

Table of Contents

Executive Summary

Chapter 1 – Introduction

1.1 Introduction..... 1-1
1.2 Purpose and Need..... 1-3
1.3 Scope of the ROS..... 1-3
1.4 Decisions To Be Made 1-4
1.5 History of Policy Changes 1-4
1.6 Scoping Process..... 1-6
 1.6.1 Public Involvement 1-7
 1.6.2 Results of the Scoping Process 1-7
1.7 DEIS Public Review Process..... 1-14
1.8 Statutory Overview 1-15
 1.8.1 Tennessee Valley Authority Act..... 1-16
 1.8.2 National Environmental Policy Act 1-16
 1.8.3 Protection of Water Quality..... 1-16
 1.8.4 Protection of Wetlands and Floodplains 1-17
 1.8.5 Flood Control Act of 1944..... 1-17
 1.8.6 Protection of Air Quality..... 1-17
 1.8.7 Protection of Threatened and Endangered Species..... 1-17
 1.8.8 Protection of Cultural Resources..... 1-18
 1.8.9 Protection of Farmland 1-18
 1.8.10 Environmental Justice 1-18
 1.8.11 Homeland Security Act..... 1-18
 1.8.12 Other Regulations and Executive Orders 1-19
1.9 Relationship to Other NEPA Reviews 1-19
1.10 EIS Overview..... 1-21

Chapter 2 – The Water Control System

2.1 Background and Water Control System Overview 2-1
 2.1.1 Rainfall and Runoff..... 2-1
 2.1.2 Structure of the Water Control System..... 2-2
2.2 Water Control System 2-7
 2.2.1 Flows through the Water Control System..... 2-7
 2.2.2 Balancing Operating Objectives 2-9
 2.2.3 Reservoir Operations Policy 2-10
2.3 Existing Water Control System Operations 2-18
 2.3.1 Operations for Navigation..... 2-18
 2.3.2 Operations for Flood Control 2-20
 2.3.3 Operations for Power Production 2-21
 2.3.4 Operations for Water Supply 2-23
 2.3.5 Operations for Water Quality 2-23
 2.3.6 Operations for Recreation 2-25
 2.3.7 Operations for Other Objectives 2-26
 2.3.8 System Monitoring and Decision Support 2-26

Table of Contents

Chapter 3 – Reservoir Operations Policy Alternatives

3.1	Introduction	3-1
3.2	Alternatives Development Process	3-2
3.2.1	Formulating Policy Alternatives	3-2
3.2.2	Screening Preliminary Policy Alternatives	3-3
3.2.3	Selecting Policy Alternatives	3-4
3.2.4	Developing a Preferred Alternative	3-5
3.3	Alternatives Evaluated in Detail	3-5
3.3.1	Base Case	3-11
3.3.2	Reservoir Recreation Alternative A	3-12
3.3.3	Reservoir Recreation Alternative B	3-14
3.3.4	Summer Hydropower Alternative	3-15
3.3.5	Equalized Summer/Winter Flood Risk Alternative	3-16
3.3.6	Commercial Navigation Alternative	3-18
3.3.7	Tailwater Recreation Alternative	3-18
3.3.8	Tailwater Habitat Alternative	3-19
3.3.9	Preferred Alternative	3-20
3.4	Other Actions Considered	3-22
3.4.1	Actions That Exist or Could Be Implemented Independent of a Change in the Reservoir Operations Policy	3-23
3.4.2	Actions Not Included in Any Policy Alternative	3-25
3.5	Comparison of Alternatives	3-28
3.5.1	Objectives Identified during Scoping	3-29
3.5.2	Impacts on Resource Areas	3-29
3.5.3	Regional Economic Effects	3-54
3.6	TVA's Preferred Alternative	3-55

Chapter 4 – Description of the Affected Environment

4.1	Introduction to Affected Environment	4.1-1
4.1.1	Organization of Resource-Specific Sections	4.1-1
4.1.2	Reservoir and Waterbody Classifications	4.1-3
4.1.4	General Setting	4.1-4
4.2	Air Resources	4.2-1
4.2.1	Introduction	4.2-1
4.2.2	Regulatory Programs and TVA Management Activities	4.2-1
4.2.3	Existing Conditions	4.2-2
4.2.4	Expected Future Changes in Emissions	4.2-11
4.3	Climate	4.3-1
4.3.1	Introduction	4.3-1
4.3.2	Regulatory Programs and TVA Management Activities	4.3-1
4.3.3	Existing Conditions	4.3-2
4.3.4	Emissions of Greenhouse Gases	4.3-3
4.4	Water Quality	4.4-1
4.4.1	Introduction	4.4-1
4.4.2	Regulatory Programs and TVA Management Activities	4.4-2
4.4.3	Existing Conditions	4.4-7
4.4.4	Future Trends	4.4-12

Table of Contents

4.5	Water Supply	4.5-1
4.5.1	Introduction.....	4.5-1
4.5.2	Regulatory Programs and TVA Management Activities	4.5-2
4.5.3	Water Supply Availability	4.5-2
4.5.4	Water Supply Pumping Requirements	4.5-5
4.5.5	Water Supply Quality and Treatment	4.5-6
4.6	Groundwater Resources.....	4.6-1
4.6.1	Introduction.....	4.6-1
4.6.2	Regulatory Programs and TVA Management Activities	4.6-1
4.6.3	Geology and Hydrogeology of the Tennessee Valley	4.6-1
4.6.4	Groundwater Use	4.6-2
4.7	Aquatic Resources	4.7-1
4.7.1	Introduction.....	4.7-1
4.7.2	Regulatory Programs and TVA Management Activities	4.7-2
4.7.3	General Description of Aquatic Resources.....	4.7-6
4.7.4	Reservoir Biodiversity.....	4.7-9
4.7.5	Tailwater Biodiversity	4.7-14
4.7.6	Commercial Fishing Operations	4.7-17
4.7.7	Commercial Mussel Operations	4.7-18
4.7.8	Sport Fisheries	4.7-19
4.8	Wetlands.....	4.8-1
4.8.1	Introduction.....	4.8-1
4.8.2	Regulatory Programs and TVA Management Activities	4.8-2
4.8.3	Wetland Location.....	4.8-2
4.8.4	Wetland Type	4.8-8
4.8.5	Wetland Functions.....	4.8-12
4.9	Aquatic Plants.....	4.9-1
4.9.1	Introduction.....	4.9-1
4.9.2	Regulatory Programs and TVA Management Activities	4.9-9
4.9.3	Coverage of Aquatic Plants	4.9-10
4.10	Terrestrial Ecology.....	4.10-1
4.10.1	Introduction.....	4.10-1
4.10.2	Regulatory Programs and TVA Management Activities	4.10-2
4.10.3	Lowland Plant Communities	4.10-6
4.10.4	Upland Plant Communities.....	4.10-8
4.10.5	Wildlife Communities	4.10-9
4.11	Invasive Plants and Animals.....	4.11-1
4.11.1	Introduction.....	4.11-1
4.11.2	Regulatory Programs and TVA Management Activities	4.11-2
4.11.3	Population Abundance and Spread of Invasive Terrestrial Animals and Plants.....	4.11-3
4.11.4	Population Abundance and Spread of Invasive Aquatic Animals.....	4.11-4
4.12	Vector Control.....	4.12-1
4.12.1	Introduction.....	4.12-1
4.12.2	Regulatory Programs and TVA Management Activities	4.12-2
4.12.3	Population Abundance of Permanent Pool Species.....	4.12-3
4.12.4	Population Abundance of Floodwater Species.....	4.12-4

