

## Introduction and Overview

This report provides an assessment of the Delaware River's support of various uses from 2002 through 2004 that are protected by the Delaware River Basin Commission's (DRBC) Water Quality Regulations, or by the federal Clean Water Act of 1972. The uses are: maintenance of aquatic life; providing a raw water source for human consumption; swimming and recreation; fish consumption; and shellfish consumption. The assessment involves comparison of several key water quality parameters with applicable DRBC water quality standards and stream quality objectives. DRBC Water Quality Regulations also designate agricultural and industrial uses for the Delaware River. However, since these two uses would require less stringent water quality criteria than the other uses discussed, they were not assessed for this report.

Assessed water bodies (assessment units) are placed into one of five categories. These are based primarily upon the totality of designated use support within those water bodies as well as the availability of data for assessing water quality in those water bodies. For each designated use, in each assessment unit, a number of water quality parameters, relevant to the use, are compared to the existing, applicable water quality criteria. The methodology used to make the assessments is presented in Part 3 of this report.

### 1. Summary

Table 1.1 shows the levels to which the assessed portions, or assessment units, of the non-tidal Delaware River supported their designated uses during the 2002 through 2004 monitoring seasons. Segments of the River that were assessed as not supporting the aquatic life designated use were 1A1 and 1A2, due to high pH, and 1D4 due to Total Dissolved Solids. Additionally, the recreation designated use was considered not supported in 1E3 and 1E4 due to fecal coliform. The drinking water designated use was considered supported in all assessment units for which sufficient data were available. The Fish consumption use was the most widely non-supported use, with the entire non-tidal Delaware River falling under one or more state fish consumption advisories.

Table 1.2 provides a summary of the extent of use support for the designated uses, in the different assessment units of the Delaware Estuary. The aquatic life designated use was considered not supported in 5C due to low dissolved oxygen. The recreation designated use was considered supported in all assessment units for which sufficient data were available. The drinking water designated use was considered to be supported in 2 and 3, the parts of the Estuary where drinking water is a designated use. The fish consumption designated use was considered to be not supported in any part of the Estuary, due to state fish consumption advisories that are in place.

Table 1.3 provides a summary of the extent of use support for the designated uses, in different assessment units of the Delaware Bay. The aquatic life designated use was considered to be supported in all assessment units for which sufficient data were available. The recreation designated use was not considered to be supported in 6nj8 due to high enterococcus bacteria. Fish consumption was not supported in any portion of the Bay due to the presence of state fish consumption advisories. The shellfish designated use was considered not supported in all areas closed to shellfish harvesting or where recent total coliform bacteria data showed that the use was not supported. These areas correspond to 6br1a, 6br2a, 6br2d, 6br3a, 6de2, 6de3, 6de4, 6de5, 6nj6, 6nj7, 6nj8 and 6nj9.

Tables 1.4 and 1.5 provide a summary of use support by region (Non-Tidal and Estuary/Bay), expressed in miles or square miles and percent of total miles or total square miles.

Tables 1.6 - 1.8 provide an overview of causes and sources of pollutants or conditions that created the non-support of uses as described in this report. The causes of the non-support are the chemical constituents, pollutants or conditions that created the criteria violations. The source is the activity that creates the condition or pollutant, or causes the pollutant to enter the stream. In many circumstances, professional judgment was used in identifying possible sources.

