HAMPTON ROADS REGIONAL WATER SUPPLY PLAN

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION

July 2011

PEP11-06

HAMPTON ROADS PLANNING DISTRICT COMMISSION

DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

CHESAPEAKE
AMAR DWARKANATH
WILLIAM E. HARRELL
CLIFTON E. HAYES, JR.
* ALAN P. KRASNOFF
ELLA P. WARD

FRANKLIN
* JUNE FLEMING
BARRY CHEATHAM

GLOUCESTER COUNTY
* BRENDA G. GARTON
GREGORY WOODWARD

HAMPTON
MARY BUNTING
ROSS A. KEARNEY
* MOLLY JOSEPH WARD

ISLE OF WIGHT COUNTY
W. DOUGLAS CASKEY
* STAN D. CLARK

JAMES CITY COUNTY
* BRUCE C. GOODSON
ROBERT C. MIDDAUGH

NEWPORT NEWS
* NEIL A. MORGAN
MCKINLEY L. PRICE
SHARON P. SCOTT

NORFOLK
ANTHONY L. BURFOOT
* PAUL D. FRAIM
THOMAS R. SMIGIEL
MARCUS JONES
DR. THERESA W. WHIBLEY

POQUOSON
W. EUGENE HUNT, JR
* J, RANDALL WHEELER

PORTSMOUTH
KENNETH L. CHANDLER
* KENNETH I. WRIGHT

SOUTHAMPTON
ANITA T. FELTS
* MICHAEL W. JOHNSON

SUFFOLK
* SELENA CUFFEE-GLENN
LINDA T. JOHNSON

SURRY
* TYRONE W. FRANKLIN
JOHN M. SEWARD

VIRGINIA BEACH
HARRY E. DIEZEL
ROBERT M. DYER
BARBARA M. HENLEY
* LOUIS R. JONES
VACANT
JAMES K. SPORE
JOHN E. UHRIN

WILLIAMSBURG
* CLYDE A. HAULMAN
JACKSON C. TUTTLE

YORK COUNTY
* JAMES O. McREYNOLDS
THOMAS G. SHEPPERD, JR.

*EXECUTIVE COMMITTEE MEMBER

PROJECT STAFF

JOHN M. CARLOCK	HRPDC DEPUTY EXECUTIVE DIRECTOR
WHITNEY S. KATCHMARK	PRINCIPAL WATER RESOURCES ENGINEER
JENNIFER L. TRIBO	SENIOR WATER RESOURCES PLANNER
TIFFANY M. SMITH	WATER RESOURCES PLANNER
LISA L. HARDY	ENVIRONMENTAL PLANNER
SARA J. KIDD	SENIOR REGIONAL PLANNER
BENJAMIN J. McFARLANE	REGIONAL PLANNER
FRANCES D. HUGHEY	ADMINISTRATIVE ASSISTANT
ROBERT C. JACOBS	GENERAL SERVICES MANAGER
MICHAEL R. LONG	ASSISTANT GENERAL SERVICES MANAGER
CHRISTOPHER W. VAIGNEUR	REPROGRAPHIC COORDINATOR

HAMPTON ROADS
REGIONAL WATER SUPPLY PLAN

The Hampton Roads Regional Water Supply Plan was prepared pursuant to the State Water Control Law Section 62.1-44.15 and 62.1-44.38:1 of the Code of Virginia and the State Water Control Board implementing regulations, 9 VAC 25-780, which establishes the planning process and criteria that local governments must use in the development of local or regional water supply plans.

The Hampton Roads Regional Water Supply Plan includes the Cities of Chesapeake, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg, the Counties of Gloucester, Isle of Wight, James City, Southampton, Surry, and York, and the Towns of Boykins, Branchville, Capron, Claremont, Courtland, Dendron, Ivor, Newsoms, Smithfield, Surry, and Windsor.

The plan includes the following elements: description of existing water sources; description of existing water use; assessment of projected water demand; statement of need; alternatives analysis to address projected deficits in water supplies; and descriptions of water management and drought response actions.

Information in the plan is organized by sub-regions as follows:

Peninsula sub-region: Cities of Hampton, Newport News, Poquoson, and Williamsburg; and Counties of Gloucester, James City, and York.

Southside sub-region: Cities of Norfolk, Portsmouth, Virginia Beach, Chesapeake, and Suffolk.

Western Tidewater sub-region: City of Franklin; Counties of Isle of Wight, Southampton, and Surry; and Towns of Boykins, Branchville, Capron, Claremont, Courtland, Dendron, Ivor, Newsoms, Smithfield, Surry, and Windsor.

The March 7, 2007 "Memorandum of Agreement (MOA) Guiding the Hampton Roads Regional Water Supply Planning Process" established the administrative framework for the regional plan, developed under the direction of the Hampton Roads Planning District Commission, Directors of Utilities Committee. The Virginia Department of Environmental Quality contributed funding toward the MOA development.

Preparation of this report was included in the Hampton Roads Planning District Commission
Unified Planning Work Program for Fiscal Years 2008, 2009, 2010, and 2011.

