

Water for the Future: Upstate Water Supply Resiliency

Final Environmental Impact Statement

December 2017

CEQR No: 15DEP006U

Lead Agency: **New York City Department of Environmental Protection**

Commissioner: **Vincent Sapienza, P.E.**

Lead Agency Contact: Angela Licata, Deputy Commissioner of Sustainability
Attention: Sangamithra Iyer, P.E.
Director of Office of Water Supply
Infrastructure & Watershed Assessment
New York City Department of Environmental Protection
Bureau of Environmental Planning and Analysis
59-17 Junction Boulevard
Flushing, NY 11373
(718) 595-3585
WFFComments@dep.nyc.gov

Preparers: **New York City Department of Environmental Protection**
Bureau of Environmental Planning and Analysis

Henningson, Durham & Richardson, Architecture and
Engineering, P.C.
711 Westchester Avenue
White Plains, NY 10604

Hazen and Sawyer
498 Seventh Avenue, 11th Floor
New York, NY 10018

ACRONYMS..... A-1

GLOSSARY..... G-1

EXECUTIVE SUMMARY ES-1

CHAPTER 1 : INTRODUCTION..... 1.1-1

1.1 Overview of Water for the Future 1.1-1

1.2 Organization of this Draft Environmental Impact Statement 1.2-1

CHAPTER 2 : PURPOSE AND NEED FOR THE PROPOSED UPSTATE WATER SUPPLY RESILIENCY 2.0-1

CHAPTER 3 : OVERVIEW OF THE CITY’S WATER SUPPLY SYSTEM 3.1-1

3.1 Surface Water Supply System Overview 3.1-1

 3.1.1 Catskill Water Supply System Overview 3.1-1

 3.1.2 Delaware Water Supply System Overview..... 3.1-4

 3.1.3 Croton Water Supply System Overview..... 3.1-5

 3.1.4 Surface Water Supply System Operation 3.1-6

3.2 Groundwater System Overview 3.2-1

CHAPTER 4 : WATER FOR THE FUTURE BACKGROUND AND PLANNING..... 4.1-1

4.1 Background..... 4.1-1

4.2 Water Supply Augmentation Planning 4.2-1

CHAPTER 5 : PROGRAM DESCRIPTION..... 5.1-1

5.1 Water for the Future Project Components 5.1-1

5.2 Water for the Future Supporting Projects..... 5.2-1

 5.2.1 Demand Management 5.2-1

 5.2.2 Catskill/Delaware Interconnection at Shaft 4 5.2-1

 5.2.3 Improvements to Catskill Aqueduct Stop Shutters..... 5.2-2

 5.2.4 Croton Water Filtration Plant..... 5.2-2

 5.2.5 Cross River and Croton Falls Pump Stations..... 5.2-3

5.3	Summary of Environmental Review of WFF Components and Supporting Projects.....	5.3-1
CHAPTER 6 : PROJECT DESCRIPTIONS.....		
6.1	Catskill Aqueduct Repair and Rehabilitation	6.1-1
6.2	Water for the Future Shutdown System Operations	6.2-1
6.3	Rondout-West Branch Tunnel Inspection and Repair	6.3-1
CHAPTER 7 : POTENTIAL MAJOR DISCRETIONARY PERMITS, APPROVALS, AND CONSULTATION.....		
CHAPTER 8 : ANALYTICAL FRAMEWORK.....		
8.1	EIS Assessment Conditions and Impact Categories	8.1-1
8.2	Definition of Impact Categories and Analysis Thresholds	8.2-1
8.2.1	Land Use, Zoning, and Public Policy	8.2-1
8.2.2	Socioeconomic Conditions	8.2-1
8.2.3	Community Facilities and Services	8.2-3
8.2.4	Open Space and Recreation	8.2-3
8.2.5	Critical Environmental Areas	8.2-4
8.2.6	Shadows	8.2-4
8.2.7	Historic and Cultural Resources	8.2-5
8.2.8	Urban Design and Visual Resources.....	8.2-7
8.2.9	Natural Resources	8.2-8
8.2.10	Hazardous Materials	8.2-9
8.2.11	Water and Sewer Infrastructure	8.2-10
8.2.12	Solid Waste and Sanitation Services.....	8.2-11
8.2.13	Energy.....	8.2-12
8.2.14	Greenhouse Gas Emissions and Climate Change	8.2-12
8.2.15	Transportation	8.2-12
8.2.16	Air Quality	8.2-14
8.2.17	Noise	8.2-15
8.2.18	Neighborhood Character.....	8.2-17
8.2.19	Public Health.....	8.2-17
CHAPTER 9 : PROPOSED CATSKILL AQUEDUCT REPAIR AND REHABILITATION.....		
9.1	Purpose and Need.....	9.1-1

9.2	Project Description.....	9.2-1
9.2.1	Background.....	9.2-1
9.2.2	Overview of Proposed Activities.....	9.2-3
9.2.3	Schedule.....	9.2-5
9.2.4	Description of the Upper Catskill Aqueduct.....	9.2-10
9.2.5	Operation of the Upper Catskill Aqueduct.....	9.2-15
9.2.6	Proposed Repair and Rehabilitation Activities.....	9.2-16
9.2.7	Catskill Aqueduct Repair and Rehabilitation Study Areas and Activities.....	9.2-45
9.3	Screening Assessment and Impact Analysis Methodology.....	9.3-1
9.3.1	Definition of Study Areas.....	9.3-3
9.3.2	Screening Assessment Approach.....	9.3-6
9.3.3	Land Use, Zoning, and Public Policy.....	9.3-8
9.3.4	Socioeconomic Conditions.....	9.3-55
9.3.5	Community Facilities and Services.....	9.3-56
9.3.6	Open Space and Recreation.....	9.3-58
9.3.7	Historic and Cultural Resources.....	9.3-60
9.3.8	Visual Resources.....	9.3-63
9.3.9	Natural Resources.....	9.3-70
9.3.10	Hazardous Materials.....	9.3-147
9.3.11	Water and Sewer Infrastructure.....	9.3-149
9.3.12	Energy.....	9.3-158
9.3.13	Transportation.....	9.3-159
9.3.14	Air Quality.....	9.3-160
9.3.15	Noise.....	9.3-161
9.3.16	Neighborhood Character.....	9.3-164
9.3.17	Public Health.....	9.3-165
9.4	Town of Olive.....	9.4-1
9.4.1	Town of Olive Project Description.....	9.4-1
9.4.2	Town of Olive Impact Analysis.....	9.4-3
9.4.3	Ashokan Screen Chamber Study Area Impact Analysis.....	9.4-5
9.4.4	Beaverkill Road Study Area Impact Analysis.....	9.4-34
9.4.5	Atwood-Olivebridge Road Study Area Impact Analysis.....	9.4-61

9.5	Town of Marbletown.....	9.5-1
9.5.1	Town of Marbletown Project Description	9.5-1
9.5.2	Town of Marbletown Impact Analysis	9.5-3
9.5.3	Vly Atwood Road Study Area Impact Analysis	9.5-5
9.5.4	Pine Bush Road Study Area Impact Analysis.....	9.5-40
9.5.5	Lucas Turnpike Study Area Impact Analysis	9.5-65
9.5.6	Canal Road Study Area Impact Analysis.....	9.5-121
9.5.7	Mossybrook Road Study Area Impact Analysis.....	9.5-147
9.5.8	Lower Knolls Road Study Area Impact Analysis.....	9.5-184
9.6	Town of New Paltz.....	9.6-1
9.6.1	Town of New Paltz Project Description	9.6-1
9.6.2	Town of New Paltz Impact Analysis	9.6-3
9.6.3	Mountain Rest Road Study Area Impact Analysis	9.6-6
9.6.4	New Paltz-Minnewaska Road Study Area Impact Analysis.....	9.6-26
9.7	Town of Gardiner	9.7-1
9.7.1	Town of Gardiner Project Description.....	9.7-1
9.7.2	Town of Gardiner Impact Analysis.....	9.7-3
9.7.3	Forest Glen Road Study Area Impact Analysis	9.7-5
9.7.4	Le Fevre Lane Study Area Impact Analysis	9.7-36
9.7.5	Armato Lane Study Area Impact Analysis	9.7-55
9.8	Town of Shawangunk.....	9.8-1
9.8.1	Town of Shawangunk Project Description	9.8-1
9.8.2	Town of Shawangunk Impact Analysis	9.8-3
9.8.3	Strawridge Road Study Area Impact Analysis	9.8-4
9.9	Town of Montgomery.....	9.9-1
9.9.1	Town of Montgomery Project Description	9.9-1
9.9.2	Town of Montgomery Impact Analysis.....	9.9-1
9.9.3	Winchell Drive Study Area Impact Analysis.....	9.9-3
9.10	Town of New Windsor	9.10-1
9.10.1	Town of New Windsor Project Description.....	9.10-1
9.10.2	Town of New Windsor Impact Analysis	9.10-3
9.10.3	Mount Airy Road Study Area Impact Analysis.....	9.10-5
9.10.4	Passaro Drive Study Area Impact Analysis	9.10-38

9.11	Village of Nelsonville	9.11-1
9.11.1	Village of Nelsonville Project Description	9.11-1
9.11.2	Gatehouse Road Study Area Impact Analysis	9.11-3
9.11.3	Fishkill Road Study Area Impact Analysis.....	9.11-26
9.12	Town of Philipstown.....	9.12-1
9.12.1	Town of Philipstown Project Description.....	9.12-1
9.12.2	Town of Philipstown Impact Analysis.....	9.12-3
9.12.3	Indian Brook Road Study Area Impact Analysis.....	9.12-5
9.12.4	Old Albany Post Road Study Area Impact Analysis	9.12-37
9.12.5	Sprout Brook Road Study Area Impact Analysis	9.12-60
9.13	Town of Cortlandt	9.13-1
9.13.1	Town of Cortlandt Project Description.....	9.13-1
9.13.2	Town of Cortlandt Impact Analysis.....	9.13-3
9.13.3	Aqueduct Road Study Area Impact Analysis	9.13-5
9.14	Town of Yorktown.....	9.14-1
9.14.1	Town of Yorktown Project Description.....	9.14-1
9.14.2	Town of Yorktown Impact Analysis.....	9.14-3
9.14.3	Jacob Road Study Area Impact Analysis.....	9.14-5
9.14.4	Chapman Road Study Area Impact Analysis.....	9.14-34
9.14.5	Croton Dam Road Study Area Impact Analysis	9.14-74
9.14.6	Kitchawan Road Study Area Impact Analysis.....	9.14-111
9.14.7	Pines Bridge Road Study Area Impact Analysis	9.14-135
9.15	Town of New Castle.....	9.15-1
9.15.1	Town of New Castle Project Description	9.15-1
9.15.2	Town of New Castle Impact Analysis	9.15-3
9.15.3	Somerstown Turnpike Study Area Impact Analysis.....	9.15-8
9.15.4	Station Place Study Area Impact Analysis	9.15-36
9.15.5	Campfire Road Study Area Impact Analysis.....	9.15-65
9.16	Town of Mount Pleasant.....	9.16-1
9.16.1	Town of Mount Pleasant Project Description.....	9.16-1
9.16.2	Town of Mount Pleasant Impact Analysis.....	9.16-3
9.16.3	Chappaqua Road Study Area Impact Analysis.....	9.16-6
9.16.4	Nanny Hagen Road Study Area Impact Analysis.....	9.16-51
9.16.5	Westlake Drive Study Area Impact Analysis	9.16-87

9.17	Village of Pleasantville	9.17-1
9.17.1	Village of Pleasantville Project Description	9.17-1
9.17.2	Village of Pleasantville Impact Analysis	9.17-3
9.17.3	Washington Avenue Study Area Impact Analysis.....	9.17-6
9.17.4	Pleasantville Alum Plant Study Area Impact Analysis.....	9.17-39
9.17.5	Willow Street Study Area Impact Analysis	9.17-69
9.18	New Paltz Temporary Transmission Water Main Study Area Impact Analysis.....	9.18-1
9.18.1	Introduction	9.18-1
9.18.2	Background	9.18-2
9.18.3	Project Description.....	9.18-2
9.18.4	Project Schedule	9.18-7
9.18.5	Analytical Framework	9.18-8
9.18.6	Probable Impacts	9.18-12
9.19	Project-wide Impact Analysis.....	9.19-1
9.19.1	Natural Resources	9.19-1
9.19.2	Chlorination and Dechlorination.....	9.19-14
9.20	Commitments.....	9.20-1
9.20.1	Operations.....	9.20-1
9.20.2	Natural Resources	9.20-1
9.20.3	Water and Sewer Infrastructure	9.20-2
9.20.4	Transportation	9.20-2
9.20.5	Noise	9.20-2
9.20.6	Public Health.....	9.20-3
 CHAPTER 10: PROPOSED WATER FOR THE FUTURE SHUTDOWN SYSTEM OPERATIONS		
10.1	Purpose and Need and Project Description	10.1-1
10.1.1	Purpose and Need	10.1-1
10.1.2	Project Description.....	10.1-2
10.1.3	OST Modeling	10.1-12
10.1.4	Proposed Activities	10.1-14
10.1.5	Study Areas.....	10.1-16
10.1.6	Schedule.....	10.1-16

10.2	Hydrologic Evaluation and Impact Analysis Methodology.....	10.2-1
10.2.1	Hydrologic Evaluation.....	10.2-1
10.2.2	Hydraulic Analysis.....	10.2-13
10.2.3	Impact Analysis Methodology.....	10.2-13
10.3	Delaware Water Supply System Assessment and Impact Analysis.....	10.3-1
10.3.1	Cannonsville Reservoir Study Area Impact Analysis.....	10.3-3
10.3.2	West Branch Delaware River Downstream of the Cannonsville Reservoir Study Area Impact Analysis.....	10.3-5
10.3.3	Pepacton Reservoir Study Area Impact Analysis.....	10.3-13
10.3.4	East Branch Delaware River Downstream of the Pepacton Reservoir Study Area Impact Analysis.....	10.3-15
10.3.5	Neversink Reservoir Study Area Impact Analysis.....	10.3-18
10.3.6	Neversink River Downstream of Neversink Reservoir Study Area Impact Analysis.....	10.3-23
10.3.7	Delaware Tunnels Study Area Impact Analysis.....	10.3-27
10.3.8	Rondout Reservoir Study Area Impact Analysis.....	10.3-36
10.3.9	Rondout Creek Downstream of Rondout Reservoir Study Area Impact Analysis.....	10.3-72
10.4	Catskill Water Supply System Assessment and Impact Analysis.....	10.4-1
10.4.1	Schoharie Reservoir Study Area Impact Analysis.....	10.4-4
10.4.2	Schoharie Creek Downstream of Schoharie Reservoir Study Area Impact Analysis.....	10.4-8
10.4.3	Esopus Creek Downstream of Shandaken Tunnel Study Area Impact Analysis.....	10.4-12
10.4.4	Ashokan Reservoir Study Area Impact Analysis.....	10.4-18
10.4.5	Esopus Creek Downstream of Ashokan Reservoir Study Area Impact Analysis.....	10.4-22
10.4.6	Kensico Reservoir Study Area Impact Analysis.....	10.4-29
10.4.7	Pleasantville Alum Plant Study Area Impact Analysis.....	10.4-43
10.5	Croton Water Supply System Assessment and Impact Analysis.....	10.5-1
10.5.1	Boyd’s Corners Reservoir Study Area Impact Analysis.....	10.5-3
10.5.2	West Branch Croton River Downstream of Boyd’s Corners Reservoir Study Area Impact Analysis.....	10.5-6
10.5.3	West Branch Reservoir Study Area Impact Analysis.....	10.5-11
10.5.4	West Branch Croton River Downstream of the West Branch Reservoir Study Area Impact Analysis.....	10.5-13

10.5.5	Middle Branch Reservoir Study Area Impact Analysis.....	10.5-32
10.5.6	Bog Brook Reservoir Study Area Impact Analysis	10.5-35
10.5.7	Bog Brook Downstream of Bog Brook Reservoir Study Area Impact Analysis	10.5-61
10.5.8	East Branch Reservoir Study Area Impact Analysis	10.5-63
10.5.9	East Branch Croton River Downstream of East Branch Reservoir Study Area Impact Analysis	10.5-90
10.5.10	Croton Falls Diverting Reservoir Study Area Impact Analysis.....	10.5-95
10.5.11	East Branch Croton River Downstream of Croton Falls Diverting Reservoir Study Area Impact Analysis.....	10.5-98
10.5.12	Croton Falls Reservoir Study Area Impact Analysis.....	10.5-103
10.5.13	West Branch Croton River Downstream of Croton Falls Reservoir Study Area Impact Analysis	10.5-107
10.5.14	Amawalk Reservoir Study Area Impact Analysis	10.5-107
10.5.15	Muscoot River Downstream of Amawalk Reservoir Study Area Impact Analysis	10.5-113
10.5.16	Titicus Reservoir Study Area Impact Analysis.....	10.5-116
10.5.17	Titicus River Below Titicus Reservoir Study Area Impact Analysis	10.5-122
10.5.18	Cross River Reservoir Study Area Impact Analysis.....	10.5-122
10.5.19	Cross River Downstream of Cross River Reservoir Study Area Impact Analysis	10.5-128
10.5.20	Muscoot Reservoir Study Area Impact Analysis.....	10.5-131
10.5.21	New Croton Reservoir Study Area Impact Analysis	10.5-137
10.5.22	Croton River Downstream of New Croton Reservoir Study Area Impact Analysis	10.5-164
10.6	Commitments.....	10.6-1
10.6.1	Operations.....	10.6-1
10.6.2	Natural Resources	10.6-1
10.6.3	Noise.....	10.6-1
 CHAPTER 11 : PROPOSED RONDOUT-WEST BRANCH TUNNEL		
INSPECTION AND REPAIR.....		11.1-1
11.1	Purpose and Need.....	11.1-1
11.2	Project Description.....	11.1-1
11.2.1	Overview of Rondout-West Branch Tunnel Leaks.....	11.2-5
11.2.2	Inspection and Repair Activities.....	11.2-6
11.2.3	Schedule.....	11.2-8

11.3	Screening Assessment and Impact Analysis Methodology	11.3-1
11.3.1	Screening Assessment Approach	11.3-3
11.3.2	Land Use, Zoning, and Public Policy	11.3-6
11.3.3	Socioeconomic Conditions	11.3-19
11.3.4	Community Facilities and Services	11.3-20
11.3.5	Open Space and Recreation	11.3-21
11.3.6	Historic and Cultural Resources	11.3-22
11.3.7	Visual Resources.....	11.3-23
11.3.8	Natural Resources	11.3-28
11.3.9	Hazardous Materials	11.3-60
11.3.10	Water and Sewer Infrastructure	11.3-62
11.3.11	Energy.....	11.3-63
11.3.12	Transportation.....	11.3-64
11.3.13	Air Quality	11.3-65
11.3.14	Noise.....	11.3-65
11.3.15	Neighborhood Character.....	11.3-67
11.3.16	Public Health.....	11.3-68
11.4	Rondout Effluent Chamber Study Area Impact Analysis.....	11.4-1
11.4.1	Rondout Effluent Chamber Study Area Project Description.....	11.4-1
11.4.2	Public Policy	11.4-7
11.4.3	Open Space and Recreation	11.4-10
11.4.4	Visual Resources.....	11.4-12
11.4.5	Natural Resources	11.4-14
11.4.6	Hazardous Materials	11.4-17
11.4.7	Transportation.....	11.4-18
11.4.8	Noise	11.4-20
11.4.9	Neighborhood Character.....	11.4-24
11.4.10	Public Health.....	11.4-24
11.5	Shaft 1 Study Area Impact Analysis.....	11.5-1
11.5.1	Shaft 1 Study Area Project Description.....	11.5-1
11.5.2	Public Policy	11.5-7
11.5.3	Visual Resources.....	11.5-9
11.5.4	Natural Resources	11.5-9
11.5.5	Hazardous Materials	11.5-13

11.5.6	Transportation.....	11.5-14
11.5.7	Noise.....	11.5-17
11.5.8	Neighborhood Character.....	11.5-20
11.5.9	Public Health.....	11.5-21
11.6	Shaft 2A and Wawarsing Leak Repair Study Area Impact Analysis	11.6-1
11.6.1	Shaft 2A and Wawarsing Leak Repair Study Area Project Description	11.6-1
11.6.2	Shaft 2A and Wawarsing Leak Repair Study Area.....	11.6-1
11.6.3	Description of Existing Shaft 2A and Wawarsing Leak Repair Sites and Study Areas.....	11.6-3
11.6.4	Proposed Activities at the Shaft 2A and Wawarsing Leak Repair Study Area	11.6-9
11.6.5	Public Policy.....	11.6-12
11.6.6	Open Space and Recreation	11.6-16
11.6.7	Historic and Cultural Resources	11.6-19
11.6.8	Visual Resources.....	11.6-19
11.6.9	Natural Resources.....	11.6-24
11.6.10	Hazardous Materials	11.6-64
11.6.11	Water and Sewer Infrastructure	11.6-65
11.6.12	Transportation.....	11.6-71
11.6.13	Noise.....	11.6-74
11.6.14	Neighborhood Character.....	11.6-78
11.6.15	Public Health.....	11.6-79
11.7	Shaft 8 Study Area Impact Analysis.....	11.7-1
11.7.1	Shaft 8 Study Area Project Description.....	11.7-1
11.7.2	Public Policy.....	11.7-7
11.7.3	Open Space and Recreation	11.7-8
11.7.4	Natural Resources.....	11.7-8
11.7.5	Hazardous Materials	11.7-12
11.7.6	Transportation.....	11.7-13
11.7.7	Noise.....	11.7-15
11.7.8	Neighborhood Character.....	11.7-18
11.7.9	Public Health.....	11.7-19
11.8	Shaft 9 Study Area Impact Analysis.....	11.8-1
11.8.1	Shaft 9 Study Area Project Description.....	11.8-1