**Table 1.1: Use Support in Non-Tidal River Assessment Units from 2006 Integrated Assessment**

AU	River Miles*	DO	pH	Fecal Col.	TDS Aquatic Life	TDS Drinking Water	Alkalinity	Aquatic Life Assessment	Recreation Assessment	Drinking Water Assessment	Fish Consumption Assessment	Final Assessment
1A1	335.54-308.01	+	-	+	ID	ID	NA	Not Supported	Supported	ID	Not Supported	5
1A2	308.01-299.38	+	-	+	ID	ID	NA	Not Supported	Supported	ID	Not Supported	5
1A3	299.38-293.62	+	+	+	ID	ID	NA	ID	Supported	ID	Not Supported	5
1B1	293.62-281.11	ID	ID	+	ID	ID	NA	ID	Supported	ID	Not Supported	5
1B2	281.11-264.88	+	+	+	ID	ID	NA	Supported	Supported	ID	Not Supported	5
1B3	264.88-257.67	+	+	+	ID	ID	NA	ID	Supported	ID	Not Supported	5
1C1	257.67-256.53	ID	ID	ID	ID	ID	NA	ID	Probably Supported	ID	Not Supported	5
1C2	256.53-229.85	+	+	+	+	+	NA	Supported	Supported	Supported	Not Supported	5
1C3	229.85-228.13	+	+	+	ID	ID	NA	ID	Supported	ID	Not Supported	5
1C4	228.13-219.35	ID	ID	ID	ID	ID	NA	ID	Probably Supported	ID	Not Supported	5
1D1	219.35-214.70	+	+	+	ID	ID	NA	ID	Supported	ID	Not Supported	5
1D2	214.70-210.20	+	+	+	ID	ID	NA	ID	Supported	ID	Not Supported	5
1D3	210.20-200.89	+	+	+	+	+	NA	Supported	Supported	Supported	Not Supported	5
1D4	200.09-192.71	+	+	+	-	+	NA	Not Supported	Supported	Supported	Not Supported	5
1D5	192.71-185.83	ID	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	5
1D6	185.83-185.41	ID	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	5
1E1	185.41-179.02	+	+	+	+	+	+	Supported	Supported	Supported	Not Supported	5
1E2	179.02-176.16	ID	ID	ID	ID	ID	ID	Probably Supported	ID	Probably Supported	Not Supported	5
1E3	176.16-173.88	+	+	-	+	+	+	Supported	Not Supported	Supported	Not Supported	5
1E4	173.88-156.22	+	+	-	+	+	+	Supported	Not Supported	Supported	Not Supported	5
1E5	156.22-133.4	+	+	+	+	+	+	Supported	Supported	Supported	Not Supported	5

**Notes:**

\* River miles reflect National Hydrographic Dataset mileage system, which differs slightly from DRBC river mileage system.

ID: Insufficient data to compare this parameter to current water quality criterion

+(-): This parameter meets (does not meet) DRBC's current water quality criterion

Aquatic Life Use Support Assessed by: Dissolved Oxygen, pH, Total Dissolved Solids, Alkalinity

Recreation Use Support Assessed by: Fecal Coliform

Drinking Water Use Assessed by: TDS

Fish Consumption Use Assessed by: Presence of Advisories

**Table 1.2: Use Support in Estuary Assessment Units from 2006 Integrated Assessment**

Parameter	Assessment Unit (River Miles)					
	2 (133.4-108.4)	3 (108.4-95.0)	4 (95.0-78.8)	5A (78.8-70.0)	5B (70.0-59.5)	5C (59.5-48.2)
Dissolved Oxygen	+	+	+	ID	ID	-
Temperature	+	+	+	+	+	+
pH	+	+	+	+	+	+
Fecal Coliform	+	+	+	+	+	+
Enterococcus	+	+	+	+	+	+
Alkalinity	+	+	+	+	+	+
Hardness	+	+	NA	NA	NA	NA
Sodium	NA	+	NA	NA	NA	NA
Chloride	+	+	NA	NA	NA	NA
TDS	+	+	NA	NA	NA	NA
Toxicity	+	+	+	ID	ID	+
Toxic Parameters	-	-	-	-	-	-
Designated Use	Use Support Level					
Aquatic Life	Supported	Supported	Supported	ID	ID	Not Supported
Recreation	Supported	Supported	Supported	Supported	Supported	Supported
Drinking Water	Supported	Supported	NA	NA	NA	NA
Fish Consumption	Not Supported	Not Supported	Not Supported	Not Supported	Not Supported	Not Supported
<b>Final Assessment Category</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>
<p><u>Notes:</u>            NA: DRBC criterion does not apply to this water quality zone            +(-): This parameter meets (does not meet) DRBC's current water quality criterion</p>						