Table of Contents

4.13	Threatened and Endangered Species.....	4.13-1
4.13.1	Introduction.....	4.13-1
4.13.2	Regulatory and TVA Management Activities.....	4.13-2
4.13.3	Occurrence Patterns.....	4.13-2
4.14	Managed Areas and Ecologically Significant Sites.....	4.14-1
4.14.1	Introduction.....	4.14-1
4.14.2	Regulatory Programs and TVA Management Activities.....	4.14-2
4.14.3	Managed Area Integrity of Reservoir- and Tailwater- Dependent Sites.....	4.14-2
4.15	Land Use.....	4.15-1
4.15.1	Introduction.....	4.15-1
4.15.2	Regulatory Programs and TVA Management Activities.....	4.15-2
4.15.3	Shoreline Residential Development.....	4.15-3
4.16	Shoreline Erosion.....	4.16-1
4.16.1	Introduction.....	4.16-1
4.16.2	Regulatory Programs and TVA Management Activities.....	4.16-1
4.16.3	Reservoir Shoreline Erosion Conditions.....	4.16-2
4.16.4	Tailwater Shoreline Erosion Conditions.....	4.16-5
4.17	Prime Farmland.....	4.17-1
4.17.1	Introduction.....	4.17-1
4.17.2	Regulatory Programs and TVA Management Activities.....	4.17-1
4.17.3	Farmland Conversion.....	4.17-3
4.18	Cultural Resources.....	4.18-1
4.18.1	Introduction.....	4.18-1
4.18.2	Regulatory Programs and TVA Management Activities.....	4.18-2
4.18.3	Archaeological Sites.....	4.18-2
4.18.4	Historic Structures.....	4.18-7
4.19	Visual Resources.....	4.19-1
4.19.1	Introduction.....	4.19-1
4.19.2	Regulatory Programs and TVA Management Activities.....	4.19-2
4.19.3	Descriptions of Scenic Value.....	4.19-3
4.19.4	Barren Drawdown Zone or Shoreline Ring.....	4.19-8
4.19.5	Exposure of Reservoir Bottoms and Flats.....	4.19-10
4.19.6	Shoreline Development.....	4.19-13
4.20	Dam Safety.....	4.20-1
4.20.1	Introduction.....	4.20-1
4.20.2	Regulatory Programs and TVA Management Activities.....	4.20-1
4.20.3	Seismology.....	4.20-1
4.20.4	Reservoir Levels.....	4.20-2
4.20.5	Reservoir Drawdown Rates.....	4.20-3
4.20.6	Leakage.....	4.20-3
4.21	Navigation.....	4.21-1
4.21.1	Introduction.....	4.21-1
4.21.2	Regulatory Programs and TVA Management Activities.....	4.21-3
4.21.3	Cargo Movements on the Tennessee River.....	4.21-3
4.22	Flood Control.....	4.22-1
4.22.1	Introduction.....	4.22-1
4.22.2	Regulatory Programs and TVA Management Activities.....	4.22-2
4.22.3	Peak Flows and Frequency.....	4.22-2
4.22.4	Potential Flood Damage.....	4.22-8

4.22.5	Flood Recovery	4.22-10
4.23	Power	4.23-1
4.23.1	Introduction.....	4.23-1
4.23.2	Regulatory Programs and TVA Management Activities	4.23-2
4.23.3	Power Generation Dispatch	4.23-3
4.23.4	Power System Reliability.....	4.23-8
4.23.5	Coal and Nuclear Unit Derates.....	4.23-9
4.24	Recreation	4.24-1
4.24.1	Introduction.....	4.24-1
4.24.2	Regulatory Programs and TVA Management Activities	4.24-4
4.24.3	Recreation use	4.24-4
4.25	Social and Economic Resources.....	4.25-1
4.25.1	Introduction.....	4.25-1
4.25.2	Regulatory Programs and TVA Management Activities	4.25-2
4.25.3	Population	4.25-2
4.25.4	Employment	4.25-3
4.25.5	Total Personal Income	4.25-8
4.25.6	Gross Regional Product.....	4.25-10
4.25.7	Environmental Justice	4.25-10
4.25.8	Direct Economic Drivers.....	4.25-12

Chapter 5 – Environmental Consequences of the Alternatives

5.1	Introduction to Environmental Consequences.....	5.1-1
5.1.1	Organization of Resource Areas Sections.....	5.1-1
5.1.2	Weekly Scheduling Model	5.1-1
5.2	Air Resources	5.2-1
5.2.1	Introduction.....	5.2-1
5.2.2	Assessment Methodology and Results	5.2-1
5.2.3	Base Case.....	5.2-5
5.2.4	Reservoir Recreation Alternative A	5.2-5
5.2.5	Reservoir Recreation Alternative B	5.2-5
5.2.6	Summer Hydropower Alternative.....	5.2-6
5.2.7	Equalized Summer/Winter Flood Risk Alternative.....	5.2-6
5.2.8	Commercial Navigation Alternative	5.2-7
5.2.9	Tailwater Recreation Alternative.....	5.2-7
5.2.10	Tailwater Habitat Alternative.....	5.2-7
5.2.11	Preferred Alternative	5.2-8
5.2.12	Summary of Impacts	5.2-9
5.3	Climate	5.3-1
5.3.1	Impact Assessment Methods	5.3-1
5.3.2	Base Case.....	5.3-2
5.3.3	Reservoir Recreation Alternative A	5.3-2
5.3.4	Reservoir Recreation Alternative B	5.3-3
5.3.5	Summer Hydropower Alternative.....	5.3-3
5.3.6	Equalized Summer/Winter Flood Risk.....	5.3-3
5.3.7	Commercial Navigation Alternative	5.3-3
5.3.8	Tailwater Recreation Alternative.....	5.3-3
5.3.9	Tailwater Habitat Alternative.....	5.3-3
5.3.10	Preferred Alternative	5.3-4
5.3.11	Summary of Impacts	5.3-4

Table of Contents

5.4	Water Quality.....	5.4-1
5.4.1	Introduction.....	5.4-1
5.4.2	Impact Assessment Methods and Data Summarization.....	5.4-2
5.4.3	Base Case.....	5.4-13
5.4.4	Reservoir Recreation Alternative A.....	5.4-13
5.4.5	Reservoir Recreation Alternative B.....	5.4-14
5.4.6	Summer Hydropower Alternative.....	5.4-15
5.4.7	Equalized Summer/Winter Flood Risk Alternative.....	5.4-16
5.4.8	Commercial Navigation Alternative.....	5.4-16
5.4.9	Tailwater Recreation Alternative.....	5.4-17
5.4.10	Tailwater Habitat Alternative.....	5.4-17
5.4.11	Preferred Alternative.....	5.4-18
5.4.12	Impacts of Policy Alternative of DO under Low-Flow Conditions.....	5.4-21
5.4.13	Impacts of Policy Alternatives on Algae.....	5.4-24
5.4.14	General Water Quality Impacts.....	5.4-25
5.4.15	Assimilative Capacity and Anoxic Products.....	5.4-25
5.5	Water Supply.....	5.5-1
5.5.1	Introduction.....	5.5-1
5.5.2	Impact Assessment Methods.....	5.5-1
5.5.3	Base Case.....	5.5-9
5.5.4	All Action Alternatives.....	5.5-9
5.5.5	Summary of Impacts.....	5.5-11
5.6	Groundwater Resources.....	5.6-1
5.6.1	Introduction.....	5.6-1
5.6.2	Impact Assessment Methods.....	5.6-1
5.6.3	Base Case.....	5.6-3
5.6.4	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Tailwater Recreation Alternative, and Tailwater Habitat Alternative—Reservoirs.....	5.6-3
5.6.5	Summer Hydropower Alternative, Equalized Summer/Winter Flood Risk Alternative, and Commercial Navigation Alternative—Reservoirs.....	5.6-4
5.6.6	Preferred Alternative.....	5.6-4
5.6.7	All Policy Alternatives—Tailwaters.....	5.6-4
5.6.8	Summary of Impacts.....	5.6-4
5.7	Aquatic Resources.....	5.7-1
5.7.1	Introduction.....	5.7-1
5.7.2	Impact Assessment Methods.....	5.7-1
5.7.3	Base Case.....	5.7-24
5.7.4	Reservoir Recreation Alternative A.....	5.7-25
5.7.5	Reservoir Recreation Alternative B.....	5.7-27
5.7.6	Summer Hydropower Alternative.....	5.7-28
5.7.7	Equalized Summer/Winter Flood Risk Alternative.....	5.7-30
5.7.8	Commercial Navigation Alternative.....	5.7-31
5.7.9	Tailwater Recreation Alternative.....	5.7-32
5.7.10	Tailwater Habitat Alternative.....	5.7-32
5.7.11	Preferred Alternative.....	5.7-33
5.7.12	Summary of Impacts.....	5.7-36