11.8.2	Public Policy	11.8-7
11.8.3	Open Space and Recreation	11.8-7
11.8.4	Visual Resources	11.8-9
11.8.5	Natural Resources	11.8-10
11.8.6	Hazardous Materials	11.8-12
11.8.7	Transportation	11.8-14
11.8.8	Noise	11.8-16
11.8.9	Neighborhood Character	11.8-19
11.8.10	Public Health	11.8-20
11.9	Proposed Decommissioning	11.9-1
11.9.1	Overview	11.9-1
11.9.2	Description of Rondout-West Branch Tunnel Decommissioning	11.9-3
11.9.3	Roseton Study Area: Location and Description	11.9-5
11.9.4	Screening Assessment, Methodology, and Impact Analysis Overview	11.9-13
11.9.5	Natural Resources	11.9-14
11.9.6	Land Use, Zoning, and Public Policy	11.9-268
11.9.7	Socioeconomic Conditions	11.9-273
11.9.8	Community Facilities and Services	11.9-274
11.9.9	Open Space and Recreation	11.9-276
11.9.10	Historic and Cultural Resources	11.9-279
11.9.11	Visual Resources	11.9-283
11.9.12	Hazardous Materials	11.9-290
11.9.13	Water and Sewer Infrastructure	11.9-290
11.9.14	Energy	11.9-296
11.9.15	Transportation	11.9-296
11.9.16	Air Quality	11.9-297
11.9.17	Noise	11.9-297
11.9.18	Neighborhood Character	11.9-297
11.9.19	Public Health	11.9-298
11.10	Commitments	11.10-1
11.10.1	Natural Resources	11.10-1
11.10.2	Noise	11.10-1
11.10.3	Water and Sewer Infrastructure	11.10-1
11.10.4	Public Health	11.10-6

11.10.5	Geology and Soils.....	11.10-6
11.11	Mitigation	11.11-1
11.11.1	Wetlands	11.11-1
CHAPTER 12:	CUMULATIVE IMPACTS	12.1-1
12.1	Cumulative Impacts	12.1-1
12.1.1	Energy.....	12.1-4
12.1.2	Greenhouse Gas Emissions and Climate Change.....	12.1-4
12.1.3	Socioeconomic Conditions	12.1-6
12.1.4	Public Health.....	12.1-10
CHAPTER 13:	COMMITMENTS.....	13.1-1
13.1	Catskill Repair and Rehabilitation.....	13.1-1
13.1.1	Operations.....	13.1-1
13.1.2	Natural Resources.....	13.1-1
13.1.3	Water and Sewer Infrastructure	13.1-2
13.1.4	Transportation.....	13.1-3
13.1.5	Noise	13.1-3
13.1.6	Public Health.....	13.1-3
13.2	Water for the Future Shutdown System Operations	13.2-1
13.2.1	Operations.....	13.2-1
13.2.2	Natural Resources.....	13.2-1
13.2.3	Noise	13.2-1
13.3	Rondout-West Branch Tunnel Inspection and Repair	13.3-1
13.3.1	Natural Resources.....	13.3-1
13.3.2	Noise	13.3-1
13.3.3	Water and Sewer Infrastructure	13.3-1
13.3.4	Public Health.....	13.3-6
13.3.5	Geology and Soils.....	13.3-6
CHAPTER 14:	MITIGATION.....	14.1-1
14.1	Rondout-West Branch Tunnel Inspection and Repair	14.1-1
14.1.1	Wetlands	14.1-1
CHAPTER 15:	ALTERNATIVES ANALYSIS.....	15.1-1
15.1	Introduction	15.1-1

15.2	Upstate Water Supply Resiliency Alternatives Analysis	15.2-1
15.3	Alternative 1: No Action Alternative.....	15.3-1
15.4	Alternative 2: Interconnections to Water Supplies in New Jersey	15.4-1
15.4.1	New Jersey Water Supply	15.4-1
15.4.2	Key Components of the Alternative	15.4-3
15.4.3	Potential Impacts of the Interconnections to Water Supplies in New Jersey Alternative	15.4-5
15.5	Alternative 3: RWBT Leak Stabilization.....	15.5-1
15.5.1	Pilot Study Results.....	15.5-1
15.5.2	Summary Comparison of Alternatives.....	15.5-3
CHAPTER 16: UNAVOIDABLE ADVERSE IMPACTS		16.0-1
CHAPTER 17: IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES		17.0-1
CHAPTER 18: RESPONSE TO COMMENTS.....		18.0-1
CHAPTER 19: REFERENCES.....		19.0-1
CHAPTER 20: LIST OF PREPARERS.....		20.0-1

APPENDIX 1 – AGENCY RESPONSES

List of Tables

Table ES-1:	Project Components by Municipality	ES-22
Table 5.3-1:	Summary of Environmental Review of WFF Components and Supporting Projects	5.3-1
Table 7.0-1:	Summary of Potential Discretionary Permits, Approvals, and Consultations for Upstate Water Supply Resiliency	7.0-2
Table 8.2-1:	Transportation Passenger Car Equivalents (PCEs)	8.2-13
Table 9.2-1:	Outside Community Connections to the Catskill Aqueduct	9.2-8
Table 9.2-2:	Description of Catskill Aqueduct Appurtenances	9.2-13
Table 9.3-1:	Repair and Rehabilitation Construction and Operational Analysis Periods	9.3-3
Table 9.3-2:	Repair and Rehabilitation Impact Categories with Screening Assessment and/or Impact Analyses	9.3-4
Table 9.3-3:	Municipalities and Corresponding Public Policies Applicable to the Repair and Rehabilitation	9.3-10
Table 9.3-4:	Open Spaces within the Repair and Rehabilitation Study Areas	9.3-59
Table 9.3-5:	Historic Resources within the Repair and Rehabilitation Study Areas	9.3-61
Table 9.3-6:	Repair and Rehabilitation Visual Resources Screening Assessment Summary	9.3-65
Table 9.3-7:	Visual Resources within the Repair and Rehabilitation Study Areas	9.3-68
Table 9.3-8:	Repair and Rehabilitation Natural Resources Screening Assessment and Impact Analysis Summary	9.3-72
Table 9.3-9:	Surface Water within the Repair and Rehabilitation Study Areas	9.3-79
Table 9.3-10:	Stream Visual Assessment Protocol Scoring Categories	9.3-88
Table 9.3-11:	Wetlands within Repair and Rehabilitation Study Areas	9.3-91
Table 9.3-12:	Floodplains within the Repair and Rehabilitation Study Areas	9.3-96
Table 9.3-13:	Terrestrial Resources within the Repair and Rehabilitation Study Areas ..	9.3-101
Table 9.3-14:	Federal/State Threatened, Endangered, and Candidate Species, State Species of Special Concern, and Unlisted Rare and Vulnerable Species within the Repair and Rehabilitation Study Areas	9.3-108

Table 9.3-15:	Water and Sewer Infrastructure within Repair and Rehabilitation Study Areas	9.3-151
Table 9.3-16:	Typical Daytime and Nighttime Noise Levels for Residential Land Use Categories	9.3-164
Table 9.3-17:	Stationary Source Construction Equipment to be Used Intermittently for Short Periods and Reference Noise Levels (Leq)	9.3-164
Table 9.3-18:	Published Values for the Lucas Turnpike Study Area Analytical Solution used in Similar Hydrogeologic Conditions	9.3-169
Table 9.3-19:	Published Values for the Mossybrook Road Study Area Analytical Solution used in Similar Hydrogeologic Conditions	9.3-170
Table 9.4-1:	Schedule of Work Activities within the Town of Olive	9.4-1
Table 9.4-2:	Schedule of Work Activities within the Ashokan Screen Chamber Study Area	9.4-12
Table 9.4-3:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Ashokan Screen Chamber Natural Resources Study Area	9.4-21
Table 9.4-4:	Stationary Source Construction Equipment Modeled at the Ashokan Screen Chamber Study Area Noise Analysis and Reference Noise Levels (Leq)	9.4-32
Table 9.4-5:	Schedule of Work Activities within the Beaverkill Road Study Area.....	9.4-43
Table 9.4-6:	Water Resources and Classifications within the Beaverkill Road Natural Resources Study Area.....	9.4-49
Table 9.4-7:	Estimated Disturbance to Water Resources within the Beaverkill Road Natural Resources Study Area.....	9.4-52
Table 9.4-8:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitats within the Beaverkill Road Natural Resources Study Area.....	9.4-55
Table 9.4-9:	Schedule of Work Activities within the Atwood-Olivebridge Road Study Area	9.4-67
Table 9.4-10:	Water Resources and Classifications within the Atwood-Olivebridge Road Natural Resources Study Area.....	9.4-76
Table 9.4-11:	Estimated Disturbance to Water Resources within the Atwood-Olivebridge Road Natural Resources Study Area	9.4-78
Table 9.4-12:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Atwood-Olivebridge Road Natural Resources Study Area	9.4-82
Table 9.5-1:	Schedule of Work Activities within the Town of Marbletown.....	9.5-1
Table 9.5-2:	Schedule of Work Activities within the Vly Atwood Road Study Area	9.5-13

Table 9.5-3:	Water Resources and Classifications within the Vly Atwood Road Natural Resources Study Area.....	9.5-21
Table 9.5-4:	Estimated Disturbance to Water Resources within the Vly Atwood Road Natural Resources Study Area.....	9.5-25
Table 9.5-5:	Estimated Leak Contributions for Vly Atwood Road Study Area	9.5-26
Table 9.5-6:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitats within the Vly Atwood Road Natural Resources Study Area.....	9.5-30
Table 9.5-7:	Stationary Source Construction Equipment Modeled at the Vly Atwood Road Study Area - Noise Analysis and Reference Noise Levels (Leq)	9.5-39
Table 9.5-8:	Schedule of Work Activities within the Pine Bush Road Study Area.....	9.5-48
Table 9.5-9:	Estimated Disturbance to Water Resources within the Pine Bush Road Natural Resources Study Area.....	9.5-53
Table 9.5-10:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitats within the Pine Bush Road Natural Resources Study Area	9.5-56
Table 9.5-11:	Stationary Source Construction Equipment Modeled at the Pine Bush Road Study Area - Noise Analysis and Reference Noise Levels (Leq)	9.5-64
Table 9.5-12:	Schedule of Work Activities within the Lucas Turnpike Study Area	9.5-70
Table 9.5-13:	Water Resources and Classifications within the Lucas Turnpike Natural Resources Study Area.....	9.5-89
Table 9.5-14:	Estimated Disturbance to Water Resources within the Lucas Turnpike Natural Resources Study Area.....	9.5-97
Table 9.5-15:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitats within the Lucas Turnpike Natural Resources Study Area.....	9.5-102
Table 9.5-16:	Stationary Source Construction Equipment Modeled at the Lucas Turnpike Study Area - Noise Analysis and Reference Noise Levels (Leq).....	9.5-116
Table 9.5-17:	Schedule of Work Activities within the Canal Road Study Area.....	9.5-127
Table 9.5-18:	Water Resources and Classifications within the Canal Road Natural Resources Study Area.....	9.5-133
Table 9.5-19:	Estimated Disturbance to Water Resources within the Canal Road Natural Resources Study Area.....	9.5-135
Table 9.5-20:	Estimated Leak Contributions for Canal Road Study Area.....	9.5-136
Table 9.5-21:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Canal Road Natural Resources Study Area	9.5-138

Table 9.5-22:	Stationary Source Construction Equipment Modeled at the Canal Road Study Area Noise Analysis and Reference Noise Levels (Leq)	9.5-146
Table 9.5-23:	Schedule of Work Activities within the Mossybrook Road Study Area ...	9.5-152
Table 9.5-24:	Water Resources and Classifications within the Mossybrook Road Natural Resources Study Area	9.5-160
Table 9.5-25:	Estimated Disturbance to Water Resources within the Mossybrook Road Natural Resources Study Area.....	9.5-163
Table 9.5-26:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitats within the Mossybrook Road Natural Resources Study Area	9.5-167
Table 9.5-27:	Stationary Source Construction Equipment Modeled at the Mossybrook Road Study Area - Noise Analysis and Reference Noise Levels (Leq)	9.5-179
Table 9.5-28:	Schedule of Work Activities within the Lower Knolls Road Study Area .	9.5-188
Table 9.5-29:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Lower Knolls Road Natural Resources Study Area	9.5-199
Table 9.5-30:	Stationary Source Construction Equipment Modeled at the Lower Knolls Road Study Area - Noise Analysis and Reference Noise Levels (Leq).....	9.5-207
Table 9.6-1:	Schedule of Work Activities within the Town of New Paltz.....	9.6-1
Table 9.6-2:	Schedule of Work Activities within the Mountain Rest Road Study Area.....	9.6-11
Table 9.6-3:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitats within the Mountain Rest Road Natural Resources Study Area.....	9.6-19
Table 9.6-4:	Stationary Source Construction Equipment Modeled at the Mountain Rest Road Study Area - Noise Analysis and Reference Noise Levels (Leq).....	9.6-25
Table 9.6-5:	Schedule of Work Activities within the New Paltz-Minnewaska Road Study Area	9.6-32
Table 9.6-6:	Water Resources and Classifications within the New Paltz-Minnewaska Road Natural Resources Study Area.....	9.6-50
Table 9.6-7:	Estimated Disturbance to Water Resources within the New Paltz-Minnewaska Road Natural Resources Study Area.....	9.6-52
Table 9.6-8:	Estimated Leak Contributions for New Paltz-Minnewaska Road Study Area.....	9.6-53
Table 9.6-9:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the New Paltz-Minnewaska Road Natural Resources Study Area ...	9.6-56

Table 9.6-10:	Stationary Source Construction Equipment Modeled at the New Paltz-Minnewaska Road Study Area - Noise Analysis and Reference Noise Levels (Leq).....	9.6-65
Table 9.6-11:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the New Paltz-Minnewaska Road Study Area.....	9.6-66
Table 9.7-1:	Schedule of Work Activities within the Town of Gardiner.....	9.7-1
Table 9.7-2:	Schedule of Work Activities within the Forest Glen Road Study Area	9.7-12
Table 9.7-3:	Water Resources and Classifications within the Forest Glen Road Natural Resources Study Area.....	9.7-17
Table 9.7-4:	Estimated Disturbance to Water Resources within the Forest Glen Road Natural Resources Study Area.....	9.7-19
Table 9.7-5:	Estimated Leak Contributions for Forest Glen Road Study Area.....	9.7-21
Table 9.7-6:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Forest Glen Road Natural Resources Study Area.....	9.7-23
Table 9.7-7:	Stationary Source Construction Equipment Modeled for Repair and Rehabilitation within the Forest Glen Road Study Area – Noise Analysis and Reference Noise Levels (Leq).....	9.7-34
Table 9.7-8:	Stationary Construction Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors for Repair and Rehabilitation within the Forest Glen Road Study Area	9.7-34
Table 9.7-9:	Schedule of Work Activities within the Le Fevre Lane Study Area	9.7-40
Table 9.7-10:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Le Fevre Lane Natural Resources Study Area.....	9.7-47
Table 9.7-11:	Stationary Source Construction Equipment Modeled at the Le Fevre Lane Study Area – Noise Analysis and Reference Noise Levels (Leq)	9.7-53
Table 9.7-12:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Le Fevre Lane Study Area.....	9.7-54
Table 9.7-13:	Schedule of Work Activities within the Armato Lane Study Area	9.7-59
Table 9.7-14:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Armato Lane Natural Resources Study Area.....	9.7-65
Table 9.7-15:	Stationary Source Construction Equipment Modeled at the Armato Lane Study Area – Noise Analysis and Reference Noise Levels (Leq)	9.7-71
Table 9.7-16:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Armato Lane Study Area	9.7-71
Table 9.8-1:	Schedule of Work Activities within the Town of Shawangunk	9.8-1

Table 9.8-2:	Schedule of Work Activities within the Strawridge Road Study Area.....	9.8-8
Table 9.8-3:	Estimated Disturbance to Water Resources within the Strawridge Road Natural Resources Study Area	9.8-15
Table 9.8-4:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Strawridge Road Natural Resources Study Area	9.8-18
Table 9.8-5:	Stationary Source Construction Equipment Modeled at the Strawridge Road Study Area – Noise Analysis and Reference Noise Levels (Leq).....	9.8-26
Table 9.8-6:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Strawridge Road Study Area	9.8-26
Table 9.9-1:	Schedule of Work Activities within the Town of Montgomery	9.9-1
Table 9.9-2:	Schedule of Work Activities within the Winchell Drive Study Area.....	9.9-7
Table 9.9-3:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Winchell Drive Natural Resources Study Area	9.9-12
Table 9.9-4:	Stationary Source Construction Equipment Modeled at the Winchell Drive Study Area – Noise Analysis and Reference Noise Levels (Leq and Lmax)	9.9-17
Table 9.9-5:	Stationary Noise Analysis Results (Leq and Lmax) at the Nearest Noise-Sensitive Receptors within the Winchell Drive Study Area	9.9-18
Table 9.10-1:	Schedule of Work Activities within the Town of New Windsor.....	9.10-1
Table 9.10-2:	Schedule of Work Activities within the Mount Airy Road Study Area	9.10-14
Table 9.10-3:	Water Resources and Classifications within the Mount Airy Road Natural Resources Study Area	9.10-21
Table 9.10-4:	Estimated Disturbance to Water Resources within the Mount Airy Road Natural Resources Study Area	9.10-23
Table 9.10-5:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitat within the Mount Airy Road Natural Resources Study Area	9.10-27
Table 9.10-6:	Stationary Source Construction Equipment Modeled at the Mount Airy Road Study Area – Noise Analysis and Reference Noise Levels (Lmax).	9.10-35
Table 9.10-7:	Stationary Noise Analysis Results (Lmax) at the Nearest Noise-Sensitive Receptors within the Mount Airy Road Study Area	9.10-36
Table 9.10-8:	Schedule of Work Activities within the Passaro Drive Study Area	9.10-43
Table 9.10-9:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Passaro Drive Natural Resources Study Area.....	9.10-50

Table 9.10-10:	Stationary Source Construction Equipment Modeled at the Passaro Drive Study Area – Noise Analysis and Reference Noise Levels (Lmax)	9.10-57
Table 9.10-11:	Stationary Noise Analysis Results (Lmax) at the Nearest Noise-Sensitive Receptors within the Passaro Drive Study Area	9.10-58
Table 9.11-1:	Schedule of Work Activities within the Village of Nelsonville	9.11-1
Table 9.11-2:	Schedule of Work Activities within the Gatehouse Road Study Area	9.11-6
Table 9.11-3:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Gatehouse Road Natural Resources Study Area.....	9.11-17
Table 9.11-4:	Stationary Source Construction Equipment Modeled of at the Gatehouse Road Study Area – Noise Analysis and Reference Noise Levels (Lmax).....	9.11-25
Table 9.11-5:	Stationary Noise Analysis Results (Lmax) at the Nearest Noise-Sensitive Receptors within the Gatehouse Road Study Area	9.11-25
Table 9.11-6:	Schedule of Work Activities within the Fishkill Road Study Area.....	9.11-32
Table 9.11-7:	Water Resources and Classifications within the Fishkill Road Natural Resources Study Area.....	9.11-44
Table 9.11-8:	Estimated Disturbance to Water Resources within the Fishkill Road Natural Resources Study Area.....	9.11-48
Table 9.11-9:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Fishkill Road Natural Resources Study Area	9.11-52
Table 9.11-10:	Stationary Source Construction Equipment Modeled at the Fishkill Road Study Area – Noise Analysis and Reference Noise Levels (Lmax and Leq)	9.11-61
Table 9.11-11:	Stationary Noise Analysis Results (Lmax or Leq) at the Nearest Noise-Sensitive Receptors within the Fishkill Road Study Area.....	9.11-61
Table 9.12-1:	Schedule of Work Activities within the Town of Philipstown	9.12-1
Table 9.12-2:	Schedule of Work Activities within the Indian Brook Road Study Area..	9.12-10
Table 9.12-3:	Water Resources and Classifications within the Indian Brook Road Natural Resources Study Area.....	9.12-19
Table 9.12-4:	Estimated Disturbance to Water Resources within the Indian Brook Road Natural Resources Study Area.....	9.12-22
Table 9.12-5:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Indian Brook Road Natural Resources Study Area	9.12-27

Table 9.12-6:	Stationary Source Construction Equipment Modeled at the Indian Brook Road Study Area – Noise Analysis and Reference Noise Levels (Leq).....	9.12-35
Table 9.12-7:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Indian Brook Road Study Area.....	9.12-36
Table 9.12-8:	Schedule of Work Activities within the Old Albany Post Road Study Area.....	9.12-45
Table 9.12-9:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Old Albany Post Road Natural Resources Study Area.....	9.12-51
Table 9.12-10:	Stationary Source Construction Equipment Modeled at the Old Albany Post Road Study Area – Noise Analysis and Reference Noise Levels (Leq).....	9.12-58
Table 9.12-11:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Old Albany Post Road Study Area	9.12-58
Table 9.12-12:	Schedule of Work Activities within the Sprout Brook Road Study Area..	9.12-65
Table 9.12-13:	Water Resources and Classifications within the Sprout Brook Road Natural Resources Study Area.....	9.12-71
Table 9.12-14:	Estimated Disturbance to Water Resources within the Sprout Brook Road Natural Resources Study Area.....	9.12-75
Table 9.12-15:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Sprout Brook Road Natural Resources Study Area.....	9.12-80
Table 9.12-16:	Stationary Source Construction Equipment Modeled at the Sprout Brook Road Study Area – Noise Analysis and Reference Noise Levels (Leq).....	9.12-93
Table 9.12-17:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Sprout Brook Road Study Area	9.12-93
Table 9.13-1:	Schedule of Work Activities within the Town of Cortlandt.....	9.13-1
Table 9.13-2:	Schedule of Work Activities within the Aqueduct Road Study Area.....	9.13-8
Table 9.13-3:	Water Resources and Classifications within the Aqueduct Road Natural Resources Study Area.....	9.13-25
Table 9.13-4:	Estimated Disturbance to Water Resources within the Aqueduct Road Natural Resources Study Area.....	9.13-29
Table 9.13-5:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitats within the Aqueduct Road Natural Resources Study Area.....	9.13-33