Prepared by the staff of the
Hampton Roads Planning District Commission
PEP-11-06

HAMPTON ROADS PDC PLANNING DISTRICT COMMISSION

JULY 2011

Acknowledgements

The Hampton Roads Planning District Commission (HRPDC) would like to thank the Directors of Utilities Committee and locality representatives for their contributions to the Hampton Roads Regional Water Supply Plan and for their cooperation in the developing the document.

Directors of Utilities Committee:

Lynn Allsbrook, City of Hampton
Daniel G. Clayton III, City of Williamsburg
John B. Edwards, Jr., Surry County
Bryan Foster, City of Portsmouth
Larry Foster, James City County
H. Reed Fowler II, City of Newport News
Edward G. Henifin, Hampton Roads Sanitation District
Julien Johnson, Southampton County
Thomas M. Leahy III, City of Virginia Beach
Kristen M. Lentz, City of Norfolk
Albert Moor II, City of Suffolk
Russell Pace, City of Franklin
Brian Ramaley, City of Newport News
Martin Schlesinger, Gloucester County
Michael Stallings, Town of Windsor
Bob Speechly, City of Poquoson
Peter M. Stephenson, Town of Smithfield
James K. Walski, City of Chesapeake
Brian K. Woodward, York County
Edwin P. Wrightson, Isle of Wight County

Locality Representatives:

Brian Freeman, Town of Smithfield
Frank Haltom, Isle of Wight County
Richard Hartman, City of Portsmouth
Steve Hatcher, Isle of Wight County
Bill Hopkins, Town of Smithfield
John Hudgins, York County
Vernon Land, City of Suffolk and City of Norfolk
Eileen Leininger, City of Newport News
Craig Maples, City of Chesapeake
Jason Mitchell, City of Hampton
Dave Morris, City of Newport News
Sonja Pruitt, Town of Smithfield
Ellen Roberts, City of Poquoson
Gina Shaw, City of Norfolk
Lynda Shaw, City of Suffolk
Everett Skipper, City of Newport News
Moses Thompson, City of Portsmouth
James L. Van de Riet, City of Virginia Beach
Mike Vergakis, James City County
Stephen Watson, City of Franklin
Susan Watson, City of Portsmouth
Joe Wenger, City of Williamsburg
Mark Swilley, York County
Craig Ziesemer, City of Suffolk

HRPDC staff would like to acknowledge consultant CH2M Hill for support in preparing the plan.

Report Documentation

TITLE:

Hampton Roads Regional Water Supply Plan

REPORT DATE:

July 2011

AUTHORS:

Whitney S. Katchmark
Tiffany M. Smith
Lisa L. Hardy
Sara J. Kidd

ORGANIZATION NAME AND CONTACT INFORMATION:

Hampton Roads Planning District Commission
723 Woodlake Drive
Chesapeake, Virginia 23320
(757) 420-8300
http://www.hrpdcva.gov

ABSTRACT:

This document was prepared pursuant to the State Water Control Law Section 62.1-44.15 and 62.1-44.38:1 of the Code of Virginia and the State Water Control Board implementing regulations, 9 VAC 25-780, which establishes the planning process and criteria for local governments to use in the development of local or regional water supply plans. The Hampton Roads Regional Water Supply Plan includes the Cities of Chesapeake, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg, the Counties of Gloucester, Isle of Wight, James City, Southampton, Surry, and York, and the Towns of Boykins, Branchville, Capron, Claremont, Courtland, Dendron, Ivor, Newsoms, Smithfield, Surry, and Windsor. The plan includes the following elements: description of existing water sources; description of existing water use; assessment of projected water demand; statement of need; alternatives analysis to address projected deficits in water supplies; and water management and drought response actions.

ACKNOWLEDGEMENTS:

Funding for this document was provided by the Hampton Roads localities through the Regional Water Program. The Virginia Department of Environmental Quality contributed funding toward the development of the March 7, 2007 “Memorandum of Agreement (MOA) Guiding the Hampton Roads Regional Water Supply Planning Process.”

This document was prepared by the Hampton Roads Planning District Commission in cooperation with the localities. Preparation of this report was included in the Hampton Roads Planning District Commission Unified Planning Work Program for Fiscal Years 2008, 2009, 2010, and 2011.

(This page intentionally left blank.)