Table of Contents

5.8	Wetlands.....	5.8-1
5.8.1	Introduction.....	5.8-1
5.8.2	Impact Assessment Methods	5.8-1
5.8.3	Base Case	5.8-2
5.8.4	Reservoir Recreation Alternative A and Tailwater Habitat Alternative	5.8-3
5.8.5	Reservoir Recreation Alternative B and Tailwater Recreation Alternative	5.8-4
5.8.6	Summer Hydropower Alternative.....	5.8-5
5.8.7	Equalized Summer/Winter Flood Risk Alternative.....	5.8-6
5.8.8	Commercial Navigation Alternative	5.8-7
5.8.9	Preferred Alternative	5.8-8
5.8.10	Summary of Impacts	5.8-9
5.9	Aquatic Plants.....	5.9-1
5.9.1	Introduction.....	5.9-1
5.9.2	Impact Assessment Methods	5.9-1
5.9.3	Base Case	5.9-3
5.9.4	Commercial Navigation Alternative	5.9-3
5.9.5	Reservoir Recreation Alternative A and Tailwater Habitat Alternative	5.9-3
5.9.6	Reservoir Recreation Alternative B and Tailwater Recreation Alternative	5.9-4
5.9.7	Summer Hydropower Alternative.....	5.9-4
5.9.8	Equalized Summer/Winter Flood Risk Alternative.....	5.9-4
5.9.9	Preferred Alternative	5.9-5
5.9.10	Summary of Impacts	5.9-5
5.10	Terrestrial Ecology.....	5.10-1
5.10.1	Introduction.....	5.10-1
5.10.2	Impact Assessment Methods	5.10-1
5.10.3	Base Case	5.10-2
5.10.4	Commercial Navigation Alternative	5.10-2
5.10.5	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Tailwater Recreation Alternative, and Tailwater Habitat Alternative.....	5.10-3
5.10.6	Summer Hydropower Alternative.....	5.10-5
5.10.7	Equalized Summer/Winter Flood Risk Alternative.....	5.10-6
5.10.8	Preferred Alternative	5.10-7
5.10.9	Summary of Impacts	5.10-8
5.11	Invasive Plants and Animals.....	5.11-1
5.11.1	Introduction.....	5.11-1
5.11.2	Impact Assessment Methods	5.11-1
5.11.3	Base Case	5.11-1
5.11.4	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Equalized Summer/Winter Flood Risk Alternative, and Tailwater Recreation Alternative.....	5.11-2
5.11.5	Summer Hydropower Alternative.....	5.11-2
5.11.6	Commercial Navigation Alternative	5.11-3
5.11.7	Tailwater Habitat Alternative.....	5.11-3
5.11.8	Preferred Alternative	5.11-3
5.11.9	Summary of Impacts	5.11-4

Table of Contents

5.12	Vector Control.....	5.12-1
5.12.1	Introduction.....	5.12-1
5.12.2	Impact Assessment Methods	5.12-1
5.12.3	Base Case.....	5.12-1
5.12.4	Summer Hydropower Alternative.....	5.12-2
5.12.5	Commercial Navigation Alternative	5.12-2
5.12.6	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Equalized Summer/Winter Flood Risk Alternative, Tailwater Recreation Alternative, and Tailwater Habitat Alternative.....	5.12-2
5.12.7	Preferred Alternative	5.12-2
5.12.8	Summary of Impacts	5.12-3
5.13	Threatened and Endangered Species.....	5.13-1
5.13.1	Introduction.....	5.13-1
5.13.2	Impact Assessment Methods	5.13-1
5.13.3	Base Case.....	5.13-14
5.13.4	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, and Tailwater Recreation Alternative	5.13-15
5.13.5	Equalized Summer/Winter Flood Risk Alternative and Tailwater Habitat Alternative.....	5.13-16
5.13.6	Commercial Navigation Alternative	5.13-17
5.13.7	Summer Hydropower Alternative.....	5.13-18
5.13.8	Preferred Alternative	5.13-18
5.13.9	Summary of Impacts	5.13-19
5.14	Managed Areas and Ecologically Significant Sites.....	5.14-1
5.14.1	Introduction.....	5.14-1
5.14.2	Impact Assessment Methods	5.14-1
5.14.3	Base Case.....	5.14-2
5.14.4	Commercial Navigation Alternative	5.14-2
5.14.5	Reservoir Recreation Alternative A and Tailwater Habitat Alternative	5.14-2
5.14.6	Reservoir Recreation Alternative B and Tailwater Recreation Alternative	5.14-3
5.14.7	Summer Hydropower Alternative.....	5.14-3
5.14.8	Equalized Summer/Winter Flood Risk Alternative.....	5.14-3
5.14.9	Preferred Alternative	5.14-4
5.14.10	Summary of Impacts	5.14-4
5.15	Land Use	5.15-1
5.15.1	Introduction.....	5.15-1
5.15.2	Impact Assessment Methods	5.15-1
5.15.3	Base Case.....	5.15-3
5.15.4	Reservoir Recreation Alternative A	5.15-3
5.15.5	Reservoir Recreation Alternative B	5.15-3
5.15.6	Summer Hydropower Alternative.....	5.15-4
5.15.7	Equalized Summer/Winter Flood Risk Alternative.....	5.15-4
5.15.8	Commercial Navigation Alternative	5.15-4
5.15.9	Tailwater Recreation Alternative.....	5.15-4
5.15.10	Tailwater Habitat Alternative.....	5.15-4
5.15.11	Preferred Alternative	5.15-4
5.15.12	Summary of Impacts	5.15-5

5.16	Shoreline Erosion	5.16-1
5.16.1	Introduction.....	5.16-1
5.16.2	Impact Assessment Methods	5.16-1
5.16.3	Base Case.....	5.16-6
5.16.4	Reservoir Recreation Alternative A	5.16-7
5.16.5	Reservoir Recreation Alternative B and Tailwater Recreation Alternative	5.16-7
5.16.6	Summer Hydropower Alternative.....	5.16-7
5.16.7	Equalized Summer/Winter Flood Risk Alternative.....	5.16-8
5.16.8	Commercial Navigation Alternative	5.16-8
5.16.9	Tailwater Habitat Alternative.....	5.16-8
5.16.10	Preferred Alternative	5.16-8
5.16.11	Summary of Impacts	5.16-9
5.17	Prime Farmland	5.17-1
5.17.1	Impact Assessment Methods	5.17-1
5.17.2	Base Case.....	5.17-2
5.17.3	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Tailwater Recreation Alternative, and Tailwater Habitat Alternative.....	5.17-2
5.17.4	Summer Hydropower Alternative and Equalized Summer/ Winter Flood Risk Alternative	5.17-2
5.17.5	Commercial Navigation Alternative	5.17-3
5.17.6	Preferred Alternative	5.17-3
5.17.7	Summary of Impacts	5.17-3
5.18	Cultural Resources	5.18-1
5.18.1	Introduction.....	5.18-1
5.18.2	Impact Assessment Methods	5.18-1
5.18.3	Base Case.....	5.18-3
5.18.4	Reservoir Recreation Alternative A	5.18-3
5.18.5	Reservoir Recreation Alternative B and Tailwater Recreation Alternative	5.18-4
5.18.6	Summer Hydropower Alternative.....	5.18-4
5.18.7	Equalized Summer/Winter Flood Risk Alternative.....	5.18-5
5.18.8	Commercial Navigation Alternative	5.18-5
5.18.9	Tailwater Habitat Alternative.....	5.18-6
5.18.10	Preferred Alternative	5.18-7
5.18.11	Summary of Impacts	5.18-7
5.19	Visual Resources.....	5.19-1
5.19.1	Introduction.....	5.19-1
5.19.2	Impact Assessment Methods	5.19-1
5.19.3	Base Case.....	5.19-5
5.19.4	Reservoir Recreation Alternative A	5.19-5
5.19.5	Reservoir Recreation Alternative B and Tailwater Recreation Alternative	5.19-5
5.19.6	Summer Hydropower Alternative.....	5.19-6
5.19.7	Equalized Summer/Winter Flood Risk Alternative.....	5.19-6
5.19.8	Commercial Navigation Alternative	5.19-7
5.19.9	Tailwater Habitat Alternative.....	5.19-7
5.19.10	Preferred Alternative	5.19-7
5.19.11	Summary of Impacts	5.19-7