Table 9.13-6:	Stationary Source Construction Equipment Modeled for Repair and Rehabilitation within the Aqueduct Road Study Area – Noise Analysis and Reference Noise Levels (Leq).....	9.13-43
Table 9.13-7:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Aqueduct Road Study Area	9.13-44
Table 9.14 1:	Schedule of Work Activities within the Town of Yorktown.....	9.14-1
Table 9.14 2:	Schedule of Work Activities within the Jacob Road Study Area	9.14-11
Table 9.14 3:	Water Resources and Classifications within the Jacob Road Natural Resources Study Area	9.14-18
Table 9.14 4:	Estimated Disturbance to Water Resources within the Jacob Road Natural Resources Study Area	9.14-21
Table 9.14 5:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitat within the Jacob Road Natural Resources Study Area	9.14-26
Table 9.14 6:	Stationary Source Construction Equipment Modeled at the Jacob Road Study Area - Noise Analysis and Reference Noise Levels (Leq).....	9.14-32
Table 9.14 7:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Jacob Road Study Area.....	9.14-32
Table 9.14 8:	Schedule of Work Activities within the Chapman Road Study Area.....	9.14-43
Table 9.14 9:	Water Resources and Classifications within the Chapman Road Natural Resources Study Area	9.14-54
Table 9.14 10:	Estimated Disturbance to Water Resources within the Chapman Road Natural Resources Study Area	9.14-57
Table 9.14 11:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitat within the Chapman Road Natural Resources Study Area	9.14-62
Table 9.14 12:	Stationary Source Construction Equipment Modeled at the Chapman Road Study Area - Noise Analysis and Reference Noise Levels (Leq)	9.14-72
Table 9.14 13:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Chapman Road Study Area.....	9.14-72
Table 9.14 14:	Schedule of Work Activities within the Croton Dam Road Study Area ...	9.14-82
Table 9.14 15:	Water Resources and Classifications within the Croton Dam Road Natural Resources Study Area	9.14-91
Table 9.14 16:	Estimated Disturbance to Water Resources within the Croton Dam Road Natural Resources Study Area.....	9.14-95
Table 9.14 17:	Estimated Leak Contributions for Croton Dam Road Study Area	9.14-96

Table 9.14 18:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitat within the Croton Dam Road Natural Resources Study Area.....	9.14-100
Table 9.14 19:	Stationary Source Construction Equipment Modeled for Repair and Rehabilitation Work Activities within the Croton Dam Road Study Area - Noise Analysis and Reference Noise Levels (Leq)	9.14-109
Table 9.14 20:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Croton Dam Road Study Area	9.14-109
Table 9.14 21:	Schedule of Work Activities within the Kitchawan Road Study Area....	9.14-117
Table 9.14 22:	Water Resources and Classifications within the Kitchawan Road Natural Resources Study Area	9.14-121
Table 9.14 23:	Estimated Disturbance to Water Resources within the Kitchawan Road Natural Resources Study Area	9.14-124
Table 9.14 24:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitat within the Kitchawan Road Natural Resources Study Area	9.14-127
Table 9.14 25:	Stationary Source Construction Equipment Modeled at the Kitchawan Road Study Area - Noise Analysis and Reference Noise Levels (Leq) ..	9.14-134
Table 9.14 26:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Kitchawan Road Study Area.....	9.14-134
Table 9.14 27:	Schedule of Work Activities within the Pines Bridge Road Study Area.	9.14-141
Table 9.14 28:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitat within the Pines Bridge Road Natural Resources Study Area.....	9.14-148
Table 9.14 29:	Stationary Source Construction Equipment Modeled at the Pines Bridge Road Study Area - Noise Analysis and Reference Noise Levels (Leq) ..	9.14-155
Table 9.14 30:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Pines Bridge Road Study Area	9.14-155
Table 9.15-1:	Schedule of Work Activities within the Town of New Castle.....	9.15-1
Table 9.15-2:	Schedule of Work Activities within the Somerstown Turnpike Study Area.....	9.15-16
Table 9.15-3:	Water Resources and Classifications within the Somerstown Turnpike Natural Resources Study Area	9.15-21
Table 9.15-4:	Estimated Disturbance to Water Resources within the Somerstown Turnpike Natural Resources Study Area	9.15-23
Table 9.15-5:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitat within the Somerstown Turnpike Natural Resources Study Area	9.15-27

Table 9.15-6:	Stationary Source Construction Equipment Modeled at the Somerstown Turnpike Study Area - Noise Analysis and Reference Noise Levels (Leq).....	9.15-34
Table 9.15-7:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors Within the Somerstown Turnpike Study Area.....	9.15-34
Table 9.15-8:	Schedule of Work Activities within the Station Place Study Area.....	9.15-41
Table 9.15-9:	Estimated Disturbance to Water Resources within the Station Place Natural Resources Study Area.....	9.15-52
Table 9.15-10:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitat within the Station Place Natural Resources Study Area.....	9.15-55
Table 9.15-11:	Stationary Source Construction Equipment Modeled at the Station Place Study Area - Noise Analysis and Reference Noise Levels (Leq).....	9.15-63
Table 9.15-12:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Station Place Study Area.....	9.15-63
Table 9.15-13:	Schedule of Work Activities within the Campfire Road Study Area.....	9.15-69
Table 9.15-14:	Water Resources and Classifications within the Campfire Road Natural Resources Study Area.....	9.15-76
Table 9.15-15:	Estimated Disturbance to Water Resources within the Campfire Road Natural Resources Study Area.....	9.15-78
Table 9.15-16:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitat within the Campfire Road Natural Resources Study Area.....	9.15-81
Table 9.15-17:	Stationary Source Construction Equipment Modeled at the Campfire Road Study Area - Noise Analysis and Reference Noise Levels (Leq)	9.15-88
Table 9.15-18:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Campfire Road Study Area.....	9.15-88
Table 9.16-1:	Schedule of Work Activities within the Town of Mount Pleasant.....	9.16-1
Table 9.16-2:	Schedule of Work Activities within the Chappaqua Road Study Area.....	9.16-14
Table 9.16-3:	Water Resources and Classifications within the Chappaqua Road Natural Resources Study Area.....	9.16-20
Table 9.16-4:	Estimated Disturbance to Water Resources within the Chappaqua Road Natural Resources Study Area.....	9.16-25
Table 9.16-5:	Stream Visual Assessment of Unnamed Tributary 3 to Pocantico River within Chappaqua Road Natural Resources Study Area.....	9.16-27
Table 9.16-6:	Runoff Calculation for Delineated Watershed in Chappaqua Road Study Area.....	9.16-34

Table 9.16-7:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitat within the Chappaqua Road Natural Resources Study Area	9.16-40
Table 9.16-8:	Stationary Source Construction Equipment Modeled at the Chappaqua Road Study Area - Noise Analysis and Reference Noise Levels (Leq and L10)	9.16-49
Table 9.16-9:	Stationary Noise Analysis Results (Leq and L10) at the Nearest Noise-Sensitive Receptors within the Chappaqua Road Study Area	9.16-50
Table 9.16-10:	Schedule of Work Activities within the Nanny Hagen Road Study Area	9.16-58
Table 9.16-11:	Water Resources and Classifications within the Nanny Hagen Road Natural Resources Study Area	9.16-65
Table 9.16-12:	Estimated Disturbance to Water Resources within the Nanny Hagen Road Natural Resources Study Area.....	9.16-69
Table 9.16-13:	Relative Fish Species Abundance in Kensico Reservoir	9.16-70
Table 9.16-14:	Fish Collected in 1995 Whippoorwill Brook Electrofishing Survey.....	9.16-71
Table 9.16-15:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitat within the Nanny Hagen Road Study Area.....	9.16-75
Table 9.16-16:	Stationary Source Construction Equipment Modeled at the Nanny Hagen Road Study Area - Noise Analysis and Reference Noise Levels (L10)	9.16-85
Table 9.16-17:	Stationary Noise Analysis Results (L10) at the Nearest Noise-Sensitive Receptors within the Nanny Hagen Road Study Area.....	9.16-85
Table 9.16-18:	Schedule of Work Activities within the Westlake Drive Study Area.....	9.16-95
Table 9.16-19:	Water Resources and Classifications within the Westlake Drive Natural Resources Study Area	9.16-101
Table 9.16-20:	Estimated Disturbance to Water Resources within the Westlake Drive Natural Resources Study Area	9.16-105
Table 9.16-21:	Relative Fish Species Abundance in Kensico Reservoir	9.16-106
Table 9.16-22:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitat within the Westlake Drive Natural Resources Study Area.....	9.16-111
Table 9.16-23:	Stationary Source Construction Equipment Modeled at the Westlake Drive Study Area - Noise Analysis and Reference Noise Levels (L10)..	9.16-119
Table 9.16-24:	Stationary Noise Analysis Results (L10) at the Nearest Noise-Sensitive Receptors within the Westlake Drive Study Area	9.16-120
Table 9.17-1:	Schedule of Work Activities within the Village of Pleasantville	9.17-1
Table 9.17-2:	Schedule of Work Activities within the Washington Avenue Study Area	9.17-11

Table 9.17-3:	Water Resources and Classifications within the Washington Avenue Natural Resources Study Area.....	9.17-21
Table 9.17-4:	Estimated Disturbance to Water Resources Activities within the Washington Avenue Natural Resources Study Area	9.17-24
Table 9.17-5:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern, and Habitat within the Washington Avenue Natural Resources Study Area	9.17-28
Table 9.17-6:	Stationary Source Construction Equipment Modeled at the Washington Avenue Study Area - Noise Analysis and Reference Noise Levels (Leq/L10).....	9.17-37
Table 9.17-7:	Stationary Noise Analysis Results (Leq/L10) at the Nearest Noise-Sensitive Receptors within the Washington Avenue Study Area.....	9.17-38
Table 9.17-8:	Schedule of Work Activities within the Pleasantville Alum Plant Study Area.....	9.17-46
Table 9.17-9:	Water Resources and Classifications within the Pleasantville Alum Plant Natural Resources Study Area.....	9.17-53
Table 9.17-10:	Estimated Disturbance to Water Resources within the Pleasantville Alum Plant Natural Resources Study Area.....	9.17-55
Table 9.17-11:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitat within the Pleasantville Alum Plant Natural Resources Study Area	9.17-58
Table 9.17-12:	Stationary Source Construction Equipment Modeled at the Pleasantville Alum Plant Study Area - Noise Analysis and Reference Noise Levels (Leq).....	9.17-67
Table 9.17-13:	Stationary Construction Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors for Repair and Rehabilitation Work Activities within the Pleasantville Alum Plant Study Area	9.17-67
Table 9.17-14:	Stationary Operational Equipment Located Inside the Pleasantville Alum Plant	9.17-68
Table 9.17-15:	Schedule of Work Activities within the Willow Street Study Area	9.17-72
Table 9.17-16:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitat within the Willow Street Natural Resources Study Area.....	9.17-82
Table 9.17-17:	Stationary Source Construction Equipment Modeled at the Willow Street Study Area - Noise Analysis and Reference Noise Levels (Leq/L10)	9.17-88
Table 9.17-18:	Stationary Noise Analysis Results (Leq/L10) at the Nearest Noise-Sensitive Receptors within the Willow Street Study Area	9.17-88

Table 9.18 1:	Surface Waters within the Natural Resource Study Area– New Paltz Temporary Transmission Water Main Study Area.....	9.18-22
Table 9.18 2:	Analysis of Potential Disturbance to Federal/State Threatened and Endangered Species and State Species of Special Concern and Habitats within the Natural Resources Study Area– New Paltz Temporary Transmission Water Main Study Area.....	9.18-26
Table 9.18 3:	Stationary Source Construction Equipment Modeled - Noise Analysis and Reference Noise Levels (Leq) – New Paltz Temporary Transmission Water Main Study Area.....	9.18-39
Table 9.18 4:	Stationary Construction Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors – New Paltz Temporary Transmission Water Main Study Area.....	9.18-40
Table 9.19-1:	Coldwater Fishery Resources with In-Water Work Associated with the Repair and Rehabilitation	9.19-4
Table 9.19-2:	Catskill Aqueduct Repair and Rehabilitation – Permanent Water Resources Disturbance.....	9.19-12
Table 9.19-3:	Outside Community Connections to the Catskill Aqueduct.....	9.19-16
Table 9.19-4:	Disinfection By-products.....	9.19-18
Table 9.19-5:	Discharge Type for the Repair and Rehabilitation Study Areas.....	9.19-30
Table 9.19-6:	Discharge Analysis Associated with Study Areas along Steel Pipe Siphons of the Catskill Aqueduct	9.19-34
Table 9.19-7:	Discharge Analysis Associated with Study Areas at Culvert Drain Sluice Gates of the Catskill Aqueduct	9.19-35
Table 10.2-1:	Illustrative Example Tabular Comparison of Monthly Average Daily Release Flows for Each Month for a Single Reservoir.....	10.2-6
Table 10.2-2:	Illustrative Example Tabular Comparison of Monthly Reservoir Water Surface Elevations	10.2-11
Table 10.2-3:	Summary Results of the Hydrologic Evaluation for WSSO.....	10.2-12
Table 10.2-4:	Typical Daytime and Nighttime Noise Levels (Leq) for Residential Land Use Categories	10.2-31
Table 10.3-1:	Rondout Reservoir Historical Drawdowns 1,2	10.3-40
Table 10.3-2:	Rondout Reservoir Siphon Hydraulic Performance Design	10.3-41
Table 10.3-3:	Federal/State Threatened, Endangered, and Candidate Species, State Species of Special Concern, and Unlisted Rare or Vulnerable Species with the Potential to Occur within the Rondout Reservoir Study Area.....	10.3-52
Table 10.3-4:	Representative Ambient Air Quality Data Baseline Conditions.....	10.3-65
Table 10.3-5:	Types of Construction Emission Sources	10.3-66

Table 10.3-6:	Typical Daytime and Nighttime Noise Levels for Residential Land Use Categories	10.3-68
Table 10.3-7:	Stationary Source Construction Equipment Modeled in the Rondout Reservoir Study Area and Reference Noise Levels (Lmax)	10.3-69
Table 10.3-8:	Results of the Noise Analysis at the Rondout Reservoir Study Area	10.3-70
Table 10.3-9:	Geomorphic Parameters and Estimated Effective Discharge for Rondout Creek Reaches, Surveyed April 28 to May 1, 2015	10.3-98
Table 10.3-10:	Effective Discharge Shear Stress, Predicted Largest Moveable Particle Sizes, and Particle Sizes for Riffle Pebble Count, Bar Sample, for Rondout Creek Reaches, Surveyed April 28 to May 1, 2015	10.3-99
Table 10.3-11:	Pavement and Sub-pavement Sample Results, Rondout Creek Reaches, Surveyed April 28 to May 1, 2015.....	10.3-100
Table 10.3-12:	Maximum and Sustained Releases as a Percentage of Estimated Effective Discharge for Each Stream Reach.....	10.3-100
Table 10.3-13:	Predicted Sediment Entrainment for Rondout Creek Effective Discharge and Planned Rondout Reservoir Release Flow, Compared to Riffle Substrate D84 Observed during 2015 Geomorphic Survey	10.3-101
Table 10.3-14:	Federal/State Threatened and Threatened, Endangered, and Candidate Species, State Species of Special Concern, and Unlisted Rare or Vulnerable Species with the Potential to Occur within the Rondout Creek Downstream of Rondout Reservoir Study Area.....	10.3-112
Table 10.3-15:	Rondout Creek Open Space and Recreation Resources	10.3-129
Table 10.4-1:	Summary Data from Historical Alum Addition Events.....	10.4-41
Table 10.5-1:	West Branch Reservoir Regulated Releases	10.5-13
Table 10.5-2:	Federal/State Threatened and Threatened, Endangered, and Candidate Species, State Species of Special Concern, and Unlisted Rare or Vulnerable Species with the Potential to Occur within the West Branch Croton River Downstream of West Branch Reservoir Study Area	10.5-22
Table 10.5-3:	Bog Brook Reservoir Historical Drawdowns	10.5-39
Table 10.5-4:	Federal/State Threatened and Threatened, Endangered, and Candidate Species, State Species of Special Concern, and Unlisted Rare or Vulnerable Species with the Potential to Occur within the Bog Brook Reservoir Study Area.....	10.5-47
Table 10.5-5:	East Branch Reservoir Historical Drawdowns	10.5-65
Table 10.5-6:	Federal/State Threatened and Threatened, Endangered, and Candidate Species, State Species of Special Concern, and Unlisted Rare or Vulnerable Species with the Potential to Occur within the East Branch Reservoir Study Area.....	10.5-76
Table 10.5-7:	Amawalk Reservoir Regulated Releases per 6 NYCRR Part 672-3.....	10.5-113

Table 10.5-8:	New Croton Reservoir Regulated Releases	10.5-137
Table 10.5-9:	New Croton Reservoir Open Space and Recreation Resources.....	10.5-141
Table 10.5-10:	Federal/State Threatened, Endangered, and Candidate Species, State Species of Special Concern, and Unlisted Rare or Vulnerable Species with the Potential to Occur within the New Croton Reservoir Study Area.....	10.5-150
Table 10.5-11:	New Croton Reservoir Open Space and Recreation Resources.....	10.5-172
Table 10.5-12:	Federal/State Threatened and Threatened, Endangered, and Candidate Species, State Species of Special Concern, and Unlisted Rare or Vulnerable Species with the Potential to Occur within the Croton River Downstream of New Croton Reservoir Study Area	10.5-179
Table 11.2-1:	Primary Inspection and Repair Activities by Site.....	11.2-7
Table 11.3-1:	Inspection and Repair Impact Categories with Screening Assessment and/or Impact Analyses.....	11.3-5
Table 11.3-2:	Public Policies Applicable to the Inspection and Repair and Corresponding Study Areas	11.3-7
Table 11.3-3:	Inspection and Repair Applicable Town Codes and Corresponding Study Areas	11.3-8
Table 11.3-4:	Community Facilities and Services within the Leak Repair Study Area...	11.3-20
Table 11.3-5:	Open Space and Recreation Resources within the Inspection and Repair Study Areas.....	11.3-22
Table 11.3-6:	Inspection and Repair Visual Resources Screening Assessment Summary	11.3-24
Table 11.3-7:	Visual Resources within the Inspection and Repair Study Areas.....	11.3-27
Table 11.3-8:	Inspection and Repair Natural Resources Screening Assessment	11.3-29
Table 11.3-9:	Surface Water within the Inspection and Repair Study Areas.....	11.3-34
Table 11.3-10:	Wetlands within the Rondout Effluent Chamber Study Area and Shaft 8 and 9 Study Areas	11.3-36
Table 11.3-11:	USFWS NWI Wetlands within the Leak Repair Study Area	11.3-38
Table 11.3-12:	Floodplains within the Inspection and Repair Study Areas.....	11.3-39
Table 11.3-13:	Potentially Affected Federal/State Threatened and Endangered Species within the Inspection and Repair Study Areas.....	11.3-49
Table 11.3-14:	Typical Daytime and Nighttime Noise Levels for Residential Land Use Categories	11.3-67
Table 11.4-1:	Federal/State Threatened and Endangered Species, and Habitat Potentially within the Rondout Effluent Chamber Study Area	11.4-14

Table 11.4-2:	Stationary Source Construction Equipment Modeled at the Rondout Effluent Chamber Site and Reference Noise Levels (Leq).....	11.4-22
Table 11.4-3:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Rondout Effluent Chamber Study Area.....	11.4-23
Table 11.5-1:	Federal/State Threatened and Endangered Species, and Habitat Potentially within the Shaft 1 Study Area	11.5-12
Table 11.5-2:	Stationary Source Construction Equipment Modeled at the Shaft 1 Site and Reference Noise Levels (Leq).....	11.5-19
Table 11.5-3:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Shaft 1 Study Area.....	11.5-20
Table 11.6-1:	Visual Resources within the Shaft 2A and Wawarsing Leak Repair Study Area	11.6-23
Table 11.6-2:	Leak Repair Study Area Soil Series.....	11.6-57
Table 11.6-3:	Federal/State Threatened and Endangered Species, and Habitat Potentially within the Shaft 2A Study Area.....	11.6-62
Table 11.6-4:	Stationary Source Construction Equipment Modeled at the Shaft 2A Site and Reference Noise Levels (Leq)	11.6-77
Table 11.6-5:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Shaft 2A Study Area.....	11.6-77
Table 11.7-1:	Federal/State Threatened and Endangered Species, and Habitat Potentially within the Shaft 8 Study Area	11.7-11
Table 11.7-2:	Stationary Source Construction Equipment Modeled at the Shaft 8 Site and Reference Noise Levels (Leq).....	11.7-18
Table 11.7-3:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Shaft 8 Study Area.....	11.7-18
Table 11.8-1:	Federal/State Threatened and Endangered Species, and Habitat Potentially within the Shaft 9 Study Area	11.8-10
Table 11.8-2:	Stationary Source Construction Equipment Modeled at the Shaft 9 Site and Reference Noise Levels (Leq).....	11.8-18
Table 11.8-3:	Stationary Noise Analysis Results (Leq) at the Nearest Noise-Sensitive Receptors within the Shaft 9 Study Area.....	11.8-19
Table 11.9-1:	Roseton Study Area Groundwater Monitoring Locations	11.9-19
Table 11.9-2:	Depressurization Events.....	11.9-19
Table 11.9-3:	Natural Resources Study Area Surface Water Monitoring Stations and Instrumentation	11.9-26
Table 11.9-4:	Natural Resources Study Area Shallow Groundwater Monitoring Locations and Wetlands.....	11.9-34