TABLE OF CONTENTS

Section 1 | Existing Sources

Existing Sources - Introduction 1-1

Existing Sources - Peninsula Sub-Region 1-2

- York-James Peninsula 1-5
- Cities of Hampton, Newport News, Poquoson, and York County: Publicly-Owned Community Water Systems 1-5
- Newport News Waterworks Service Area: Privately-Owned Community Water Systems 1-7
- Newport News Waterworks Service Area: Self-Supplied Water Systems 1-8
- James City County: Publicly-Owned Community Water Systems 1-11
- James City County: Privately-Owned Community Water Systems 1-12
- James City County: Self-Supplied Water Systems 1-13
- City of Williamsburg: Publicly-Owned Community Water Systems 1-14
- City of Williamsburg: Privately-Owned Community Water Systems 1-14
- City of Williamsburg: Self-Supplied Water Systems 1-15
- Middle Peninsula 1-15
- Gloucester County: Publicly-Owned Community Water Systems 1-15
- Gloucester County: Privately-Owned Community Water Systems 1-16
- Gloucester County: Self-Supplied Water Systems 1-16

Existing Sources - Southside Sub-Region 1-17

- Southside Sub-Region: Water Contracts 1-18
- City of Chesapeake: Publicly-Owned Community Water Systems 1-22
  - Northwest River System 1-22
  - South Norfolk System 1-23
  - Western Branch System 1-24
- City of Chesapeake: Privately-Owned Community Water Systems 1-24

TABLE OF CONTENTS

Section 1 | Existing Sources (continued)

City of Chesapeake: Self-Supplied Water Systems 1-24
City of Norfolk: Publicly-Owned Community Water System 1-27
Western Reservoirs 1-28
Intown Reservoirs 1-29
City of Norfolk: Self-Supplied Water Systems 1-30
City of Portsmouth: Publicly-Owned Community Water System 1-32
City of Portsmouth: Self-Supplied Water Systems 1-33
City of Suffolk: Publicly-Owned Community Water System 1-36
Main System 1-38
Holland System 1-38
Whaleyville System 1-38
City of Suffolk: Privately-Owned Community Water Systems 1-39
City of Suffolk: Self-Supplied Water Systems 1-39
City of Virginia Beach: Publicly-Owned Community Water System 1-40
City of Virginia Beach: Self-Supplied Water Systems 1-41
Existing Sources – Western Tidewater Sub-Region 1-43
City of Franklin 1-47
Isle of Wight County: Publicly-Owned Community Water Systems 1-48
Isle of Wight County: Privately-Owned Community Water Systems 1-52
Isle of Wight County: Self-Supplied Water Systems 1-54
Town of Smithfield: Publicly-Owned Community Water System 1-56
Town of Smithfield: Privately-Owned Community Water Systems 1-56
Town of Smithfield: Self-Supplied Water Systems 1-57

TABLE OF CONTENTS

Section 1 | Existing Sources (continued)

Town of Windsor: Publicly-Owned Community Water System 1-58
Southampton County: Publicly-Owned Community Water Systems 1-59
Town of Capron 1-59
Town of Courtland 1-60
Town of Ivor 1-60
Southampton County: Privately-Owned Community Water Systems 1-61
Southampton County: Self-Supplied Water Systems 1-63
Surry County: Publicly-Owned Community Water Systems 1-65
Town of Claremont 1-65
Town of Dendron 1-65
Town of Surry 1-65
Surry County: Privately-Owned Community Water System 1-68
Surry County: Self-Supplied Water Systems 1-68

Section 2 | Existing Water Use

Existing Water Use 2-1
Existing Water Use – Peninsula Sub-Region 2-2
Publicly-Owned Community Water Systems 2-3
York-James Peninsula 2-6
Newport News Waterworks: Publicly-Owned Community Water System 2-6
JCSA: Publicly-Owned Community Water Systems 2-7
The City of Williamsburg: Publicly-Owned Community Water System 2-7

TABLE OF CONTENTS

Section 2 | Existing Water Use (continued)

Middle Peninsula 2-7
Gloucester County: Publicly-Owned Community Water System 2-7
Privately-Owned Community Water Systems 2-8
Self-Supplied Users Served by Private Residential or Private Business Wells 2-9
Self-Supplied Users Withdrawing More Than 300,000 Gallons per Month 2-10
Non-Agricultural Users: Surface Water Use 2-10
Non-Agricultural Users: Groundwater Use 2-10
Agricultural Users 2-10
Existing Water Use – Southside Sub-Region 2-12
Publicly-Owned Community Water Systems 2-13
City of Chesapeake: Publicly-Owned Community Water Systems 2-14
City of Norfolk: Publicly-Owned Community Water System 2-15
City of Portsmouth: Publicly-Owned Community Water System 2-16
City of Suffolk: Publicly-Owned Community Water Systems 2-16
City of Virginia Beach: Publicly-Owned Community Water System 2-17
Privately-Owned Community Water Systems 2-18
Chesapeake: Privately-Owned Community Water Systems 2-18
Suffolk: Privately-Owned Community Water Systems 2-18
Self-Supplied Users Served by Private Residential or Private Business Wells 2-19
Self-Supplied Users Withdrawing More Than 300,000 Gallons per Month 2-20
Non-Agricultural Users: Surface Water Use 2-20
Non-Agricultural Users: Groundwater Use 2-20
Agricultural User 2-22

TABLE OF CONTENTS

Section 2 | Existing Water Use (continued)