Table of Contents

5.20	Dam Safety	5.20-1
5.20.1	Introduction.....	5.20-1
5.20.2	Impact Assessment Methods	5.20-1
5.20.3	Base Case	5.20-1
5.20.4	All Action Alternatives.....	5.20-1
5.20.5	Summary of Impacts	5.20-2
5.21	Navigation.....	5.21-1
5.21.1	Introduction.....	5.21-1
5.21.2	Impact Assessment Methods	5.21-1
5.21.3	Base Case	5.21-2
5.21.4	SummerHydropower Alternative.....	5.21-3
5.21.5	Equalized Summer/Winter Flood Risk Alternative.....	5.21-3
5.21.6	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Commercial Navigation Alternative, Tailwater Recreation Alternative, and Tailwater Habitat Alternative	5.21-3
5.21.7	Preferred Alternative	5.21-5
5.21.8	Summary of Impacts	5.21-5
5.22	Flood Control	5.22-1
5.22.1	Introduction.....	5.22-1
5.22.2	Impact Assessment Methods	5.22-1
5.22.3	Base Case	5.22-16
5.22.4	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Summer Hydropower Alternative, Tailwater Recreation Alternative, and Tailwater Habitat Alternative	5.22-17
5.22.5	Equalized Summer/Winter Flood Risk Alternative.....	5.22-18
5.22.6	Commercial Navigation Alternative	5.22-19
5.22.7	Preferred Alternative	5.22-19
5.22.8	Summary of Impacts	5.22-19
5.23	Power	5.23-1
5.23.1	Introduction.....	5.23-1
5.23.2	Impact Assessment Methodology.....	5.23-1
5.23.3	Base Case	5.23-4
5.23.4	Reservoir Recreation Alternative A	5.23-5
5.23.5	Reservoir Recreation Alternative B and Tailwater Recreation Alternative	5.23-8
5.23.6	Summer Hydropower Alternative.....	5.23-9
5.23.7	Equalized Summer/Winter Flood Risk Alternative.....	5.23-10
5.23.8	Commercial Navigation Alternative	5.23-11
5.23.9	Tailwater Habitat Alternative.....	5.23-12
5.23.10	Preferred Alternative	5.23-13
5.23.11	Summary of Impacts	5.23-14
5.24	Recreation	5.24-1
5.24.1	Introduction.....	5.24-1
5.24.2	Impact Assessment Methods	5.24-1
5.24.3	Base Case.....	5.24-1
5.24.4	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Tailwater Recreation Alternative, Tailwater Habitat Alternative, and Preferred Alternative	5.24-3
5.24.5	Summer Hydropower Alternative.....	5.24-5
5.24.6	Equalized Summer/Winter Flood Risk Alternative.....	5.24-6

5.24.7	Commercial Navigation Alternative	5.24-6
5.24.8	Summary of Impacts	5.24-7
5.25	Social and Economic Resources	5.25-1
5.25.1	Introduction.....	5.25-1
5.25.2	Impact Assessment Methods	5.25-1
5.25.3	Base Case.....	5.25-19
5.25.4	Reservoir Recreation Alternative A	5.25-20
5.25.5	Reservoir Recreation Alternative B	5.25-20
5.25.6	Summer Hydropower Alternative.....	5.25-20
5.25.7	Equalized Summer/Winter Flood Risk Alternative.....	5.25-21
5.25.8	Commercial Navigation Alternative	5.25-21
5.25.9	Tailwater Recreation Alternative.....	5.25-21
5.25.10	Tailwater Habitat Alternative.....	5.25-21
5.25.11	Preferred Alternative	5.25-22
5.25.12	Environmental Justice	5.25-22
5.25.13	Summary of Impacts	5.25-23

Chapter 6 – Cumulative Impacts

6.1	Introduction.....	6-1
6.2	Cumulative Impacts Associated with Future Trends	6-2
6.2.1	Air Resources/Climate.....	6-2
6.2.2	Water Quality.....	6-3
6.2.3	Water Supply.....	6-5
6.2.4	Aquatic Resources	6-5
6.2.5	Wetlands	6-6
6.2.6	Terrestrial Ecology	6-7
6.2.7	Vector Control	6-7
6.2.8	Threatened and Endangered Species.....	6-8
6.2.9	Managed Areas and Ecologically Significant Sites.....	6-8
6.2.10	Shoreline Erosion	6-8
6.2.11	Cultural Resources.....	6-9
6.2.12	Flood Control.....	6-10
6.2.13	Visual Resources	6-10
6.2.14	Recreation	6-11
6.3	Cumulative Impacts Associated with Future Projects.....	6-11
6.3.1	Identification of Future Projects.....	6-11
6.3.2	Cumulative Impacts Associated with TVA Land Management Plans	6-12
6.3.3	Cumulative Impacts Associated with Other Land Development Programs.....	6-18
6.3.4	Cumulative Impacts Associated with U.S. Forest Service Land Management Plans	6-18
6.3.5	Cumulative Impacts Associated with Hydro Modernization Projects	6-19
6.3.6	Cumulative Impacts Associated with Hydroelectric Projects Licensed by the FERC	6-21

Chapter 7 – Potential Mitigation Measures

7.1	Introduction.....	7-1
7.2	Programmatic Approach to Mitigation	7-1

Table of Contents

7.3	TVA Management Programs—Providing a Framework for Mitigation	7-2
7.4	Potential Impacts and Mitigation for the Preferred Alternative	7-7
7.4.1	Avoidance and Minimization in the Preferred Alternative	7-7
7.4.2	Mitigation for the Preferred Alternative	7-8
7.4.3	Mitigation and Monitoring	7-9
Chapter 8 – List of Preparers		
8.1	TVA Staff	8-1
8.2	TVA Consultants	8-8
Chapter 9 – Distribution List		
9.1	Federal Agencies	9-1
9.2	American Indian Nations	9-3
9.3	State Agencies	9-4
9.4	Libraries	9-6
9.5	Individuals and Organizations	9-8
Chapter 10 – Supporting Information		
10.1	Literature Cited	10.1-1
10.2	Glossary	10.2-1
10.3	Index	10.3-1

List of Appendices (Volume II)

- Appendix A – Water Control System Description Tables**
- Appendix B – Reservoir Operations Study Preliminary Alternatives**
- Appendix C – Model Descriptions and Results**
- Appendix D – Additional Information for Resource Areas**
- Appendix E – Prime Farmland Technical Report**
- Appendix F – Response to Comments on the DEIS**
- Appendix G – Results of Consultation Performed under Section 7 of the Endangered Species Act**
- Appendix H – Results of Consultation Performed under the National Historic Preservation Act**

Table of Contents

List of Figures

<u>Figure</u>		<u>Page</u>
ES.2-01	Tennessee River Watershed and TVA Power Service Area	ES-2
1.1-01	Tennessee River Watershed and TVA Power Service Area	1-2
1.6-01	Community Workshop Keypad Results--Comparison of the Public's Perceptions of and Preferences for TVA Management Priorities	1-10
1.6-02	Telephone Survey Results--Comparison of the Public's Perceptions of and Preferences for TVA Management Priorities	1-10
1.10-01	Contents of the ROS EIS	1-22
2.1-01	Monthly Average Rainfall and Runoff (1903 to 2001)	2-2
2.2-01	Schematic Diagram of the TVA Water Control System	2-8
2.2-02	Achieving a Balance of Reservoir System Operating Objectives (Summer/Fall).....	2-9
2.2-03	Generic Tributary Reservoir Guide Curve	2-12
2.2-04	Generic Mainstem Reservoir Guide Curve.....	2-13
2.3-01	Illustration of Minimum Channel Depth for Navigation	2-19
2.3-02	Storage of Increased Runoff to Prevent Flooding	2-20
2.3-03	Aeration Methods to Increase Oxygen in Water below Hydropower Projects	2-24
3.3-01	Example of Critical-Period Storage Versus Current Flood Guide at Chatuge Reservoir	3-17
4.1-01	Reservoir Operations Study Waterbodies	4.1-5
4.1-02	Physiographic Regions within the Tennessee River Watershed	4.1-10
4.2-01	Ozone Non-Attainment Areas in the Tennessee Valley Region—1-Hour Standard.....	4.2-3
4.2-02	Air Quality Trends for Particulate Matter in the Tennessee Valley Region (1979 to 2002).....	4.2-5
4.2-03	Air Quality Trends for Sulfur Dioxide in the Tennessee Valley Region (1979 to 2002).....	4.2-5
4.2-04	Air Quality Trends for Ozone in the Tennessee Valley Region (1979 to 2002)	4.2-6
4.2-05	National Park and National Wilderness Areas Designated as Air Quality Class I Areas for the Prevention of Significant Deterioration in the Tennessee Valley Region	4.2-8
4.2-06	Rainfall Hydrogen Ion Concentration in the Tennessee Valley Region (1979 to 2002).....	4.2-10
4.2-07	Rainfall Sulfate Concentration in the Tennessee Valley Region (1979 to 2002)	4.2-10
4.3-01	Precipitation Departure from the 1971 to 2000 Average in the Tennessee River Basin	4.3-4
4.4-01	Average Reservoir Ecological Health Score 1994 to 2001	4.4-5