Table 11.9-5:	Summary of Fish and Benthic Field Surveys Conducted within the Natural Resources Study Area	11.9-43
Table 11.9-6:	Groundwater Study Area Depressurization Response in Groundwater and Boring Monitoring Locations.....	11.9-77
Table 11.9-7:	NYSDEC Class C Water Quality Standards.....	11.9-78
Table 11.9-8:	Stream Segments and Cowardin Classifications in the Natural Resources Study Area	11.9-79
Table 11.9-9:	Average Shallow Groundwater Levels at Wetlands in the Natural Resources Study Area1	11.9-98
Table 11.9-10:	Monthly Average Precipitation from 1949 to 2014 and Monthly Total Precipitation for 2013 and 2014.....	11.9-101
Table 11.9-11:	Monthly Average Precipitation from 1949 to 2014 and Monthly Total Precipitation for 2013 and 2014, by Growing Season	11.9-102
Table 11.9-12:	Natural Resources Study Area Wetland Summary Table.....	11.9-103
Table 11.9-13:	Calcareous Wetland Plant Species, Natural Resources Study Area	11.9-118
Table 11.9-14:	Results of Wetland Soil Analysis — Roseton Natural Resources Study Area.....	11.9-119
Table 11.9-15:	Natural Resources Study Area Total Number of Fish Collected and Length Range (millimeter) of Each Species	11.9-123
Table 11.9-16:	Natural Resources Study Area Catch per Unit Effort (Total Number of Fish Collected Per Minute of Electrofishing) of Each Species by Sampling Station.....	11.9-124
Table 11.9-17:	Natural Resources Study Area Total Number of Fish Collected and Length Range (millimeter) of Each Species — Fall 2012 Sampling.....	11.9-125
Table 11.9-18:	Natural Resources Study Area Total Number of Fish Collected and Length Range (millimeter) of Each Species — Spring 2013 Sampling ..	11.9-126
Table 11.9-19:	Natural Resources Study Area Total Number of Fish Collected and Length Range (millimeter) of Each Species — Summer 2013 Sampling	11.9-127
Table 11.9-20:	Natural Resources Study Area Seasonal Benthic Invertebrate Community Metrics	11.9-129
Table 11.9-21:	Natural Resources Study Area Benthic Invertebrate Community Metric Ranges.....	11.9-130
Table 11.9-22:	Results of Spring 2015 Odonate Survey	11.9-132
Table 11.9-23:	Water Quality Parameters Measured at Electrofishing/Macroinvertebrate Locations Baseline Conditions	11.9-133
Table 11.9-24:	Water Quality Recorded during Tidal Inlet Fish Sampling April 27, 2015	11.9-134

Table 11.9-25: Amphibian and Reptile Species with the Potential to Exist within the Natural Resources Study Area	11.9-136
Table 11.9-26: Avian Species With the Potential to Exist within the Natural Resources Study Area	11.9-139
Table 11.9-27: Mammal Species with the Potential to Exist within the Natural Resources Study Area	11.9-147
Table 11.9-28: Threatened, Endangered, and Special Concern Species with the Potential to Occur within the Natural Resources Study Area1	11.9-149
Table 11.9-29: USDA Soil Series for the Roseton Study Area.....	11.9-168
Table 11.9-30: Supporting Data for Development of Streamflow Rating Curves.....	11.9-194
Table 11.9-31: Summary Statistics for the 23 Reference Streams for the Baseflow Index Analysis	11.9-197
Table 11.9-32: Baseflow Indices for the Seven Surface Water Monitoring Stations	11.9-200
Table 11.9-33: Mean Leak Contributions Estimated Through the Baseflow Index Analysis.....	11.9-202
Table 11.9-34: Net Changes in Flow from the Seepage Investigation.....	11.9-209
Table 11.9-35: Water Quality Parameters Measured during the Seepage Investigation..	11.9-210
Table 11.9-36: Median Streamflow Depths Based on Daily Data Over October 1, 2013 to October 31, 2014.....	11.9-227
Table 11.9-37: Observed1 and Estimated Changes to Average Shallow Groundwater Levels in the Natural Resources Study Area as a Result of Decommissioning	11.9-231
Table 11.9-38: The Percentage of the 2014 Growing Season and the Estimated Percentage of the Growing Season following Decommissioning, that Groundwater was within One Foot of the Ground Surface at Wetlands Located in the Natural Resources Study Area	11.9-237
Table 11.9-39: Existing Wetland Area and the Estimated Loss of Wetland Area in the Natural Resources Study Area.....	11.9-238
Table 11.9-40: Fish Species in the Natural Resources Study Area Expected to Populate Stream Segments 3, 3B, and 4 After Decommissioning1.....	11.9-251
Table 11.9-41: Open Spaces within the Roseton Study Area	11.9-276
Table 11.9-42: Historic Resources Eligible for Listing on the National/State Register of Historic Places	11.9-282
Table 11.9-43: Decommissioning Visual Resources Analysis Summary	11.9-283
Table 11.9-44: Decommissioning Visual Resources.....	11.9-285
Table 11.9-45: Potential Changes to Visual Resources with Decommissioning	11.9-289

Table 12.1-1: Estimated Baseline Household Water and Sewer Costs for City Residential Users 12.1-7

Table 12.1-2: Estimated Baseline Water Costs for Upstate Communities Based on Wholesale Water Rates for Municipalities Outside of the City of New York 12.1-8

Table 12.1-3: Estimated Future Without WFF Household Water and Sewer Costs for City Residential Users..... 12.1-8

Table 12.1-4: Estimated Future Without WFF Water Costs for Upstate Communities Based on Wholesale Water Rates for Municipalities Outside of the City of New York 12.1-8

Table 12.1-5: Estimated Household Water and Sewer Costs for City Residential Users in the Future With WFF Compared to the Future Without WFF 12.1-9

Table 12.1-6: Estimated Water Costs for Upstate Communities in the Future With WFF Compared to the Future Without WFF Based on Wholesale Water Rates for Municipalities Outside of the City of New York 12.1-9

Table 15.5-1: Comparison of Alternatives 15.5-4

List of Figures

Figure ES-1:	New York City Surface Water Supply System Map	ES-2
Figure ES-2:	Water for the Future Overview	ES-5
Figure ES-3:	Upstate Water Supply Resiliency Overall Timeline.....	ES-8
Figure ES-4:	Upstate Water Supply Resiliency Detailed Timeline	ES-9
Figure ES-5:	Proposed Catskill Aqueduct Repair and Rehabilitation.....	ES-14
Figure ES-6:	New Paltz Temporary Transmission Water Main and Connection to the Catskill/Delaware Interconnection at Shaft 4	ES-16
Figure ES-7:	Proposed Water for the Future Shutdown System Operations	ES-18
Figure ES-8:	Proposed Rondout-West Branch Tunnel Inspection and Repair	ES-21
Figure ES-9:	Well Action Plan – Lucas Turnpike Study Area, Town of Marbletown, Ulster County	ES-31
Figure ES-10:	Well Action Plan – Mossybrook Road Study Area, Town of Marbletown, Ulster County	ES-32
Figure ES- 11:	Well Action Plan – Wawarsing Leak Repair Study Area.....	ES-35
Figure ES- 12:	Well Action Plan – Roseton Study Area Estimated Groundwater Influence Areas	ES-36
Figure ES-13:	Action Plan Parcels in Roseton.....	ES-41
Figure ES-14:	Estimated Impacts to Non-regulated Wetlands - Roseton Study Area	ES-44
Figure 1.1-1:	New York City Surface Water Supply System Map	1.1-2
Figure 1.1-2:	Delaware Aqueduct Rondout-West Branch Tunnel Location and Bypass	1.1-3
Figure 1.1-3:	Water for the Future Overview	1.1-5
Figure 1.1-4:	Proposed Catskill Aqueduct Repair and Rehabilitation.....	1.1-7
Figure 1.1-5:	Proposed Water for the Future Shutdown System Operations	1.1-8
Figure 1.1-6:	Proposed Rondout-West Branch Tunnel Inspection and Repair	1.1-9
Figure 3.1-1:	Catskill and Delaware Water Supply Systems.....	3.1-2
Figure 3.1-2:	Croton Water Supply System.....	3.1-3
Figure 5.1-1:	Overall Water for the Future Schedule	5.1-3
Figure 6.1-1:	Proposed Chlorination Facility at Ashokan Screen Chamber.....	6.1-3

Figure 6.1-2:	Proposed Dechlorination Facility at Pleasantville Alum Plant.....	6.1-4
Figure 6.2-1:	Rondout Reservoir Siphons Rendering.....	6.2-3
Figure 6.3-1:	Rondout-West Branch Tunnel: Decommissioned Segment and Bypass Tunnel	6.3-2
Figure 8.0-1:	Water for the Future Schedule	8.0-3
Figure 9.1-1:	Upper Catskill Aqueduct.....	9.1-2
Figure 9.2-1:	Rondout-West Branch Tunnel: Decommissioned Section and Bypass Tunnel	9.2-2
Figure 9.2-2:	Biofilm Removal along the Upper Catskill Aqueduct.....	9.2-4
Figure 9.2-3:	Leak Repair, Local Dechlorination, and Mechanical and Structural Repairs along the Upper Catskill Aqueduct.....	9.2-6
Figure 9.2-4:	Catskill Aqueduct Repair and Rehabilitation Schedule.....	9.2-7
Figure 9.2-5:	Types of Tunnel Segments along the Upper Catskill Aqueduct.....	9.2-11
Figure 9.2-6:	Historic Photograph of the Peekskill Cut-and-Cover Tunnel, May 12, 1910.....	9.2-12
Figure 9.2-7:	Primary and Secondary Staging Areas and Study Areas	9.2-17
Figure 9.2-8:	Chlorination Facility at the Ashokan Screen Chamber.....	9.2-19
Figure 9.2-9:	Dechlorination Facility at the Pleasantville Alum Plant.....	9.2-20
Figure 9.2-10:	Local Passive Dechlorination System Schematic	9.2-25
Figure 9.2-11:	Catskill Influent Chamber Concrete Repairs	9.2-28
Figure 9.2-12:	Bridge Repair	9.2-30
Figure 9.2-13:	Siphon Drain Blow-off Valve Repairs – Under-stream.....	9.2-32
Figure 9.2-14:	Siphon Drain Blow-off Valve Repairs – Over-stream.....	9.2-33
Figure 9.2-15:	Boathole Installation	9.2-35
Figure 9.2-16:	Air Vent Installation Example	9.2-36
Figure 9.2-17:	Culvert Drain Sluice Gate Repairs.....	9.2-38
Figure 9.2-18:	Croton Lake Downtake Chamber Repairs	9.2-39
Figure 9.2-19:	Catskill Kensico Bypass Location	9.2-40
Figure 9.2-20:	Catskill Kensico Bypass Sediment Removal and Manhole Abandonment.....	9.2-41
Figure 9.2-21:	Example Biofilm Removal and Wash Water Treatment Sequence of Activities	9.2-44
Figure 9.3-1:	Catskill Aqueduct Repair and Rehabilitation Study Areas.....	9.3-2
Figure 9.3-2:	Breeding Bird Atlas Blocks along the Catskill Aqueduct Corridor.....	9.3-103

Figure 9.3-3:	Herp Atlas Quadrangles along the Catskill Aqueduct Corridor	9.3-105
Figure 9.4-1:	Town of Olive Study Areas	9.4-2
Figure 9.4-2:	Study Area – Ashokan Screen Chamber.....	9.4-7
Figure 9.4-3:	Photographs – Ashokan Screen Chamber Study Area.....	9.4-8
Figure 9.4-4:	Land Use – Ashokan Screen Chamber Study Area	9.4-9
Figure 9.4-5:	Zoning – Ashokan Screen Chamber Study Area	9.4-10
Figure 9.4-6:	Site Plan – Ashokan Screen Chamber Study Area	9.4-11
Figure 9.4-7:	Open Space Resources - Ashokan Screen Chamber Study Area.....	9.4-15
Figure 9.4-8:	Visual Resources - Ashokan Screen Chamber Study Area	9.4-17
Figure 9.4-9:	Natural Resources - Ashokan Screen Chamber Study Area.....	9.4-19
Figure 9.4-10:	Transportation – Ashokan Screen Chamber Study Area	9.4-28
Figure 9.4-11:	Noise - Ashokan Screen Chamber Study Area.....	9.4-31
Figure 9.4-12:	Study Area – Beaverkill Road	9.4-35
Figure 9.4-13:	Photographs – Beaverkill Road Study Area	9.4-36
Figure 9.4-14:	Land Use – Beaverkill Road Study Area.....	9.4-38
Figure 9.4-15:	Zoning – Beaverkill Road Study Area.....	9.4-39
Figure 9.4-16:	Site Plan for Esopus SPS North Chamber – Beaverkill Road Study Area.....	9.4-40
Figure 9.4-17:	Site Plan for Esopus SPS Blow-off Chambers – Beaverkill Road Study Area	9.4-41
Figure 9.4-18:	Site Plan for Esopus SPS South Chamber – Beaverkill Road Study Area.....	9.4-42
Figure 9.4-19:	Open Space and Visual Resources - Beaverkill Road Study Area	9.4-45
Figure 9.4-20:	Natural Resources for Esopus SPS North Chamber and Blow-off Chambers - Beaverkill Road Study Area.....	9.4-48
Figure 9.4-21:	Study Area – Atwood-Olivebridge Road.....	9.4-63
Figure 9.4-22:	Photographs – Atwood-Olivebridge Road Study Area.....	9.4-64
Figure 9.4-23:	Land Use – Atwood-Olivebridge Road Study Area	9.4-65
Figure 9.4-24:	Zoning – Atwood-Olivebridge Road Study Area	9.4-66
Figure 9.4-25:	Site Plan for Tongore SPS North Chamber, Tongore SPS Bridge, and Tongore SPS Blow-off Chambers – Atwood-Olivebridge Road Study Area.....	9.4-68
Figure 9.4-26:	Site Plan for Tongore SPS South Chamber – Atwood-Olivebridge Road Study Area.....	9.4-69

Figure 9.4-27:	Open Space and Visual Resources - Atwood-Olivebridge Road Study Area.....	9.4-72
Figure 9.4-28:	Natural Resources - Atwood-Olivebridge Road Study Area.....	9.4-75
Figure 9.5-1:	Town of Marbletown Study Areas.....	9.5-2
Figure 9.5-2:	Study Area – Vly Atwood Road.....	9.5-6
Figure 9.5-3:	Photographs – Leaks 1A and 1B - Vly Atwood Road Study Area.....	9.5-8
Figure 9.5-4:	Site Plan for Leaks 1A and 1B - Vly Atwood Road Study Area.....	9.5-9
Figure 9.5-5:	Photograph – Leak 2 – Vly Atwood Road Study Area.....	9.5-11
Figure 9.5-6:	Site Plan for Leak 2 – Vly Atwood Road Study Area.....	9.5-12
Figure 9.5-7:	Land Use – Vly Atwood Road Study Area.....	9.5-15
Figure 9.5-8:	Zoning Map – Vly Atwood Road Study Area.....	9.5-16
Figure 9.5-9:	Natural Resources for Leaks 1A and 1B - Vly Atwood Road Study Area.....	9.5-19
Figure 9.5-10:	Natural Resources for Leak 2 - Vly Atwood Road Study Area.....	9.5-20
Figure 9.5-11:	Noise – Vly Atwood Road Study Area.....	9.5-38
Figure 9.5-12:	Study Area – Pine Bush Road.....	9.5-41
Figure 9.5-13:	Photograph – Pine Bush Road Study Area.....	9.5-43
Figure 9.5-14:	Land Use – Pine Bush Road Study Area.....	9.5-44
Figure 9.5-15:	Zoning – Pine Bush Road Study Area.....	9.5-45
Figure 9.5-16:	Site Plan for Esopus CCT at Peak Road – Pine Bush Road Study Area ..	9.5-46
Figure 9.5-17:	Site Plan for Rondout Pressure Tunnel Downtake Chamber – Pine Bush Road Study Area.....	9.5-47
Figure 9.5-18:	Natural Resources for Peak Road - Pine Bush Road Study Area.....	9.5-50
Figure 9.5-19:	Natural Resources for Rondout Pressure Tunnel Downtake Chamber - Pine Bush Road Study Area.....	9.5-51
Figure 9.5-20:	Noise – Pine Bush Road Study Area.....	9.5-63
Figure 9.5-21:	Study Area – Lucas Turnpike.....	9.5-66
Figure 9.5-22:	Photographs – Lucas Turnpike Study Area (Sheet 1).....	9.5-68
Figure 9.5-23:	Photographs – Lucas Turnpike Study Area (Sheet 2).....	9.5-69
Figure 9.5-24:	Site Plan for Leaks 3A and 3B – Lucas Turnpike Study Area.....	9.5-71
Figure 9.5-25:	Site Plan for Leak 4 and Private Well – Lucas Turnpike Study Area.....	9.5-72
Figure 9.5-26:	Land Use – Lucas Turnpike Study Area.....	9.5-75
Figure 9.5-27:	Zoning – Lucas Turnpike Study Area.....	9.5-76

Figure 9.5-28:	Open Space and Visual Resources – Lucas Turnpike Study Area	9.5-80
Figure 9.5-29:	Watercourses and Wetlands – Lucas Turnpike Study Area.....	9.5-84
Figure 9.5-30:	Bedrock Geology - Lucas Turnpike Study Area.....	9.5-86
Figure 9.5-31:	Generalized Geologic Cross-Section - Lucas Turnpike Study Area	9.5-88
Figure 9.5-32:	Watercourses and Wetlands at Leaks 3A and 3B – Lucas Turnpike Study Area	9.5-90
Figure 9.5-33:	Watercourses and Wetlands at Leak 4 – Lucas Turnpike Study Area.....	9.5-92
Figure 9.5-34:	Natural Resources - Lucas Turnpike Study Area	9.5-106
Figure 9.5-35:	Area Well Inventory - Lucas Turnpike Study Area.....	9.5-112
Figure 9.5-36:	Noise - Lucas Turnpike Study Area.....	9.5-115
Figure 9.5-37:	Potential Travel Distance of Chlorinated Water from Aqueduct Leaks at Depth – Lucas Turnpike Study Area.....	9.5-120
Figure 9.5-38:	Study Area - Canal Road	9.5-122
Figure 9.5-39:	Photographs - Canal Road Study Area	9.5-124
Figure 9.5-40:	Land Use - Canal Road Study Area.....	9.5-125
Figure 9.5-41:	Zoning – Canal Road Study Area	9.5-126
Figure 9.5-42:	Site Plan – Canal Road Study Area	9.5-128
Figure 9.5-43:	Natural Resources - Canal Road Study Area.....	9.5-132
Figure 9.5-44:	Noise - Canal Road Study Area	9.5-145
Figure 9.5-45:	Study Area – Mossybrook Road.....	9.5-148
Figure 9.5-46:	Photographs – Rondout Pressure Tunnel Shaft 7 Leak – Mossybrook Road Study Area.....	9.5-150
Figure 9.5-47:	Site Plan – Mossybrook Road Study Area.....	9.5-151
Figure 9.5-48:	Land Use – Mossybrook Road Study Area.....	9.5-154
Figure 9.5-49:	Zoning – Mossybrook Road Study Area	9.5-155
Figure 9.5-50:	Natural Resources – Mossybrook Road Study Area	9.5-157
Figure 9.5-51:	Bedrock Geology - Mossybrook Road Study Area	9.5-159
Figure 9.5-52:	Generalized Geologic Cross-Section - Mossybrook Road Study Area ..	9.5-161
Figure 9.5-53:	Area Well Inventory - Mossybrook Road Study Area.....	9.5-174
Figure 9.5-54:	Noise - Mossybrook Road Study Area	9.5-178
Figure 9.5-55:	Potential Travel Distance of Chlorinated Water from Aqueduct Leak at Depth – Mossybrook Road Study Area	9.5-182
Figure 9.5-56:	Study Area – Lower Knolls Road.....	9.5-185

Figure 9.5-57:	Photographs – Lower Knolls Road Study Area.....	9.5-186
Figure 9.5-58:	Site Plan – Lower Knolls Study Area.....	9.5-187
Figure 9.5-59:	Land Use – Lower Knolls Road Study Area	9.5-190
Figure 9.5-60:	Zoning – Lower Knolls Road Study Area	9.5-191
Figure 9.5-61:	Historic and Cultural Resources – Lower Knolls Road Study Area.....	9.5-193
Figure 9.5-62:	Natural Resources - Lower Knolls Road Study Area	9.5-196
Figure 9.5-63:	Noise - Lower Knolls Road Study Area	9.5-206
Figure 9.6-1:	Town of New Paltz Study Areas.....	9.6-2
Figure 9.6-2:	Study Area – Mountain Rest Road	9.6-7
Figure 9.6-3:	Photographs – Mountain Rest Road Study Area	9.6-8
Figure 9.6-4:	Land Use – Mountain Rest Road Study Area.....	9.6-9
Figure 9.6-5:	Zoning – Mountain Rest Road Study Area.....	9.6-10
Figure 9.6-6:	Site Plan – Mountain Rest Road Study Area	9.6-12
Figure 9.6-7:	Open Space and Visual Resources – Mountain Rest Road Study Area ...	9.6-14
Figure 9.6-8:	Natural Resources – Mountain Rest Road Study Area.....	9.6-17
Figure 9.6-9:	Noise – Mountain Rest Road Study Area	9.6-24
Figure 9.6-10:	Study Area – New Paltz-Minnewaska Road.....	9.6-28
Figure 9.6-11:	Photographs – New Paltz-Minnewaska Road Study Area.....	9.6-29
Figure 9.6-12:	Photographs – New Paltz-Minnewaska Road Study Area.....	9.6-30
Figure 9.6-13:	Site Plan for Poor Farm Arch Bridge – New Paltz-Minnewaska Road Study Area	9.6-33
Figure 9.6-14:	Site Plan for Walkkill PT Downtake Chamber – New Paltz- Minnewaska Road Study Area.....	9.6-34
Figure 9.6-15:	Site Plan for Deceleration Lane – New Paltz-Minnewaska Road Study Area.....	9.6-35
Figure 9.6-16:	Land Use – New Paltz-Minnewaska Road Study Area	9.6-38
Figure 9.6-17:	Zoning – New Paltz-Minnewaska Road Study Area	9.6-39
Figure 9.6-18:	Open Space and Visual Resources – New Paltz-Minnewaska Road Study Area	9.6-41
Figure 9.6-19:	Historic and Cultural Resources – New Paltz-Minnewaska Road Study Area	9.6-44
Figure 9.6-20:	Natural Resources for Poor Farm Arch Bridge – New Paltz- Minnewaska Road Study Area.....	9.6-48

