the sanitary sewers by stormwater does occur and can result in sewage overflow. Digital files of storm water outfalls are available in some watershed municipalities, but we have not, so far, found a county or state level layer.

Combined Sewer Outflows (CSOs), Northern NJ



Digital data on surface water and ground water discharge is available in the Pollutant Discharge Elimination System (PDES) and these sites are mapped in Figure 19. They are clustered in several areas: along the East Branch, on the main stem in Union and tributaries in Cranford and Westfield, and in the lower Rahway, both in the South Branch and in the main stem below the South Branch.

Surface Water Discharges in Rahway Watershed



Data: NJPDES

All told, water quality in the Rahway River watershed has been monitored by DEP and USGS at various sites to provide data for the biennial reporting requirements of the federal Clean Water Act. The water quality at these sites is currently rated as “poor” and a long list of impaired waters lacks TMDLs. The Rahway River Watershed Association is embarking on a citizen science water monitoring plan in partnership with the Watershed Institute, NJDEP and others to assess sites at the top and bottom of each of the nine freshwater subwatersheds. In addition, we have on-going educational programs to address both flooding and the most widespread non-attainment, phosphorous non-point source pollution. We hope that the increased monitoring efforts will provide data useful for setting up TMDLs for the waters of this region.

List of Appendices

1. Rationale for Benthic Macroinvertebrate Sampling
2. RRW Site Reports, 1992
3. RRW Site Reports, 2004
4. RRW Site Reports, 2009
5. 1992 Map of Sampling Sites
6. 1999 Map of Sampling Sites
7. 2004 Map of Sampling Sites
8. 2009 Map of sampling Sites
9. 2012 water quality limited 303d list for RRW