List of Figures (continued)

<u>Figure</u>		<u>Page</u>
4.4-02	Reservoir Characteristics during Summer Pool Elevation from Spring to Early Fall	4.4-9
4.5-01	Water Use in the Tennessee Valley Region for 2000 and 2030	4.5-3
4.5-02	Total Water Use for Thermoelectric Power, Industrial Use, and Public Supply for 2000 and 2030	4.5-4
4.5-03	Consumptive Water Use for Thermoelectric Power, Industrial Use, Public Supply, and Irrigation for 2000 and 2030	4.5-4
4.5-04	Consumptive Water Use Plus Water Transfers out of the Tennessee River Watershed.....	4.5-6
4.6-01	Groundwater Withdrawals by Hydrologic Unit in the Tennessee Valley Region in 2000	4.6-3
4.7-01	Diagram of Flow Zones Used in TVA Reservoir Ecological Monitoring	4.7-13
4.8-01	Wetlands of the TVA Reservoir System by Vegetation Class	4.8-9
4.8-02	Wetland Reservoir Types and Locations (Lacustrine Wetlands).....	4.8-10
4.8-03	Tailwater Reservoir Types and Locations (Riverine Wetlands).....	4.8-11
4.8-04	Other Wetland Types and Positions within the Area of Groundwater Influence (Palustrine System)	4.8-12
4.8-05	Wetlands of the TVA Reservoir System by Water Regime	4.8-13
4.9-01	Aquatic Plant Coverage on TVA Mainstem Reservoirs (1976 to 2002)	4.9-9
4.9-02	Generalized Diagram of Aquatic Plant Zones in a TVA Mainstem Storage Reservoir	4.9-11
4.15-01	Section 26a Permit Approvals of Structures Related to Shoreline Recreation at Norris and Pickwick Reservoirs	4.15-5
4.16-01	Reservoir Shoreline Erosion Rankings (Percent).....	4.16-5
4.17-01	Farmland Conversion within Counties in the Tennessee River Watershed (1987 to 1997).....	4.17-7
4.19-01	The "Ring Effect" from Lower Water Levels—Observed from Fontana Reservoir at an Overlook Site near the Dam.....	4.19-9
4.19-02	The Effects of Lower Pool Levels in Exposing Reservoir Bottom and Flats—Boone Reservoir Observed from a Rural Road Adjacent to a Residential Area	4.19-11
4.19-03	The Effects of Lower Pool Levels—Upper Boone Reservoir Observed from Highway 11E near Bluff City	4.19-12
4.19-04	Effects of Floating Structures Sitting on Exposed Reservoir Bottom and Other Exposed Structures, Resulting in Lowered Scenic Integrity	4.19-14
4.21-01	Inland Navigation System for the Tennessee River and Connecting River Systems	4.21-2
4.22-01	Simulated Peak Discharge Frequency for Chickamauga Dam (1903 to 2001).....	4.22-4

Table of Contents

List of Figures (continued)

<u>Figure</u>	<u>Page</u>
4.22-02 Simulated Peak Discharge under Existing Operations Policy for the Historical Inflows at Six Flood Damage Centers in the Tennessee Valley Region	4.22-4
4.22-03 Peak Discharges from Hypothetical Design Storms for Chickamauga Dam (Scaling Factor 1.50)	4.22-6
4.22-04 Simulated Peak Discharge from 69 Hypothetical Design Storms (Scaling Factor 2.0) at Seven Flood Damage Centers in the Tennessee Valley Region	4.22-6
4.22-05 Estimated Peak Flood Damage from 99-Year Continuous Simulation at Ten Flood Damage Centers in the Tennessee Valley Region	4.22-9
4.23-01 Typical Dispatch of TVA Generating Reserouces to Meet Daily Power Demand (July 11, 2000)	4.23-6
4.24-01 Annual Recreation Use (User Days) of the 35 ROS Projects by Public Access, Private Access, and Commercial Site Users (2002)	4.24-5
4.24-02 Comparative Public Access Recreation Use (User Days) at ROS Reservoirs and Tailwaters (2002)	4.24-6
4.24-03 Reservoir Use (User Days) by Season at Public Access Sites (2002)	4.24-6
4.24-04 Public Access Use (User Days) at ROS Tailwaters (2002)	4.24-7
4.24-05 User Profiles for Public Access Recreation Use at ROS Reservoirs (2002)	4.24-8
4.24-06 Commercial Recreation Use Activities by Project Type (2002)	4.24-10
4.24-07 Commercial Recreation Use at the 35 Reservoirs Studied in the ROS (2002)	4.24-11
4.24-08 Private Recreation Use by Project Type (2002)	4.24-14
4.24-09 Private Recreation Use at the 35 Reservoirs Studied in the ROS (2002)	4.24-14
4.25-01 Projected External Recreation Expenditures during August through October across the TVA System under Existing Reservoir Operating Policy	4.25-19
5.2-01 Comparison of Air Pollutant Emissions by Policy Alternative	5.2-4
5.2-02 Comparison of Policy Alternatives by Season	5.2-4
5.3-01 Comparison of Changes in Annual Total TVA CO ₂ Emissions by Policy Alternative	5.3-2
5.22-01 Simulated Annual Flood Flow Frequency for Chickamauga Dam (1903 to 2001)	5.22-4
5.22-02a Increase in Simulated Peak Flow for Largest Event in 99-Year Period of Record for Six Flood Damage Centers in the Tennessee Valley Region under Reservoir Recreation Alternative A	5.22-5
5.22-02b Increase in Simulated Peak Elevation for Largest Event in 99-Year Period of Record for 10 Flood Damage Centers in the Tennessee Valley Region under Reservoir Recreation Alternative A	5.22-5

List of Figures (continued)

<u>Figure</u>		<u>Page</u>
5.22-03	Peak Discharges from Hypothetical Design Storms for Chickamauga Dam (Scaling Factor 1.50)	5.22-6
5.22-04	Simulated Annual Elevation Frequency in Chattanooga, TN (1903 to 2001)	5.22-7
5.22-05	Expected Additional Dollar Damage at Chattanooga by Policy Alternative Evaluated in Detail Relative to the Base Case for the Largest Event in 99-Year Period of Record.....	5.22-15
5.22-06	Expected Change in Average Annual Damage at Chattanooga by Policy Alternative Evaluated in Detail Relative to the Base Case for the 99-Year Period of Record.....	5.22-16
5.24-01	Changes in Recreation during August through October (2002) by Policy Alternative.....	5.24-4
5.24-02	Percent Changes in Recreation Use by Recreation User Type during August through October (2002) by Policy Alternative	5.24-4
5.25-01	Projected External Recreation Expenditures by Policy Alternative (August through October).....	5.25-7