Figure 9.6-21:	Natural Resources for Wallkill PT Downtake Chamber – New Paltz-Minnewaska Road Study Area.....	9.6-49
Figure 9.6-22:	Noise – New Paltz-Minnewaska Road Study Area	9.6-63
Figure 9.7-1:	Town of Gardiner Study Areas	9.7-2
Figure 9.7-2:	Study Area – Forest Glen Road	9.7-6
Figure 9.7-3:	Photographs – Forest Glen Road Study Area	9.7-7
Figure 9.7-4:	Land Use – Forest Glen Road Study Area.....	9.7-9
Figure 9.7-5:	Zoning – Forest Glen Road Study Area.....	9.7-10
Figure 9.7-6:	Site Plan – Forest Glen Road Study Area.....	9.7-11
Figure 9.7-7:	Natural Resources – Forest Glen Road Study Area.....	9.7-16
Figure 9.7-8:	Noise – Forest Glen Road Study Area.....	9.7-32
Figure 9.7-9:	Study Area – Le Fevre Lane	9.7-37
Figure 9.7-10:	Photographs – Le Fevre Lane Study Area	9.7-38
Figure 9.7-11:	Land Use – Le Fevre Lane Study Area.....	9.7-39
Figure 9.7-12:	Zoning – Le Fevre Lane Study Area.....	9.7-41
Figure 9.7-13:	Site Plan – Le Fevre Lane Study Area.....	9.7-42
Figure 9.7-14:	Natural Resources – Le Fevre Lane Study Area.....	9.7-45
Figure 9.7-15:	Noise – Le Fevre Lane Study Area.....	9.7-52
Figure 9.7-16:	Study Area – Armato Lane	9.7-56
Figure 9.7-17:	Photographs – Armato Lane Study Area	9.7-57
Figure 9.7-18:	Land Use – Armato Lane Study Area.....	9.7-58
Figure 9.7-19:	Zoning – Armato Lane Study Area.....	9.7-60
Figure 9.7-20:	Site Plan – Armato Lane Study Area.....	9.7-61
Figure 9.7-21:	Noise – Armato Lane Study Area.....	9.7-70
Figure 9.8-1:	Town of Shawangunk Study Area	9.8-2
Figure 9.8-2:	Study Area – Strawridge Road Study Area	9.8-5
Figure 9.8-3:	Photographs – Strawridge Road Study Area	9.8-6
Figure 9.8-4:	Land Use – Strawridge Road Study Area.....	9.8-7
Figure 9.8-5:	Zoning – Strawridge Road Study Area.....	9.8-9
Figure 9.8-6:	Site Plan – Strawridge Road Study Area	9.8-10
Figure 9.8-7:	Natural Resources – Strawridge Road Study Area.....	9.8-13
Figure 9.8-8:	Noise – Strawridge Road Study Area	9.8-25
Figure 9.9-1:	Town of Montgomery Study Area.....	9.9-2

Figure 9.9-2:	Study Area – Winchell Drive.....	9.9-4
Figure 9.9-3:	Land Use – Winchell Drive Study Area	9.9-5
Figure 9.9-4:	Zoning – Winchell Drive Study Area	9.9-6
Figure 9.9-5:	Site Plan – Winchell Drive Study Area	9.9-8
Figure 9.9-6:	Natural Resources – Winchell Drive Study Area	9.9-10
Figure 9.9-7:	Noise – Winchell Drive Study Area	9.9-16
Figure 9.10-1:	Town of New Windsor Study Areas.....	9.10-2
Figure 9.10-2:	Study Area – Mount Airy Road.....	9.10-6
Figure 9.10-3:	Photographs – Mount Airy Road Study Area.....	9.10-8
Figure 9.10-4:	Land Use – Mount Airy Road Study Area.....	9.10-9
Figure 9.10-5:	Zoning – Mount Airy Road Study Area	9.10-10
Figure 9.10-6:	Site Plan for Washington Square SPS North Chamber – Mount Airy Road Study Area.....	9.10-11
Figure 9.10-7:	Site Plan for Washington Square SPS Blow-off Chambers and Newburgh Connection Chamber – Mount Airy Road Study Area.....	9.10-12
Figure 9.10-8:	Site Plan for Washington Square SPS South Chamber – Mount Airy Road Study Area.....	9.10-13
Figure 9.10-9:	Natural Resources for Washington Square SPS North Chamber – Mount Airy Road Study Area.....	9.10-19
Figure 9.10-10:	Natural Resources for Washington Square SPS Blow-off Chambers and Newburgh Connection Chamber – Mount Airy Road Study Area ..	9.10-20
Figure 9.10-11:	Noise – Mount Airy Road Study Area.....	9.10-34
Figure 9.10-12:	Study Area – Passaro Drive	9.10-39
Figure 9.10-13:	Photographs – Passaro Drive Study Area	9.10-40
Figure 9.10-14:	Land Use – Passaro Drive Study Area.....	9.10-41
Figure 9.10-15:	Zoning - Passaro Drive Study Area	9.10-42
Figure 9.10-16:	Site Plan - Passaro Drive Study Area	9.10-44
Figure 9.10-17:	Natural Resources – Passaro Drive Study Area.....	9.10-47
Figure 9.10-18:	Noise – Passaro Drive Study Area.....	9.10-55
Figure 9.11-1:	Village of Nelsonville Study Areas	9.11-2
Figure 9.11-2:	Study Area – Gatehouse Road	9.11-4
Figure 9.11-3:	Land Use – Gatehouse Road Study Area.....	9.11-5
Figure 9.11-4:	Zoning – Gatehouse Road Study Area.....	9.11-7
Figure 9.11-5:	Site Plan – Gatehouse Road Study Area.....	9.11-8

Figure 9.11-6:	Open Space and Visual Resources – Gatehouse Road Study Area	9.11-11
Figure 9.11-7:	Natural Resources – Gatehouse Road Study Area.....	9.11-14
Figure 9.11-8:	Noise – Gatehouse Road Study Area.....	9.11-23
Figure 9.11-9:	Study Area – Fishkill Road.....	9.11-28
Figure 9.11-10:	Photographs – Fishkill Road Study Area.....	9.11-29
Figure 9.11-11:	Land Use – Fishkill Road Study Area	9.11-30
Figure 9.11-12:	Zoning – Fishkill Road Study Area	9.11-31
Figure 9.11-13:	Site Plan for Foundry Brook SPS North Blow-off Chambers – Fishkill Road Study Area.....	9.11-33
Figure 9.11-14:	Site Plan for Foundry Brook SPS South Blow-off Chambers and Foundry Brook SPS Bridge – Fishkill Road Study Area.....	9.11-34
Figure 9.11-15:	Site Plan for Foundry Brook SPS South Chamber – Fishkill Road Study Area	9.11-35
Figure 9.11-16:	Open Space and Visual Resources – Fishkill Road Study Area.....	9.11-38
Figure 9.11-17:	Historic and Cultural Resources – Fishkill Road Study Area.....	9.11-40
Figure 9.11-18:	Natural Resources – Fishkill Road Study Area	9.11-43
Figure 9.11-19:	Floodplains – Fishkill Road Study Area.....	9.11-46
Figure 9.11-20:	Noise – Fishkill Road Study Area	9.11-59
Figure 9.12-1:	Town of Philipstown Study Areas	9.12-2
Figure 9.12-2:	Study Area – Indian Brook Road.....	9.12-6
Figure 9.12-3:	Photographs – Indian Brook Road Study Area.....	9.12-7
Figure 9.12-4:	Site Plan – Indian Brook Road Study Area	9.12-9
Figure 9.12-5:	Land Use – Indian Brook Road Study Area	9.12-12
Figure 9.12-6:	Zoning – Indian Brook Road Study Area	9.12-13
Figure 9.12-7:	Visual Resources – Indian Brook Road Study Area.....	9.12-16
Figure 9.12-8:	Natural Resources – Indian Brook Road Study Area	9.12-18
Figure 9.12-9:	Floodplains – Indian Brook Road Study Area.....	9.12-20
Figure 9.12-10:	Noise – Indian Brook Road Study Area	9.12-33
Figure 9.12-11:	Study Area – Old Albany Post Road	9.12-38
Figure 9.12-12:	Photographs – Old Albany Post Road Study Area	9.12-39
Figure 9.12-13:	Land Use – Old Albany Post Road Study Area.....	9.12-41
Figure 9.12-14:	Zoning – Old Albany Post Road Study Area.....	9.12-42

Figure 9.12-15:	Site Plan for Entrance off Old Albany Post Road – Old Albany Post Road Study Area	9.12-43
Figure 9.12-16:	Site Plan for Sprout Brook SPS North Chamber – Old Albany Post Road Study Area	9.12-44
Figure 9.12-17:	Historic and Cultural Resources – Old Albany Post Road Study Area ..	9.12-47
Figure 9.12-18:	Natural Resources – Old Albany Post Road Study Area	9.12-50
Figure 9.12-19:	Noise – Old Albany Post Road Study Area	9.12-56
Figure 9.12-20:	Study Area – Sprout Brook Road	9.12-61
Figure 9.12-21:	Photographs – Sprout Brook Road Study Area	9.12-62
Figure 9.12-22:	Land Use – Sprout Brook Road Study Area	9.12-63
Figure 9.12-23:	Zoning – Sprout Brook Road Study Area	9.12-64
Figure 9.12-24:	Site Plan for Sprout Brook SPS Blow-off Chambers – Sprout Brook Road Study Area	9.12-66
Figure 9.12-25:	Site Plan for Sprout Brook SPS South Chamber – Sprout Brook Road Study Area	9.12-67
Figure 9.12-26:	Natural Resources – Sprout Brook Road Study Area	9.12-70
Figure 9.12-27:	Floodplains – Sprout Brook Road Study Area	9.12-73
Figure 9.12-28:	Noise – Sprout Brook Road Study Area	9.12-91
Figure 9.13-1:	Town of Cortlandt Study Area	9.13-2
Figure 9.13-2:	Study Area – Aqueduct Road	9.13-6
Figure 9.13-3:	Photographs – Aqueduct Road Study Area	9.13-7
Figure 9.13-4:	Site Plan for Peekskill SPS North Siphon Chamber – Aqueduct Road Study Area	9.13-9
Figure 9.13-5:	Site Plan for Peekskill SPS North Blow-off Chambers – Aqueduct Road Study Area	9.13-10
Figure 9.13-6:	Site Plan for Peekskill SPS South Blow-off Chambers – Aqueduct Road Study Area	9.13-11
Figure 9.13-7:	Site Plan for Peekskill SPS South Siphon Chamber – Aqueduct Road Study Area	9.13-12
Figure 9.13-8:	Land Use – Aqueduct Road Study Area	9.13-15
Figure 9.13-9:	Zoning – Aqueduct Road Study Area	9.13-16
Figure 9.13-10:	Open Space and Visual Resources – Aqueduct Road Study Area	9.13-18
Figure 9.13-11:	Natural Resources for Peekskill SPS North Blow-off Chambers – Aqueduct Road Study Area	9.13-23

Figure 9.13-12:	Natural Resources for Peekskill SPS South Blow-off Chambers – Aqueduct Road Study Area	9.13-24
Figure 9.13-13:	Floodplains – Aqueduct Road Study Area.....	9.13-27
Figure 9.13-14:	Noise – Aqueduct Road Study Area	9.13-41
Figure 9.14 1:	Town of Yorktown Study Areas	9.14-2
Figure 9.14 2:	Study Area – Jacob Road.....	9.14-7
Figure 9.14 3:	Photographs – Jacob Road Study Area.....	9.14-8
Figure 9.14 4:	Land Use – Jacob Road Study Area	9.14-9
Figure 9.14 5:	Zoning – Jacob Road Study Area	9.14-10
Figure 9.14 6:	Site Plan for Hunters Brook SPS North Chamber – Jacob Road Study Area.....	9.14-12
Figure 9.14 7:	Site Plan for Hunters Brook SPS Blow-off Chambers and Hunter Brook SPS South Chamber – Jacob Road Study Area	9.14-13
Figure 9.14 8:	Natural Resources – Hunters Brook SPS North Chamber – Jacob Road Study Area.....	9.14-16
Figure 9.14 9:	Natural Resources – Hunters Brook SPS Blow-off Chambers and Hunter Brook SPS South Chamber – Jacob Road Study Area	9.14-17
Figure 9.14 10:	Floodplain – Jacob Road Study Area.....	9.14-19
Figure 9.14 11:	Noise – Jacob Road Study Area.....	9.14-31
Figure 9.14 12:	Study Area – Chapman Road.....	9.14-35
Figure 9.14 13:	Photographs – Chapman Road Study Area.....	9.14-37
Figure 9.14 14:	Land Use – Chapman Road Study Area	9.14-38
Figure 9.14 15:	Zoning – Chapman Road Study Area	9.14-39
Figure 9.14 16:	Site Plan for Turkey Mountain SPS North Chamber and Turkey Mountain SPS Blow-off Chambers – Chapman Road Study Area.....	9.14-40
Figure 9.14 17:	Site Plan for Turkey Mountain SPS South Chamber – Chapman Road Study Area	9.14-41
Figure 9.14 18:	Site Plan for Croton Lake Pressure Tunnel Downtake Chamber – Chapman Road Study Area.....	9.14-42
Figure 9.14 19:	Open Space and Visual Resources - Chapman Road Study Area	9.14-46
Figure 9.14 20:	Historic and Cultural Resources - Chapman Road Study Area	9.14-49
Figure 9.14 21:	Natural Resources for Turkey Mountain SPS North Chamber and Turkey Mountain SPS Blow-off Chambers – Chapman Road Study Area.....	9.14-52

Figure 9.14 22:	Natural Resources for Turkey Mountain SPS South Chamber and Croton Lake Pressure Tunnel Downtake Chamber – Chapman Road Study Area	9.14-53
Figure 9.14 23:	Floodplain - Chapman Road Study Area	9.14-55
Figure 9.14 24:	Transportation – Chapman Road Study Area	9.14-68
Figure 9.14 25:	Noise – Chapman Road Study Area	9.14-71
Figure 9.14 26:	Study Area – Croton Dam Road	9.14-75
Figure 9.14 27:	Photographs – Croton Dam Road Study Area	9.14-76
Figure 9.14 28:	Photographs – Croton Dam Road Study Area	9.14-77
Figure 9.14 29:	Land Use – Croton Dam Road Study Area.....	9.14-79
Figure 9.14 30:	Zoning – Croton Dam Road Study Area.....	9.14-80
Figure 9.14 31:	Site Plan – Croton Dam Road Study Area.....	9.14-81
Figure 9.14 32:	Open Space and Visual Resources – Croton Dam Road Study Area	9.14-85
Figure 9.14 33:	Historic and Cultural Resources – Croton Dam Road Study Area.....	9.14-87
Figure 9.14 34:	Natural Resources – Croton Dam Road Study Area.....	9.14-90
Figure 9.14 35:	Noise - Croton Dam Road Study Area	9.14-108
Figure 9.14 36:	Study Area – Kitchawan Road.....	9.14-112
Figure 9.14 37:	Land Use – Kitchawan Road Study Area	9.14-113
Figure 9.14 38:	Zoning – Kitchawan Road Study Area	9.14-114
Figure 9.14 39:	Site Plan – Kitchawan Road Study Area	9.14-116
Figure 9.14 40:	Open Space and Visual Resources – Kitchawan Road Study Area.....	9.14-118
Figure 9.14 41:	Natural Resources- Kitchawan Road Study Area.....	9.14-122
Figure 9.14 42:	Noise – Kitchawan Road Study Area	9.14-132
Figure 9.14 43:	Study Area – Pines Bridge Road	9.14-137
Figure 9.14 44:	Photographs – Pines Bridge Road Study Area	9.14-138
Figure 9.14 45:	Land Use – Pines Bridge Road Study Area	9.14-139
Figure 9.14 46:	Zoning – Pines Bridge Road Study Area.....	9.14-140
Figure 9.14 47:	Site Plan – Pines Bridge Road Study Area	9.14-142
Figure 9.14 48:	Natural Resources- Pines Bridge Road Study Area.....	9.14-144
Figure 9.14 49:	Noise – Pines Bridge Road Study Area	9.14-154
Figure 9.15-1:	Town of New Castle Study Areas.....	9.15-2
Figure 9.15-2:	Study Area – Somerstown Turnpike.....	9.15-9
Figure 9.15-3:	Photographs – Somerstown Turnpike Study Area.....	9.15-10

Figure 9.15-4:	Land Use – Somerstown Turnpike Study Area	9.15-11
Figure 9.15-5:	Zoning – Somerstown Turnpike Study Area	9.15-13
Figure 9.15-6:	Site Plan for Millwood North CCT Access Manhole with Culvert Drain (North Culvert) – Somerstown Turnpike Study Area.....	9.15-14
Figure 9.15-7:	Site Plan for Millwood North CCT Access Manhole with Culvert Drain (South Culvert) – Somerstown Turnpike Study Area.....	9.15-15
Figure 9.15-8:	Open Space and Visual Resources – Somerstown Turnpike Study Area.....	9.15-18
Figure 9.15-9:	Natural Resources for Site Plan for Millwood North CCT Access Manhole with Culvert Drain (North Culvert) - Somerstown Turnpike Study Area	9.15-20
Figure 9.15-10:	Noise – Somerstown Turnpike Study Area	9.15-33
Figure 9.15-11:	Study Area – Station Place	9.15-37
Figure 9.15-12:	Photograph – Station Place Study Area	9.15-38
Figure 9.15-13:	Land Use – Station Place Study Area	9.15-39
Figure 9.15-14:	Zoning – Station Place Study Area.....	9.15-40
Figure 9.15-15:	Site Plan for Access at Millwood Road – Station Place Study Area	9.15-42
Figure 9.15-16:	Site Plan for Millwood North CCT Access Manhole – Station Place Study Area	9.15-43
Figure 9.15-17:	Open Space and Visual Resources - Station Place Study Area	9.15-45
Figure 9.15-18:	Historic and Cultural Resources - Station Place Study Area.....	9.15-47
Figure 9.15-19:	Natural Resources - Station Place Study Area.....	9.15-50
Figure 9.15-20:	Noise – Station Place Study Area	9.15-62
Figure 9.15-21:	Study Area – Campfire Road.....	9.15-66
Figure 9.15-22:	Land Use – Campfire Road Study Area	9.15-67
Figure 9.15-23:	Zoning – Campfire Road Study Area	9.15-68
Figure 9.15-24:	Site Plan – Campfire Road Study Area.....	9.15-71
Figure 9.15-25:	Open Space and Visual Resources – Campfire Road Study Area	9.15-73
Figure 9.15-26:	Natural Resources - Campfire Road Study Area	9.15-75
Figure 9.15-27:	Noise – Campfire Road Study Area.....	9.15-86
Figure 9.16-1:	Town of Mount Pleasant Study Areas	9.16-2
Figure 9.16-2:	Study Area – Chappaqua Road	9.16-7
Figure 9.16-3:	Land Use - Chappaqua Road Study Area	9.16-8
Figure 9.16-4:	Zoning - Chappaqua Road Study Area	9.16-9

Figure 9.16-5:	Photographs – Leak 8 – Chappaqua Road Study Area	9.16-11
Figure 9.16-6:	Photographs – Leak 9 - Chappaqua Road Study Area.....	9.16-12
Figure 9.16-7:	Site Plan – Leaks 8 and 9 - Chappaqua Road Study Area	9.16-13
Figure 9.16-8:	Open Space and Visual Resources - Chappaqua Road Study Area.....	9.16-16
Figure 9.16-9:	Natural Resources – Chappaqua Road Study Area.....	9.16-19
Figure 9.16-10:	Historical Precipitation Data (1983 - 2013) – Chappaqua Road Study Area.....	9.16-31
Figure 9.16-11:	Wetland Watershed Delineation – Chappaqua Road Study Area.....	9.16-32
Figure 9.16-12:	Hydrologic Budget and Depth to Water for the Representative Dry Year - Chappaqua Road Study Area.....	9.16-35
Figure 9.16-13:	Hydrologic Budget and Depth to Water for the Representative Wet Year - Chappaqua Road Study Area.....	9.16-36
Figure 9.16-14:	Hydrologic Budget and Depth to Water for the Representative Average Year - Chappaqua Road Study Area	9.16-37
Figure 9.16-15:	Noise - Chappaqua Road Study Area	9.16-48
Figure 9.16-16:	Study Area – Nanny Hagen Road.....	9.16-52
Figure 9.16-17:	Photographs – Nanny Hagen Road Study Area.....	9.16-54
Figure 9.16-18:	Land Use – Nanny Hagen Road Study Area	9.16-55
Figure 9.16-19:	Zoning – Nanny Hagen Road Study Area	9.16-56
Figure 9.16-20:	Site Plan – Nanny Hagen Road Study Area.....	9.16-57
Figure 9.16-21:	Open Space and Visual Resources – Nanny Hagen Road Study Area...	9.16-61
Figure 9.16-22:	Natural Resources - Nanny Hagen Road Study Area	9.16-64
Figure 9.16-23:	Floodplain – Nanny Hagen Road Study Area.....	9.16-67
Figure 9.16-24:	Transportation – Nanny Hagen Road Study Area	9.16-81
Figure 9.16-25:	Noise – Nanny Hagen Road Study Area.....	9.16-84
Figure 9.16-26:	Study Area – Westlake Drive	9.16-89
Figure 9.16-27:	Photographs – Westlake Drive Study Area	9.16-90
Figure 9.16-28:	Land Use – Westlake Drive Study Area.....	9.16-91
Figure 9.16-29:	Zoning – Westlake Drive Study Area.....	9.16-92
Figure 9.16-30:	Site Plan for Catskill Kensico Bypass CCT Access Manhole – Westlake Drive Study Area	9.16-93
Figure 9.16-31:	Site Plan for Kensico Upper Effluent Chamber – Westlake Drive Study Area	9.16-94
Figure 9.16-32:	Open Space and Visual Resources – Westlake Drive Study Area.....	9.16-97