Existing Water Use – Western Tidewater Sub-Region 2-23

Publicly-Owned Community Water Systems 2-24

Isle of Wight County: Publicly Owned Community Water Systems 2-25

Towns of Smithfield and Windsor: Publicly-Owned Community Water System 2-26

Southampton County: Publicly-Owned Community Water Systems 2-27

City of Franklin: Publicly-Owned Community Water System 2-28

Surry County: Publicly-Owned Community Water Systems 2-29

Privately-Owned Community Water Systems 2-30

Isle of Wight County: Privately-Owned Community Water Systems 2-30

Southampton County: Privately-Owned Community Water Systems 2-30

Surry County: Privately-Owned Community Water Systems 2-30

Self-Supplied Users Served by Private Residential or Private Business Wells 2-32

Self-Supplied Users Withdrawing More Than 300,000 Gallons per Month 2-33

Non-Agricultural Users: Surface Water Use 2-33

Non-Agricultural Users: Groundwater Use 2-33

Agricultural Users 2-35

Section 3 | Existing Resources

Geological Conditions 3-1

Hydrologic Conditions 3-3

Meteorological Conditions 3-7

State and Federal Listed Threatened or Endangered Species and Habitats of Concern 3-13

TABLE OF CONTENTS

Section 3 | Existing Resources (continued)

Anadromous, Trout and Other Significant Fisheries 3-15
River Segments with Recreational Significance 3-17
Sites of Historic or Archaeological Significance 3-22
Unusual Geologic Formations 3-22
Wetlands 3-25
Riparian Buffers and Conservation Easements 3-32
Land Use & Land Cover 3-38
Impaired Waters & Type of Impairment 3-42
Point Source Discharges 3-48
Uranium Mining 3-58
Fluoride 3-59

Section 4 | Projected Water Demands

Publicly-Owned CWSs 4-1
Privately-Owned CWSs 4-6
Large Self-Supplied Water Users 4-8
Small Self-Supplied Water Users 4-9
Projected Demands Across the Region 4-11
Potential Additional Demands on Publicly-Owned CWSs 4-13
    Privately-Owned CWSs 4-13
    Small Self-Supplied Users 4-13
    Large Self-Supplied Users 4-13

TABLE OF CONTENTS

Section 5 | Water Demand Management

Water Demand Management 5-2
- Regional Water Conservation History 5-2
- Water Demand Management Practices 5-4
- Water Efficiency 5-4
  - Wasteful water use ordinance 5-4
  - Landscaping 5-4
  - Water loss awareness: 5-5
  - Water Reuse: 5-6
- Water Conservation Measures 5-8
  - Water Conservation Ordinances 5-9
  - Retrofit Kits: 5-10
  - Water Pressure Reduction: 5-10
  - Irrigation Management: 5-10
  - Rebate Programs: 5-10
  - Water Bills: 5-11
- Reducing Water Loss 5-16
- Water Conservation Summary 5-19

Drought Response and Contingency Plan 5-20
- Water System Relationships 5-20
- Local Policies 5-26
- Drought Response Actions 5-31
- Conclusion 5-34

TABLE OF CONTENTS

Section 6 | Statement of Need

Statement of Need 6-1
Uncertainties Associated with Statement of Need 6-1
Availability of Groundwater 6-1
Climate Change Impacts 6-4
Southside Sub-Region Statement of Need: CWS and Domestic Users 6-6
Western Tidewater Sub-Region Statement of Need: CWS and Domestic Users 6-6
York-James Peninsula Statement of Need: CWS and Domestic Users 6-8
Middle Peninsula Statement of Need: CWS and Domestic Users 6-9
Statement of Need: Self-Supplied Users 6-10
Statement of Need: Summary 6-10

Section 7 | Alternatives

Alternatives 7-1
Historical Alternative Projects 7-1
Alternatives for Increasing Water Supply 7-3
Alternatives for Decreasing Demands 7-7
Summary 7-10

Section 8 | References

References 8-1

TABLE OF CONTENTS

Appendix

Appendix A Department of Environmental Quality Data Sheets for Local and Regional Water Supply Planning Criteria, Existing Water Source (9 VAC 25-780-70) and Existing Water Use (9 VAC 25-780-80) Information

Attachment (DVD in Pocket)

Attachment 1 Hampton Roads Regional Water Supply Plan (Electronic Copy) and Supporting Information

(Supporting information includes 2007 Memorandum of Agreement, water contracts, demand projections, water use data, and conservation and drought policies.)

TABLE OF CONTENTS

(This page intentionally left blank.)