**Table 1.3: Use Support in Delaware Bay Assessment Units from 2006 Integrated Assessment**

Assessment Unit	Miles <sup>2</sup>	DO	Temp.	pH	Alkalinity	Fecal	Entero.	Aquatic Life	Recreation	Fish	Shellfish	Final
6brA	47.10	+	+	+	+	+	+	Supported	Supported	Not Supported	Supported	5
6brB	40.82	+	+	+	+	+	+	Supported	Supported	Not Supported	Supported	5
6brC	22.39	+	+	+	+	+	+	Supported	Supported	Not Supported	Supported	5
6br1a	2.66	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Not Supported	5
6br1b	20.61	+	+	+	+	+	+	Supported	Supported	Not Supported	Supported	5
6br2a	1.09	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Not Supported	5
6br2b	25.88	+	+	+	+	+	+	Supported	Supported	Not Supported	Supported	5
6br2c	0.31	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Supported	5
6br2d	1.52	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Not Supported	5
6br3a	16.45	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Not Supported	5
6br3b	12.63	+	+	+	+	+	+	Supported	Supported	Not Supported	Supported	5
6br3c	8.53	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Supported	5
6de1	187.24	+	+	+	+	ID	+	Supported	ID	Not Supported	Supported	5
6de2	0.72	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Not Supported	5
6de3	5.31	ID	ID	ID	ID	ID	+	ID	ID	Not Supported	Not Supported	5
6de4	5.39	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Not Supported	5
6de5	5.81	+	+	+	+	ID	+	Supported	ID	Not Supported	Not Supported	5
6nj1	268.96	+	+	ID	ID	+	+	ID	Supported	Not Supported	Supported	5
6nj2	1.65	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Supported	5
6nj3	2.96	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Supported	5
6nj4	0.65	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Supported	5
6nj5	0.82	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Supported	5
6nj6	0.69	ID	ID	ID	ID	+	ID	ID	ID	Not Supported	Not Supported	5
6nj7	7.17	ID	ID	ID	ID	+	ID	ID	ID	Not Supported	Not Supported	5
6nj8	3.23	+	+	ID	ID	+	-	ID	Not Supported	Not Supported	Not Supported	5
6nj9	1.32	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Not Supported	5
6nj10	1.00	ID	ID	ID	ID	ID	ID	ID	ID	Not Supported	Supported	5

**Table 1.4: Extent of Support of Designated Uses (Non-Tidal River)**

Use	Total Miles	Miles Supporting	Miles with Insufficient Data	Miles Not Supporting
Aquatic Life	202	102	56	44
Fish Consumption	202	0	0	202
Primary Contact Recreation	202	162	20	20
Drinking Water	202	93	109	0

**Table 1.5: Extent of Support of Designated Uses (Estuary and Bay)**

Use	Total Area (mi <sup>2</sup> )*	Area Supporting (mi <sup>2</sup> )	Area with Insufficient Data (mi <sup>2</sup> )	Area Not Supporting (mi <sup>2</sup> )
Aquatic Life	790	394	364	31
Fish Consumption	790	0	0	790
Shellfishing	693	642	0	51
Primary Contact Recreation	769	514	251	3
Secondary Contact Recreation	21	21	0	0
Drinking Water	15	0	0	15

Note: Zone 2 = 8 square miles, Zone 3 = 7 square miles, Zone 4 = 17 square miles, Zone 5 = 65 square miles, Zone 6 = 693 square miles (total area is 790 square miles)

\* Areas in columns 3, 4 and 5 may not add up to Total Area due to rounding.

**Table 1.6: Overview of Causes and Potential Sources of Impairments in Non-Tidal Delaware River**

Assessment Unit	Use Not Supported	Causes	Potential Sources
1A1	Aquatic Life	pH	Internal Nutrient Recycling*
1A1	Fish Consumption	Mercury	Air Deposition, Source Unknown
1A2	Aquatic Life	pH	Internal Nutrient Recycling*
1A2	Fish Consumption	Mercury	Air Deposition, Source Unknown
1A3	Fish Consumption	Mercury	Air Deposition, Source Unknown
1B1	Fish Consumption	Mercury	Air Deposition, Source Unknown
1B2	Fish Consumption	Mercury	Air Deposition, Source Unknown
1B3	Fish Consumption	Mercury	Air Deposition, Source Unknown
1C1	Fish Consumption	Mercury	Air Deposition, Source Unknown
1C2	Fish Consumption	Mercury	Air Deposition, Source Unknown
1C3	Fish Consumption	Mercury	Air Deposition, Source Unknown
1C4	Fish Consumption	Mercury	Air Deposition, Source Unknown
1D1	Fish Consumption	Mercury	Air Deposition, Source Unknown
1D2	Fish Consumption	Mercury	Air Deposition, Source Unknown
1D3	Fish Consumption	Mercury	Air Deposition, Source Unknown
1D4	Aquatic Life	Total Dissolved Solids	Natural Sources, Unknown Sources
1D4	Fish Consumption	Mercury	Air Deposition, Source Unknown
1D5	Fish Consumption	Mercury	Air Deposition, Source Unknown
1D6	Fish Consumption	Mercury	Air Deposition, Source Unknown
1E1	Fish Consumption	Mercury	Air Deposition, Source Unknown
1E2	Fish Consumption	Mercury	Air Deposition, Source Unknown
1E3	Fish Consumption	Mercury	Air Deposition, Source Unknown
1E3	Primary Contact Recreation	Fecal Coliform	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
1E4	Fish Consumption	Mercury	Some Industrial Point Sources, Nonpoint Sources, Air Deposition
1E4	Primary Contact Recreation	Fecal Coliform	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
1E5	Fish Consumption	Dioxins, Mercury, PCBs	Brownfield Sites, Contaminated Sediments, Air Deposition, Source Unknown