Figure 9.16-33:	Natural Resources – Westlake Drive Study Area	9.16-100
Figure 9.16-34:	Floodplain – Westlake Drive Study Area	9.16-103
Figure 9.16-35:	Noise – Westlake Drive Study Area	9.16-117
Figure 9.17-1:	Village of Pleasantville Study Areas	9.17-2
Figure 9.17-2:	Study Area – Washington Avenue Study Area.....	9.17-7
Figure 9.17-3:	Photographs – Washington Avenue Study Area.....	9.17-9
Figure 9.17-4:	Site Plan – Washington Avenue Study Area	9.17-10
Figure 9.17-5:	Access Road Alternatives – Washington Avenue Study Area	9.17-12
Figure 9.17-6:	Land Use – Washington Avenue Study Area	9.17-15
Figure 9.17-7:	Zoning – Washington Avenue Study Area	9.17-16
Figure 9.17-8:	Natural Resources – Washington Avenue Study Area	9.17-20
Figure 9.17-9:	Floodplain – Washington Avenue Study Area	9.17-22
Figure 9.17-10:	Transportation – Washington Avenue Study Area	9.17-32
Figure 9.17-11:	Noise – Washington Avenue Study Area	9.17-35
Figure 9.17-12:	Study Area – Pleasantville Alum Plant Study Area.....	9.17-40
Figure 9.17-13:	Photographs – Pleasantville Alum Plant Study Area.....	9.17-42
Figure 9.17-14:	Land Use – Pleasantville Alum Plant Study Area	9.17-43
Figure 9.17-15:	Zoning – Pleasantville Alum Plant Study Area	9.17-44
Figure 9.17-16:	Site Plan – Pleasantville Alum Plant Study Area	9.17-45
Figure 9.17-17:	Open Space and Visual Resources – Pleasantville Alum Plant Study Area.....	9.17-49
Figure 9.17-18:	Natural Resources – Pleasantville Alum Plant Study Area	9.17-52
Figure 9.17-19:	Noise – Pleasantville Alum Plant Study Area	9.17-66
Figure 9.17-20:	Study Area - Willow Street.....	9.17-70
Figure 9.17-21:	Photographs – Willow Street Study Area	9.17-71
Figure 9.17-22:	Land Use – Willow Street Study Area.....	9.17-73
Figure 9.17-23:	Zoning – Willow Street Study Area.....	9.17-74
Figure 9.17-24:	Site Plan – Willow Street Study Area.....	9.17-75
Figure 9.17-25:	Open Space and Visual Resources – Willow Street Study Area	9.17-77
Figure 9.17-26:	Natural Resources – Willow Street Study Area.....	9.17-80
Figure 9.17-27:	Noise – Willow Street Study Area.....	9.17-86
Figure 9.18 1:	New Paltz Temporary Transmission Water Main and Connection to the Catskill/Delaware Interconnection at Shaft 4	9.18-4

Figure 9.18 2:	Proposed Pipeline Cross-Section and Plan View.....	9.18-6
Figure 9.18 3:	Study Area – New Paltz Temporary Transmission Water Main Study Area.....	9.18-11
Figure 9.18 4:	Open Space and Recreational Resources – New Paltz Temporary Transmission Water Main Study Area.....	9.18-16
Figure 9.18 5:	Historic Resources – New Paltz Temporary Transmission Water Main Study Area	9.18-19
Figure 9.18 6:	Natural Resources – New Paltz Temporary Transmission Water Main Study Area	9.18-21
Figure 9.18 7:	Noise – New Paltz Temporary Transmission Water Main Study Area..	9.18-32
Figure 9.18 8:	Construction - Noise – New Paltz Temporary Transmission Water Main Study Area.....	9.18-38
Figure 9.19-1:	Catskill Aqueduct Repair and Rehabilitation Study Areas.....	9.19-2
Figure 9.19-2:	Outside Community Connections to the Catskill Aqueduct.....	9.19-17
Figure 9.20-1:	Well Action Plan – Lucas Turnpike Study Area, Town of Marbletown, Ulster County	9.20-4
Figure 9.20-2:	Well Action Plan – Mossybrook Road Study Area, Town of Marbletown, Ulster County	9.20-5
Figure 10.1-1:	Catskill and Delaware Water Supply Systems.....	10.1-4
Figure 10.1-2:	Croton Water Supply System.....	10.1-8
Figure 10.1-3:	The New York City Surface Water Supply System Flow Diagram	10.1-11
Figure 10.2-1:	Illustrative Example of Average of Daily Release Flows across the Collection of 3-Year Blocks for a Single Reservoir for a Single Month (Typical Operations)	10.2-4
Figure 10.2-2:	Illustrative Example of Average of Daily Release Flows across the Collection of 3-Year Blocks for a Single Reservoir for 12 Months	10.2-5
Figure 10.2-3:	Illustrative Example of the High Flow Probability Plot with National Weather Service Flood Stages	10.2-7
Figure 10.2-4:	Illustrative Example Graphical Comparison of Daily Reservoir Water Surface Elevations for a Single Reservoir	10.2-10
Figure 10.3-1:	Cannonsville Reservoir Study Area.....	10.3-4
Figure 10.3-2:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Cannonsville Reservoir Study Area.....	10.3-6
Figure 10.3-3:	West Branch Delaware River Downstream of Cannonsville Reservoir Study Area	10.3-7

Figure 10.3-4:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – West Branch Delaware River Downstream of Cannonsville Reservoir Study Area	10.3-9
Figure 10.3-5:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – West Branch Delaware River Downstream of Cannonsville Reservoir Study Area	10.3-10
Figure 10.3-6:	Annual Probability of High Flow Stage at Stilesville USGS Gauge – West Branch Delaware River Downstream of Cannonsville Reservoir Study Area	10.3-11
Figure 10.3-7:	Annual Probability of High Flow Stage at Hale Eddy USGS Gauge – West Branch Delaware River Downstream of Cannonsville Reservoir Study Area	10.3-12
Figure 10.3-8:	Pepacton Reservoir Study Area	10.3-14
Figure 10.3-9:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Pepacton Reservoir Study Area	10.3-16
Figure 10.3-10:	East Branch Delaware River Downstream of Pepacton Reservoir Study Area	10.3-17
Figure 10.3-11:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – East Branch Delaware River Downstream of Pepacton Reservoir Study Area	10.3-19
Figure 10.3-12:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – East Branch Delaware River Downstream of Pepacton Reservoir Study Area	10.3-20
Figure 10.3-13:	Annual Probability of High Flow Stage at Downsville USGS Gauge – East Branch Delaware River Downstream of Pepacton Reservoir Study Area	10.3-21
Figure 10.3-14:	Neversink Reservoir Study Area	10.3-22
Figure 10.3-15:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Neversink Reservoir Study Area	10.3-25
Figure 10.3-16:	Neversink River Downstream of Neversink Reservoir Study Area	10.3-26
Figure 10.3-17:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – Neversink River Downstream of Neversink Reservoir Study Area	10.3-28
Figure 10.3-18:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – Neversink River Downstream of Neversink Reservoir Study Area	10.3-29
Figure 10.3-19:	Annual Probability of High Flow Stage at Neversink USGS Gauge – Neversink River Downstream of Neversink Reservoir Study Area	10.3-30

Figure 10.3-20:	Annual Probability of High Flow Stage at Bridgeville USGS Gauge – Neversink River Downstream of Neversink Reservoir Study Area	10.3-31
Figure 10.3-21:	Net Electricity Generation in New York State	10.3-35
Figure 10.3-22:	Rondout Reservoir Study Area	10.3-37
Figure 10.3-23:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Rondout Reservoir Study Area (Sheet 1).....	10.3-38
Figure 10.3-24:	Open Space and Recreation Resources – Rondout Reservoir Study Area.....	10.3-44
Figure 10.3-25:	Visual Resources – Rondout Reservoir Study Area	10.3-46
Figure 10.3-26:	Rendering of Rondout Reservoir Siphons – Rondout Reservoir Study Area.....	10.3-49
Figure 10.3-27:	Wetlands Resources – Rondout Reservoir Study Area.....	10.3-61
Figure 10.3-28:	Noise-Sensitive Land Uses – Rondout Reservoir Study Area.....	10.3-67
Figure 10.3-29:	Rondout Creek Downstream of Rondout Reservoir Study Area	10.3-73
Figure 10.3-30:	Subwatershed Areas – Rondout Creek Downstream of Rondout Reservoir Study Area.....	10.3-74
Figure 10.3-31:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – Rondout Creek Downstream of Rondout Reservoir Study Area.....	10.3-76
Figure 10.3-32:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – Rondout Creek Downstream of Rondout Reservoir Study Area.....	10.3-77
Figure 10.3-33:	Annual Probability of High Flows from Spills and Releases – Rondout Creek Downstream of Rondout Reservoir Study Area	10.3-79
Figure 10.3-34:	Photograph Documentation of Spill Event June 14, 2013 – Rondout Creek Downstream of Rondout Reservoir Study Area (Sheet 1)	10.3-80
Figure 10.3-35:	Topographic Cross Sections – Rondout Creek Downstream of Rondout Reservoir Study Area	10.3-85
Figure 10.3-36:	Example Vegetation Encroachment – Rondout Creek Downstream of Rondout Reservoir Study Area	10.3-90
Figure 10.3-37:	Geomorphology Survey Reaches – Rondout Creek Downstream of Rondout Reservoir Study Area	10.3-92
Figure 10.3-38:	Geomorphology Survey – Rondout Creek Downstream of Rondout Reservoir Study Area (Sheet 1)	10.3-93
Figure 10.3-39:	Vegetation Survey and Wetlands – Rondout Creek Downstream of Rondout Reservoir Study Area (Sheet 1).....	10.3-104

Figure 10.3-40:	Open Space and Recreation Resources – Rondout Creek Downstream of Rondout Reservoir Study Area.....	10.3-130
Figure 10.4-1:	Catskill and Delaware Water Supply Systems.....	10.4-2
Figure 10.4-2:	Schoharie Reservoir Study Area.....	10.4-5
Figure 10.4-3:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Schoharie Reservoir Study Area.....	10.4-7
Figure 10.4-4:	Schoharie Creek Downstream of Schoharie Reservoir Study Area.....	10.4-9
Figure 10.4-5:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – Schoharie Creek Downstream of Schoharie Reservoir Study Area.....	10.4-10
Figure 10.4-6:	Annual Probability of High Flow Stage at Gilboa USGS Gauge – Schoharie Creek Downstream of Schoharie Reservoir Study Area.....	10.4-11
Figure 10.4-7:	Esopus Creek Downstream of Shandaken Tunnel Study Area.....	10.4-13
Figure 10.4-8:	Diversions Dataset Mean and Range of Diversions Predicted under Typical Operations and WSSO for Shandaken Tunnel Diversions – Esopus Creek Downstream of Shandaken Tunnel Study Area.....	10.4-15
Figure 10.4-9:	Diversion Dataset Mean and Range of Diversions Predicted under Typical Operations and WSSO for Combined Shandaken Tunnel Diversions and Natural Esopus Creek Flow – Esopus Creek Downstream of Shandaken Tunnel Study Area.....	10.4-16
Figure 10.4-10:	Annual Probability of High Flows at Coldbrook USGS Gauge – Esopus Creek Downstream of Shandaken Tunnel Study Area.....	10.4-17
Figure 10.4-11:	Ashokan Reservoir Study Area.....	10.4-19
Figure 10.4-12:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Ashokan Reservoir Study Area (West Basin).....	10.4-20
Figure 10.4-13:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Ashokan Reservoir Study Area (East Basin).....	10.4-21
Figure 10.4-14:	Esopus Creek Downstream of Ashokan Reservoir Study Area.....	10.4-23
Figure 10.4-15:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – Esopus Creek Downstream of Ashokan Reservoir Study Area.....	10.4-25
Figure 10.4-16:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – Esopus Creek Downstream of Ashokan Reservoir Study Area.....	10.4-26
Figure 10.4-17:	Annual Probability of High Flows from Spills and Releases – Esopus Creek Downstream of Ashokan Reservoir Study Area	10.4-27
Figure 10.4-18:	Annual Probability of High Flows at Mount Marion USGS Gauge – Esopus Creek Downstream of Ashokan Reservoir Study Area.....	10.4-28

Figure 10.4-19:	Kensico Reservoir Study Area.....	10.4-30
Figure 10.4-20:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Kensico Reservoir Study Area.....	10.4-31
Figure 10.4-21:	Critical Environmental Areas – Kensico Reservoir Study Area.....	10.4-34
Figure 10.4-22:	Benthic Sampling Locations – Kensico Reservoir Study Area	10.4-38
Figure 10.4-23:	Estimated Depth of Sediment Containing Alum from 2014 Geophysical Cores and Modeled Range of Average Settled Thickness of Alum Floc during RWBT Shutdown Operations – Kensico Reservoir Study Area.....	10.4-40
Figure 10.4-24:	Pleasantville Alum Plant Study Area.....	10.4-44
Figure 10.5-1:	Croton Water Supply System.....	10.5-2
Figure 10.5-2:	Boyd’s Corners Reservoir Study Area.....	10.5-4
Figure 10.5-3:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Boyd’s Corners Reservoir Study Area.....	10.5-5
Figure 10.5-4:	West Branch Croton River Downstream of Boyd’s Corners Reservoir Study Area	10.5-7
Figure 10.5-5:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – West Branch Croton River Downstream of Boyd’s Corners Reservoir Study Area.....	10.5-8
Figure 10.5-6:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – West Branch Croton River Downstream of Boyd’s Corners Reservoir Study Area.....	10.5-9
Figure 10.5-7:	Annual Probability of High Flows from Spills and Releases – West Branch Croton River Downstream of Boyd’s Corners Reservoir Study Area.....	10.5-10
Figure 10.5-8:	West Branch Reservoir Study Area	10.5-12
Figure 10.5-9:	Elevation Dataset Mean and Range for Typical Operations and WSSO – West Branch Reservoir Study Area	10.5-14
Figure 10.5-10:	West Branch Croton River Downstream of West Branch Reservoir Study Area	10.5-15
Figure 10.5-11:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – West Branch Croton River Downstream of West Branch Reservoir Study Area	10.5-17
Figure 10.5-12:	Wetlands Resources – West Branch Croton River Downstream of West Branch Reservoir Study Area	10.5-29
Figure 10.5-13:	Middle Branch Reservoir Study Area.....	10.5-33
Figure 10.5-14:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Middle Branch Reservoir Study Area.....	10.5-34

Figure 10.5-15:	Bog Brook Reservoir Study Area	10.5-36
Figure 10.5-16:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Bog Brook Reservoir Study Area (Sheet 1).....	10.5-37
Figure 10.5-17:	Open Space and Recreation Resources – Bog Brook Reservoir Study Area.....	10.5-41
Figure 10.5-18:	Visual Resources – Bog Brook Reservoir Study Area	10.5-44
Figure 10.5-19:	Wetlands Resources – Bog Brook Reservoir Study Area.....	10.5-58
Figure 10.5-20:	Bog Brook Downstream of Bog Brook Reservoir Study Area.....	10.5-62
Figure 10.5-21:	East Branch Reservoir Study Area	10.5-64
Figure 10.5-22:	Elevation Dataset Mean and Range for Typical Operations and WSSO – East Branch Reservoir Study Area (Sheet 1).....	10.5-66
Figure 10.5-23:	Open Space and Recreation Resources – East Branch Reservoir Study Area.....	10.5-69
Figure 10.5-24:	Critical Environmental Areas – East Branch Reservoir Study Area	10.5-71
Figure 10.5-25:	Visual Resources – East Branch Reservoir Study Area.....	10.5-73
Figure 10.5-26:	Wetlands Resources – East Branch Reservoir Study Area.....	10.5-86
Figure 10.5-27:	East Branch Croton River Downstream of East Branch Reservoir Study Area	10.5-91
Figure 10.5-28:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – East Branch Croton River Downstream of East Branch Reservoir Study Area	10.5-92
Figure 10.5-29:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – East Branch Croton River Downstream of East Branch Reservoir Study Area	10.5-93
Figure 10.5-30:	Combined Release and Spill Dataset Mean and Range of Combined Release and Spill Predicted under Typical Operations and WSSO – East Branch Croton River Downstream of East Branch Reservoir Study Area	10.5-94
Figure 10.5-31:	Annual Probability of High Flows from Spills and Releases – East Branch Croton River Downstream of East Branch Reservoir Study Area.....	10.5-96
Figure 10.5-32:	Croton Falls Diverting Reservoir Study Area.....	10.5-97
Figure 10.5-33:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Croton Falls Diverting Reservoir Study Area.....	10.5-99
Figure 10.5-34:	East Branch Croton River Downstream of Croton Falls Diverting Reservoir Study Area.....	10.5-100

Figure 10.5-35:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – East Branch Croton River Downstream of Croton Falls Diverting Reservoir Study Area.....	10.5-101
Figure 10.5-36:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – East Branch Croton River Downstream of Croton Falls Diverting Reservoir Study Area.....	10.5-102
Figure 10.5-37:	Annual Probability of High Flows from Spills and Releases – East Branch Croton River Downstream of Croton Falls Diverting Reservoir Study Area.....	10.5-104
Figure 10.5-38:	Croton Falls Reservoir Study Area.....	10.5-105
Figure 10.5-39:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Croton Falls Reservoir Study Area.....	10.5-106
Figure 10.5-40:	West Branch Croton River Downstream of Croton Falls Reservoir Study Area	10.5-108
Figure 10.5-41:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – West Branch Croton River Downstream of Croton Falls Reservoir Study Area.....	10.5-109
Figure 10.5-42:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – West Branch Croton River Downstream of Croton Falls Reservoir Study Area.....	10.5-110
Figure 10.5-43:	Annual Probability of High Flows from Spills and Releases – West Branch Croton River Downstream of Croton Falls Reservoir Study Area.....	10.5-111
Figure 10.5-44:	Amawalk Reservoir Study Area	10.5-112
Figure 10.5-45:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Amawalk Reservoir Study Area	10.5-114
Figure 10.5-46:	Muscot River Downstream of Amawalk Reservoir Study Area.....	10.5-115
Figure 10.5-47:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – Muscot River Downstream of Amawalk Reservoir Study Area.....	10.5-117
Figure 10.5-48:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – Muscot River Downstream of Amawalk Reservoir Study Area.....	10.5-118
Figure 10.5-49:	Annual Probability of High Flows from Spills and Releases – Muscot River Downstream of Amawalk Reservoir Study Area.....	10.5-119
Figure 10.5-50:	Titicus Reservoir Study Area.....	10.5-120
Figure 10.5-51:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Titicus Reservoir Study Area.....	10.5-121
Figure 10.5-52:	Titicus River Downstream of Titicus Reservoir Study Area.....	10.5-123

Figure 10.5-53:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – Titicus River Downstream of Titicus Reservoir Study Area.....	10.5-124
Figure 10.5-54:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – Titicus River Downstream of Titicus Reservoir Study Area.....	10.5-125
Figure 10.5-55:	Annual Probability of High Flows from Spills and Releases – Titicus River Downstream of Titicus Reservoir Study Area	10.5-126
Figure 10.5-56:	Cross River Reservoir Study Area.....	10.5-127
Figure 10.5-57:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Cross River Reservoir Study Area.....	10.5-129
Figure 10.5-58:	Cross River Downstream of Cross River Reservoir Study Area	10.5-130
Figure 10.5-59:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – Cross River Downstream of Cross River Reservoir Study Area.....	10.5-132
Figure 10.5-60:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – Cross River Downstream of Cross River Reservoir Study Area.....	10.5-133
Figure 10.5-61:	Annual Probability of High Flows from Spills and Releases – Cross River Downstream of Cross River Reservoir Study Area	10.5-134
Figure 10.5-62:	Muscoot Reservoir Study Area.....	10.5-135
Figure 10.5-63:	Elevation Dataset Mean and Range for Typical Operations and WSSO – Muscoot Reservoir Study Area.....	10.5-136
Figure 10.5-64:	New Croton Reservoir Study Area	10.5-138
Figure 10.5-65:	Elevation Dataset Mean and Range for Typical Operations and WSSO – New Croton Reservoir Study Area	10.5-139
Figure 10.5-66:	Open Space and Recreation Resources – New Croton Reservoir Study Area.....	10.5-142
Figure 10.5-67:	Critical Environmental Areas – New Croton Reservoir Study Area	10.5-144
Figure 10.5-68:	Visual Resources – New Croton Reservoir Study Area	10.5-146
Figure 10.5-69:	Wetlands Resources – New Croton Reservoir Study Area (Sheet 1) ...	10.5-160
Figure 10.5-70:	Croton River Downstream of New Croton Reservoir Study Area	10.5-165
Figure 10.5-71:	Release Dataset Mean and Range of Releases Predicted under Typical Operations and WSSO – Croton River Downstream of New Croton Reservoir Study Area.....	10.5-167
Figure 10.5-72:	Spill Dataset Mean and Range of Spills Predicted under Typical Operations and WSSO – Croton River Downstream of New Croton Reservoir Study Area.....	10.5-168