LIST OF MAPS

Section 1 | Existing Sources

Map 1-1 Virginia Groundwater Management Areas 1-1
Map 1-2 Peninsula Sub-Region Community Water System Service Areas and Sources 1-3
Map 1-3 Peninsula Sub-Region Self-Supplied Water Systems 1-4
Map 1-4 Newport News Waterworks Service Area and Water Sources 1-5
Map 1-5 Privately-Owned CWS, Newport News Waterworks Service Area 1-8
Map 1-6 Self-Supplied Water Users in the Newport News Waterworks Service Area 1-9
Map 1-7 James City Service Authority Service Area, Privately-Owned Community Water Systems, and Self-Supplied Users 1-11
Map 1-8 Williamsburg Service Area and Self-Supplied Users 1-14
Map 1-9 Gloucester County Service Area and Privately-Owned Community Water Systems 1-15
Map 1-10 Southside Sub-Region Community Water System Service Areas and Sources 1-19
Map 1-11 Southside Sub-Region Self-Supplied Water Systems 1-20
Map 1-12 City of Chesapeake Sources and Service Area, Privately-Owned Water Systems, and Self-Supplied Water Systems 1-22
Map 1-13 City of Norfolk Sources and Service Area 1-28
Map 1-14 Self-Supplied Water Systems in Norfolk 1-30
Map 1-15 City of Portsmouth Sources and Service Area 1-32
Map 1-16 Self-Supplied Water Systems in Portsmouth 1-34
Map 1-17 City of Suffolk Sources and Service Area, Privately-Owned Water Systems, and Self-Supplied Water Systems 1-37
Map 1-18 City of Virginia Beach Sources and Service Area 1-40
Map 1-19 Self-Supplied Water Systems in Virginia Beach 1-41
Map 1-20 Western Tidewater Sub-Region Community Water System Service Areas and Sources 1-45
Map 1-21 Western Tidewater Sub-Region Self-Supplied Water Systems 1-46
Map 1-22 City Of Franklin Service Area and Self-Supplied Water Systems 1-47
Map 1-23 Isle of Wight County Development Service Districts 1-48
Map 1-24 Isle of Wight County Community Water Systems 1-50

LIST OF MAPS

Section 1 | Existing Sources (continued)

Map 1-25 Self-Supplied Water Systems in Isle of Wight County 1-54
Map 1-26 Town of Smithfield Publicly-Owned Community Water System Service Area and Self Supplied Water Systems 1-56
Map 1-27 Town of Windsor Publicly-Owned Community Water System Service Area 1-58
Map 1-28 Southampton County, Capron, Courtland, Ivor Publicly-Owned Community Water Systems 1-59
Map 1-29 Privately-Owned Community Water Systems in Southampton County 1-61
Map 1-30 Self-Supplied Water Systems in Southampton County 1-64
Map 1-31 Publicly and Privately-Owned Community Water Systems in Surry County 1-66
Map 1-32 Self-Supplied Water Systems in Surry County 1-69

Section 3 | Existing Resources

Map 3-1 Geologic Features in Hampton Roads 3-2
Map 3-2 Major Watersheds 3-4
Map 3-3 Selected Weather Stations 3-8
Map 3-4 Anadromous Fish Presence 3-16
Map 3-5 River Segments with Recreation Significance 3-18
Map 3-6 Chesapeake Bay Impact Crater 3-23
Map 3-7 Wetlands by Type, Peninsula Sub-Region 3-28
Map 3-8 Wetlands by Type, Southside Sub-Region 3-29
Map 3-9 Wetlands by Type, Western Tidewater Sub-Region 3-30
Map 3-10 Land Use Restrictions, Peninsula Sub-Region 3-35
Map 3-11 Land Use Restrictions, Southside Sub-Region 3-36
Map 3-12 Land Use Restrictions, Western Tidewater Sub-Region 3-37
Map 3-13 Land Cover, Peninsula Sub-Region 3-39
Map 3-14 Land Cover, Southside Sub-Region 3-40

LIST OF MAPS

Section 3 | Existing Resources (continued)