Table of Contents

List of Tables

<u>Table</u>		<u>Page</u>
ES-01	Summary of Policy Alternative Performance by Objectives Identified during Public Scoping.....	ES-10
ES-02	Summary of Impacts by Policy Alternative	ES-13
ES-03	Annual Economic Effects of Policy Alternatives Based on Changes in Gross Regional Product (2010).....	ES-22
1.6-01	Community Workshops Held during the Scoping Process.....	1-8
1.6-02	Public Feedback Provided during the Scoping Process.....	1-9
1.6-03	Description of Objectives Identified during the Scoping Process	1-12
1.6-04	Operating Options Developed during the Scoping Process	1-14
1.7-01	DEIS Community Workshops.....	1-15
2.1-01	Characteristics of TVA Reservoirs	2-4
3.3-01	General Description of Operations under the Policy Alternatives That Were Evaluated in Detail.....	3-7
3.5-01	Summary of Policy Alternative Performance by Objectives Identified during Public Scoping.....	3-31
3.5-02	Summary of Impacts by Policy Alternative	3-33
3.5-03	Annual Economic Effects of Policy Alternatives Based on Changes in Gross Regional Product (2010).....	3-54
4.1-01	Resource Areas Included in the EIS and Focus of Discussion	4.1-2
4.1-02	ROS Waterbodies Classifications	4.1-6
4.1-03	Physiographic Regions of the Tennessee Valley	4.1-11
4.2-01	National Ambient Air Quality Standards	4.2-2
4.2-02	Summary of TVA Power Plant Emissions of Air Pollutants	4.2-7
4.3-01	Average Temperatures and Departures for the TVA Power Service Area.....	4.3-3
4.3-02	Greenhouse Gas Emissions (millions of tons) (1990 to 2001)	4.3-5
4.4-01	Ecological Health Indicators for TVA Reservoirs in the ROS (2000 and 2001).....	4.4-6
4.4-02	Physical Characteristics of Selected TVA Reservoirs	4.4-8
4.6-01	Summary of Aquifer Properties for the Physiographic Regions in the Tennessee River Region.....	4.6-2
4.6-02	Public Groundwater Supplies within 1 Mile of Reservoir and Tailwater Areas	4.6-4
4.7-01	Key Issues Identified for Assessment of Potential Impacts on Aquatic Resources in the TVA Reservoir System.....	4.7-3
4.7-02	Data Sources Used to Characterize Existing Conditions of Key Issues.....	4.7-4
4.7-03	Potential Impacts of Reservoirs on Aquatic Environment of Regulated Rivers	4.7-7

List of Tables (continued)

<u>Table</u>	<u>Page</u>
4.7-04 Average Benthic Metric Score for Reservoir Samples Collected (1994 through 2001).....	4.7-12
4.7-05 Summary of Scores for the Reservoir Fish Assemblage Index Samples (1993 to 2001).....	4.7-10
4.7-06 Number of Sites in Each Scoring Category in Tailwaters Using the Fish Index of Biotic Integrity	4.7-15
4.7-07 Number of Sites in Each Scoring Category of the Tailwater Benthic Index Samples.....	4.7-16
4.7-08 Average Reservoir Scores for Sport Fish Index Based on Samples from 1997 to 2000	4.7-21
4.8-01 Wetland Amounts for Reservoirs and Tailwaters in the ROS EIS.....	4.8-4
4.8-02 Wetlands with Water-Level Control Structures.....	4.8-3
4.9-01 Invasive or Nuisance Aquatic Plants of Concern to TVA	4.9-3
4.9-02 Aquatic Plant Coverage on TVA Mainstem Reservoirs (1976 to 2002)	4.9-4
4.9-03 Aquatic Plant Species on TVA Mainstem Reservoirs.....	4.9-12
4.9-04 Submersed and Floating-Leaved Aquatic Macrophytes Occurring along Rivers of the Tennessee River System	4.9-15
4.10-01 Globally Imperiled Wetland Plant Communities Known to Occur in the Study Area.....	4.10-3
4.10-02 Globally Imperiled Wetland Plant Communities Not Known but with Potential to Occur in the Study Area	4.10-4
4.10-03 Representative Tree Species Found in Bottomland Hardwood Forests	4.10-6
4.10-04 Representative Tree and Shrub Species Found in Scrub/Shrub Wetlands	4.10-7
4.10-05 Representative Plant Species Found on TVA Reservoir Flats.....	4.10-7
4.13-01 Summary Protection Statistics about the Endangered, Threatened, and Special-Concern Species Known from within 1 Mile or (in parentheses) within 200 Feet around the Waterbodies Included in the ROS.....	4.13-4
4.13-02 Summary Statistics about the Typical Habitats of the Endangered, Threatened, and Special-Concern Species that Exist within 1 Mile or (in parentheses) 200 Feet around the Waterbodies Included in the ROS.....	4.13-6
4.13-03 Summary Statistics about the Known Occurrences of Endangered, Threatened, and Special-Concern Species within 1 Mile or (in parentheses) 200 Feet around the Waterbodies Included in the ROS, Arranged by Waterbody Category.....	4.13-10
4.14-01 Number of Managed Areas and Ecologically Significant Sites by Reservoir.....	4.14-3
4.14-02 Shoreline Miles of Managed Areas and Ecologically Significant Sites for Seven Representative Reservoirs in the TVA System.....	4.14-6

Table of Contents

List of Tables (continued)

<u>Table</u>	<u>Page</u>
4.15-01 The USGS Land-Use Classification System	4.15-4
4.15-02 Shoreline Development for Reservoirs Considered in the Land Use Analysis	4.15-7
4.16-01 Representative Reservoirs Used in the Erosion Analysis	4.16-2
4.16-02 Reservoir Shoreline Erosion Conditions from TVA Automated Land Information System (ALIS) Data	4.16-4
4.16-03 Tailwater Shoreline Erosion Conditions	4.16-6
4.17-01 Acreage of Prime Farmland in the Tennessee River Watershed	4.17-3
4.17-02 Land Use of Prime Farmland within 0.25 Mile of Representative Reservoirs	4.17-4
4.17-03 Acreage of Farmland by Reservoir Grouping	4.17-5
4.17-04 Projection of Prime Farmland Conversion within 0.25 Mile of Representative Reservoirs	4.17-8
4.18-01 Numbers of Archaeological Sites in the Area of Potential Effects	4.18-3
4.18-02 Cultural Affiliation of Archaeological Sites Located between Summer and Winter Pool Elevations	4.18-5
4.18-03 Cultural Affiliation of Archaeological Sites in the Area of Potential Effect	4.18-6
4.18-04 Numbers of Historic Structures in the Area of Potential Effects	4.18-8
4.19-01 Primary Visual Attributes of Representative Reservoirs	4.19-2
4.19-02 Existing Scenic Conditions for Representative Reservoirs	4.19-4
4.20-01 Drawdown Limits for Tributary Reservoirs	4.20-4
4.20-02 Leakage Monitored at Non-Power and Power Projects	4.20-5
4.21-01 Tennessee River Tonnages by Traffic Category	4.21-4
4.21-02 Tennessee River Tonnages by Commodity Group	4.21-4
4.21-03 Regional Economic Development Tennessee River Tonnages by Commodity Group	4.21-5
4.22-01 Critical Locations for Evaluation of Flood Risk Potential	4.22-5
4.23-01 Key Characteristics of the Power System Generation Resources	4.23-5
4.23-02 Power Generation Resources	4.23-7
4.24-01 General Characteristics of the ROS Projects	4.24-2
4.24-02 Comparisons of Types of Recreation Use at Public Access Sites at Six TVA Projects	4.24-9
4.24-03 Commercial Recreational Activities across All Affected Reservoirs	4.24-12
4.24-04 Private Recreation Activity Profiles at the 13 Surveyed Projects	4.24-16
4.25-01 Population in the ROS Analysis Area (1980–2000) (thousands)	4.25-3
4.25-02 Population Forecast for the ROS Analysis Area (2004 to 2030) (thousands)	4.25-4
4.25-03 Employment in the ROS Analysis Area (1980 to 2000) (thousands)	4.25-5

List of Tables (continued)