Figure 10.5-73:	Combined Release and Spill Dataset Mean Predicted under the Temporary Shutdown – Croton River Downstream of New Croton Reservoir Compared to Regulated Minimum Releases without the Variance	10.5-169
Figure 10.5-74:	Annual Probability of High Flows from Spills and Releases – Croton River Downstream of New Croton Reservoir Study Area.....	10.5-170
Figure 10.5-75:	Open Space and Recreation Resources – Croton River Downstream of New Croton Reservoir Study Area	10.5-173
Figure 10.5-76:	Critical Environmental Areas – Croton River Downstream of New Croton Reservoir Study Area.....	10.5-175
Figure 10.5-77:	Wetlands Resources – Croton River Downstream of New Croton Reservoir Study Area.....	10.5-189
Figure 11.2-1:	Rondout-West Branch Tunnel: Roseton and Wawarsing Crossings	11.2-2
Figure 11.2-2:	Rondout-West Branch Tunnel Inspection and Repair	11.2-4
Figure 11.2-3:	Conceptual Linear Schedule	11.2-9
Figure 11.3-1:	Rondout-West Branch Tunnel Inspection and Repair Study Areas.....	11.3-2
Figure 11.3-2:	Leak Repair – Study Area.....	11.3-31
Figure 11.3-3:	Example of Hydraulic Grade Line (HGL) in the RWBT	11.3-32
Figure 11.3-4:	Subsurface Investigation Locations – Leak Repair Study Area	11.3-43
Figure 11.4-1:	Site Location – Rondout Effluent Chamber Study Area	11.4-2
Figure 11.4-2:	Land Use – Rondout Effluent Chamber Study Area	11.4-3
Figure 11.4-3:	Zoning – Rondout Effluent Chamber Study Area	11.4-4
Figure 11.4-4:	Rondout Effluent Chamber	11.4-6
Figure 11.4-5:	Open Space and Recreation – Rondout Effluent Chamber Study Area..	11.4-11
Figure 11.4-6:	Visual Resources – Rondout Effluent Chamber Study Area	11.4-13
Figure 11.4-7:	Natural Resources – Rondout Effluent Chamber Study Area	11.4-15
Figure 11.4-8:	Transportation – Rondout Effluent Chamber Study Area	11.4-19
Figure 11.4-9:	Noise – Rondout Effluent Chamber Study Area.....	11.4-21
Figure 11.5-1:	Site Location – Shaft 1 Study Area.....	11.5-2
Figure 11.5-2:	Land Use – Shaft 1 Study Area.....	11.5-3
Figure 11.5-3:	Zoning – Shaft 1 Study Area	11.5-4
Figure 11.5-4:	Shaft 1	11.5-6
Figure 11.5-5:	Visual Resources – Shaft 1 Study Area	11.5-10
Figure 11.5-6:	Natural Resources – Shaft 1 Study Area.....	11.5-11

Figure 11.5-7:	Transportation – Shaft 1 Study Area	11.5-15
Figure 11.5-8:	Noise – Shaft 1 Study Area.....	11.5-18
Figure 11.6-1:	Site Location – Shaft 2A and Wawarsing Leak Repair Study Area	11.6-2
Figure 11.6-2:	Site Location – Shaft 2A Study Area.....	11.6-4
Figure 11.6-3:	Land Use – Shaft 2A Study Area.....	11.6-5
Figure 11.6-4:	Zoning – Shaft 2A Study Area.....	11.6-6
Figure 11.6-5:	Site Location – Leak Repair Study Area	11.6-7
Figure 11.6-6:	Land Use – Leak Repair Study Area	11.6-8
Figure 11.6-7:	Zoning – Leak Repair Study Area	11.6-10
Figure 11.6-8:	Shaft 2A	11.6-11
Figure 11.6-9:	Open Space and Recreation – Shaft 2A Study Area.....	11.6-17
Figure 11.6-10:	Historic and Cultural Resources – Leak Repair Study Area.....	11.6-20
Figure 11.6-11:	Visual Resources – Shaft 2A Study Area	11.6-21
Figure 11.6-12:	Visual Resources – Leak Repair Study Area.....	11.6-22
Figure 11.6-13:	Natural Resources – Shaft 2A Study Area.....	11.6-25
Figure 11.6-14:	Geologic Cross Sections – Leak Repair Study Area	11.6-28
Figure 11.6-15:	Surficial Geology – Leak Repair Study Area	11.6-29
Figure 11.6-16:	Illustration of How Groundwater Saturates Soil.....	11.6-31
Figure 11.6-17:	Illustration of the Water Table.....	11.6-32
Figure 11.6-18:	Illustration of Confined Aquifer, Potentiometric Surface, and Artesian Pressure.....	11.6-33
Figure 11.6-19:	Illustration of Regional Groundwater Flow	11.6-34
Figure 11.6-20:	Rondout-West Branch Tunnel – Elevation of the Water Table in the Unconsolidated Aquifer	11.6-35
Figure 11.6-21:	Illustration of Openings in Unconsolidated Soils and Bedrock.....	11.6-37
Figure 11.6-22:	Rondout-West Branch Tunnel - Elevation of the Potentiometric Surface in the Bedrock Aquifer	11.6-38
Figure 11.6-23:	United States Geological Survey Monitoring Locations	11.6-40
Figure 11.6-24:	Maximum Water Level Response in the Unconsolidated Aquifer during Depressurizations	11.6-42
Figure 11.6-25:	Maximum Water Level Response in the Bedrock Aquifer During Depressurizations.....	11.6-44
Figure 11.6-26:	Estimated Groundwater Influence Area in the Bedrock Aquifer – Leak Repair Study Area.....	11.6-50

Figure 11.6-27:	Estimated Groundwater Influence Area in the Unconsolidated Aquifer – Leak Repair Study Area.....	11.6-51
Figure 11.6-28:	Bedrock Geology – Leak Repair Study Area	11.6-54
Figure 11.6-29:	Soils Map – Leak Repair Study Area	11.6-58
Figure 11.6-30:	Parcels with Known or Potential Water Supply Wells – Leak Repair Study Area	11.6-66
Figure 11.6-31:	Estimated Groundwater Influence Area - Parcels With Known, Potential, or Future Wells in the Unconsolidated Aquifer – Leak Repair Study Area.....	11.6-69
Figure 11.6-32:	Estimated Groundwater Influence Area - Parcels With Known, Potential or Future Wells in the Bedrock Aquifer – Leak Repair Study Area	11.6-70
Figure 11.6-33:	Transportation – Shaft 2A Study Area.....	11.6-72
Figure 11.6-34:	Noise – Shaft 2A Study Area.....	11.6-75
Figure 11.7-1:	Site Location – Shaft 8 Study Area.....	11.7-2
Figure 11.7-2:	Land Use – Shaft 8 Study Area.....	11.7-3
Figure 11.7-3:	Zoning – Shaft 8 Study Area	11.7-4
Figure 11.7-4:	Shaft 8	11.7-6
Figure 11.7-5:	Open Space and Recreation – Shaft 8 Study Area.....	11.7-9
Figure 11.7-6:	Natural Resources – Shaft 8 Study Area.....	11.7-10
Figure 11.7-7:	Transportation – Shaft 8 Study Area	11.7-14
Figure 11.7-8:	Noise – Shaft 8 Study Area.....	11.7-16
Figure 11.8-1:	Site Location – Shaft 9 Study Area.....	11.8-2
Figure 11.8-2:	Land Use – Shaft 9 Study Area.....	11.8-3
Figure 11.8-3:	Zoning – Shaft 9 Study Area	11.8-4
Figure 11.8-4:	Shaft 9	11.8-6
Figure 11.8-5:	Open Space and Visual Resources – Shaft 9 Study Area	11.8-8
Figure 11.8-6:	Natural Resources – Shaft 9 Study Area.....	11.8-11
Figure 11.8-7:	Transportation – Shaft 9 Study Area	11.8-15
Figure 11.8-8:	Noise – Shaft 9 Study Area.....	11.8-17
Figure 11.9-1:	Rondout-West Branch Tunnel: Wawarsing and Roseton Crossings	11.9-2
Figure 11.9-2:	Roseton Study Area – Hamlet of Roseton, Town of Newburgh, Orange County	11.9-7
Figure 11.9-3:	Roseton Study Area – Geologic and Groundwater Features	11.9-8

Figure 11.9-4:	Land Use – Roseton Study Area.....	11.9-10
Figure 11.9-5:	Zoning – Roseton Study Area.....	11.9-12
Figure 11.9-6:	Surface Expressions, Delineated Wetlands, and Stream Segments – Natural Resources Study Area.....	11.9-16
Figure 11.9-7:	Groundwater Monitoring Locations – Roseton Study Area	11.9-20
Figure 11.9-8:	Prior Depressurization Monitoring Locations – Roseton Study Area	11.9-21
Figure 11.9-9:	Hydraulic Grade Line in the Rondout-West Branch Tunnel	11.9-22
Figure 11.9-10:	Surface Water – Natural Resources Study Area.....	11.9-25
Figure 11.9-11:	Surface Water Monitoring Station Locations – Natural Resources Study Area	11.9-27
Figure 11.9-12:	Surface Water Network Diagram – Natural Resources Study Area.....	11.9-28
Figure 11.9-13:	Shallow Groundwater Monitoring Locations – Natural Resources Study Area	11.9-35
Figure 11.9-14:	Electrofishing and Benthic Monitoring Locations – Natural Resources Study Area	11.9-44
Figure 11.9-15:	Geotechnical Field Investigation	11.9-55
Figure 11.9-16:	Bedrock Geology – Roseton Study Area.....	11.9-57
Figure 11.9-17:	Surficial Geology – Roseton Study Area.....	11.9-59
Figure 11.9-18:	Illustration of How Groundwater Saturates Soil.....	11.9-60
Figure 11.9-19:	Illustration of the Water Table.....	11.9-61
Figure 11.9-20:	Illustration of Regional Groundwater Flow.....	11.9-62
Figure 11.9-21:	Illustration of Openings in Unconsolidated Soils and Bedrock.....	11.9-64
Figure 11.9-22:	Illustration of Confined Aquifer, Potentiometric Surface, and Artesian Pressure.....	11.9-65
Figure 11.9-23:	Regional Groundwater Flow – Roseton Study Area.....	11.9-66
Figure 11.9-24:	Groundwater Use in the Roseton Study Area.....	11.9-68
Figure 11.9-25:	Seasonal Groundwater Level Variations in Roseton Monitoring Wells.	11.9-70
Figure 11.9-26:	Seasonal Groundwater Temperature Variations in Roseton Monitoring Wells (Sheet 1)	11.9-71
Figure 11.9-27:	Water Levels Measured during the February/March 2008 Depressurization	11.9-74
Figure 11.9-28:	Water Levels Measured during the October/November 2008 Depressurization	11.9-75
Figure 11.9-29:	Water Levels Measured during the November 2009 to January 2010 Depressurization	11.9-76

Figure 11.9-30:	Stream Segments, Photograph Locations, Electrofishing and Benthic Monitoring Stations – Natural Resources Study Area.....	11.9-80
Figure 11.9-31:	Photographs – Stream Segment 1	11.9-81
Figure 11.9-32:	Photograph – Stream Segment 1	11.9-82
Figure 11.9-33:	Stream Segments, Photograph Locations, Electrofishing and Benthic Monitoring Stations – Natural Resources Study Area.....	11.9-84
Figure 11.9-34:	Photographs – Stream Segment 2	11.9-85
Figure 11.9-35:	Stream Segments, Photograph Locations, Electrofishing and Benthic Monitoring Stations – Natural Resources Study Area.....	11.9-86
Figure 11.9-36:	Photographs – Stream Segment 3A	11.9-87
Figure 11.9-37:	Photographs – Stream Segment 3	11.9-89
Figure 11.9-38:	Photographs – Weir.....	11.9-90
Figure 11.9-39:	Photographs – Stream Segment 3B.....	11.9-91
Figure 11.9-40:	Stream Segments, Photograph Locations, Electrofishing and Benthic Monitoring Stations – Natural Resources Study Area.....	11.9-92
Figure 11.9-41:	Photographs – Stream Segment 4	11.9-94
Figure 11.9-42:	Example of Shallow Groundwater and Surface Water Monitoring, Water Year 2014 – Natural Resources Study Area	11.9-96
Figure 11.9-43:	Shallow Groundwater Monitoring Box Plot for Water Year 2014, Growing Season, and Non-Growing Season – Natural Resources Study Area	11.9-97
Figure 11.9-44:	Historic and Baseline Precipitation Summary – Natural Resources Study Area	11.9-100
Figure 11.9-45:	Delineated Wetlands, Photograph Locations, Soil pH Sampling, NWI/NYSDEC Wetlands – Natural Resources Study Area (1 of 4)....	11.9-104
Figure 11.9-46:	Delineated Wetlands, Photograph Locations, Soil pH Sampling, NWI/NYSDEC Wetlands – Natural Resources Study Area (2 of 4)....	11.9-105
Figure 11.9-47:	Delineated Wetlands, Photograph Locations, Soil pH Sampling, NWI/NYSDEC Wetlands – Natural Resources Study Area (3 of 4)....	11.9-106
Figure 11.9-48:	Delineated Wetlands, Photograph Locations, Soil pH Sampling, NWI/NYSDEC Wetlands – Natural Resources Study Area (4 of 4)....	11.9-107
Figure 11.9-49:	Photographs – Stream Segment 3, Wetland A and Wetland B.....	11.9-109
Figure 11.9-50:	Photograph – Stream Segment 3 and Wetland C.....	11.9-110
Figure 11.9-51:	Photographs – Stream Segment 3, Wetland D and Wetland E.....	11.9-112
Figure 11.9-52:	Photographs – Stream Segment 2 and Wetland G.....	11.9-114
Figure 11.9-53:	Photographs – Stream Segment 1 and Wetland I.....	11.9-116

Figure 11.9-54:	FEMA Flood Hazard Areas – Natural Resources Study Area.....	11.9-121
Figure 11.9-55:	Soil Map – Roseton Study Area.....	11.9-166
Figure 11.9-56:	Potential Change in Groundwater Level in the Unconsolidated Aquifer During the Temporary Shutdown.....	11.9-175
Figure 11.9-57:	Potential Change in Groundwater Level in the Bedrock Aquifer During the Temporary Shutdown	11.9-176
Figure 11.9-58:	Potential Change in Groundwater Level in the Unconsolidated Aquifer Long Term Over the Long Term After Decommissioning	11.9-177
Figure 11.9-59:	Potential Change in Groundwater Level in the Bedrock Aquifer Long Term Over the Long Term After Decommissioning	11.9-178
Figure 11.9-60:	Streamflow Distributions for Water Year 2014, Growing Season and Non-Growing Season.....	11.9-180
Figure 11.9-61:	Stream Stage Distributions for Water Year 2014, Growing Season, and Non-Growing Season.....	11.9-182
Figure 11.9-62:	Specific Conductivity Distributions for Water Year 2014, Growing Season, and Non-Growing Season.....	11.9-183
Figure 11.9-63:	Water Temperature Distributions for Water Year 2014, Growing Season, and Non-Growing Season.....	11.9-185
Figure 11.9-64:	Water Temperature Time Series for Water Year 2014.....	11.9-186
Figure 11.9-65:	Relationship Between RWBT Water Pressure and Weir Flow Rate	11.9-187
Figure 11.9-66:	Streamflow Distributions for October 2014 Depressurization Shutdown, Pre-Shutdown, and Post-Shutdown	11.9-189
Figure 11.9-67:	Stream Stage Distributions for October 2014 Depressurization Shutdown, Pre-Shutdown, and Post-Shutdown	11.9-190
Figure 11.9-68:	Specific Conductivity Distributions for October 2014 Depressurization Shutdown, Pre-Shutdown, and Post-Shutdown	11.9-191
Figure 11.9-69:	Water Temperature Distributions for October 2014 Depressurization Shutdown, Pre-Shutdown, and Post-Shutdown	11.9-193
Figure 11.9-70:	Locations of Reference Streams for Baseflow Index Analysis	11.9-199
Figure 11.9-71:	Streamflow Duration Curves for Water Year 2014 – Natural Resources Study Area.....	11.9-201
Figure 11.9-72:	Baseflow Duration Curves for Water Year 2014 – Natural Resources Study Area	11.9-203
Figure 11.9-73:	Mean Leak Contributions Under Various Baseflow Index Scenarios ..	11.9-205
Figure 11.9-74:	Percentage of Baseflow Assumed to be Leak Water Under Various Baseflow Index Scenarios – Natural Resources Study Area	11.9-206

Figure 11.9-75:	Seepage Investigation Network Diagram – Natural Resources Study Area.....	11.9-207
Figure 11.9-76:	Seepage Investigation Results – Natural Resources Study Area	11.9-208
Figure 11.9-77:	Baseflow Distributions under Observed and Projected Conditions for Stream Segment 1 (S1-SW-01).....	11.9-212
Figure 11.9-78:	Baseflow Distributions under Observed and Projected Conditions for Stream Segment 3A (S3-SW-01).....	11.9-213
Figure 11.9-79:	Baseflow Distributions under Observed and Projected Conditions for Stream Segment 3 (S3-SW-02).....	11.9-214
Figure 11.9-80:	Baseflow Distributions under Observed and Projected Conditions for the Unnamed Tributary to Stream Segment 3 (S3-SW-03).....	11.9-215
Figure 11.9-81:	Baseflow Distributions under Observed and Projected Conditions for Stream Segment 3B (S3-SW-04)	11.9-216
Figure 11.9-82:	Baseflow Distributions under Observed and Projected Conditions for Stream Segment 4 (S4-SW-01).....	11.9-217
Figure 11.9-83:	Baseflow Distributions under Observed and Projected Conditions for Stream Segment 4 (S4-SW-02).....	11.9-218
Figure 11.9-84:	Streamflow Distributions under Observed and Projected Conditions for Stream Segment 1 (S1-SW-01).....	11.9-219
Figure 11.9-85:	Streamflow Distributions under Observed and Projected Conditions for Stream Segment 3A (S3-SW-01)	11.9-220
Figure 11.9-86:	Streamflow Distributions under Observed and Projected Conditions for Stream Segment 3 (S3-SW-02).....	11.9-221
Figure 11.9-87:	Streamflow Distributions under Observed and Projected Conditions for the Unnamed Tributary to Stream Segment 3 (S3-SW-03)	11.9-222
Figure 11.9-88:	Streamflow Distributions under Observed and Projected Conditions for Stream Segment 3B (S3-SW-04)	11.9-223
Figure 11.9-89:	Streamflow Distributions under Observed and Projected Conditions for Stream Segment 4 (S4-SW-01).....	11.9-224
Figure 11.9-90:	Streamflow Distributions under Observed and Projected Conditions for Stream Segment 4 (S4-SW-02).....	11.9-225
Figure 11.9-91:	Measured and Predicted Depth to Shallow Groundwater Wetland A, D, and E – Natural Resources Study Area.....	11.9-232
Figure 11.9-92:	Measured and Predicted Depth to Shallow Groundwater Wetland B – Natural Resources Study Area.....	11.9-233
Figure 11.9-93:	Measured and Predicted Depth to Shallow Groundwater Wetland C – Natural Resources Study Area.....	11.9-234

Figure 11.9-94:	Measured and Predicted Depth to Shallow Groundwater Wetland G – Natural Resources Study Area	11.9-235
Figure 11.9-95:	Measured and Predicted Depth to Shallow Groundwater Wetland I – Natural Resources Study Area	11.9-236
Figure 11.9-96:	Estimated Wetland Change - Wetland C North – Natural Resources Study Area	11.9-239
Figure 11.9-97:	Estimated Wetland Change - Wetlands A and Southern C – Natural Resources Study Area	11.9-240
Figure 11.9-98:	Estimated Wetland Change – Wetland B – Natural Resources Study Area.....	11.9-241
Figure 11.9-99:	Estimated Wetland Change – Wetlands D and E – Natural Resources Study Area	11.9-242
Figure 11.9-100	Estimated Wetland Change – Wetland G – Natural Resources Study Area.....	11.9-243
Figure 11.9-101:	Estimated Wetland Change – Wetland I – Natural Resources Study Area.....	11.9-244
Figure 11.9-102:	Estimated Unconsolidated Aquifer Groundwater Influence Area	11.9-262
Figure 11.9-103:	Estimated Unconsolidated Aquifer Groundwater Influence Area and Geotechnical Investigation Boundary	11.9-264
Figure 11.9-104	Illustration of Settlement Due to a Decline in Water Levels	11.9-265
Figure 11.9-105:	Community Facilities – Roseton Study Area.....	11.9-275
Figure 11.9-106:	Open Space and Recreation – Roseton Study Area	11.9-278
Figure 11.9-107:	Historic and Cultural Resources – Roseton Study Area	11.9-281
Figure 11.9-108:	Visual Resources – Roseton Study Area	11.9-287
Figure 11.9-109:	Photographs – Our Lady of Mercy Church.....	11.9-288
Figure 11.9-110:	Estimated Bedrock Aquifer Groundwater Influence Area - Parcels With Known, Potential or Future Wells	11.9-295
Figure 11.10-1:	Well Action Plan – Wawarsing Leak Repair Study Area.....	11.10-3
Figure 11.10-2 :	Well Action Plan – Roseton Study Area Estimated Groundwater Influence Areas	11.10-4
Figure 11.10-3:	Action Plan Parcels in Roseton.....	11.10-8
Figure 11.11-1:	Estimated Impacts to Non-regulated Wetlands - Roseton Study Area...	11.11-2
Figure 12.1-1:	Water for the Future Timeline	12.1-3
Figure 13.1-1:	Well Action Plan – Lucas Turnpike Study Area, Town of Marbletown, Ulster County	13.1-4

Figure 13.1-2: Well Action Plan – Mossybrook Road Study Area, Town of Marbletown, Ulster County 13.1-5