Map 3-15 Land Cover, Western Tidwater Sub-Region 3-41

Map 3-16 Water Quality Use Impairments, Peninsula Sub-Region 3-43

Map 3-17 Water Quality Use Impairments, Southside Sub-Region 3-44

Map 3-18 Water Quality Use Impairments, Western Tidewater Sub-Region 3-45

Map 3-19 VPDES Permitted Facilities 3-54

Map 3-20 Water Systems with Fluoride Violations 3-61

LIST OF FIGURES

Section 2 | Existing Water Use

Figure 2-1 2007 Peninsula Sub-Region Total Water Use (mgd) 2-2
Figure 2-2 2007 Peninsula Sub-Region Locality Populations Served by Publicly-Owned Community Water Systems 2-3
Figure 2-3 2007 Peninsula Sub-Region Publicly-Owned Community Water System Use by Type (mgd) 2-4
Figure 2-4 Peninsula Population Served by Private Residential Wells vs. CWSs 2-9
Figure 2-5 Percent of Peninsula Population on Private Residential Wells 2-9
Figure 2-6 Peninsula Self-Supplied Use > 300,000 Gallons per Month (mgd) 2-10
Figure 2-7 2007 Southside Total Water Use (mgd) 2-12
Figure 2-8 2007 Southside Population Served by Publicly-Owned Community Water Systems 2-13
Figure 2-9 2007 Southside Publicly-Owned Community Water System Use by Type (mgd) 2-13
Figure 2-10 2007 City of Chesapeake Publicly-Owned CWS Use by Type (mgd) 2-14
Figure 2-11 2007 City of Norfolk Publicly-Owned CWS Use by Type (mgd) 2-15
Figure 2-12 2007 City of Portsmouth Publicly-Owned CWS Use by Type (mgd) 2-16
Figure 2-13 2007 City of Suffolk Publicly-Owned CWS Use by Type (mgd) 2-16
Figure 2-14 2007 City of Virginia Beach Publicly-Owned CWS Use by Type (mgd) 2-17
Figure 2-15 Southside Population Served by Private Residential Well vs. CWS 2-19
Figure 2-16 Percent of Southside Population on Private Residential Wells 2-19
Figure 2-17 2007 Southside Self-Supplied Use > 300,000 gallons per month (mgd) 2-20
Figure 2-18 2007 Western Tidewater Total Water Use (mgd) 2-23
Figure 2-19 2007 Western Tidewater Population Served by Publicly-Owned Community Water Systems 2-24
Figure 2-20 2007 Western Tidewater Publicly-Owned Community Water System Use by Type (mgd) 2-24
Figure 2-21 2007 Isle of Wight County: Smithfield and Windsor, Publicly-Owned CWS Use by Type (mgd) 2-26
Figure 2-22 2007 Southampton County, Towns of Capron, Courtland, and Ivor Publicly-Owned CWS Use by Type (mgd) 2-27
Figure 2-23 2007 City of Franklin Publicly-Owned CWS Use by Type (mgd) 2-28
Figure 2-24 2007 Surry County Publicly-Owned CWS Use by Type (mgd) 2-29

LIST OF FIGURES

Section 2 | Existing Water Use (continued)

Figure 2-25 2007 Western Tidewater Population Served by Private Residential Wells vs. CWS 2-32
Figure 2-26 2007 Percent of Western Tidewater on Private Residential Wells (mgd) 2-32
Figure 2-27 2007 Western Tidewater Self-Supplied Use > 300,000 gallons per month (mgd) 2-34

Section 3 | Existing Resources

Figure 3-1 Cross-section of Coastal Plain aquifer system (McFarland & Bruce, 2006) 3-1
Figure 3-2 Historic climate data from monitoring station in Hampton, Virginia. 3-9
Figure 3-3 Historic climate data from monitoring station in Williamsburg, Virginia. 3-10
Figure 3-4 Historic climate data from monitoring station in Suffolk, Virginia. 3-11
Figure 3-5 Historic climate data from monitoring station in Norfolk, Virginia. 3-12
Figure 3-6 Blackwater Ecological Preserve 3-13
Figure 3-7 Carbell Swamp 3-13
Figure 3-8 Beaverdam Creek swamp forest 3-14
Figure 3-9 Beaverdam Creek floodplain forest 3-14
Figure 3-10 James River near Swanns Point 3-14
Figure 3-11 Northwest River tributary 3-14
Figure 3-12 Simulated water density near the saltwater transition zone, Chesapeake Bay Impact Crater 3-24

Section 4 | Projected Water Demands

Figure 4-1 Projected Water Demands for Publicly-Owned CWSs 4-3
Figure 4-2 Projected Water Demand for Privately-Owned CWS 4-7
Figure 4-3 Projected Water Demands for Large Self-Supplied Users (use > 300,000 gallons per month) 4-8
Figure 4-4 Projected Water Demands for Small Self-Supplied Users (use < 300,000 gal/month) 4-10

LIST OF FIGURES

Section 4 | Projected Water Demands (continued)

Figure 4-5 Projected Water Demands for Public and Private CWSs through 2050 4-11
Figure 4-6 Projected Water Demands for Publicly- and Privately-Owned CWSs and Small Self-Supplied Users (use<300,000 gal/month) .. 4-11

Section 5 | Water Demand Management

Figure 5-1 Reasons for Implementing Water Demand Management Programs 5-1
Figure 5-2 EPA Water Sense Partner Logo 5-7
Figure 5-3 "Water Use it Wisely" logo 5-13
Figure 5-4 HR WET website 5-15
Figure 5-5 Top U.S. Water Conservation Programs 5-19
Figure 5-6 Peninsula Sub-Region 5-21
Figure 5-7 Peninsula Sub-Region 5-23
Figure 5-8 Peninsula Sub-Region 5-25

Section 6 | Statement of Need

Figure 6-1 Cross section of Coastal Plain aquifer system (McFarland and Bruce 2006) 6-3
Figure 6-2 Saltwater may migrate farther inland if sea level rises (Barlow 2003). 6-5
Figure 6-3 Comparison of the combined water supplies and projected demands for the Southside and Western Tidewater sub-regions. 6-7
Figure 6-4 Comparison of the water supply and projected demands for the York-James Peninsula. 6-8
Figure 6-5 Comparison of the water supply and projected demands of the Middle Peninsula. 6-9