<u>Table</u>	<u>Page</u>
4.25-04 Labor Force and Unemployment in the ROS Analysis Area (2000) (average annual in thousands).....	4.25-6
4.25-05 Employment by Economic Sector in the ROS Analysis Area (2000) (thousands)	4.25-6
4.25-06 Employment Forecast in the ROS Analysis Area (2004 to 2030) (thousands)	4.25-7
4.25-07 Total Personal Income in the ROS Analysis Area (2002 dollars in billions)	4.25-8
4.25-08 Total Income Forecast in the ROS Analysis Area (2004 to 2030) (2002 dollars in billions).....	4.25-9
4.25-09 Gross Regional Product in the ROS Analysis Area (2002 dollars in billions)	4.25-10
4.25-10 Gross Regional Product Forecast (2004 to 2030) (2002 dollars in billions)	4.25-11
4.25-11 Environmental Justice Populations in the ROS Analysis Area (thousands)	4.25-13
4.25-12 Total Power Sales Revenue in the TVA Power Service Area (2004 to 2030) (2002 dollars in millions)	4.25-14
4.25-13 Tennessee River Tonnage that Originated and Terminated on the Tennessee or Cumberland River Systems (1980 to 2000)	4.25-15
4.25-14 Total Traffic on the Tennessee and Cumberland River Systems Less Through-Movement (2004 to 2030) (millions of tons)	4.25-16
4.25-15 Total Shipper Savings by Commodity for the TVA Region under Existing Conditions and Future Trends (2002 dollars in millions)	4.25-16
4.25-16 Annual Expenditures within TVA Economic Sub-Regions (2004 to 2030) (2002 dollars in millions)	4.25-18
4.25-17 Median Values for Properties Adjacent to ROS Reservoirs (thousands)	4.25-20
5.2-01 Summary of Annual Emission Increases/Decreases by Policy Alternative (Based on PROSYM Model Outputs for 2005) (in tons per year)	5.2-2
5.2-02 Increases/Decreases of Nitrogen Oxides Emissions by Policy Alternative (in tons)	5.2-3
5.2-03 Summary of Impacts on Air Resources by Policy Alternative	5.2-10
5.3-01 Summary of Impacts on Climate by Policy Alternative	5.3-5
5.4-01 Water Quality Metrics Used to Evaluate Policy Alternatives	5.4-3
5.4-02 Summation of Responses for Water Quality Characteristics in Representative Reservoirs by Policy Alternative.....	5.4-7
5.4-03 Summation of Responses for Water Quality Characteristics in Representative Dam Releases by Policy Alternative	5.4-10

Table of Contents

List of Tables (continued)

<u>Table</u>	<u>Page</u>
5.4-04	Frequency of Meeting Preferred Minimum Flows at Chickamauga during Summer under the Base Case and the Preferred Alternative5.4-19
5.4-05	Water Quality Model Years with Modeled Flows at or below Preferred Minimum Flows under the Preferred Alternative 5.4-19
5.4-06	Predicted Water Volumes and Percentage of Total Reservoir Volume with Low DO Concentration by Policy Alternative (1993 Flows)5.4-22
5.4-07	Summer Residence Time Changes for Representative Mainstem Reservoirs (1993 Flows)5.4-24
5.4-08	Summary of Impacts on Assimilative Capacity and Anoxia by Policy Alternative5.4-27
5.5-01	Comparison of TVA-Published Minimum Reservoir Elevations to Existing and Proposed Elevations..... 5.5-2
5.5-02	2030 Total Average Water Supply Pumping Rates.....5.5-5
5.5-03	Change in Pumping Energy Required for Action Alternatives.....5.5-6
5.5-04	Comparison of Maximum Algae Concentrations by Policy Alternative.....5.5-7
5.5-05	Impacts on Water Supply by Action Alternative5.5-10
5.5-06	Summary of Impacts on Water Supply by Action Alternative5.5-11
5.6-01	Public Groundwater Wells within Zones of Influence of TVA Reservoirs 5.6-2
5.6-02	Summary of Impacts on Groundwater Resources by Policy Alternative5.6-5
5.7-01	Environmental Factors Used to Evaluate Potential Changes among Species or Communities by Policy Alternative5.7-2
5.7-02	Comparison of Reservoir Dissolved Oxygen Metrics by Policy Alternative 5.7-9
5.7-03	Comparison of Reservoir Hydrology Metrics.....5.7-11
5.7-04	Comparison of Summer Tailwater Metric Values for Tailwaters by Policy Alternative.....5.7-14
5.7-05	Comparison of August-September Tailwater Metric Values by Policy Alternative5.7-16
5.7-06	Comparison of Water Temperature Metric Values for Tailwaters by Policy Alternative.....5.7-18
5.7-07	Comparison of Cool-Water Habitat Reservoir Metrics by Policy Alternative5.7-20
5.7-08	Comparison of Cold-Water Habitat Reservoir Metrics by Policy Alternative5.7-22
5.7-09	Estimated Values for Flowing Mainstem Waterbodies5.7-23
5.8-01	Summary of Impacts on Wetland Resources by Policy Alternative.....5.8-11
5.9-01	Impact Analysis Considerations Related to Aquatic Plants by Operating Option.....5.9-6

List of Tables (continued)

<u>Table</u>	<u>Page</u>
5.9-02 Summary of Impacts on Aquatic and Invasive Aquatic Plants by Policy Alternative	5.9-7
5.10-01 Dates That Shorebird Habitats (Flats) Would Be Exposed during Summer Drawdown by Policy Alternative	5.10-4
5.10-02 Summary of Impacts on Terrestrial Ecology by Policy Alternative	5.10-9
5.11-01 Summary of Impacts on Invasive Terrestrial and Aquatic Animals and Terrestrial Plants by Policy Alternative	5.11-5
5.12-01 Summary of Impacts on Mosquito Population Abundance at Selected Reservoirs by Policy Alternative	5.12-4
5.12-02 Summary of Impacts on Vector Control by Policy Alternative	5.12-5
5.13-01 Number of Protected Species Included in Each Part of the Direct Effects Evaluation.....	5.13-3
5.13-02 Flowing-Water Habitat Evaluation Metrics	5.13-4
5.13-03 Summary of Direct Effects on Threatened and Endangered Species for Mainstem Reservoirs and Tailwaters	5.13-5
5.13-04 Summary of Direct Effects Metrics Related to Protected Species for Warm and Cool-to-Warm Tributary Tailwaters	5.13-7
5.13-05 Summary of Impacts on Endangered, Threatened, and Other Protected Species by Policy Alternative	5.13-21
5.14-01 Summary of Impacts on Managed Areas and Ecologically Significant Sites by Policy Alternative	5.14-5
5.15-01 Summary of Impacts on Land Use by Policy Alternative	5.15-6
5.16-01 Comparison of Duration of Reservoir Surface Elevations in the Shoreline Erosion Zone of Policy Alternatives to Base Case for Representative Reservoirs	5.16-4
5.16-02 Change in Cumulative Shear Stress of Policy Alternatives Compared to Base Case for Representative Reservoirs	5.16-5
5.16-03 Summary of Change from Base Case in Recreation Use by Policy Alternative (August, September, and October)	5.16-6
5.16-04 Summary of Impacts on Shoreline Erosion by Policy Alternative.....	5.16-10
5.17-01 Summary of Impacts on Prime Farmland and Soils by Policy Alternative	5.17-4
5.18-01 NRHP Archaeological Sites by Zone and Policy Alternative	5.18-2
5.18-02 Relative Ranking of Impacts on Cultural Resources by Policy Alternative	5.18-9
5.19-01 Water Level Fluctuations for Representative Reservoirs by Policy Alternative	5.19-2
5.19-02 Duration at High-Pool Elevations for Representative Reservoirs by Policy Alternative.....	5.19-3

Table of Contents

List of Tables (continued)