Figure 13.3-1: Well Action Plan – Wawarsing Leak Repair Study Area..... 13.3-2

Figure 13.3-2: Well Action Plan – Roseton Study Area Estimated Groundwater Influence Areas 13.3-3

Figure 13.3-3: Action Plan Parcels in Roseton..... 13.3-7

Figure 14.1-1: Estimated Impacts to Non-regulated Wetlands - Roseton Study Area 14.1-2

Figure 15.4-1: Potential Candidates for Interconnection with New York City 15.4-2

Figure 15.4-2: Configuration of Key Components of the Staten Island Interconnections to New Jersey Water Supply Alternative..... 15.4-4

ADV – acoustic Doppler velocimeter

ArcGIS – A suite of geographic information system software provided by Esri

ASTM – American Society for Testing and Materials

AUV – autonomous underwater vehicle

BANCS – Bank Assessment for Non-point Source Consequences of Sediment

BGPA – Bald and Golden Eagle Protection Act

BMP – Best Management Practice

BWS – Bureau of Water Supply

CATIC – Catskill Aqueduct at the Catskill Influent Chamber

CEA – Critical Environmental Area

CEC – cation exchange capacity

CEQR – City Environmental Quality Review

CMP – Coastal Management Program

COC – contaminant of concern

CPUE – catch per unit effort

CSSO – Combined Seasonal Storage Objective

dB_A – A-weighted decibels

dbh – diameter at breast height

DBP – disinfection by-product

DEIS – Draft Environmental Impact Statement

DEP – Department of Environmental Protection

DGPS – Differential Global Positioning System

EFH – Essential Fish Habitat

EIS – Environmental Impact Statement

EPA – U.S. Environmental Protection Agency

EPT – Ephemeroptera, Plecoptera, Trichoptera

ESA – Environmental Site Assessment

FAD – Filtration Avoidance Determination

FEIS – Final Environmental Impact Statement

FEMA – Federal Emergency Management Agency

FFMP – Flexible Flow Management Program

FIRM – Federal Insurance Rate Map

FP – flowpath

GAC – granular activated carbon

GHG – greenhouse gas

gpm – gallons per minute

HAA – haloacetic acids

HBI – Hilsenhoff's Biotic Index

HDDV – heavy-duty diesel vehicle

HEC-RAS – Hydrologic Engineering Center – River Analysis System

HFC – hydrofluorocarbon

HGL – hydraulic grade line

HUC – Hydrologic Unit Code

IESNA – Illuminating Engineering Society of North America

IPaC – Information for Planning and Conservation

IRP – Interim Ashokan Release Protocol

Leq – equivalent average noise level

LiDAR – Light Detection and Ranging

Lmax – maximum noise level

MBTA – Migratory Bird Treaty Act

MCL – maximum contaminant level

mgd – million gallons per day

mg/L – milligrams per liter

MRDL – maximum residual disinfectant level

NAAQS – National Ambient Air Quality Standards

NAVD 88 – North American Vertical Datum of 1988

NJDEP – New Jersey Department of Environmental Protection

NMFS – National Marine Fisheries Service

NOAA – National Oceanic and Atmospheric Administration

NPDES – National Pollutant Discharge Elimination System

NPL – National Priority List

NRCS – Natural Resources Conservation Service

NTU – Nephelometric Turbidity Units

NWI – National Wetlands Inventory

NWS – National Weather Service

NYC – New York City

NYCRR – New York Code of Rules and Regulations

NYISO – New York Independent System Operator

NYNHP – New York Natural Heritage Program

NYS – New York State

NYSDEC – New York State Department of Environmental Conservation

NYSDOH – New York State Department of Health

NYSDOS – New York State Department of State

NYSDOT – New York State Department of Transportation

NYSOPRHP – New York State Office of Parks, Recreation and Historic Preservation

O&W – Ontario and Western

OSHA – Occupational Safety and Health Administration

OSL – Official Species List

OST – Operations Support Tool

PCB – polychlorinated biphenyl

PCE – Passenger Car Equivalent

PEM – palustrine emergent

PFC – perfluorocarbons

pH – potential of hydrogen

PM₁₀ – particulate matter less than 10 microns in diameter

PM₂₅ – particulate matter less than 2.5 microns in diameter

PMA – Percent Model Affinity

REC – Recognized Environmental Condition

ROW – right-of-way

RWBT – Rondout-West Branch Tunnel

SEQRA – State Environmental Quality Review Act

SHPA – New York State Historic Preservation Act

SHPO – State Historic Preservation Office

SPDES – State Pollutant Discharge Elimination System

SPS – steel pipe siphon

SUNY – State University of New York

SWPPP – Stormwater Pollution Prevention Plan

THM – trihalomethanes

TSD – treatment, storage, and disposal

µg/L – micrograms per liter

USACE – United States Army Corps of Engineers

USDA – United States Department of Agriculture

USFWS – United States Fish and Wildlife Service

USGS – United States Geological Survey

UV – ultraviolet

WFF – Water for the Future

WL – Wetland

WSSO – Water for the Future Shutdown System Operations

air vent – Flue-like structure to be incorporated at pressure tunnels, siphon chambers, and cut-and-cover segments to allow release of trapped air.

alum floc – The resulting mass of alum and natural particles that bind together during alum treatment, settle out of the water column, and deposit on the reservoir bed.

alum system – A system by which alum is added to water to remove turbidity.

aquifer – A formation, group of formations, or part of a formation that contains sufficient saturated, permeable material to yield significant quantities of water to wells and springs.

artesian – Water under pressure where the water level rises above the top of the aquifer.

atmospheric deposition – Deposition of air pollutants to water or land.

Autonomous Underwater Vehicle (AUV) – A robot that travels underwater without an operator. The vehicle is controlled from the surface and used to record various data during deployment.

Bank Assessment for Non-point Source Consequences of Sediment (BANCS) – A modeling tool to determine erodibility of stream banks.

bankfull flow – Flow that fills only the stream channel to the top of its banks, and is statistically equivalent to the 1.5-year flood.

bar – An elevated mass of sediment (such as sand or gravel) that has been deposited by the flow in a stream.

bedding planes – A visible change in rock type or color that marks a division between distinct successive layers in sedimentary rocks.

bedrock aquifer – An aquifer composed of consolidated material such as limestone, sandstone, shale, or other rock type.

bedrock geology – The rock formations found on the earth that can be found exposed at the surface or below the unconsolidated deposits or water.

biofilm – An assemblage of microbial cells that forms when bacteria adhere to surfaces in aqueous environments. It typically consists of a matrix of materials (e.g., polysaccharides) produced by the bacteria and also can contain non-cellular material such as mineral crystals, silt, or other materials.

blow-off chamber – See *siphon drain blow-offs and blow-off valves*.

blow-off valve – See *siphon drain blow-offs and blow-off valves*.

boathole – A large access opening in cut-and-cover tunnel segments to allow personnel and large equipment access to the interior of the aqueduct.

Catskill Influent Chamber – Located at the southern terminus of the Pleasantville Cut-and-Cover Tunnel and through which Catskill Aqueduct water discharges to Kensico Reservoir.

chlorination – For the purposes of this EIS, chlorination is the process of adding chemical oxidants/disinfectants to water, commonly to control biofilm and prevent bacteria growth in water systems. One of two chlorine-based chemicals would be added to the Catskill Aqueduct at Ashokan Screen Chamber: sodium hypochlorite or chlorine dioxide.

chlorine residuals – That portion of applied chlorine, whether from sodium hypochlorite or chlorine dioxide, that remains free and available for disinfection or oxidation reactions. It includes the portion of the chlorine dose that remains after all oxidation and other immediate reactions are complete.

City – New York City

Classification of Waters¹ – A class and standard designation assigned to all waters of the State based on existing or expected best usage of each water or waterway segment.

- Class A and AA: The best usages of Class A and Class AA waters are as a source of water supply for drinking, culinary, or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival.
- Class B: The best usages of Class B waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival.
- Class C: The best usage of Class C waters is fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
- Class D: The best usage of Class D waters is fishing. Due to such natural conditions as intermittency of flow, water conditions not conducive to propagation of game fishery, or stream bed conditions, the waters will not support fish propagation. These waters shall be suitable for fish, shellfish, and wildlife survival. The water quality shall be suitable for

¹ State of New York, New York Codes, Rules and Regulations, 6 NYCRR 701.5, 701.6, 701.7, 701.8, 701.9, and 701.25.

primary and secondary contact recreation, although other factors may limit the use for these purposes.

- The symbol (T) means that the classified waters are trout waters. Any water quality standard, guidance value, or thermal criterion that specifically refers to trout or trout waters applies.
- The symbol (TS) means that the classified waters are trout spawning waters. Any water quality standard, guidance value, or thermal criterion that specifically refers to trout, trout spawning, trout waters, or trout spawning waters applies.

Classification of Wetlands² – Class rankings of wetlands protected by the State based on the benefits and values provided by each wetland. Higher class wetlands provide the greatest level of benefits and are afforded a higher level of protection. New York State defines four classes of wetlands (Class I, II, III, and IV) that are further defined under NYCRR Part 664.5.

cohesionless soils – Soils including gravel, sands, and some silts that allow water to drain rapidly from the pore spaces.

cohesive soils – Soils including clayey silt, sandy clay, silty clay, clay, and organic clay that allow water to drain very slowly from the pore spaces.

compaction grouting – The process of injecting grout under high pressure to displace and compact soils to underpin (stabilize) potentially impacted structures.

conductive – A relative measure of an aquifer’s ability to allow groundwater to flow through the aquifer material.

confined aquifer – An aquifer that is below the land surface that is saturated with water. Layers of impermeable material are both above and below the aquifer, causing it to be under pressure so that when the aquifer is penetrated by a well, the water will rise above the top of the aquifer in an artesian condition.

connection chambers – Chambers connected to the aqueduct where aqueduct water is provided to outside communities.

consolidated – Solid rock that has formed by various geologic processes that result in a rigid solid matrix.

consolidation settlement – A time-related process in saturated soil where the draining of water results in the reduced volume of the soil layer.

culvert drain sluice gates – Located where cut-and-cover tunnels pass over a drainage culvert, and consist of a 10-inch-diameter rising stem sluice gate located in the Catskill Aqueduct. When

² State of New York, New York Codes, Rules and Regulations, 6 NYCRR 664.5

open, the sluice gate allows aqueduct water to drain from the aqueduct into underneath culverts and into streams or drainage channels.

cut-and-cover tunnel – Segments of the aqueduct that are in horseshoe-shaped concrete arches that generally lie a few feet below the ground surface and are approximately 17 feet high and 17.5 feet wide.

dataset mean – The average value for a parameter (e.g., release, spill, water surface elevation) calculated from a collection of model simulations.

dead storage – The water surface elevation below which water cannot be hydraulically accessed and transferred through the water supply system based on intake elevation, which typically indicates low reservoir water surface elevations but may not represent a completely drained reservoir.

dechlorination – The process of removing chlorine residuals from water. Facilities or systems would be constructed to remove chlorine residuals prior to discharge into Kensico Reservoir or other surface waters along the upper Catskill Aqueduct.

dechlorination facility – A larger treatment unit that would remove chlorine residuals from aqueduct water prior to release to Kensico Reservoir.

dechlorination system – Treatment units that will be used at aqueduct leaks or connection chambers for the removal of chlorine residuals prior to release to the environment or receiving waters.

decommission – To remove infrastructure from functional service. Buried infrastructure (e.g., pipelines and tunnels) can be decommissioned in place by disconnecting and sealing, while above grade infrastructure, such as dams, require breaching or removal.

decommissioning – Decommissioning of the bypassed section of the Rondout-West Branch Tunnel and the cessation of existing aqueduct leaks.

depressurization – The act of unwatering the Rondout-West Branch Tunnel by opening a blow-off valve and subsequently closing the blow-off valve to gradually restore flow and re-pressurize the Rondout-West Branch Tunnel.

dewatering – Construction water control that may involve the removal or draining of groundwater or surface water from a construction site or streambed, typically by pumping. On a construction site, dewatering may be implemented before subsurface excavations to temporarily lower the water table during the work effort. This frequently involves the use of submersible pumps.

disinfection – Removal, deactivation, or killing of pathogenic or other microorganisms in water and wastewater.

disinfection by-product – Chemical, organic, and inorganic substances that can be formed during a reaction of a disinfectant (i.e., sodium hypochlorite or chlorine dioxide) with naturally

present organic matter in the water. These may include trihalomethanes (THM), haloacetic acids (HAA), chlorite, and/or chlorate.

diversion – Controlled movement of water between reservoirs or systems through tunnels or aqueducts that would not otherwise be connected.

downtake chamber – A chamber located at the start of a pressure tunnel segment and that is a connection point with an adjacent aqueduct segment.

effective discharge – An index that describes the streamflow responsible for carrying the most sediment over time and forming the geometry of the channel.

emitting property line – The property line nearest to the work activities.

entrainment – The ability of the flow of water to move or transport particles downstream.

flashboards – Removable vertical boards used to prevent backflow of water to facilitate access to the aqueduct for the repair and rehabilitation and future maintenance.

floodplain – The area of land adjacent to a stream or river that stretches from the banks of its channel to the base of the enclosing valley walls and experiences flooding during periods of high flow.

FRAC3DVS Model – A groundwater flow and transport model that can be used for discretely fractured porous bedrock aquifers.

free field conditions – An environment free from obstructions that could affect the way sound travels away from a noise source.

functional feeding groups – Feeding categories assigned to macroinvertebrates by the NYSDEC based on main sources of food. Feeding groups consist of generalist feeders such as gathering collectors, filtering collectors, and predators, and specialized feeders such as scrapers and shredders.

grade tunnel – Unpressurized horseshoe-shaped tunnel segments that are up to 17 feet high and 13 feet wide, with steeper grades than cut-and-cover tunnels.

granular soils – Soils including gravel, sand, or silt with little or no clay content that have no cohesive strength.

HEC-RAS Model – Hydrologic Engineering Center – River Analysis System model used for modeling the hydraulics of water flow through natural rivers and other channels.

hydraulic conductivity – A measurement of the ability of groundwater to flow through a material including bedrock and unconsolidated deposits.

Hydraulic Grade Line (HGL) – An aqueduct's pressure profile that is controlled by the rate of flow and the water levels in the reservoirs it connects.

hydraulic gradient – The change in groundwater level over a particular distance.

hydraulics – The applied science discipline for analyzing the mechanical properties of liquids or fluids.

hydrology – The scientific study of the movement and distribution of water.

inspection and repair – Rondout-West Branch Tunnel Inspection and Repair project.

jet grouting – The process of adding a grout mix to a column of soil to strengthen the soil.

large-scale wash water treatment system – A temporary system that would treat water used during the biofilm removal process in the Catskill Aqueduct. The system would be located before the start of a pressure tunnel or Kensico Reservoir, and would be sized to treat the anticipated volume of biofilm wash water generated from the work segments upgradient of that location.

Light Detecting and Ranging (LiDAR) – A topographic surveying technology that measures elevations of surface features with laser light, typically from an airplane.

limits of construction – The outermost area of disturbance during construction, including, but not limited to, access roads and staging areas requiring improvements, tree removal, excavation and grading, and/or temporary or permanent stream crossings.

littoral zone – The area along the shore of a reservoir.

maximum contaminant level (MCL) – Standard set by the U.S. Environmental Protection Agency for drinking water quality that establishes the limit on the amount of a substance that is allowed in drinking water.

maximum residual disinfectant limit (MRDL) – A level of disinfectant measured at a consumer's tap, above which the possibility of unacceptable health effects exists.

Nephelometric Turbidity Units (NTU) – A measure of suspended particulates using light passing through a sample of water.

Operations Support Tool (OST) Model – DEP's sole integrated water supply and water quality modeling system, used to inform daily operational decisions and support long-term planning for the water supply system.

Outside Community Connections – Also known as Upstate Water Suppliers, Water Supply Connections, upstate wholesale customers, and upstate community customers. Water is supplied via the City's aqueducts and reservoirs directly to communities north of the City via connections to DEP's water supply system. In some cases, one community connection serves multiple municipalities.

oxidant – For water supply systems, a chemical that alters or inactivates pathogens or dissolved constituents in the water, thereby minimizing public health risks and aesthetic concerns.

oxidation – For water supply systems, the chemical process involving loss of electrons by which an oxidant alters constituents present in water.

parent materials – Materials from which soils are derived and formed. A majority of the parent materials in New York are of glacial origin.

passive dechlorination system – An in-line trench constructed within an existing leak flowpath and filled with gravel and granulated activated carbon to remove chlorine residuals from leaking aqueduct water.

Pfankuch – A methodology for determining stream channel stability.

piezometric – The level to which groundwater will rise in a well installed in an unconfined aquifer.

potentiometric – The level to which groundwater will rise in a well installed in a confined aquifer.

pressure tunnel – Segments of the aqueduct located deep beneath the surface. They are circular, concrete-lined, pressurized sections that flow full, with diameters of up to 14.5 feet. They are located in rock to sustain the heavy outward pressure from the water in the tunnel. Vertical shafts are located at each end to connect pressure tunnels to other tunnel segments.

public fishing rights – Permanent easements purchased by NYSDEC from landowners reserved for the purpose of fishing only. Public fishing rights give anglers the right to fish and walk along the bank (usually a 33-foot-wide strip on one or both banks of the stream).

raw water – Untreated aqueduct water.

release – A controlled discharge of water from a reservoir to a downstream waterbody.

repair and rehabilitation – Catskill Aqueduct Repair and Rehabilitation project.

residual water – Water remaining in the aqueduct while it is out of service.

riffles – A shallow section of a stream or river with rapid current and a surface broken by gravel, rubble, or boulders.

riprap – Rock used to protect embankments, streambeds, and shorelines against scour or erosion.

RIVERMorph® – A database software for collecting and processing stream channel measurement data for river assessment/monitoring and engineering applications.

Rosgen Stream Class – A classification system used to divide river reaches into groups that share common physical characteristics as defined in Applied River Morphology (Rosgen 1996).

Scenic Area of Statewide Significance – Area designated by New York State to protect scenic qualities of coastal landscapes.

screen chamber – Structure containing screens capable of capturing debris from aqueduct/reservoir water. A screen chamber is located at the start of the Esopus Cut-and-Cover Tunnel near Ashokan Reservoir.

sedimentary rock – A layered rock, such as limestone or shale, resulting from the consolidation of sediment that has been long buried.

siphon drain blow-offs and blow-off valves – Located at low points in the steel pipe siphon segments to allow water to drain siphon pipes into nearby streams. Each blow-off valve is located in a blow-off chamber, allows water to flow through the blow-off pipes, and is intended to provide drainage of the siphon pipes through siphon drain blow-offs. Blow-off chambers are concrete structures that extend from the below-ground steel pipe siphons to the overlying ground surface.

sluice gate – See *culvert drain sluice gates*.

small-scale wash water treatment system – A temporary system that would treat water used during the biofilm removal process in the Catskill Aqueduct. The system would be located at each of the 10 steel pipe siphons and several proposed boatholes, and would be sized to treat a smaller volume of wash water generated in the immediate work area.

spill – An uncontrolled discharge of water from a reservoir to a downstream waterbody.

spillway – The structure through which excess water flows out of a reservoir when the water surface elevation is above the spillway crest elevation.

spillway rating curve – The relationship between the height of water flowing above the dam spillway (stage height) and flow.

State – New York State

steel pipe siphon chamber – Chambers located at connection points adjoining cut-and-cover tunnels and steel pipe siphons.

steel pipe siphons – Pressurized tunnel segments that run full and convey water across low-lying areas and dip under or over small valleys, railroads, or waterways. They are up to several thousand feet in length and consist of three cement and mortar-lined steel pipes with a diameter ranging from 7 to 9.5 feet that run parallel to one another.

substrate – The material that rests at the bottom of a stream.

surficial aquifer – An unconfined aquifer that is very near the land surface and whose water surface fluctuates with precipitation, evapotranspiration, well withdrawals, and other local hydrology.

toe-of-slope – The lowest part of an embankment slope and refers to the base of cut-and-cover tunnel berms.

transfers – The controlled movement of water between connected reservoirs primarily via natural flow paths for the purpose of supplying drinking water.

transmissive – A relative measure of a unit thickness of an aquifer to transmit a volume of water.

turbidity – An optical property of water influenced by the presence of higher concentrations of suspended particles that make water opaque or cloudy. These particles normally consist of suspended clay, silt, organic and inorganic material, and microscopic organisms. Turbidity is of concern primarily due to its potential effects on public health because the cloudiness could interfere with chlorine and ultraviolet-light disinfection, rendering disinfection less effective. Further, contaminants may adhere to or be encapsulated by the suspended particles.

turbidity curtain – A floating barrier used to contain silt and sediment within the construction zone when performing in-water construction.

unconfined aquifer – An aquifer whose upper water surface (water table) is at atmospheric pressure and thus is able to rise and fall.

unconsolidated – A geologic material whose particles are not cemented together in a solid matrix.

unconsolidated aquifer – An aquifer composed of loosely arranged uncemented particles and grains ranging from clay to sand.

unwater – When an aqueduct is taken out of service for maintenance. Water can be removed from the aqueduct by gravity flow, pumping to a downstream segment, or discharging to surface water through an existing drainage structure (see also *culvert drain sluice gates* and *siphon drain blow-offs and blow-off valves*).

upper Catskill Aqueduct – The first 74 miles of the Catskill Aqueduct, beginning at Ashokan Reservoir in Ulster County, New York, and ending at Kensico Reservoir in Westchester County, New York.

uptake chamber – A chamber located at the end of a pressure tunnel segment and that is a connection point with an adjacent aqueduct segment.

wash water – Water used in the biofilm removal process that would be treated prior to returning it to the Catskill Aqueduct or discharging it to a receiving waterbody.

water surface elevation – The height of the free surface of a reservoir or waterbody in relation to a defined datum.

well yield – Sustainable rate of water flow that a well can draw continuously over an extended period of time.