Section 7 | Alternatives

Figure 7-1 Historical demand throughout the Hampton Roads Region 7-8

LIST OF TABLES

Section 1 | Existing Sources

Table 1-1: Newport News Waterworks Water Supply 1-7
Table 1-2: 2007 Non-Agricultural Self-Supplied Use > 300,000 gallons/month in the Newport News Waterworks Service Area 1-10
Table 1-3: 2007 James City Service Authority Publicly-Owned Community Water Systems 1-12
Table 1-4: 2007 Non-Agricultural Self-Supplied Use > 300,000 gallons/month in James City County 1-13
Table 1-5: Southside Sub-Region Water Sales 1-21
Table 1-6: 2007 Chesapeake Publicly-Owned CWSs 1-23
Table 1-7: 2007 Privately–Owned CWSs in Chesapeake 1-25
Table 1-8: 2007 Self-Supplied Use > 300,000 gallons/month in Chesapeake 1-26
Table 1-9: 2007 City of Norfolk - Contracts for Water Sales 1-27
Table 1-10: 2007 Norfolk Publicly-Owned CWSs 1-29
Table 1-11: 2007 Self-Supplied Use > 300,000 gallons per month in Norfolk 1-31
Table 1-12: 2007 City of Portsmouth – Contracts for Water Sales 1-33
Table 1-13: 2007 Self-Supplied Use > 300,000 gallons/month in Portsmouth 1-35
Table 1-14: 2007 Suffolk Publicly-Owned Community Water System 1-36
Table 1-15: Privately-owned CWS in Suffolk 1-39
Table 1-17: 2007 Self-Supplied Use > 300,000 gallons/month in Virginia Beach 1-42
Table 1-18: 2007 Isle of Wight County Water Agreements 1-49
Table 1-19: 2007 Isle of Wight County Publicly-Owned Water Systems 1-51
Table 1-20: 2007 Privately-Owned Community Water Systems in Isle of Wight County 1-53
Table 1-21: 2007 Non-Agricultural Self-Supplied Use > 300,000 gallons/month in Isle of Wight County 1-55
Table 1-22: 2007 Agricultural Self-Supplied Use > 300,000 gallons/month in Isle of Wight County 1-55
Table 1-23: 2007 Non-Agricultural Self-Supplied Use > 300,000 gallons/month in the Town of Smithfield 1-57
Table 1-24: 2007 Publicly-Owned Community Water Systems in Southampton County 1-60
Table 1-25: 2007 Privately-Owned Community Water Systems in Southampton County 1-62

LIST OF TABLES

Section 1 | Existing Sources (continued)

Table 1-26: 2007 Non-Agricultural Self-Supplied Use > 300,000 gallons/month in Southampton County 1-63
Table 1-27: 2007 Agricultural Self-Supplied Use > 300,000 gallons/month in Southampton County 1-65
Table 1- 28: 2007 Publicly-Owned Community Water Systems in Surry County 1-67
Table 1-29: 2007 Privately-Owned Community Water Systems in Surry County 1-67
Table 1-30: 2007 Non-Agricultural Self-Supplied Use > 300,000 gallons/month in Surry County 1-70
Table 1-31: 2007 Self-Supplied Agricultural Use > 300,000 gallons/month in Surry County 1-70

Section 2 | Existing Water Use

Table 2-1: Categories of Use for Peninsula Publicly-Owned Community Water Systems 2-5
Table 2-2: 2007 Peninsula Privately-Owned 2-8
Table 2-3: 2007 Peninsula Self-Supplied Non-Agricultural Users > 300,000 Gallons per Month 2-11
Table 2-4: 2007 Chesapeake Privately-Owned CWS Use 2-18
Table 2-5: 2007 Suffolk Privately-Owned CWS Use 2-18
Table 2-6: 2007 Southside Self-Supplied Non-Agricultural Users >300,000 Gallons Per Month 2-21
Table 2-7: 2007 Southside Self-Supplied Agricultural Users >300,000 gallons per month 2-22
Table 2-8: 2007 Isle of Wight County Publicly-Owned CWS Use 2-25
Table 2-9: 2007 Western Tidewater Privately-Owned Community Water System Use 2-31
Table 2-10: 2007 Western Tidewater Self-Supplied Non-Agricultural Users >300,000 gallons per month 2-33
Table 2-11: 2007 Western Tidewater Self-Supplied -Agricultural Users >300,000 gallons per month 2-35

Section 3 | Existing Resources

Table 3-1: James River Basin USGS HUC 8 Sub-Basins 3-5
Table 3-2: York River Basin USGS HUC 8 Sub-Basins 3-5
Table 3-3: Chesapeake Bay and Small Coastal Basin USGS HUC 8 Sub-Basins 3-6

LIST OF TABLES

Section 3 | Existing Resources (continued)

Table 3-4: Albemarle - Chowan Basin USGS HUC 8 Sub-Basins 3-7
Table 3-5: Selected Weather Stations 3-7
Table 3-6: Annual Meteorological Averages 3-7
Table 3-7: Designated Scenic Rivers in the Hampton Roads 3-17
Table 3-8: National Rivers Inventory Outstandingly Remarkable Values Threshold Criteria 3-19
Table 3-9: National Rivers Inventory Segments in Hampton Roads 3-20
Table 3-10: Wetlands Systems 3-25
Table 3-11: Hampton Roads Wetlands Acreage Summary 3-27
Table 3-12: Hampton Roads Surface Water Supply Sources and Wetlands Summary 3-31
Table 3-13: Hampton Roads Land Cover Type 3-38
Table 3-14: 2008 Impaired Drinking Water Sources in Hampton Roads 3-47
Table 3-15: 2005 VPDES Permitted Facilities in Hampton Roads 3-49
Table 3-16: 2008 Active Solid Waste Management Facilities in Hampton Roads 3-56
Table 3-17: 2008 Superfund Sites in Hampton Roads 3-58
Table 3-18: Community Water Systems in Violation of Fluoride Levels (February 2010) 3-60