<u>Table</u>	<u>Page</u>
5.19-03 Late October Median-Pool Level for Representative Reservoirs by Policy Alternative	5.19-4
5.19-04 Summary of Impacts on Scenic Integrity by Policy Alternative	5.19-8
5.20-01 Summary of Impacts on Dam Safety by Policy Alternative	5.20-3
5.21-01 Tennessee River Shipper Savings under the Base Case	5.21-3
5.21-02 Tennessee River Shipper Savings under the Commercial Navigation Alternative	5.21-4
5.21-03 Summary of Impacts on Navigation by Policy Alternative	5.21-6
5.22-01 Critical Locations for Evaluation of Flood Risk Potential	5.22-1
5.22-02 Summary Matrix Evaluation of the Effect of Reservoir Recreation Alternative A on Flood Risk	5.22-8
5.22-03 Summary Matrix Evaluation of the Effect of Reservoir Recreation Alternative B on Flood Risk	5.22-9
5.22-04 Summary Matrix Evaluation of Effect of the Equalized Summer/Winter Flood Risk Alternative on Flood Risk	5.22-10
5.22-05 Summary Matrix Evaluation of Effect of the Commercial Navigation Alternative on Flood Risk	5.22-11
5.22-06 Summary Matrix Evaluation of Effect of the Tailwater Habitat Alternative on Flood Risk	5.22-12
5.22-07 Summary of Impacts on Flood Control by Policy Alternative	5.22-21
5.23-01 Effect of Policy Alternatives on Hydropower Generation Relative to the Base Case	5.23-6
5.23-02 Effect of Policy Alternatives on Shift of Hydropower Generation Relative to the Base Case	5.23-7
5.23-03 Impacts on Power Generation—Annual Production Costs (2010) (millions of dollars)	5.23-8
5.23-04 Summary of Impacts on Power by Policy Alternative	5.23-16
5.24-01 Recreational Use by Policy Alternative for 2002 (August through October)	5.24-2
5.24-02 Summary of Changes in Recreational Use by Policy Alternative (August through October)	5.24-8
5.25-01 Power Cost Change as a Percent of TVA Total Revenue (2004 to 2030) (percent)	5.25-3
5.25-02 Forecast Shipper Savings under the Base Case (2004 to 2030) (2002 dollars in millions)	5.25-4
5.25-03 Changes in Shipper Savings by Policy Alternative (2004 to 2030) (2002 dollars in millions)	5.25-4
5.25-04 Cost to Modify Intakes on Reservoirs with Pool Levels below TVA-Published Minimum Elevations by Policy Alternative (2002 dollars in thousands)	5.25-6

List of Tables (continued)

<u>Table</u>	<u>Page</u>
5.25-05 Changes in Recreational Expenditures from outside the TVA Region (August through October) (2002 dollars in millions)	5.25-8
5.25-06 Estimated Impacts of Changes in Property Values on Consumer Spending across the TVA Region by Policy Alternative (2004 to 2030) (2002 dollars in millions)	5.25-10
5.25-07 Total Economic Effects on Consumer Spending under Reservoir Recreation Alternative A (2004 to 2030)	5.25-11
5.25-08 Total Economic Effects on Consumer Spending under Reservoir Recreation Alternative B (2004 to 2030)	5.25-12
5.25-09 Total Economic Effects on Consumer Spending under the Summer Hydropower Alternative (2004 to 2030).....	5.25-13
5.25-10 Total Economic Effects on Consumer Spending under the Equalized Summer/Winter Flood Risk Alternative (2004 to 2030)	5.25-14
5.25-11 Total Economic Effects on Consumer Spending under the Commercial Navigation Alternative (2004 to 2030).....	5.25-15
5.25-12 Total Economic Effects on Consumer Spending under the Tailwater Recreation Alternative (2004 to 2030).....	5.25-16
5.25-13 Total Economic Effects on Consumer Spending under the Tailwater Habitat Alternative (2004 to 2030).....	5.25-17
5.25-14 Direct Effects by Policy Alternative.....	5.25-18
5.25-15 Summary of Economic Effects by Policy Alternative.....	5.25-19
6.3-01 Summary of Projects Included in the Cumulative Analysis	6-13
6.3-02 Hydro Modernization Projects Considered in Cumulative Impact Analysis	6-20
7.4-01 Mitigation for Potential Adverse Impacts Associated with the Preferred Alternative	7-9
7.4-02 Monitoring for Potential Adverse Impacts Associated with the Preferred Alternative	7-10
7.4-03 Monitoring for Other Resource Areas.....	7-11

List of Acronyms

AHPA	Archaeological and Historic Preservation Act
ALIS	Automated Land Information Systems
AQRV	air quality-related values
APE	area of potential effect
ARPA	Archeological Resources Protection Act
BIBI	Benthic Index of Biotic Integrity
BMPs	best management practices
Board	TVA Board of Directors
CAA	Clean Air Act
CEQ	Council on Environmental Quality
cfs	cubic feet per second
CO	carbon monoxide
CO₂	carbon dioxide
CWA	Clean Water Act
CWIS	cooling water intake structures
DBPs	disinfection by-products
DEIS	Draft Environmental Impact Statement
DO	dissolved oxygen
DOM	dissolved organic matter
EA	Environmental Assessment
EIS	Environmental Impact Statement
ELCP	Emergency Load Curtailment Plan
ESA	Endangered Species Act
FEIS	Final Programmatic Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FPPA	Farmland Protection and Policy Act
GDP	gross domestic product
GIS	geographic information system
GRP	gross regional product
ha	hectares
HAP	hazardous air pollutant
HMOD	hydro modernization
HPA	habitat protection area
IAT	Interagency Team
IAT/PRG	Interagency Team and Public Review Group
IBI	Index of Biotic Integrity
IBT	inter-basin transfer

List of Acronyms (continued)

IDF	inflow design flood
LMP	Land Management Plan
LOLP	loss of load probability
m	meter
Mg/L	milligrams per liter
mgd	million gallons per day
MOG	Minimum Operations Guide
MPF	maximum probable flood
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Council
NFIP	National Flood Insurance Program
NFMA	National Forest Management Act
NHPA	National Historic Preservation Act
NO₂	nitrogen dioxide
NOM	natural organic material
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
NWR	national wildlife refuge
NWS	National Weather Service
O₃	ozone
Pb	lead
PCBs	polychlorinated biphenyls
PI	personal income
PM_{2.5}	particulate matter whose particles are \leq 2.5 micrometers
PM₁₀	particulate matter whose particles are \leq 10 micrometers
PMF	probable maximum flood
PPS	Population Protection Planning Site
PRG	Public Review Group
RED	Regional Economic Development
REITS	real estate investment trusts
REMI	Regional Economic Model, Inc
RFAI	Reservoir Fisheries Assemblage Index
ROS	Reservoir Operations Study

List of Acronyms (continued)

RRI	Reservoir Release Improvement
RTS	reservoir-triggered seismicity
SAHI	Shoreline Aquatic Habitat Index
SAMI	Southern Appalachian Mountains Initiative
SERC	Southeastern Electric Reliability Council
SFI	Sport Fish Index
SFRA	Southern Forest Resource Assessment
SHPO	State Historic Preservation Officer
SIP	state implementation plan
SMI	Shoreline Management Initiative
SMP	Shoreline Management Policy
SMS	Scenery Management System
SO₂	sulfur dioxide
TDEC	Tennessee Department of Environment and Conservation
The Board	TVA Board of Directors
Valley	Tennessee River Valley
TMDL	total maximum daily load
TOC	total organic carbon
TRI	Toxics Release Inventory
TRM	Tennessee River Mile
TSP	total suspended particulates
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound
WMA	wildlife management area
WSM	Weekly Scheduling Model

Metric Conversion Chart

Metric to U.S. Customary

Multiply	By	To Obtain
Millimeters (mm)	0.03937	Inches
Centimeters (cm)	0.3937	Inches
Meters (m)	3.281	Feet
Kilometers (km)	0.6214	Miles
Square meters (m ²)	10.76	Square feet
Square kilometers (km ²)	0.3861	Square miles
Hectares (ha)	2.471	Acres
Liters (l)	0.2642	Gallons
Cubic meters (m ³)	35.31	Cubic feet
Cubic meters	0.0008110	Acre-feet
Milligrams (mg)	0.00003527	Ounces
Grams (g)	0.03527	Ounces
Kilograms (kg)	2.205	Pounds
Metric tons (t)	2205.0	Pounds
Metric tons	1.102	Short tons
Kilocalories (kcal)	3.968	BTU
Celsius degrees	1.8(°C) +32	Fahrenheit degrees

U.S. Customary to Metric

Multiply	By	To Obtain
Inches	25.40	Millimeters
Inches	2.54	Centimeters
Feet (ft)	0.3048	Meters
Fathoms	1.829	Meters
Miles (mi)	1.609	Kilometers
Nautical miles (nmi)	1.852	Kilometers
Square feet (ft ²)	0.0929	Square meters
Acres	0.4047	Hectares
Square miles (mi ²)	2.590	Square kilometers
Gallons (gal)	3.785	Liters
Cubic feet (ft ³)	0.02831	Cubic meters
Acre-feet	1233.0	Cubic meters
Ounces (oz)	28.35	Grams
Pounds (lb)	0.4536	Kilograms
Short tons (ton)	0.9072	Metric tons
British thermal units (BTU)	0.2520	Kilocalories
Fahrenheit degrees	0.5556 (°F -32)	Celsius degrees

This page intentionally left blank.