\* Excessive plant growth, if a source of pH criterion exceedance, may be caused by nutrient enrichment

**Table 1.7: Overview of Causes and Potential Sources of Impairments in Delaware Estuary**

<b>Assessment Unit</b>	<b>Use Not Supported</b>	<b>Causes</b>	<b>Potential Sources</b>
2	Fish Consumption	PCBs, Dioxins, Chlordane, Dieldrin, DDD, DDE, DDT, Mercury	Air Deposition, Brownfield Sites, Contaminated Sediments, Inappropriate Waste Disposal, Pesticide Application, Source Unknown
3	Fish Consumption	PCBs, Dioxins, Chlordane, Dieldrin, DDD, DDE, DDT, Mercury	Air Deposition, Brownfield Sites, Contaminated Sediments, Inappropriate Waste Disposal, Pesticide Application, Source Unknown
4	Fish Consumption	PCBs, Dioxins, Chlordane, Dieldrin, DDD, DDE, DDT, Mercury	Air Deposition, Brownfield Sites, Contaminated Sediments, Inappropriate Waste Disposal, Pesticide Application, Source Unknown
5a	Fish Consumption	PCBs, Dioxins, Chlordane, Dieldrin, DDD, DDE, DDT, Mercury	Air Deposition, Brownfield Sites, Contaminated Sediments, Inappropriate Waste Disposal, Pesticide Application, Source Unknown
5b	Fish Consumption	PCBs, Dioxins, Chlordane, Dieldrin, DDD, DDE, DDT, Mercury	Air Deposition, Brownfield Sites, Contaminated Sediments, Inappropriate Waste Disposal, Pesticide Application, Source Unknown
5c	Aquatic Life	Dissolved Oxygen	Agriculture, Habitat Modification, Municipal Point Source Discharges, Package Plant or Other Permitted Small Flows Discharges, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)
5c	Fish Consumption	PCBs, Dioxins, Chlordane, Dieldrin, DDD, DDE, DDT, Mercury	Air Deposition, Brownfield Sites, Contaminated Sediments, Inappropriate Waste Disposal, Pesticide Application, Source Unknown

**Table 1.8: Overview of Causes and Potential Sources of Impairments in Delaware Bay**

Assessment Unit	Use Not Supported	Causes	Potential Sources
All Units	Fish Consumption	Chlordane, DDD, DDE, DDT, Dieldrin, Dioxin, Mercury, PCBs	Atmospheric Deposition, Brownfields, Contaminated Sediments, Wet Weather Discharges (Non-Point Source), Source Unknown
6br1a	Shellfishing	Pathogens	Residential Districts, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
6br2a	Shellfishing	Pathogens	Residential Districts, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
6br2d	Shellfishing	Pathogens	Residential Districts, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
6br3a	Shellfishing	Pathogens	Residential Districts, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
6de2	Shellfishing	Pathogens	Residential Districts, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
6de3	Shellfishing	Pathogens	Residential Districts, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
6de4	Shellfishing	Pathogens	Residential Districts, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
6de5	Shellfishing	Pathogens	Residential Districts, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
6nj6	Shellfishing	Pathogens	Residential Districts, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
6nj7	Shellfishing	Pathogens	Residential Districts, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
6nj8	Primary Contact Recreation	Enterococcus	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Residential Districts, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
6nj8	Shellfishing	Pathogens	Residential Districts, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown
6nj9	Shellfishing	Pathogens	Residential Districts, Wet Weather Discharges (Non-Point Source), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Source Unknown