Section 4 | Projected Water Demands

Table 4-1: Percentage of Population Served by Publicly-Owned CWSs by Decade 4-2
Table 4-2: 2004 to 2008 Average Per-Capita Water Use 4-2
Table 4-3: Population and Percentage of Population Served by Publicly-Owned CWSs by Decade 4-4
Table 4-4: Projected Public Water Demands for 2050 Disaggregated into Use Categories 4-5
Table 4-5: Projected Population Served by Privately-Owned CWSs 4-6
Table 4-6: Projected Population Served by Private Residential Wells 4-9

LIST OF TABLES

Section 4 | Projected Water Demands (continued)

Table 4-7: Hampton Roads 2010 to 2050 Projected Water Demands 4-12
Table 4-8: Potential Additional Water Demands for Publicly-Owned CWS 4-14

Section 5 | Water Demand Management

Table 5-1: 2007 Hampton Roads Public Utilities 5-3
Table 5-2: Water Efficiency Practices by Locality 5-5
Table 5-3: Maximum Flow Rates and Consumption for Plumbing Fixtures 5-7
Table 5-4: Hampton Roads WaterSense Partners 5-7
Table 5-5: Water Conservation Practices by Locality 5-8
Table 5-6: Local Water Rate Structures 5-11
Table 5-7: HR WET Mobile Educational Trailer Events (2007-2008) 5-14
Table 5-8: Practices by Locality to Reduce Water Loss 5-17
Table 5-9: Local Drought Management Policy Formats 5-26
Table 5-10: Establishing Local Drought Authority in a Water Emergency 5-27
Table 5-11: Penalties Used to Enforce Water Violations 5-29
Table 5-12: Appeals Procedure during a Water Emergency 5-30
Table 5-13: Terminating Drought Emergency 5-30
Table 5-14: State II Drought Warning Response 5-32
Table 5-15: Stage III Drought Emergency Response 5-33
Table 5-16: Stage IV Extreme Drought Emergency Response 5-34

Section 7 | Alternatives

Table 7-1: Historical Alternative Plant Capacity and Cost 7-2

LIST OF ABBREVIATIONS

Abbreviation	Name
305(b)/303(d) Report	Virginia Water Quality Assessment Integrated Report
ASR	aquifer storage and recovery
AWWA	American Water Works Association
Bay Act	Chesapeake Bay Preservation Act
CBPA	Chesapeake Bay Preservation Areas
CIL	commercial, institutional, and light industrial
CIP	Capital Improvement Plan
Corps	U.S. Army Corps of Engineers
CPC	Climate Prediction Center
CWS	community water system
DCR	Department of Conservation and Recreation
DEQ	Department of Environmental Quality
DSD	development service district
EPA	Environmental Protection Agency
GIS	Geographic Information System
gpm	gallon per minute
GWMA	Groundwater Management Area
HRPDC	Hampton Roads Planning District Commission
HRSD	Hampton Roads Sanitation District
HR WET	Hampton Roads Water Efficiency Team
HUC	Hydrologic Unit Code
JCSA	James City Service Authority
kgal	thousand gallons
MCL	maximum contaminant level
mgd	million gallons per day
MS4s	Municipal Separate Storm Sewer Systems
NAWQA	National Water Quality Assessment
NDMC	National Drought Mitigation Center
NCDC	National Climatic Data Center
NCEP	National Centers for Environmental Prediction
NNWW	Newport News Waterworks
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRI	Nationwide Rivers Inventory
NWS	National Weather Service
psi	pounds per square inch
PCBs	polychlorinated biphenyls
PCG	Public Clamming Ground
PMP	Probable Maximum Precipitation
REMI	Regional Economic Models, Inc.
SPSA	Southeastern Public Service Authority
STP	sewage treatment plant
SWAP	Source Water Assessment Program
TMDL	Total Maximum Daily Load
UAW	unaccounted-for water
UIC	underground injection control
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VA USBC	Virginia Uniform Statewide Building Code
VAC	Virginia Administrative Code
VDH	Virginia Department of Health
VPDES	Virginia Pollutant Discharge Elimination System
VDOT	Virginia Department of Transportation
VFWIS	Virginia Fish and Wildlife Information Service
VPDES	Virginia Pollutant Discharge Elimination System
VPPSA	Virginia Peninsulas Public Services Authority
WAOB	World Agricultural Outlook Board
WTP	water treatment plant
WTWA	Western Tidewater Water Authority
WWTP	wastewater treatment plant

(This page intentionally left blank.)